# Kensington Gold Project
# 2008 Annual Report

Prepared by:
Coeur Alaska, Inc.
3031 Clinton Drive, Suite 202
Juneau, AK 99801

for:
U.S. Forest Service
Alaska Region (R-10)
Tongass Minerals Group
Juneau Ranger District
8510 Mendenhall Loop Road
Juneau, AK 99801

February 2009

## Table of Contents


Introduction ..... 1
Summary of 2008 Activities ..... 2
1.0 Public Safety ..... 2
2.0 Construction Activities ..... 2
2.1 Storm Water Controls ..... 3
2.2 Corps of Engineers Wetland Disturbance ..... 3
2.3 Access Corridors ..... 4
3.0 Mine Operations ..... 4
3.1 Ore Production ..... 4
3.2 Development Rock Production ..... 4
3.3 Dust Suppression Activities ..... 4
4.0 Mill Operations ..... 5
4.1 Gold Production ..... 5
4.2 Tailing Production ..... 5
5.0 Solid/Hazardous Waste Generation and Transport ..... 5
6.0 Tailings Storage Facility ..... 6
7.0 Compliance ..... 6
8.0 Reclamation ..... 7
8.1 Revegetation Test Plots ..... 7
9.0 Monitoring ..... 7
9.1 NPDES ..... 7
9.2 Fresh Water ..... 7
9.3 Water Usage ..... 7
9.4 Aquatic Resource Surveys ..... 8
9.5 Marine ..... 8
9.6 Air ..... 8
9.7 Archeology ..... 8
9.8 Tailing Storage Facility Ecological Monitoring Plan ..... 9
9.9 Berners Bay Transportation Plan ..... 9
9.10 Development Rock, Borrow Source, and Tails Material ..... 9
9.11 Construction/Excavation Dewatering (Non-Stormwater) ..... 9
9.12 Tailing Storage Facility Monitoring ..... 9
9.13 Wildlife ..... 10
9.13.1 ADFG Goat Monitoring ..... 10
9.13.2 Goshawk Observations ..... 10
10.0 Avalanche Safety Plan ..... 10
11.0 Dam Safety Oversight Status ..... 11
Projected Activities for 2009 ..... 11
Key Issues and Permitting Activities ..... 11
1.0 Public Safety ..... 12
2.0 Mine Operations ..... 12
3.0 Mill Operations ..... 12

4.0 Tailings Storage Facility ..... 12
5.0 Access Corridors ..... 12
6.0 Reclamation ..... 12
7.0 Proposed Modifications to Monitoring Plans for 2009 ..... 12
8.0 Bonding ..... 12

## Tables

Table 1 Project Surface Disturbance
Table 2 Wetlands Disturbance
Table 3 2008 Spill Summary

## Figures

Figure 1 Site Vicinity
Figure 2 Site Layout
Figures 3-10 Site Facilities

## Attachments

1. Mountain Goat Assessment and Monitoring along the Juneau Access Road Corridor and near the Kensington Mine, Southeast Alaska, ADFG, Sept. 2008.

2. Kensington Marine Mammal Report – 2008 Transportation Action Strategy, September 2008, Kate Savage, Juneau, AK

3. 2008 Northern Goshawk Survey – Kensington Mine Site, July 2008, Kate Savage, Juneau, AK

4. TSF Ecological Monitoring: Upper Slate Lake Dolly Varden Survey, January 2008, Liz Flory, Juneau, AK

5. Preliminary Pre-Construction Survey Results of Herring Spawning Habitat Assessment and Monitoring at Cascade Point, Berners Bay, March 2008, ADFG, Juneau, AK

6. Development Rock Characterization Data for 2008

## References


1. Coeur Alaska, Inc., 2008, Kensington Gold Project NPDES Permit AK-005057-1 Annual Water Quality Monitoring Summary Volume 1: Aquatic Resource Surveys 2008.
2. Coeur Alaska, Inc., 2008, Kensington Gold Project NPDES Permit AK-005057-1 Annual Water Quality Monitoring Summary 2008 Volume 2: Water Quality Data.

# Introduction

The Kensington Gold Project is owned and operated by Coeur Alaska, Inc. (Coeur) a wholly owned subsidiary of Coeur d'Alene Mines, Inc. The project is located on the western and southern flanks of Lions Head Mountain; between Berners Bay and Lynn Canal; and in the drainages of Johnson, Sherman, and Slate Creeks (See Figures 1-10). Coeur Alaska has prepared this annual report to comply with requirements of the U.S. Forest Service (USFS) Plan of Operations (POO) for the Kensington Gold Project.

The Kensington Gold Project received authorization under the POO on June 13, 2005. The Final Supplemental Environmental Impact Statement, U.S. Forest Service Record of Decision and all necessary major permits were issued prior to year end 2005. Coeur Alaska issued construction contracts and ground breaking was initiated during July 2005.

An injunction was granted by the Ninth Circuit Court of Appeals on August 2006 which led to the suspension of construction activities associated with the Slate Lake Tailings Facility. On June, 27, 2008, the U.S. Supreme Court granted the State of Alaska and the Company's Petitions for a writ of certiorari to review the Ninth Circuit Court of Appeals decision relating to the Kensington 404 tailings permit. Oral arguments were presented to the U.S. Supreme Court on January 12, 2009. A final Supreme Court decision on the appeal is expected in the first or second quarter of 2009 which may allow for construction to take place in 2009, leading to potential production in late 2009.

Coeur Alaska submitted a proposed Modified Plan of Operations (MPO) for the Kensington Mine to the U.S. Forest Service (USFS) on January 25, 2008. The MPO proposed the use of the Comet site on the Kensington side of the mine area for tailings storage, using "paste" technology. On September 23, 2008, the company requested that the Forest Service terminate the permitting process for a potential alternative Kensington paste tailings plan.

Section 1.0 contains a synopsis of the activities conducted at the Kensington Gold Project during calendar year 2008, and Section 2.0 contains projections of activities planned for calendar year 2009.

Construction activities and operations have been consistent with the approved POO. No gold production occurred during calendar year 2008.

# Summary of 2008 Activities

## *1.0 Public Safety*

Public access to the project site is managed as defined in the established Public Access Control Plan. Public access to the site must be controlled to ensure the safety of the public. During the construction and operational phases of the Project, hazards such as truck traffic, blasting, barge and tug operations, clearing operations, and earthwork could result in physical harm to unauthorized visitors.

During 2008, personnel accessed the site via boat and rotary wing aircraft. Agency inspections and other public personnel generally accessed the site by fixed winged aircraft and boat.

Supplies and equipment for the facility are delivered by barge to the Slate Creek Cove Marine Terminal.

## 2.0 Construction Activities

Site infrastructure construction continued into 2008 with the exception of the work on the tailings treatment facility. An injunction was received in August 2006 which led to the suspension of construction activities associated with the continued development of the tailings facility. Ongoing surface work in this area is limited to measures taken to stabilize and protect water quality from potential erosion of exposed areas that were previously under construction.

The majority of surface disturbance associated with construction was completed in 2005 and 2006 as outlined in the project disturbance summary Table 1. During 2008, activities focused primarily on completing the mill and support facilities, storm water management, environmental monitoring, and continued maintenance. The water treatment plant and associated ponds and infrastructure received upgrades and were operated and maintained through the year in accordance with the NPDES Permit. Access to the mine, along with the underground mine workings and access to the mine was maintained with some limited underground exploration and development activities occurring throughout the year.

In October of 2008, a workforce reduction of approximately fifty percent occurred at the site. Following the reduction of workforce, approximately 48 individuals were employed at the site. The demographics of the employees were defined as:

- 14.8% Alaska Natives;
- 75.4% Local (Juneau) Hire; and
- 80.3% Alaska Hire.

In addition to Coeur employees, approximately 13 contractors were employed in various positions at the site. The number of contract employees was reduced following the reduction in force in October.

## 2.1 Storm Water Controls

Construction operations on both the Jualin and Comet sides of the Kensington Gold Project were conducted in compliance with Storm Water Pollution Prevention Plan (SWPPP) requirements. Both temporary construction Best Management Practices (BMPs) and sediment pond BMPs were utilized to control excess sediment production from disturbed areas that otherwise might enter waters of the state. A full description of storm water controls can be found in the Storm Water Pollution Prevention Plan (SWPPP) for the Kensington Gold Project, October 2008.

Sediment ponds and silt fences were maintained, existing check dams were maintained, interim stabilization and reclamation activities at Lower Slate Lake were conducted in 2008. Designs for these construction BMPs are discussed in the SWPPP. Most operational (long-term) sediment ponds were constructed during 2005, and all were constructed as designed in the SWPPP Addendum B. Interim stabilization measures conducted in 2008 at Lower Slate Lake are described in Addendum E entitled Lower Slate Lake Storm Water Management Plan (December 17, 2007), and Addendum G entitled Lower Slate Lake Storm Water Management Plan (August 13, 2008. Interim reclamation activities were described in the Lower Slate Lake Interim Reclamation Plan and Addendum 1 to the plan dated April 11 and April 29, 2008 respectively. The Plan was approved by the agencies prior to completing the reclamation.

The nature of construction BMPs is transitory; i.e., they change in response to site conditions and the rapidly evolving ground conditions encountered during construction. Therefore, designs are dependent on site conditions, which may change day by day. However, as construction elements are completed, operational BMP sediment ponds can be developed or eliminated, which discretely demonstrate compliance with the SWPPP as amended.

In addition to SWPPP monitoring and inspections, site receiving water monitoring was also conducted in compliance with the current site NPDES permit to help document compliance with state water quality standards. Receiving water sampling data are discussed below under NPDES monitoring (section 1.9.1).

## 2.2 Corps of Engineers Wetland Disturbance

An annual summary of wetland areas impacted and reclaimed is a requirement of the Corps of Engineers (COE) 404 fill permit. Wetland areas impacted are tallied in Table 2. Overall, total fill in waters of U.S. as of December 2008 was 45.2 acres. As shown in Table 2, there are changes in acreage of wetland impacts from the 2005 404 permit to 2008. There are two primary reasons and a few additional minor reasons why wetland impact acres, on a parcel-by-parcel or facility-by-facility basis, are different than described in the 2005 permit. The primary reasons are: 1) a new wetland delineation on

the Kensington side of the project area that showed less area to be wetland, and 2) the discovery of a mapping error on the Jualin side of the project area. The Jualin mapping error apparently resulted from translating a file from GIS to AutoCAD, resulting in some upland area being shown as wetland and showing upland/wetland mosaic areas as upland. Minor changes resulted from the actual construction conditions on the ground differing from planned leading to small changes from the permitted acres such that less wetland was filled in some areas and more in other areas. Other minor changes resulted from better distinguishing between wetland fill, subject to the 404 permit, and wetland excavation or clearing that are recognized as wetland impacts, but are not treated as fill in the permit. A slight overall net reduction in wetland fill is the end result of changes due to all of these reasons.

An application to modify the 404 permit with the revised wetland impact acreages was prepared and submitted to the COE in January of 2009.

### 2.3 Access Corridors

Road improvements during 2008 were an ongoing priority of project. Continued road surfacing and interim reclamation seeding were major improvements to the road projects in 2008. The maintenance of storm water BMPs along the Jualin and Kensington access corridors were also a major ongoing priority for 2008.

## 3.0 Mine Operations

### 3.1 Ore Production

Mining operations had not commenced during the reporting period, and no ore was milled. However, limited underground development activities did occur during the year.

### 3.2 Development Rock Production

Mine development continued underground with the production of approximately 36,060 tons of development rock, which was hauled outside and stored on the Kensington Development Rock Storage Facility. Additionally, approximately 889 tons of ore was produced in 2008 and stockpiled on the Comet Ore Rock Storage Facility. These numbers assume 10% overbreak and 50% swell factor.

### 3.3 Dust Suppression Activities

During this period the project's climate was exceptionally wet and very limited road watering via water wagon was required. When extended periods of dry weather were encountered road watering activities were utilized to control fugitive dust.

## 4.0 Mill Operations

Activities continued on the mill bench and included continued set-up of the milling facilities inside of the mill and crusher buildings for the eventual milling of ore from the underground workings.

### 4.1 Gold Production

No gold or gold equivalent was produced during the reporting period.

### 4.2 Tailing Production

An injunction was received in August 2006 which led to the suspension of construction activities associated with the continued development of the tails facility. As the tailings portion of the mill complex was not completed, the project was not operational during 2008, therefore no tailings were produced.

## 5.0 Solid/Hazardous Waste Generation and Transport

Solid waste was generated from the Comet and Jualin sides of the Kensington Gold Project, including: incinerator ash, construction debris, worn cable, tires and broken equipment. This material was managed in accordance with the approved ADEC Solid Waste Management Permit. Coeur Alaska generated approximately 123.5 tons of solid waste, including 3.35 tons of incinerator ash, and 1.7 tons of tires. Additionally, approximately 38.5 tons of scrap metal was recycled. These materials were shipped to Juneau, then transported to disposal facilities or otherwise managed according to controlling regulations and permits

In an effort to reduce the quantity of solid waste being sent to the landfill, a site recycling program was established in 2008 for the following materials: scrap metal, plastic bottles, aluminum cans, paper, and cardboard. In addition the used oil, used antifreeze and used batteries recycling programs were maintained. A guideline was developed for the recycling program and training was provided to site personnel

Toxicity Charactristic Leaching Procedure (TCLP) aqueous solution metals extraction results for the incinerator ash sample collected on October 8, 2008 showed all metals were non-detect except for barium and cadmium. Sample concentration results for barium were 0.15, 0.24, 0.29, 0.28, and 0.32 mg/L. Sample concentration results for cadmium were 0.091, 0.057, 0.039, 0.098, and 0.051 mg/L. These values are two orders of magnitude below the levels established by EPA for hazardous waste (barium = 100mg/L and cadmium = 1.0 mg/L).

Hazardous waste, including Universal waste, generated at the site could include:

- Lead/acid batteries
- Light Bulbs
- Lamps
- Paint and paint related waste

- Computer backup power supplies

Universal wastes (batteries, lamps, mercury switches) need not be manifested. In no month was more than 100 kg of hazardous waste generated, accumulated, or transported for disposal.

.

## 6.0 Tailings Storage Facility

No construction was conducted during 2008, as the work was suspended due to an injunction being issued in August 2006, which resulted in the ACOE suspending their approval to proceed with the development of this facility. Interim stabilization measures were conducted at the facility as described in the approved Addendum E and G to the SWPPP.

## 7.0 Compliance

One Notice of Violation (NOV) was issued to Coeur Alaska for water quality standard exceedances in Slate Creek associated with low pH water entering the drainage from a graphitic phyllite formation exposed during construction activities at Lower Slate Lake.. The phyllite material was exposed during the construction activities that were suspended by the temporary injunction. Had the construction continued the embankment would have buried the material thereby eliminating the conditions that currently create low pH water from the insitu materials in the area of the previously planned tailings storage facility dam.

All reporting was completed as required by permit conditions. One component of this document is the reporting of spills. Each spill that occurred during 2008 was taken very seriously and all site resources were utilized, as appropriate for each occurrence. The spills were all properly reported and cleaned up in accordance with ADEC guidelines. (Refer to Table 3). A bioremediation cell was designed, permitted, and constructed during 2008. Soil that had previously been excavated from a construction related spill was screened and placed into the bioremediation cell with the appropriate nutrients to begin the remediation process. Following the placement of the contaminated soil into the cell, samples were collected and submitted to the laboratory to determine the initial/baseline hydrocarbon concentration.

During the 2008 year, the following fifteen guidelines were developed in various aspects of environmental management at the site to ensure permit compliance:

- Johnson Creek In-stream flow monitoring
- Daily TSS Sampling
- Labeling
- Hazardous and Non-Hazardous Waste Handling
- Spill Response Notification
- Empty Container Management

- Fueling Guidelines
- Hydrocarbon Contaminated Soil
- NOx Analyzer
- Purchasing
- Secondary Containment Pumping
- Sample Container
- Site Recycling
- Equipment Washing
- NPDES QA/QC

# 8.0 Reclamation

No permanent concurrent reclamation was performed in 2008; however, interim seeding stabilization associated with topsoil stockpiles, road ditches, and the area adjacent to Lower Slate Lake was performed as a BMP under the approved SWPPP plan and Interim Reclamation Plan.

## 8.1 Revegetation Test Plots

Revegetation test plots were to be installed at the Tailings Storage Facility (TSF) following construction of the Phase I dam and flooding of the reservoir. As construction of the dam and TSF was not initiated in 2008 these test plots were not installed during the reporting period.

# 9.0 Monitoring

## 9.1 NPDES

Results of the extensive monitoring program contained in the Kensington Gold Project NPDES permit AK-005057-1 1 are compiled in Volume 1: Aquatic Resource Surveys and Volume 2: Water Quality Data of the NPDES Annual Water Quality Monitoring Summary 2008 (Coeur, 2008). This report will be submitted to the US Forest Service, Juneau under separate cover.

## 9.2 Fresh Water

Fresh water monitoring requirements are contained within the USFS POO. Monitoring performed for the NPDES permit and summarized in the Kensington Gold Project NPDES Permit AK-005057-1 Annual Water Quality Monitoring Summary 2008 Volume 2. Water Quality Data are inclusive of the requirements under the USFS POO. This report will be submitted to the US Forest Service, Juneau and EPA, Seattle under separate cover, as the NPDES 2008 Annual Report.

## 9.3 Water Usage

Under requirements of the ADNR water rights, certain water usage and stream flow submittals are prepared. Some of these filings are made monthly while others are submitted quarterly. These reports are available at ADNR's offices, Juneau.

## 9.4 Aquatic Resource Surveys

The USFS POO references aquatic resource surveys, which are to include:

- Annual photographs of stream habitat types.
- Fish surveys and minnow trapping in Upper Slate Lake.
- Salmon escapement surveys in Sherman, Slate, and Johnson Creeks.

Annual photographs of stream habitat types are included in the Kensington Gold Project NPDES Permit AK-005057-1 Annual Water Quality Monitoring Summary Volume 1: Aquatic Resource Surveys 2008.

Salmon escapement surveys were performed in 2008 on Sherman, Slate, and Johnson Creeks. Tabulations of these data are presented in the Kensington Gold Project NPDES Permit AK-005057-1 Annual Water Quality Monitoring Summary Volume 1: Aquatic Resource Surveys 2008.

## 9.5 Marine

The U.S. Forest Service Plan of Operations Appendix 4.d. contains a marine monitoring program for Berners Bay. Requirements of this monitoring plan have been contracted to various agencies that are responsible to implement and report on portions of the plan.

Between April 1 and May 28 of 2008, Coeur conducted a total of 62 aerial, terrestrial and marine based surveys to monitor marine mammal numbers in Berners Bay, with particular emphasis on Stellar sea lions and humpback whales. Monitoring of mammals within the Bay was completed during 2008 by select flight personnel traveling to and from the mine site over Berners Bay. Survey results were forwarded to the NMFS Office of Protected Resources, Juneau in the spring of 2008. These survey findings, as well as communication with the USFS personnel monitoring eulachon numbers in the Berners Bay river systems and weekly ADF&G herring surveys were utilized in the NMFS adoption of May 2-16 as the 2008 "eulachon spawning season." Please refer to attachment 2 for additional information related to the marine surveys.

## 9.6 Air

During the reporting period, bi-annual Facility Operating Reports, including fuel use summaries, were submitted to the Fairbanks office of ADEC Air Permits Program (610 University Avenue) in compliance with ADEC air quality permits. These reports are not reproduced here, but can be provided upon request.

## 9.7 Archeology

Surface disturbance activities within historic areas were completed during 2005. No additional surface disturbance was created in 2008.

The Data Recovery and Testing Plan for the Upper Jualin Mine Camp (JUN-931) were finalized during 2008. Work was conducted with the Forest Service archaeologists in

2008 to ensure the training and education program for new employees and recurring annual training contained a historical overview of the area and provided an awareness of cultural resource protection laws and regulations. Following the finalization of the training and education program, all new employees and existing Coeur employees were provided the training.

## 9.8 Tailing Storage Facility Ecological Monitoring Plan

Dolly Varden spawning activities are documented for the ultimate closure of the tailing storage facility. This study is included in Attachment 4.

## 9.9 Berners Bay Transportation Plan

Marine vessel transport occurred between Juneau and Slate Cove or Comet Beach. Heavy equipment and supplies were transported via barge or landing craft and were received at Slate Cove or Comet Beach. Additionally, mine employees were transported via boat and were also received at Slate Cove. Marine waters around all marine facilities discussed above were open to public access.

It is a requirement of the Berners Bay Transportation Policy, Mitigation, and BMP Plan to collect information on company marine vessel encounters with special fish, marine mammals, and important bird species during the eulachon spawning season in Berners Bay. This information is documented in Attachment 2.

Monitoring in Berners Bay included a herring study conducted by ADFG. The ADFG Survey Results of Herring Spawning Habitat Assessment and Monitoring report is included as Attachment 5.

## 9.10 Development Rock, Borrow Source, and Tails Material

Development rock and tailing sampling for acid base accounting (ABA) is a requirement of the POO. Development rock sampling results for 2008 are contained in Attachment 6.

No tails were generated during 2008. Future quarterly sampling of tailing for acid base accounting will commence following project commissioning and commercial production.

## 9.11 Construction/Excavation Dewatering (Non-Stormwater)

No construction/excavation dewatering occurred at the site during 2008. Groundwater intercepted in the mine workings is treated and discharged to Sherman creek. This discharge is authorized under EPA NPDES permit AK-005057-1.

## 9.12 Tailing Storage Facility Monitoring

During 2006, work was suspended on the tailing storage facility due to an injunction being issued, thus no water balance measurements are available.

## 9.13 Wildlife

### 9.13.1 ADFG Goat Monitoring

Mountain goat monitoring in the Lions Head Mountain area associated with the Kensington Gold Project has been conducted intermittently since the late 1980's, in part to help determine potential future mine impacts on this population. An updated ADFG goat study is included with this report as Attachment 1.

### 9.13.2 Goshawk Observations

A baseline Goshawk survey was conducted in 2008 to determine the potential presence of Northern Goshawks in the area of the previously proposed Paste Tailings Facility. This report is included as Attachment 3 in this annual report.

# 10.0 Avalanche Safety Plan

Coeur Alaska implemented an avalanche hazard awareness and mitigation safety plan, during the 2008/09 winter season. A qualified Avalanche Program Director was retained to:

- Identify and quantify the snow avalanche safety hazard
- Prepare recommendations on managing that hazard
- Train employees and contractors in pertinent requirements of the resulting safety plan
- Prepare daily hazard forecasts and perform potential avalanche control activities

Because of the steep terrain adjacent to the site and large quantities of snow-fall, risk avoidance cannot be accomplished in all cases. Therefore, an active avalanche risk mitigation program was initiated. This involves the use of explosives to initiate controlled release of smaller avalanches so as to reduce the risk of naturally triggered larger and more destructive avalanches.

During 2008, active control work was required and performed. During the 2008 reporting period,

- Areas of avalanche risk were placarded
- Crews were informed of avalanche hazards and the appropriate responses to those hazards
- Daily risk forecasts were prepared and communicated to crews, based on site weather and snow condition data
- Avalanche rescue equipment was located on-site
- Crews were trained in their roll in avalanche rescue operations and the use of the rescue equipment – as appropriate
- Avalanche control was utilized on several occasions through the use of an avalauncher and explosives.

During the reporting period, site activities were not curtailed as a result of identified avalanche hazards. No personnel were caught or injured in avalanches, nor were any facilities or material negatively impacted.

### 11.0 Dam Safety Oversight Status

The dam safety approval to construct was issued in March 2006, and construction was initiated and continued until August when an injunction against further development of the tailings facility was issued. Work at Lower Slate Lake was restricted to interim stabilization and reclamation activities and maintenance of storm water BMPs. No embankment has been constructed.

# Projected Activities for 2009

## Key Issues and Permitting Activities

An injunction was granted by the Ninth Circuit Court of Appeals on August 2006 which led to the suspension of construction activities associated with the Slate Lake Tailings Facility. On June, 27, 2008, the U.S. Supreme Court granted the State of Alaska and the Company's Petitions for a writ of certiorari to review the Ninth Circuit Court of Appeals decision relating to the Kensington 404 tailings permit. Oral arguments were presented to the U.S. Supreme Court on January 12, 2009. A final Supreme Court decision on the appeal is expected in the first or second quarter of 2009 which may allow for construction to take place in 2009, leading to potential production in late 2009. Continued interim activities are planned as described in the letter provided to the USFS on October 16, 2008.

As part of the avalanche safety program, Coeur is proposing avalanche berms to provide structural avalanche control protection for the Mill site and Kensington portal. The proposed avalanche berms would be located on patented land. Avalanche berm locations are indicated on the attached figure 4. The revised 404 permit application that was prepared and submitted to the COE in January 2009 contained the proposed avalanche berm.

A geochemical and geotechnical investigation plan was prepared for Coeur Alaska by Golder Associates and Knight Piesold for the Lower Slate Lake Area. Coeur intends to conduct these investigations to further examine the area where graphitic phyllite exists at Lower Slate Lake and to better define the geotechnical characteristics of the bedrock in the area. The investigation plan is expected to be submitted in February 2009.

Coeur Alaska, Inc. currently holds a Title I minor source air quality permit AQ0111MSS01 Revision 2 issued January 13, 2006 which sets forth permit conditions for the Kensington Mine. During the construction phase of the Kensington Mine some components of the mine plan have been modified from those currently permitted. An application was submitted to ADEC to revise the terms and conditions of the permit and

to establish additional owner requested limits (ORLs) consistent with the operational needs of the current mine plan.

## 1.0 Public Safety

No changes to the Public Access Control Plan are contemplated for 2009.

## 2.0 Mine Operations

Should a favorable decision be granted by the U.S. Supreme Court, mining operations could potentially begin in the late 2009.

## 3.0 Mill Operations

Should a favorable decision be granted by the U.S. Supreme Court, mill start-up could potentially begin as early as the fourth quarter of 2009.

## 4.0 Tailings Storage Facility

Should a favorable decision be granted by the U.S. Supreme Court, construction of the Lower Slate Tailings Storage Facility could begin in the 2$^{nd}$ or 3$^{rd}$ quarter of 2009.

## 5.0 Access Corridors

Most access road and corridor upgrades were completed in 2006. Road maintenance of the access corridors will continue in 2009.

## 6.0 Reclamation

No final reclamation is anticipated to occur in 2009.

## 7.0 Proposed Modifications to Monitoring Plans for 2009

No modifications to the existing monitoring plans are proposed at this time..

## 8.0 Bonding

The Kensington Gold Project is currently bonded, including the tailings storage facility, as described in the 2005 FSEIS and USFS Record of Decision. Bonding activities have been coordinated with US Forest Service as needed with each revision.

.

**Table 1 Kensington Gold Project – Surface Disturbance**

| Area | Description | Status 2008 | Permitted Disturbance Acreage – Total | Actual Disturbance - Acreage- Total |
|---|---|---|---|---|
| 1 | Kensington Comet Beach Camp | Existing / Permitted | 3.2 | 3.2 |
| 2 | Kensington Access Road | Existing / Permitted | 8.1 | 8.1 |
| 3 | Kensington Borrow Pit #1 | Not built | 1.5 | 1.5 |
| 4 | Kensington Development Rock Stockpile | Existing / Permitted | 14.3 | 14.3 |
| 5 | Kensington Water Treatment Plant & Ponds | Existing / Permitted | 4.3 | 4.3 |
| 6 | Kensington Snow / Topsoil Stockpile | Existing / Permitted | 2.1 | 0 |
| 7 | Kensington 2050 Level Portal Development Rock Storage | Existing / Permitted | 1.5 | 1.5 |
| 8 | Jualin Process Area | Built | 12.9 | 16 |
| 8A | Jualin Avalanche Berms & Road | Not built | 0 | 0 |
| 9/9A | Jualin Development Rock Storage | Mostly Built | 4.3 | 8.1 |
| 10 | Jualin Storm Water Treatment Pond | Built | 1.5 | 1.7 |
| 11 | Jualin Process Area Snow/Topsoil Stockpile Area | Built | 0.3 | 0.5 |
| 12 | Jualin Pumphouse | Built | 0.1 | 0.1 |
| 13 | Jualin Access Road | Existing / Built | 33.8 | 31.2 |
| 14 | Jualin Laydown #1 | Built | 0.4 | 0.7 |
| 15 | Jualin Laydown #2 | Built | 3.5 | 3.7 |
| 16 | Jualin Laydown #3 | Built | 0.8 | 0.5 |
| 17 | Jualin Administration Area | Built | 2.5 | 5.7 |
| 18 | Jualin Pit Source #1 | Built | 2 | 3.5 |
| 19 | Jualin Pit Source #2 | Built | 1.3 | 1.3 |
| 20 | Jualin Pit #3 | Built | 12.3 | 12.1 |
| 21 | Jualin Pit #4 | Not built | 0.7 | 0 |
| 22 | LSL Tailings Pipeline & Access Road (Upper) | Partially built | 7.4 | 5.2 |
| 23 | LSL Tailings Facility Access Road (Lower) | Mostly built | 9.2 | 9.2 |
| 24 | LSL Tailings Lake (tailings as fill) | Not built | 39.9 | 19.9 |
| 25 | LSL Tailings Lake Margin Working Area | Partially occupied | 17.9 | 18.6 |
| 26 | LSL Tailings Dam Borrow Source | Partially built | 4.6 | 4.9 |
| 27 | LSL Tailings Pipeline Road (Mill to Snowslide Gulch) | Partially built | 10.1 | 7.2 |
| 28 | LSL Tailings Dam & Plunge Pool Area | Partially built | 6.8 | 7.1 |

| Area | Description | Status 2008 | Permitted Disturbance Acreage – Total | Actual Disturbance - Acreage- Total |
|---|---|---|---|---|
| 29 | Slate Creek Cove Marine Terminal | Built | 1.9 | 0.9 |
| 30 | Slate Creek Cove Snow/Stockpile Area | Built | 0.2 | 0.2 |
| 31 | Jualin Topsoil Stockpile | Built | 0 | 0 |
| 32 | Jualin Borrow Source #6 | Partially built | 0 | 3 |
| 33 | Jualin Borrow Source #7 | Built | 0 | 1.6 |
| 36 | Tailings Area Topsoil Stockpile | Not built | 0 | 0 |
| | **TOTALS** | | **209.4** | **194.7** |

## Table 2 Kensington Gold Project – Wetlands Disturbance

| Area | Description | Status 2008 | Permitted Acres of Fill in Waters of the U.S. per 2005 Permit Table 1 | Permitted Acres of Fill in Waters of the U.S. per 2006 ROD | Actual Waters of U.S. Acres Filled as of December 2008 | Fill Volume (Cubic Yards) – As of December 2008 | Acres to be Reclaimed as Wetlands or Waters |
|---|---|---|---|---|---|---|---|
| 1 | Kensington Comet Beach Camp | Existing / Permitted | 0 | 0 | 0 | 0 | NA |
| 2 | Kensington Access Road | Existing / Permitted | 0.9 | 0.9 | 0 | 0 | NA |
| 3 | Kensington Borrow Pit #1 | Not built | 0.3 | 0.3 | 0 | 0 | NA |
| 4 | Kensington Development Rock Stockpile | Existing / Permitted | 5.1 | 5.1 | 1.1 | 220,000 | 8 |
| 5 | Kensington Water Treatment Plant & Ponds | Existing / Permitted | 2.6 | 2.6 | 2.6 | 85,000 | 3.5 |
| 6 | Kensington Snow / Topsoil Stockpile | Existing / Permitted | 2.1 | 2.1 | 0 | 10,000 | 2.1 |
| 7 | Kensington 2050 Level Portal Development Rock Storage | Existing / Permitted | 0 | 0 | 0 | 0 | 0 |
| 8 | Jualin Process Area | Built | 1.1 | 1.1 | 2.0 | 97,000 | NA |
| 8A | Jualin Avalanche Berms & Road | Not built | | | 0 | 23,000 | NA |
| 9/9A | Jualin Development Rock Storage | Mostly Built | 4.3 | 4.3 | 2.0 | 121,000 | 1.7 |
| 10 | Jualin Storm Water Treatment Pond | Built | 0 | 0 | 0.1 | 1,500 | NA |
| 11 | Jualin Process Area Snow/Topsoil Stockpile Area | Built | 0 | 0 | 0.2 | 3,000 | 0.6 |
| 12 | Jualin Pumphouse | Built | 0.1 | 0.1 | 0.1 | 1,500 | NA |
| 13 | Jualin Access Road | Existing / Built | 8.2 | 8.2 | 7.7 | 37,000 | 0.6 |
| 14 | Jualin Laydown #1 | Built | 0.4 | 0.4 | 0 | 0 | NA |
| 15 | Jualin Laydown #2 | Built | 3.5 | 3.5 | 0 | 0 | NA |
| 16 | Jualin Laydown #3 | Built | 0.8 | 0.8 | 0 | 0 | NA |
| 17 | Jualin Administration Area | Built | 2.5 | 2.5 | 0.1 | 1,500 | 2.5 |
| 18 | Jualin Pit Source #1 | Built | 0 | 0 | 0 | | 0.2 |
| 19 | Jualin Pit Source #2 | Built | 0.1 | 0.1 | 1.1 | 10,500 | |

| Area | Description | Status 2008 | Permitted Acres of Fill in Waters of the U.S. per 2005 Permit Table 1 | Permitted Acres of Fill in Waters of the U.S. per 2006 ROD | Actual Waters of U.S. Acres Filled as of December 2008 | Fill Volume (Cubic Yards) – As of December 2008 | Acres to be Reclaimed as Wetlands or Waters |
|---|---|---|---|---|---|---|---|
| 20 | Jualin Pit #3 | Built | 2.4 | 2.4 | 1.2 | 11,500 | 6.0 |
| 21 | Jualin Pit #4 | Not built | 0.7 | 0.7 | 0 | 0 | NA |
| 22 | LSL Tailings Pipeline & Access Road (Upper) | Partially built | 4.7 | 4.7 | 0 | 41,500 | 4.3 |
| 23 | LSL Tailings Facility Access Road (Lower) | Mostly built | 0.3 | 0.3 | 1.3 | 13,500 | 2.8 |
| 24 | LSL Tailings Lake (tailings as fill) | Not built | 23.5 | 23.5 | 0 | 3,920,000 | (23.5) |
| 25 | LSL Tailings Lake Margin Working Area | Partially occupied | 8.5 | 8.5 | 10.9 | 500 | 8.7 (38.5) |
| 26 | LSL Tailings Dam Borrow Source | Partially built | 0.3 | 0.3 | 0.3 | 3,000 | 0 |
| 27 | LSL Tailings Pipeline Road (Mill to Snowslide Gulch) | Partially built | 3.0 | 3.0 | 0.2 | 3,500 | 2.2 |
| 28 | LSL Tailings Dam & Plunge Pool Area | Partially built | 5.9 | 5.9 | 6.1 | 236,000 | 2.4 |
| 29 | Slate Creek Cove Marine Terminal | Built | 1.9 | 1.9 | 0.5 | 12,000 | 3.2 |
| 30 | Slate Creek Cove Snow/Stockpile Area | Built | 0.2 | 0.2 | 0 | 0 | 0.5 |
| 31 | Jualin Topsoil Stockpile | Built | | 7.0 | 6.8 | 165,000 | 6.8 |
| 32 | Jualin Borrow Source #6 | Partially built | | 3.5 | 0.1 | 1,500 | 0 |
| 33 | Jualin Borrow Source #7 | Built | | 0.8 | 0.8 | | NA |
| 36 | Tailings Area Topsoil Stockpile | Not built | | 1.2 | 0 | 14,500 | 0.6 |
| | **TOTALS** | | **83.4** | **95.9** | **45.2** | **5,033,500** | **110.0** |

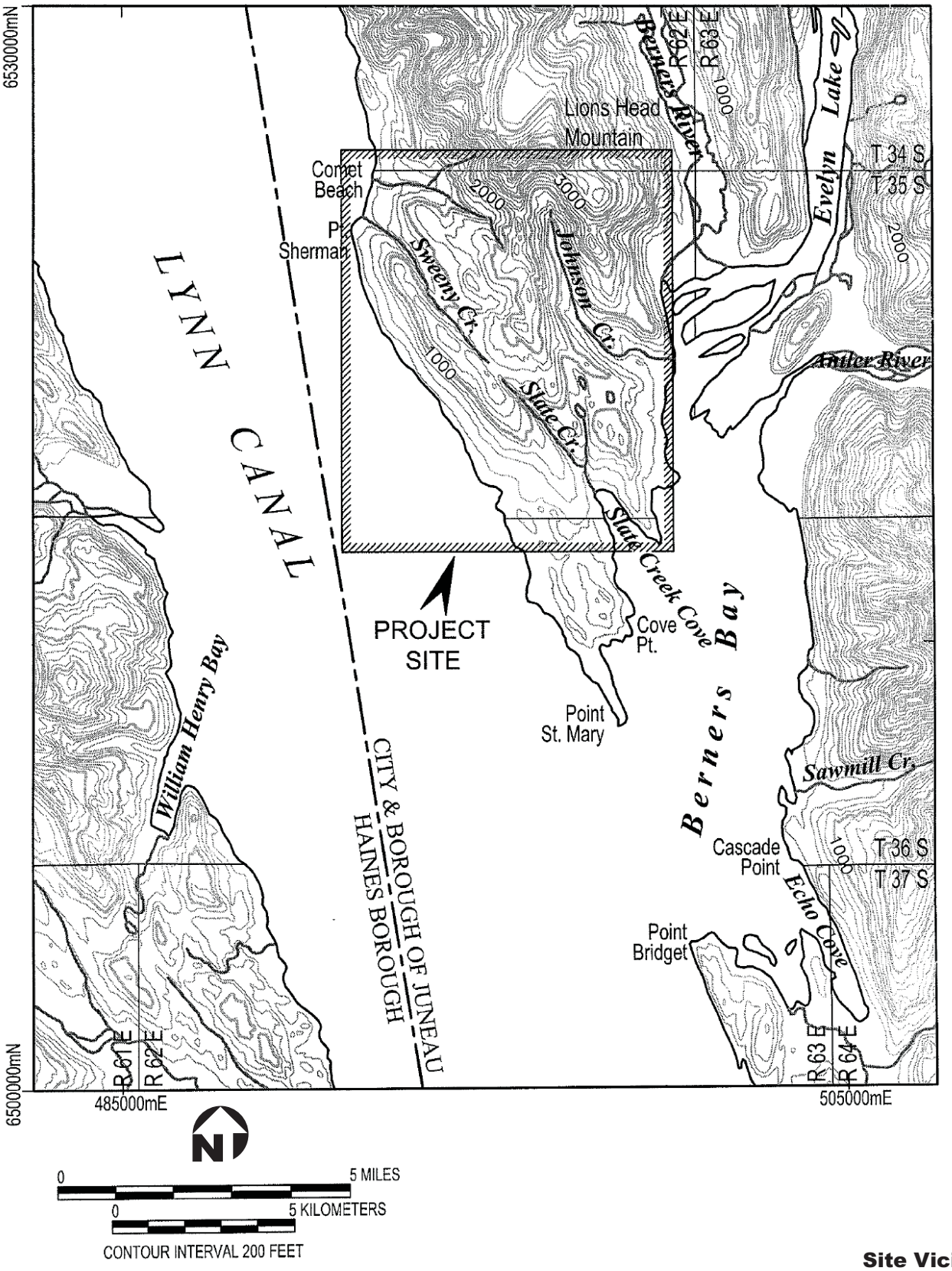
Note that the total completed/proposed wetland fill is 3.1 acres less than in the 2005 permit, but 15.6 acres less than the 2006 ROD.

## Table 3

### SPILL SUMMARY

| Date of Spill | Time of Spill | Product Spilled | Quantity Spilled | Location of Spill | Cause of Spill or additional information | Area(s) Affected | Clean Up (Y/N) | Reported to State |
|---|---|---|---|---|---|---|---|---|
| 1/27/2008 | 13:00 | Hydraulic Oil | 1 Quart | Jualin - Road | Damaged hydraulic line in the Volvo road grader. | Land - snow covered | Y | Y - Monthly Report |
| 2/8/2008 | 9:00 | Antifreeze (Ethylene Glycol) | 2 Quarts | Upper camp motor pool | Antifreeze leaked out of the overflow tank in the Haul Truck DT8521 Radiator | Land - snow covered | Y | Y - 02/08/08, 12:15 |
| 2/10/2008 | 22:00 | Hydraulic Oil | 27 Gallons | Road - 300 yards north of Pit 4 | Main hose was rubbing on the frame of the Road Grader V602, causing excessive wear which lead to the ultimate failure of the hose | Land - snow covered | Y | Y - 02/11/08, 11:20 |
| 3/6/2008 | 15:00 | Diesel Fuel - Winter Blend | 1 Quart | Slate Lake Seep Project Road | A small light tower was bumped during the diorite hauling for the Slake Lake Seep project - the truck bumped the tow bar and the tower rolled over on to the snow bank at about a 70% angle which caused diesel fuel to spill from the air vent cap. | Land - snow covered | Y | Y - Monthly Report |
| 3/11/2008 | 9:30 | Hydraulic Oil | 4.5 Gallons | Portal hill road near warehouse | Brake Booster line on Road Grader failed at the coupling causing a small release | Land - snow covered | Y | Y - Monthly Report |
| 3/13/2008 | 8:00 | Hydraulic Oil | 5.5 Gallons | Underground - 850 Main Haulage | # 16 hose on the MB01 Bolter blew spilling hydraulic Oil | Land - Underground | Y | Y - Monthly Report |
| 4/8/2008 | 7:00 | Hyrdaulic Oil | 0.50 Gallons | Underground - 850 Main, next to | Broken hose on MB01 caused .5 gallons of Hydraulic oil to spill | Underground - rock | Y | Y - Monthly Report |
| 4/8/2008 | 17:55 | Sewage | 2 Gallons | Kitchen Lift Station | Electrical failure in the pump power supply. | Compacted rock | Y | 4-9-08; 3:56 PM |
| 4/12/2008 | 5:30 | Hydraulic Oil | 8 Gallons | Underground - 850 main muck | Mucker 82 broke a #16 hose in the articulation | Underground - rock | Y | Monthly Report |
| 4/13/2008 | 9:00 | Engine Oil | 0.50 pints | Jualin Heights Pad | Discharge of oil from the crank case via the dipstick spout on the CA1 | Land - snow covered | Y | Monthly Report |
| 5/1/2008 | 10:45 | Hydraulic Oil | 3 Gallons | Underground - 780 Vent Drift | Hydraulic hose failure. | Underground - rock | Y | Y - Monthly Report |
| 5/3/2008 | 11:30 | Engine Oil | 0.5 Gallons | Helipad | Oil was pushed out of the dipstick. | Compacted rock | Y | Y - Monthly Report |
| 5/4/2008 | 14:30 | Hydraulic Oil | 0.5 Quarts | Main Road - Mile 2 | Hydraulic hose failure. | Road surface | Y | Y - Monthly Report |
| 5/22/2008 | 11:00 | Brake Fluid | 1.5 Quarts | Mill Shop | Brake bleeding assembly mistakenly loosened. | Compacted rock | Y | Y - Monthly Report |
| 5/24/2008 | 10:30 | Hydraulic Oil | 4 Gallons | 850 Drift | Hydraulic hose failure. | Underground - rock | Y | Y - Monthly Report |
| 5/21/2008 | 9:00 | Used Oil | 27.5 Gallons | Comet Water Treatment Plant | Drum pushed over during snow removal | Compacted rock | Y | Y - 05/22/08 @ 07:11 |
| 6/11/2008 | 21:25 | Gray Water | 2.5 Gallons | Wash Car Lift Station | Electrical failure in the pump power supply. | Compacted rock | Y | 6-12-08; 11:20 AM |
| 6/13/2008 | 8:40 | Gray Water | 2.0 Gallons | Wash Car Lift Station | Electrical failure in the pump power supply. | Compacted rock | Y | 6-16-08; 8:40 AM |
| 7/26/2008 | 17:28 | Hyrdaulic Oil | 20 Gallons | UG - 850' drift | 3/8" cable entangled around axle breaking hydraulic brake lines | UG - Rock | Y | Y, 07/28/08 @ 08:45 |
| 8/13/2008 | 16:45 | Gray Water | 75 Gallons | Jualin STP | Wrench fell and broke a valve. | Compacted rock | Y | 8-14-08; 11:00 AM |

33760854_06.cdr




**Site Vicinity**

**Applicant:** Couer Alaska, Inc.
**Permit No:**

**Location Address:** Approximately Lynn Canal at Berners Bay, Juneau, Alaska

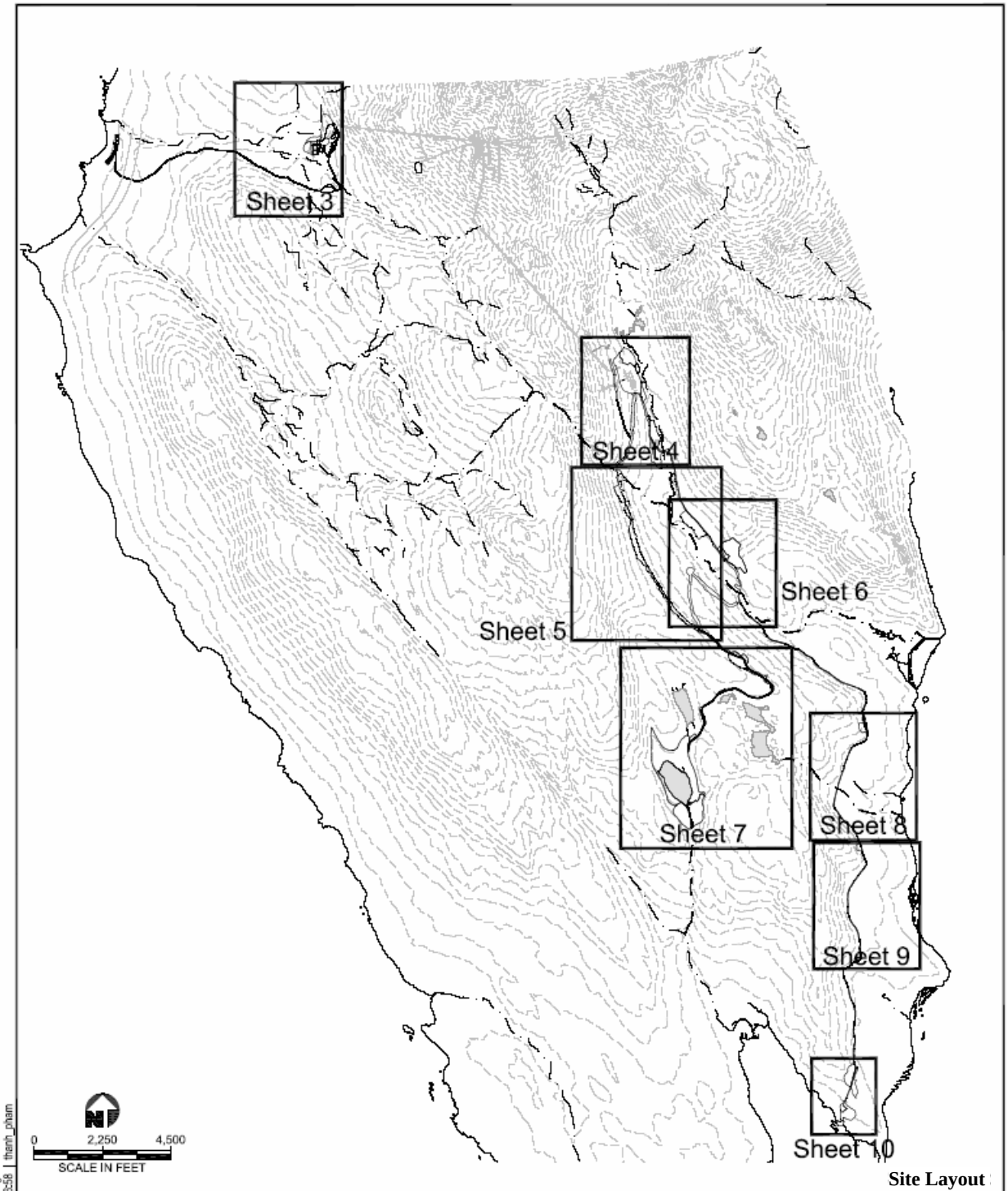
**Adjacent Property Owners:**
1. U.S. Forest Service

**Proposed:** Kensington Gold Project

**Purpose:** Construction of mining related facilities and appurtenances

**Near/At:** T35S, R62E
**Municipality:** City and Borough of Juneau
**State:** Alaska

**Sheet:** 1 of 10
**Date:** December 2008




**Site Layout**

**Applicant:** Coeur Alaska, Inc
**Permit No:**

**Location Address:** Approximately Lynn Canal at Berners Bay, Juneau, Alaska

**Adjacent Property Owners:**
1. U.S. Forest Service

**Datum:** Alaska State Plane Zone 1
NAD 83 on a NAD 27 Baseline

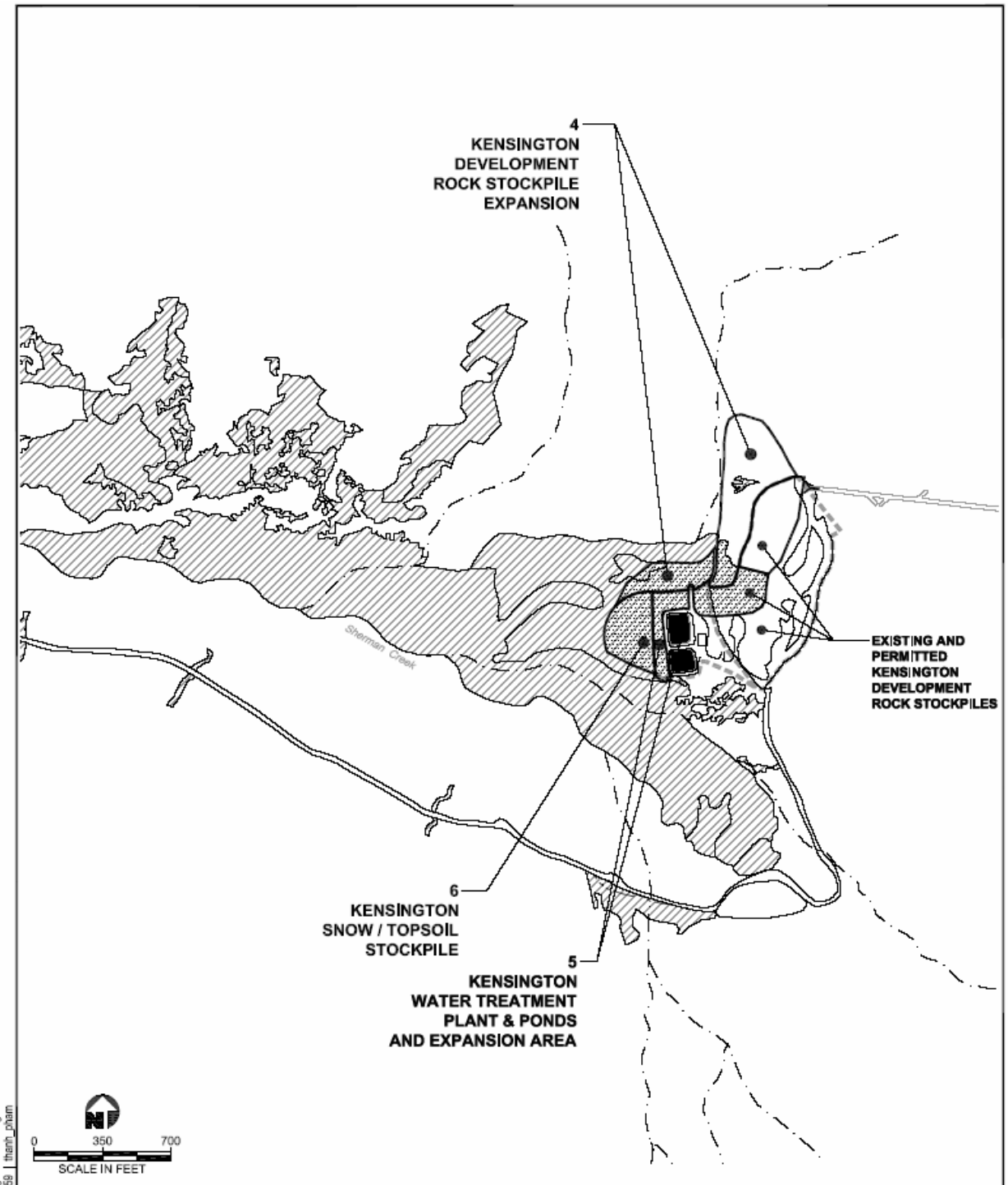
**Proposed:** Kensington Gold Project

**Purpose:** Construction of mining related facilities and appurtenances.

**Near/At:** T35S, R62E
**Municipality:** City and Borough of Juneau
**State:** Alaska

**Sheet:** 2 of 10
**Date:** December, 2008

T:\Misc-Jobs\Coeur Alaska\JARPA\Sheet 1 Site.dwg
Mod: 12/19/2008, 16:10 | Plotted: 12/19/2008, 16:58 | thanh_pham




T:\Misc-Jobs\Coeur Alaska\JARPA\Sheet 2 Kensington Portal.dwg
Mod: 12/19/2008, 16:15 | Plotted: 12/19/2008, 16:58 | thanh_pham

Legend

- Work Area Boundary
- Wetland
- 25% Wetland Mosaic
- Upland or Bay
- Fill Impact
- Cut Impact
- Existing Prior to Permitting

**Applicant:** Coeur Alaska, Inc
**Permit No:**

**Location Address:** Approximately Lynn Canal at Berners Bay, Juneau, Alaska

**Adjacent Property Owners:**
1. U.S. Forest Service

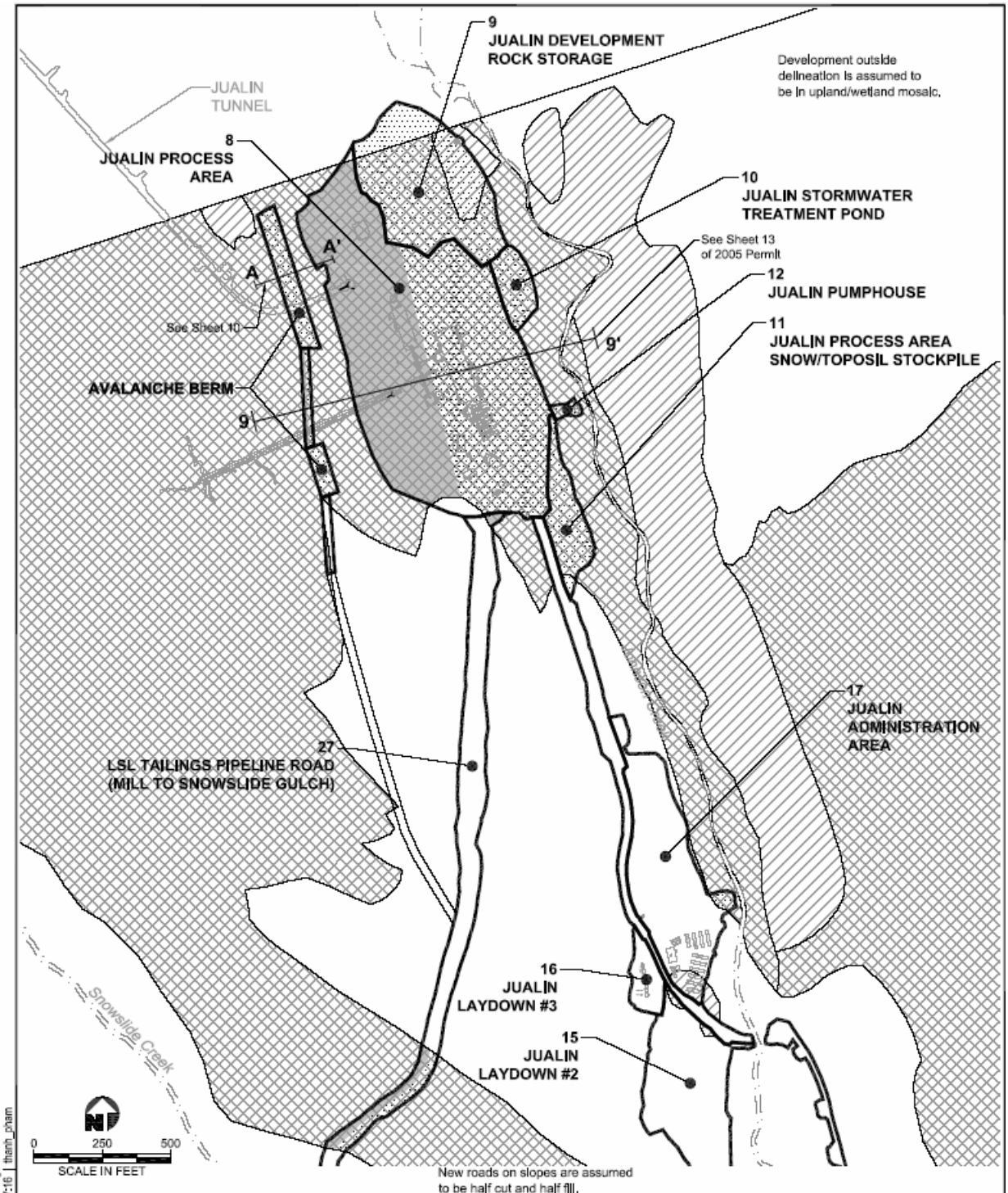
**Datum:** Alaska State Plane Zone 1
NAD 83 on a NAD 27 Baseline

**Proposed:** Kensington Gold Project

**Purpose:** Construction of mining related facilities and appurtenances.

**Near/At:** T35S, R62E
**Municipality:** City and Burough of Juneau
**State:** Alaska

**Sheet:** 3 of 10
**Date:** December, 2008




T:\Misc-Jobs\Coeur Alaska\JARPA\Sheet 3 Jualin.dwg
Mod: 12/19/2008, 16:52 | Plotted: 12/19/2008, 17:16 | thann_pnam

Legend

- Work Area Boundary
- Wetland
- 25% Wetland Mosaic
- Upland or Bay
- Fill Impact
- Cut Impact

**Applicant:** Coeur Alaska, Inc
**Permit No:**

**Location Address:** Approximately Lynn Canal at Berners Bay, Juneau, Alaska

**Adjacent Property Owners:**
1. U.S. Forest Service

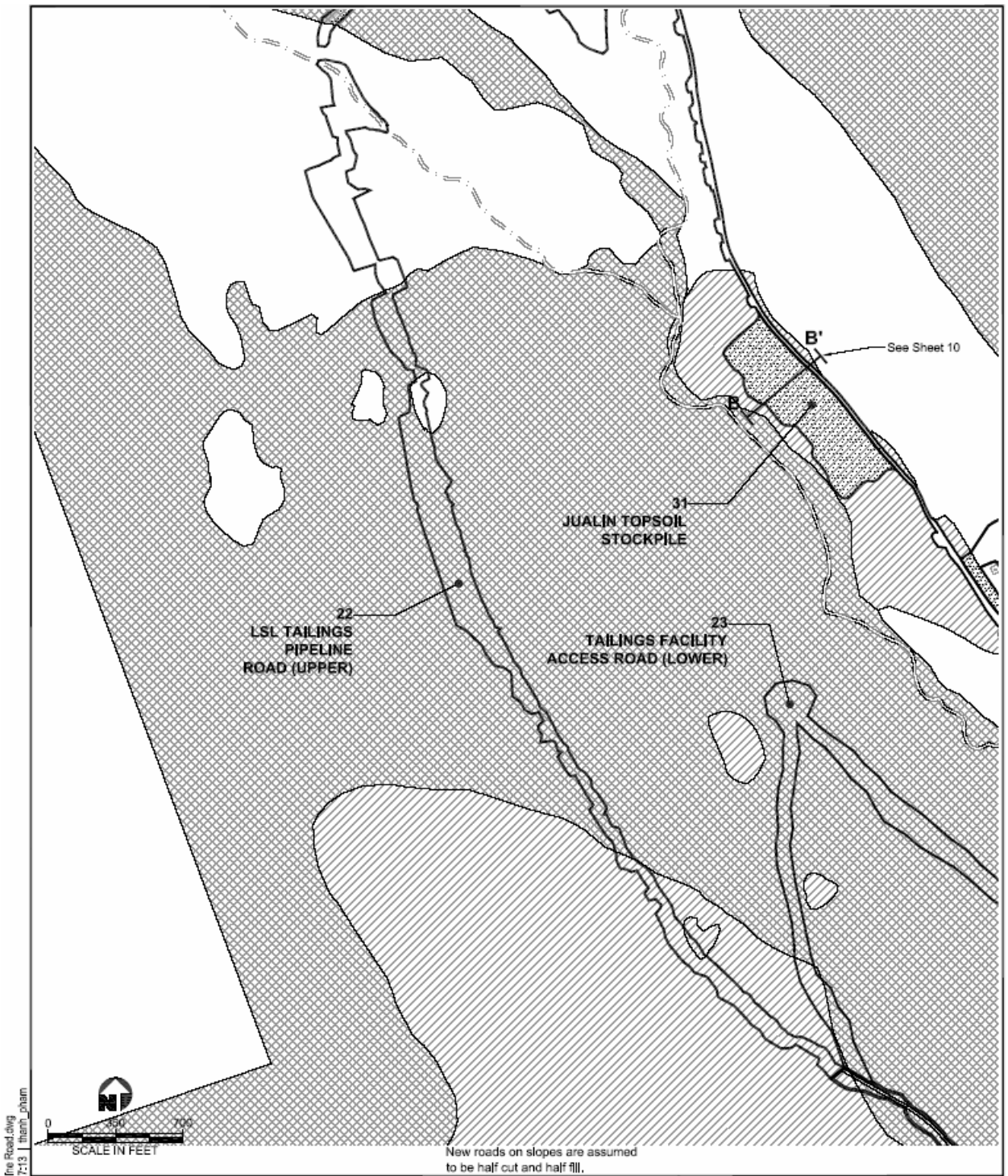
**Datum:** Alaska State Plane Zone 1
NAD 83 on a NAD 27 Baseline

**Proposed:** Kensington Gold Project

**Purpose:** Construction of mining related facilities and appurtenances.

**Near/At:** T35S, R62E
**Municipality:** City and Burough of Juneau
**State:** Alaska

**Sheet:** 4 of 10
**Date:** December, 2008




T:\Misc-Jobs\Coeur Alaska\JARPA\Sheet 4 Pipeline Road.dwg
Mod: 12/19/2008, 17:30 | Plotted: 12/19/2008, 17:13 | thanh_pham

Legend

- Work Area Boundary
- Wetland
- 25% Wetland Mosaic
- Upland or Bay
- Fill Impact
- Cut Impact

**Applicant:** Coeur Alaska, Inc
**Permit No:**

**Location Address:** Approximately Lynn Canal at Berners Bay, Juneau, Alaska

**Adjacent Property Owners:**
1. U.S. Forest Service

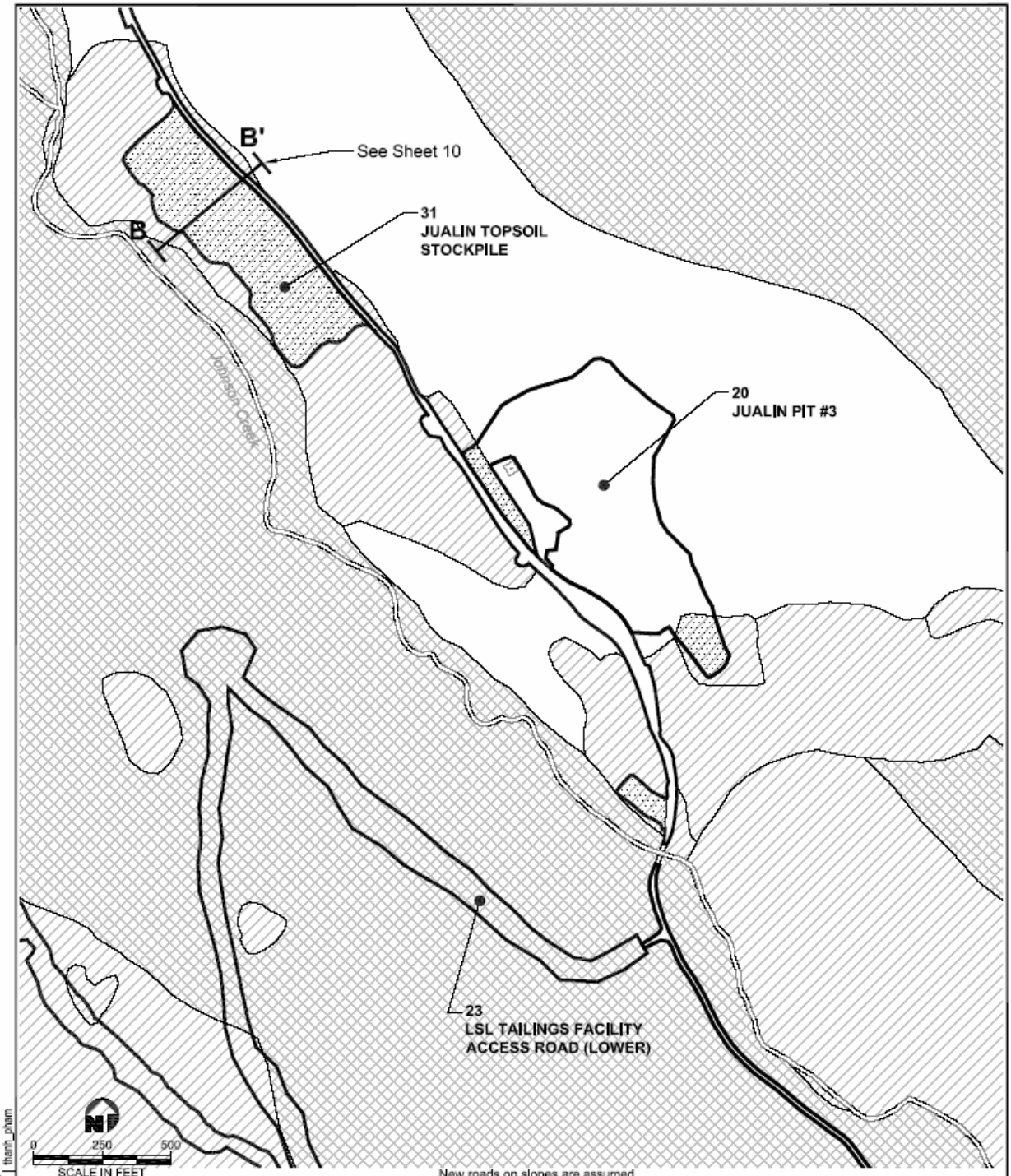
**Datum:** Alaska State Plane Zone 1
NAD 83 on a NAD 27 Baseline

**Proposed:** Kensington Gold Project

**Purpose:** Construction of mining related facilities and appurtenances.

**Near/At:** T35S, R62E
**Municipality:** City and Borough of Juneau
**State:** Alaska

**Sheet:** 5 of 10
**Date:** December, 2008




Legend

- Work Area Boundary
- Wetland
- 25% Wetland Mosaic
- Upland or Bay
- Fill Impact
- Cut Impact

**Applicant:** Coeur Alaska, Inc
**Permit No:**

**Location Address:** Approximately Lynn Canal at Berners Bay, Juneau, Alaska

**Adjacent Property Owners:**
1. U.S. Forest Service

**Datum:** Alaska State Plane Zone 1
NAD 83 on a NAD 27 Baseline

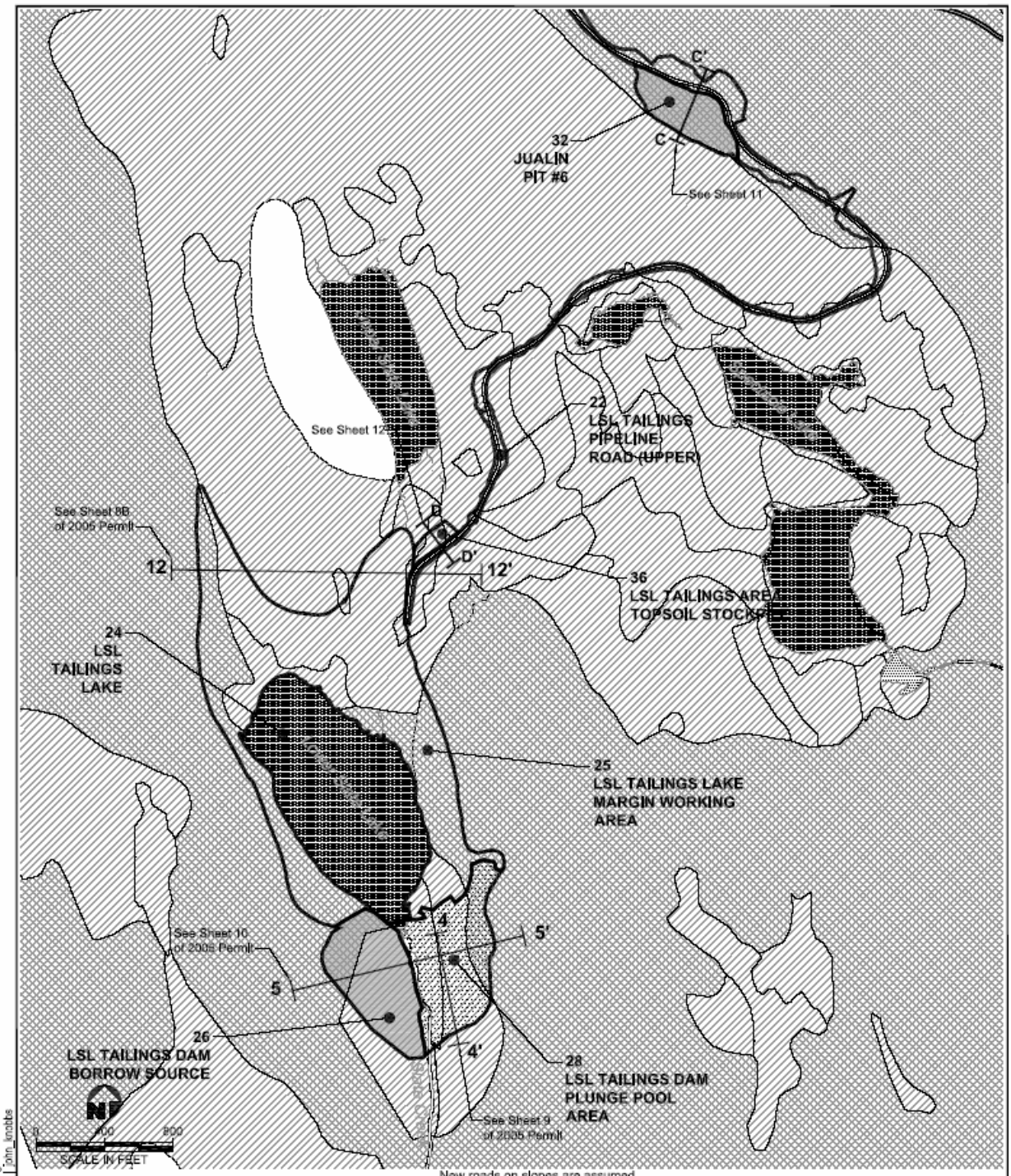
**Proposed:** Kensington Gold Project

**Purpose:** Construction of mining related facilities and appurtenances.

**Near/At:** T35S, R62E
**Municipality:** City and Burough of Juneau
**State:** Alaska

**Sheet:** 6 of 10
**Date:** December, 2008

T:\Misc-Jobs\Coeur Alaska\JARPA\Sheet 5 Jualn.dwg
Mod: 12/19/2008, 17:02 | Plotted: 12/19/2008, 17:14 | thanh_pham




T:\Misc-Jobs\Coeur Alaska\JA\RPA\Sheet 7 Tailings.dwg
Mod: 01/02/2009, 11:09 | Plotted: 01/02/2009, 13:36 | John_knobbs

Legend

- Work Area Boundary
- Wetland
- 25% Wetland Mosaic
- Upland or Bay
- Fill Impact
- Cut Impact

**Applicant:** Coeur Alaska, Inc
**Permit No:**

**Location Address:** Approximately Lynn Canal at Berners Bay, Juneau, Alaska

**Adjacent Property Owners:**
1. U.S. Forest Service

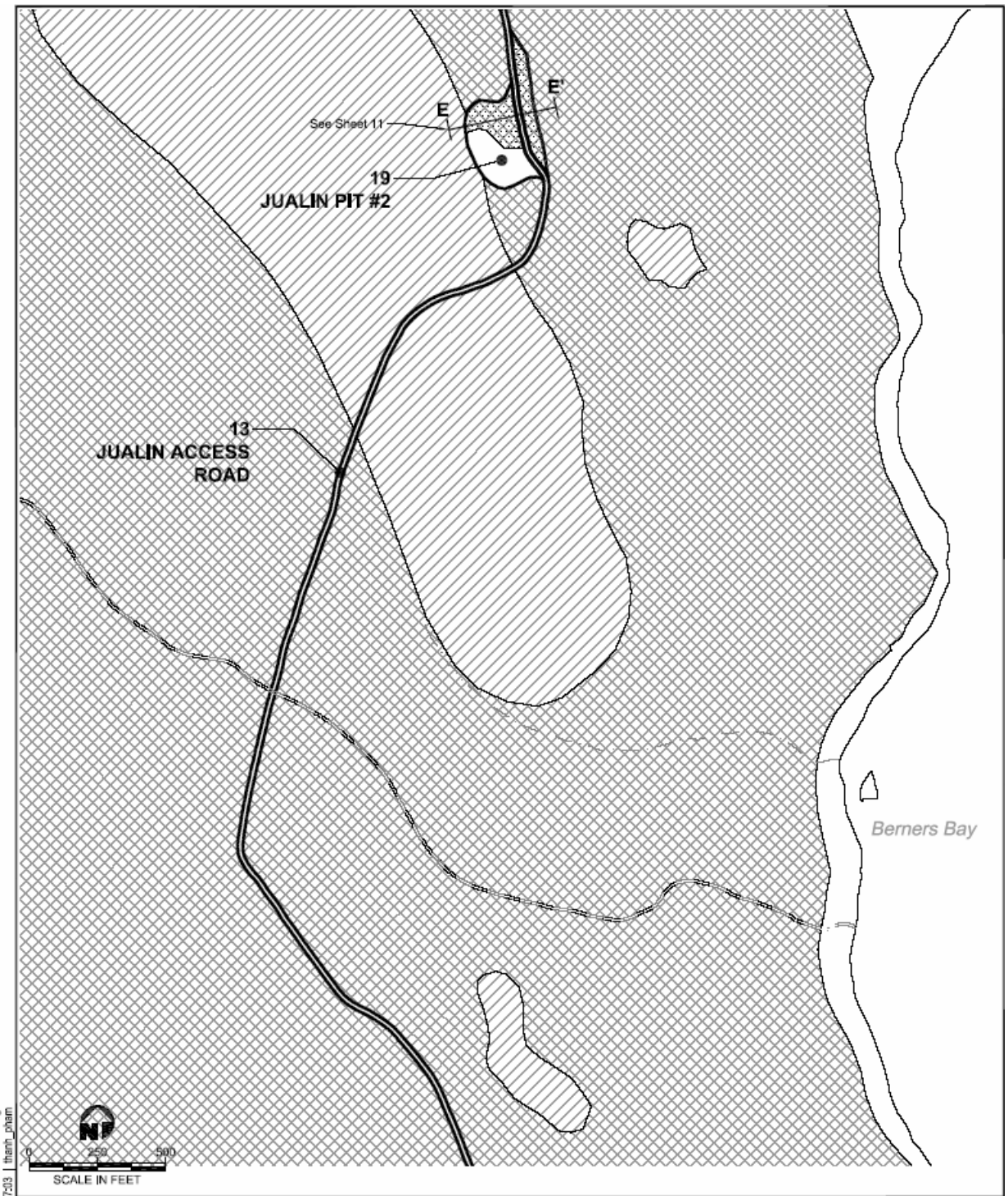
**Datum:** Alaska State Plane Zone 1
NAD 83 on a NAD 27 Baseline

**Proposed:** Kensington Gold Project

**Purpose:** Construction of mining related facilities and appurtenances.

**Near/At:** T35S, R62E
**Municipality:** City and Burough of Juneau
**State:** Alaska

**Sheet:** 7 of 10
**Date:** December, 2008




Legend

- Work Area Boundary
- Wetland
- 25% Wetland Mosaic
- Upland or Bay
- Fill Impact
- Cut Impact

**Applicant:** Coeur Alaska, Inc
**Permit No:**

**Location Address:** Approximately Lynn Canal at Berners Bay, Juneau, Alaska

**Adjacent Property Owners:**
1. U.S. Forest Service

**Datum:** Alaska State Plane Zone 1
NAD 83 on a NAD 27 Baseline

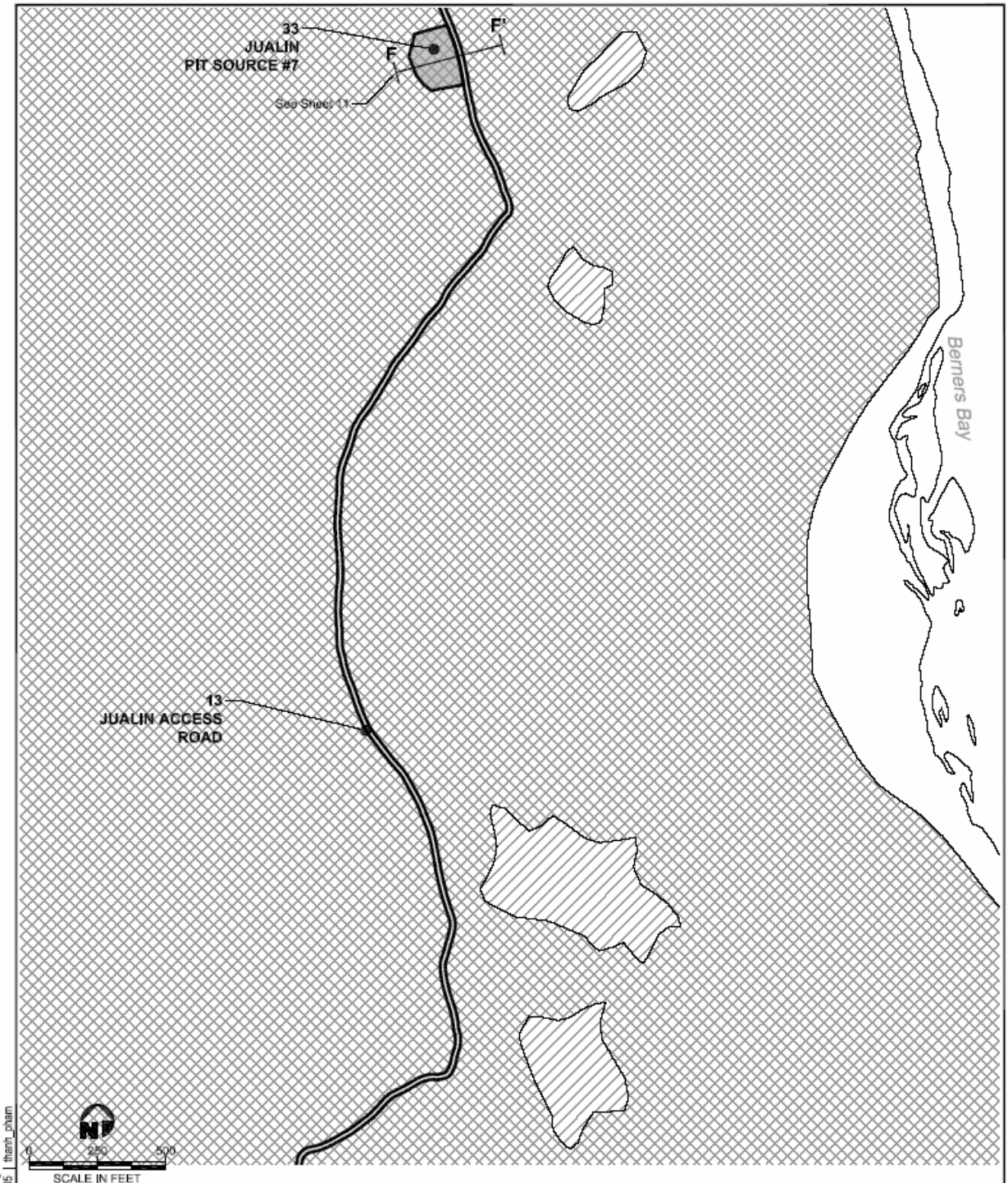
**Proposed:** Kensington Gold Project

**Purpose:** Construction of mining related facilities and appurtenances.

**Near/At:** T35S, R62E
**Municipality:** City and Burough of Juneau
**State:** Alaska

**Sheet:** 8 of 10
**Date:** December, 2008

T:\Misc-Jobs\Coeur Alaska\JARPA\Sheet 7 Jualin Access Road.dwg
Mod: 12/19/2008, 16:21 | Plotted: 12/19/2008, 17:03 | thanh_pham




T:\Misc--Jobs\Coeur Alaska\JARPA\Sheet 8 Road.dwg
Mod: 12/19/2008, 16:23 | Plotted: 12/19/2008, 17:05 | thanh_pham

Legend

- Work Area Boundary
- Wetland
- 25% Wetland Mosaic
- Upland or Bay
- Fill Impact
- Cut Impact

**Applicant:** Coeur Alaska, Inc
**Permit No:**

**Location Address:** Approximately Lynn Canal at Berners Bay, Juneau, Alaska

**Adjacent Property Owners:**
1. U.S. Forest Service

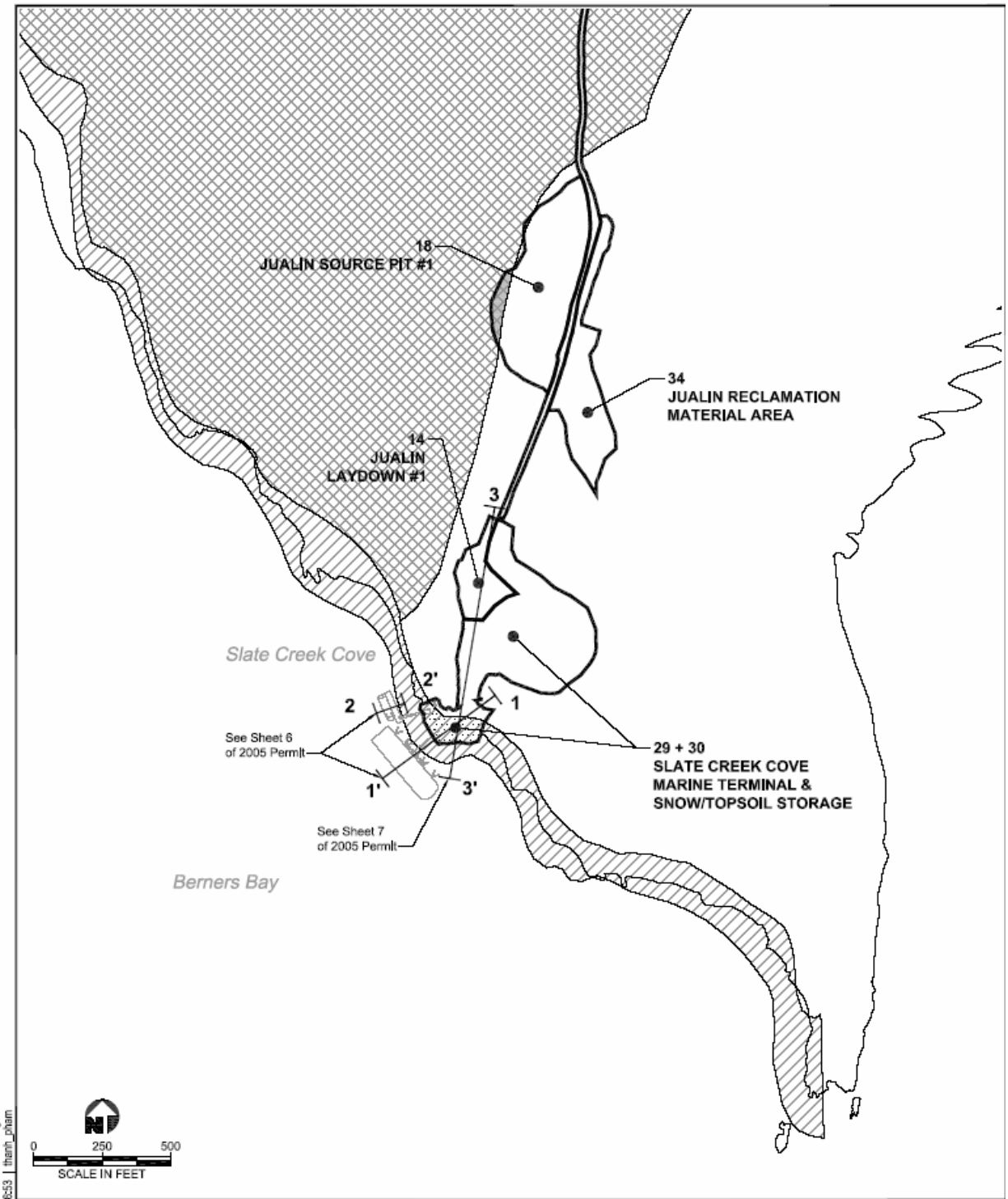
**Datum:** Alaska State Plane Zone 1
NAD 83 on a NAD 27 Baseline

**Proposed:** Kensington Gold Project

**Purpose:** Construction of mining related facilities and appurtenances.

**Near/At:** T35S, R62E
**Municipality:** City and Burough of Juneau
**State:** Alaska

**Sheet:** 9 of 10
**Date:** December, 2008




T:\Misc-Jobs\Coeur Alaska\JARPA\Sheet 9 Slate Creek Cove.dwg
Mod: 12/19/2008, 16:49 | Plotted: 12/19/2008, 16:53 | thanh_pham

Legend

- Work Area Boundary
- Wetland
- 25% Wetland Mosaic
- Upland or Bay
- Fill Impact
- Cut Impact

**Applicant:** Coeur Alaska, Inc
**Permit No:**

**Location Address:** Approximately Lynn Canal at Berners Bay, Juneau, Alaska

**Adjacent Property Owners:**
1. U.S. Forest Service

**Datum:** Alaska State Plane Zone 1
NAD 83 on a NAD 27 Baseline

**Proposed:** Kensington Gold Project

**Purpose:** Construction of mining related facilities and appurtenances,

**Near/At:** T35S, R62E
**Municipality:** City and Burough of Juneau
**State:** Alaska

**Sheet:** 10 of 10
**Date:** December, 2008

# Attachment 1

# Mountain Goat Assessment - ADFG

Wildlife Research Annual Progress Report

# Mountain Goat Assessment and Monitoring along the Juneau Access Road Corridor and near the Kensington Mine, Southeast Alaska

Kevin S. White and Neil L. Barten

Alaska Department of Fish and Game
Division of Wildlife Conservation

# Mountain Goat Assessment and Monitoring along the Juneau Access Road Corridor and near the Kensington Mine, Southeast Alaska.

Kevin S. White and Neil L. Barten

Alaska Department of Fish and Game
Division of Wildlife Conservation
P. O. Box 110024, Juneau, AK 99811
Tel: 907-465-4353

Annual Progress Report

September 2008

This report contains preliminary data and should not be cited without permission of the authors.

# September 2008


## ACKNOWLEDGEMENTS

This project was funded by the State of Alaska Department of Transportation and Public Facilities and Coeur Alaska. Reuben Yost (SOA, DOT/PF) and Carl Schrader (SOA/DNR) coordinated project funding. John Crouse, Brenda Hildre, Eran Hood, Jeff Jemison, Jamie King, Brian Lieb, Steve Lewis, Karin McCoy, Jeff Nichols, Dale Rabe, Chad Rice, Ryan Scott, Greg Snedgen, Peter Strow, and Jamie Womble assisted in field and/or office work. Fixed-wing survey flights were conducted by Lynn Bennett (LAB), Mark Morris, Jacques Norvell (Tal Air) and Pat Valkenburg (WRAM). Helicopter support was provided by Rey Madrid, Mitch Horton, Christian Kolden, John Weeden (Temsco Helicopters) as well as Chuck Schroth (Fjord Flying Service). Coordination of ground work activities was provided by Peter Strow, Clyde Gillespie, Frank Bergstrom and Al Gillan (Coeur Alaska) and Coastal Helicopters.



The Alaska Department of Fish and Game administers all programs and activities free from discrimination on the basis of race, religion, color, natural origin, age, sex, marital status, pregnancy, parenthood, or disability. For information on alternative formats for this and other department publications, please contact the department ADA Coordinator at [voice] 907-465-4120, telecommunications device for the deaf [TDD] 1-800-478-3648, or fax 907-465-6078. Any person who believes she/he has been discriminated against should write to ADFG, PO Box 25526, Juneau, AK 99802-5526, or OEO, U.S. Department of the Interior, Washington, DC 20240.


Cover photo: Mountain goat #LG-107 walking in front of the Meade Glacier in mid-August 2008. A seven year old male, this animal weighed 307 lbs. at time of capture.

## Contents

INTRODUCTION..... 1
Background..... 1

STUDY OBJECTIVES..... 1

STUDY AREA..... 1

METHODS..... 2
Mountain Goat Capture..... 2
GPS Location Data..... 2
Diet Composition..... 2
Habitat Use and Movement Patterns..... 3
Winter Severity and Snow Modeling..... 3
Reproduction and Survival..... 3
Population Abundance and Composition..... 4

RESULTS AND DISCUSSION..... 4
Mountain Goat Capture..... 4
Diet Composition..... 5
GPS Location Data..... 6
Winter Severity and Snow Modeling..... 6
Reproduction and Survival..... 7
Population Abundance and Composition..... 8

FUTURE WORK..... 9

REFERENCES..... 9-10

APPENDIX 1..... 11-13

APPENDIX 2..... 14

APPENDIX 3..... 15

## INTRODUCTION

This annual progress report was prepared to meet the reporting requirements for State of Alaska Department of Transportation and Public Facilities and Coeur Alaska. Funding for this project was made available in September 2005 and this report summarizes activities completed by September 30, 2008.

### Background

Coeur Alaska has recently re-initiated development activities at the Kensington mine site, located a short distance northwest of Berners Bay. In addition, the Department of Transportation and Public Facilities is planning to construct an all-season highway between Echo Cove and the Katzehin River. Among the wildlife species potentially affected by mine development and road construction activities are mountain goats (Oreamnos americanus). A small-scale study of mountain goats conducted in the vicinity of the Kensington mine by Robus and Carney (1995) showed that goats moved seasonally from high alpine elevations in the summer and fall to low, timbered elevations during winter months. One of the main objectives of the Robus and Carney (1995) study was to assess the impacts of the mine development activities on habitat use, movement patterns and, ultimately, productivity of mountain goats. However, the mine never became operational, thus these objectives could not be achieved, and by 1995 goat monitoring in the area wound down and eventually ended. Currently, the mine is in the process of re-opening and the Alaska Department of Fish and Game maintains that many of the same concerns that prompted the Robus and Carney (1995) study are still valid and need to be addressed. In addition, large-scale plans for development of the Juneau Access road raise new, potentially more substantial, concerns regarding not only the enlarged "footprint" of industrial development activities in eastern Lynn Canal, but also the cumulative impacts of both development projects on wildlife resources.

The potential effects of mining and road development activities on local mountain goat populations in the vicinity of the Kensington mine and eastern Lynn Canal are not well known. However, studies conducted elsewhere indicate that mountain goats can be negatively impacted by industrial development activities. Such effects include temporary range abandonment, alteration of foraging behavior and population decline (Chadwick 1973, Foster and Rahs 1983, Joslin 1986, Cote and Festa-Bianchet 2003). Consequently, information about the distribution of mountain goats proximate to the mine and road development corridor is needed to determine the extent to which populations may be affected by associated industrial activities. Information collected by Robus and Carney (1995), in the vicinity of Kensington mine, as well as Schoen and Kirchhoff (1982), near Echo Cove, suggest that spatial overlap between mountain goats and the proposed industrial activity will be most pronounced when goats are over-wintering in low-elevation habitats. In addition, it is not clear where goats spend non-winter months and, by extension, the spatial extent to which development activities are thereby translated across the landscape.

In response to the above concerns, the Alaska Department of Fish and Game, with funding provided by the Department of Transportation and Public Facilities and Coeur Alaska, has initiated monitoring and assessment activities to determine possible impacts of road construction and mine development on mountain goats and identify potential mitigation measures, to the extent needed. Assessment and monitoring work includes collection of vital rate, habitat use and movement data from a sample of radio-marked mountain goats in addition to conducting annual aerial population abundance and productivity surveys. These efforts are aimed at providing the Alaska Department of Fish and Game with information necessary to appropriately manage mountain goats in the proposed areas of development.

## STUDY OBJECTIVES

This research is designed to investigate the spatial relationships, vital rates and abundance of mountain goats in the Berners Bay and upper Lynn Canal area. The specific objectives are as follows:

1) Determine seasonal movement patterns of mountain goats in areas near the Kensington mine and Juneau Access road corridor;

2) Characterize mountain goat habitat selection patterns and the extent of spatial overlap with areas impacted by Kensington mine and Juneau Access road corridor development activities;

3) Estimate reproductive success and survival of mountain goats in areas near the Kensington mine and Juneau Access road corridor; and

4) Estimate mountain goat population abundance and composition in areas near the Kensington mine and Juneau Access road corridor.

## STUDY AREA

Mountain goats were studied in a ca. 600 $km^2$ area located in a mainland coastal mountain range east of Lynn Canal, a post-glacial fiord located near Haines in southeastern Alaska. The study area is oriented along a north-south axis and bordered in the south by Berners Bay (58.76N,

135.00W) and by Dayebas Creek (59.29N, 135. 35W) in the north. Within this area, three separate study sites were delineated based on the actual or expected extent of industrial activity occurring in or near each locality.

An additional study area located east of Berners Bay was established in spring 2006. This area was not originally included in the study design however recent information about road construction timelines resulted in a re-evaluation of the efficacy of conducting research activities in this area. Research efforts in this area will be limited in scope and low intensity sampling in this area is intended to provide managers with baseline information needed to assist future management efforts in light of the road construction, gravel crushing and/or stock-piling that is likely to occur in this area. Additional ADFG funding was allocated to partially offset costs associated with research activities in this area.

Elevation within the study areas range from sea-level to 6300 feet. This area is an active glacial terrain underlain by late cretaceous-paleocene granodiorite and tonalite geologic formations (Gehrels 2000). Specifically, it is a geologically young, dynamic and unstable landscape that harbors a matrix of perennial snowfields and small glaciers at high elevations (i.e. above 4000 feet) and rugged, broken terrain that descends to a rocky, tidewater coastline. The northern part of the area is bisected by the Katzehin river, a moderate volume (ca. 1500 cfs; USGS, unpublished data) glacial river system that is fed by a tributary of the Juneau Icefield.

The maritime climate in this area is characterized by cool, wet summers and relatively warm snowy winters. Annual precipitation at sea-level averages 55 inches and winter temperatures are rarely less than 5º F and average 30º F (Haines, AK; National Weather Service, Juneau, AK, unpublished data). Elevations at 2600' typically receive ca. 250 inches of snowfall, annually (Eaglecrest Ski Area, Juneau, AK, unpublished data). Predominant vegetative communities occurring at low-moderate elevations (<1500') include Sitka spruce (Picea sitchensis)-western hemlock (Tsuga heterophylla) coniferous forest, mixed-conifer muskeg and deciduous riparian forests. Mountain hemlock (Tsuga mertensiana) dominated 'krummholtz" forest comprises a subalpine, timberline band occupying elevations between 1500-2500 feet. Alpine plant communities are composed of a mosaic of relatively dry ericaceous heathlands, moist meadows dominated by grasses and forbs and wet fens. Avalanche chutes are common in the study area, bisect all plant community types and often terminate at sea-level.

Figure 1: Mountain goat capture site near Mt. Selby. Photo shows LG101 (5 yr-old male) and HD500 helicopter. Orange colored GPS radio-collar and red ear tags, used for monitoring purposes and identification during aerial surveys, are also visible.

## METHODS

### Mountain Goat Capture

Mountain goats were captured using standard helicopter darting techniques and immobilized by injecting 3.0 - 2.55mg of carfentanil citrate, depending on sex and time of year (Taylor 2000), via projectile syringe fired from a Palmer dart gun (Cap-Chur, Douglasville, GA). During handling, all animals were carefully examined and monitored following standard veterinary procedures (Taylor 2000) and routine biological samples and morphological data collected. Following handling procedures, the effects of the immobilizing agent was reversed with 100mg of naltrexone hydrochloride per 1mg of carfentanil citrate (Taylor 2000). All capture procedures were approved by the State of Alaska Animal Care and Use Committee.

### GPS Location Data

Telonics TGW-3590 GPS radio-collars (Telonics, Inc., Mesa, AZ) were deployed on most animals captured (Figure 1); eight Telonics MOD-500 VHF radio-collars were deployed on an experimental basis. GPS radio-collars were programmed to collect location data at 6-hour intervals (collar lifetime: 2-3 years). During each location attempt, ancillary data about collar activity (i.e. percent of 1-second switch transitions calculated over a 15 minute period following each GPS fix attempt) and temperature (degrees C) were simultaneously collected. Complete data-sets for each individual were remotely downloaded (via fixed-wing aircraft) at 8-week intervals. Location data were post-processed and filtered for "impossible" points and 2D locations with PDOP (i.e. position dilution of precision) values greater than 10, following D'Eon et al. (2002) and D'Eon and Delparte (2005).

### Diet Composition

Fresh fecal pellets were collected from live-captured

animals during the summer-fall period (late-July to mid-October). Fecal pellet samples were also collected opportunistically during winter reconaissance and snow surveys. Individual samples collected from live-captured animals during 2005-2006 summer-fall period (Females, n = 18; Males, n = 28) and a single composite sample collected in february 2006 were sent to Washington State University (Wildlife Habitat Analysis Lab, Pullman, WA) for dietary analyses. Specifically, microhistological analyses of plant cell fragments in pellet samples were conducted to provide an estimate of diet composition for individual mountain goats and the winter composite sample. Data were subsequently summarized by sex-class to determine whether diet composition varied between males and females. This preliminary analyses did not account for differential digestability of each dietary food item identified in diets; an analysis is planned for the future. Nonetheless, while results do not provide an accurate estimate of actual diet intake patterns they do provide a relaible estimate of relative differences in diet composition between males and females.

## Habitat Selection and Movement Patterns

*Altitudinal Distribution.*—Comprehensive analyses of mountain goat habitat use and movement patterns will not be conducted until all GPS location information is collected (i.e. 2011). Nevertheless, preliminary analyses focused on describing sex specific variation in terrain use, and movement patterns were conducted using a subset of the data (White 2006). Additional topics related to altitudinal and spatial distriution have been addressed in White et al. (2006, 2007).

## Winter Severity and Snow Modeling Data Collection

Winter distribution of mountain goats is strongly influenced by snow depth and distribution. Since patterns of snow accumulation vary at both small and large spatial scales it is often necessary to collect site-specific field data in order to accurately characterize these relationships within focal areas. Unfortunately, standardized snow depth monitoring information is extremely limited within the study area and additional information is needed in order to properly characterize spatial patterns of snow accumulation and, ultimately, mountain goat winter distribution. Consequently, we initiated field efforts designed to create a snow depth database in order to generate spatially explicit snow depth models within the study area.

Standardized field surveys were conducted in order to estimate patterns of snow depth as it related to habitat type (i.e. forested/non-forested), altitude, and slope aspect (Figure 2). These preliminary efforts focused on four sites located in different mountain goat winter ranges. During

Figure 2: Winter snow conditions at 3000 feet on Echo Ridge, 3/31/08. At this subalpine site, snow was heavily drifted and estimed at ca. 9 feet, about 10 inches less than 2007. Wolverine tracks were seen in this area though mountain goat sign was not evident above ca. 1500 ft.

surveys snow depth was measured at geo-referenced locations along an altitudinal gradient (beginning at sea level). Snow measurements were replicated at each sampling location (n = 5) and associated covariate information was collected. Sampling locations were spaced at regular (100-200m) intervals, depending upon terrain complexity. Steep (>35 degrees), exposed slopes were, generally, not sampled due to safety considerations. In addition, daily climate information for reference weather stations was acquired from the National Weather Service (Haines Weather Station).

## Reproduction and Survival

Kidding rates and subsequent survival were estimated by monitoring individual study animals during monthly surveys using fixed-wing aircraft (Heliocourier, Piper PA-18 Super Cub) equipped for radio-telemetry tracking. During surveys, radio-collared adult female mountain goats were monitored to determine whether they gave birth to kids and, if so, how long they survived. Monitoring kid production and survival was only possible during the non-winter months when animals could be reliably observed in open habitats. We assumed that kids did not survive winter if they were not seen with their mothers the following spring. Cases in which kid status assessments were equivocal were filtered from the data set and not used for subsequent estimates of kid survival.

Mortality of individual radio-collared mountain goats was determined by detecting radio-frequency pulse rate changes during monthly monitoring surveys. In cases where mortality pulse rates were detected, efforts were made to investigate sites as soon as possible via helicopter or boat. To the extent possible, all mortalities were thoroughly investigated to ascertain the cause of death and relevant biological samples collected. We determined date of mortalities via examination of activity sensor data logged on GPS radio-collars. Annual survival of radio-collared animals was estimated using the Kaplan-Meier procedure (Pollock et al. 1989). This procedure allows for staggered

entry and exit of newly captured or deceased animals, respectively.

### Population Abundance and Composition Estimation

*Aerial Surveys.*—Population abundance and composition surveys were conducted using fixed-wing aircraft (Heliocourier and PA-18 "Super Cub") and helicopter (Hughes 500) during August-Septmeber 2007. Original project planning required flying 3 replicate surveys in the Lions Head, Sinclair and Villard study areas. Additional funding provided by the Alaska Department of Fish and Game provided the opportunity to fly surveys in the East Berners area and additional replicate surveys in the three focal study areas.

Aerial surveys were typically conducted when conditions met the following requirements: 1) flight ceiling above 5000 feet ASL, 2) wind speed less than 20 knots, 3) sea-level temperature less than 65 degrees F. Surveys were typically flown along established flight paths between 2500-3500 feet ASL and followed geographic contours. Flight speeds varied between 60-70 knots. During surveys, the pilot and experienced observers enumerated and classified all mountain goats seen as either adults (includes adults and sub-adults) or kids. In addition, each mountain group observed was checked (via 14X image stabilizing binoculars) to determine whether GPS-collared animals were present. Flight conditions, terrain complexity and animal behavior often complicated efforts to determine whether observed mountain goats were collared. As a result, the number of adults for which collar presence could be ascertained with a high degree of confidence was also recorded for each group observed.

Estimating the probability of observing mountain goats on a given survey (i.e. sightability) is critical for deriving population size estimates for focal areas. This is typically achieved by comparing the number of marked animals in an area to the number of marked animals actually seen (or re-sighted) during a survey. This fairly simple procedure can be complicated when its not always possible to assess whether observed animals are marked. This situation occurs on mountain goat surveys and requires additional refinement of standard mark-resight population estimators. New analytical methods appropriate for estimating mountain goat population size in this study are currently being developed. As a result, mountain goat survey data were summarized in this report to include estimates of population composition and the minimum number of mountain goats seen on surveys (i.e. the number observed) but not the estimated actual number of mountain goats in focal areas.

Figure 3: Photograph taken through a spotting scope of LG43 (and yearling) engaged in a dominace interaction with a unmarked adult female (and kid) that occurred during an GPS radio-collar activity sensor validation trial on July 1, 2008, Mt. Villard.

*Ground Surveys.*—Evaluation of ground-based techniques for estimating mountain goat population size and composition were conducted in a small portion of the Lions Head study area (i.e. 13.2 $km^2$) in June 2006, the Mt. Villard area during June 2007 and the Mt Villard and Mt Selby areas during June-July 2008. Previous research has concluded that aerial surveys are often inadequate for providing accurate estimates of the proportion of adult males and females, as well as sub-adults during aerial surveys (Cote and Festa-Bianchet 2003); only the proportion of adults and kids in a population can be reliably estimated. As a result, ground-based survey techniques were tested to evaluate whether this method might serve as a reliable tool for classifying individuals of separate sex and age classes during survey efforts.

Additional field efforts involved collection of GPS-collar activity sensor validation data. In these cases, individual study animals were observed during pre-programmed activity sensor evaluation periods (i.e. 15 minute intervals following fix initiation events)(Figure 3). During observation periods, detailed behavioral data were collected using focal animal sampling procedures (Altman 1974).

## RESULTS AND DISCUSSION

### Mountain Goat Capture and Handling

*Capture Activities.*—Mountain goats were captured over 5 days between August 16-17 and 19 and September 21 and 24, 2008. Overall, 33 animals were captured using standard helicopter darting methods (Appendix 1). Twenty-five animals were deployed with Telonics TGW-3590 GPS radio-collars and 8 were deployed with Telonics MOD-500 VHF radio-collars (including 4 re-captures). We deployed VHF radio-collars on a subset of captured mountain goats because battery life-span is significantly longer (radio-collar battery life span: VHF = 8 years, GPS = 2-3 years). The extended life span of VHF radio-collars will

enable collection of supplementary mountain goat survival and reproduction data and reduce the frequency in which mountain goats must be captured.

Helicopter captures were attempted during periods when mountain goats were distributed at high elevations and weather conditions were favorable (i.e. high flight ceiling and moderate wind speed). Additionally, captures were scheduled to avoid periods within 8 weeks of parturition in order to avoid unnecessary disturbance of adult females and associated neonates. Captures were attempted in areas where mountain goat access to dangerously steep terrain was limited. As a result of these constraints, opportunities to capture mountain goats were fairly limited. Nevertheless, given the fairly large area of study and decent summer weather conditions, it was typically possible to capture approximately six mountain goats per day of effort.

*Biological Sample Collection.*—During handling procedures, standard biological specimens were collected and morphological measures recorded. Specific biological samples collected from study animals included: whole blood (4 mL), blood serum (8 mL), ear tissue, hair and fecal pellets. Whole blood, serum and fecal pellet subsamples were sent to Dr. Kimberlee Beckmen (ADFG, Fairbanks, AK) for disease screening. In addition, tissue sub-samples were sent Dr. Steeve Cote/Aaron Shafer (University of Laval, Quebec) for inclusion in a broad-scale mountain goat population genetics analysis.

*Diet Composition.*—Preliminary estimates of diet composition during the summer-fall period indicate that four major forage types were the most important constituents of mountain goat diets. Specifically, sedges/rushes, lichens, forbs and ferns (in order of decreasing importance) comprised 85% of diets (Appendix 2). Interestingly, some differences in diet composition between the sexes was evident. In particular, preliminary evidence suggests that sedges/rushes were more common in male diets while ferns were more common in female diets (Figure 4). Overall, the most common individual food items in diets during summer-fall were *Carex* sp. (20.7%), *Luzula/Juncus* sp. (14.4) (sedges/rushes), *Cladonia* sp. (11.4)(lichen), *Lupinus nootkatensis* (8.6%)(forb) and unidentified fern rhizomes (7.4%)(Figure 5a, Appendix 2). During winter, diets were overwhelmingly composed of confier needles (*Tsuga* sp., 72.5%) and also included *Lobaria* sp. lichen (11.7) and *Vaccinium* sp. (9.9%)(Figure 5b, Appendix 2).

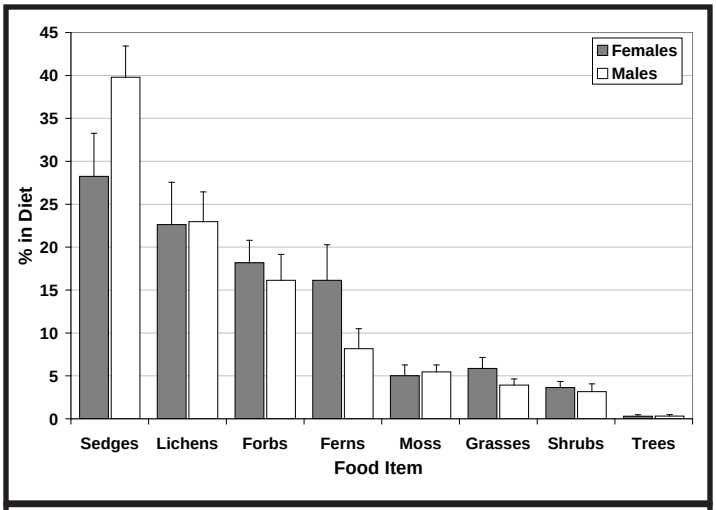



Figure 4: Percent diet composition of male and female mountain goats between late-July to mid-October, 2005-2006 in the Lynn Canal study areas. Estimates are not corrected for differential digestibility of food items.

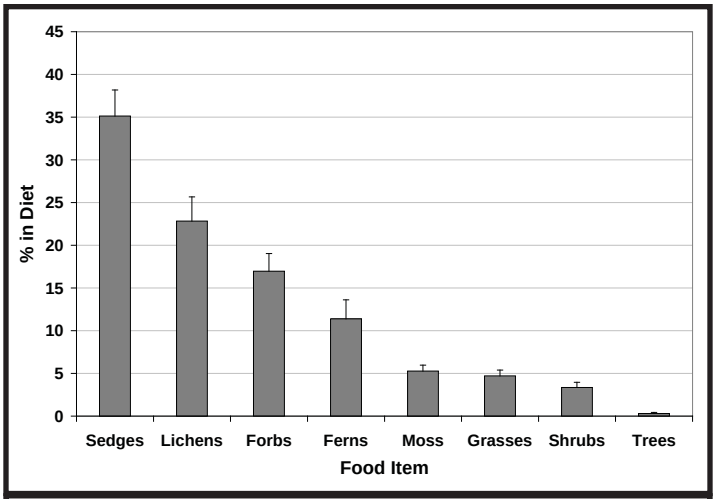



Figure 5a: Percent diet composition of all mountain goats (sexes combined) between late-July to mid-October, 2005-2006 in the Lynn Canal study areas. Estimates are not corrected for differential digestibility of food items.

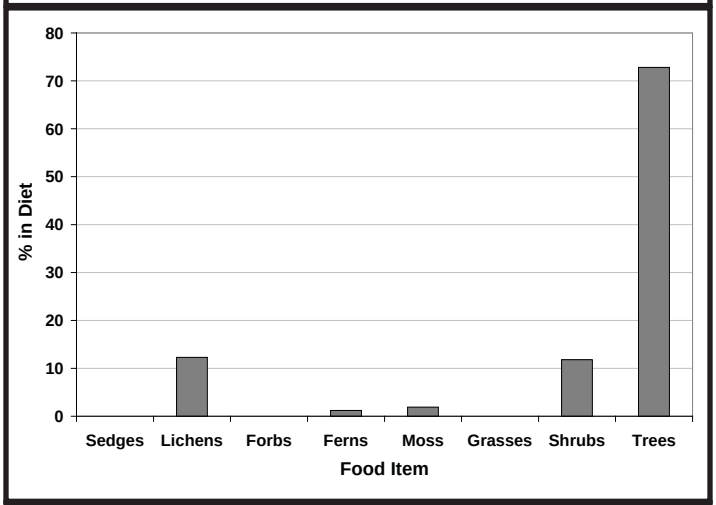



Figure 5b: Percent diet composition of mountain goats (unknown sex) in mid-February, 2006 in the Echo ridge area. Estimates are not corrected for differential digestibility of food items.

*Mountain Goat Body Mass.*—Data relating to morphological characteristics of mountain goats were collected for all animals, when practicable. Preliminary analysis of age- and sex-specific body mass were conducted. Body mass data were standardized following Cote et al. (1998) to control for the effects of capture date on body mass and

allow for comparisons with other studies.
Preliminary analyses suggest that body mass of adult females is less for animals with kids in mid-summer than those that did not have kids (Figure 6). This relationship is consistent with past studies that demonstrate energetic costs associated with parturition and lactation negatively influence body condition in ungulates.

Standard morphological measurements such as chest girth can be reliable predictors of animal body mass. Preliminary analyses indicate chest girth measurements were better at predicting body mass for males than females, though in both cases relationships between these variables were reliable (Figure 7a, 7b). The chest girth/body mass relationship is likely to be of utility for individuals interested in a simple and reasonably precise technique for estimating body mass in the field such as hunters.

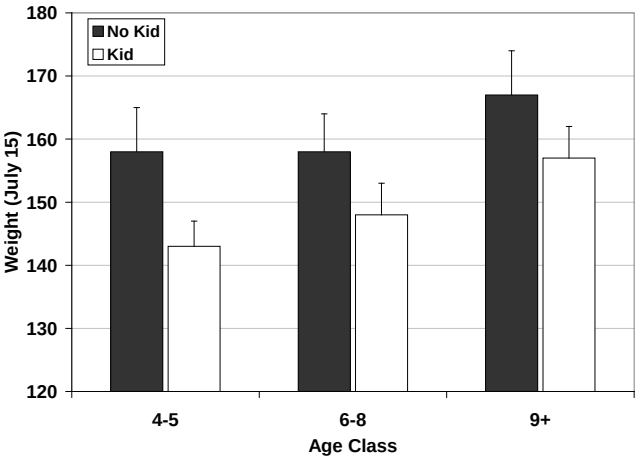



Figure 6: Standardized body weights for female mountain goats with and without kids at heel in late-summer.

## GPS Location Data

*GPS System Performance.*—The performance of GPS radio-collars (as of 8/21/07) has been evaluated for 79 collars deployed since the beginning of the study. In general, the remote GPS data collection system used in this study worked as expected. We did not encounter any problems with GPS collar performance, nor did significant problems occur with remote data download attempts. This high level of success was achieved despite occasionally poor weather conditions and, in some cases, substantial download distances between aircraft and mountain goats (i.e. up to 3 miles). However, several pre-programmed bi-monthly GPS data download periods were missed due to weather conditions. Nevertheless, it was always possibly to download missed GPS data on subsequent surveys.

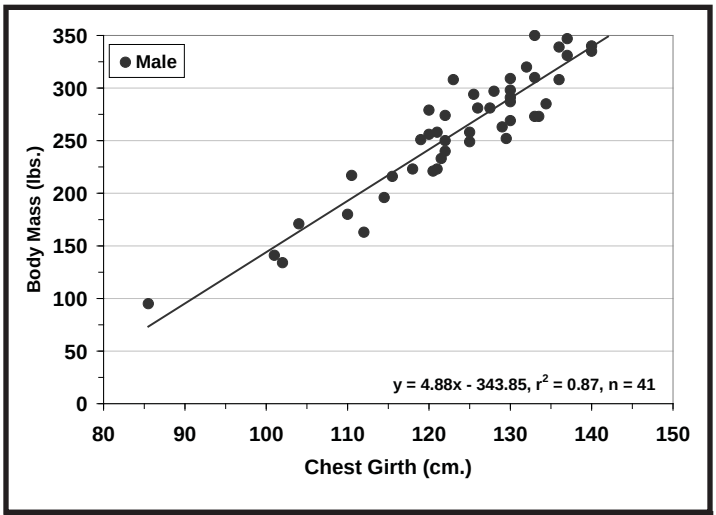



Figure 7a: Relationship between body mass and chest girth for male mountain goats, Lynn Canal, AK

*Collar Retrieval.*—Of the 11 animals that died during 2007/2008, all collars were retrieved from the field and GPS data downloaded from the collar. Twenty-six GPS collars deployed in fall 2006 had been pre-programmed to automatically release on September 11, 2007. Twenty-one of these collars were retrieved from the field by October 9, 2008 and subsequently downloaded. These data revealed every collar released on the exact day they were programmed to do so. This differs with results obtained in brown bear studies where collars can take up to a few weeks to release (Rod Flynn, Alaska Department of Fish and Game, personal communication).

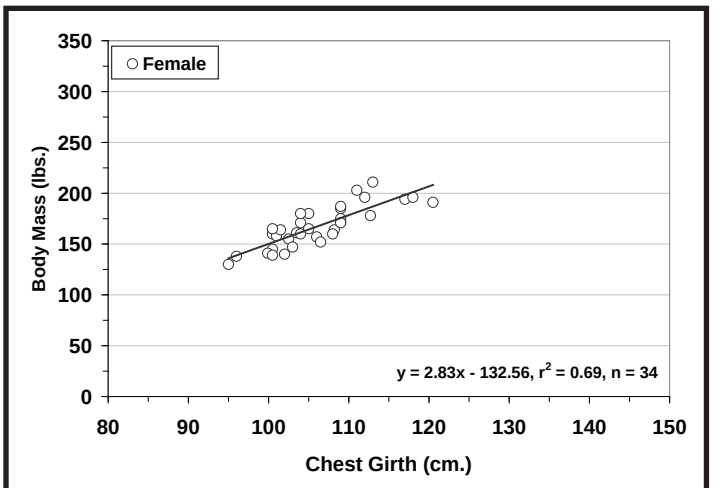



Figure 7b: Relationship between body mass and chest girth for female mountain goats, Lynn Canal, AK

## Winter Severity and Snow Modeling

*Snow Surveys.*—Field-based snow surveys were conducted during March 31, 2008 on Echo Ridge. This survey was conducted within 3 days of an identical survey conducted in 2007. Preliminary analyses of these data quantified the degree to which snow depth differs with increasing elevation between forested and non-forested sites (White et al.

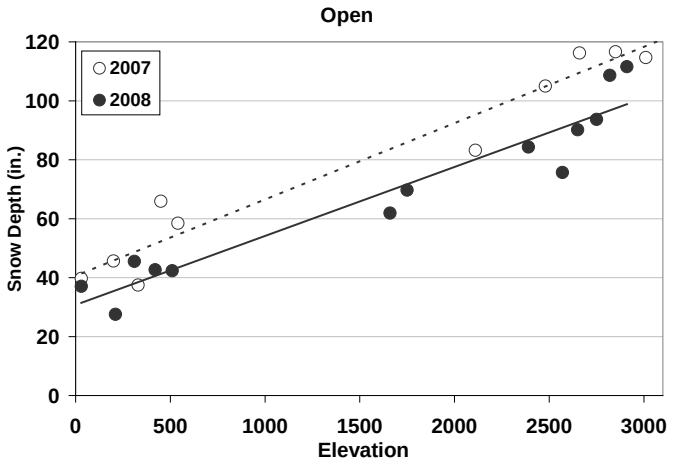



Figure 8: Relationship between snow depth and elevation in non-forested sites in late-March 2007 and 2008. Snow depth was about 10 inches less in 2008 than in 2007. Data were collected on Echo Ridge, AK.

2007). Comparison of data collected in 2007 and 2008 indicated that snow depths were similar at elevation within forested habitats between years. However, in open habitats snow depth was 10 inches less, on average, in 2008 than in 2007 (Figure 8).

*Climate Data*.—Daily climate data were archived from the National Weather Service database to characterize broader scale climate patterns. Mean daily snow depth and snowfall data were summarized from data collected at the National Weather Service station in Haines, AK (Figures 9a, 9b, 9c). Mean snow depth during mid-winter (January-March) 2007/2008 was ca. 200% of normal in Haines (Figure 9c). While substantial, recorded snow depths were notably less than the historical record winter of 2006/2007 (Figure 9b, 9c). The previous two winters should be considered severe relative to the historical record for Haines. Nonetheless, the winter of 2007/2008 differed from 2006/2007 in two important ways. In 2007/2008, substantial snow accumulation (i.e. snow depth > 20 inches) was not evident until late-December while in 2006/2007 the equivalent snow depth threshold was reached by mid-November, six weeks earlier. Also, substantially more now accumulated during late-winter (i.e. March) in 2006/2007 as compared to 2007/2008 (Figure 9b, 9c).

## Survival and Reproduction

*Survival*.—Mountain goats were monitored monthly during fixed-wing aerial telemetry flights. Of the 67 animals monitored during 2007/2008 (i.e. 6/1/2007– 5/30/2008), 9 animals died of various natural causes. An additional 15 animals had GPS radio-collars that released in mid-August 2007 (as planned). Consequently, for most of the biological year, we monitored 52 animals. Overall, preliminary survival estimates were 9% higher in 2007/2008 than in 2006/2007 (Table 1). In general, survival of females was higher than males (Table 1) and older ani-

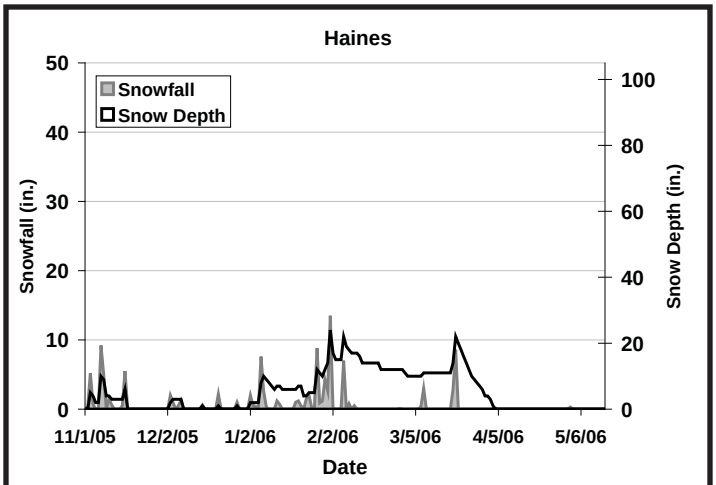



Figure 9a: Daily measures of snowfall and snow depth recorded at the NWS station in Haines, AK during the winter of 2005-2006. Snowfall events are depicted by the grey colored peaks; the black solid line describes snow depth patterns.

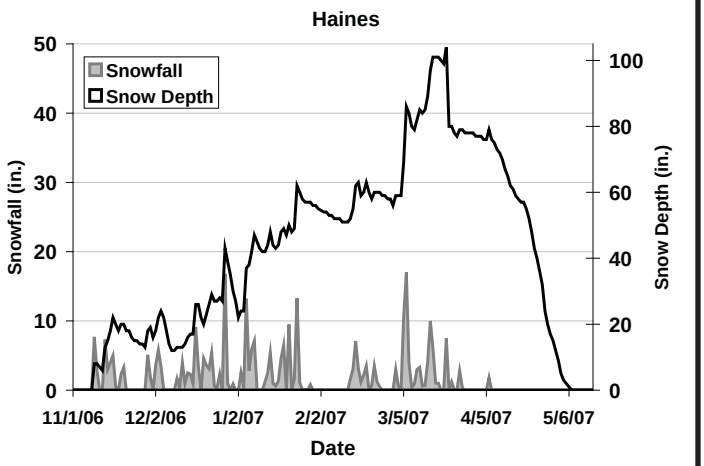



Figure 9b: Daily measures of snowfall and snow depth recorded at the NWS station in Haines, AK during the winter of 2006-2007. Snowfall events are depicted by the grey colored peaks; the black solid line describes snow depth patterns.

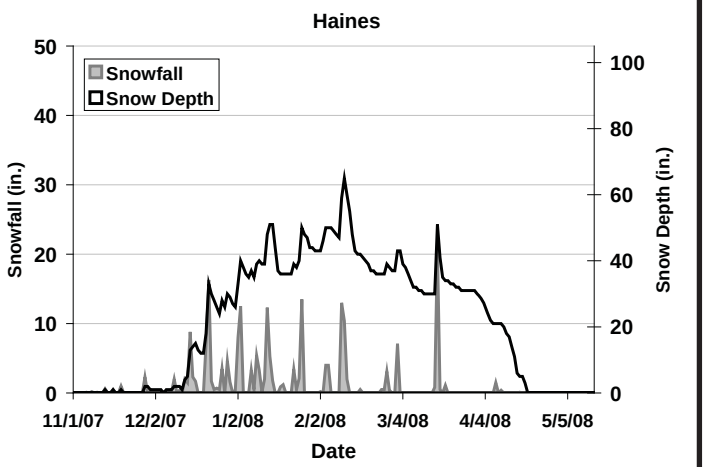



Figure 9c: Daily measures of snowfall and snow depth recorded at the NWS station in Haines, AK during the winter of 2006-2007. Snowfall events are depicted by the grey colored peaks; the black solid line describes snow depth patterns. These data indicate six snowfall events > 10 inches during the winter season. Substantial snow accumulation (snow depth > 20 in.) occurred between late-December to mid-April.

mals were more likely to die than younger animals (White et al. 2007). Most mortality occurred during late winter (February-May), however, two adult males died during October-November, a period coinciding with the rut. The preliminary estimates of survival reported for 2006/2007 are lower than has been documented elsewhere (Smith 1986, Festa-Bianchet and Cote 2007), however, survival estimates for 2005/2006 and 2007/2008 are similar to previous studies. Given that winter snowfall accumulation during 2006/2007 was the highest on record, severe winter conditions likely played a key role on increased mortality of mountain goats during this period.

*Causes of Mortality and Scavenging.*—Unequivocally assigning cause of death for mountain goat mortalities was difficult. This results because known predators of mountain goats will also readily scavenge carcasses that die from other causes. Most mortality sites investigated in this study had also been previously visited by known predators of mountain goats (i.e. bears, wolves and wolverines) however in most cases it was not clear whether study animals were killed or died from other causes and subsequently scavenged.

In one notable case, we were able to clearly document a case of black bear scavenging on a mountain goat. Specifically, we determined that LG-55 (11-yro female) died on October 31, 2006 of unknown causes. On July 5, 2007, a black bear scavenged on the carcass of LG-55. In the course of scavenging activities, the black bear inadvertently attached the GPS radio-collar previously deployed by field researchers to LG-55 to itself. It is unclear exactly how this occurred. Nonetheless, due to the remote data downloading capability of the GPS radio-collars used in this study, it was possible to clearly document this event via GIS analysis and, later, via aerial and ground monitoring. To our knowledge, this is the first instance of radio-collar larceny by a black bear.

*Kid Recruitment.*—Kid recruitment of radio-marked female mountain goats was estimated by determining the percentage of radio-marked females seen with kids during May-June aerial telemetry surveys (n = 3). Since each radio-marked female was not observed daily during the kidding period, it was not possible to determine if kids were born and subsequently died prior to, or between, surveys. As such, estimates of kid production reported here are presumably lower than the actual percentage of females that gave birth. Nevertheless, our estimates of kid production were similar to estimates of kidding rates reported elsewhere (Festa-Bianchet and Cote 2007).

Table 1: Estimates of mountain goat survival for different sex classes during 2005-2008, Lynn Canal, AK.

| | Males | | | | Females | | | | Total | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | At Risk | Died | $\hat{S}$ | SE | At Risk | Died | $\hat{S}$ | SE | At Risk | Died | $\hat{S}$ | SE |
| 2005/2006 | 11 | 2 | 0.82 | 0.12 | 11 | 1 | 0.91 | 0.09 | 22 | 3 | 0.86 | 0.07 |
| 2006/2007 | 33 | 11 | 0.67 | 0.08 | 25 | 4 | 0.84 | 0.07 | 58 | 15 | 0.74 | 0.06 |
| 2007/2008 | 29 | 6 | 0.79 | 0.07 | 23 | 3 | 0.88 | 0.07 | 52 | 9 | 0.83 | 0.05 |
| All years | 73 | 19 | 0.74 | 0.05 | 59 | 8 | 0.85 | 0.04 | 132 | 26 | 0.79 | 0.03 |

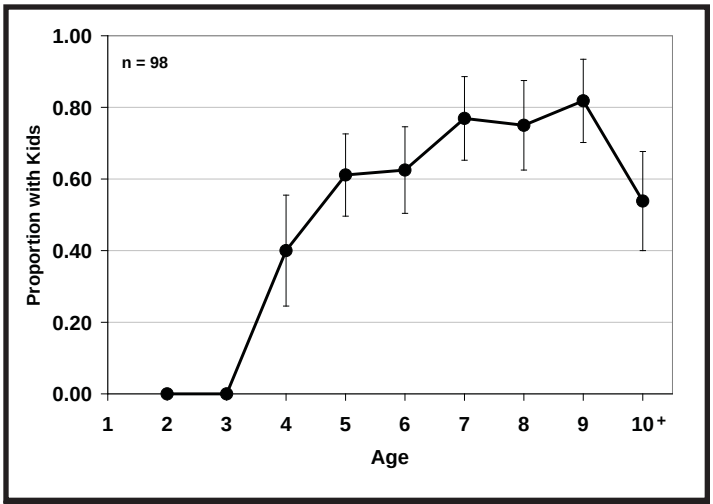



Figure 10: Age-specific estimates of kid production for female mountain goats in different age classes during 2005-2008, Lynn Canal, AK.

Past studies have documented late age at first reproduction for mountain goats, as compared to other ungulates (Festa-Bianchet and Cote 2007, Galliard et al. 2000). Consistent with these findings, we did not document any cases where females less than four years of age had kids at heel in summer. Overall, kid production estimates varied with female age (range = 40-82%) such that younger and older females were generally less likely to have a kid at heel than prime-aged females (i.e. 7-9 years old; Figure 10). We did not observe cases of kid abandonment when females with kids were captured, as determined via post-capture aerial telemetry surveys.

## Population Abundance and Composition

*Aerial Surveys.*—Overall, 10 fixed-wing and 2 helicopter surveys were conducted in August-September 2007 (Lions Head, n = 4, Sinclair Mountain, n = 3, Mount Villard, n = 3, East Berners, n = 2; Appendix 3). One survey was attempted but not completed in entirety. Incomplete surveys provide meaningful data but are not, at this point, directly comparable to other surveys. Of the complete surveys flown (n = 11), substantial variation was observed in the minimum number of mountain goats observed and the proportion of kids (Appendix 1). These findings underscore the value of conducting replicate surveys in each area.

The proportion of mountain goats for which the presence

or absence of a collar could be ascertained was variable and primarily depended upon weather conditions and aircraft type. Use of 14X image stabilizing binoculars (Fujinon) significantly increased the ability to assess collar status, as compared to past years. During 2007, habitat and behavioral covariate data were collected for 47 marked mountain goats during surveys. These data were paired with records of whether animals were either seen or not seen during routine surveys in order to compile a database suitable for determining factors related to mountain goat survey sighting probability.

*Ground-based Surveys.*—Ground based surveys were conducted in the Mount Villard and upper Dayebas Creek area during June 24-July 2, 2008 and during July 29-August 3, 2008 in the Mt. Selby area. In addition to gathering age and sex composition data for mountain goats in these areas, detailed behavioral data was collected for GPS radio-collared adult females in order to validate data collected by activity sensors imbedded in radio-collars. In addition, focal animal and scan sampling behavioral data were collected to compile baseline activity budget and behavioral data for animals in these areas.

## FUTURE WORK

Study animals will continue to be monitored monthly to assess reproductive status and survival. Additionally, at 8-week intervals GPS data will be downloaded from each animal during aerial surveys. These data will be post-processed and integrated with the existing GPS location database. Three replicate aerial surveys will be conducted in early-fall 2009, weather permitting, in order to estimate mountain goat sightability, population abundance and composition. Results of these efforts will be summarized and submitted as an annual research progress report by November 1, 2009.

## PROJECT PUBLICATIONS

White, K. S., N. L. Barten and D. Larsen. 2006. Mountain goat assessment and monitoring along the Juneau Access road corridor and near the Kensington Mine, southeast Alaska. Research Progress Report, Alaska Department of Fish and Game, Division of Wildlife Conservation, Juneau, AK. 65pp.

White, K. S. 2006. Seasonal and sex-specific variation in terrain use and movement patterns of mountain goats in southeastern Alaska. Proceedings of the Biennial Symposium of the Northern Wild Sheep and Goat Council, 15: 183-193.

White, K. S., N. L. Barten and D. Larsen. 2007. Mountain goat assessment and monitoring along the Juneau Access road corridor and near the Kensington Mine, southeast Alaska. Research Progress Report, Alaska Department of Fish and Game, Division of Wildlife Conservation, Juneau, AK. 16pp.

K.S. White, G. Pendleton, D. Crowley, H. Griese, K. Hundertmark, T. McDonough, L. Nichols, B. Porter, M. Robus, C. Smith and J. Schoen. 2008. Survival of mountain goats in coastal Alaska: synthesis and applications. 16th Biennial Symposium of the Northern Wild Sheep and Goat Council, Midway, UT. (Abstract).

## REFERENCES

Altman, J. 1974. Observational study of behavior: sampling methods. Behaviour, 49: 227-267.

Chadwick, D.H. 1973. Mountain goat ecology: logging relationships in the Bunker creek drainage of western Montana. Montana Fish and Game Dept., P-R Project Report W-120-R-3,4. Helena, MT. Pp. 262.

Cote, S. D., M. Festa-Bianchet and F. Fournier. 1998. Life history effects of chemical immobilization and radiocollars on mountain goats. Journal of Wildlife Management, 62:745-752.

Cote, S.D. and M. Festa-Bianchet. 2003. Mountain goat. In Wild Mammals of North America (G.A. Feldhamer and B. Thompson, eds.). John Hopkins Univ. Press, Baltimore, MD. Pp. 1061-1075.

D'Eon, R. G. and D. Delaparte. 2005. Effects of radio-collar position and orientation on GPS radio-collar performance, and implications of PDOP in data screening. Journal of Applied Ecology, 42: 383-388.

D'Eon, R. G., R. Serrouya, G. Smith and C. O. Kochanny. 2002. GPS radiotelemetry error and bias in mountainous terrain. Wildlife Society Bulletin, 30: 430-439.

Festa-Bianchet, M. and S. D. Cote. 2007. Mountain goats: ecology, behavior, and conservation of an alpine ungulate. Island Press. Covelo, CA.

Foster, B.R. and E.Y Rahs. 1983. Mountain goat response to hydroelectric exploration in northwestern British Columbia. Environmental Management, 7:189-197.

Joslin, G. 1986. Mountain goat population changes in relation to energy exploration along Montana's Rocky Mountain Front. Proceedings of the Fifth Biennial Northern Wild Sheep and Goat Council, 5:253-271.

Galliard, J.-M., M. Festa-Bianchet, N. G. Yoccoz, A. Loison, and C. Toigo. 2000. Temporal variation in fitness components and population dynamics of large herbivores. Annual Review of Ecology and Systematics, 31:367-393.

Gehrels, G. E. 2000. Reconnaissance geology and U-Pb geochronology of the western flank of the Coast Mountains between Juneau and Skagway, southeastern Alaska. In Special Paper, Geological Society of America, Pages 213-233. Geological Society of America, Boulder, CO.

Pollock, K. H., S. R. Winterstein, C. M. Bunck and P. D. Curtis. 1989. Survival analysis in telemetry studies: the staggered entry design. Journal of Wildlife Management, 53: 7-15.

Robus, M. H. and B. L. Carney. 1995. Effects of Kensington mine development on black bears and mountain goats. Wildlife baseline studies and monitoring plan. Final report. Alaska Department of Fish and Game, Douglas, AK.

Schoen, J. W. and M. D. Kirchhoff. 1982. Habitat use by mountain goats in Southeast Alaska. Research Final Report. Alaska Department of Fish and Game, Juneau, AK. 67pp.

Smith, C. A. 1986. Rates and causes of mortality in mountain goats in southeast Alaska. Journal of Wildlife management, 50:743-46.

Smith, C.A. and K.T. Bovee. 1984. A mark-recapture census and density estimate for a coastal mountain goat population. Biennial Symposium of the Northern Wild Sheep and Goat Council, 4:487-498.

Taylor, W.P. 2000. Wildlife capture and restraint manual. Alaska Department of Fish and Game, Anchorage, AK.

White, K. S., N. L. Barten and D. Larsen. 2006. Mountain goat assessment and monitoring along the Juneau Access road corridor and near the Kensington Mine, southeast Alaska. Research Progress Report, Alaska Department of Fish and Game, Division of Wildlife Conservation, Juneau, AK. 65pp.

White, K. S. 2006. Seasonal and sex-specific variation in terrain use and movement patterns of mountain goats in southeastern Alaska. Proceedings of the Biennial Symposium of the Northern Wild Sheep and Goat Council, 15: 183-193.

White, K. S., N. L. Barten and D. Larsen. 2007. Mountain goat assessment and monitoring along the Juneau Access road corridor and near the Kensington Mine, southeast Alaska. Research Progress Report, Alaska Department of Fish and Game, Division of Wildlife Conservation, Juneau, AK. 16pp.

Appendix 1: Summary of mountain goat capture and monitoring records, 2005-2008, Lynn Canal, AK (as of 10/4/08).

| Mtn Goat ID | Area | Capture Date | Sex | Est. Age | Weight (lbs.) | Collar Type | Months Monitored | Status |
|---|---|---|---|---|---|---|---|---|
| LG-01 | Lions Head | 09/26/05 | M | 9 | 308 | GPS | 6.7 | Died, 4/17/06 |
| LG-02 | Lions Head | 09/26/05 | F | 11 | 140 | GPS | 6.6 | Died, 4/16/06 |
| LG-03 | Sinclair Mtn. | 09/26/05 | F | 7 | 180 | GPS | 18.5 | Died, 4/10/07 |
| LG-04 | Sinclair Mtn. | 09/26/05 | F | 7 | 196 | GPS | 22.9 | Collar Released, 8/23/07 |
| LG-05 | Sinclair Mtn. | 09/26/05 | M | 9 | | GPS | 19.4 | Died, 5/9/07 |
| LG-06 | Lions Head | 10/02/05 | M | 8 | 347 | GPS | 4.3 | Died, 2/10/06 |
| LG-07 | Lions Head | 10/02/05 | M | 2 | 163 | GPS | 22.7 | Collar Released, 8/23/07 |
| LG-08 | Lions Head | 10/02/05 | F | 5 | 171 | GPS | 22.7 | Collar Released, 8/23/07 |
| LG-09 | Lions Head | 10/02/05 | F | 10 | | GPS | 22.7 | Collar Released, 8/23/07 |
| LG-10 | Sinclair Mtn. | 10/03/05 | F | 7 | 187 | GPS | 22.7 | Collar Released, 8/23/07 |
| LG-11 | Sinclair Mtn. | 10/03/05 | M | 9 | 335 | GPS | 16.3 | Died, 2/11/07 |
| LG-12 | Mt. Villard | 10/03/05 | F | 8 | 196 | GPS | 22.7 | Collar Released, 8/23/07 |
| LG-13 | Mt. Villard | 10/03/05 | F | 9 | | GPS | 0.1 | Died, 10/5/05 |
| LG-14 | Mt. Villard | 10/03/05 | F | 5 | 211 | GPS | 22.7 | Collar Released, 8/23/07 |
| LG-15 | Mt. Villard | 10/03/05 | M | 6 | 279 | GPS | 22.7 | Collar Released, 8/23/07 |
| LG-16 | Sinclair Mtn. | 10/14/05 | M | 5 | 273 | GPS | 22.3 | Collar Released, 8/23/07 |
| LG-17 | Mt. Villard | 10/14/05 | F | 7 | 161 | GPS | 22.3 | Collar Released, 8/23/07 |
| LG-18 | Mt. Villard | 10/14/05 | M | 3 | 196 | GPS | 22.3 | Collar Released, 8/23/07 |
| LG-19 | Lions Head | 10/15/05 | M | 5 | 273 | GPS | 8.4 | Died, 6/26/06 |
| LG-20 | Lions Head | 10/15/05 | M | 8 | 285 | GPS | 22.3 | Collar Released, 8/23/07 |
| LG-21 | Lions Head | 10/15/05 | F | 4 | 194 | GPS | 22.3 | Collar Released, 8/23/07 |
| LG-22 | Lions Head | 10/15/05 | F | 8 | | GPS | 22.3 | Collar Released, 8/23/07 |
| LG-23 | Lions Head | 10/15/05 | M | 9 | 221 | GPS | 22.3 | Collar Released, 8/23/07 |
| LG-24 | Lions Head | 07/28/06 | M | 3 | 134 | GPS | 23.6 | Died, 7/13/08 |
| LG-25 | Lions Head | 07/28/06 | F | 6 | 130 | GPS | 9.4 | Died, 5/11/07 |
| LG-26 | Lions Head | 07/28/06 | M | 6 | 251 | GPS | 3.7 | Died, 11/17/06 |
| LG-27 | Lions Head | 07/28/06 | M | 10 | 274 | GPS | 17.1 | Died, 12/31/07 |
| LG-28 | Lions Head | 07/28/06 | M | 8 | | GPS | 11.7 | Died, 7/18/06 |
| LG-29 | Sinclair Mtn. | 07/28/06 | F | 7 | 160 | GPS | 25.5 | Collar Released, 9/11/08 |
| LG-30 | Lions Head | 07/28/06 | F | 8 | | GPS | 8.9 | Died, 4/25/07 |
| LG-31 | East Berners | 07/28/06 | M | 12 | 223 | GPS | 7.7 | Died, 3/18/07 |
| LG-32 | East Berners | 07/28/06 | F | 4 | 138 | GPS | 10.3 | Died, 6/6/07 |
| LG-33 | East Berners | 07/29/06 | M | 9 | 256 | GPS | 9.4 | Died, 5/12/07 |
| LG-34 | East Berners | 07/29/06 | M | 6 | 258 | GPS | 25.5 | Collar Released, 9/11/08 |
| LG-35 | East Berners | 07/29/06 | F | 5 | | GPS | 25.5 | Collar Released, 9/11/08 |
| LG-36 | Lions Head | 07/29/06 | M | 6 | 308 | GPS | 25.5 | Collar Released, 9/11/08 |
| LG-37 | Lions Head | 07/29/06 | M | 4 | 216 | GPS | 18.7 | Died, 2/18/08 |
| LG-38 | Lions Head | 07/29/06 | F | 4 | 141 | GPS | 25.5 | Collar Released, 9/11/08 |
| LG-39 | Sinclair Mtn. | 08/29/06 | F | 10 | 165 | GPS | 8.4 | Died, 5/10/07 |
| LG-40 | Sinclair Mtn. | 08/29/06 | M | 8 | | GPS | 24.5 | Collar Released, 9/11/08 |
| LG-41 | Sinclair Mtn. | 08/29/06 | F | 5 | | GPS | 24.5 | Collar Released, 9/11/08 |
| LG-42 | Mt. Villard | 08/29/06 | F | 3 | 178 | GPS | 24.5 | Collar Released, 9/11/08 |
| LG-43 | Mt. Villard | 08/29/06 | F | 4 | 164 | GPS | 24.5 | Collar Released, 9/11/08 |

Appendix 1 (cont.): Summary of mountain goat capture and monitoring records, 2005-2008, Lynn Canal, AK (as of 10/4/08).

| Mtn Goat ID | Area | Capture Date | Sex | Est. Age | Weight (lbs.) | Collar Type | Months Monitored | Status |
|---|---|---|---|---|---|---|---|---|
| LG-44 | Mt. Villard | 08/29/06 | M | 12 | | GPS | 1.7 | Died, 10/19/06 |
| LG-45 | Sinclair Mtn. | 09/25/06 | F | 6 | 185 | GPS | 23.6 | Collar Released, 9/11/08 |
| LG-46 | Mt. Villard | 09/25/06 | M | 8 | 331 | GPS | 23.3 | Died, 9/1/08 |
| LG-47 | Mt. Villard | 09/25/06 | M | 11 | 294 | GPS | 5.0 | Died, 2/23/07 |
| LG-48 | Mt. Villard | 09/25/06 | M | 12 | 291 | GPS | 7.0 | Died, 4/26/07 |
| LG-49 | Mt. Villard | 09/25/06 | M | 6 | 340 | GPS | 23.6 | Collar Released, 9/11/08 |
| LG-50 | Sinclair Mtn. | 10/07/06 | M | 8 | 250 | GPS | 6.3 | Died, 4/17/07 |
| LG-51 | Sinclair Mtn. | 10/07/06 | F | 2 | 145 | GPS | 23.2 | Collar Released, 9/11/08 |
| LG-52 | Sinclair Mtn. | 10/07/06 | F | 3 | 160 | GPS | 23.2 | Collar Released, 9/11/08 |
| LG-53 | Lions Head | 10/07/06 | M | 3 | 171 | GPS | 23.2 | Collar Released, 9/11/08 |
| LG-54 | Mt. Villard | 10/12/06 | M | 7 | 320 | GPS | 23.0 | Collar Released, 9/11/08 |
| LG-55 | Mt. Villard | 10/12/06 | F | 12 | 203 | GPS | 0.6 | Died, 10/31/06 |
| LG-56 | Mt. Villard | 10/12/06 | M | 9 | 339 | GPS | 6.1 | Died, 4/16/07 |
| LG-57 | Mt. Villard | 10/12/06 | F | 8 | 180 | GPS | 9.8 | Died, 8/5/07 |
| LG-58 | Mt. Villard | 10/12/06 | M | 4 | 263 | GPS | 23.0 | Collar Released, 9/11/08 |
| LG-59 | Mt. Villard | 10/12/06 | F | 5 | 158 | GPS | 23.0 | Collar Released, 9/11/08 |
| LG-60 | Sinclair Mtn. | 10/13/06 | M | 5 | 287 | GPS | 23.0 | Collar Released, 9/11/08 |
| LG-61 | Sinclair Mtn. | 10/13/06 | M | 10 | 350 | GPS | 22.2 | Collar Removed, 8/18/08 |
| LG-62 | Sinclair Mtn. | 10/13/06 | M | 10 | 310 | GPS | 23.0 | Collar Released, 9/11/08 |
| LG-63 | Sinclair Mtn. | 10/13/06 | M | 10 | 297 | GPS | 5.1 | Died, 3/16/07 |
| LG-64 | Sinclair Mtn. | 10/13/06 | M | 4 | 281 | GPS | 11.7 | Died, 10/4/07 |
| LG-65 | East Berners | 07/29/07 | M | 8 | 252 | GPS | 13.3 | Died, 9/4/08 |
| LG-66 | East Berners | 07/29/07 | F | 7 | 147 | GPS | 14.2 | Alive |
| LG-67 | East Berners | 07/29/07 | M | 11 | ~300 | GPS | 1.7 | 9/20/2007 |
| LG-68 | East Berners | 07/29/07 | F | 11 | 171 | GPS | 14.2 | Alive |
| LG-69 | Lions Head | 07/29/07 | M | 1 | 95 | GPS | 14.2 | Alive |
| LG-70 | East Berners | 07/29/07 | F | 5 | 139 | GPS | 14.2 | Alive |
| LG-71 | Mt. Villard | 08/01/07 | F | 5 | 164 | GPS | 14.1 | Alive |
| LG-72 | Mt. Villard | 08/01/07 | F | 5 | 165 | GPS | 2.8 | Died, 10/24/07 |
| LG-73 | Mt. Villard | 08/01/07 | M | 11 | 309 | GPS | 7.9 | Died, 3/28/08 |
| LG-74 | Mt. Villard | 08/01/07 | M | 6 | 298 | GPS | 14.1 | Alive |
| LG-75 | Sinclair Mtn. | 08/02/07 | M | 3 | 141 | GPS | 11.2 | Died, 7/7/08 |
| LG-76 | Sinclair Mtn. | 08/02/07 | F | 4 | 155 | GPS | 14.1 | Alive |
| LG-77 | Sinclair Mtn. | 08/02/07 | M | 6 | 249 | GPS | 14.1 | Alive |
| LG-78 | Sinclair Mtn. | 08/02/07 | F | 9 | 175 | GPS | 13.4 | Collar Released, 9/11/08 |
| LG-79 | Sinclair Mtn. | 08/02/07 | M | 11 | 269 | GPS | 0.7 | Died, 8/24/07 |
| LG-80 | Sinclair Mtn. | 08/02/07 | M | 6 | 281 | GPS | 13.4 | Collar Released, 9/11/08 |
| LG-81 | Sinclair Mtn. | 08/02/07 | M | 4 | 217 | GPS | 13.4 | Collar Released, 9/11/08 |
| LG-82 | Mt. Villard | 08/02/07 | F | 6 | 152 | VHF | 1.1 | Died, 9/3/07 |
| LG-83 | Lions Head | 08/03/07 | M | 5 | 258 | VHF | 14.1 | Alive |
| LG-84 | Lions Head | 08/03/07 | M | 4 | 180 | VHF | 14.1 | Alive |
| LG-85 | Mt. Villard | 08/03/07 | F | 9 | 191 | -- | 0.0 | Died, 8/3/07 |
| LG-86 | Lions Head | 08/11/07 | M | 4 | 223 | VHF | 13.8 | Alive |

Appendix 1 (cont.): Summary of mountain goat capture and monitoring records, 2005-2008, Lynn Canal, AK (as of 10/4/08).

| Mtn Goat ID | Area | Capture Date | Sex | Est. Age | Weight (lbs.) | Collar Type | Months Monitored | Status |
|---|---|---|---|---|---|---|---|---|
| LG-87 | Lions Head | 08/11/07 | M | 5 | 233 | GPS | 13.8 | Alive |
| LG-88 | Sinclair Mtn. | 08/11/07 | F | 8 | 160 | VHF | 13.8 | Alive |
| LG-89 | Sinclair Mtn. | 08/11/07 | M | 4 | 240 | VHF | 13.8 | Alive |
| LG-90 | Sinclair Mtn. | 08/11/07 | F | 3 | 157 | GPS | 13.8 | Alive |
| LG-91 | Mt. Villard | 08/11/07 | F | 5 | 172 | VHF | 13.8 | Alive |
| LG-92 | East Berners | 08/16/08 | M | 7 | 279 | GPS | 1.6 | Alive |
| LG-93 | East Berners | 08/16/08 | M | 3 | 173 | GPS | 1.6 | Alive |
| LG-94 | East Berners | 08/16/08 | F | 13 | 167 | GPS | 1.6 | Alive |
| LG-95 | East Berners | 08/16/08 | M | 5 | 266 | GPS | 1.5 | Died, 10/1/08 |
| LG-96 | East Berners | 08/16/08 | M | 5 | 258 | GPS | 1.6 | Alive |
| LG-97 | Lions Head | 08/16/08 | F | 5 | 151 | GPS | 1.6 | Alive |
| LG-98 | Lions Head | 08/16/08 | M | 6 | 279 | GPS | 1.6 | Alive |
| LG-99 | Lions Head | 08/18/08 | M | 6 | 266 | GPS | 1.5 | Alive |
| LG-100 | Sinclair Mtn. | 08/18/08 | F | 10 | 163 | GPS | 1.5 | Alive |
| LG-101 | Sinclair Mtn. | 08/18/08 | M | 5 | 277 | GPS | 1.5 | Alive |
| LG-102 | Sinclair Mtn. | 08/18/08 | M | 7 | 328 | VHF | 1.5 | Alive |
| LG-103 | Sinclair Mtn. | 08/18/08 | F | 7 | 185 | GPS | 1.5 | Alive |
| LG-61 | Sinclair Mtn. | 08/18/08 | M | 12 | 301 | GPS | 1.5 | Alive, Re-capture |
| LG-104 | Sinclair Mtn. | 08/18/08 | F | 6 | 192 | GPS | 1.5 | Alive |
| LG-105 | East Berners | 08/19/08 | F | 5 | 179 | GPS | 1.5 | Alive |
| LG-106 | Lions Head | 08/19/08 | M | 5 | 242 | VHF | 1.5 | Alive |
| LG-107 | Mt. Villard | 08/19/08 | M | 7 | 307 | GPS | 1.5 | Alive |
| LG-108 | Mt. Villard | 08/19/08 | F | 4 | 165 | GPS | 1.5 | Alive |
| LG-109 | Mt. Villard | 08/19/08 | M | 3 | 166 | VHF | 1.5 | Alive |
| LG-17 | Mt. Villard | 08/19/08 | F | 8 | 149 | VHF | 1.5 | Alive, Re-capture |
| LG-110 | Mt. Villard | 08/19/08 | M | 6 | 298 | GPS | 1.5 | Alive |
| LG-111 | East Berners | 09/21/08 | F | 4 | 194 | GPS | 0.4 | Alive |
| LG-112 | Lions Head | 09/21/08 | F | 11 | 199 | GPS | 0.4 | Alive |
| LG-113 | Mt. Villard | 09/21/08 | F | 4 | 182 | GPS | 0.4 | Alive |
| LG-114 | Mt. Villard | 09/21/08 | M | 7 | 345 | GPS | 0.4 | Alive |
| LG-115 | Mt. Villard | 09/21/08 | M | 8 | 306 | GPS | 0.4 | Alive |
| LG-116 | Mt. Villard | 09/21/08 | F | 4 | 186 | GPS | 0.4 | Alive |
| LG-117 | Lions Head | 09/24/08 | F | 3 | 170 | GPS | 0.3 | Alive |
| LG-118 | Lions Head | 09/24/08 | F | 3 | 166 | GPS | 0.3 | Alive |
| LG-15 | Mt. Villard | 09/24/08 | M | 8 | 303 | VHF | 0.3 | Alive, Re-capture |
| LG-119 | Sinclair Mtn. | 09/24/08 | M | 4 | 237 | VHF | 0.3 | Alive |
| LG-120 | Sinclair Mtn. | 09/24/08 | F | 5 | 175 | GPS | 0.3 | Alive |
| LG-40 | Sinclair Mtn. | 09/24/08 | M | 10 | 309 | VHF | 0.3 | Alive, Re-capture |

Appendix 2: Percent diet composition of mountain goats in in Lynn Canal, AK. Summer-fall data (i.e. 7/28-10/15) were collected from live-captured animals (Females, n = 19; Males, n = 28) throughout the Lynn Canal study area. The winter diet summary is derived from a composite sample (n = 6 pellet-groups) collected in February 2006 in the Echo Cove area. These results are not corrected for differential digestability of food items.

| | Summer-Fall | | | Winter (Composite Sample) | | |
|---|---|---|---|---|---|---|
| | mean | SE | n | mean | SE | n |
| Alnus spp. leaf | 0.0 | 0.0 | 47 | 0.0 | -- | 1 |
| Cassiope spp. | 0.5 | 0.1 | 47 | 0.0 | -- | 1 |
| Dryas drummondii leaf | 0.1 | 0.1 | 47 | 0.0 | -- | 1 |
| Dryas drummondii stem | 0.0 | 0.0 | 47 | 0.0 | -- | 1 |
| Empetrum nigrum leaf | 0.5 | 0.1 | 47 | 0.0 | -- | 1 |
| Rubus spectabilis leaf | 0.1 | 0.0 | 47 | 0.0 | -- | 1 |
| Rubus spectabilis stem | 0.3 | 0.2 | 47 | 0.0 | -- | 1 |
| Salix spp.leaf | 0.6 | 0.2 | 47 | 0.0 | -- | 1 |
| Salix spp.stem | 0.7 | 0.3 | 47 | 1.9 | -- | 1 |
| Vaccinium spp. leaf | 0.2 | 0.1 | 47 | 0.0 | -- | 1 |
| Vaccinium spp. stem | 0.1 | 0.1 | 47 | 9.9 | -- | 1 |
| Other Shrub leaf | 0.2 | 0.1 | 47 | 0.0 | -- | 1 |
| Other Shrub stem | 0.1 | 0.1 | 47 | 0.0 | -- | 1 |
| ***Total Shrubs:*** | ***3.4*** | ***0.6*** | ***47*** | ***11.8*** | ** | ***1*** |
| | | | | | | |
| Achillea borealis | 0.1 | 0.0 | 47 | 0.0 | -- | 1 |
| Anemone narcissiflora | 0.0 | 0.0 | 47 | 0.0 | -- | 1 |
| Symphyotrichum (Aster) subspicatum | 0.1 | 0.1 | 47 | 0.0 | -- | 1 |
| Astragalus ? | 0.0 | 0.0 | 47 | 0.0 | -- | 1 |
| Caltha leptosepala | 0.0 | 0.0 | 47 | 0.0 | -- | 1 |
| Campanula lasiocarpa | 0.1 | 0.0 | 47 | 0.0 | -- | 1 |
| Castilleja spp. | 0.1 | 0.1 | 47 | 0.0 | -- | 1 |
| Cornus canadensis | 0.5 | 0.3 | 47 | 0.0 | -- | 1 |
| Epilobium spp. | 1.2 | 0.6 | 47 | 0.0 | -- | 1 |
| Equisetum spp. | 0.1 | 0.1 | 47 | 0.0 | -- | 1 |
| Erigeron spp. | 0.1 | 0.1 | 47 | 0.0 | -- | 1 |
| Geranium erianthum | 0.6 | 0.2 | 47 | 0.0 | -- | 1 |
| Heracleum (lanatum) maximum | 0.2 | 0.2 | 47 | 0.0 | -- | 1 |
| Lupinus nootkatensis | 8.6 | 1.5 | 47 | 0.0 | -- | 1 |
| Maianthemum dilatatum | 0.1 | 0.1 | 47 | 0.0 | -- | 1 |
| Moneses uniflora | 0.2 | 0.1 | 47 | 0.0 | -- | 1 |
| Pedicularis spp. | 0.2 | 0.1 | 47 | 0.0 | -- | 1 |
| Petasites spp. | 1.1 | 1.0 | 47 | 0.0 | -- | 1 |
| Polygonum viviparum | 0.3 | 0.1 | 47 | 0.0 | -- | 1 |
| Potentilla spp. (sh or forb) | 0.6 | 0.2 | 47 | 0.0 | -- | 1 |
| Ranunculus spp. | 0.8 | 0.3 | 47 | 0.0 | -- | 1 |
| Saxifraga spp. | 0.1 | 0.0 | 47 | 0.0 | -- | 1 |
| Senecio triangularis | 0.1 | 0.1 | 47 | 0.0 | -- | 1 |
| Solidago multiradiata | 0.0 | 0.0 | 47 | 0.0 | -- | 1 |
| Stellaria spp. | 0.1 | 0.1 | 47 | 0.0 | -- | 1 |
| Streptopus amplexifolius | 0.6 | 0.2 | 47 | 0.0 | -- | 1 |
| Viola langsdorffii | 0.0 | 0.0 | 47 | 0.0 | -- | 1 |
| Other Forbs | 1.1 | 0.2 | 47 | 0.0 | -- | 1 |
| ***Total Forbs:*** | ***17.0*** | ***2.1*** | ***47*** | ***0.0*** | ** | ***1*** |
| | | | | | | |
| Carex spp. | 20.7 | 2.0 | 47 | 0.0 | -- | 1 |
| Luzula / Juncus | 14.4 | 1.5 | 47 | 0.0 | -- | 1 |
| ***Total Sedge/Rushes:*** | ***35.1*** | ***3.0*** | ***47*** | ***0.0*** | ** | ***1*** |
| | | | | | | |
| Agropyron spp. | 0.1 | 0.1 | 47 | 0.0 | -- | 1 |
| Agrostis spp. | 1.9 | 0.4 | 47 | 0.0 | -- | 1 |
| Calamagrostis spp. | 0.1 | 0.1 | 47 | 0.0 | -- | 1 |
| Deschampsia spp. | 0.1 | 0.1 | 47 | 0.0 | -- | 1 |
| Festuca spp. | 0.1 | 0.0 | 47 | 0.0 | -- | 1 |
| Hierochloe alpina | 0.3 | 0.1 | 47 | 0.0 | -- | 1 |
| Phleum alpinum (commutatum) | 0.5 | 0.2 | 47 | 0.0 | -- | 1 |
| Poa spp. | 1.2 | 0.3 | 47 | 0.0 | -- | 1 |
| Other Grasses | 0.5 | 0.1 | 47 | 0.0 | -- | 1 |
| ***Total Grasses:*** | ***4.7*** | ***0.7*** | ***47*** | ***0.0*** | ** | ***1*** |
| | | | | | | |
| Populus balsamifera ssp.trichocarpa stem | 0.1 | 0.1 | 47 | 0.0 | -- | 1 |
| Tsuga spp. | 0.3 | 0.1 | 47 | 72.8 | -- | 1 |
| **Total Trees:** | **0.3** | **0.1** | **47** | **72.8** | ** | **1** |
| | | | | | | |
| ***Moss*** | ***5.3*** | ***0.7*** | ***47*** | ***1.9*** | ** | ***1*** |
| | | | | | | |
| Alectoria / Usnea | 5.4 | 0.8 | 47 | 0.0 | -- | 1 |
| Cetraria | 2.3 | 0.4 | 47 | 0.0 | -- | 1 |
| Cladonia | 11.4 | 1.8 | 47 | 0.6 | -- | 1 |
| Peltigera | 0.8 | 0.2 | 47 | 0.0 | -- | 1 |
| Lobaria | 3.0 | 0.5 | 47 | 11.7 | -- | 1 |
| Other Lichen | 0.0 | 0.0 | 47 | 0.0 | -- | 1 |
| ***Total Lichen:*** | ***22.8*** | ***2.8*** | ***47*** | ***12.3*** | ** | ***1*** |
| | | | | | | |
| Athyrium spp. | 3.5 | 1.1 | 47 | 0.0 | -- | 1 |
| Dryopteris expansa (dilatata) | 0.0 | 0.0 | 47 | 0.0 | -- | 1 |
| Gymnocarpium dryopteris | 0.1 | 0.1 | 47 | 0.0 | -- | 1 |
| Fern rhizome | 7.4 | 1.8 | 47 | 1.2 | -- | 1 |
| Other Fern | 0.3 | 0.1 | 47 | 0.0 | -- | 1 |
| ***Total Ferns:*** | ***11.4*** | ***2.2*** | ***47*** | ***1.2*** | ** | ***1*** |
| | | | | | | |
| **TOTAL** | **100.0** | **0.0** | **47** | **100.0** | ** | **1** |

Appendix 3: Summary of mountain goat population abundance and composition survey data, 2007, Lynn Canal, AK.

| Study Area | Date | Adults | Kids | Total | % Kids | Temp | Weather | Wind | Aircraft | # Observers |
|---|---|---|---|---|---|---|---|---|---|---|
| East Berners | 9/2/2007 | 105 | 28 | 133 | 21.1 | 44F | Clear | 0-5 | Heliocourier | 2 |
| East Berners | 9/22/2007 | 97 | 28 | 125 | 22.4 | 35-40 | High Overcast | 0-10 | Cub | 2 |
| Lions Head | 8/10/2007 | 18 | 2 | 20 | 10.0 | 51-57 | Clear | 2-7 | Heliocourier | 3 |
| Lions Head | 8/27/2007 | 43 | 3 | 46 | 6.5 | 44-50 | High Overcast | 0-5 | Heliocourier | 3 |
| Lions Head | 9/13/2007 | 46 | 5 | 51 | 9.8 | ~45-55F | High Overcast/ Low Fog | 0-5 | Cub | 2 |
| Lions Head | 9/28/2007 | 78 | 15 | 93 | 16.1 | 35-40 | Mostly Clear | 0-10 | Hughes 500 | 3 |
| Sinclair | 8/27/2007 | 57 | 4 | 61 | 6.6 | 44-50 | High Overcast | 0-5 | Heliocourier | 3 |
| Sinclair | 9/13/2007 | 75 | 13 | 88 | 14.8 | ~45-55F | High Overcast/ Low Fog | 0-5 | Cub | 2 |
| Sinclair | 9/28/2007 | 173 | 38 | 211 | 18.0 | 35-40 | High Overcast | 0-10 | Hughes 500 | 3 |
| Villard | 9/3/2007 | 88 | 23 | 111 | 20.7 | 47-54F | Clear | 0-10 | Heliocourier | 3 |
| Villard[1] | 9/14/2007 | 74 | 23 | 97 | 23.7 | 44 | Overcast/Fog | 0-27 | Heliocourier | 3 |
| Villard | 9/22/2007 | 132 | 22 | 154 | 14.3 | 35-40 | Overcast/Lt Snow/Fog | 0-15 | Cub | 2 |

[1] surveyed to Paradise Ridge only

# Attachment 2

# Marine Mammal Report - 2008

# 2008 TRANSPORTATION ACTION STRATEGY
# COEUR ALASKA
# KENSINGTON GOLD MINE

Prepared for Coeur by K. Savage
September 28, 2008

# 2008 Transportation Action Strategy

Coeur Alaska's "*Transportation Plan and Mitigation and Best Management Practices*" (Jan. 2008) includes the adoption of standard operating guidelines to ensure minimal disruption of marine mammals in the area due to marine traffic. Guidelines designed to minimize and mitigate impacts regarding vessel routing, schedule and speed are consistent throughout the year. However, during the spring eulachon and herring runs, when marine mammal species are especially prevalent, special considerations include:

1. Mutual agreement between Coeur and agencies in designating a "eulachon spawning season".

Between April 1 and May 28 of 2008, Coeur conducted a total of 62 aerial, terrestrial and marine based surveys to monitor marine mammal numbers in Berner's Bay, with particular emphasis on Steller sea lions and humpback whales (Table 1). Although 94% of the surveys were conducted by environmental personnel, an identification guide was also included in the aerial surveys to ensure proper identification by non-environmental personnel, e.g. helicopter pilots (Fig. 1). Survey results were forwarded to NMFS's Office of Protected Resources. Coeur marine mammal surveys indicated a substantial increase in marine mammal activity relative to the ferry routing on May 2. These survey findings, as well as communication with USFS personnel monitoring eulachon numbers in the Berner's Bay river systems and weekly ADF&G herring surveys were used in the NMFS adoption of May 2 – 16 as the 2008 "eulachon spawning season".

2. Once the "eulachon spawning season" is established, a "transportation action strategy" is implemented. At this time, a NMFS-qualified "marine observer" accompanies the personnel vessel pilot in determining the best daily routing from waters off Yankee Cove to Slate Creek Cove dock, so as to minimize marine mammal encounters within the context of insuring reasonable access to the Kensington Gold Project mine site.

During the 2008 eulachon spawning season, NMFS-qualified marine observers worked with the personnel transport vessel pilot on each run between Juneau and the mine site (Table 2). NMFS- approved observer guidelines were in place prior to the start of the season, which included standardized marine mammal monitoring, avoidance and reporting procedures (Fig.2). Guided crossings began on April 28, four days prior to the designated spawning period. Transport vessels included Allen Marine's *St. Herman*, *St. Nicholas* or *St. Maria,* 78 x 28.5' diesel powered catamarans with water jets designed for lower acoustical impact. The pilot and crew were well versed in federal dictates relative to marine mammal protection and the pilot was equally seasoned in marine mammal avoidance procedures. Of the 16 guided crossings, only 2 involved recordable marine mammal encounters; the first a Steller sea lion swimming alongside the ferry, the second three Steller sea lions passing across the bow of the ferry. Both encounters were reported to NMFS.

# Table 1. Coeur Marine Mammal Surveys, Berner's Bay 2008

| No. | DATE | TIME | OBSERVERS[1] | TYPE | ROUTE[2] | COUNTS OF MARINE MAMMALS OBSERVED | | | | | WEATHER[3] | VIS[4] | ALT, SPEED | Wave Ht | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | SSL | HS | HW | HP | Other | | | | | |
| 1 | 4/1/2008 | 730 | KS, LF | Aerial | II,III | 2 | | | | | LO | E | | 1/2 to 1' | 2 singles, 1 raft of 4 along coast opposite Benjamin |
| 2 | 4/1/2008 | 740 | A. Kitchen | Aerial | NA | | | | | | LO | G | | NA | 2 rafts SSL: 1 with 2, 1 with 3 southwest of Pt. Bridget |
| 3 | 4/2/2008 | 700 | JR | Aerial | I,II,III | | | | | | O | F | | NA | |
| 4 | 4/4/2008 | 1635 | KS | Aerial | II,III | | | | | | HO | G | | 1/2 to 1' | |
| 5 | 4/7/2008 | 705 | KS | Aerial | I,II,III | | 3 | | | | Partly cloudy | G | 2000' | <1' | |
| 6 | 4/7/2008 | 1630 | ChG, RP | Aerial | I-IV, C | | 4 | | | | Snow flurries | P | | 1 - 2' | Raft of 7 SSL west of Pt. Bridget |
| 7 | 4/8/2008 | 1805 | B. Snyder (pilot) | Aerial | NA | 9 | | | | | Clear | E | 1000' | <1' | Mouth of river system |
| 8 | 4/9/2008 | 1100 | LF | Aerial | II,III, C | 7 | | | | | O | G | | 1 - 2' | |
| 9 | 4/9/2008 | 1635 | LF | Aerial | II,III, C | 2 | | | | | LO, rain | G | | 1 - 2' | |
| 10 | 4/10/2008 | 1630 | ClG | Aerial | NA | | | | | | O | G | | 2' | |
| 11 | 4/11/2008 | 1530 | PS | Aerial | II,III,C | 2 | | | | | O, rain | F | 500' | Flat | |
| 12 | 4/14/2008 | 1200 | ChG | Aerial | I | | | | | | Snow flurries | F | | 1-2' | |
| 13 | 4/15/2008 | 700 | JR | Aerial | II,III,C | | | | | | O | F | | <1' | |
| 14 | 4/15/2008 | 1630 | KS, JR | Aerial | II,III,C | 6 | | | | | Clear | E | 1300' | 1' | Group of 6 foraging |
| 15 | 4/18/2008 | 1600 | KS | Aerial | II,III,C | 9 | | | | | Clear | E | | 1/2to 1' | |
| 16 | 4/20/2008 | 1000 | KS | Beach | I, Cove | 1 | | | | | Clear | E | | Flat | |
| 17 | 4/21/2008 | 630 | ChG, BM | Ferry | I,IV | | | | | | Partly cloudy | G | | Flat | |
| 18 | 4/21/2008 | 1420 | NK, BM | Beach | I, Cove | | | | | | Clear | E | | <6" | 4 trumpeter swans |
| 19 | 4/22/2008 | 1130 | NK, RP | Dock | Dock | 3 | | | | | Clear | E | | <6" | Barge pulling into dock with loud music, SSL porpoising out of way |
| 20 | 4/23/2008 | 1245 | BM, ChG | Beach | I, Cove | | | | | | Clear | E | | Flat | |
| 21 | 4/24/2008 | 1600 | ChG | Aerial | II,III,C | 4 | | | | | Clear | E | | Flat | 3 SSL together, 1 single |
| 22 | 4/24/2008 | 1330 | NK, BM | Beach | I, Cove | | | | | | Clear | F | | 1 - 2' | |
| 23 | 4/25/2008 | 930 | NK, BM | Beach | I, Cove | | | | | | O | G | | 1' | 4 HS near dock, 1 near Slate Creek |
| 24 | 4/26/2008 | 1030 | KS, NK | Beach | I, Cove | | | | 2 | | HO | E | | Flat | |
| 25 | 4/27/2008 | 900 | KS, RP | Beach | I, Cove | | | | | | O, drizzle | E | | Flat | 5 in water east of dock, >36 at haulout |
| 26 | 4/28/2007 | 700 | BM | Ferry | I,IV,C | 35 | | | | | LO | G | | Flat | |
| 27 | 4/28/2008 | 1600 | LF | Aerial | II,III,C | | | | | | O | G | | 1-2' | Large group of scoters(?) in Echo Cove |
| 28 | 4/28/2008 | 1030 | KS, ChG | Beach | I, Cove | 76 | | 2 | | | HO, drizzle | E | | Flat | Single SSL near dock, rest in a raft between Pt. St Mary's and Cove Pt. |
| 29 | 4/28/2008 | 1645 | NK | Aerial | II,III,C | 13 | | | | | LO | G | | 1/2 to 1' | Single SSL and raft of 12 |
| 30 | 4/29/2008 | 1030 | KS, RP | Beach | I, Cove | 75 | | 5 | | | Partly cloudy | E | | Flat | |
| 31 | 4/30/2008 | 700 | BM | Aerial | II,III,C | | | | | | HO | G | | 2' | |

| No. | DATE | TIME | OBSERVERS[1] | TYPE | ROUTE[2] | COUNTS OF MARINE MAMMALS OBSERVED | | | | | WEATHER[3] | VIS[4] | ALT, SPEED | Wave Ht | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | SSL | HS | HW | HP | Other | | | | | |
| 32 | 4/30/2008 | 1000 | KS,BM | Beach | I, Cove | 50 | | 3 | | | HO | G | | Flat | |
| 33 | 4/30/2008 | 1630 | NK | Aerial | II | | | | | | HO | P | | <6" | |
| 34 | 4/30/2008 | 1700 | KS | Aerial | I,III,IV | 14 | | 2 | | | Clear | E | 1100' | Flat | I:rafts of 4 and 6, IV:raft of 4 |
| 35 | 5/1/2008 | 920 | LF, NK | Beach | I, Cove | 12 | | 2 | | | O | G | | <1' | |
| 36 | 5/2/2008 | 910 | NK, BM | Beach | Cove | 47 | | 2 | | | O | E | | <6" | |
| 37 | 5/2/2008 | 1030 | LF | Aerial | I,II,IV | 180 | | 1 | | | HO | E | | Flat | |
| 38 | 5/2/2008 | 1800 | NK, ChG, RP | Beach | I, Cove | 120 | | 4 | | | O | E | | Flat | |
| 39 | 5/3/2008 | 1420 | NK, RP | Beach | I, Cove | 70 | | 4 | | | O | F | | 3' | |
| 40 | 5/4/2008 | 1430 | NK, RP | Beach | I, Cove | 77 | | | | | O | G | | <6" | |
| 41 | 5/4/2008 | 1830 | NK, RP | Beach | I, Cove | 98 | | 1 | | | O | G | | <6" | 80 SSL moving north towards Slate Creek right before low tide at 7 pm |
| 42 | 5/5/2008 | 700 | KS | Ferry | I,IV,C | 36 | 5 | 2 | | | HO | E | | Flat | |
| 43 | 5/5/2008 | 720 | NK, RP, BM, ChG | Beach | I, Cove | 8 | | | | | LO | G | | <6" | Ferry arrival |
| 44 | 5/5/2008 | 1415 | NK, RP, BM | Beach | I, Cove | 11 | | 3 | | | LO | G | | <1' | |
| 45 | 5/6/2008 | 1040 | A. Kitchen | Aerial | II,III | | 1 | | | | | | | | |
| 46 | 5/6/2008 | 1235 | NK, BM | Beach | I, Cove | 5 | | | | | Partly cloudy | G | | 1-2' | |
| 47 | 5/6/2008 | 1530 | LF | Aerial | II,IIIC | | | | | | Partly cloudy | E | | 2-3' | |
| 48 | 5/7/2008 | 700 | KS | Ferry | I,IV,C | 3 | 3 | | | | Clear | E | | Flat | |
| 49 | 5/7/2008 | 1500 | ChG | Ferry | I,IV,C | | | | | | Partly cloudy | E | | Flat | |
| 50 | 5/8/2008 | 1300 | KS, RP | Beach | I, Cove | | | | | | HO | E | | Flat | |
| 51 | 5/8/2008 | 1630 | ChG | Ferry | I,IV,C | 3 | 3 | | | | Partly cloudy | E | | Flat | |
| 52 | 5/9/2008 | 1215 | KS, NK | Beach | I, Cove | | | 1 | | | Clear | E | | <1' | 1500-2000 scoters from river system to Cove to Pt. St. Mary's |
| 53 | 5/10/2008 | 1200 | KS, RP | Beach | I, Cove | | | | | | Partly cloudy | G | | 0 - 1' | |
| 54 | 5/11/2008 | 840 | LF,RP | Beach | I, Cove | | | 1 | | | HO | E | | Flat | Seals hauled out |
| 55 | 5/12/2008 | 700 | BM | Ferry | I,IV,C | | | 3 | | | LO | E | | Ripples | |
| 56 | 5/12/2008 | 1630 | NK | Aerial | II,III | | | | | | LO | P | | 3-4' | |
| 57 | 5/14/2008 | 1700 | KS | Ferry | I,IV,C | | 5 | | | 2 Dalls | LO | G | | Flat | |
| 58 | 5/15/2008 | 1600 | ChG | Ferry | I,IV,C | | 1 | | | | Partly cloudy | E | | <6" | |
| 59 | 5/18-19/2008 | All day | KS | Echo Ranch | IV | | | 2 | | | LO | G | | NA | 2 Humpbacks in same vicinity for 2 days |
| 60 | 5/20/2008 | 700 | KS, LF | Aerial | II,III,C | | | | | | Partly cloudy | G | | Flat | |
| 61 | 5/26/2008 | 940 | KS | Beach | I, Cove | | | | 1 | | Clear | E | | Flat | No seals at haulout |
| 62 | 5/28/2008 | 1130 | KS, ChG | Beach | I, Cove | | | 3 | 1 | | Clear | E | | Flat | |

[1] Kate Savage(KS), Liz Flory(LF), John Randolph(JR), Char Guiterrez(ChG), Ray Pohl(RP), Clyde Gillispie(CIG),:Pete Strow(PS), Brian Maupin (BM), Nikki Koehler(NK) [2] I = NW Berner's Bay, II = NE Berner's Bay, III = SE Berner's Bay, IV = SW Berner's Bay, C = coastline, Cove = Slate Cove, Dock = Slate Cove Marine Terminal [3] LO = low overcast, O = overcast, HO = high overcast [4] Visibility: E = excellent, G = good, F = fair, P = poor

## AERIAL IDENTIFICATION OF STELLER SEA LIONS VS. HARBOR SEALS

Both may be seen at "haul outs" on land as well as in the water. Two major distinctions that can help distinguish the species from the air include:

## STELLER SEA LIONS

- **COLOR** - Steller sea lions tend to be varying shades of brown, from light tan to reddish brown
- **BEHAVIOR** - Steller sea lions can be seen foraging singly or together as a small or large group. At haul-outs they are often seen lying very close to or even on top of each other.

Steller sea lions swimming and at haul-out

## HARBOR SEALS

- **COLOR** - Harbor seals are generally shades of light to very dark gray.
- **BEHAVIOR** - Though harbor seals can be seen foraging in the same area, they are not seen foraging as a group. At haul-outs, they tend to maintain more space between each other.

Harbor seals at haul-out

Figure 1. Aerial Identification of Steller Sea Lions and Harbor Seals

## Marine Observer Guidelines

As part of Coeur's "transportation action strategy" during the designated eulachon spawning season, a marine observer will accompany personnel transport vessels. Within the context of insuring reasonable access to the Kensington Gold project mine site, observer focus will be on ensuring that harassment of marine mammals does not occur, which includes avoidance of any encounters with marine mammals that may result in behavioral changes due to vessel presence.

Observer guidelines include:

**Prior to departure:**

1. The observer shall be thoroughly familiar with "Coeur Alaska Kensington Gold Mine Berner's Bay/Lynn Canal Transportation Plan and Mitigation and Best Management Practices", dated January 2008.
2. The observer shall be aware of current trends in marine mammal movements as well as the location of the most recent sightings. This information is currently available through both aerial survey data and land-based survey data collected from sightings at Slate Cove.

**En route:**

1. From the vessel bridge, the observer shall use provided equipment, including binoculars and range finder, to continually scan for the presence of marine mammals either in the path of the approaching vessel or potentially moving into the path of the vessel.
2. Should such a marine mammal sighting occur, the vessel operator shall be notified and avoidance measures practiced by either changing course or adjusting the vessel speed in order to ensure: a. any behavioral changes due to vessel presence are avoided and b. a distance of at least 100 yards from the marine mammal is maintained.
3. During the designated eulachon spawning season, the vessel speed is designated at 13 knots or less. In areas of known concentrated marine mammal presence, the observer may request a further reduction in the vessel speed.
4. Any unforeseen encounters with marine mammals shall be mitigated by cautiously moving away from the animal, especially if erratic swimming patterns or escape tactics are exhibited.
5. Measures will be implemented to marine mammals are not aggressively bothered by the vessel's presence (i.e., erratic swimming, tail slapping, prolonged diving). If an encounter occurs the observer shall request the vessel operator to leave the area immediately and report the incident to NMFS.
6. The observer shall document all sightings of marine mammals, special fish species, and concentrated water bird species on the Marine Survey Form. All encounters with marine mammals, special fish species and important bird species will be recorded on the Marine Mammal Encounter Report Form. Coeur officials, and consequently NMFS, will be contacted if
    - Any marine mammal encounters during vessel operation
    - An injury or mortality occurs to any marine mammal
    - Vessel personnel involved in the encounter did not follow prescribed Transportation Plan guidelines
7. The observer shall ensure that other federal regulations are followed, which include the prohibition of offering food, discarding waste or pursuing marine mammals.

**Following arrival:**

1. The observer shall ensure forms are turned in to site Environmental Department personnel the same day that travel/observations are completed. The Environmental Department will report any encounters to the NMFS.

Figure 2. Marine Observer Guidelines

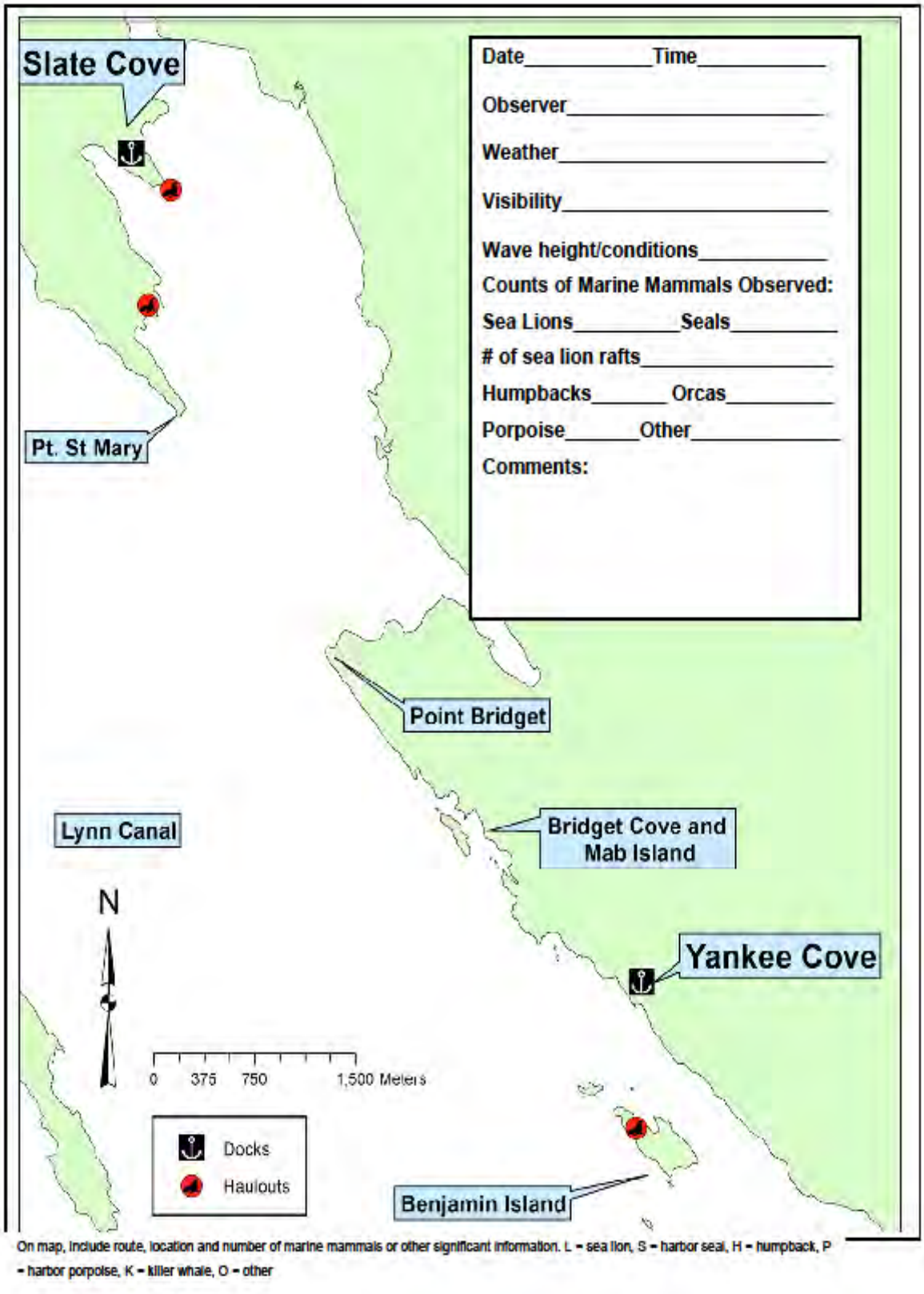



Figure 3. Marine Observer Survey Form

## Marine Wildlife Encounter Report

| |
|---|
| Data of event: |
| Time of event: |
| Personnel Involved: |
| Location (latitude/longitude): |
| Type of Wildlife encountered: |
| Was the wildlife encountered a threatened or endangered species? (Y/N) |
| Was the wildlife within 100 yards of the marine vessel? (Y/N) |
| Did the wildlife display and behavior indicating that it was disturbed? (Y/N) |
| Were there any injuries to Wildlife (Y/N) |
| Were there any mortalities to wildlife (Y/N) |
| If you answered YES to any of the above questions, please provide a detailed description of the encounter and provide contact and response information below. |
| Description of Encounter: |
| Agency contacted: |
| Name of person contacted: |
| Phone: |
| Date contacted: |
| Time contacted |
| Instructions received: |
| Actions completed by (date): |

Figure 4. Marine Wildlife Encounter Report Form

| No. | Date | Day | Approx. ETD | Route | Observer | Survey Form | Encounter Form | Comments |
|---|---|---|---|---|---|---|---|---|
| 1 | 28-Apr | M | 6:00 AM | JNU - Jualin | C. Gutierrez | yes | yes | 1 SSL alongside ferry |
| 2 | | M | 7:00 AM | Jualin - JNU | B. Maupin | yes | no | |
| 3 | 5-May | M | 6:00 AM | JNU - Jualin | K. Savage | yes | no | |
| 4 | | M | 7:00 AM | Jualin - JNU | K. Savage | yes | yes | 3 SSL in front of ferry |
| 5 | 7-May | W | 6:00 AM | JNU - Jualin | K. Savage | yes | no | |
| 6 | | W | 7:00 AM | Jualin - JNU | B. Maupin | yes | no | |
| 7 | | W | 3:00 PM | JNU - Jualin | C. Gutierrez | yes | no | |
| 8 | | W | 4:00 PM | Jualin - JNU | C. Gutierrez | yes | no | |
| 9 | 8-May | Th | 3:00 PM | JNU - Jualin | C. Gutierrez | yes | no | |
| 10 | | Th | 4:00 PM | Jualin - JNU | C. Gutierrez | yes | no | |
| 11 | 12-May | M | 6:00 AM | JNU - Jualin | B. Maupin | yes | no | |
| 12 | | M | 7:00 AM | Jualin - JNU | K. Savage | yes | no | |
| 13 | 14-May | W | 3:00 PM | JNU - Jualin | K. Savage | yes | no | |
| 14 | | W | 4:00 PM | Jualin - JNU | C. Gutierrez | yes | no | |
| 15 | 15-May | Th | 3:00 PM | JNU - Jualin | C. Gutierrez | yes | no | |
| 16 | | Th | 4:00 PM | Jualin - JNU | C. Gutierrez | yes | no | |

Table 2. Summary of Marine Observer Activity and Reporting

# Attachment 3

# Goshawk Monitoring Report – 2008

# 2008 NORTHERN GOSHAWK SURVEY
# JUALIN MINE SITE

Coeur Alaska
3031 Clinton Drive
Suite 202
Juneau, Alaska 99801

Prepared for Coeur by K. Savage
July 23, 2008

# 2008 Northern Goshawk Survey
# Table of Contents

Introduction……..... 3

Survey Area and Methods…….....…..... 4

Survey Results.....…….....…..... 5

References..... 6

List of Figures and Tables:

Figure 1 2008 Northern Goshawk Survey Sites.....……..... 7
Figure 2 Vegetation Structure at Selected Sites..... 8
Figure 3 Looking out over Borrow Sites..... 9
Table 1 Summary of 2008 Surveys..... 9

# Introduction

Coeur Alaska's Kensington Gold Mine Project is located approximately 45 air miles north of Juneau, Alaska, with the Jualin site of the mine project immediately north of Berner's Bay and the Comet site adjacent to Lynn Canal. Construction at the Comet site includes the establishment of a Paste Tailings Facility (PTF), where tailings will be stored in solid form, as well as two borrow sites, where material will be extracted for the PTF. The adjoining roadway will also be modified to accommodate traffic between the two sites. These phases of construction involve limited timber clearing within the Tongass National Forest. As timber harvesting has proved to be a principal threat to nesting habitat of the Northern Goshawk (Squires and Reynolds 1997), Coeur Alaska has determined the need to conduct a baseline survey for the potential presence of Northern Goshawks in these designated areas.

The Northern Goshawk is a large, robust hawk found in several forested regions throughout the United States. In Southeast Alaska, the Queen Charlotte Goshawk (*Accipiter gentilis laingi*) is the recognized subspecies. A lack of information regarding goshawk population trends, coupled with the potential impact of forestry management practices, has lead to the Northern Goshawk being designated as a sensitive species in many national forests, including the Tongass National Forest. Consequently, US Forest Service (USFS) policy requires evaluation of proposed management actions on goshawks as well as documentation of findings (Woodbridge and Hargis 2005). The Queen Charlotte Goshawk was also designated as a species of special concern by the Alaska Department of Fish and Game (ADF&G) in 1994 (Iverson et al. 1996).

The goal of the 2008 Northern Goshawk Survey at the Kensington mine site was to determine whether breeding and/or nesting Queen Charlotte Goshawks are present in the PTF, borrow sites and adjoining roadway as well as to assess habitat suitability in these areas.

# Survey Area and Methods

The 2008 Northern Goshawk survey protocol followed guidelines from Woodbridge and Hargis (2005) with techniques timed to follow goshawk breeding biology. ADF&G (1996) data suggests that goshawk are nonmigratory in SE Alaska, though lesser seasonal movements may occur between winter and breeding areas in the region. Breeding pairs may begin to frequent nesting stands in late February to early March. From this point until egg-laying, courtship vocalization and over-canopy flights may be detected via dawn acoustical and valley watch surveys. Egg-laying in SE Alaska is estimated to occur between April 12 and May 24, with incubation continuing for approximately 30 days. The mean hatching date in SE Alaska is June 3 (range: May 12 – June 23) and the mean fledging date estimated as July 13 (range: June 23 – August 4) (ADF&G, 1996). During incubation and the early nestling period, adult females are often unresponsive and detectability is very low. However, during nestling and fledgling periods, defensive behavior by adult goshawks increases detectability. Broadcast surveys are undertaken at this time, preferably during the nestling stage when goshawk response is more common than with fledglings (Joy et al. 1994).

The 2008 Northern Goshawk survey conducted on the Comet site of the Kensington Mine Project focused on 3 distinct areas which included: 1. the PTF, 2. borrow sites 1 and 2, and 3. the adjoining roadway. Because the holding pad adjacent to the mine portal afforded an excellent view of both borrow sites, valley watch surveys were possible in these areas. Both valley watch and dawn acoustic surveys of the borrow sites began on April 2 and were repeated on April 12 and 29 to cover variability in the timing of breeding behavior. Surveys began at least 45 minutes before dawn, continued for 1 ½ hours after sunrise and consisted of uninterrupted listening as well as observing the canopy over the borrow sites. A habitat assessment of the borrow sites at prescribed locations was also made on April 12. A dawn acoustic survey and habitat assessment of the PTF was conducted on April 4 and further habitat assessment made on April 11. A dawn acoustic survey of the adjoining road was made on April 19 and consisted of 4 minutes of listening at stations approximately 150 m apart. On July 2 and 3, broadcast surveys in accordance with Kennedy and Stahlecker (1993) were conducted in all areas. Playback recordings of adult female alarm calls were broadcast at maximum volume with call stations approximately 250 meters apart in areas of most suitable goshawk habitat. Broadcasts were started facing the direction of travel, with 10 seconds of recorded calls followed by 30 seconds of listening and observing. This procedure was then repeated at $60^{o}$ and $180^{o}$ from the direction of travel and conducted twice at each station. A search for nests or signs of nesting activity was also done continuously along the route.

The weather was good for all surveys.

# Survey Results

Goshawk presence was not detected at any of the three surveyed areas. All bird calls heard in the acoustical surveys were identifiable. No goshawk activity was observed during the valley watches nor were any signs of nesting noted during the habitat assessments or broadcast surveys.

All sites were also assessed for potential suitability as goshawk nesting habitat. Habitat may be defined as "the resources and conditions present in an area that affect occupancy by a species" (Morrison 2002) and may include vegetation structure, topography and prey availability.

Although goshawks may nest in a wide range of forest types (Daw 1998), mature forests of Sitka spruce and Western hemlock are preferred in Southeast Alaska (Titus 1994). High canopy closure and larger trees within the stand are also fairly consistent nesting habitat features (Cooper 2000). The vegetation structure along the periphery of the PTF and the northern two thirds of the borrow sites included predominantly small to medium sized mixed Sitka spruce (*Picea sitchensis*) and Western hemlock (*Tsuga heterophylla*) second growth forest. Occasional larger trees as well as clearings were present in both locations. Canopy cover was variable. Understory vegetation included blueberry (*Vaccinium* spp.), menziesia (*Menziesia* spp.) and devil's club (*Oplopanax horridus*). The northeastern section of the PTF included thick, scrub vegetation and mainly red alder trees (*Alnus rubra*). The middle section of the PTF and southern most section of the borrow sites was wetland/bog with small, sparse Western hemlock and shore pine (*Pinus contortus*).

Regarding topography, Iverson et al. (1996) found goshawk relocations in Southeast Alaska predominantly occurred at elevations below 800'. The majority of relocations also occurred on more gentle slopes; however, this was thought due to the poorer vegetation structures often associated with steeper slopes. The eastern edge on the PTF as well as the northern sections of the borrow sites included steep slopes, though none of the sites were over 800' in elevation.

Prey availability and abundance has also been indicated as a limiting factor in goshawk presence. ADF&G (1999) found that some goshawks in SE Alaska consume mainly songbirds and squirrels, while others preyed upon birds or mammals that feed in intertidal or marine environments. The most common prey in Southeast Alaska include Steller's jay, blue and spruce grouse, varied thrush, red squirrels, and woodpeckers, followed by sharp-shinned hawk , alcids, yellowlegs, ptarmigan, and Northwestern crow (Titus 1994). Many of these species can been found at the Comet sites and birds specifically noted during the acoustical surveys included varied thrush (*Ixoreus naevius*), blue grouse (*Dendragapus obscurus*), red-breasted sapsucker (*Sphyrapicus rubber*) and Stellar's jays *(Cyanocitta stelleri).* Squirrel middens were also present. It must be noted, however, that simple presence of prey species does not indicate prey availability or abundance.

Because of steep slopes and poor vegetation structure, much of the PTF and borrow sites were not deemed optimum goshawk habitat. The most suitable habitat was located within the middle sections of both borrow sites as well as along the edge of the PTF where the incline was gentle and larger trees were occasionally present.

# References


Squires, J.R. and R.T. Reynolds. 1997. Northern goshawk (Accipiter gentilis). In A. Poole and F. Gill, editors. The Birds of North America, Number 298. The Academy of Natural Sciences, Philadelphia, Pennsylvania.

Woodbridge, B. and C. D. Hargis. 2005. Northern goshawk inventory and monitoring technical guide. USDA Forest Service, Washington Office.

Iverson, G.C., et al. 1996. Conservation assessment for the Northern Goshawk in southeast Alaska. Gen. Tech. Rep. PNW-GTR-387. U.S. Dep. Agric., For.Serv., Pacific Northwest Res. Stn., Portland, OR. 101pp.

Kennedy, P.L. and D. W. Stahlecker. 1993. Responsiveness of nesting northern goshawks to taped broadcast of 3 conspecific calls. Journal of Wildlife Management 57: 249-257.

Titus, K., C.J. Flatten, and R.E. Lowell, 1996**.** Goshawk ecology and habitat relationships on the Tongass National Forest. Juneau, AK: Alaska Department of Fish and Game, Division of Wildlife Conservation; 1995 field season progress report.

Joy, S., Reynolds, R.T. and D.G. Leslie. 1994. Northern goshawk broadcast surveys: hawk response variables and survey cost. Studies in Avian Biology No. 16:24-30

Morrison, M.L. 2002. Wildlife Restoration: Techniques for Habitat Analysis and Animal Monitoring. Island Press, Washington D.C.

Daw, S.K., S. DeStefano and R.J. Steidl. 1998. Does survey method bias the description of northern goshawk nest-site structure? Journal of Wildlife Management 62: 1379-1384.

Titus, K., C.J. Flatten, and R.E. Lowell. 1994. Northern Goshawk ecology and habitat relationships on the Tongass National Forest (goshawk nest sites, food habits, morphology, home range and habitat data). Alaska Department of Fish and Game, Division of Wildlife Conservation; First Ann. Project Rep.

Cooper, J.M. and V. Stevens. 2000. A Review of the Ecology, Management and Conservation of the Northern Goshawk in British Columbia. Wildlife Bulletin No B-101.Ministry of Environment, Lands and Parks Wildlife Branch, Victoria, B.C.

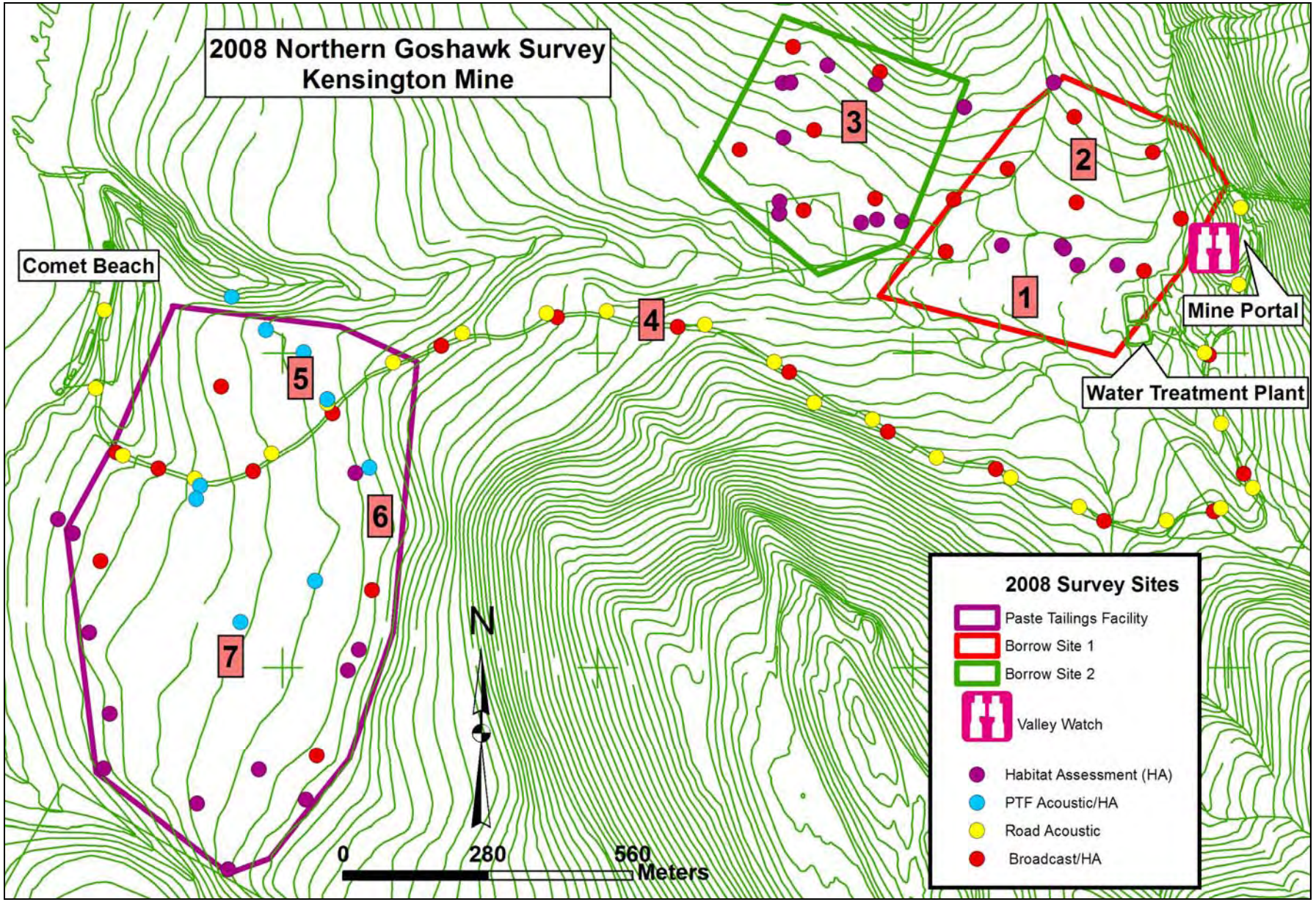
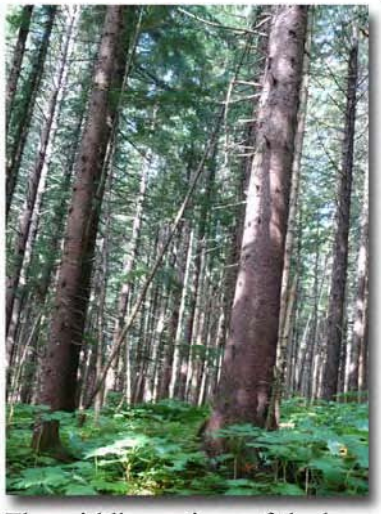



Figure 1 2008 Northern Goshawk Survey Locations
(See page 8 for examples of vegetation structure at selected sites)

1. The southern edge of both borrow sites with sparse and scrubby tree growth.

3. A section of borrow site 2 with a stand of predominantly small hemlock trees..



2. The middle sections of the borrow sites with mixed spruce/hemlock forest and mild elevation gain..

4. The roadway adjoining the borrow sites and the PTF.

6. The eastern periphery of the PTF with mixed forest at the base of the hillside.

5. The northeastern section of the PTF with few trees and thick undergrowth.

7. The middle section of the PTF with sparse tree growth.

Figure 2. Vegetation Structure at Selected Sites


Figure 3 Looking out over Borrow Sites,
Valley Watch/ Dawn Acoustic Survey, April 12, 2008

Table 1 Summary of 2008 Surveys

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **DATE** | 4/2/08 | 4/4/08 | 4/11/08 | 4/12/08 | 4/19/08 | 4/29/08 | 7/2/08 | 7/3/08 |
| **PERS.** | KS,LF | KS,LF | KS, RP | KS, LF | KS, LF | KS, LF | KS, BM | KS, BM |
| **START** | 6:30 AM | 5:15 AM | 11:00 AM | 5:00 AM | 4:40 AM | 4:20 AM | 9:12 AM | 9:15 AM |
| **FINISH** | 7:30 AM | 8:15 AM | 2:00 PM | 7:20 AM | 7:00 AM | 6:40 AM | 2:30 PM | 2:10 PM |
| **DAWN** | 6:21 AM | 6:16 AM | - | 5:53 AM | 5:34 AM | 5:08 AM | - | - |
| **WEATHER** | HO, very light flurries/drizzle, wind variable from E | HO, light drizzle | HO, patchy, no precip, calm | LO, snow mixed with rain | Clear, cold, calm | Clear, calm | HO, calm | HO, calm |
| **TYPE** | Valley, dawn acoustic | Dawn acoustic, HA | HA | Valley, HA | Dawn acoustic | Valley, dawn acoustic | Broadcast | Broadcast |
| **LOCATION** | Over BS 1 & 2 | PTF | PTF | Over BS 1 & 2 | Road | Over BS 1 & 2 | BS 1 & 2 | Road, PTF |
| **AVIAN SPECIES** | R.B. Sap., blue grouse, common raven | V. thrush, C.B. chickadee, Stellar jay | | Winter wren | N. Pygmy owl, D.E. junco, G.B. Heron | A. robin, marbled murrelet, brown creeper, R.C.. kinglet | H. Thrush | |
| **COMMENTS** | | | | | Stations about 150 m apart, 3 - 4 minutes listening at each | | Stations about 250 m apart, kept to likely habitat | Stations about 250 m apart, kept to likely habitat |

KS = Kate Savage, LF = Liz Flory, RP = Ray Pohl, BM = Briam Maupin

# Attachment 4

# Upper Slate Lake Dolly Varden Survey – 2008

# COEUR ALASKA KENSINGTON PROJECT

## USFS Annual Report 2008

## TSF Ecological Monitoring:

## Upper Slate Dolly Varden

## January 2009

## 1.0 Introduction

This report describes restoration work conducted at Mid-Lake Slate Creek during 2008 and summarizes monitoring conducted in accordance with the Ecological Monitoring Plan for the TSF (Tailings Storage Facility). The diversion pipe at Mid-Lake Slate Creek was removed and the creek restored to allow downstream fish passage. No minnow trapping has yet been conducted in the restored creek to determine habitat suitability. Dolly Varden spawner surveys were conducted in October and November in Upper Slate Lake.

## 2.0 Mid-Lake Slate Creek Restoration

The Ecological Monitoring Plan for the TSF states that "*Dolly Varden in Mid-Lake Slate Creek will be captured and released below the TSF dam from the beginning of construction of the TSF until confirmation that suitable conditions for Dolly Varden are present in the TSF.*" During the summer of 2006, preparation of the TSF involved diversion of Mid-Lake Slate Creek around Lower Slate Lake to East Fork Slate Creek (Figure 1). The diversion was removed and the creek restored to allow downstream fish passage during September and October of 2008 (Figure 2).

Mid-Lake Slate Creek (MLSC) runs from Upper Slate Lake (USL) to Lower Slate Lake (LSL), however, water was diverted from the creek around LSL in 2006 to reduce the lake water level prior to dam construction. The creek begins at elevation 200m at Lower Slate Lake (LSL) and rises to 226m at Upper Slate Lake (Figure 3). The original creek was dominated by riffle and cascade habitat with few pools. The creek was 468m long prior to road construction in 2006, with a natural barrier to upstream fish migration at approximately 215m from LSL (Figure 4). Figures 5, 6 and 8 show how the stream looked prior to restoration, while Figures 7, 9 and 11 show the restored channel.

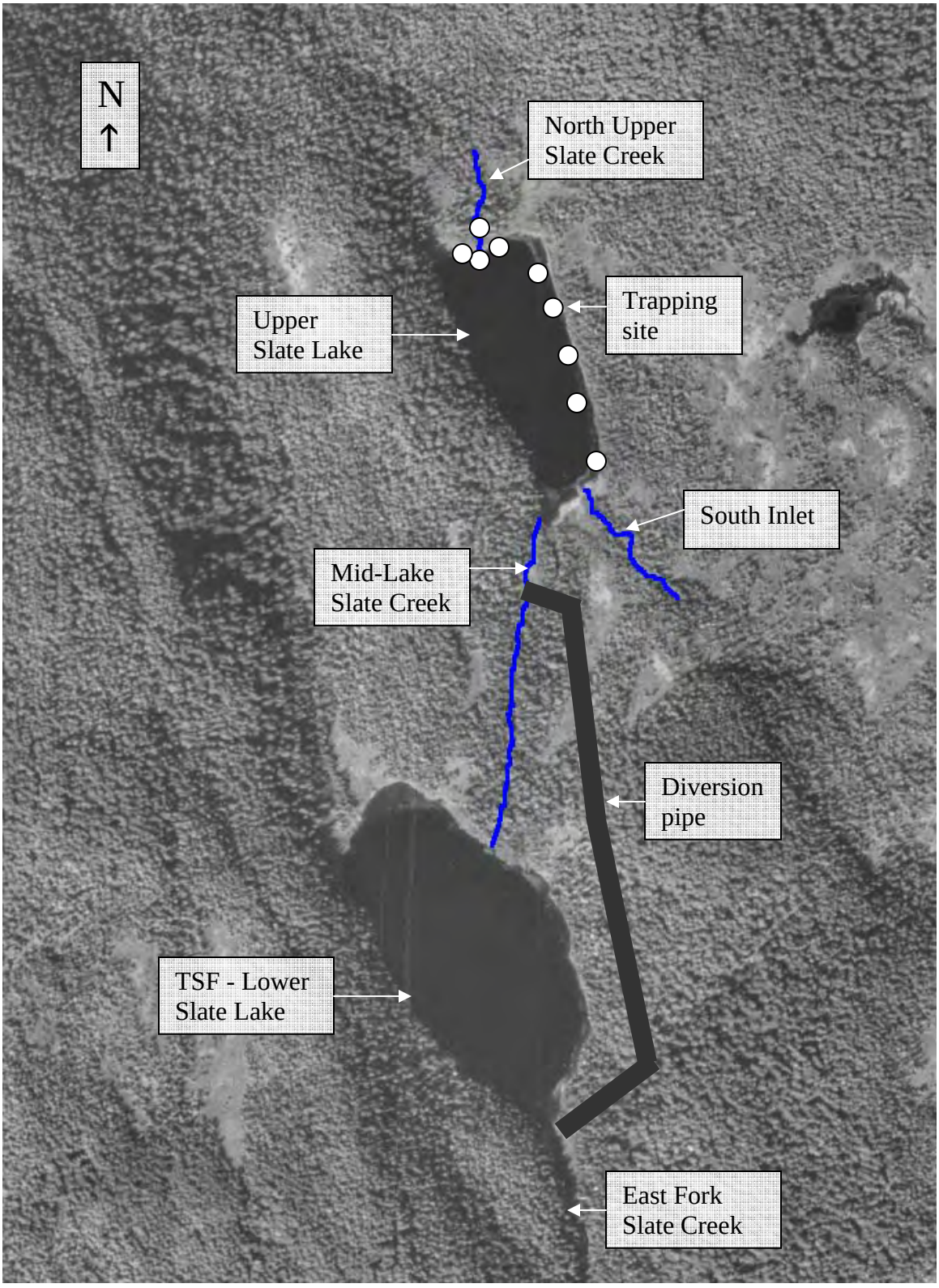



**Figure 1**: Upper Slate Aerial View. Mid-Lake Slate Creek is now diverted around the TSF through a pipe. Trapping sites for spawner surveys are shown by white circles.


**Figure 2:** Mid-Lake Slate Creek with water restored to the channel.

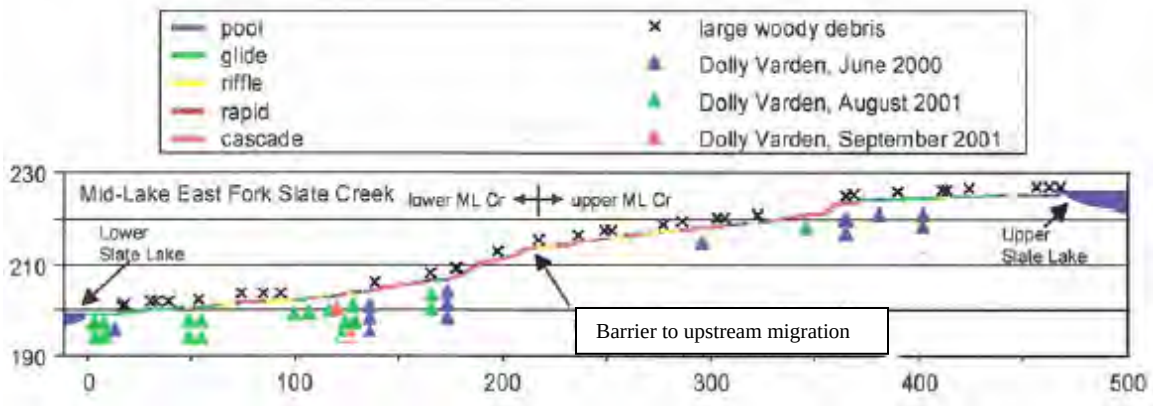



**Figure 3**: Profile of Mid-Lake Slate Creek. Earthworks Technology 2002.

## 2.1 Methods

The creek had been filled with slash from logging activities which diverted water into three channels at the lower end of the creek (Figure 6). All cut logs were removed to allow water to concentrate in the main channel. The original channel bed was dominated by bedrock and easily identified. Large boulders from the diversion intake were used to redirect water into the main channel near the lower end of the creek (Figure 6). Uncut woody debris was left in place to help maintain pool habitat such as that in Figure 5.

Figure 4: Barrier to upstream fish passage.


Figure 5: The creek prior to restoration.

A roadway constructed at the lower end of the creek had resulted in a near vertical drop of approximately 8ft from the creek into Lower Slate Lake. In addition, culverts at the lower end of the creek, installed after water was diverted, appeared to be having a damming effect on the creek and were situated too high above the lake for safe fish passage downstream (Figure 8). The roadway across the lower end of the creek was breached at the main stream channel and the roadway reshaped to a gradual slope down to the lake shore (Figure 9). This eliminated the need for culverts and their damming effect on the creek, as well as the vertical drop into the lake.

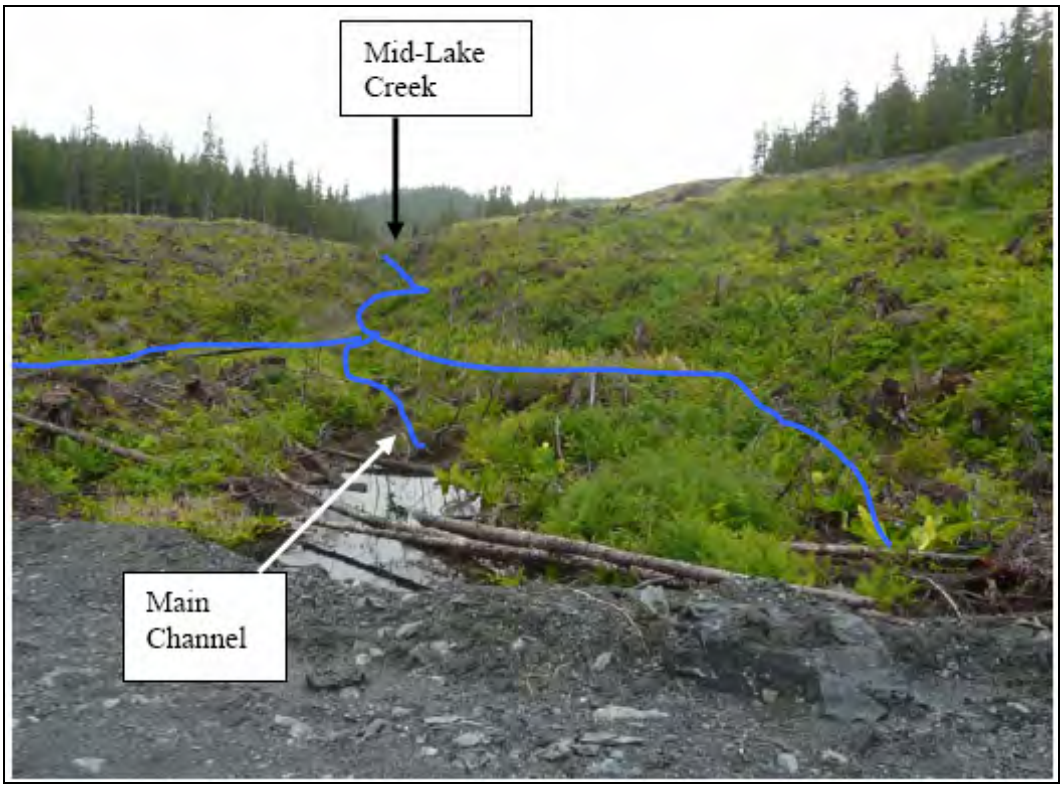



**Figure 6**: Before restoration the creek split into three channels.

**Figure 7**: The creek restored to a single channel and slash cleaned out.

**Figure 8**: Culverts at the lower end had a damming effect on the creek.

**Figure 9**: The restored channel has a gradual descent; culverts eliminated.

At the upper end of the creek, water spilled from a 24-inch penstock onto large boulders (>24-inch diameter). Fish arriving through this pipe would likely suffer damage upon entering this area and had no access to habitat once there. The penstock was therefore extended past the boulder field (Figure 10). A plunge pool was created immediately downstream of the boulder field by placing large boulders (>12-inch diameter) at the lower end of the pool. Water was returned to the creek on September 13, 2008 and some final adjustments made to the pipe drop height to pool depth ratio to ensure that fish could safely navigate downstream.

The penstock from Upper Slate Lake was originally positioned 2.5ft above the entry plunge pool to the creek, which had a depth of 2.5 to 3ft. The recommended ratio for fish passage is 1:2 for drop height versus pool depth. The pipe was lowered by removal of material underneath it and the pool level was raised closer to the pipe by additional of material to the creek (Figure 11). The pipe drop was 1.02 ft and pool depth was 2.61 ft deep when measured on November 24, 2008, at which time the creek was declared suitable for downstream passage of fish. No minnow trap surveys have been conducted yet to determine fish passage down the creek. No fish were transported around the lake by hand in 2008. A large number of Dolly Varden were trapped and measured at Upper Slate Lake during spawning surveys.

**Figure 10**: The penstock was extended past the boulder field.

**Figure 11**: The pipe drop to pool depth ratio is 1:2.6ft.

## 3.0 Dolly Varden Spawner Surveys

Potential Dolly Varden spawning habitat occurs mostly in North Upper Slate Creek and along the eastern shore of Upper Slate Lake (Figures 1, 13). Suitably sized gravel for spawning with flow from inlet streams exists in these areas (Figure 12). Spawner surveys were conducted in October and November 2008 to gain an understanding of the variability in recruitment of Dolly Varden to the Slate Creek basin from the Upper Slate area in accordance with the Ecological Monitoring Plan for the TSF. The plan states that surveys will be conducted from July through September, however, Dolly Varden in South-East Alaska are known to spawn in late Fall (Armstrong 1965, Armstrong & Morrow 1980, Blackett 1973, Heiser 1966) therefore surveys were adapted accordingly.

### 3.1 Methods

Dark-colored tannins in the water in fall prevent direct observation of the lake bed along the shore, therefore minnow trapping was used to capture and examine fish for signs of spawning. Surveys were conducted by setting minnow traps near likely spawning areas, namely gravel beds at the mouth of small streams running into Upper Slate Lake and the North Inlet Creek (Figure 1). A new design of minnow trap was adopted in 2008. The traps are made of soft ¼ inch mesh with flat openings that allow large fish to enter, but prevent them escaping.

Traps baited with salmon eggs were set near potential spawning areas on October 3, 15, 22 and 29 and on November 13, and left to soak overnight. Between four and ten traps were set on each occasion. Captured fish were anesthetized in a solution of MS222 (Tricanemethane Sulphonate), weighed to the nearest 0.1g and their total length measured to the nearest 1mm. Fish were also examined for any spawning coloration or milt production (Figure 14). The fish were allowed to recover in a container of aerated stream water and released back into the habitat from which they captured.

### 3.2 Results

The lengths and weights of Dolly Varden captured in Upper Slate Lake are presented in Appendix 1. Lengths and weights were used to calculate Fulton's condition factor (K) using the equation given in Anderson & Neumann (1996):

$$K = W/L^3 \times 10{,}000$$

W = weight in g; L = total length in mm

Table 1 summarizes the minimum and maximum lengths and condition factors of all Dolly Varden captured compared to spawners. The size distribution of fish captured is displayed in histograms in Figure 15. Spawning signs included bright orange belly, bright red to orange spots, and milt production. Figure 14 shows a Dolly Varden with spawning coloration. A total of 873 Dolly Varden were captured over the six week sampling period and 169 of these showed spawning sign. The percentage of spawners captured varied from 24% on October 4 to 17% on October 23 back to 21% on November 14. The smallest fish captured with spawning sign was 121mm and 13.4g and the largest was 234mm and 93.6g. The largest fish captured (258mm) did not show any signs of spawning. Milt was found in two larger fish (234mm and 219mm) on October 4 and in three small to medium-sized fish on November 14 (142, 183, 189mm).

| Date | 4-Oct | 16-Oct | 23-Oct | 30-Oct | 14-Nov |
|---|---|---|---|---|---|
| **All Fish** | | | | | |
| Number | 162 | 197 | 256 | 168 | 90 |
| Min Length | 68 | 89 | 82 | 95 | 83 |
| Max Length | 258 | 253 | 257 | 232 | 246 |
| Mean K | 0.712 | 0.726 | 0.739 | 0.718 | 0.711 |
| 95% Conf K | 0.007 | 0.007 | 0.007 | 0.007 | 0.011 |
| Min K | 0.566 | 0.547 | 0.600 | 0.629 | 0.632 |
| Max K | 0.876 | 0.915 | 0.969 | 0.864 | 0.874 |
| **Spawners** | | | | | |
| Number | 39 | 37 | 44 | 30 | 19 |
| % spawners | 24.1 | 19.3 | 17.2 | 17.9 | 21.1 |
| Min Length | 121 | 127 | 144 | 150 | 141 |
| Max Length | 234 | 232 | 231 | 232 | 232 |
| Mean K | 0.706 | 0.716 | 0.721 | 0.715 | 0.701 |
| 95% Conf K | 0.012 | 0.016 | 0.016 | 0.013 | 0.016 |
| Min K | 0.602 | 0.575 | 0.600 | 0.659 | 0.641 |
| Max K | 0.779 | 0.800 | 0.841 | 0.817 | 0.758 |

**Table 1**: Summary statistics for all captured fish and spawners.

**Figure 12**: North Upper Slate Creek contains gravel suitable for spawning.

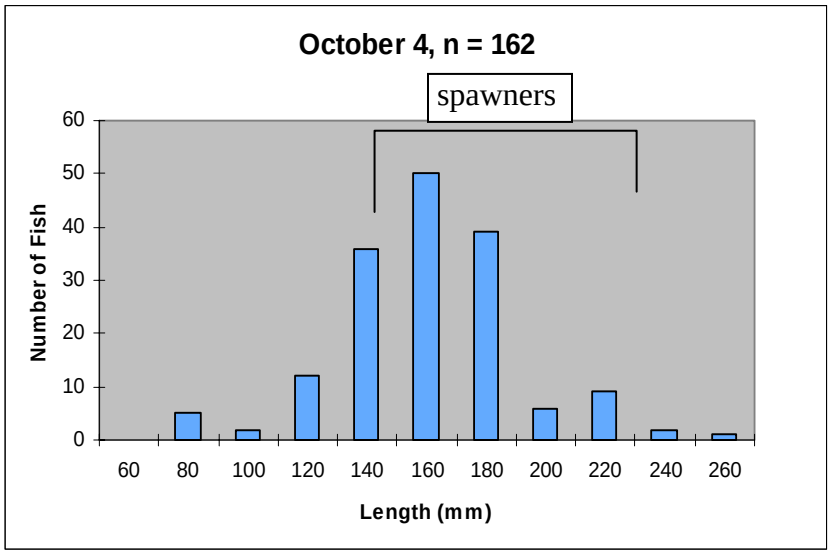
**Figure 13**: Retrieving minnow traps from under the ice, Upper Slate Lake.

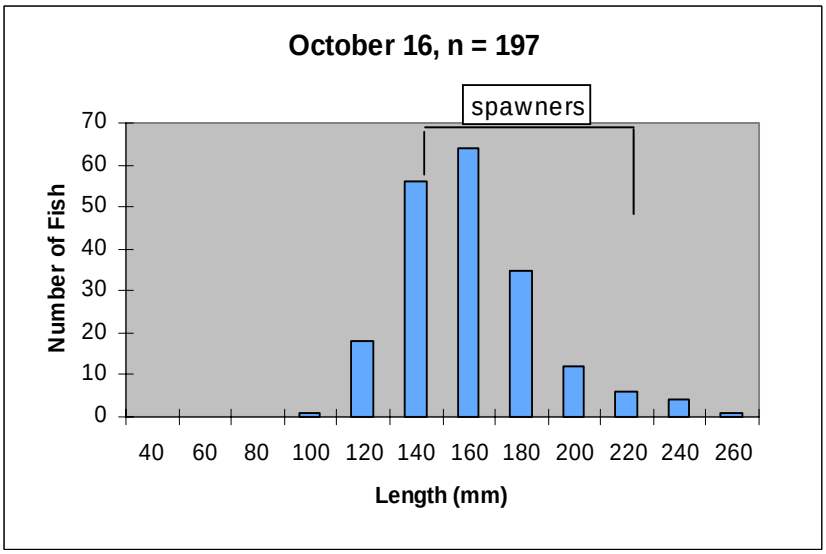

**Figure 14**: Dolly Varden with spawning colors, orange belly, red spots.

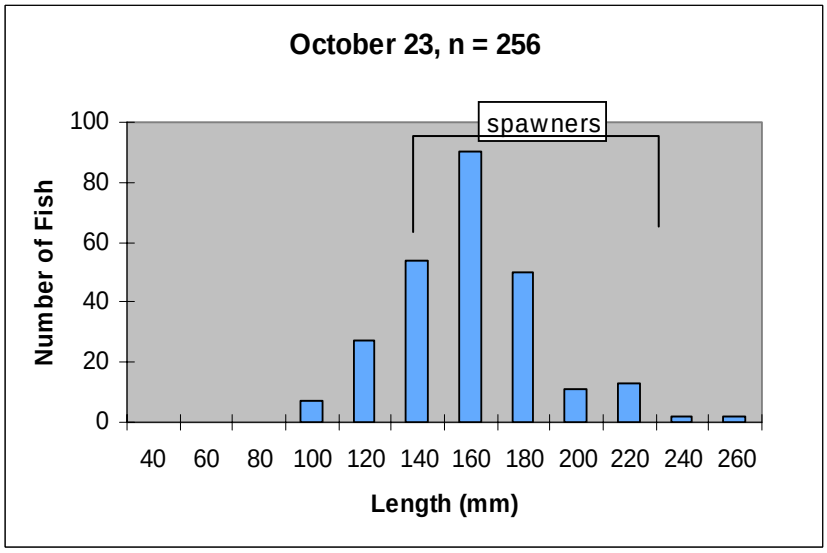
### 3.3 Discussion

A larger number of fish were captured in 2008 than previous years due to the new trap design that prevented fish escaping. The percentage (19.3%) of captured fish in spawning colors was greater in 2008 (19.3%) than 2007 (12.2%). Van Alen (1983) found evidence from the Indian Lake system in Southeast Alaska that Dolly Varden females spawn every year, but males apparently only spawned every 2 years. This would explain the lower number of spawners found in 2007 compared to 2008 or 2006, despite capturing fish in the same size range. In 2006 and 2008, the size range of Dolly Varden spawners was similar (140-240mm); in 2007 the size range of spawners was narrower with the smallest spawner being 195mm. The sample size was also smaller in 2007; therefore smaller spawners might have been present, but were not captured.

The condition factor of spawning fish in 2008 was slightly lower than non-spawning fish although the difference was only significant on October 23 and November 14 ($p<0.05$). This might simply be an indication that some energy is being used for reproduction rather than growth.


October 4, n = 162
spawners
Number of Fish
0
10
20
30
40
50
60
60
80
100
120
140
160
180
200
220
240
260
Length (mm)


October 16, n = 197
spawners
Number of Fish
0
10
20
30
40
50
60
70
40
60
80
100
120
140
160
180
200
220
240
260
Length (mm)


October 23, n = 256
spawners
Number of Fish
0
20
40
60
80
100
40
60
80
100
120
140
160
180
200
220
240
260
Length (mm)

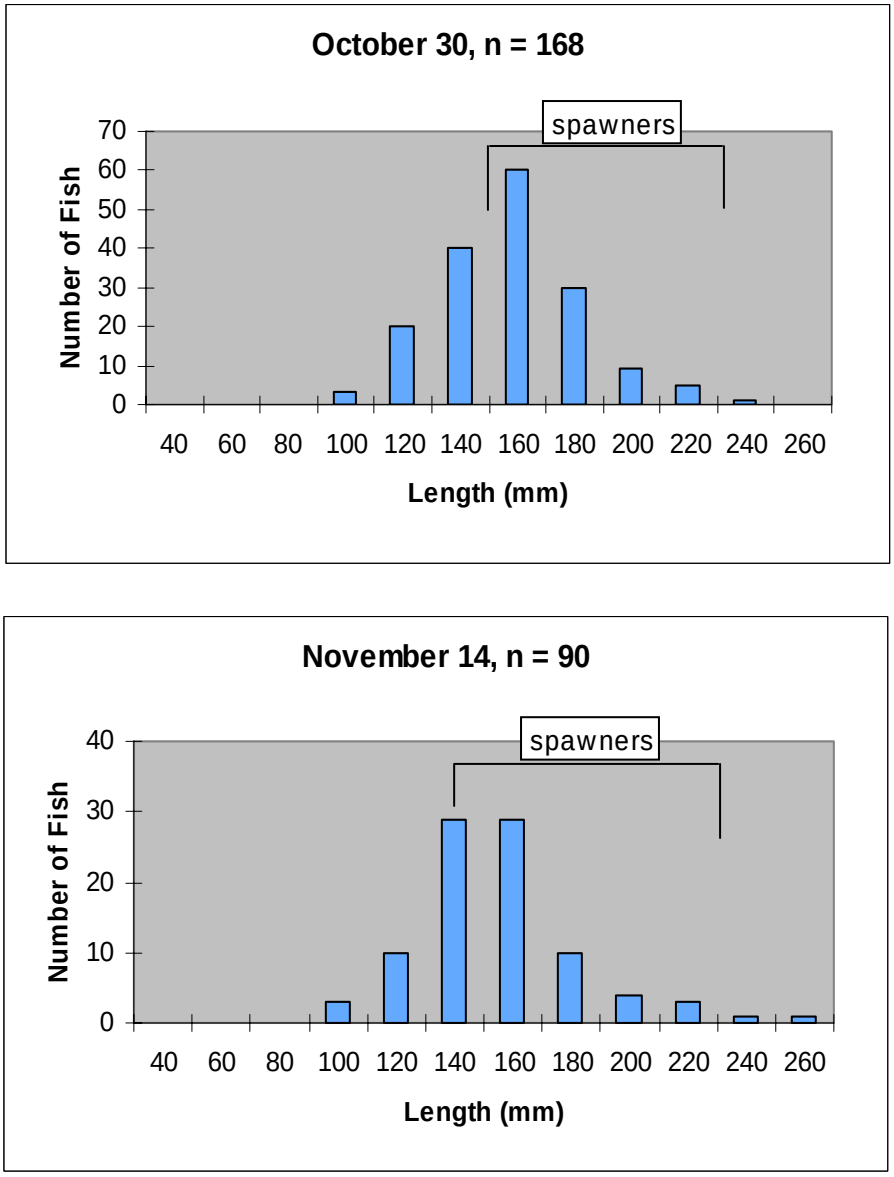



**Figure 15**: Length-Frequency Histograms of fish captured during spawning surveys.

The size of spawners did not appear to vary much over time, with a fairly wide range of sizes appearing to spawn. Only larger fish (over 200mm) were found with milt at the beginning of the survey. By November, smaller fish (142mm) were found to have milt. Spawning appeared to be spread over a longer period of time in 2008 than 2006 when a large percentage of spawners were found in mid to late October. The large sample size of 2008 should give a better representation of spawner size and timing. These fish should now be able to pass down into Lower Slate Lake once more.

The age of fish present in Upper Slate Lake has not been examined. Dolly Varden seldom live longer than 8-10 years, unless their diet is supplemented by kokanee (landlocked sockeye salmon) which can increase their lifespan to 19 years (Armstrong 1991). Van Alen (1983) reported Dolly Varden of 14 years in a Southeast Alaska lake where kokanee were present, but these were over 550mm in length whereas the largest fish found in Upper Slate Lake was 258mm. The presence of three-spine stickleback (*Gasterosteus aculeatus*) might increase Dolly Varden life span beyond 10 years, but no studies have been conducted to determine age.

**References:**

Anderson, R.O. and R,M. Neumann, 1996. Length, weight, and associated structural indices. Chapter 15 in: B.R. Murphy and D.W. Willis (eds), Fisheries Techniques. Second Edition. American Fisheries Society, Bethesda, MD.

Armstrong, R.H. 1965. Some Migratory Habits of The Anadromous Dolly varden in Southeastern Alaska. Research Report No.3, ADFG, Juneau, Alaska. 36pp.

Armstrong, R.H.1991. Dolly Varden Char. Pages 266-272 in J. Stolz & J. Schnell (Eds), Trout: The Wildlife Series. Stackpole Books, Harrisburg, PA.

Armstrong R.H. and J.E. Morrow. 1980. The Dolly varden Char, *Salvelinus malma*. Charrs, Salmonid Fishes of the Genus Salvelinus Vol 1: 99-140. Edited by E.K. Balon. The Netherlands.

Blackett, R.F. 1973. Fecundity of Resident and Anadromous Dolly Varden (Salvelinus malma) in Southeastern Alaska. Journal of the Fisheries Research Board of Canada 30: 543-548.

Earthworks Technology 2002, Kensington Project, August-September 2001 Slate Lakes Basin Survey Data Report. 220pp.

Heiser, D.W. 1966. Age and Growth of Anadromous Dolly Varden Char Salvelinus malma in Eva Creek, Baranof Island, Southeastern Alaska. Research Report No. 5. ADFG, Juneau, Alaska.29pp.

Van Alen, B.W. 1983. Feasibility of salmon enhancement programs in the Indian Lake system, Southeastern Alaska, with emphasis on population characteristics of resident Dolly Varden char, *Salvelinus malma* (Walbaum). Information Leaflet No. 215. ADFG.

Appendix 1: Length, weight, condition and spawning sign of Dolly Varden captured during spawner surveys in 2008.

**Upper Slate Lake** **10/3/2004** Dolly Varden

| Spawn indicator | Length (mm) | Weight (g) | L power 3 | | k |
|---|---|---|---|---|---|
| orange spots | 187 | 46.3 | 6539203 | 7.0804E-06 | 0.708 |
| | 153 | 26.9 | 3581577 | 7.5107E-06 | 0.751 |
| | 176 | 44.3 | 5451776 | 8.1258E-06 | 0.813 |
| pale orange spots | 157 | 27.2 | 3869893 | 7.0286E-06 | 0.703 |
| | 158 | 27.2 | 3944312 | 6.896E-06 | 0.690 |
| pale orange spots | 149 | 23.8 | 3307949 | 7.1948E-06 | 0.719 |
| | 122 | 12.7 | 1815848 | 6.994E-06 | 0.699 |
| red spots | 167 | 31.5 | 4657463 | 6.7633E-06 | 0.676 |
| old scar | 142 | 19.5 | 2863288 | 6.8104E-06 | 0.681 |
| | 152 | 24.5 | 3511808 | 6.9765E-06 | 0.698 |
| orange spots | 150 | 23.0 | 3375000 | 6.8148E-06 | 0.681 |
| | 170 | 32.8 | 4913000 | 6.6762E-06 | 0.668 |
| | 147 | 21.1 | 3176523 | 6.6425E-06 | 0.664 |
| | 165 | 28.9 | 4492125 | 6.4335E-06 | 0.643 |
| | 119 | 12.7 | 1685159 | 7.5364E-06 | 0.754 |
| orange spots | 182 | 38.2 | 6028568 | 6.3365E-06 | 0.634 |
| | 138 | 18.2 | 2628072 | 6.9252E-06 | 0.693 |
| orange spots | 169 | 34.8 | 4826809 | 7.2097E-06 | 0.721 |
| | 146 | 22.2 | 3112136 | 7.1334E-06 | 0.713 |
| | 157 | 25.8 | 3869893 | 6.6669E-06 | 0.667 |
| | 150 | 23.5 | 3375000 | 6.963E-06 | 0.696 |
| | 155 | 26.3 | 3723875 | 7.0625E-06 | 0.706 |
| | 141 | 18.3 | 2803221 | 6.5282E-06 | 0.653 |
| | 121 | 13.4 | 1771561 | 7.564E-06 | 0.756 |
| | 134 | 16.8 | 2406104 | 6.9822E-06 | 0.698 |
| | 123 | 13.6 | 1860867 | 7.3084E-06 | 0.731 |
| | 133 | 17.0 | 2352637 | 7.2259E-06 | 0.723 |
| | 126 | 14.9 | 2000376 | 7.4486E-06 | 0.745 |
| | 124 | 15.3 | 1906624 | 8.0247E-06 | 0.802 |
| | 205 | 62.1 | 8615125 | 7.2083E-06 | 0.721 |
| | 207 | 59.7 | 8869743 | 6.7307E-06 | 0.673 |
| orange spots | 168 | 34.8 | 4741632 | 7.3392E-06 | 0.734 |
| | 148 | 23.1 | 3241792 | 7.1257E-06 | 0.713 |
| | 135 | 16.8 | 2460375 | 6.8282E-06 | 0.683 |
| | 122 | 13.6 | 1815848 | 7.4896E-06 | 0.749 |
| | 136 | 18.0 | 2515456 | 7.1558E-06 | 0.716 |
| | 120 | 12.3 | 1728000 | 7.1181E-06 | 0.712 |
| | 140 | 19.6 | 2744000 | 7.1429E-06 | 0.714 |
| | 124 | 15.2 | 1906624 | 7.9722E-06 | 0.797 |
| | 133 | 17.2 | 2352637 | 7.3109E-06 | 0.731 |
| orange spots | 157 | 23.3 | 3869893 | 6.0208E-06 | 0.602 |
| orange spots | 171 | 34.9 | 5000211 | 6.9797E-06 | 0.698 |
| | 136 | 18.7 | 2515456 | 7.434E-06 | 0.743 |
| orange spots | 164 | 29.0 | 4410944 | 6.5746E-06 | 0.657 |
| | 114 | 11.1 | 1481544 | 7.4922E-06 | 0.749 |
| | 158 | 29.2 | 3944312 | 7.4031E-06 | 0.740 |
| red spots | 177 | 36.8 | 5545233 | 6.6363E-06 | 0.664 |
| few pale orange spots | 197 | 53.2 | 7645373 | 6.9585E-06 | 0.696 |
| | 150 | 22.7 | 3375000 | 6.7259E-06 | 0.673 |
| | 133 | 16.9 | 2352637 | 7.1834E-06 | 0.718 |
| few pale orange spots | 200 | 52.4 | 8000000 | 0.00000655 | 0.655 |
| | 218 | 71.1 | 10360232 | 6.8628E-06 | 0.686 |
| | 258 | 97.2 | 17173512 | 5.6599E-06 | 0.566 |
| | 156 | 27.1 | 3796416 | 7.1383E-06 | 0.714 |
| | 155 | 26.3 | 3723875 | 7.0625E-06 | 0.706 |
| orange spots | 160 | 29.3 | 4096000 | 7.1533E-06 | 0.715 |
| | 158 | 27.3 | 3944312 | 6.9214E-06 | 0.692 |
| | 140 | 18.8 | 2744000 | 6.8513E-06 | 0.685 |
| | 150 | 24.3 | 3375000 | 0.0000072 | 0.720 |
| | 151 | 24.0 | 3442951 | 6.9708E-06 | 0.697 |
| | 113 | 9.9 | 1442897 | 6.8612E-06 | 0.686 |
| orange spots | 194 | 50.5 | 7301384 | 6.9165E-06 | 0.692 |
| red spots, orange belly | 212 | 66.5 | 9528128 | 6.9793E-06 | 0.698 |
| | 155 | 25.7 | 3723875 | 6.9014E-06 | 0.690 |
| | 139 | 17.7 | 2685619 | 6.5907E-06 | 0.659 |
| | 126 | 14.6 | 2000376 | 7.2986E-06 | 0.730 |
| orange spots | 159 | 28.3 | 4019679 | 7.0404E-06 | 0.704 |
| | 133 | 17.1 | 2352637 | 7.2684E-06 | 0.727 |
| pale orange spots | 121 | 13.4 | 1771561 | 7.564E-06 | 0.756 |
| | 134 | 18.1 | 2406104 | 7.5225E-06 | 0.752 |
| | 149 | 22.9 | 3307949 | 6.9227E-06 | 0.692 |
| | 138 | 18.1 | 2628072 | 6.8872E-06 | 0.689 |
| pale orange spots | 165 | 30.9 | 4492125 | 6.8787E-06 | 0.688 |
| | 142 | 20.5 | 2863288 | 7.1596E-06 | 0.716 |
| | 174 | 34.6 | 5268024 | 6.5679E-06 | 0.657 |
| | 74 | 3.0 | 405224 | 7.4033E-06 | 0.740 |
| | 172 | 36.2 | 5088448 | 7.1142E-06 | 0.711 |
| | 142 | 19.2 | 2863288 | 6.7056E-06 | 0.671 |
| | 143 | 19.1 | 2924207 | 6.5317E-06 | 0.653 |

| | |
|---|---|
| mean | 0.712 |
| ST dev | 0.043853 |
| n | 162 |
| 95% CI | 0.006753 |
| min k | 0.566 |
| max k | 0.876 |
| # spawners | 39 |
| % spawners | 24.1 |
| min L | 68 |
| max L | 258 |

Appendix 1 cont.

| **Upper Slate Lake** | **10/3/2004** Dolly Varden | | | | |
|---|---|---|---|---|---|
| Spawn indicator | Length (mm) | Weight (g) | L power 3 | | k |
| | 179 | 40.4 | 5735339 | 7.044E-06 | 0.704 |
| | 143 | 20.7 | 2924207 | 7.0788E-06 | 0.708 |
| | 150 | 25.0 | 3375000 | 7.4074E-06 | 0.741 |
| | 133 | 19.7 | 2352637 | 8.3736E-06 | 0.837 |
| | 162 | 27.9 | 4251528 | 6.5623E-06 | 0.656 |
| orange spots | 180 | 40.7 | 5832000 | 6.9787E-06 | 0.698 |
| | 171 | 36.0 | 5000211 | 7.1997E-06 | 0.720 |
| | 127 | 15.4 | 2048383 | 7.5181E-06 | 0.752 |
| | 115 | 11.2 | 1520875 | 7.3642E-06 | 0.736 |
| | 128 | 15.5 | 2097152 | 7.391E-06 | 0.739 |
| | 135 | 17.8 | 2460375 | 7.2347E-06 | 0.723 |
| | 217 | 74.2 | 10218313 | 7.2615E-06 | 0.726 |
| | 165 | 30.9 | 4492125 | 6.8787E-06 | 0.688 |
| few pale orange spots | 141 | 19.5 | 2803221 | 6.9563E-06 | 0.696 |
| | 162 | 28.9 | 4251528 | 6.7976E-06 | 0.680 |
| | 117 | 12.1 | 1601613 | 7.5549E-06 | 0.755 |
| | 156 | 26.9 | 3796416 | 7.0856E-06 | 0.709 |
| | 127 | 15.3 | 2048383 | 7.4693E-06 | 0.747 |
| | 170 | 35.6 | 4913000 | 7.2461E-06 | 0.725 |
| red spots, orange belly, milt | 234 | 93.6 | 12812904 | 7.3051E-06 | 0.731 |
| | 163 | 31.5 | 4330747 | 7.2736E-06 | 0.727 |
| pale orange spots | 174 | 36.1 | 5268024 | 6.8527E-06 | 0.685 |
| | 153 | 23.9 | 3581577 | 6.673E-06 | 0.667 |
| pale orange spots | 165 | 33.5 | 4492125 | 7.4575E-06 | 0.746 |
| | 139 | 18.6 | 2685619 | 6.9258E-06 | 0.693 |
| | 113 | 11.0 | 1442897 | 7.6236E-06 | 0.762 |
| orange spots | 178 | 41.8 | 5639752 | 7.4117E-06 | 0.741 |
| | 178 | 39.7 | 5639752 | 7.0393E-06 | 0.704 |
| | 162 | 29.2 | 4251528 | 6.8681E-06 | 0.687 |
| | 155 | 24.8 | 3723875 | 6.6597E-06 | 0.666 |
| few pale orange spots | 169 | 37.6 | 4826809 | 7.7898E-06 | 0.779 |
| | 152 | 25.2 | 3511808 | 7.1758E-06 | 0.718 |
| | 112 | 10.0 | 1404928 | 7.1178E-06 | 0.712 |
| | 135 | 18.8 | 2460375 | 7.6411E-06 | 0.764 |
| pale orange spots | 152 | 24.5 | 3511808 | 6.9765E-06 | 0.698 |
| | 134 | 17.9 | 2406104 | 7.4394E-06 | 0.744 |
| | 97 | 6.1 | 912673 | 6.6837E-06 | 0.668 |
| | 136 | 18.4 | 2515456 | 7.3148E-06 | 0.731 |
| | 141 | 22.1 | 2803221 | 7.8838E-06 | 0.788 |
| red spots | 175 | 35.7 | 5359375 | 6.6612E-06 | 0.666 |
| | 131 | 19.7 | 2248091 | 8.763E-06 | 0.876 |
| | 192 | 48.7 | 7077888 | 6.8806E-06 | 0.688 |
| | 173 | 41.6 | 5177717 | 8.0344E-06 | 0.803 |
| | 158 | 27.7 | 3944312 | 7.0228E-06 | 0.702 |
| | 90 | 5.6 | 729000 | 7.6818E-06 | 0.768 |
| | 155 | 27.7 | 3723875 | 7.4385E-06 | 0.744 |
| | 134 | 18.1 | 2406104 | 7.5225E-06 | 0.752 |
| | 175 | 32.1 | 5359375 | 5.9895E-06 | 0.599 |
| orange spots | 154 | 26.8 | 3652264 | 7.3379E-06 | 0.734 |
| few pale orange spots | 174 | 38.6 | 5268024 | 7.3272E-06 | 0.733 |
| pale orange spots | 208 | 65.7 | 8998912 | 7.3009E-06 | 0.730 |
| red spots, orange belly | 229 | 80.4 | 12008989 | 6.695E-06 | 0.669 |
| red spots, orange belly, milt | 219 | 71.3 | 10503459 | 6.7882E-06 | 0.679 |
| | 180 | 33.3 | 5832000 | 5.7099E-06 | 0.571 |
| | 169 | 33.4 | 4826809 | 6.9197E-06 | 0.692 |
| orange spots | 170 | 35.0 | 4913000 | 7.124E-06 | 0.712 |
| | 204 | 63.8 | 8489664 | 7.515E-06 | 0.752 |
| | 152 | 24.4 | 3511808 | 6.948E-06 | 0.695 |
| | 169 | 31.8 | 4826809 | 6.5882E-06 | 0.659 |
| | 166 | 30.1 | 4574296 | 6.5802E-06 | 0.658 |
| | 118 | 11.8 | 1643032 | 7.1818E-06 | 0.718 |
| | 143 | 20.2 | 2924207 | 6.9079E-06 | 0.691 |
| | 157 | 28.4 | 3869893 | 7.3387E-06 | 0.734 |
| | 157 | 27.0 | 3869893 | 6.9769E-06 | 0.698 |
| | 141 | 20.3 | 2803221 | 7.2417E-06 | 0.724 |
| | 147 | 23.3 | 3176523 | 7.3351E-06 | 0.734 |
| | 127 | 14.8 | 2048383 | 7.2252E-06 | 0.723 |
| | 175 | 43.9 | 5359375 | 8.1913E-06 | 0.819 |
| | 156 | 26.7 | 3796416 | 7.0329E-06 | 0.703 |
| | 104 | 8.1 | 1124864 | 7.2009E-06 | 0.720 |
| red spots | 168 | 36.1 | 4741632 | 7.6134E-06 | 0.761 |
| | 125 | 14.6 | 1953125 | 7.4752E-06 | 0.748 |
| | 68 | 2.3 | 314432 | 7.3148E-06 | 0.731 |
| | 120 | 13.1 | 1728000 | 7.581E-06 | 0.758 |
| orange spots | 161 | 30.6 | 4173281 | 7.3324E-06 | 0.733 |
| | 118 | 11.8 | 1643032 | 7.1818E-06 | 0.718 |
| few orange spots | 171 | 38.1 | 5000211 | 7.6197E-06 | 0.762 |
| | 158 | 28.6 | 3944312 | 7.2509E-06 | 0.725 |
| | 146 | 23.3 | 3112136 | 7.4868E-06 | 0.749 |
| | 75 | 3.1 | 421875 | 7.3481E-06 | 0.735 |
| | 75 | 2.7 | 421875 | 0.0000064 | 0.640 |
| | 74 | 2.8 | 405224 | 6.9098E-06 | 0.691 |
| pale orange spots, no milt | 202 | 63.3 | 8242408 | 7.6798E-06 | 0.768 |

| **Upper Slate Lake** | **10/15/2008** Dolly Varden | | | | | | |
|---|---|---|---|---|---|---|---|
| Spawn indicator | Length (mm) | Weight (g) | L power 3 | | k | | |
| | 164 | 29.3 | 4410944 | 6.6E-06 | 0.664 | mean | 0.726 |
| | 144 | 21.4 | 2985984 | 7.2E-06 | 0.717 | ST dev | 0.05266 |
| | 141 | 22.5 | 2803221 | 8E-06 | 0.803 | n | 197 |
| | 152 | 23.9 | 3511808 | 6.8E-06 | 0.681 | 95% CI | 0.00735 |
| | 154 | 26.8 | 3652264 | 7.3E-06 | 0.734 | min k | 0.547 |
| | 117 | 12.7 | 1601613 | 7.9E-06 | 0.793 | max k | 0.915 |
| | 137 | 19.1 | 2571353 | 7.4E-06 | 0.743 | # spawners | 38 |
| few orange spots | 155 | 24.0 | 3723875 | 6.4E-06 | 0.644 | % spawner | 19.3 |
| few orange spots | 156 | 27.8 | 3796416 | 7.3E-06 | 0.732 | min L | 89 |
| orange spots | 151 | 25.2 | 3442951 | 7.3E-06 | 0.732 | max L | 253 |
| | 89 | 6.4 | 704969 | 9.1E-06 | 0.908 | | |
| | 120 | 12.9 | 1728000 | 7.5E-06 | 0.747 | | |
| | 176 | 35.9 | 5451776 | 6.6E-06 | 0.659 | | |
| | 162 | 30.6 | 4251528 | 7.2E-06 | 0.720 | | |
| | 133 | 17.9 | 2352637 | 7.6E-06 | 0.761 | | |
| | 135 | 18.9 | 2460375 | 7.7E-06 | 0.768 | | |
| | 125 | 14.9 | 1953125 | 7.6E-06 | 0.763 | | |
| | 174 | 39.5 | 5268024 | 7.5E-06 | 0.750 | | |
| | 152 | 24.7 | 3511808 | 7E-06 | 0.703 | | |
| | 140 | 20.0 | 2744000 | 7.3E-06 | 0.729 | | |
| | 122 | 14.8 | 1815848 | 8.2E-06 | 0.815 | | |
| | 133 | 16.6 | 2352637 | 7.1E-06 | 0.706 | | |
| | 170 | 37.8 | 4913000 | 7.7E-06 | 0.769 | | |
| | 139 | 19.5 | 2685619 | 7.3E-06 | 0.726 | | |
| | 130 | 16.0 | 2197000 | 7.3E-06 | 0.728 | | |
| | 149 | 23.4 | 3307949 | 7.1E-06 | 0.707 | | |
| | 147 | 23.6 | 3176523 | 7.4E-06 | 0.743 | | |
| few orange spots | 171 | 35.5 | 5000211 | 7.1E-06 | 0.710 | | |
| | 153 | 24.5 | 3581577 | 6.8E-06 | 0.684 | | |
| | 141 | 22.0 | 2803221 | 7.8E-06 | 0.785 | | |
| | 132 | 18.3 | 2299968 | 8E-06 | 0.796 | | |
| | 143 | 21.9 | 2924207 | 7.5E-06 | 0.749 | | |
| red spots | 157 | 28.0 | 3869893 | 7.2E-06 | 0.724 | | |
| | 142 | 21.0 | 2863288 | 7.3E-06 | 0.733 | | |
| red spots | 170 | 33.7 | 4913000 | 6.9E-06 | 0.686 | | |
| | 135 | 17.6 | 2460375 | 7.2E-06 | 0.715 | | |
| red spots | 170 | 32.5 | 4913000 | 6.6E-06 | 0.662 | | |
| | 134 | 16.3 | 2406104 | 6.8E-06 | 0.677 | | |
| | 144 | 20.8 | 2985984 | 7E-06 | 0.697 | | |
| few orange spots | 205 | 67.6 | 8615125 | 7.8E-06 | 0.785 | | |
| | 159 | 28.6 | 4019679 | 7.1E-06 | 0.711 | | |
| few orange spots | 164 | 30.6 | 4410944 | 6.9E-06 | 0.694 | | |
| | 117 | 12.4 | 1601613 | 7.7E-06 | 0.774 | | |
| | 123 | 13.3 | 1860867 | 7.1E-06 | 0.715 | | |
| | 143 | 21.5 | 2924207 | 7.4E-06 | 0.735 | | |
| orange spots | 197 | 60.7 | 7645373 | 7.9E-06 | 0.794 | | |
| | 232 | 72.9 | 1.2E+07 | 5.8E-06 | 0.584 | | |
| | 197 | 53.8 | 7645373 | 7E-06 | 0.704 | | |
| red spots | 232 | 91.6 | 1.2E+07 | 7.3E-06 | 0.734 | | |
| pale orange spots | 170 | 39.3 | 4913000 | 8E-06 | 0.800 | | |
| | 153 | 27.3 | 3581577 | 7.6E-06 | 0.762 | | |
| | 150 | 23.2 | 3375000 | 6.9E-06 | 0.687 | | |
| pale orange spots | 159 | 27.4 | 4019679 | 6.8E-06 | 0.682 | | |
| few orange spots | 145 | 22.9 | 3048625 | 7.5E-06 | 0.751 | | |
| | 119 | 11.1 | 1685159 | 6.6E-06 | 0.659 | | |
| | 110 | 11.9 | 1331000 | 8.9E-06 | 0.894 | | |
| | 208 | 59.7 | 8998912 | 6.6E-06 | 0.663 | | |
| pale orange spots | 175 | 38.9 | 5359375 | 7.3E-06 | 0.726 | | |
| pale orange spots | 229 | 84.0 | 1.2E+07 | 7E-06 | 0.699 | | |
| orange spots | 155 | 28.5 | 3723875 | 7.7E-06 | 0.765 | | |
| | 134 | 17.3 | 2406104 | 7.2E-06 | 0.719 | | |
| few orange spots | 188 | 45.4 | 6644672 | 6.8E-06 | 0.683 | | |

| **Upper Slate Lake** | **10/15/2008** Dolly Varden | | | | | |
|---|---|---|---|---|---|---|
| Spawn indicator | Length (mm) | Weight (g) | L power 3 | | k | |
| few orange spots | 163 | 28.4 | 4330747 | 6.6E-06 | 0.656 | |
| pale orange spots | 155 | 27.5 | 3723875 | 7.4E-06 | 0.738 | |
| | 136 | 18.7 | 2515456 | 7.4E-06 | 0.743 | |
| | 153 | 26.6 | 3581577 | 7.4E-06 | 0.743 | |
| pale orange spots | 222 | 67.9 | 1.1E+07 | 6.2E-06 | 0.621 | |
| | 170 | 35.1 | 4913000 | 7.1E-06 | 0.714 | |
| | 173 | 37.8 | 5177717 | 7.3E-06 | 0.730 | |
| | 147 | 23.6 | 3176523 | 7.4E-06 | 0.743 | |
| | 135 | 18.3 | 2460375 | 7.4E-06 | 0.744 | |
| | 147 | 23.9 | 3176523 | 7.5E-06 | 0.752 | |
| few orange spots | 159 | 29.4 | 4019679 | 7.3E-06 | 0.731 | |
| | 133 | 18.3 | 2352637 | 7.8E-06 | 0.778 | |
| bright color fins | 147 | 22.5 | 3176523 | 7.1E-06 | 0.708 | |
| | 113 | 10.8 | 1442897 | 7.5E-06 | 0.748 | |
| few orange spots | 163 | 31.3 | 4330747 | 7.2E-06 | 0.723 | |
| | 116 | 11.4 | 1560896 | 7.3E-06 | 0.730 | |
| | 122 | 13.7 | 1815848 | 7.5E-06 | 0.754 | |
| | 160 | 26.9 | 4096000 | 6.6E-06 | 0.657 | |
| | 157 | 27.8 | 3869893 | 7.2E-06 | 0.718 | |
| | 130 | 16.2 | 2197000 | 7.4E-06 | 0.737 | |
| | 128 | 15.0 | 2097152 | 7.2E-06 | 0.715 | |
| | 155 | 27.0 | 3723875 | 7.3E-06 | 0.725 | |
| pale orange spots | 148 | 25.9 | 3241792 | 8E-06 | 0.799 | |
| orange spots | 167 | 32.9 | 4657463 | 7.1E-06 | 0.706 | |
| | 142 | 20.9 | 2863288 | 7.3E-06 | 0.730 | |
| | 147 | 22.9 | 3176523 | 7.2E-06 | 0.721 | |
| pale orange spots | 148 | 23.5 | 3241792 | 7.2E-06 | 0.725 | |
| | 136 | 18.0 | 2515456 | 7.2E-06 | 0.716 | |
| | 136 | 18.4 | 2515456 | 7.3E-06 | 0.731 | |
| | 127 | 15.7 | 2048383 | 7.7E-06 | 0.766 | |
| | 146 | 24.5 | 3112136 | 7.9E-06 | 0.787 | |
| | 120 | 13.2 | 1728000 | 7.6E-06 | 0.764 | |
| | 148 | 25.1 | 3241792 | 7.7E-06 | 0.774 | |
| | 175 | 29.3 | 5359375 | 5.5E-06 | 0.547 | |
| | 193 | 46.0 | 7189057 | 6.4E-06 | 0.640 | |
| | 253 | 95.5 | 1.6E+07 | 5.9E-06 | 0.590 | |
| orange belly, red spots | 184 | 41.1 | 6229504 | 6.6E-06 | 0.660 | |
| few orange spots | 182 | 43.4 | 6028568 | 7.2E-06 | 0.720 | |
| | 134 | 17.3 | 2406104 | 7.2E-06 | 0.719 | |
| | 124 | 15.3 | 1906624 | 8E-06 | 0.802 | |
| few orange spots | 184 | 46.8 | 6229504 | 7.5E-06 | 0.751 | |
| | 181 | 45.0 | 5929741 | 7.6E-06 | 0.759 | |
| | 166 | 36.2 | 4574296 | 7.9E-06 | 0.791 | |
| | 135 | 17.6 | 2460375 | 7.2E-06 | 0.715 | |
| | 156 | 26.9 | 3796416 | 7.1E-06 | 0.709 | |
| | 135 | 17.0 | 2460375 | 6.9E-06 | 0.691 | |
| few orange spots | 155 | 25.4 | 3723875 | 6.8E-06 | 0.682 | |
| | 146 | 21.3 | 3112136 | 6.8E-06 | 0.684 | |
| | 116 | 12.0 | 1560896 | 7.7E-06 | 0.769 | |
| | 126 | 14.8 | 2000376 | 7.4E-06 | 0.740 | |
| | 155 | 24.0 | 3723875 | 6.4E-06 | 0.644 | |
| | 160 | 28.2 | 4096000 | 6.9E-06 | 0.688 | |
| | 146 | 23.6 | 3112136 | 7.6E-06 | 0.758 | |
| | 143 | 20.6 | 2924207 | 7E-06 | 0.704 | |
| | 174 | 37.0 | 5268024 | 7E-06 | 0.702 | |
| | 167 | 29.0 | 4657463 | 6.2E-06 | 0.623 | |
| | 142 | 21.6 | 2863288 | 7.5E-06 | 0.754 | |
| | 169 | 32.3 | 4826809 | 6.7E-06 | 0.669 | |
| | 137 | 19.0 | 2571353 | 7.4E-06 | 0.739 | |
| | 159 | 28.2 | 4019679 | 7E-06 | 0.702 | |
| few orange spots | 127 | 15.5 | 2048383 | 7.6E-06 | 0.757 | |
| | 120 | 14.2 | 1728000 | 8.2E-06 | 0.822 | |
| | 149 | 25.6 | 3307949 | 7.7E-06 | 0.774 | |

| **Upper Slate Lake** | **10/15/2008** Dolly Varden | | | | | |
|---|---|---|---|---|---|---|
| Spawn indicator | Length (mm) | Weight (g) | L power 3 | | k | |
| | 139 | 19.4 | 2685619 | 7.2E-06 | 0.722 | |
| | 127 | 15.4 | 2048383 | 7.5E-06 | 0.752 | |
| | 103 | 10.0 | 1092727 | 9.2E-06 | 0.915 | |
| | 146 | 20.9 | 3112136 | 6.7E-06 | 0.672 | |
| | 137 | 17.4 | 2571353 | 6.8E-06 | 0.677 | |
| | 143 | 19.0 | 2924207 | 6.5E-06 | 0.650 | |
| | 154 | 25.5 | 3652264 | 7E-06 | 0.698 | |
| | 196 | 55.4 | 7529536 | 7.4E-06 | 0.736 | |
| | 134 | 16.4 | 2406104 | 6.8E-06 | 0.682 | |
| few orange spots | 170 | 33.9 | 4913000 | 6.9E-06 | 0.690 | |
| | 156 | 27.4 | 3796416 | 7.2E-06 | 0.722 | |
| | 145 | 22.9 | 3048625 | 7.5E-06 | 0.751 | |
| pale orange spots | 168 | 36.2 | 4741632 | 7.6E-06 | 0.763 | |
| | 121 | 13.3 | 1771561 | 7.5E-06 | 0.751 | |
| | 134 | 17.4 | 2406104 | 7.2E-06 | 0.723 | |
| red spots, bright fins | 188 | 42.0 | 6644672 | 6.3E-06 | 0.632 | |
| | 168 | 32.6 | 4741632 | 6.9E-06 | 0.688 | |
| | 142 | 20.5 | 2863288 | 7.2E-06 | 0.716 | |
| | 155 | 25.5 | 3723875 | 6.8E-06 | 0.685 | |
| | 152 | 24.8 | 3511808 | 7.1E-06 | 0.706 | |
| | 146 | 23.3 | 3112136 | 7.5E-06 | 0.749 | |
| | 114 | 10.8 | 1481544 | 7.3E-06 | 0.729 | |
| | 144 | 22.7 | 2985984 | 7.6E-06 | 0.760 | |
| | 140 | 19.9 | 2744000 | 7.3E-06 | 0.725 | |
| pale orange spots | 172 | 36.9 | 5088448 | 7.3E-06 | 0.725 | |
| | 132 | 17.1 | 2299968 | 7.4E-06 | 0.743 | |
| | 148 | 27.2 | 3241792 | 8.4E-06 | 0.839 | |
| | 131 | 16.8 | 2248091 | 7.5E-06 | 0.747 | |
| red spots | 203 | 60.4 | 8365427 | 7.2E-06 | 0.722 | |
| | 135 | 17.4 | 2460375 | 7.1E-06 | 0.707 | |
| orange spots | 174 | 30.3 | 5268024 | 5.8E-06 | 0.575 | |
| | 165 | 30.5 | 4492125 | 6.8E-06 | 0.679 | |
| | 158 | 26.9 | 3944312 | 6.8E-06 | 0.682 | |
| | 140 | 19.3 | 2744000 | 7E-06 | 0.703 | |
| | 121 | 14.7 | 1771561 | 8.3E-06 | 0.830 | |
| pale orange spots | 160 | 29.3 | 4096000 | 7.2E-06 | 0.715 | |
| | 124 | 15.3 | 1906624 | 8E-06 | 0.802 | |
| | 134 | 17.5 | 2406104 | 7.3E-06 | 0.727 | |
| | 163 | 31.2 | 4330747 | 7.2E-06 | 0.720 | |
| | 166 | 28.3 | 4574296 | 6.2E-06 | 0.619 | |
| | 133 | 17.8 | 2352637 | 7.6E-06 | 0.757 | |
| | 136 | 17.9 | 2515456 | 7.1E-06 | 0.712 | |
| | 134 | 17.8 | 2406104 | 7.4E-06 | 0.740 | |
| | 121 | 13.2 | 1771561 | 7.5E-06 | 0.745 | |
| | 161 | 31.5 | 4173281 | 7.5E-06 | 0.755 | |
| | 110 | 10.2 | 1331000 | 7.7E-06 | 0.766 | |
| | 132 | 17.8 | 2299968 | 7.7E-06 | 0.774 | |
| | 123 | 15.6 | 1860867 | 8.4E-06 | 0.838 | |
| | 116 | 11.9 | 1560896 | 7.6E-06 | 0.762 | |
| | 129 | 16.5 | 2146689 | 7.7E-06 | 0.769 | |
| | 173 | 36.3 | 5177717 | 7E-06 | 0.701 | |
| few orange spots | 172 | 37.7 | 5088448 | 7.4E-06 | 0.741 | |
| | 149 | 23.9 | 3307949 | 7.2E-06 | 0.723 | |
| red spots | 159 | 29.6 | 4019679 | 7.4E-06 | 0.736 | |
| | 182 | 37.1 | 6028568 | 6.2E-06 | 0.615 | |
| | 107 | 9.2 | 1225043 | 7.5E-06 | 0.751 | |
| | 208 | 58.2 | 8998912 | 6.5E-06 | 0.647 | |
| | 202 | 58.6 | 8242408 | 7.1E-06 | 0.711 | |
| | 189 | 51.9 | 6751269 | 7.7E-06 | 0.769 | |
| | 167 | 31.8 | 4657463 | 6.8E-06 | 0.683 | |
| | 203 | 62.3 | 8365427 | 7.4E-06 | 0.745 | |
| | 179 | 38.4 | 5735339 | 6.7E-06 | 0.670 | |
| | 125 | 14.8 | 1953125 | 7.6E-06 | 0.758 | |
| | 129 | 14.6 | 2146689 | 6.8E-06 | 0.680 | |
| | 130 | 16.5 | 2197000 | 7.5E-06 | 0.751 | |
| | 168 | 34.4 | 4741632 | 7.3E-06 | 0.725 | |
| | 104 | 7.8 | 1124864 | 6.9E-06 | 0.693 | |
| | 123 | 13.3 | 1860867 | 7.1E-06 | 0.715 | |
| | 153 | 24.9 | 3581577 | 7E-06 | 0.695 | |
| | 111 | 10.7 | 1367631 | 7.8E-06 | 0.782 | |
| | 135 | 17.7 | 2460375 | 7.2E-06 | 0.719 | |
| | 103 | 8.4 | 1092727 | 7.7E-06 | 0.769 | |

| **Upper Slate Lake** | **10/22/2004** Dolly Varden | | | | | | |
|---|---|---|---|---|---|---|---|
| Spawn indicator | Length (mm) | Weight (g) | L power 3 | | k | | |
| orange belly | 167 | 33.5 | 4657463 | 7.19276E-06 | 0.719 | mean | 0.739 |
| | 201 | 65.8 | 8120601 | 8.10285E-06 | 0.810 | ST dev | 0.061 |
| | 164 | 29.4 | 4410944 | 6.66524E-06 | 0.667 | n | 256 |
| few orange spots | 177 | 37.6 | 5545233 | 6.7806E-06 | 0.678 | 95% CI | 0.007 |
| | 154 | 25.4 | 3652264 | 6.95459E-06 | 0.695 | min k | 0.600 |
| | 168 | 33.5 | 4741632 | 7.06508E-06 | 0.707 | max k | 0.969 |
| | 147 | 23.4 | 3176523 | 7.36655E-06 | 0.737 | # spawners | 44 |
| | 158 | 29.1 | 3944312 | 7.37771E-06 | 0.738 | % spawners | 17.2 |
| | 137 | 19.7 | 2571353 | 7.66134E-06 | 0.766 | min L | 82 |
| | 218 | 64.9 | 10360232 | 6.26434E-06 | 0.626 | max L | 257 |
| | 148 | 24.6 | 3241792 | 7.5884E-06 | 0.759 | | |
| | 142 | 21.3 | 2863288 | 7.439E-06 | 0.744 | | |
| | 149 | 25.5 | 3307949 | 7.7087E-06 | 0.771 | | |
| light orange belly | 144 | 23.8 | 2985984 | 7.97057E-06 | 0.797 | | |
| | 117 | 11.5 | 1601613 | 7.18026E-06 | 0.718 | | |
| | 159 | 29.8 | 4019679 | 7.41353E-06 | 0.741 | | |
| orange belly, spots | 174 | 37.9 | 5268024 | 7.19435E-06 | 0.719 | | |
| | 144 | 22.5 | 2985984 | 7.5352E-06 | 0.754 | | |
| | 154 | 28.1 | 3652264 | 7.69386E-06 | 0.769 | | |
| | 152 | 27.3 | 3511808 | 7.77377E-06 | 0.777 | | |
| | 120 | 12.5 | 1728000 | 7.2338E-06 | 0.723 | | |
| | 134 | 17.3 | 2406104 | 7.19005E-06 | 0.719 | | |
| | 135 | 17.8 | 2460375 | 7.23467E-06 | 0.723 | | |
| | 135 | 18.5 | 2460375 | 7.51918E-06 | 0.752 | | |
| few orange spots | 152 | 25.1 | 3511808 | 7.14732E-06 | 0.715 | | |
| | 148 | 22.9 | 3241792 | 7.06399E-06 | 0.706 | | |
| | 177 | 37.3 | 5545233 | 6.7265E-06 | 0.673 | | |
| | 107 | 9.4 | 1225043 | 7.6732E-06 | 0.767 | | |
| | 140 | 18.2 | 2744000 | 6.63265E-06 | 0.663 | | |
| | 124 | 14.4 | 1906624 | 7.55262E-06 | 0.755 | | |
| | 137 | 19.1 | 2571353 | 7.428E-06 | 0.743 | | |
| | 109 | 11.3 | 1295029 | 8.72567E-06 | 0.873 | | |
| | 132 | 17.3 | 2299968 | 7.52184E-06 | 0.752 | | |
| | 163 | 35.5 | 4330747 | 8.1972E-06 | 0.820 | | |
| red spots; no milt | 202 | 57.6 | 8242408 | 6.98825E-06 | 0.699 | | |
| few orange spots | 178 | 39.1 | 5639752 | 6.93293E-06 | 0.693 | | |
| | 146 | 23.1 | 3112136 | 7.42255E-06 | 0.742 | | |
| | 139 | 17.9 | 2685619 | 6.66513E-06 | 0.667 | | |
| | 142 | 19.1 | 2863288 | 6.67065E-06 | 0.667 | | |
| | 97 | 7.2 | 912673 | 7.88892E-06 | 0.789 | | |
| | 126 | 14.5 | 2000376 | 7.24864E-06 | 0.725 | | |
| | 164 | 29.9 | 4410944 | 6.77859E-06 | 0.678 | | |
| | 93 | 6.8 | 804357 | 8.45396E-06 | 0.845 | | |
| | 106 | 10.9 | 1191016 | 9.15185E-06 | 0.915 | | |
| | 192 | 46.6 | 7077888 | 6.58388E-06 | 0.658 | | |
| | 147 | 21.4 | 3176523 | 6.73693E-06 | 0.674 | | |
| | 135 | 19.1 | 2460375 | 7.76304E-06 | 0.776 | | |
| orange spots | 172 | 34.1 | 5088448 | 6.70145E-06 | 0.670 | | |
| | 114 | 12.3 | 1481544 | 8.30215E-06 | 0.830 | | |
| | 106 | 8.1 | 1191016 | 6.80092E-06 | 0.680 | | |
| | 160 | 28.3 | 4096000 | 6.90918E-06 | 0.691 | | |
| | 257 | 134 | 16974593 | 7.89415E-06 | 0.789 | | |
| | 155 | 24.6 | 3723875 | 6.60602E-06 | 0.661 | | |
| | 134 | 17.3 | 2406104 | 7.19005E-06 | 0.719 | | |
| | 104 | 10.9 | 1124864 | 9.69006E-06 | 0.969 | | |
| | 139 | 18.8 | 2685619 | 7.00025E-06 | 0.700 | | |
| | 166 | 30.9 | 4574296 | 6.75514E-06 | 0.676 | | |
| | 110 | 10.3 | 1331000 | 7.73854E-06 | 0.774 | | |
| few orange spots | 208 | 74.1 | 8998912 | 8.23433E-06 | 0.823 | | |
| | 130 | 16.4 | 2197000 | 7.46472E-06 | 0.746 | | |
| | 148 | 23.3 | 3241792 | 7.18738E-06 | 0.719 | | |
| | 139 | 18.2 | 2685619 | 6.77684E-06 | 0.678 | | |
| | 138 | 18.1 | 2628072 | 6.88718E-06 | 0.689 | | |
| | 143 | 22.1 | 2924207 | 7.5576E-06 | 0.756 | | |
| | 180 | 42.7 | 5832000 | 7.32167E-06 | 0.732 | | |
| | 89 | 5.8 | 704969 | 8.22731E-06 | 0.823 | | |
| red spots; no milt | 168 | 32.1 | 4741632 | 6.76982E-06 | 0.677 | | |

| **Upper Slate Lake** | **10/22/2004** Dolly Varden | | | | | | |
|---|---|---|---|---|---|---|---|
| Spawn indicator | Length (mm) | Weight (g) | L power 3 | | k | | |
| | 149 | 22.4 | 3307949 | 6.77157E-06 | 0.677 | | |
| | 120 | 14.7 | 1728000 | 8.50694E-06 | 0.851 | | |
| | 140 | 19 | 2744000 | 6.9242E-06 | 0.692 | | |
| | 118 | 13.2 | 1643032 | 8.03393E-06 | 0.803 | | |
| | 82 | 4.8 | 551368 | 8.70562E-06 | 0.871 | | |
| orange belly, spots | 231 | 74 | 12326391 | 6.00338E-06 | 0.600 | | |
| | 162 | 30.9 | 4251528 | 7.26798E-06 | 0.727 | | |
| few orange spots | 204 | 66.3 | 8489664 | 7.8095E-06 | 0.781 | | |
| | 144 | 21.9 | 2985984 | 7.33427E-06 | 0.733 | | |
| | 160 | 27.5 | 4096000 | 6.71387E-06 | 0.671 | | |
| | 175 | 39.4 | 5359375 | 7.3516E-06 | 0.735 | | |
| | 160 | 28.2 | 4096000 | 6.88477E-06 | 0.688 | | |
| | 139 | 18.4 | 2685619 | 6.85131E-06 | 0.685 | | |
| | 125 | 14.8 | 1953125 | 7.5776E-06 | 0.758 | | |
| | 173 | 37.7 | 5177717 | 7.2812E-06 | 0.728 | | |
| | 155 | 24.3 | 3723875 | 6.52546E-06 | 0.653 | | |
| few orange spots; no m | 199 | 61.9 | 7880599 | 7.85473E-06 | 0.785 | | |
| few orange spots | 153 | 25 | 3581577 | 6.98017E-06 | 0.698 | | |
| | 119 | 15.1 | 1685159 | 8.96058E-06 | 0.896 | | |
| | 129 | 16.8 | 2146689 | 7.82601E-06 | 0.783 | | |
| | 154 | 22.7 | 3652264 | 6.21532E-06 | 0.622 | | |
| | 127 | 15.8 | 2048383 | 7.7134E-06 | 0.771 | | |
| | 214 | 67 | 9800344 | 6.83649E-06 | 0.684 | | |
| | 151 | 25.1 | 3442951 | 7.29026E-06 | 0.729 | | |
| | 141 | 20.9 | 2803221 | 7.45571E-06 | 0.746 | | |
| | 219 | 65.6 | 10503459 | 6.24556E-06 | 0.625 | | |
| orange spots; no milt | 227 | 73.2 | 11697083 | 6.25797E-06 | 0.626 | | |
| | 155 | 28.1 | 3723875 | 7.5459E-06 | 0.755 | | |
| | 172 | 36.7 | 5088448 | 7.21242E-06 | 0.721 | | |
| | 166 | 31.9 | 4574296 | 6.97375E-06 | 0.697 | | |
| | 158 | 28.3 | 3944312 | 7.17489E-06 | 0.717 | | |
| | 137 | 19.2 | 2571353 | 7.46689E-06 | 0.747 | | |
| | 146 | 21.3 | 3112136 | 6.84417E-06 | 0.684 | | |
| | 148 | 22.4 | 3241792 | 6.90976E-06 | 0.691 | | |
| | 122 | 15.9 | 1815848 | 8.75624E-06 | 0.876 | | |
| | 104 | 10.3 | 1124864 | 9.15666E-06 | 0.916 | | |
| | 163 | 30.1 | 4330747 | 6.9503E-06 | 0.695 | | |
| | 162 | 29.3 | 4251528 | 6.89164E-06 | 0.689 | | |
| | 127 | 15.2 | 2048383 | 7.42049E-06 | 0.742 | | |
| | 92 | 6.1 | 778688 | 7.83369E-06 | 0.783 | | |
| few orange spots | 165 | 31.6 | 4492125 | 7.03453E-06 | 0.703 | | |
| | 115 | 13.4 | 1520875 | 8.81072E-06 | 0.881 | | |
| few orange spots | 167 | 34.1 | 4657463 | 7.32158E-06 | 0.732 | | |
| orange spots | 170 | 35.7 | 4913000 | 7.26644E-06 | 0.727 | | |
| | 154 | 27.3 | 3652264 | 7.47482E-06 | 0.747 | | |
| | 148 | 25.1 | 3241792 | 7.74263E-06 | 0.774 | | |
| | 157 | 27.4 | 3869893 | 7.0803E-06 | 0.708 | | |
| few orange spots | 156 | 27.1 | 3796416 | 7.13831E-06 | 0.714 | | |
| orange spots; no milt | 194 | 59.8 | 7301384 | 8.19023E-06 | 0.819 | | |
| | 152 | 27.3 | 3511808 | 7.77377E-06 | 0.777 | | |
| | 113 | 13.1 | 1442897 | 9.07896E-06 | 0.908 | | |
| | 157 | 27.2 | 3869893 | 7.02862E-06 | 0.703 | | |
| | 151 | 25 | 3442951 | 7.26121E-06 | 0.726 | | |
| | 142 | 23.3 | 2863288 | 8.1375E-06 | 0.814 | | |
| | 148 | 24.6 | 3241792 | 7.5884E-06 | 0.759 | | |
| few orange spots | 196 | 53 | 7529536 | 7.03895E-06 | 0.704 | | |
| | 165 | 31.1 | 4492125 | 6.92323E-06 | 0.692 | | |
| few orange spots | 167 | 31.2 | 4657463 | 6.69893E-06 | 0.670 | | |
| | 135 | 17.5 | 2460375 | 7.11274E-06 | 0.711 | | |
| | 167 | 31.2 | 4657463 | 6.69893E-06 | 0.670 | | |
| | 148 | 22 | 3241792 | 6.78637E-06 | 0.679 | | |
| | 140 | 19.9 | 2744000 | 7.25219E-06 | 0.725 | | |
| | 151 | 23.7 | 3442951 | 6.88363E-06 | 0.688 | | |
| | 167 | 32.6 | 4657463 | 6.99952E-06 | 0.700 | | |
| | 117 | 12.5 | 1601613 | 7.80463E-06 | 0.780 | | |
| | 123 | 14.9 | 1860867 | 8.00702E-06 | 0.801 | | |
| | 143 | 22.4 | 2924207 | 7.6602E-06 | 0.766 | | |
| | 212 | 68.4 | 9528128 | 7.17874E-06 | 0.718 | | |

| **Upper Slate Lake** | **10/22/2004** Dolly Varden | | | | | | |
|---|---|---|---|---|---|---|---|
| Spawn indicator | Length (mm) | Weight (g) | L power 3 | | k | | |
| | 255 | 129 | 16581375 | 7.77981E-06 | 0.778 | | |
| | 170 | 37.1 | 4913000 | 7.55139E-06 | 0.755 | | |
| | 161 | 29.4 | 4173281 | 7.04482E-06 | 0.704 | | |
| | 174 | 39.8 | 5268024 | 7.55501E-06 | 0.756 | | |
| | 175 | 40.3 | 5359375 | 7.51953E-06 | 0.752 | | |
| | 167 | 32.6 | 4657463 | 6.99952E-06 | 0.700 | | |
| | 184 | 43.9 | 6229504 | 7.04711E-06 | 0.705 | | |
| | 152 | 26.2 | 3511808 | 7.46054E-06 | 0.746 | | |
| | 145 | 22.9 | 3048625 | 7.51158E-06 | 0.751 | | |
| | 132 | 17.1 | 2299968 | 7.43489E-06 | 0.743 | | |
| | 166 | 31.8 | 4574296 | 6.95189E-06 | 0.695 | | |
| | 133 | 18.7 | 2352637 | 7.94853E-06 | 0.795 | | |
| | 158 | 26.6 | 3944312 | 6.74389E-06 | 0.674 | | |
| | 121 | 14.2 | 1771561 | 8.01553E-06 | 0.802 | | |
| | 154 | 23.6 | 3652264 | 6.46175E-06 | 0.646 | | |
| | 151 | 21.5 | 3442951 | 6.24464E-06 | 0.624 | | |
| | 109 | 11.1 | 1295029 | 8.57124E-06 | 0.857 | | |
| orange spots | 213 | 69.9 | 9663597 | 7.23333E-06 | 0.723 | | |
| | 118 | 11.3 | 1643032 | 6.87753E-06 | 0.688 | | |
| | 200 | 66.8 | 8000000 | 0.00000835 | 0.835 | | |
| | 151 | 23.9 | 3442951 | 6.94172E-06 | 0.694 | | |
| | 154 | 24.4 | 3652264 | 6.68079E-06 | 0.668 | | |
| fat belly | 202 | 67.1 | 8242408 | 8.14082E-06 | 0.814 | | |
| orange spots | 172 | 40.1 | 5088448 | 7.8806E-06 | 0.788 | | |
| | 145 | 23.5 | 3048625 | 7.70839E-06 | 0.771 | | |
| | 149 | 24.6 | 3307949 | 7.43663E-06 | 0.744 | | |
| | 135 | 19.6 | 2460375 | 7.96627E-06 | 0.797 | | |
| | 148 | 24.5 | 3241792 | 7.55755E-06 | 0.756 | | |
| | 141 | 22.9 | 2803221 | 8.16917E-06 | 0.817 | | |
| | 134 | 18.8 | 2406104 | 7.81346E-06 | 0.781 | | |
| | 106 | 10.6 | 1191016 | 8.89996E-06 | 0.890 | | |
| | 142 | 21.4 | 2863288 | 7.47393E-06 | 0.747 | | |
| | 113 | 12.6 | 1442897 | 8.73243E-06 | 0.873 | | |
| | 117 | 13.8 | 1601613 | 8.61631E-06 | 0.862 | | |
| orange spots | 199 | 66.3 | 7880599 | 8.41307E-06 | 0.841 | | |
| | 154 | 25.4 | 3652264 | 6.95459E-06 | 0.695 | | |
| | 158 | 26.7 | 3944312 | 6.76924E-06 | 0.677 | | |
| | 151 | 23.8 | 3442951 | 6.91267E-06 | 0.691 | | |
| | 135 | 18.9 | 2460375 | 7.68176E-06 | 0.768 | | |
| pale orange spots | 173 | 41.6 | 5177717 | 8.03443E-06 | 0.803 | | |
| | 125 | 14.1 | 1953125 | 7.2192E-06 | 0.722 | | |
| | 143 | 22.4 | 2924207 | 7.6602E-06 | 0.766 | | |
| | 117 | 14.4 | 1601613 | 8.99094E-06 | 0.899 | | |
| few orange spots | 147 | 23.7 | 3176523 | 7.46099E-06 | 0.746 | | |
| | 156 | 25.9 | 3796416 | 6.82222E-06 | 0.682 | | |
| | 167 | 37.3 | 4657463 | 8.00865E-06 | 0.801 | | |
| | 135 | 19.7 | 2460375 | 8.00691E-06 | 0.801 | | |
| | 128 | 14.9 | 2097152 | 7.10487E-06 | 0.710 | | |
| | 125 | 14.1 | 1953125 | 7.2192E-06 | 0.722 | | |
| fat belly | 208 | 60.3 | 8998912 | 6.70081E-06 | 0.670 | | |
| orange spots | 214 | 66.3 | 9800344 | 6.76507E-06 | 0.677 | | |
| | 165 | 29 | 4492125 | 6.45574E-06 | 0.646 | | |
| | 157 | 28.1 | 3869893 | 7.26118E-06 | 0.726 | | |
| | 157 | 27.6 | 3869893 | 7.13198E-06 | 0.713 | | |
| | 150 | 23.2 | 3375000 | 6.87407E-06 | 0.687 | | |
| | 144 | 22.4 | 2985984 | 7.50171E-06 | 0.750 | | |
| | 148 | 23.8 | 3241792 | 7.34162E-06 | 0.734 | | |
| | 142 | 21.3 | 2863288 | 7.439E-06 | 0.744 | | |

| **Upper Slate Lake** | **10/22/2004** Dolly Varden | | | | | | |
|---|---|---|---|---|---|---|---|
| Spawn indicator | Length (mm) | Weight (g) | L power 3 | | k | | |
| | 172 | 38.5 | 5088448 | 7.56616E-06 | 0.757 | | |
| | 155 | 28.7 | 3723875 | 7.70703E-06 | 0.771 | | |
| | 158 | 29.6 | 3944312 | 7.50448E-06 | 0.750 | | |
| | 135 | 20.7 | 2460375 | 8.41335E-06 | 0.841 | | |
| | 117 | 11.6 | 1601613 | 7.2427E-06 | 0.724 | | |
| | 135 | 20.3 | 2460375 | 8.25077E-06 | 0.825 | | |
| | 161 | 30.3 | 4173281 | 7.26047E-06 | 0.726 | | |
| | 161 | 30.9 | 4173281 | 7.40425E-06 | 0.740 | | |
| | 176 | 39.4 | 5451776 | 7.227E-06 | 0.723 | | |
| | 157 | 27.2 | 3869893 | 7.02862E-06 | 0.703 | | |
| | 139 | 19.9 | 2685619 | 7.40984E-06 | 0.741 | | |
| | 168 | 31.1 | 4741632 | 6.55892E-06 | 0.656 | | |
| | 142 | 21.9 | 2863288 | 7.64855E-06 | 0.765 | | |
| | 170 | 34.8 | 4913000 | 7.08325E-06 | 0.708 | | |
| | 155 | 25.8 | 3723875 | 6.92827E-06 | 0.693 | | |
| | 133 | 17.4 | 2352637 | 7.39596E-06 | 0.740 | | |
| fat belly | 150 | 24.1 | 3375000 | 7.14074E-06 | 0.714 | | |
| | 130 | 15.9 | 2197000 | 7.23714E-06 | 0.724 | | |
| | 108 | 9.9 | 1259712 | 7.85894E-06 | 0.786 | | |
| | 183 | 45.6 | 6128487 | 7.44066E-06 | 0.744 | | |
| few orange spots | 175 | 36.9 | 5359375 | 6.88513E-06 | 0.689 | | |
| few orange spots | 160 | 31.5 | 4096000 | 7.69043E-06 | 0.769 | | |
| | 160 | 29 | 4096000 | 7.08008E-06 | 0.708 | | |
| | 130 | 16.7 | 2197000 | 7.60127E-06 | 0.760 | | |
| | 131 | 16.9 | 2248091 | 7.51749E-06 | 0.752 | | |
| | 126 | 15.7 | 2000376 | 7.84852E-06 | 0.785 | | |
| | 136 | 18.7 | 2515456 | 7.43404E-06 | 0.743 | | |
| few orange spots | 155 | 30.3 | 3723875 | 8.13669E-06 | 0.814 | | |
| | 144 | 21.5 | 2985984 | 7.20031E-06 | 0.720 | | |
| | 111 | 12 | 1367631 | 8.7743E-06 | 0.877 | | |
| | 134 | 17.1 | 2406104 | 7.10692E-06 | 0.711 | | |
| | 151 | 24.8 | 3442951 | 7.20312E-06 | 0.720 | | |
| | 173 | 37.5 | 5177717 | 7.24257E-06 | 0.724 | | |
| | 128 | 17.3 | 2097152 | 8.24928E-06 | 0.825 | | |
| | 157 | 27.8 | 3869893 | 7.18366E-06 | 0.718 | | |
| | 160 | 29.4 | 4096000 | 7.17773E-06 | 0.718 | | |
| | 150 | 23.9 | 3375000 | 7.08148E-06 | 0.708 | | |
| | 135 | 18.9 | 2460375 | 7.68176E-06 | 0.768 | | |
| | 127 | 16.6 | 2048383 | 8.10395E-06 | 0.810 | | |
| | 148 | 24.3 | 3241792 | 7.49585E-06 | 0.750 | | |
| | 138 | 18.5 | 2628072 | 7.03938E-06 | 0.704 | | |
| | 111 | 10.7 | 1367631 | 7.82375E-06 | 0.782 | | |
| | 98 | 6.3 | 941192 | 6.69364E-06 | 0.669 | | |
| few orange spots | 159 | 29 | 4019679 | 7.21451E-06 | 0.721 | | |
| | 156 | 26.5 | 3796416 | 6.98027E-06 | 0.698 | | |
| few orange spots | 158 | 29 | 3944312 | 7.35236E-06 | 0.735 | | |
| | 149 | 24.2 | 3307949 | 7.31571E-06 | 0.732 | | |
| | 136 | 18.1 | 2515456 | 7.19551E-06 | 0.720 | | |
| | 126 | 15.8 | 2000376 | 7.89852E-06 | 0.790 | | |
| | 149 | 25.7 | 3307949 | 7.76916E-06 | 0.777 | | |
| | 136 | 17.6 | 2515456 | 6.99674E-06 | 0.700 | | |
| | 97 | 6.3 | 912673 | 6.9028E-06 | 0.690 | | |
| | 114 | 11.8 | 1481544 | 7.96466E-06 | 0.796 | | |
| red spots; no milt | 175 | 36.9 | 5359375 | 6.88513E-06 | 0.689 | | |
| red spots; no milt | 184 | 42.3 | 6229504 | 6.79027E-06 | 0.679 | | |
| orange spots | 181 | 41.1 | 5929741 | 6.93116E-06 | 0.693 | | |
| orange spots | 176 | 36.9 | 5451776 | 6.76844E-06 | 0.677 | | |
| few orange spots | 182 | 43.1 | 6028568 | 7.14929E-06 | 0.715 | | |
| pale orange spots | 207 | 57.9 | 8869743 | 6.52781E-06 | 0.653 | | |
| orange spots | 169 | 34.2 | 4826809 | 7.08543E-06 | 0.709 | | |
| pale orange spots | 172 | 36.4 | 5088448 | 7.15346E-06 | 0.715 | | |
| few orange spots; fat b | 178 | 39.6 | 5639752 | 7.02159E-06 | 0.702 | | |
| few orange spots | 151 | 24.3 | 3442951 | 7.0579E-06 | 0.706 | | |

| **Upper Slate Lake** | **10/29/2004** Dolly Varden | | | | | | |
|---|---|---|---|---|---|---|---|
| Spawn indicator | Length (mm) | Weight (g) | L power 3 | | k | | |
| orange spots | 202 | 56.0 | 8242408 | 6.8E-06 | 0.679 | mean | 0.718 |
| | 157 | 28.4 | 3869893 | 7.3E-06 | 0.734 | ST dev | 0.04357 |
| few orange spots | 156 | 27.9 | 3796416 | 7.3E-06 | 0.735 | n | 168 |
| orange belly; no milt | 232 | 91.7 | 12487168 | 7.3E-06 | 0.734 | 95% CI | 0.00659 |
| | 150 | 23.7 | 3375000 | 7E-06 | 0.702 | min k | 0.629 |
| | 135 | 16.7 | 2460375 | 6.8E-06 | 0.679 | max k | 0.864 |
| red spots | 167 | 33.5 | 4657463 | 7.2E-06 | 0.719 | # spawners | 30 |
| orange spots; small DV in mouth | 181 | 40.2 | 5929741 | 6.8E-06 | 0.678 | % spawners | 17.9 |
| | 173 | 38.1 | 5177717 | 7.4E-06 | 0.736 | min L | 95 |
| | 127 | 14.2 | 2048383 | 6.9E-06 | 0.693 | max L | 232 |
| | 124 | 13.1 | 1906624 | 6.9E-06 | 0.687 | | |
| | 116 | 11.3 | 1560896 | 7.2E-06 | 0.724 | | |
| | 158 | 28.0 | 3944312 | 7.1E-06 | 0.710 | | |
| orange spots | 174 | 37.9 | 5268024 | 7.2E-06 | 0.719 | | |
| | 154 | 25.3 | 3652264 | 6.9E-06 | 0.693 | | |
| few orange spots | 154 | 26.3 | 3652264 | 7.2E-06 | 0.720 | | |
| | 157 | 26.2 | 3869893 | 6.8E-06 | 0.677 | | |
| few orange spots | 153 | 25.2 | 3581577 | 7E-06 | 0.704 | | |
| | 165 | 30.6 | 4492125 | 6.8E-06 | 0.681 | | |
| | 166 | 36.6 | 4574296 | 8E-06 | 0.800 | | |
| few orange spots | 151 | 25.3 | 3442951 | 7.3E-06 | 0.735 | | |
| | 146 | 21.8 | 3112136 | 7E-06 | 0.700 | | |
| | 152 | 25.5 | 3511808 | 7.3E-06 | 0.726 | | |
| | 172 | 37.9 | 5088448 | 7.4E-06 | 0.745 | | |
| | 157 | 27.7 | 3869893 | 7.2E-06 | 0.716 | | |
| | 150 | 22.0 | 3375000 | 6.5E-06 | 0.652 | | |
| | 149 | 22.3 | 3307949 | 6.7E-06 | 0.674 | | |
| | 134 | 16.7 | 2406104 | 6.9E-06 | 0.694 | | |
| | 154 | 25.4 | 3652264 | 7E-06 | 0.695 | | |
| orange spots; no milt | 167 | 32.5 | 4657463 | 7E-06 | 0.698 | | |
| orange spots; no milt | 196 | 56.9 | 7529536 | 7.6E-06 | 0.756 | | |
| | 166 | 33.4 | 4574296 | 7.3E-06 | 0.730 | | |
| | 157 | 26.3 | 3869893 | 6.8E-06 | 0.680 | | |
| | 158 | 26.4 | 3944312 | 6.7E-06 | 0.669 | | |
| | 133 | 14.8 | 2352637 | 6.3E-06 | 0.629 | | |
| | 138 | 17.5 | 2628072 | 6.7E-06 | 0.666 | | |
| | 127 | 14.4 | 2048383 | 7E-06 | 0.703 | | |
| | 133 | 16.6 | 2352637 | 7.1E-06 | 0.706 | | |
| | 125 | 13.3 | 1953125 | 6.8E-06 | 0.681 | | |
| few orange spots | 171 | 33.1 | 5000211 | 6.6E-06 | 0.662 | | |
| | 158 | 28.3 | 3944312 | 7.2E-06 | 0.717 | | |
| no color; fat belly | 190 | 48.5 | 6859000 | 7.1E-06 | 0.707 | | |
| | 167 | 33.2 | 4657463 | 7.1E-06 | 0.713 | | |
| few pale orange spots | 154 | 27.3 | 3652264 | 7.5E-06 | 0.747 | | |
| | 141 | 20.3 | 2803221 | 7.2E-06 | 0.724 | | |
| | 146 | 22.5 | 3112136 | 7.2E-06 | 0.723 | | |
| | 149 | 24.0 | 3307949 | 7.3E-06 | 0.726 | | |
| | 117 | 11.7 | 1601613 | 7.3E-06 | 0.731 | | |
| | 136 | 17.0 | 2515456 | 6.8E-06 | 0.676 | | |
| | 120 | 12.8 | 1728000 | 7.4E-06 | 0.741 | | |
| | 136 | 17.7 | 2515456 | 7E-06 | 0.704 | | |
| | 143 | 20.2 | 2924207 | 6.9E-06 | 0.691 | | |

| **Upper Slate Lake** | **10/29/2004** Dolly Varden | | | | | |
|---|---|---|---|---|---|---|
| Spawn indicator | Length (mm) | Weight (g) | L power 3 | | k | |
| orange spots | 217 | 71.5 | 10218313 | 7E-06 | 0.700 | |
| | 179 | 41.1 | 5735339 | 7.2E-06 | 0.717 | |
| | 143 | 19.1 | 2924207 | 6.5E-06 | 0.653 | |
| | 110 | 11.5 | 1331000 | 8.6E-06 | 0.864 | |
| | 131 | 16.5 | 2248091 | 7.3E-06 | 0.734 | |
| | 165 | 28.8 | 4492125 | 6.4E-06 | 0.641 | |
| | 155 | 27.1 | 3723875 | 7.3E-06 | 0.728 | |
| few orange spots | 158 | 27.9 | 3944312 | 7.1E-06 | 0.707 | |
| | 138 | 20.7 | 2628072 | 7.9E-06 | 0.788 | |
| | 142 | 21.5 | 2863288 | 7.5E-06 | 0.751 | |
| few orange spots | 182 | 42.4 | 6028568 | 7E-06 | 0.703 | |
| few orange spots | 150 | 25.7 | 3375000 | 7.6E-06 | 0.761 | |
| | 160 | 28.6 | 4096000 | 7E-06 | 0.698 | |
| | 162 | 30.5 | 4251528 | 7.2E-06 | 0.717 | |
| | 138 | 19.1 | 2628072 | 7.3E-06 | 0.727 | |
| | 145 | 23.5 | 3048625 | 7.7E-06 | 0.771 | |
| | 130 | 16.3 | 2197000 | 7.4E-06 | 0.742 | |
| | 158 | 29.4 | 3944312 | 7.5E-06 | 0.745 | |
| orange spots; no milt | 178 | 46.1 | 5639752 | 8.2E-06 | 0.817 | |
| | 145 | 26.3 | 3048625 | 8.6E-06 | 0.863 | |
| | 146 | 21.3 | 3112136 | 6.8E-06 | 0.684 | |
| | 148 | 22.8 | 3241792 | 7E-06 | 0.703 | |
| | 154 | 23.3 | 3652264 | 6.4E-06 | 0.638 | |
| few orange spots | 218 | 69.1 | 10360232 | 6.7E-06 | 0.667 | |
| red spots; orange belly | 176 | 38.3 | 5451776 | 7E-06 | 0.703 | |
| | 115 | 11.9 | 1520875 | 7.8E-06 | 0.782 | |
| | 190 | 51.1 | 6859000 | 7.5E-06 | 0.745 | |
| | 162 | 30.7 | 4251528 | 7.2E-06 | 0.722 | |
| | 134 | 16.5 | 2406104 | 6.9E-06 | 0.686 | |
| | 142 | 22.5 | 2863288 | 7.9E-06 | 0.786 | |
| orange belly; no milt | 172 | 36.7 | 5088448 | 7.2E-06 | 0.721 | |
| | 138 | 17.6 | 2628072 | 6.7E-06 | 0.670 | |
| | 132 | 16.8 | 2299968 | 7.3E-06 | 0.730 | |
| | 117 | 11.2 | 1601613 | 7E-06 | 0.699 | |
| few orange spots | 168 | 34.2 | 4741632 | 7.2E-06 | 0.721 | |
| | 182 | 39.9 | 6028568 | 6.6E-06 | 0.662 | |
| few orange spots | 189 | 51.8 | 6751269 | 7.7E-06 | 0.767 | |
| | 167 | 34.1 | 4657463 | 7.3E-06 | 0.732 | |
| | 156 | 28.1 | 3796416 | 7.4E-06 | 0.740 | |
| | 162 | 33.1 | 4251528 | 7.8E-06 | 0.779 | |
| few orange spots | 164 | 33.5 | 4410944 | 7.6E-06 | 0.759 | |
| | 159 | 29.8 | 4019679 | 7.4E-06 | 0.741 | |
| | 133 | 17.4 | 2352637 | 7.4E-06 | 0.740 | |
| | 146 | 22.1 | 3112136 | 7.1E-06 | 0.710 | |
| | 167 | 34.5 | 4657463 | 7.4E-06 | 0.741 | |
| | 147 | 23.3 | 3176523 | 7.3E-06 | 0.734 | |
| | 174 | 34.4 | 5268024 | 6.5E-06 | 0.653 | |
| | 210 | 63.8 | 9261000 | 6.9E-06 | 0.689 | |
| | 133 | 15.6 | 2352637 | 6.6E-06 | 0.663 | |
| | 135 | 17.7 | 2460375 | 7.2E-06 | 0.719 | |
| | 121 | 15.0 | 1771561 | 8.5E-06 | 0.847 | |
| | 134 | 16.6 | 2406104 | 6.9E-06 | 0.690 | |
| | 141 | 20.8 | 2803221 | 7.4E-06 | 0.742 | |

| **Upper Slate Lake** | **10/29/2004** Dolly Varden | | | | | |
|---|---|---|---|---|---|---|
| Spawn indicator | Length (mm) | Weight (g) | L power 3 | | k | |
| | 120 | 14.9 | 1728000 | 8.6E-06 | 0.862 | |
| | 105 | 8.6 | 1157625 | 7.4E-06 | 0.743 | |
| | 97 | 6.3 | 912673 | 6.9E-06 | 0.690 | |
| | 159 | 27.0 | 4019679 | 6.7E-06 | 0.672 | |
| | 121 | 12.2 | 1771561 | 6.9E-06 | 0.689 | |
| | 155 | 27.8 | 3723875 | 7.5E-06 | 0.747 | |
| | 151 | 23.7 | 3442951 | 6.9E-06 | 0.688 | |
| | 141 | 19.0 | 2803221 | 6.8E-06 | 0.678 | |
| | 198 | 53.1 | 7762392 | 6.8E-06 | 0.684 | |
| | 174 | 34.4 | 5268024 | 6.5E-06 | 0.653 | |
| | 142 | 20.9 | 2863288 | 7.3E-06 | 0.730 | |
| | 121 | 14.5 | 1771561 | 8.2E-06 | 0.818 | |
| | 135 | 17.8 | 2460375 | 7.2E-06 | 0.723 | |
| | 157 | 25.8 | 3869893 | 6.7E-06 | 0.667 | |
| | 171 | 36.9 | 5000211 | 7.4E-06 | 0.738 | |
| | 149 | 25.5 | 3307949 | 7.7E-06 | 0.771 | |
| | 156 | 29.5 | 3796416 | 7.8E-06 | 0.777 | |
| | 139 | 18.6 | 2685619 | 6.9E-06 | 0.693 | |
| | 129 | 18.0 | 2146689 | 8.4E-06 | 0.839 | |
| | 127 | 15.0 | 2048383 | 7.3E-06 | 0.732 | |
| | 95 | 6.8 | 857375 | 7.9E-06 | 0.793 | |
| | 154 | 26.1 | 3652264 | 7.1E-06 | 0.715 | |
| | 146 | 22.5 | 3112136 | 7.2E-06 | 0.723 | |
| | 131 | 15.5 | 2248091 | 6.9E-06 | 0.689 | |
| | 138 | 19.0 | 2628072 | 7.2E-06 | 0.723 | |
| orange spots | 182 | 40.7 | 6028568 | 6.8E-06 | 0.675 | |
| | 144 | 21.1 | 2985984 | 7.1E-06 | 0.707 | |
| | 172 | 35.0 | 5088448 | 6.9E-06 | 0.688 | |
| | 151 | 26.2 | 3442951 | 7.6E-06 | 0.761 | |
| | 139 | 17.8 | 2685619 | 6.6E-06 | 0.663 | |
| | 166 | 30.7 | 4574296 | 6.7E-06 | 0.671 | |
| | 153 | 23.3 | 3581577 | 6.5E-06 | 0.651 | |
| | 135 | 18.2 | 2460375 | 7.4E-06 | 0.740 | |
| pale orange spots | 160 | 27.5 | 4096000 | 6.7E-06 | 0.671 | |
| | 148 | 23.8 | 3241792 | 7.3E-06 | 0.734 | |
| | 111 | 9.7 | 1367631 | 7.1E-06 | 0.709 | |
| | 105 | 8.1 | 1157625 | 7E-06 | 0.700 | |
| | 99 | 7.3 | 970299 | 7.5E-06 | 0.752 | |
| | 122 | 13.6 | 1815848 | 7.5E-06 | 0.749 | |
| | 136 | 18.5 | 2515456 | 7.4E-06 | 0.735 | |
| | 145 | 21.7 | 3048625 | 7.1E-06 | 0.712 | |
| | 166 | 32.2 | 4574296 | 7E-06 | 0.704 | |
| | 110 | 9.5 | 1331000 | 7.1E-06 | 0.714 | |
| few orange spots | 165 | 33.0 | 4492125 | 7.3E-06 | 0.735 | |
| | 139 | 18.8 | 2685619 | 7E-06 | 0.700 | |
| | 141 | 21.3 | 2803221 | 7.6E-06 | 0.760 | |
| | 110 | 10.2 | 1331000 | 7.7E-06 | 0.766 | |
| | 103 | 7.9 | 1092727 | 7.2E-06 | 0.723 | |
| | 104 | 7.9 | 1124864 | 7E-06 | 0.702 | |
| | 124 | 14.6 | 1906624 | 7.7E-06 | 0.766 | |
| | 120 | 11.4 | 1728000 | 6.6E-06 | 0.660 | |
| | 128 | 14.7 | 2097152 | 7E-06 | 0.701 | |
| few orange spots | 152 | 24.5 | 3511808 | 7E-06 | 0.698 | |
| | 155 | 24.6 | 3723875 | 6.6E-06 | 0.661 | |
| few orange spots | 173 | 34.1 | 5177717 | 6.6E-06 | 0.659 | |
| | 113 | 10.1 | 1442897 | 7E-06 | 0.700 | |
| few orange spots | 213 | 68.3 | 9663597 | 7.1E-06 | 0.707 | |
| | 129 | 15.2 | 2146689 | 7.1E-06 | 0.708 | |
| | 117 | 11.1 | 1601613 | 6.9E-06 | 0.693 | |
| | 113 | 11.7 | 1442897 | 8.1E-06 | 0.811 | |
| | 121 | 13.1 | 1771561 | 7.4E-06 | 0.739 | |
| | 115 | 10.7 | 1520875 | 7E-06 | 0.704 | |
| | 106 | 8.3 | 1191016 | 7E-06 | 0.697 | |

| **Upper Slate Lake** | **11/13/2004** Dolly Varden | | | | | | |
|---|---|---|---|---|---|---|---|
| Spawn indicator | Length (mm) | Weight (g) | L power 3 | | k | | |
| | 204 | 61 | 8489664 | 7.2E-06 | 0.719 | mean | 0.711 |
| | 161 | 28.6 | 4173281 | 6.9E-06 | 0.685 | ST dev | 0.05087 |
| | 124 | 13.5 | 1906624 | 7.1E-06 | 0.708 | n | 90 |
| | 154 | 24 | 3652264 | 6.6E-06 | 0.657 | 95% CI | 0.01051 |
| | 125 | 14.5 | 1953125 | 7.4E-06 | 0.742 | min k | 0.63237 |
| | 112 | 9.8 | 1404928 | 7E-06 | 0.698 | max k | 0.87445 |
| few orange spots | 153 | 25.1 | 3581577 | 7E-06 | 0.701 | # spawners | 19 |
| | 148 | 23.7 | 3241792 | 7.3E-06 | 0.731 | % spawner | 21.1 |
| | 145 | 21.1 | 3048625 | 6.9E-06 | 0.692 | min L | 83 |
| few orange spots | 151 | 26.1 | 3442951 | 7.6E-06 | 0.758 | max L | 246 |
| | 129 | 14.9 | 2146689 | 6.9E-06 | 0.694 | | |
| red spots, orange belly; milt | 183 | 43.3 | 6128487 | 7.1E-06 | 0.707 | | |
| fat belly | 210 | 74.4 | 9261000 | 8E-06 | 0.803 | | |
| | 172 | 37.5 | 5088448 | 7.4E-06 | 0.737 | | |
| | 158 | 27.7 | 3944312 | 7E-06 | 0.702 | | |
| | 113 | 11.9 | 1442897 | 8.2E-06 | 0.825 | | |
| | 148 | 23.8 | 3241792 | 7.3E-06 | 0.734 | | |
| | 129 | 15.1 | 2146689 | 7E-06 | 0.703 | | |
| | 131 | 14.7 | 2248091 | 6.5E-06 | 0.654 | | |
| red spots | 158 | 26.3 | 3944312 | 6.7E-06 | 0.667 | | |
| | 156 | 26.5 | 3796416 | 7E-06 | 0.698 | | |
| | 113 | 11.1 | 1442897 | 7.7E-06 | 0.769 | | |
| | 148 | 24.7 | 3241792 | 7.6E-06 | 0.762 | | |
| few orange spots | 153 | 26.9 | 3581577 | 7.5E-06 | 0.751 | | |
| | 124 | 15.6 | 1906624 | 8.2E-06 | 0.818 | | |
| | 116 | 11.6 | 1560896 | 7.4E-06 | 0.743 | | |
| | 122 | 12.3 | 1815848 | 6.8E-06 | 0.677 | | |
| orange spots | 180 | 43.3 | 5832000 | 7.4E-06 | 0.742 | | |
| | 155 | 30.3 | 3723875 | 8.1E-06 | 0.814 | | |
| few orange spots | 171 | 33.5 | 5000211 | 6.7E-06 | 0.670 | | |
| | 124 | 13.8 | 1906624 | 7.2E-06 | 0.724 | | |
| few orange spots | 159 | 26.6 | 4019679 | 6.6E-06 | 0.662 | | |
| | 168 | 32.1 | 4741632 | 6.8E-06 | 0.677 | | |
| red spots, orange belly; milt | 142 | 18.9 | 2863288 | 6.6E-06 | 0.660 | | |
| | 139 | 18.9 | 2685619 | 7E-06 | 0.704 | | |
| | 109 | 10.6 | 1295029 | 8.2E-06 | 0.819 | | |
| | 139 | 19.3 | 2685619 | 7.2E-06 | 0.719 | | |
| none! | 246 | 128.2 | 1.5E+07 | 8.6E-06 | 0.861 | | |
| red spots, orange belly; milt | 189 | 43.3 | 6751269 | 6.4E-06 | 0.641 | | |
| | 150 | 25.9 | 3375000 | 7.7E-06 | 0.767 | | |
| | 139 | 20.9 | 2685619 | 7.8E-06 | 0.778 | | |
| | 134 | 16.7 | 2406104 | 6.9E-06 | 0.694 | | |
| | 133 | 15.8 | 2352637 | 6.7E-06 | 0.672 | | |
| | 133 | 16.7 | 2352637 | 7.1E-06 | 0.710 | | |
| | 126 | 13.6 | 2000376 | 6.8E-06 | 0.680 | | |

| **Upper Slate Lake** | **11/13/2004** Dolly Varden | | | | |
|---|---|---|---|---|---|
| Spawn indicator | Length (mm) | Weight (g) | L power 3 | | k |
| | 120 | 13.7 | 1728000 | 7.9E-06 | 0.793 |
| | 140 | 20 | 2744000 | 7.3E-06 | 0.729 |
| | 134 | 16.3 | 2406104 | 6.8E-06 | 0.677 |
| | 137 | 17.9 | 2571353 | 7E-06 | 0.696 |
| | 121 | 14.4 | 1771561 | 8.1E-06 | 0.813 |
| | 121 | 11.9 | 1771561 | 6.7E-06 | 0.672 |
| orange spots & belly | 232 | 84 | 1.2E+07 | 6.7E-06 | 0.673 |
| few orange spots | 175 | 36.9 | 5359375 | 6.9E-06 | 0.689 |
| orange spots & belly | 166 | 29.5 | 4574296 | 6.4E-06 | 0.645 |
| orange spots | 141 | 18.6 | 2803221 | 6.6E-06 | 0.664 |
| | 170 | 32.6 | 4913000 | 6.6E-06 | 0.664 |
| | 146 | 21.9 | 3112136 | 7E-06 | 0.704 |
| | 155 | 25.2 | 3723875 | 6.8E-06 | 0.677 |
| | 124 | 13.1 | 1906624 | 6.9E-06 | 0.687 |
| | 167 | 33 | 4657463 | 7.1E-06 | 0.709 |
| few orange spots | 165 | 32.6 | 4492125 | 7.3E-06 | 0.726 |
| | 156 | 24.9 | 3796416 | 6.6E-06 | 0.656 |
| few orange spots | 157 | 26.5 | 3869893 | 6.8E-06 | 0.685 |
| | 135 | 17.3 | 2460375 | 7E-06 | 0.703 |
| | 152 | 24.1 | 3511808 | 6.9E-06 | 0.686 |
| orange spots | 181 | 42.2 | 5929741 | 7.1E-06 | 0.712 |
| | 137 | 16.3 | 2571353 | 6.3E-06 | 0.634 |
| | 125 | 13.9 | 1953125 | 7.1E-06 | 0.712 |
| | 135 | 16.1 | 2460375 | 6.5E-06 | 0.654 |
| | 150 | 22.4 | 3375000 | 6.6E-06 | 0.664 |
| | 134 | 17.1 | 2406104 | 7.1E-06 | 0.711 |
| | 159 | 29 | 4019679 | 7.2E-06 | 0.721 |
| | 145 | 23.8 | 3048625 | 7.8E-06 | 0.781 |
| | 153 | 25 | 3581577 | 7E-06 | 0.698 |
| | 144 | 22.6 | 2985984 | 7.6E-06 | 0.757 |
| | 140 | 19.1 | 2744000 | 7E-06 | 0.696 |
| few orange spots | 183 | 40.6 | 6128487 | 6.6E-06 | 0.662 |
| | 95 | 5.8 | 857375 | 6.8E-06 | 0.676 |
| | 149 | 24 | 3307949 | 7.3E-06 | 0.726 |
| | 148 | 20.5 | 3241792 | 6.3E-06 | 0.632 |
| | 98 | 6.3 | 941192 | 6.7E-06 | 0.669 |
| | 117 | 11.4 | 1601613 | 7.1E-06 | 0.712 |
| | 106 | 8.9 | 1191016 | 7.5E-06 | 0.747 |
| | 114 | 10.2 | 1481544 | 6.9E-06 | 0.688 |
| | 83 | 5 | 571787 | 8.7E-06 | 0.874 |
| orange spots | 209 | 65.3 | 9129329 | 7.2E-06 | 0.715 |
| | 160 | 27.4 | 4096000 | 6.7E-06 | 0.669 |
| | 136 | 16.8 | 2515456 | 6.7E-06 | 0.668 |
| | 130 | 15.8 | 2197000 | 7.2E-06 | 0.719 |
| | 120 | 11.3 | 1728000 | 6.5E-06 | 0.654 |

# Attachment 5

# Survey Results of Herring Spawning Habitat Assessment and Monitoring at Cascade Point, Berners Bay – 2008

**Regional Information Report No. 1J08-11**

# Preliminary Pre-Construction Survey Results of Herring Spawning Habitat Assessment and Monitoring at Cascade Point, Berners Bay

**by**

**David L. Barto**

**March 2008**

**Alaska Department of Fish and Game** **Division of Commercial Fisheries**

## Symbols and Abbreviations

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

**Weights and measures (metric)**

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

**Weights and measures (English)**

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

**Time and temperature**

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

**Physics and chemistry**

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

**General**

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

**Measures (fisheries)**

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

**Mathematics, statistics**

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

*REGIONAL INFORMATION REPORT NO. 1J08-11*

# PRELIMINARY PRE-CONSTRUCTION SURVEY RESULTS OF HERRING SPAWNING HABITAT ASSESSMENT AND MONITORING AT CASCADE POINT, BERNERS BAY

By
David L. Barto
Alaska Department of Fish and Game, Division of Commercial Fisheries, Douglas

Alaska Department of Fish and Game
Division of Commercial Fisheries, Publications Section
802 3rd, Douglas, Alaska, 99824-0020

March 2008

This investigation was partially financed by Coeur Alaska

The Regional Information Report Series was established in 1987 and was redefined in 2007 to meet the Division of Commercial Fisheries regional need for publishing and archiving information such as project operational plans, area management plans, budgetary information, staff comments and opinions to Board of Fisheries proposals, interim or preliminary data and grant agency reports, special meeting or minor workshop results and other regional information not generally reported elsewhere. Reports in this series may contain raw data and preliminary results. Reports in this series receive varying degrees of regional, biometric and editorial review; information in this series may be subsequently finalized and published in a different department reporting series or in the formal literature. Please contact the author or the Division of Commercial Fisheries if in doubt of the level of review or preliminary nature of the data reported. Regional Information Reports are available through the Alaska State Library and on the Internet at: http://www.sf.adfg.ak.us/statewide/divreprots/htlm/intersearch.cfm.

*David L. Barto,*
*Alaska Department of Fish and Game, Division of Commercial Fisheries,*
*802 3rd St., Douglas, AK 99824, USA*

*This document should be cited as:*
*Barto, D.L. 2008. Preliminary Pre-Construction Survey Results of Herring Spawning Habitat Assessment and Monitoring at Cascade Point, Berners Bay. Alaska Department of Fish and Game, Regional Report Series No. 1J08-11, Douglas.*

The Alaska Department of Fish and Game (ADF&G) administers all programs and activities free from discrimination based on race, color, national origin, age, sex, religion, marital status, pregnancy, parenthood, or disability. The department administers all programs and activities in compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act (ADA) of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972.

**If you believe you have been discriminated against in any program, activity, or facility please write**:

ADF&G ADA Coordinator, P.O. Box 115526, Juneau AK 99811-5526

U.S. Fish and Wildlife Service, 4040 N. Fairfax Drive, Suite 300 Webb, Arlington VA 22203

Office of Equal Opportunity, U.S. Department of the Interior, Washington DC 20240

**The department's ADA Coordinator can be reached via phone at the following numbers:**

(VOICE) 907-465-6077, (Statewide Telecommunication Device for the Deaf) 1-800-478-3648, (Juneau TDD) 907-465-3646, or (FAX) 907-465-6078

**For information on alternative formats and questions on this publication, please contact**:

ADF&G, Sport Fish Division, Research and Technical Services, 333 Raspberry Road, Anchorage AK 99518 (907)267-2375.

# TABLE OF CONTENTS

**Page**

LIST OF FIGURES ..... ii
LIST OF APPENDICES ..... ii
ABSTRACT ..... 3
INTRODUCTION ..... 3
OBJECTIVES ..... 4
METHODS ..... 4
Dive Operations ..... 4
Habitat Survey Monitoring by Direct Observation ..... 5
Video Survey Method –Transects ..... 5
Photoquadrats Survey Method – Transects ..... 5
Herring Spawning Documentation and Biomass Measurements ..... 5
RESULTS ..... 6
REFERENCES CITED ..... 6
APPENDICES ..... 14

# LIST OF FIGURES

**Figure** **Page**
Figure 1.–Cascade Point study site location in Berners Bay north of Juneau, Alaska. ..... 7
Figure 2.–Location of originally proposed herring spawn and habitat survey transects in the vicinity of the breakwater/dredge construction area at Cascade Point. ..... 8
Figure 3.–Cascade Point 2005 and 2006 habitat dive survey transect locations ..... 9
Figure 4.–Survey transect locations and lengths ..... 10
Figure 5.–Study area depth contours observed at Cascade Point during the 2005 and 2006 habitat surveys. ..... 11
Figure 6.–Primary substrate distribution observed during 2005 and 2006 habitat surveys at Cascade Point. ..... 12
Figure 7.–Primary vegetation distribution observed during the 2005 and 2006 habitat surveys at Cascade Point ..... 13

# LIST OF APPENDICES

**Appendix** **Page**
Appendix A.–Key to bottom types used for herring spawn deposition survey ..... 15
Appendix B.–Key to vegetative types used for herring spawn deposition survey ..... 16

# ABSTRACT

Goldbelt, Inc. plans to construct a marine vessel terminal at Cascade Point to support the Kensington Gold Mine and other activities. This vessel terminal will include a rock breakwater and dredged area containing a floating dock. Because this proposed terminal is located in an area historically used for spawning by Pacific herring (*Clupea harengus*), construction will result in direct loss of spawning habitat in the dredge and fill footprint.

Underwater habitat monitoring surveys were conducted in 2005 and 2006 to document the pre-construction nearshore marine habitat at Cascade Point. A total of 9 different underwater transects were surveyed during the months of May and June. Observational data was collected using SCUBA to document the primary types of benthic substrate and vegetation within a 0.25 meter quadrat at 5-meter intervals along each transect. Vegetative coverage observations estimated the total percent cover of macroalgae and substrate within each quadrat. Vegetation and substrate type were recorded for the two most common types at each interval, with the most prevalent type reported as the primary observation.

Preliminary geo-referenced depth, substrate, and vegetation maps were developed using ArcMap GIS software to establish baseline area distributions at Cascade Point for this monitoring project. The next phase of the project will entail conducting surveys in future years to monitor habitat changes due to construction.



Key words: Pacific herring, *Clupea harengus*, spawning habitat, Southeast Alaska, habitat assessment


# INTRODUCTION

In response to the planned operation of the Kensington Gold Mine, near the northern side of Berner's Bay, Goldbelt, Inc. plans to construct a marine vessel terminal at Cascade Point, approximately 75 km north of Juneau, Alaska (Figure 1). The marine vessel terminal will support the Kensington Gold Mine, as well as other activities. The proposed terminal will include a rock breakwater and a dredged area that will contain a floating dock (Figure 2).

The Alaska Department of Fish and Game (ADF&G) has some concerns about the proposed marine terminal. The project is located in an area historically used for spawning by Pacific herring (*Clupea harengus*). Terminal construction will result in a direct loss of spawning habitat in the dredge and fill footprint. Adjacent spawning habitat could also be affected, due to breakwater construction changing hydrology and sedimentation patterns within the area. Some of the damage may be ameliorated, if aquatic plants now at the site colonize the marine terminal area (for example, on the breakwater), in the years following the project's completion.

Compared to historical abundance, the Lynn Canal herring stock is presently at very low levels. Generally, this stock of fish spawned between April 18 and May 24, in the area between Berners Bay and Auke Bay. The Lynn Canal herring stock crashed in the late 1970s. The reason is unknown; possible causes include reduction of spawning habitat, overfishing, or elevated numbers of predators in the area. Other stocks in Southeast Alaska have declined and recovered, but the Lynn Canal stock has not recovered, and remains at one-tenth of the previous spawning biomass levels. The distribution of spawning grounds for this stock is presently limited to an area that includes the proposed marine terminal. Spawning grounds extend across the southern shore of Berners Bay, and the Point Bridget area. However, herring spawning activity has only been observed twice at Cascade Point during the past 10 years.

Southeast Alaska herring stocks spawn along the shoreline in select areas between mean high tide (MHHW) and approximately 40 feet below mean low tide (MLLW) from mid-March through mid-June. Immediately after release, eggs are extremely sticky and readily adhere to a

variety of intertidal and subtidal seaweeds, macroalgae and rocky substrates. Primary habitat for herring eggs in the Cascade Point area is macroalgae.

While the breakwater and the dredge basin will alter herring spawning habitat, the rocky substrate comprising the breakwater will likely be colonized by macroalgae (the preferred spawning substrate), and provide spawning habitat that would partially replace the habitat lost as a result of construction.

The goal of this project is to detect changes in the amount of available herring spawning habitat within and adjacent to the dredge and fill areas of the marine terminal. Additionally, this project will monitor the vegetative colonization of the breakwater and dredge basin areas. If herring do spawn in the area, the project will document the extent and abundance of the spawn within and adjacent to the dredge and fill area at Cascade Point prior to construction, and for a period of near Cascade Point.

This report presents the preliminary pre-construction survey results from 2005 and 2006.

# OBJECTIVES

This monitoring project will attempt to document and addresses impacts associated with the construction and operation of the Cascade Point marine facility on herring spawning habitat within Berners Bay. While some details of the monitoring plan will differ between the pre-construction and operation phases, the monitoring objectives will remain the same for both phases.

1. Determine the annual occurrence, distribution and timing of herring spawning activity at Cascade Point within Berners Bay.
2. Monitor and document herring spawning within Berners Bay in the vicinity of Cascade Point.
3. Monitor and document the herring habitat colonization by aquatic vegetation and provided by the Cascade Point breakwater, dredged basin and adjacent shoreline compared to pre-construction conditions.

# METHODS

## DIVE OPERATIONS

On May 25, 2005 and July 3, 2006, ADF&G biologists conducted SCUBA dive surveys to document the habitat, also using outboard-powered skiffs. These dates are within the historical herring spawning periods observed for Berners Bay. U.S. Fish and Wildlife Service (USFWS) divers also participated in the 2005 survey effort, as observers. Due to delays in construction, both the 2005 and 2006 surveys took place in undisturbed conditions, and can be viewed as baseline studies for the Cascade Point terminal project.

SCUBA divers sampled the area by swimming along a series of transects laid out perpendicular to the shoreline at Cascade Point (Figure 3.). The transects extended from mean higher high water level (MHHW) to 13.7 m (45 feet) below the mean lower low water level (MLLW). Transect length varied, depending upon the slope of the bottom (Figure 4.). The longest transect surveyed (T4) was 265 meters long. The shortest transect (T6) was 55 meters. All surveyed transects reached their target depth. GPS latitude and longitude coordinates were recorded (using

a Garmin model 76) at the ending point of these surveys, to more accurately identify the transect locations in future years.

A total of 5 transects were surveyed in 2005; (Figure 3.). In the 2005 transects, a mid point transect (T3) was located along the axis of the breakwater footprint, one transect was located through the middle of the dredge basin (T4), two transects were located north of the breakwater (T1 and T2) and one transect to the south (T5) outside of the dredge basin.

Four transects were surveyed in 2006 (Figure 2). These transects (T6 through T9) were spaced to provide a higher resolution of coverage for the project area.

## HABITAT SURVEY MONITORING BY DIRECT OBSERVATION

SCUBA divers collected data from 0.25 $m^2$ quadrats at 5-meter intervals along each transect. This type of habitat data is also recorded for the established herring spawn biomass assessment dive surreys by ADF&G (Pritchett 2007). Divers documented depth, vegetative group distribution, and substrate type, for all transects surveyed within the project area. Vegetative coverage observations estimated the total percent cover of macroalgae within a 0.25 meter quadrat. Substrate type was also identified within each quadrat sampled for vegetative cover. Vegetation and substrate type were recorded for the two most common types on each segment, with the most prevalent type reported as the primary observation. The beginning and ending times for each transect were recorded, to allow for standardization to MLLW.

### Video Survey Method –Transects

The USFWS biologists used an underwater video camera to document the Cascade Point subtidal habitat was accomplished at T3 in 2005. One SCUBA diver would swim along the established transect, while a second diver would maintain a line transect heading, by referencing to a compass mounted on a dive survey rod alongside of the diver recording the video. The diver with the video camera attempted to maintain a constant distance above the bottom and a constant swimming speed.

### Photoquadrats Survey Method – Transects

The divers conducted one subtidal transect from 13.7 m (45 ft) below MLLW to zero depth at the location of each of the five transects surveyed in 2005. A 35mm Nikonos underwater camera with a Sea & Sea 15mm underwater wide angle lens was used to photograph a 0.25 $m^2$ quadrat of the bottom along each line transect at the standardized 5-meter observation intervals. This photographic record was intended to record the different vegetation types and percent coverage encountered along the transect to verify the diver observations.

The results of the 2005 photo observations are currently being analyzed. An exposure problem occurred with the photographs. We are attempting to resolve this problem by converting the 35 mm photographic slides to digital files. Photographic software will be used to adjust the exposures if possible.

## HERRING SPAWNING DOCUMENTATION AND BIOMASS MEASUREMENTS

In order to determine whether herring are spawning in Berners Bay, ADF&G biologists conduct aerial surveys from fixed-wing aircraft, beginning in early May, the historical start of herring spawning in the Berners Bay area. If herring are spawning in the area, ADF&G biologists identify the location and extent of the shoreline where active spawning is occurring. Aerial

surveys continue until active spawning is no longer observed, and herring schools are no longer staging on the spawning grounds.

## RESULTS

Divers documented depth (Figure 5.), substrate type (Figure 6.), and vegetative group distribution (Figure 7.) for all transects surveyed within the project area. Substrate (Appendix A) and vegetation (Appendix B.) were recorded for the two most common types observed on each segment of the transect.

No herring spawn activity was observed at Cascade Point in 2005 and 2006 (Pritchett et al. 2007). Thus no herring spawn assessments were made.

Preliminary geo-referenced depth, substrate, and vegetation maps were developed using ArcMap GIS software to establish baseline area distributions at Cascade Point for this monitoring project. The next phase of the project will entail conducting surveys in future years to monitor habitat changes due to construction.

## REFERENCES CITED

Pritchett, M. 2007. Project operational plan for 2007 Southeast Alaska herring stock assessment. Alaska Department of Fish and Game, Division of Commercial Fisheries Division RIR 1J07–15, Juneau.

Pritchett, M., S. Dressel, and K. Monagle. 2007. Berners Bay herring research for 2005 and 2006. Alaska Department of Fish and Game, Division of Commercial Fisheries Division RIR 1J07–01, Juneau.

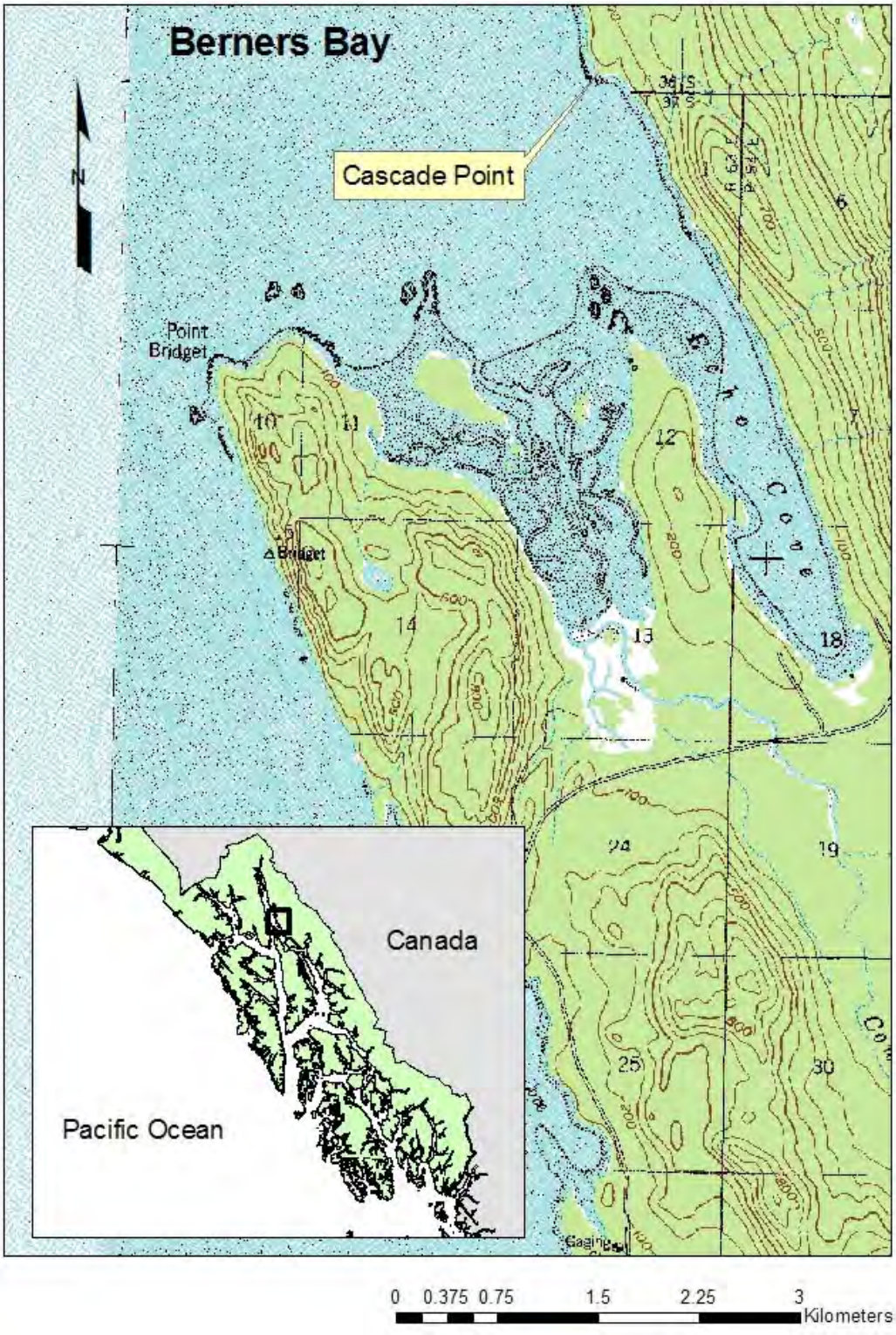



**Figure 1.–**Cascade Point study site location in Berners Bay north of Juneau, Alaska..

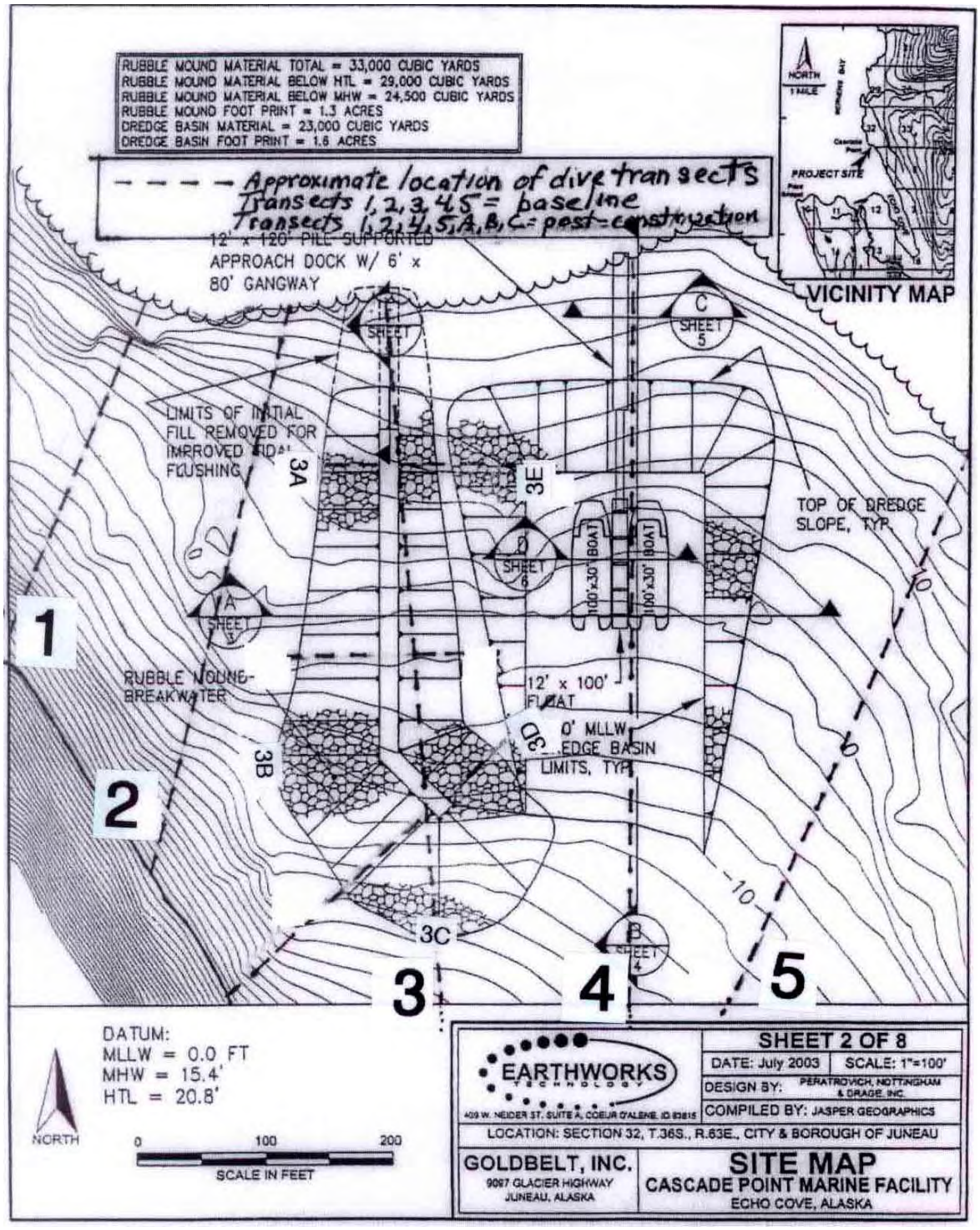



**Figure 2.–**Location of originally proposed herring spawn and habitat survey transects in the vicinity of the breakwater/dredge construction area at Cascade Point.

.

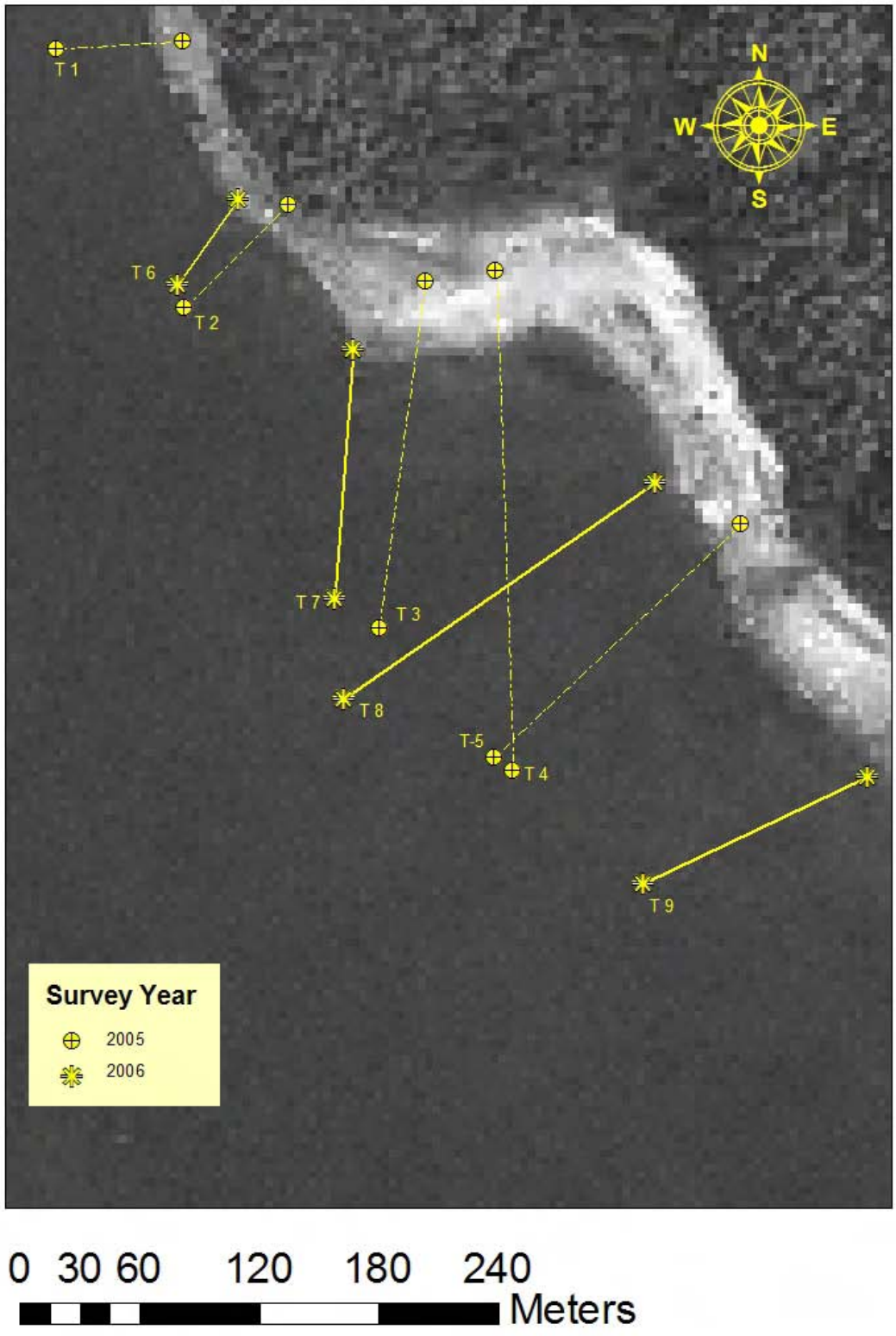



**Figure 3.–**Cascade Point 2005 and 2006 habitat dive survey transect locations

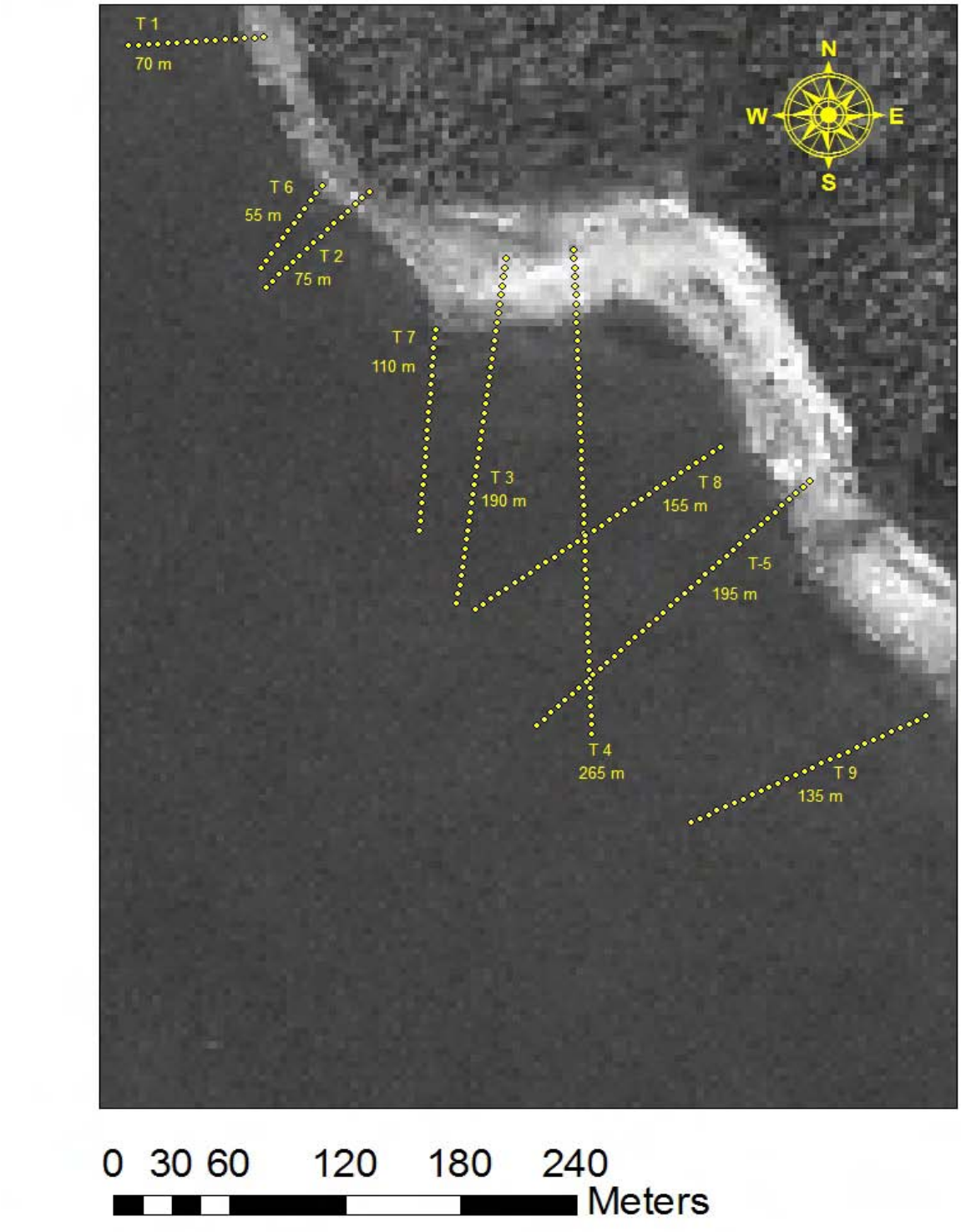



**Figure 4.–**Survey transect locations and lengths.

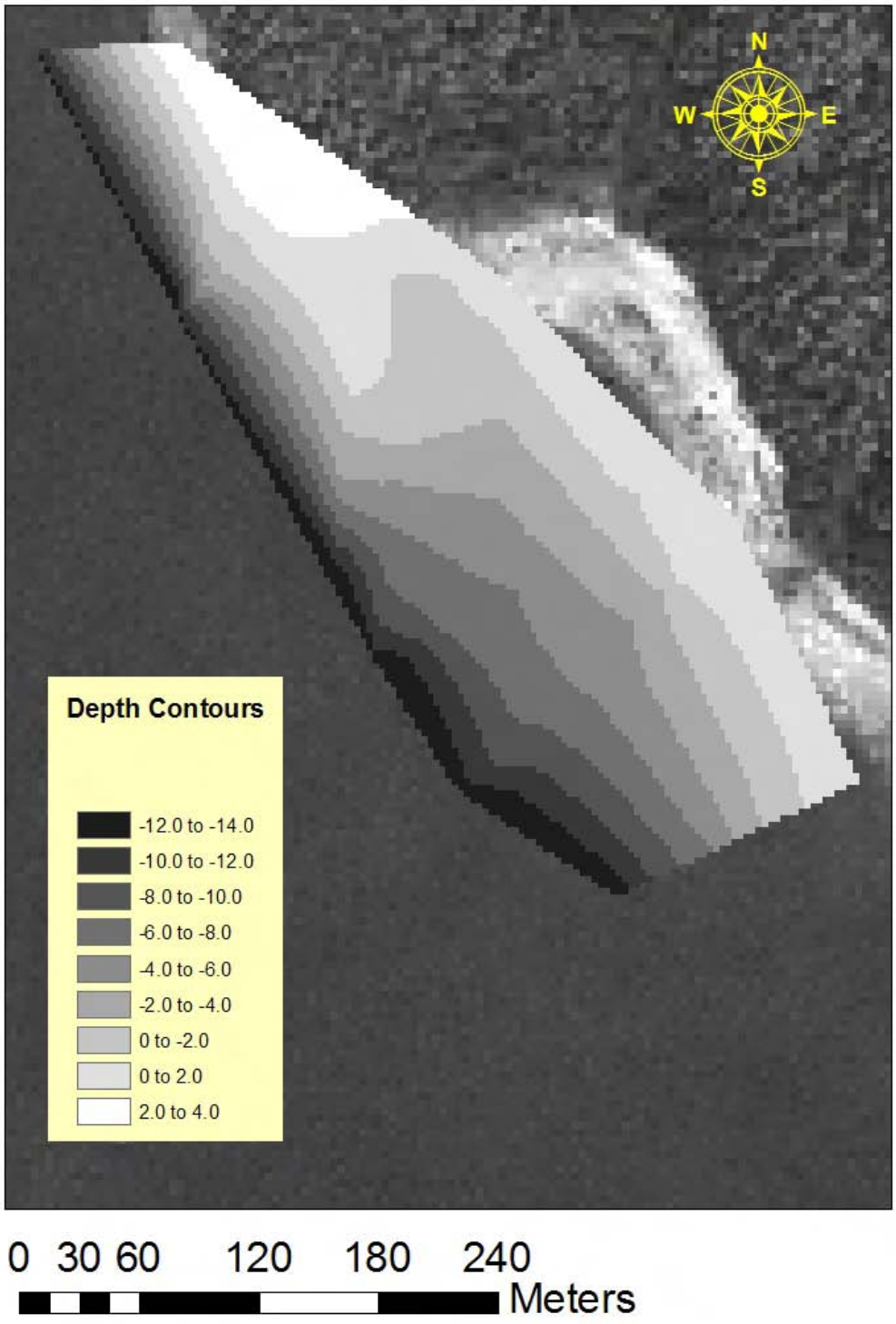



**Figure 5.–**Study area depth contours observed at Cascade Point during the 2005 and 2006 habitat surveys.

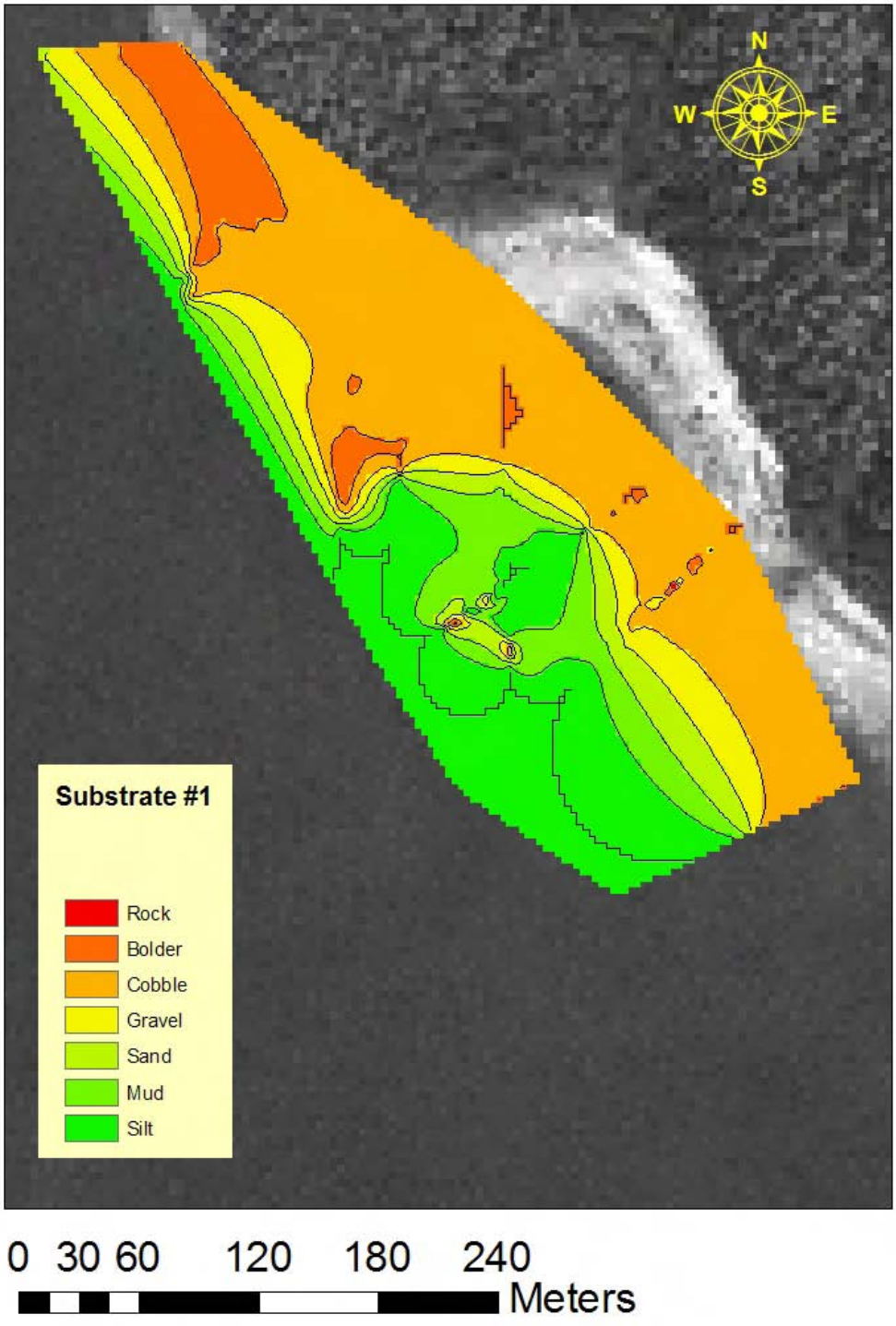



**Figure 6.–**Primary substrate distribution observed during 2005 and 2006 habitat surveys at Cascade Point.

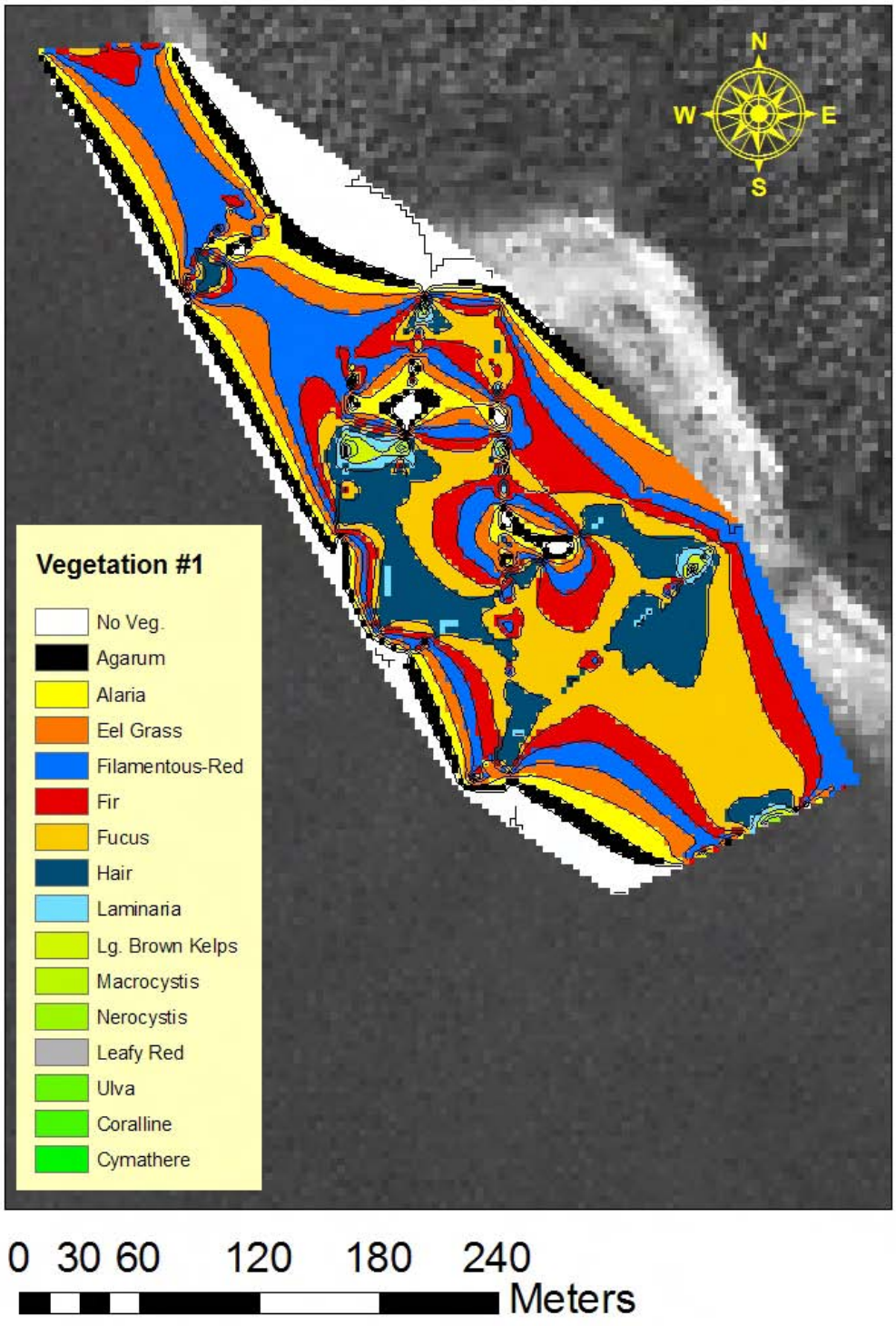



**Figure 7.–**Primary vegetation distribution observed during the 2005 and 2006 habitat surveys at Cascade Point.

# APPENDICES

**Appendix A.–**Key to bottom types used for herring spawn deposition survey.

| CODE | EXPANDED CODE | DEFINITION |
|---|---|---|
| RCK | Bedrock | Various rocky substrates > 1 meter in diameter |
| BLD | Boulder | Substrate between 25 cm and 1 meter |
| CBL | Cobble | Substrate between 6 cm and 25 cm |
| GVL | Gravel | Substrate between 0.4 cm and 6 cm |
| SND | Sand | Clearly separate grains of < 0.4 cm |
| MUD | Mud | Soft, paste-like material |
| SIL | Silt | Fine organic dusting (very rarely used) |
| BAR | Barnacles | Area primarily covered with barnacles |
| SHL | Shell | Area primarily covered with whole or crushed |
| MUS | Mussels | Area primarily covered with mussels |
| WDY | Woody debris | Any submerged bark, logs, branches or root |

**Appendix B.–**Key to vegetative types used for herring spawn deposition survey

| CODE | EXPANDED CODE | SPECIES INCLUDED | LATIN NAMES |
|---|---|---|---|
| AGM | Agarum | Sieve kelp | *Agarum clathratum* |
| ALA | Alaria | Ribbon kelps | *Alaria marginata, A. nana, A. fistulosa* |
| ELG | Eel grass | Eel grass, surfgrasses | *Zostera marina, Phyllospadix serrulatus, P. scouleri* |
| FIL | Filamentous red algae | Sea brush, poly, black tassel | *Polysiphonia pacifica, P. hendryi, Pterosiphonia bipinnata* |
| FIR | Fir kelp | Black pine, Oregon pine (red algae) | *Neorhodomela larix, N.oregona* |
| FUC | Fucus | Rockweed or popweed | *Fucus gardneri* |
| HIR | Hair kelp | Witch's hair, stringy acid kelp | *Desmarestia enestra, D. viridis* |
| LAM | Laminaria | split kelp, sugar kelp, suction-cup kelp | *Laminaria bongardiana, L. saccharina, L. yezoensis (when isolated and identifiable)* |
| LBK | Large Brown Kelps | Five-ribbed kelp, three-ribbed kelp, split kelp, sugar kelp, sea spatula, sieve kelp, ribbon kelp | *Costaria costata, Cymathere enestrate, Laminaria spp., Pleurophycus gardneri, Agarum, Alaria spp.* |
| MAC | Macrocystis | macrocystis | *Macrocystis integrifolia* |
| NER | Nereocystis | Bull kelp | *Nereocystis leutkeana* |
| RED | Red algae | All red leafy algae (red ribbons, red blades, red sea cabbage, Turkish washcloth) | *Palmaria mollis, P. hecatensis, P. callophylloides, Dilsea californica, Neodilsea borealis, Mastocarpus papillatus, Turnerella mertensiana* |
| ULV | Ulva | Sea lettuce | *Ulva enestrate, Ulvaria obscura* |
| COR | Coralline algae | Coral seaweeds (red algae) | *Bossiella, Corallina, Serraticardia* |
| CYM | Cymathere | Three-Ribbed kelp | *Cymathere triplicata* |

# Attachment 6

# Development Rock Characterization Data – 2008

Columbia Analytical Services INC

*April 19, 2008*


***Client:*** **Coeur Alaska, Inc.**
**3031 Clinton Dr. Suite 202**
**Juneau, AK 99801**

***Attn:*** **Peter Strow**


***Project:*** **Development Rock Monitoring** ***Date Received:*** **April 9, 2008**

# *Certificate of Analysis*

| *Sample ID:* | *DA Lab #:* | *Sample Date & Time* | *Sulfur, Total 3.2.4 %* | *Sulfur Forms (Acid Extractable and Non-extractable Sulfur) 3.2.6* | | |
|---|---|---|---|---|---|---|
| | | | | *Sulfate %* | *Pyritics %* | *Residual %* |
| COMET-DR-EXPOSED | DA 11082 | 2/27/08 16:00 | 0.439 | n/a | n/a | n/a |
| JUALIN-DR-EXPOSED | DA 11083 | 2/27/08 15:20 | 0.022 | n/a | n/a | n/a |
| duplicate | | | 0.018 | n/a | n/a | n/a |

| *Sample ID:* | *DA Lab #:* | *Neutralization Potential 3.2.3 t CaCO3/1000t* | *Acid - Base Accounting 1.3.1 t CaCO3/1000t* | *pH, Sat. Paste 3.2.2 units* | *pH NAG units* | *Net Acid Generation t CaCO3/1000t* |
|---|---|---|---|---|---|---|
| COMET-DR-EXPOSED | DA 11082 | 79 | 65 | 8.40 | 8.71 | <0.2 |
| JUALIN-DR-EXPOSED | DA 11083 | 60 | 59 | 8.90 | 11.04 | <0.2 |
| duplicate | | 60 | 59 | 8.91 | 11.09 | <0.2 |

***Notes:***
** - Methods follow procedures outlined in "Field and Laboratory Methods Applicable to Overburden and Mine Soils", Sobek, EPA-600/2-78-054, March 1978. Sample preparation includes: air drying, crushing to <10 mm, splitting sub-sample for storage, and grinding second split to <60 mesh to perform the above analyses. Values are reported on a Dry Weight basis.*

*Ralph V. Poulsen, Lab Director*


***3860 S. Palo Verde Rd.***
***Suite 302***
***Tucson, AZ 85714***
***520.573.1061***

1317 South 13th Avenue Kelso, Washington 98626 (360) 577-7222 (360) 636-1068 fax

Columbia Analytical Services INC.
An Employee - Owned Company

January 29, 2008 Analytical Report for Service Request No: K0800221

Ralph Poulsen
Desert Analytics Laboratory
3860 S. Palo Verde Rd.
Suite 303
Tucson, AZ 85714

**RE: MWMP Extracts Coeur Alaska-Kensington**

Dear Ralph:

Enclosed are the results of the samples submitted to our laboratory on January 09, 2008. For your reference, these analyses have been assigned our service request number K0800221.

All analyses were performed according to our laboratory's quality assurance program. Where applicable, the methods cited conform to the Methods Update Rule (effective 4/11/2007), which relates to the use of analytical methods for the drinking water and waste water programs. The test results meet requirements of the NELAC standards. Exceptions are noted in the case narrative report where applicable. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please call if you have any questions. My extension is 3316. You may also contact me via Email at JChristian@caslab.com.

Respectfully submitted,

**Columbia Analytical Services, Inc.**

Jeff Christian
Laboratory Director

JC/lb

## Acronyms

| | |
|---|---|
| ASTM | American Society for Testing and Materials |
| A2LA | American Association for Laboratory Accreditation |
| CARB | California Air Resources Board |
| CAS Number | Chemical Abstract Service registry Number |
| CFC | Chlorofluorocarbon |
| CFU | Colony-Forming Unit |
| DEC | Department of Environmental Conservation |
| DEQ | Department of Environmental Quality |
| DHS | Department of Health Services |
| DOE | Department of Ecology |
| DOH | Department of Health |
| EPA | U. S. Environmental Protection Agency |
| ELAP | Environmental Laboratory Accreditation Program |
| GC | Gas Chromatography |
| GC/MS | Gas Chromatography/Mass Spectrometry |
| LUFT | Leaking Underground Fuel Tank |
| M | Modified |
| MCL | Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA. |
| MDL | Method Detection Limit |
| MPN | Most Probable Number |
| MRL | Method Reporting Limit |
| NA | Not Applicable |
| NC | Not Calculated |
| NCASI | National Council of the Paper Industry for Air and Stream Improvement |
| ND | Not Detected |
| NIOSH | National Institute for Occupational Safety and Health |
| PQL | Practical Quantitation Limit |
| RCRA | Resource Conservation and Recovery Act |
| SIM | Selected Ion Monitoring |
| TPH | Total Petroleum Hydrocarbons |
| tr | Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL. |

## Inorganic Data Qualifiers

| | |
|---|---|
| * | The result is an outlier. See case narrative. |
| # | The control limit criteria is not applicable. See case narrative. |
| B | The analyte was found in the associated method blank at a level that is significant relative to the sample result. |
| E | The result is an estimate amount because the value exceeded the instrument calibration range. |
| J | The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL. |
| U | The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. |
| i | The MRL/MDL has been elevated due to a matrix interference. |
| X | See case narrative. |

## Metals Data Qualifiers

| | |
|---|---|
| # | The control limit criteria is not applicable. See case narrative. |
| B | The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL. |
| E | The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample. |
| M | The duplicate injection precision was not met. |
| N | The Matrix Spike sample recovery is not within control limits. See case narrative. |
| S | The reported value was determined by the Method of Standard Additions (MSA). |
| U | The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. |
| W | The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance. |
| i | The MRL/MDL has been elevated due to a matrix interference. |
| X | See case narrative. |
| * | The duplicate analysis not within control limits. See case narrative. |
| + | The correlation coefficient for the MSA is less than 0.995. |

## Organic Data Qualifiers

| | |
|---|---|
| * | The result is an outlier. See case narrative. |
| # | The control limit criteria is not applicable. See case narrative. |
| A | A tentatively identified compound, a suspected aldol-condensation product. |
| B | The analyte was found in the associated method blank at a level that is significant relative to the sample result. |
| C | The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data. |
| D | The reported result is from a dilution. |
| E | The result is an estimate amount because the value exceeded the instrument calibration range. |
| J | The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL. |
| N | The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed. |
| P | The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results (25% for CLP Pesticides). |
| U | The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. |
| i | The MRL/MDL has been elevated due to a chromatographic interference. |
| X | See case narrative. |

## Additional Petroleum Hydrocarbon Specific Qualifiers

| | |
|---|---|
| F | The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard. |
| L | The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard. |
| H | The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard. |
| O | The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard. |
| Y | The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard. |
| Z | The chromatographic fingerprint does not resemble a petroleum product. |

## Columbia Analytical Services, Inc.
## Kelso, WA
## State Certifications, Accreditations, and Licenses

| Program | Number |
|---|---|
| Alaska DEC UST | UST-040 |
| Arizona DHS | AZ0339 |
| Arkansas - DEQ | 88-0637 |
| California DHS | 2286 |
| Colorado DPHE | - |
| Florida DOH | E87412 |
| Hawaii DOH | - |
| Idaho DHW | - |
| Indiana DOH | C-WA-01 |
| Louisiana DEQ | 3016 |
| Louisiana DHH | LA050010 |
| Maine DHS | WA0035 |
| Michigan DEQ | 9949 |
| Minnesota DOH | 053-999-368 |
| Montana DPHHS | CERT0047 |
| Nevada DEP | WA35 |
| New Jersey DEP | WA005 |
| New Mexico ED | - |
| North Carolina DWQ | 605 |
| Oklahoma DEQ | 9801 |
| Oregon - DHS | WA200001 |
| South Carolina DHEC | 61002 |
| Utah DOH | COLU |
| Washington DOE | C1203 |
| Wisconsin DNR | 998386840 |
| Wyoming (EPA Region 8) | - |

# Chain of Custody Documentation

TRANSWEST GEOCHEM

3725 E. Atlanta Ave.
Phoenix, Arizona 85040
Phone: (602) 437-0330
Fax: (602) 437-0660

3860 S. Palo Verde Rd., Ste. 301
Tucson, Arizona 85714
Phone: (520) 573-1061
Fax: (520) 573-1063

# Chain of Custody

~~TGI~~ Work Order No: K0800221

Date 1/8/08 Page 1 of 1

| | |
|---|---|
| Project Manager: | Ralph Poulsen |
| Client Name: | Desert Analytics |
| Address: | 3860 S. Palo Verde Suite 303 |
| City, State, Zip: | Tucson Az 85714 |
| Phone: | Fax: |

| | |
|---|---|
| Bill To: | |
| Company: | |
| Address: | |
| City, State, Zip: | |
| Phone: | Fax: |

| | |
|---|---|
| P.O. No.: | |
| Project Name: | Coeur Alaska - Kensington |
| Project Number: | |

**SAMPLE RECEIPT**

| | | | | |
|---|---|---|---|---|
| Temperature: | | | Ice: | |
| Received Intact: | Yes | No | N/A | Absent / Present |
| Custody Seals: | Yes | No | N/A | Wet / Blue |
| Total No. of Containers: | | | | Sampled <2 hrs ago |

**ANALYSIS REQUEST**

| Sample Identification | Matrix | Date Sampled | Time Sampled | Lab ID | No. of Containers | TPH, (8015AZR.1) | BTEX (8021B) | Volatile Organics GCMS (624/8260B) | SDWA Volatiles, (524.2) | Semi-Volatile Organics GCMS (625/8270) | Organochlorine Pesticides (608/8081) | PCB's, (8082) | PAH, EPA (8310) | 8 RCRA Metals | Meteoric water Mobility Procedure extracts for | Al, As, Cd, Cr, Cu, Fe Pb, Hg, Ni, Se, Ag, Zn | SO4, pH, NO3/NO2, NH3 | TDS (report in standard water matrix units) | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COMET - DR | MWMP | 1/07/08 | 23:45 | | | | | | | | | | | | ✓ | | | | | | DA07-9339 |
| JLN - DR | I | " | 23:30 | | | | | | | | | | | | ✓ | | | | | | DA07-9340 |
| | | | | | | | | | | | | | | | | | | | | | |
| Lake Clay Test | soil | 11/27/07 | 15:50 | | | | | | | | | | | | | | | | | | DA07-9118 |
| #UP20 | | | | | | | | | | | | | | | | | | | | | Hold Sample - Client to determine if ~~SPLP~~ SPLP analysis is needed |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |

| Relinquished by: (Signature) | (Print Name) | Received by: (Signature) | (Print Name) | Date / Time |
|---|---|---|---|---|
| 1 Keith Kanola | Keith Kanola | | UPS | 1/8/08 14:00 |
| 2 | | | | 1/8/08 1000 |
| 3 | | | | |

White copy to TGI, Yellow copy for final report, Pink copy to sampler

Revised: 3/6/06

## Requested Analysis

-ABA (Acid Base Accounting) by Leco furnace and modified Sobek
-NAG (Net Acid Generating)
- pH and conductivity of the crushed sample
- Organic sulfur
-saturation paste for pH

### (MWMP) Meteoric Water Mobility Procedure testing for:

| | | |
|---|---|---|
| Al | Pb | Zn |
| As | Hg | pH |
| Cd | Ni | $NO_3$ |
| Cr | Se | $NH_4$ |
| Cu | Ag | TDS |
| Fe | $SO_4$ | |

### ABA testing for:

| | |
|---|---|
| Total Sulfur | ORGANIC SULFUR |
| T.S AB | PYRITIC SULFUR AB |
| NEUT. POT. | PYRITIC S ABP |
| T.S. ABP | NET ACID GEN. POT |
| SULFATE SULFUR | |
| PYRITIC SULFUR | |

# Columbia Analytical Services, Inc.
## Cooler Receipt and Preservation Form

PC JR

Client / Project: TRANSWEST / DESERT Service Request K08 00221

Received: 4/9/08 Opened: 4/9/08 By: JR

SHORT HOLD TIME

1. Samples were received via? *US Mail* *Fed Ex* *UPS* *DHL* *GH* *GS* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) *Cooler* *Box* *Envelope* *Other* _____ *NA*
3. Were custody seals on coolers? NA Y N If yes, how many and where? _____
   If present, were custody seals intact? Y N If present, were they signed and dated? Y N
4. Is shipper's air-bill filed? If not, record air-bill number: 1Z5Y98W7014078 7595 NA Y N

| | | | | |
|---|---|---|---|---|
| 5. **Temperature of cooler(s) upon receipt (°C):** | 1.3 | | | |
| **Temperature Blank (°C):** | 0.9 | | | |
| 6. If applicable, list Chain of Custody Numbers: | | | | |

7. Were custody papers properly filled out (ink, signed, etc.)? NA Y N
8. Packing material used. *Inserts* *Bubble Wrap* *Gel Packs* *Wet Ice* *Sleeves* *Other* _____
9. **Did all bottles arrive in good condition (unbroken)?** *Indicate in the table below.* NA Y N
10. Were all sample labels complete (i.e analysis, preservation, etc.)? Y N
11. Did all sample labels and tags agree with custody papers? *Indicate in the table below* Y N
12. **Were the correct types of bottles used for the tests indicated?** NA Y N
13. Were all of the preserved bottles received at the lab with the appropriate pH? *Indicate in the table below* NA Y N
14. Were VOA vials and 1631 Mercury bottles checked for absence of air bubbles? *Indicate in the table below.* NA Y N
15. **Are CWA Microbiology samples received with >1/2 the 24hr. hold time remaining from collection?** NA Y N
16. Was C12/Res negative? NA Y N

| Sample ID on Bottle | Sample ID on COC | Sample ID on Bottle | Sample ID on COC |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

| Sample ID | Bottle Count | Bottle Type | Out of Temp | Head-space | Broken | pH | Reagent | Volume added | Reagent Lot Number | Initials |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

*Additional Notes, Discrepancies, & Resolutions:* _____

# General Chemistry Parameters

## COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

**Client :** Desert Analytics Laboratory
**Project Name :** MWMP Extracts Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0800221
**Date Collected :** 01/07/08
**Date Received :** 01/09/08

Ammonia as Nitrogen

Analysis Method : SM 4500-NH3 G
Test Notes :

Units : mg/L
Basis : NA

| Sample Name | Lab Code | MRL | Dilution Factor | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|
| COMET-DR | K0800221-001 | 0.05 | 1 | 01/16/08 | 3.04 | |
| JLN-D | K0800221-002 | 0.05 | 1 | 01/16/08 | ND | |
| Method Blank | K0800221-MB | 0.05 | 1 | 01/16/08 | ND | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client :** Desert Analytics Laboratory
**Project Name :** MWMP Extracts Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0800221
**Date Collected :** NA
**Date Received :** NA
**Date Prepared :** NA
**Date Analyzed :** 01/16/08

Duplicate Summary
Inorganic Parameters

Sample Name : Batch QC
Lab Code : K0800346-002DUP
Test Notes :

Units : mg/L
Basis : NA

| Analyte | Analysis Method | MRL | Sample Result | Duplicate Sample Result | Average | Relative Percent Difference | Result Notes |
|---|---|---|---|---|---|---|---|
| Ammonia as Nitrogen | SM 4500-NH3 G | 0.05 | ND | ND | ND | - | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client :** Desert Analytics Laboratory
**Project Name :** MWMP Extracts Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0800221
**Date Collected :** NA
**Date Received :** NA
**Date Prepared :** NA
**Date Analyzed :** 01/16/08

Matrix Spike Summary
Inorganic Parameters

Sample Name : Batch QC
Lab Code : K0800346-002MS
Test Notes :

Units : mg/L
Basis : NA

| Analyte | Analysis Method | MRL | Spike Level | Sample Result | Spiked Sample Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Ammonia as Nitrogen | SM 4500-NH3 G | 0.05 | 2.00 | ND | 1.95 | 98 | 90-110 | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Desert Analytics Laboratory | **Service Request :** | K0800221 |
| **Project Name :** | MWMP Extracts Coeur Alaska-Kensington | **Date Collected :** | NA |
| **Project Number :** | NA | **Date Received :** | NA |
| **Sample Matrix :** | WATER | **Date Prepared :** | NA |
| | | **Date Analyzed :** | 01/16/08 |

Laboratory Control Sample Summary
Inorganic Parameters

| | | | |
|---|---|---|---|
| Sample Name : | Lab Control Sample | Units : | mg/L |
| Lab Code : | K0800221-LCS | Basis : | NA |
| Test Notes : | | | |

| Analyte | Prep Method | Analysis Method | True Value | Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|
| Ammonia as Nitrogen | NONE | SM 4500-NH3 G | 8.45 | 8.29 | 98 | 90-110 | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

## COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

**Client :** Desert Analytics Laboratory
**Project Name :** MWMP Extracts Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0800221
**Date Collected :** 01/07/08
**Date Received :** 01/09/08

Nitrate+Nitrite as Nitrogen

Analysis Method : 353.2
Test Notes :

Units : mg/L
Basis : NA

| Sample Name | Lab Code | MRL | Dilution Factor | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|
| COMET-DR | K0800221-001 | 0.25 | 5 | 01/10/08 | 7.54 | |
| JLN-D | K0800221-002 | 0.05 | 1 | 01/10/08 | 0.30 | |
| Method Blank | K0800221-MB | 0.05 | 1 | 01/10/08 | ND | |

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client :** Desert Analytics Laboratory
**Project Name :** MWMP Extracts Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0800221
**Date Collected :** NA
**Date Received :** NA
**Date Prepared :** NA
**Date Analyzed :** 01/10/08

Duplicate Summary
Inorganic Parameters

Sample Name : Batch QC
Lab Code : K0712138-001DUP
Test Notes :

Units : mg/L
Basis : NA

| Analyte | Analysis Method | MRL | Sample Result | Duplicate Sample Result | Average | Relative Percent Difference | Result Notes |
|---|---|---|---|---|---|---|---|
| Nitrate+Nitrite as Nitrogen | 353.2 | 0.05 | ND | ND | ND | - | |

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client :** Desert Analytics Laboratory
**Project Name :** MWMP Extracts Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0800221
**Date Collected :** NA
**Date Received :** NA
**Date Prepared :** NA
**Date Analyzed :** 01/10/08

Matrix Spike Summary
Inorganic Parameters

Sample Name : Batch QC
Lab Code : K0712138-001MS
Test Notes :

Units : mg/L
Basis : NA

| Analyte | Analysis Method | MRL | Spike Level | Sample Result | Spiked Sample Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Nitrate+Nitrite as Nitrogen | 353.2 | 0.05 | 2.00 | ND | 2.00 | 100 | 90-110 | |

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Desert Analytics Laboratory | **Service Request :** | K0800221 |
| **Project Name :** | MWMP Extracts Coeur Alaska-Kensington | **Date Collected :** | NA |
| **Project Number :** | NA | **Date Received :** | NA |
| **Sample Matrix :** | WATER | **Date Prepared :** | NA |
| | | **Date Analyzed :** | 01/10/08 |

Laboratory Control Sample Summary
Inorganic Parameters

| | | | |
|---|---|---|---|
| Sample Name : | Lab Control Sample | Units : | mg/L |
| Lab Code : | K0800221-LCS | Basis : | NA |
| Test Notes : | | | |

| Analyte | Prep Method | Analysis Method | True Value | Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|
| Nitrate+Nitrite as Nitrogen | NONE | 353.2 | 37.5 | 35.9 | 96 | 90-110 | |

## COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

**Client :** Desert Analytics Laboratory
**Project Name :** MWMP Extracts Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0800221
**Date Collected :** 01/07/08
**Date Received :** 01/09/08

pH

Analysis Method : SM 4500-H+ B
Test Notes :

Units : pH Units
Basis : NA

| Sample Name | Lab Code | MRL | Dilution Factor | Date/Time Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|
| COMET-DR | K0800221-001 | - | 1 | 01/09/08 14:26 | 7.62 | |
| JLN-D | K0800221-002 | - | 1 | 01/09/08 14:28 | 7.79 | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client :** Desert Analytics Laboratory
**Project Name :** MWMP Extracts Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0800221
**Date Collected :** NA
**Date Received :** NA
**Date Prepared :** NA
**Date Analyzed :** 01/09/08

Duplicate Summary
Inorganic Parameters

Sample Name : Batch QC
Lab Code : K0800201-001DUP
Test Notes :

Units : pH Units
Basis : NA

| Analyte | Analysis Method | MRL | Sample Result | Duplicate Sample Result | Average | Relative Percent Difference | Result Notes |
|---|---|---|---|---|---|---|---|
| pH | SM 4500-H+ B | - | 7.83 | 7.81 | 7.82 | <1 | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Desert Analytics Laboratory | **Service Request :** | K0800221 |
| **Project Name :** | MWMP Extracts Coeur Alaska-Kensington | **Date Collected :** | NA |
| **Project Number :** | NA | **Date Received :** | NA |
| **Sample Matrix :** | WATER | **Date Prepared :** | NA |
| | | **Date Analyzed :** | 01/09/08 |

Laboratory Control Sample Summary
Inorganic Parameters

| | | | |
|---|---|---|---|
| Sample Name : | Lab Control Sample | Units : | pH Units |
| Lab Code : | K0800221-LCS | Basis : | NA |
| Test Notes : | | | |

| Analyte | Prep Method | Analysis Method | True Value | Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|
| pH | NONE | SM 4500-H+ B | 6.18 | 6.17 | 100 | 85-115 | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

## COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

**Client :** Desert Analytics Laboratory
**Project Name :** MWMP Extracts Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0800221
**Date Collected :** 01/07/08
**Date Received :** 01/09/08

Sulfate

Analysis Method : 300.0
Test Notes :

Units : mg/L
Basis : NA

| Sample Name | Lab Code | MRL | Dilution Factor | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|
| COMET-DR | K0800221-001 | 4.0 | 20 | 01/15/08 | 160 | |
| JLN-D | K0800221-002 | 0.2 | 2 | 01/16/08 | 5.4 | |
| Method Blank | K0800221-MB | 0.2 | 1 | 01/15/08 | ND | |

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client :** Desert Analytics Laboratory
**Project Name :** MWMP Extracts Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0800221
**Date Collected :** NA
**Date Received :** NA
**Date Prepared :** NA
**Date Analyzed :** 01/16/08

Duplicate Summary
Inorganic Parameters

Sample Name : Batch QC
Lab Code : K0800344-001DUP
Test Notes :

Units : mg/L
Basis : NA

| Analyte | Analysis Method | MRL | Sample Result | Duplicate Sample Result | Average | Relative Percent Difference | Result Notes |
|---|---|---|---|---|---|---|---|
| Sulfate | 300.0 | 2.0 | 32.4 | 32.1 | 32.2 | <1 | |

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client :** Desert Analytics Laboratory
**Project Name :** MWMP Extracts Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0800221
**Date Collected :** NA
**Date Received :** NA
**Date Prepared :** NA
**Date Analyzed :** 01/16/08

Matrix Spike Summary
Inorganic Parameters

Sample Name : Batch QC
Lab Code : K0800344-001MS
Test Notes :

Units : mg/L
Basis : NA

| Analyte | Analysis Method | MRL | Spike Level | Sample Result | Spiked Sample Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Sulfate | 300.0 | 2.0 | 20.0 | 32.4 | 50.0 | 88 | 80-120 | |

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Desert Analytics Laboratory | **Service Request :** | K0800221 |
| **Project Name :** | MWMP Extracts Coeur Alaska-Kensington | **Date Collected :** | NA |
| **Project Number :** | NA | **Date Received :** | NA |
| **Sample Matrix :** | WATER | **Date Prepared :** | NA |
| | | **Date Analyzed :** | 01/15/08 |

Laboratory Control Sample Summary
Inorganic Parameters

| | | | |
|---|---|---|---|
| Sample Name : | Lab Control Sample | Units : | mg/L |
| Lab Code : | K0800221-LCS | Basis : | NA |
| Test Notes : | | | |

| Analyte | Prep Method | Analysis Method | True Value | Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|
| Sulfate | NONE | 300.0 | 5.0 | 4.9 | 98 | 90-110 | |

## COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

**Client :** Desert Analytics Laboratory
**Project Name :** MWMP Extracts Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0800221
**Date Collected :** 01/07/08
**Date Received :** 01/09/08

Solids, Total Dissolved

Analysis Method : SM 2540 C
Test Notes :

Units : mg/L
Basis : NA

| Sample Name | Lab Code | MRL | Dilution Factor | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|
| COMET-DR | K0800221-001 | 5 | 1 | 01/10/08 | 361 | |
| JLN-D | K0800221-002 | 5 | 1 | 01/10/08 | 47 | |
| Method Blank | K0800221-MB | 5 | 1 | 01/10/08 | ND | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client :** Desert Analytics Laboratory
**Project Name :** MWMP Extracts Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0800221
**Date Collected :** NA
**Date Received :** NA
**Date Prepared :** NA
**Date Analyzed :** 01/10/08

Duplicate Summary
Inorganic Parameters

Sample Name : Batch QC
Lab Code : K0800208-001DUP
Test Notes :

Units : mg/L
Basis : NA

| Analyte | Analysis Method | MRL | Sample Result | Duplicate Sample Result | Average | Relative Percent Difference | Result Notes |
|---|---|---|---|---|---|---|---|
| Solids, Total Dissolved | SM 2540 C | 5 | 1820 | 1850 | 1840 | 2 | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Desert Analytics Laboratory | **Service Request :** | K0800221 |
| **Project Name :** | MWMP Extracts Coeur Alaska-Kensington | **Date Collected :** | NA |
| **Project Number :** | NA | **Date Received :** | NA |
| **Sample Matrix :** | WATER | **Date Prepared :** | NA |
| | | **Date Analyzed :** | 01/10/08 |

Laboratory Control Sample Summary
Inorganic Parameters

| | | | |
|---|---|---|---|
| Sample Name : | Lab Control Sample | Units : | mg/L |
| Lab Code : | K0800221-LCS | Basis : | NA |
| Test Notes : | | | |

| Analyte | Prep Method | Analysis Method | True Value | Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|
| Solids, Total Dissolved | NONE | SM 2540 C | 759 | 760 | 100 | 85-115 | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

# Metals

## COLUMBIA ANALYTICAL SERVICES, INC.

**- Cover Page -**
**INORGANIC ANALYSIS DATA PACKAGE**

**Client :** Desert Analytics Laboratory
**Project Name :** MWMP Extracts Coeur Alaska-Kensington
**Project No. :** NA

**Service Request :** K0800221

| Sample Name : | Lab Code : |
|---|---|
| Batch QC | K0712080-003D |
| Batch QC | K0712080-003S |
| Batch QC | K0800162-002D |
| Batch QC | K0800162-002S |
| Batch QC | K0800207-001D |
| Batch QC | K0800207-001S |
| COMET-DR | K0800221-001 |
| JLN-D | K0800221-002 |
| Laboratory Control Sample | K0800221-LCS |
| Method Blank | K0800221-MB |

Comments:

Approved By: _____ Date: 1/24/08

## COLUMBIA ANALYTICAL SERVICES, INC.

### Analytical Report

| | | | |
|---|---|---|---|
| **Client :** | Desert Analytics Laboratory | **Service Request :** | K0800221 |
| **Project Name :** | MWMP Extracts Coeur Alaska-Kensington | **Date Collected :** | 01/07/08 |
| **Project No. :** | NA | **Date Received :** | 01/09/08 |
| **Matrix :** | Water | **Date Extracted :** | 01/14,15/08 |

Dissolved Metals

| | | | |
|---|---|---|---|
| **Sample Name :** | COMET-DR | **Units :** | ug/L (ppb) |
| **Lab Code :** | K0800221-001 | **Basis :** | NA |

| Analyte | Analysis Method | MRL | Date Analyzed | Sample Result | Result Notes |
|---|---|---|---|---|---|
| Aluminum | 200.7 | 50 | 01/22/08 | 176 | |
| Arsenic | 200.8 | 0.5 | 01/24/08 | ND | |
| Cadmium | 200.8 | 0.02 | 01/24/08 | 0.06 | |
| Chromium | 200.8 | 0.2 | 01/24/08 | 0.4 | |
| Copper | 200.8 | 0.1 | 01/24/08 | 1.8 | |
| Iron | 200.7 | 20 | 01/22/08 | ND | |
| Lead | 200.8 | 0.02 | 01/24/08 | 0.04 | |
| Mercury | 7470A | 0.2 | 01/17/08 | ND | |
| Nickel | 200.8 | 0.2 | 01/24/08 | 1.4 | |
| Selenium | 200.8 | 1.0 | 01/24/08 | ND | |
| Silver | 200.8 | 0.02 | 01/24/08 | 0.04 | |
| Zinc | 200.7 | 10 | 01/22/08 | ND | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### Analytical Report

| | | | |
|---|---|---|---|
| **Client :** | Desert Analytics Laboratory | **Service Request :** | K0800221 |
| **Project Name :** | MWMP Extracts Coeur Alaska-Kensington | **Date Collected :** | 01/07/08 |
| **Project No. :** | NA | **Date Received :** | 01/09/08 |
| **Matrix :** | Water | **Date Extracted :** | 01/14,15/08 |

Dissolved Metals

| | | | |
|---|---|---|---|
| **Sample Name :** | JLN-D | **Units :** | ug/L (ppb) |
| **Lab Code :** | K0800221-002 | **Basis :** | NA |

| Analyte | Analysis Method | MRL | Date Analyzed | Sample Result | Result Notes |
|---|---|---|---|---|---|
| Aluminum | 200.7 | 50 | 01/22/08 | 159 | |
| Arsenic | 200.8 | 0.5 | 01/24/08 | ND | |
| Cadmium | 200.8 | 0.02 | 01/24/08 | 0.05 | |
| Chromium | 200.8 | 0.2 | 01/24/08 | 0.4 | |
| Copper | 200.8 | 0.1 | 01/24/08 | 1.0 | |
| Iron | 200.7 | 20 | 01/22/08 | ND | |
| Lead | 200.8 | 0.02 | 01/24/08 | 0.03 | |
| Mercury | 7470A | 0.2 | 01/17/08 | ND | |
| Nickel | 200.8 | 0.2 | 01/24/08 | 0.3 | |
| Selenium | 200.8 | 1.0 | 01/24/08 | ND | |
| Silver | 200.8 | 0.02 | 01/24/08 | ND | |
| Zinc | 200.7 | 10 | 01/22/08 | ND | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### Analytical Report

| | | | |
|---|---|---|---|
| **Client :** | Desert Analytics Laboratory | **Service Request :** | K0800221 |
| **Project Name :** | MWMP Extracts Coeur Alaska-Kensington | **Date Collected :** | NA |
| **Project No. :** | NA | **Date Received :** | NA |
| **Matrix :** | Water | **Date Extracted :** | 01/14,15/08 |

Dissolved Metals

| | | | |
|---|---|---|---|
| **Sample Name :** | Method Blank | **Units :** | ug/L (ppb) |
| **Lab Code :** | K0800221-MB | **Basis :** | NA |

| Analyte | Analysis Method | MRL | Date Analyzed | Sample Result | Result Notes |
|---|---|---|---|---|---|
| Aluminum | 200.7 | 50 | 01/22/08 | ND | |
| Arsenic | 200.8 | 0.5 | 01/24/08 | ND | |
| Cadmium | 200.8 | 0.02 | 01/24/08 | ND | |
| Chromium | 200.8 | 0.2 | 01/24/08 | ND | |
| Copper | 200.8 | 0.1 | 01/24/08 | ND | |
| Iron | 200.7 | 20 | 01/22/08 | ND | |
| Lead | 200.8 | 0.02 | 01/24/08 | ND | |
| Mercury | 7470A | 0.2 | 01/17/08 | ND | |
| Nickel | 200.8 | 0.2 | 01/24/08 | ND | |
| Selenium | 200.8 | 1.0 | 01/24/08 | ND | |
| Silver | 200.8 | 0.02 | 01/24/08 | ND | |
| Zinc | 200.7 | 10 | 01/22/08 | ND | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Desert Analytics Laboratory | **Service Request :** | K0800221 |
| **Project Name :** | MWMP Extracts Coeur Alaska-Kensington | **Date Collected :** | NA |
| **Project No. :** | NA | **Date Received :** | NA |
| **Matrix :** | Water | **Date Extracted :** | 01/15/08 |
| | | **Date Analyzed :** | 01/17/08 |

Duplicate Summary
Total Metals

| | | | |
|---|---|---|---|
| **Sample Name :** | Batch QC | **Units :** | ug/L (ppb) |
| **Lab Code :** | K0712080-003D | **Basis :** | NA |

| Analyte | Analysis Method | MRL | Sample Result | Duplicate Sample Result | Average | Relative Percent Difference | Result Notes |
|---|---|---|---|---|---|---|---|
| Mercury | 7470A | 0.2 | ND | ND | ND | - | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### QA/QC Report

**Client :** Desert Analytics Laboratory
**Project Name :** MWMP Extracts Coeur Alaska-Kensington
**Project No. :** NA
**Matrix :** Water

**Service Request :** K0800221
**Date Collected :** NA
**Date Received :** NA
**Date Extracted :** 01/15/08
**Date Analyzed :** 01/22-24/08

Duplicate Summary
Total Metals

**Sample Name :** Batch QC
**Lab Code :** K0800162-002D

**Units :** ug/L (ppb)
**Basis :** NA

| Analyte | Analysis Method | MRL | Sample Result | Duplicate Sample Result | Average | Relative Percent Difference | Result Notes |
|---|---|---|---|---|---|---|---|
| Aluminum | 200.7 | 50 | 51 | 65 | 58 | 24 | |
| Iron | 200.7 | 20 | ND | ND | ND | - | |
| Silver | 200.8 | 0.02 | 0.04 | 0.03 | 0.03 | 29 | |
| Zinc | 200.7 | 10 | 54 | 53 | 53 | 2 | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### QA/QC Report

**Client :** Desert Analytics Laboratory
**Project Name :** MWMP Extracts Coeur Alaska-Kensington
**Project No. :** NA
**Matrix :** Water

**Service Request :** K0800221
**Date Collected :** NA
**Date Received :** NA
**Date Extracted :** 01/14/08
**Date Analyzed :** 01/24/08

Duplicate Summary
Total Metals

**Sample Name :** Batch QC
**Lab Code :** K0800207-001D

**Units :** ug/L (ppb)
**Basis :** NA

| Analyte | Analysis Method | MRL | Sample Result | Duplicate Sample Result | Average | Relative Percent Difference | Result Notes |
|---|---|---|---|---|---|---|---|
| Arsenic | 200.8 | 0.5 | 4.9 | 4.8 | 4.9 | 2 | |
| Cadmium | 200.8 | 0.02 | 0.03 | 0.02 | 0.02 | 40 | |
| Chromium | 200.8 | 0.2 | ND | ND | ND | - | |
| Copper | 200.8 | 0.1 | 1.9 | 2.0 | 2.0 | 5 | |
| Lead | 200.8 | 0.02 | 0.62 | 0.62 | 0.62 | <1 | |
| Nickel | 200.8 | 0.2 | 3.2 | 3.2 | 3.2 | <1 | |
| Selenium | 200.8 | 1.0 | ND | ND | ND | - | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Desert Analytics Laboratory | **Service Request :** | K0800221 |
| **Project Name :** | MWMP Extracts Coeur Alaska-Kensington | **Date Collected :** | NA |
| **Project No. :** | NA | **Date Received :** | NA |
| **Matrix :** | Water | **Date Extracted :** | 01/15/08 |
| | | **Date Analyzed :** | 01/17/08 |

Matrix Spike Summary
Total Metals

| | | | |
|---|---|---|---|
| **Sample Name :** | Batch QC | **Units :** | ug/L (ppb) |
| **Lab Code :** | K0712080-003S | **Basis :** | NA |

| Analyte | MRL | Spike Level | Sample Result | Spiked Sample Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|
| Mercury | 0.2 | 1.0 | ND | 1.0 | 100 | 70-130 | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Desert Analytics Laboratory | **Service Request :** | K0800221 |
| **Project Name :** | MWMP Extracts Coeur Alaska-Kensington | **Date Collected :** | NA |
| **Project No. :** | NA | **Date Received :** | NA |
| **Matrix :** | Water | **Date Extracted :** | 01/15/08 |
| | | **Date Analyzed :** | 01/22-24/08 |

Matrix Spike Summary
Total Metals

| | | | |
|---|---|---|---|
| **Sample Name :** | Batch QC | **Units :** | ug/L (ppb) |
| **Lab Code :** | K0800162-002S | **Basis :** | NA |

| Analyte | MRL | Spike Level | Sample Result | Spiked Sample Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|
| Aluminum | 50 | 2000 | 51 | 2070 | 101 | 70-130 | |
| Iron | 20 | 1000 | ND | 995 | 100 | 70-130 | |
| Silver | 0.02 | 20 | 0.04 | 23.0 | 115 | 70-130 | |
| Zinc | 10 | 500 | 54 | 542 | 98 | 70-130 | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### QA/QC Report

**Client :** Desert Analytics Laboratory
**Project Name :** MWMP Extracts Coeur Alaska-Kensington
**Project No. :** NA
**Matrix :** Water

**Service Request :** K0800221
**Date Collected :** NA
**Date Received :** NA
**Date Extracted :** 01/14/08
**Date Analyzed :** 01/24/08

Matrix Spike Summary
Total Metals

**Sample Name :** Batch QC
**Lab Code :** K0800207-001S

**Units :** ug/L (ppb)
**Basis :** NA

| Analyte | MRL | Spike Level | Sample Result | Spiked Sample Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|
| Arsenic | 0.5 | 20 | 4.9 | 23.9 | 95 | 70-130 | |
| Cadmium | 0.02 | 20 | 0.03 | 19.4 | 97 | 70-130 | |
| Chromium | 0.2 | 20 | ND | 18.5 | 93 | 70-130 | |
| Copper | 0.1 | 20 | 1.9 | 19.3 | 87 | 70-130 | |
| Lead | 0.02 | 20 | 0.6 | 18.5 | 90 | 70-130 | |
| Nickel | 0.2 | 20 | 3.2 | 20.2 | 85 | 70-130 | |
| Selenium | 1.0 | 20 | ND | 19.2 | 96 | 70-130 | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Desert Analytics Laboratory | **Service Request :** | K0800221 |
| **Project Name :** | MWMP Extracts Coeur Alaska-Kensington | **Date Collected :** | NA |
| **Project No. :** | NA | **Date Received :** | NA |
| **Matrix :** | Water | **Date Extracted :** | 01/14,15/08 |
| | | **Date Analyzed :** | 01/17-24/08 |

Laboratory Control Sample Summary
Total Metals

| | | | |
|---|---|---|---|
| **Sample Name :** | Laboratory Control Sample | **Units :** | ug/L (ppb) |
| **Lab Code :** | K0800221-LCS | **Basis :** | NA |

| Analyte | Analysis Method | True Value | Result | Percent | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|
| Aluminum | 200.7 | 5000 | 5300 | 106 | 85-115 | |
| Arsenic | 200.8 | 20 | 20.3 | 102 | 85-115 | |
| Cadmium | 200.8 | 20 | 20.0 | 100 | 85-115 | |
| Chromium | 200.8 | 20 | 19.9 | 100 | 85-115 | |
| Copper | 200.8 | 20 | 20.1 | 100 | 85-115 | |
| Iron | 200.7 | 2500 | 2590 | 104 | 85-115 | |
| Lead | 200.8 | 20 | 19.4 | 97 | 85-115 | |
| Mercury | 7470A | 5.0 | 5.00 | 100 | 85-115 | |
| Nickel | 200.8 | 20 | 19.9 | 100 | 85-115 | |
| Selenium | 200.8 | 20 | 20.5 | 102 | 85-115 | |
| Silver | 200.8 | 625 | 641 | 102 | 85-115 | |
| Zinc | 200.7 | 1250 | 1270 | 101 | 85-115 | |

Comments:

Columbia Analytical Services INC

*September 15, 2008*


***Client:*** **Coeur Alaska, Inc.**
**3031 Clinton Dr. Suite 202**
**Juneau, AK 99801**

***Attn:*** **Peter Strow**


***Project:*** **Kensington Gold Project** ***Date Received:*** **August 26, 2008**

# *Certificate of Analysis*

| Sample ID: | Lab # | Sample Date & Time | Sulfur, Total 3.2.4 % | Sulfur Forms (Acid Extractable and Non-extractable Sulfur) 3.2.6 | | |
|---|---|---|---|---|---|---|
| | | | | Sulfate % | Pyritics % | Residual % |
| COMET-DR | 13196 | 8/21/08 13:45 | 0.035 | n/a | n/a | n/a |
| JLN-DR | 13197 | 8/21/08 13:30 | 0.054 | n/a | n/a | n/a |

| Sample ID: | DA Lab #: | Neutralization Potential 3.2.3 t CaCO3/1000t | Acid - Base Accounting 1.3.1 t CaCO3/1000t | pH, Sat. Paste 3.2.2 units | pH NAG units | Net Acid Generation t CaCO3/1000t |
|---|---|---|---|---|---|---|
| COMET-DR | 13196 | 105 | 104 | 8.59 | 10.64 | <0.2 |
| JLN-DR | 13197 | 97 | 95 | 8.55 | 10.05 | <0.2 |

***Notes:***
** - Methods follow procedures outlined in "Field and Laboratory Methods Applicable to Overburden and Mine Soils", Sobek, EPA-600/2-78-054, March 1978. Sample preparation includes: air drying, crushing to <10 mm, splitting sub-sample for storage, and grinding second split to <60 mesh to perform the above analyses. Values are reported on a Dry Weight basis.*

RV Poulsen RVP

*Ralph V. Poulsen, Lab Manager*

Columbia Analytical Services INC

*December 10, 2008*


***Client:*** **Coeur Alaska, Inc.**
**3031 Clinton Dr. Suite 202**
**Juneau, AK 99801**

***Attn:*** **Peter Strow**


***Project:*** **Kensington Gold Project** ***Date Received:*** **October 30, 2008**

# *Certificate of Analysis*

| Sample ID: | DA Lab #: | Sample Date & Time | Sulfur, Total 3.2.4 % | Sulfur Forms (Acid Extractable and Non-extractable Sulfur) 3.2.6 | | |
|---|---|---|---|---|---|---|
| | | | | Sulfate % | Pyritics % | Residual % |
| COMET-DR | 14343 | 10/23/08 14:00 | 0.129 | n/a | n/a | n/a |
| JLN-DR | 14344 | 1023/2008 13:00 | 0.025 | n/a | n/a | n/a |
| COMET-DR 3rd QRTR | 14345 | 10/23/08 14:15 | 0.270 | n/a | n/a | n/a |
| JLN-DR 3rd QRTR | 14346 | 10/23/08 12:45 | 0.019 | n/a | n/a | n/a |

| Sample ID: | DA Lab #: | Neutralization Potential 3.2.3 t CaCO3/1000t | Acid - Base Accounting 1.3.1 t CaCO3/1000t | pH, Sat. Paste 3.2.2 units | pH NAG units | Net Acid Generation t CaCO3/1000t |
|---|---|---|---|---|---|---|
| COMET-DR | 14343 | 91 | 87 | 8.72 | 11.66 | <0.2 |
| JLN-DR | 14344 | 75 | 74 | 8.97 | 11.39 | <0.2 |
| COMET-DR 3rd QRTR | 14345 | 72 | 64 | 9.00 | 10.91 | <0.2 |
| JLN-DR 3rd QRTR | 14346 | 60 | 59 | 9.05 | 11.08 | <0.2 |

***Notes:***
** - Methods follow procedures outlined in "Field and Laboratory Methods Applicable to Overburden and Mine Soils", Sobek, EPA-600/2-78-054, March 1978. Sample preparation includes: air drying, crushing to <10 mm, splitting sub-sample for storage, and grinding second split to <60 mesh to perform the above analyses. Values are reported on a Dry Weight basis.*
*Sulfur Form analyses not required as ABA > 5 t CaCO3/1000t.*

RV Poulsen RVP

*Ralph V. Poulsen, Laboratory Manager*


***3860 S. Palo Verde Rd.***
***Suite 302***
***Tucson, AZ 85714***
***520.573.1061***

Columbia Analytical Services

**Meteoric Water Mobility Procedure**

**ASTM E2242-07**

| | |
|---|---|
| **Work Group #:** | |
| **Analyst:** | RVP |
| **Analysis Date:** | 09/01/08 |
| **Analyst Review:** | |
| **Supervisor Review:** | |

| Analyses | Sample ID | COMET-DR | JLN-DR | | |
|---|---|---|---|---|---|
| | Date/Time | 8/21/08 13:45 | 8/21/08 13:30 | | |
| | Lab # | 13196 | 13197 | | |
| | units | | | | |
| Sample Description | | Dry, coarse rock with very lillte fines material | Dry, coarse rock with very lillte fines material | | |
| Sample As Received Moisture | % | 0.00 | 0.08 | | |
| Tare Wt. | g | 706 | 692 | | |
| Wet Sample & Tare Wt. | g | 16100 | 14000 | | |
| Dry Sample & Tare Wt. | g | 16100 | 13990 | | |
| Drying Temp & time | | 30ºC 7 days | 30ºC 7 days | | |
| Sieve Fraction (< 5 cm) | % | 22.0 | 45.0 | | |
| Sieve Fraction (> 5 cm) | % | 78.0 | 55.0 | | |
| Tare Wt | g | 706 | 692 | | |
| Wet Sample & Tare Wt. | g | 16100 | 14000 | | |
| > 5 cm Tare Wt. | g | 711 | 748 | | |
| > 5 cm Sample & Tare Wt. | g | 12724 | 8074 | | |
| Dry Test Sample Target Mass | g | 5000 | 5000 | | |
| Wet Sample Mass equivalent | g | 5000 | 5000 | | |
| DI Water Flow Rate | mL/min | 3.5 | 3.5 | | |
| DI Water pH | units | 5.02 | 5.02 | | |
| DI Water Conductivity | umho/cm | 0.6 | 0.6 | | |
| Extraction Start Date and Time | | 9/1/08 16:45 | 9/1/08 16:45 | | |
| Extraction Finish Date and Time | | 9/2/08 17:20 | 9/2/08 17:20 | | |
| Extraction Time | hr | 24.58 | 24.58 | | |
| Extraction Temperature | °C | 22 | 22 | | |
| Final Effluent Mass | g | 4998 | 5002 | | |
| Final Effluent pH | units | 7.10 | 7.90 | | |
| Filter Date and Time | | 9/3/08 9:00 | 9/3/08 9:00 | | |
| Filter Type & Pore Size | | 0.45 um membrane | 0.45 um membrane | | |
| Residual Moisture | % | 1.28 | 1.74 | | |
| Tare Wt. | g | 2200 | 2240 | | |
| Wet Sample & Tare Wt. | g | 7214 | 7300 | | |
| Dry Sample & Tare Wt. | g | 7150 | 7212 | | |
| Drying Temp & time | | 105ºC 12 hours | 105ºC 12 hours | | |
| Oservations | | | | | |

1317 South 13th Avenue Kelso, Washington 98626 (360) 577-7222 (360) 636-1068 fax

Columbia Analytical Services INC.
An Employee - Owned Company

September 12, 2008 Analytical Report for Service Request No: K0808473

Ralph Poulsen
Columbia Analytical Services,Inc.
3860 S. Palo Verde Rd.
Suite 303
Tucson, AZ 85714

**RE: Kensington Gold Project**

Dear Ralph:

Enclosed are the results of the rush samples submitted to our laboratory on September 04, 2008. For your reference, these analyses have been assigned our service request number K0808473.

All analyses were performed according to our laboratory's quality assurance program. Where applicable, the methods cited conform to the Methods Update Rule (effective 4/11/2007), which relates to the use of analytical methods for the drinking water and waste water programs. The test results meet requirements of the NELAC standards. Exceptions are noted in the case narrative report where applicable. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please call if you have any questions. My extension is 3316. You may also contact me via Email at JChristian@caslab.com.

Respectfully submitted,

**Columbia Analytical Services, Inc.**

Jeff Christian
Laboratory Director

JC/afs

## Acronyms

| | |
|---|---|
| ASTM | American Society for Testing and Materials |
| A2LA | American Association for Laboratory Accreditation |
| CARB | California Air Resources Board |
| CAS Number | Chemical Abstract Service registry Number |
| CFC | Chlorofluorocarbon |
| CFU | Colony-Forming Unit |
| DEC | Department of Environmental Conservation |
| DEQ | Department of Environmental Quality |
| DHS | Department of Health Services |
| DOE | Department of Ecology |
| DOH | Department of Health |
| EPA | U. S. Environmental Protection Agency |
| ELAP | Environmental Laboratory Accreditation Program |
| GC | Gas Chromatography |
| GC/MS | Gas Chromatography/Mass Spectrometry |
| LUFT | Leaking Underground Fuel Tank |
| M | Modified |
| MCL | Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA. |
| MDL | Method Detection Limit |
| MPN | Most Probable Number |
| MRL | Method Reporting Limit |
| NA | Not Applicable |
| NC | Not Calculated |
| NCASI | National Council of the Paper Industry for Air and Stream Improvement |
| ND | Not Detected |
| NIOSH | National Institute for Occupational Safety and Health |
| PQL | Practical Quantitation Limit |
| RCRA | Resource Conservation and Recovery Act |
| SIM | Selected Ion Monitoring |
| TPH | Total Petroleum Hydrocarbons |
| tr | Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL. |

## Inorganic Data Qualifiers

| | |
|---|---|
| * | The result is an outlier. See case narrative. |
| # | The control limit criteria is not applicable. See case narrative. |
| B | The analyte was found in the associated method blank at a level that is significant relative to the sample result. |
| E | The result is an estimate amount because the value exceeded the instrument calibration range. |
| J | The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL. |
| U | The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. |
| i | The MRL/MDL has been elevated due to a matrix interference. |
| X | See case narrative. |

## Metals Data Qualifiers

| | |
|---|---|
| # | The control limit criteria is not applicable. See case narrative. |
| B | The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL. |
| E | The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample. |
| M | The duplicate injection precision was not met. |
| N | The Matrix Spike sample recovery is not within control limits. See case narrative. |
| S | The reported value was determined by the Method of Standard Additions (MSA). |
| U | The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. |
| W | The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance. |
| i | The MRL/MDL has been elevated due to a matrix interference. |
| X | See case narrative. |
| * | The duplicate analysis not within control limits. See case narrative. |
| + | The correlation coefficient for the MSA is less than 0.995. |

## Organic Data Qualifiers

| | |
|---|---|
| * | The result is an outlier. See case narrative. |
| # | The control limit criteria is not applicable. See case narrative. |
| A | A tentatively identified compound, a suspected aldol-condensation product. |
| B | The analyte was found in the associated method blank at a level that is significant relative to the sample result. |
| C | The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data. |
| D | The reported result is from a dilution. |
| E | The result is an estimate amount because the value exceeded the instrument calibration range. |
| J | The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL. |
| N | The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed. |
| P | The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results (25% for CLP Pesticides). |
| U | The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. |
| i | The MRL/MDL has been elevated due to a chromatographic interference. |
| X | See case narrative. |

## Additional Petroleum Hydrocarbon Specific Qualifiers

| | |
|---|---|
| F | The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard. |
| L | The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard. |
| H | The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard. |
| O | The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard. |
| Y | The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard. |
| Z | The chromatographic fingerprint does not resemble a petroleum product. |

## Columbia Analytical Services, Inc.
## Kelso, WA
## State Certifications, Accreditations, and Licenses

| Program | Number |
|---|---|
| Alaska DEC UST | UST-040 |
| Arizona DHS | AZ0339 |
| Arkansas - DEQ | 88-0637 |
| California DHS | 2286 |
| Colorado DPHE | - |
| Florida DOH | E87412 |
| Hawaii DOH | - |
| Idaho DHW | - |
| Indiana DOH | C-WA-01 |
| Louisiana DEQ | 3016 |
| Louisiana DHH | LA050010 |
| Maine DHS | WA0035 |
| Michigan DEQ | 9949 |
| Minnesota DOH | 053-999-368 |
| Montana DPHHS | CERT0047 |
| Nevada DEP | WA35 |
| New Jersey DEP | WA005 |
| New Mexico ED | - |
| North Carolina DWQ | 605 |
| Oklahoma DEQ | 9801 |
| Oregon - DHS | WA200001 |
| South Carolina DHEC | 61002 |
| Utah DOH | COLU |
| Washington DOE | C1203 |
| Wisconsin DNR | 998386840 |
| Wyoming (EPA Region 8) | - |

# Chain of Custody Documentation

K0808473

# Chain of Custody

Columbia Analytical Services™


3725 E. Atlanta Ave.
Phoenix, Arizona 85040
Phone: (602) 437-0330
Fax: (602) 437-0660

3860 S. Palo Verde Rd., Ste. 302
Tucson, Arizona 85714
Phone: (520) 573-1061
Fax: (520) 573-1063


**Work Order No:** _____

Date 9/3/08 Page 1 of 1

| | | | |
|---|---|---|---|
| Project Manager: | Ralph Poulsen rpoulsen@CASLAB.com | Bill to: | |
| Client Name: | ~~Coeur Alaska~~ CAS | Company: | |
| Address: | 3860 S. Palo Verde #302 | Address: | |
| City, State ZIP: | Tucson Az 85714 Phone: 520-573-1061 | City, State ZIP: | Phone: |
| Email: | Coeur Alaska Fax: | Email: | Fax: |

| | |
|---|---|
| Project Name: | Kensington Gold Project |
| Project Number: | |
| P.O. Number: | |
| Sampler's Name: | |

**SAMPLE RECEIPT**

| | | | | | |
|---|---|---|---|---|---|
| Temperature (°C): | | | Temp Blank Present | | |
| Received Intact: | Yes | No | N/A | Wet Ice / Blue Ice | |
| Cooler Custody Seals: | Yes | No | N/A | Total Containers: | |
| Sample Custody Seals: | Yes | No | N/A | | |

**TAT**

- ☐ Routine
- ☐ Rush - Prelim
- ☑ Rush - Final

Due Date:

**Volatiles**

- ☐ Encores
- ☐ Methanol Kits

**ANALYSIS REQUEST**

| Sample Identification | Matrix | Date Sampled | Time Sampled | Lab ID | No. of Containers | TPH (8015AZR.1) | Volatile Organics GCMS (624 / 8260B) | PAH (8310) | SDWA Volatiles (524.2) | Semi-Volatile Organics (625 / 8270) | Organochlorine Pesticides (608 / 8081) | PCB's (8082) | Metals (See Below) | Mercury (7471A / 7470 / 245.1) | ✓See Attached List | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Comet-DR 13196 | MWMP Leachate | 9/2/08 | 17:20 | | 4 | | | | | | | | | | ✓ | MWMP Leachate |
| JLN-DR 13197 | " | 9/2/08 | 17:20 | | 4 | | | | | | | | | | ✓ | Report values in mg/L |
| | | | | | | | | | | | | | | | | Use same methods as previous projects |

Metals to be analyzed as: Total TCLP Dissolved Method: 6010B 6020 200.7 200.8

Circle metals to be analyzed: 8RCRA 13PPM Al Sb As Ba Be B Cd Ca Cr Co Cu Fe Pb Mg Mn Mo Ni K Se Ag Na Tl Sn V Zn Hg

| | Relinquished by: (Signature) | (Print Name) | Received by: (Signature) | (Print Name) | Date/Time |
|---|---|---|---|---|---|
| 1 | | Kevin Brim | | | 9/4/08 1030 |
| 2 | | | | | |
| 3 | | | | | |

White copy to CAS, Yellow copy for final report, Pink copy to sampler

Revised : 3/17/2008

**Requested Analysis**
-ABA (Acid Base Accounting) by Leco furnace and modified Sobek
-NAG (Net Acid Generating)
-(MWMP)

## (MWMP) Meteoric Water Mobility Procedure testing for:

| | | |
|---|---|---|
| Al | Pb | Zn |
| As | Hg | pH RNP 9/3/08 |
| Cd | Ni | $NO_3$ / $NO_2$ |
| Cr | Se | $NH_4$ |
| Cu | Ag | TDS |
| Fe | $SO_4$ | |

## ABA testing for:

| | |
|---|---|
| Total Sulfur | ORGANIC SULFUR |
| T.S AB | PYRITIC SULFUR AB |
| NEUT. POT. | PYRITIC S ABP |
| T.S. ABP | NET ACID GEN. POT |
| SULFATE SULFUR | |
| PYRITIC SULFUR | |

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

**Columbia Analytical Services, Inc.**
**Cooler Receipt and Preservation Form**

PC JChes

Client / Project: CAS | ARIZONA Service Request *K08* 0 8473

Received: 9/4/08 Opened: 9/4/08 By: BT

1. Samples were received via? *US Mail* *Fed Ex* (UPS) *DHL* *GH* *GS* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) (Cooler) *Box* *Envelope* *Other* _____ *NA*
3. Were custody seals on coolers? NA Y (N) If yes, how many and where? _____
   If present, were custody seals intact? Y N If present, were they signed and dated? Y N
4. Is shipper's air-bill filed? If not, record air-bill number: _____ NA (Y) N

5. **Temperature of cooler(s) upon receipt (°C):** 3.2
   **Temperature Blank (°C):** 3.7
6. If applicable, list Chain of Custody Numbers:
7. Packing material used. *Inserts* *Baggies* *Bubble Wrap* *Gel Packs* *Wet Ice* *Sleeves* *Other* Newspaper
8. Were custody papers properly filled out (ink, signed, etc.)? NA (Y) N
9. **Did all bottles arrive in good condition (unbroken)?** *Indicate in the table below.* NA (Y) N
10. Were all sample labels complete (i.e analysis, preservation, etc.)? NA (Y) N
11. Did all sample labels and tags agree with custody papers? *Indicate in the table below* NA (Y) N
12. **Were appropriate bottles/containers and volumes received for the tests indicated?** NA (Y) N
13. Were the pH-preserved bottles tested* received at the appropriate pH? *Indicate in the table below* (NA) Y N
14. Were VOA vials and 1631 Mercury bottles received without headspace? *Indicate in the table below.* (NA) Y N
15. **Are CWA Microbiology samples received with >1/2 the 24hr. hold time remaining from collection?** (NA) Y N
16. Was C12/Res negative? (NA) Y N

| Sample ID on Bottle | Sample ID on COC | Sample ID on Bottle | Sample ID on COC |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

| Sample ID | Bottle Count | Bottle Type | Out of Temp | Head-space | Broken | pH | Reagent | Volume added | Reagent Lot Number | Initials |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

[redacted]

*D ed. See sample receiving SOP (SMO-GEN).

*Additional Notes, Discrepancies, & Resolutions:* _____

# General Chemistry Parameters

## COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Kensington Gold Project
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0808473
**Date Collected :** 09/02/08
**Date Received :** 09/04/08

Ammonia as Nitrogen

Analysis Method : SM 4500-NH3 G
Test Notes :

Units : mg/L
Basis : NA

| Sample Name | Lab Code | MRL | Dilution Factor | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|
| Comet-DR 13196 | K0808473-001 | 0.05 | 1 | 09/05/08 | 0.15 | |
| JLN-DR 13197 | K0808473-002 | 0.05 | 1 | 09/05/08 | 0.06 | |
| Method Blank | K0808473-MB | 0.05 | 1 | 09/05/08 | ND | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Kensington Gold Project
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0808473
**Date Collected :** NA
**Date Received :** NA
**Date Prepared :** NA
**Date Analyzed :** 09/05/08

Duplicate Summary
Inorganic Parameters

Sample Name : BatchQC
Lab Code : K0808417-001DUP
Test Notes :

Units : mg/L
Basis : NA

| Analyte | Analysis Method | MRL | Sample Result | Duplicate Sample Result | Average | Relative Percent Difference | Result Notes |
|---|---|---|---|---|---|---|---|
| Ammonia as Nitrogen | SM 4500-NH3 G | 0.05 | ND | ND | ND | - | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Kensington Gold Project
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0808473
**Date Collected :** NA
**Date Received :** NA
**Date Prepared :** NA
**Date Analyzed :** 09/05/08

Matrix Spike Summary
Inorganic Parameters

Sample Name : BatchQC
Lab Code : K0808417-001MS
Test Notes :

Units : mg/L
Basis : NA

| Analyte | Analysis Method | MRL | Spike Level | Sample Result | Spiked Sample Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Ammonia as Nitrogen | SM 4500-NH3 G | 0.05 | 2.00 | ND | 1.91 | 96 | 90-110 | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0808473 |
| **Project Name :** | Kensington Gold Project | **Date Collected :** | NA |
| **Project Number :** | NA | **Date Received :** | NA |
| **Sample Matrix :** | WATER | **Date Prepared :** | NA |
| | | **Date Analyzed :** | 09/05/08 |

Laboratory Control Sample Summary
Inorganic Parameters

| | | | |
|---|---|---|---|
| Sample Name : | Laboratory Control Sample | Units : | mg/L |
| Lab Code : | K0808473-LCS | Basis : | NA |
| Test Notes : | | | |

| Analyte | Prep Method | Analysis Method | True Value | Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|
| Ammonia as Nitrogen | NONE | SM 4500-NH3 G | 8.38 | 8.08 | 96 | 90-100 | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

## COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Kensington Gold Project
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0808473
**Date Collected :** 09/02/08
**Date Received :** 09/04/08

Nitrate+Nitrite as Nitrogen

Analysis Method : 353.2
Test Notes :

Units : mg/L
Basis : NA

| Sample Name | Lab Code | MRL | Dilution Factor | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|
| Comet-DR 13196 | K0808473-001 | 0.05 | 1 | 09/10/08 | 0.86 | |
| JLN-DR 13197 | K0808473-002 | 0.05 | 1 | 09/10/08 | 0.13 | |
| Method Blank | K0808473-MB | 0.05 | 1 | 09/10/08 | ND | |

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Kensington Gold Project
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0808473
**Date Collected :** NA
**Date Received :** NA
**Date Prepared :** NA
**Date Analyzed :** 09/10/08

Duplicate Summary
Inorganic Parameters

Sample Name : Batch QC
Lab Code : K0808547-001DUP
Test Notes :

Units : mg/L
Basis : NA

| Analyte | Analysis Method | MRL | Sample Result | Duplicate Sample Result | Average | Relative Percent Difference | Result Notes |
|---|---|---|---|---|---|---|---|
| Nitrate+Nitrite as Nitrogen | 353.2 | 0.05 | ND | ND | ND | - | |

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Kensington Gold Project
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0808473
**Date Collected :** NA
**Date Received :** NA
**Date Prepared :** NA
**Date Analyzed :** 09/10/08

Matrix Spike Summary
Inorganic Parameters

Sample Name : Batch QC
Lab Code : K0808547-001MS
Test Notes :

Units : mg/L
Basis : NA

| Analyte | Analysis Method | MRL | Spike Level | Sample Result | Spiked Sample Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Nitrate+Nitrite as Nitrogen | 353.2 | 0.05 | 2.00 | ND | 1.92 | 96 | 90-110 | |

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0808473 |
| **Project Name :** | Kensington Gold Project | **Date Collected :** | NA |
| **Project Number :** | NA | **Date Received :** | NA |
| **Sample Matrix :** | WATER | **Date Prepared :** | NA |
| | | **Date Analyzed :** | 09/10/08 |

Laboratory Control Sample Summary
Inorganic Parameters

| | | | |
|---|---|---|---|
| Sample Name : | Laboratory Control Sample | Units : | mg/L |
| Lab Code : | K0808473-LCS | Basis : | NA |
| Test Notes : | | | |

| Analyte | Prep Method | Analysis Method | True Value | Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|
| Nitrate+Nitrite as Nitrogen | NONE | 353.2 | 37.5 | 37.2 | 99 | 90-110 | |

## COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Kensington Gold Project
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0808473
**Date Collected :** 09/02/08
**Date Received :** 09/04/08

Sulfate

Analysis Method : 300.0
Test Notes :

Units : mg/L
Basis : NA

| Sample Name | Lab Code | MRL | Dilution Factor | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|
| Comet-DR 13196 | K0808473-001 | 1.0 | 5 | 09/08/08 | 17.8 | |
| JLN-DR 13197 | K0808473-002 | 4.0 | 20 | 09/05/08 | 105 | |
| Method Blank | K0808473-MB | 0.2 | 1 | 09/05/08 | ND | |
| Method Blank | K0808473-MB | 0.2 | 1 | 09/08/08 | ND | |

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Kensington Gold Project
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0808473
**Date Collected :** 9/2/2008
**Date Received :** 9/4/2008
**Date Prepared :** NA
**Date Analyzed :** 09/08/08

Duplicate Summary
Inorganic Parameters

Sample Name : Comet-DR 13196
Lab Code : K0808473-001DUP
Test Notes :

Units : mg/L
Basis : NA

| Analyte | Analysis Method | MRL | Sample Result | Duplicate Sample Result | Average | Relative Percent Difference | Result Notes |
|---|---|---|---|---|---|---|---|
| Sulfate | 300.0 | 1.0 | 17.8 | 17.8 | 17.8 | <1 | |

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Kensington Gold Project
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0808473
**Date Collected :** 9/2/2008
**Date Received :** 9/4/2008
**Date Prepared :** NA
**Date Analyzed :** 09/08/08

Matrix Spike Summary
Inorganic Parameters

Sample Name : Comet-DR 13196
Lab Code : K0808473-001MS
Test Notes :

Units : mg/L
Basis : NA

| Analyte | Analysis Method | MRL | Spike Level | Sample Result | Spiked Sample Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Sulfate | 300.0 | 2.0 | 20.0 | 17.8 | 38.6 | 104 | 80-120 | |

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0808473 |
| **Project Name :** | Kensington Gold Project | **Date Collected :** | NA |
| **Project Number :** | NA | **Date Received :** | NA |
| **Sample Matrix :** | WATER | **Date Prepared :** | NA |
| | | **Date Analyzed :** | 09/05/08 |

Laboratory Control Sample Summary
Inorganic Parameters

| | | | |
|---|---|---|---|
| Sample Name : | Lab Control Sample | Units : | mg/L |
| Lab Code : | K0808473-LCS | Basis : | NA |
| Test Notes : | | | |

| Analyte | Prep Method | Analysis Method | True Value | Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|
| Sulfate | NONE | 300.0 | 5.0 | 4.8 | 96 | 90-110 | |

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0808473 |
| **Project Name :** | Kensington Gold Project | **Date Collected :** | NA |
| **Project Number :** | NA | **Date Received :** | NA |
| **Sample Matrix :** | WATER | **Date Prepared :** | NA |
| | | **Date Analyzed :** | 09/08/08 |

Laboratory Control Sample Summary
Inorganic Parameters

| | | | |
|---|---|---|---|
| Sample Name : | Lab Control Sample | Units : | mg/L |
| Lab Code : | K0808473-LCS | Basis : | NA |
| Test Notes : | | | |

| Analyte | Prep Method | Analysis Method | True Value | Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|
| Sulfate | NONE | 300.0 | 5.0 | 4.7 | 94 | 90-110 | |

## COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Kensington Gold Project
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0808473
**Date Collected :** 09/02/08
**Date Received :** 09/04/08

Solids, Total Dissolved

Analysis Method : SM 2540 C
Test Notes :

Units : mg/L
Basis : NA

| Sample Name | Lab Code | MRL | Dilution Factor | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|
| Comet-DR 13196 | K0808473-001 | 5 | 1 | 09/05/08 | 45 | |
| JLN-DR 13197 | K0808473-002 | 5 | 1 | 09/05/08 | 167 | |
| Method Blank | K0808473-MB | 5 | 1 | 09/05/08 | ND | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Kensington Gold Project
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0808473
**Date Collected :** NA
**Date Received :** NA
**Date Prepared :** NA
**Date Analyzed :** 09/05/08

Duplicate Summary
Inorganic Parameters

Sample Name : Batch QC
Lab Code : K0808435-002DUP
Test Notes :

Units : mg/L
Basis : NA

| Analyte | Analysis Method | MRL | Sample Result | Duplicate Sample Result | Average | Relative Percent Difference | Result Notes |
|---|---|---|---|---|---|---|---|
| Solids, Total Dissolved | SM 2540 C | 5 | 34800 | 34200 | 34500 | 2 | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0808473 |
| **Project Name :** | Kensington Gold Project | **Date Collected :** | NA |
| **Project Number :** | NA | **Date Received :** | NA |
| **Sample Matrix :** | WATER | **Date Prepared :** | NA |
| | | **Date Analyzed :** | 09/05/08 |

Laboratory Control Sample Summary
Inorganic Parameters

| | | | |
|---|---|---|---|
| Sample Name : | Lab Control Sample | Units : | mg/L |
| Lab Code : | K0808473-LCS | Basis : | NA |
| Test Notes : | | | |

| Analyte | Prep Method | Analysis Method | True Value | Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|
| Solids, Total Dissolved | NONE | SM 2540 C | 1130 | 1150 | 102 | 85-115 | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

# Metals

## COLUMBIA ANALYTICAL SERVICES, INC.

**- Cover Page -**
**INORGANIC ANALYSIS DATA PACKAGE**

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Kensington Gold Project
**Project No. :** NA

**Service Request :** K0808473

| Sample Name : | Lab Code : |
|---|---|
| Batch QC | K0808144-001D |
| Batch QC | K0808144-001S |
| Comet-DR 13196 | K0808473-001 |
| Comet-DR 13196 | K0808473-001D |
| Comet-DR 13196 | K0808473-001S |
| JLN-DR 13197 | K0808473-002 |
| Laboratory Control Sample | K0808473-LCS |
| Method Blank | K0808473-MB |

Comments:

Approved By: _____ Date: 9/12/08

## COLUMBIA ANALYTICAL SERVICES, INC.

**Analytical Report**

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0808473 |
| **Project Name :** | Kensington Gold Project | **Date Collected :** | 09/02/08 |
| **Project No. :** | NA | **Date Received :** | 09/04/08 |
| **Matrix :** | Water | **Date Extracted :** | 09/08,09/08 |

Dissolved Metals

| | | | |
|---|---|---|---|
| **Sample Name :** | Comet-DR 13196 | **Units :** | ug/L (ppb) |
| **Lab Code :** | K0808473-001 | **Basis :** | NA |

| Analyte | Analysis Method | MRL | Date Analyzed | Sample Result | Result Notes |
|---|---|---|---|---|---|
| Aluminum | 200.7 | 50 | 09/09/08 | 91 | |
| Arsenic | 200.8 | 0.5 | 09/11/08 | ND | |
| Cadmium | 200.8 | 0.02 | 09/11/08 | 0.02 | |
| Chromium | 200.8 | 0.2 | 09/11/08 | ND | |
| Copper | 200.8 | 0.1 | 09/11/08 | 1.3 | |
| Iron | 200.7 | 20 | 09/09/08 | ND | |
| Lead | 200.8 | 0.02 | 09/11/08 | 0.02 | |
| Mercury | 7470A | 0.2 | 09/11/08 | ND | |
| Nickel | 200.8 | 0.2 | 09/11/08 | 0.5 | |
| Selenium | 200.8 | 1.0 | 09/11/08 | ND | |
| Silver | 200.8 | 0.04 | 09/12/08 | ND | |
| Zinc | 200.7 | 10 | 09/09/08 | ND | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### Analytical Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0808473 |
| **Project Name :** | Kensington Gold Project | **Date Collected :** | 09/02/08 |
| **Project No. :** | NA | **Date Received :** | 09/04/08 |
| **Matrix :** | Water | **Date Extracted :** | 09/08,09/08 |

Dissolved Metals

| | | | |
|---|---|---|---|
| **Sample Name :** | JLN-DR 13197 | **Units :** | ug/L (ppb) |
| **Lab Code :** | K0808473-002 | **Basis :** | NA |

| Analyte | Analysis Method | MRL | Date Analyzed | Sample Result | Result Notes |
|---|---|---|---|---|---|
| Aluminum | 200.7 | 50 | 09/09/08 | 97 | |
| Arsenic | 200.8 | 0.5 | 09/11/08 | ND | |
| Cadmium | 200.8 | 0.02 | 09/11/08 | ND | |
| Chromium | 200.8 | 0.2 | 09/11/08 | ND | |
| Copper | 200.8 | 0.1 | 09/11/08 | 1.2 | |
| Iron | 200.7 | 20 | 09/09/08 | ND | |
| Lead | 200.8 | 0.02 | 09/11/08 | 0.02 | |
| Mercury | 7470A | 0.2 | 09/11/08 | ND | |
| Nickel | 200.8 | 0.2 | 09/11/08 | 1.0 | |
| Selenium | 200.8 | 1.0 | 09/11/08 | ND | |
| Silver | 200.8 | 0.04 | 09/12/08 | ND | |
| Zinc | 200.7 | 10 | 09/09/08 | ND | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### Analytical Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0808473 |
| **Project Name :** | Kensington Gold Project | **Date Collected :** | NA |
| **Project No. :** | NA | **Date Received :** | NA |
| **Matrix :** | Water | **Date Extracted :** | 09/08,09/08 |

Dissolved Metals

| | | | |
|---|---|---|---|
| **Sample Name :** | Method Blank | **Units :** | ug/L (ppb) |
| **Lab Code :** | K0808473-MB | **Basis :** | NA |

| Analyte | Analysis Method | MRL | Date Analyzed | Sample Result | Result Notes |
|---|---|---|---|---|---|
| Aluminum | 200.7 | 50 | 09/09/08 | ND | |
| Arsenic | 200.8 | 0.5 | 09/11/08 | ND | |
| Cadmium | 200.8 | 0.02 | 09/11/08 | ND | |
| Chromium | 200.8 | 0.2 | 09/11/08 | ND | |
| Copper | 200.8 | 0.1 | 09/11/08 | ND | |
| Iron | 200.7 | 20 | 09/09/08 | ND | |
| Lead | 200.8 | 0.02 | 09/11/08 | ND | |
| Mercury | 7470A | 0.2 | 09/11/08 | ND | |
| Nickel | 200.8 | 0.2 | 09/11/08 | ND | |
| Selenium | 200.8 | 1.0 | 09/11/08 | ND | |
| Silver | 200.8 | 0.04 | 09/12/08 | ND | |
| Zinc | 200.7 | 10 | 09/09/08 | ND | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0808473 |
| **Project Name :** | Kensington Gold Project | **Date Collected :** | 09/02/08 |
| **Project No. :** | NA | **Date Received :** | 09/04/08 |
| **Matrix :** | Water | **Date Extracted :** | 09/08/08 |
| | | **Date Analyzed :** | 09/09-12/08 |

Duplicate Summary
Dissolved Metals

| | | | |
|---|---|---|---|
| **Sample Name :** | Comet-DR 13196 | **Units :** | ug/L (ppb) |
| **Lab Code :** | K0808473-001D | **Basis :** | NA |

| Analyte | Analysis Method | MRL | Sample Result | Duplicate Sample Result | Average | Relative Percent Difference | Result Notes |
|---|---|---|---|---|---|---|---|
| Aluminum | 200.7 | 50 | 91 | 88 | 89 | 3 | |
| Arsenic | 200.8 | 0.5 | ND | ND | ND | - | |
| Cadmium | 200.8 | 0.02 | 0.02 | ND | NC | NC | |
| Chromium | 200.8 | 0.2 | ND | ND | ND | - | |
| Copper | 200.8 | 0.1 | 1.3 | 1.2 | 1.2 | 8 | |
| Iron | 200.7 | 20 | ND | ND | ND | - | |
| Lead | 200.8 | 0.02 | 0.02 | 0.02 | 0.02 | <1 | |
| Nickel | 200.8 | 0.2 | 0.5 | 0.5 | 0.5 | <1 | |
| Selenium | 200.8 | 1.0 | ND | ND | ND | - | |
| Silver | 200.8 | 0.04 | ND | ND | ND | - | |
| Zinc | 200.7 | 10 | ND | 23 | NC | NC | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0808473 |
| **Project Name :** | Kensington Gold Project | **Date Collected :** | NA |
| **Project No. :** | NA | **Date Received :** | NA |
| **Matrix :** | Water | **Date Extracted :** | 09/09/08 |
| | | **Date Analyzed :** | 09/11/08 |

Duplicate Summary
Total Metals

| | | | |
|---|---|---|---|
| **Sample Name :** | Batch QC | **Units :** | ug/L (ppb) |
| **Lab Code :** | K0808144-001D | **Basis :** | NA |

| Analyte | Analysis Method | MRL | Sample Result | Duplicate Sample Result | Average | Relative Percent Difference | Result Notes |
|---|---|---|---|---|---|---|---|
| Mercury | 7470A | 0.2 | ND | ND | ND | - | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0808473 |
| **Project Name :** | Kensington Gold Project | **Date Collected :** | 09/02/08 |
| **Project No. :** | NA | **Date Received :** | 09/04/08 |
| **Matrix :** | Water | **Date Extracted :** | 09/08/08 |
| | | **Date Analyzed :** | 09/09-12/08 |

Matrix Spike Summary
Dissolved Metals

| | | | |
|---|---|---|---|
| **Sample Name :** | Comet-DR 13196 | **Units :** | ug/L (ppb) |
| **Lab Code :** | K0808473-001S | **Basis :** | NA |

| Analyte | MRL | Spike Level | Sample Result | Spiked Sample Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|
| Aluminum | 50 | 2000 | 91 | 2080 | 99 | 70-130 | |
| Arsenic | 0.5 | 20 | ND | 20.2 | 101 | 70-130 | |
| Cadmium | 0.02 | 20 | 0.02 | 20.2 | 101 | 70-130 | |
| Chromium | 0.2 | 20 | ND | 19.7 | 99 | 70-130 | |
| Copper | 0.1 | 20 | 1.3 | 20.9 | 98 | 70-130 | |
| Iron | 20 | 1000 | ND | 1010 | 101 | 70-130 | |
| Lead | 0.02 | 20 | 0.02 | 20.6 | 103 | 70-130 | |
| Nickel | 0.2 | 20 | 0.5 | 20.3 | 99 | 70-130 | |
| Selenium | 1.0 | 20 | ND | 19.6 | 98 | 70-130 | |
| Silver | 0.04 | 50 | ND | 49.1 | 98 | 70-130 | |
| Zinc | 10 | 500 | ND | 474 | 95 | 70-130 | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0808473 |
| **Project Name :** | Kensington Gold Project | **Date Collected :** | NA |
| **Project No. :** | NA | **Date Received :** | NA |
| **Matrix :** | Water | **Date Extracted :** | 09/09/08 |
| | | **Date Analyzed :** | 09/11/08 |

Matrix Spike Summary
Total Metals

| | | | |
|---|---|---|---|
| **Sample Name :** | Batch QC | **Units :** | ug/L (ppb) |
| **Lab Code :** | K0808144-001S | **Basis :** | NA |

| Analyte | MRL | Spike Level | Sample Result | Spiked Sample Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|
| Mercury | 0.2 | 1.0 | ND | 1.0 | 100 | 78-122 | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### QA/QC Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Kensington Gold Project
**Project No. :** NA
**Matrix :** Water

**Service Request :** K0808473
**Date Collected :** NA
**Date Received :** NA
**Date Extracted :** 09/08,09/08
**Date Analyzed :** 09/09-12/08

Laboratory Control Sample Summary
Dissolved Metals

**Sample Name :** Laboratory Control Sample
**Lab Code :** K0808473-LCS

**Units :** ug/L (ppb)
**Basis :** NA

| Analyte | Analysis Method | True Value | Result | Percent | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|
| Aluminum | 200.7 | 5000 | 5000 | 100 | 85-115 | |
| Arsenic | 200.8 | 20 | 20.6 | 103 | 85-115 | |
| Cadmium | 200.8 | 20 | 20.7 | 104 | 85-115 | |
| Chromium | 200.8 | 20 | 19.6 | 98 | 85-115 | |
| Copper | 200.8 | 20 | 19.8 | 99 | 85-115 | |
| Iron | 200.7 | 2500 | 2480 | 99 | 85-115 | |
| Lead | 200.8 | 20 | 21.1 | 106 | 85-115 | |
| Mercury | 7470A | 5.0 | 4.6 | 93 | 84-117 | |
| Nickel | 200.8 | 20 | 19.9 | 99 | 85-115 | |
| Selenium | 200.8 | 20 | 21.9 | 109 | 85-115 | |
| Silver | 200.8 | 625 | 623 | 100 | 85-115 | |
| Zinc | 200.7 | 1250 | 1170 | 94 | 85-115 | |

Comments:

Columbia Analytical Services

| | |
|---|---|
| **Work Group #:** | |
| **Analyst:** | RVP |
| **Analysis Date:** | 12/16/08 |
| **Analyst Review:** | |
| **Supervisor Review:** | |

**Meteoric Water Mobility Procedure**

**ASTM E2242-07**

| Analyses | Sample ID | COMET-DR | JLN-DR | COMET-DR 3rd quart | JLN-DR 3rd quart |
|---|---|---|---|---|---|
| | Date/Time | 11/30/08 18:00 | 11/30/08 18:00 | 11/30/08 18:00 | 11/30/08 18:00 |
| | Lab # | 14343 | 14344 | 14345 | 14346 |
| | units | | | | |
| Sample Description | | Dry, coarse rock with very lillte fines material | Dry, coarse rock with very lillte fines material | Dry, coarse rock with very lillte fines material | Dry, coarse rock with very lillte fines material |
| Sample As Received Moisture | % | 0.57 | 0.61 | 0.27 | 0.59 |
| Tare Wt. | g | 711 | 768 | 768 | 765 |
| Wet Sample & Tare Wt. | g | 16878 | 18427 | 17879 | 16266 |
| Dry Sample & Tare Wt. | g | 16786 | 18319 | 17833 | 16175 |
| Drying Temp & time | | AD 20 - 30C 20 days | AD 20 - 30C 20 days | AD 20 - 30C 20 days | AD 20 - 30C 20 days |
| Sieve Fraction (< 5 cm) | % | 41.8 | 25.2 | 20.8 | 39.7 |
| Sieve Fraction (> 5 cm) | % | 58.2 | 74.8 | 79.2 | 60.3 |
| Tare Wt | g | 711 | 768 | 766 | 765 |
| Wet Sample & Tare Wt. | g | 16786 | 18319 | 17833 | 16175 |
| > 5 cm Tare Wt. | g | 773 | 773 | 773 | 773 |
| > 5 cm Sample & Tare Wt. | g | 10136 | 13909 | 14295 | 10068 |
| Dry Test Sample Target Mass | g | 5000 | 5000 | 5000 | 5000 |
| Wet Sample Mass equivalent | g | 5000 | 5000 | 5000 | 5000 |
| DI Water Flow Rate | mL/min | 3.4 | 3.4 | 3.4 | 3.4 |
| DI Water pH | units | n/a | n/a | n/a | n/a |
| DI Water Conductivity | umho/cm | 0.5 | 0.5 | 0.5 | 0.5 |
| Extraction Start Date and Time | | 12/2/08 13:28 | 12/2/08 13:28 | 12/4/08 9:06 | 12/4/08 9:06 |
| Extraction Finish Date and Time | | 12/3/08 18:45 | 12/3/08 18:55 | 12/5/08 14:15 | 12/5/08 15:45 |
| Extraction Time | hr | 29.28 | 29.45 | 29.15 | 30.65 |
| Extraction Temperature | °C | 23 | 23 | 23 | 23 |
| Final Effluent Mass | g | 5140 | 4976 | 4991 | 4953 |
| Final Effluent pH | units | 7.68 | 7.91 | 7.84 | 7.96 |
| Filter Date and Time | | 12/5/08 13:00 | 12/5/08 13:00 | 12/5/08 13:00 | 12/5/08 13:00 |
| Filter Type & Pore Size | | Membrane 0.45u | Membrane 0.45u | Membrane 0.45u | Membrane 0.45u |
| Residual Moisture | % | 0.82 | 1.17 | 1.31 | 2.43 |
| Tare Wt. | g | 767 | 766 | 690 | 705 |
| Wet Sample & Tare Wt. | g | 5774 | 5803 | 5735 | 5799 |
| Dry Sample & Tare Wt. | g | 5733 | 5744 | 5669 | 5675 |
| Drying Temp & time | | AD 20 - 30C 4 days | AD 20 - 30C 4 days | AD 20 - 30C 4 days | AD 20 - 30C 4 days |
| **Oservations** | | Total Moisture = 0.60% | Total Moisture = 0.62% | Total Moisture = 0.30% | Total Moisture = 0.61% |

1317 South 13th Avenue Kelso, Washington 98626 (360) 577-7222 (360) 636-1068 fax

Columbia Analytical Services INC.
An Employee - Owned Company

December 16, 2008 Analytical Report for Service Request No: K0811836

Ralph Poulsen
Columbia Analytical Services,Inc.
3860 S. Palo Verde Rd.
Suite 303
Tucson, AZ 85714

**RE: Coeur Alaska-Kensington**

Dear Ralph:

Enclosed are the results of the rush samples submitted to our laboratory on December 06, 2008. For your reference, these analyses have been assigned our service request number K0811836.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.caslab.com. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please call if you have any questions. My extension is 3316. You may also contact me via Email at JChristian@caslab.com.

Respectfully submitted,

**Columbia Analytical Services, Inc.**

Jeff Christian
Laboratory Director

JC/afs

## Acronyms

| | |
|---|---|
| ASTM | American Society for Testing and Materials |
| A2LA | American Association for Laboratory Accreditation |
| CARB | California Air Resources Board |
| CAS Number | Chemical Abstract Service registry Number |
| CFC | Chlorofluorocarbon |
| CFU | Colony-Forming Unit |
| DEC | Department of Environmental Conservation |
| DEQ | Department of Environmental Quality |
| DHS | Department of Health Services |
| DOE | Department of Ecology |
| DOH | Department of Health |
| EPA | U. S. Environmental Protection Agency |
| ELAP | Environmental Laboratory Accreditation Program |
| GC | Gas Chromatography |
| GC/MS | Gas Chromatography/Mass Spectrometry |
| LUFT | Leaking Underground Fuel Tank |
| M | Modified |
| MCL | Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA. |
| MDL | Method Detection Limit |
| MPN | Most Probable Number |
| MRL | Method Reporting Limit |
| NA | Not Applicable |
| NC | Not Calculated |
| NCASI | National Council of the Paper Industry for Air and Stream Improvement |
| ND | Not Detected |
| NIOSH | National Institute for Occupational Safety and Health |
| PQL | Practical Quantitation Limit |
| RCRA | Resource Conservation and Recovery Act |
| SIM | Selected Ion Monitoring |
| TPH | Total Petroleum Hydrocarbons |
| tr | Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL. |

## Acronyms

| | |
|---|---|
| ASTM | American Society for Testing and Materials |
| A2LA | American Association for Laboratory Accreditation |
| CARB | California Air Resources Board |
| CAS Number | Chemical Abstract Service registry Number |
| CFC | Chlorofluorocarbon |
| CFU | Colony-Forming Unit |
| DEC | Department of Environmental Conservation |
| DEQ | Department of Environmental Quality |
| DHS | Department of Health Services |
| DOE | Department of Ecology |
| DOH | Department of Health |
| EPA | U. S. Environmental Protection Agency |
| ELAP | Environmental Laboratory Accreditation Program |
| GC | Gas Chromatography |
| GC/MS | Gas Chromatography/Mass Spectrometry |
| LUFT | Leaking Underground Fuel Tank |
| M | Modified |
| MCL | Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA. |
| MDL | Method Detection Limit |
| MPN | Most Probable Number |
| MRL | Method Reporting Limit |
| NA | Not Applicable |
| NC | Not Calculated |
| NCASI | National Council of the Paper Industry for Air and Stream Improvement |
| ND | Not Detected |
| NIOSH | National Institute for Occupational Safety and Health |
| PQL | Practical Quantitation Limit |
| RCRA | Resource Conservation and Recovery Act |
| SIM | Selected Ion Monitoring |
| TPH | Total Petroleum Hydrocarbons |
| tr | Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL. |

## Inorganic Data Qualifiers

| | |
|---|---|
| * | The result is an outlier. See case narrative. |
| # | The control limit criteria is not applicable. See case narrative. |
| B | The analyte was found in the associated method blank at a level that is significant relative to the sample result. |
| E | The result is an estimate amount because the value exceeded the instrument calibration range. |
| J | The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL. |
| U | The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. |
| i | The MRL/MDL has been elevated due to a matrix interference. |
| X | See case narrative. |

## Metals Data Qualifiers

| | |
|---|---|
| # | The control limit criteria is not applicable. See case narrative. |
| B | The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL. |
| E | The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample. |
| M | The duplicate injection precision was not met. |
| N | The Matrix Spike sample recovery is not within control limits. See case narrative. |
| S | The reported value was determined by the Method of Standard Additions (MSA). |
| U | The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. |
| W | The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance. |
| i | The MRL/MDL has been elevated due to a matrix interference. |
| X | See case narrative. |
| * | The duplicate analysis not within control limits. See case narrative. |
| + | The correlation coefficient for the MSA is less than 0.995. |

## Organic Data Qualifiers

| | |
|---|---|
| * | The result is an outlier. See case narrative. |
| # | The control limit criteria is not applicable. See case narrative. |
| A | A tentatively identified compound, a suspected aldol-condensation product. |
| B | The analyte was found in the associated method blank at a level that is significant relative to the sample result. |
| C | The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data. |
| D | The reported result is from a dilution. |
| E | The result is an estimate amount because the value exceeded the instrument calibration range. |
| J | The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL. |
| N | The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed. |
| P | The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results (25% for CLP Pesticides). |
| U | The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. |
| i | The MRL/MDL has been elevated due to a chromatographic interference. |
| X | See case narrative. |

## Additional Petroleum Hydrocarbon Specific Qualifiers

| | |
|---|---|
| F | The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard. |
| L | The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard. |
| H | The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard. |
| O | The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard. |
| Y | The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard. |
| Z | The chromatographic fingerprint does not resemble a petroleum product. |

## Columbia Analytical Services, Inc.
## Kelso, WA
## State Certifications, Accreditations, and Licenses

| Program | Number |
|---|---|
| Alaska DEC UST | UST-040 |
| Arizona DHS | AZ0339 |
| Arkansas - DEQ | 88-0637 |
| California DHS | 2286 |
| Colorado DPHE | - |
| Florida DOH | E87412 |
| Hawaii DOH | - |
| Idaho DHW | - |
| Indiana DOH | C-WA-01 |
| Louisiana DEQ | 3016 |
| Louisiana DHH | LA050010 |
| Maine DHS | WA0035 |
| Michigan DEQ | 9949 |
| Minnesota DOH | 053-999-368 |
| Montana DPHHS | CERT0047 |
| Nevada DEP | WA35 |
| New Jersey DEP | WA005 |
| New Mexico ED | - |
| North Carolina DWQ | 605 |
| Oklahoma DEQ | 9801 |
| Oregon - DHS | WA200001 |
| South Carolina DHEC | 61002 |
| Utah DOH | COLU |
| Washington DOE | C1203 |
| Wisconsin DNR | 998386840 |
| Wyoming (EPA Region 8) | - |

# Chain of Custody Documentation

K0811836

Columbia Analytical Services™

3725 E. Atlanta Ave.
Phoenix, Arizona 85040
Phone: (602) 437-0330
Fax: (602) 437-0660

3860 S. Palo Verde Rd., Ste. 302
Tucson, Arizona 85714
Phone: (520) 573-1061
Fax: (520) 573-1063

# Chain of Custody

**Work Order No:** _____

Date 12/5/08 Page 1 of 1

| | | | |
|---|---|---|---|
| Project Manager: | Ralph Poulsen | | |
| Client Name: | CAS-Tucson | | |
| Address: | 3860 S Palo Verde Suite 302 | | |
| City, State ZIP: | Tucson, AZ 85714 | Phone: | 520-623-8501 |
| Email: | | Fax: | |

| | | | |
|---|---|---|---|
| Bill to: | | | |
| Company: | | | |
| Address: | | | |
| City, State ZIP: | | Phone: | |
| Email: | | Fax: | |

| | |
|---|---|
| Project Name: | Coeur Alaska-Kensington |
| Project Number: | |
| P.O. Number: | |
| Sampler's Name: | |

**SAMPLE RECEIPT**

| | | | | | |
|---|---|---|---|---|---|
| Temperature (°C): | | Temp Blank Present | | | |
| Received Intact: | Yes | No | N/A | Wet Ice / Blue Ice | |
| Cooler Custody Seals: | Yes | No | N/A | Total Containers: | |
| Sample Custody Seals: | Yes | No | N/A | | |

**ANALYSIS REQUEST**

| Sample Identification | Matrix | Date Sampled | Time Sampled | Lab ID | No. of Containers | TPH (8015AZR.1) | Volatile Organics GCMS (624 / 8260B) | PAH (8310) | SDWA Volatiles (524.2) | Semi-Volatile Organics (625 / 8270) | Organochlorine Pesticides (608 / 8081) | PCB's (8082) | Metals (See Below) | Mercury (7471A / 7470 / 245.1) | NH3-N NO3/NO2-N | SO4 (IC) TDS | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Comet-DR (14343) | Leachate | 12/3/08 | 18:45 | | 4 | | | | | | | | Dissolved | | | | MWMT Leachates |
| JLN-DR (14344) | | 12/3/08 | 18:55 | | 4 | | | | | | | | | | | | |
| Comet-DR 3rd QRTR (14345) | | 12/5/08 | 14:15 | | 4 | | | | | | | | | | | | |
| JLN-DR 3rd QRTR (14346) | | 12/5/08 | 15:45 | | 4 | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | Same as project K0808473 |
| | | | | | | | | | | | | | | | | | |

**TAT**

- ☐ Routine
- ☐ Rush - Prelim
- ☑ Rush - Final

Due Date: 12/12/08

**Volatiles**

- ☐ Encores
- ☐ Methanol Kits

Metals to be analyzed as: Total TCLP Dissolved

Method: 6010B 6020 (200.7) (200.8)

Circle metals to be analyzed: 8RCRA 13PPM (Al) Sb (As) Ba Be B (Cd) Ca (Cr) Co (Cu) (Fe) (Pb) Mg Mn Mo (Ni) K (Se) (Ag) Na Tl Sn V (Zn) (Hg)

| | Relinquished by: (Signature) | (Print Name) | | Received by: (Signature) | (Print Name) | Date/Time |
|---|---|---|---|---|---|---|
| 1 | RV Poulsen | Ralph V. Poulsen | 12/5/08 16:00 | UPS | UPS | 12/5/08 16:00 |
| 2 | | | | | Jwell - CAS | 12/10/08 0900 |
| 3 | | | | | | |

White copy to CAS, Yellow copy for final report, Pink copy to sampler

Revised: 3/17/2008

# Columbia Analytical Services, Inc.
## Cooler Receipt and Preservation Form

PC Christian

Client / Project: CAS TUCSON Service Request K08 11836

Received: 12/6/08 Opened: 12-6-08 By: SD

1. Samples were received via? *US Mail* *Fed Ex* (*UPS*) *DHL* *GH* *GS* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) (*Cooler*) *Box* *Envelope* *Other* _____ *NA*
3. Were custody seals on coolers? NA Y (N) If yes, how many and where? _____
   If present, were custody seals intact? Y (N) If present, were they signed and dated? Y (N)
4. Is shipper's air-bill filed? If not, record air-bill number: 1Z 5A9 W7 44 4431 7597 NA Y N

5. **Temperature of cooler(s) upon receipt (°C):** -.2
   **Temperature Blank (°C):** FROZEN
6. If applicable, list Chain of Custody Numbers:
7. Packing material used. *Inserts* *Baggies* *Bubble Wrap* *Gel Packs* (*Wet Ice*) *Sleeves* *Other* _____

| | | | |
|---|---|---|---|
| 8. Were custody papers properly filled out (ink, signed, etc.)? | NA | (Y) | N |
| 9. **Did all bottles arrive in good condition (unbroken)?** *Indicate in the table below.* | NA | (Y) | N |
| 10. Were all sample labels complete (i.e analysis, preservation, etc.)? | NA | (Y) | N |
| 11. Did all sample labels and tags agree with custody papers? *Indicate in the table below* | NA | (Y) | N |
| 12. **Were appropriate bottles/containers and volumes received for the tests indicated?** | NA | (Y) | N |
| 13. Were the pH-preserved bottles tested* received at the appropriate pH? *Indicate in the table below* | (NA) | Y | N |
| 14. Were VOA vials and 1631 Mercury bottles received without headspace? *Indicate in the table below.* | (NA) | Y | N |
| 15. **Are CWA Microbiology samples received with >1/2 the 24hr. hold time remaining from collection?** | (NA) | Y | N |
| 16. Was C12/Res negative? | (NA) | Y | N |

| Sample ID on Bottle | Sample ID on COC | Sample ID on Bottle | Sample ID on COC |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

| Sample ID | Bottle Count | Bottle Type | Out of Temp | Head-space | Broken | pH | Reagent | Volume added | Reagent Lot Number | Initials |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

*Does not include all pH preserved sample aliquots received. See sample receiving SOP (SMO-GEN).

*Additional Notes, Discrepancies, & Resolutions:* _____

# General Chemistry Parameters

## COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0811836
**Date Collected :** 12/03-05/08
**Date Received :** 12/06/08

Solids, Total Dissolved

Analysis Method : SM 2540 C
Test Notes :

Units : mg/L
Basis : NA

| Sample Name | Lab Code | MRL | Dilution Factor | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|
| Comet-DR (14343) | K0811836-001 | 5 | 1 | 12/08/08 | 102 | |
| JLN-DR (14344) | K0811836-002 | 5 | 1 | 12/08/08 | 27 | |
| Comet-DR 3rd Qrtr (14345) | K0811836-003 | 5 | 1 | 12/08/08 | 40 | |
| JLN-DR 3rd Qrtr (14346) | K0811836-004 | 5 | 1 | 12/12/08 | 25 | |
| Method Blank | K0811836-MB | 5 | 1 | 12/12/08 | ND | |
| Method Blank | K0811836-MB | 5 | 1 | 12/08/08 | ND | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0811836
**Date Collected :** NA
**Date Received :** NA
**Date Prepared :** NA
**Date Analyzed :** 12/08/08

Duplicate Summary
Inorganic Parameters

Sample Name : Batch QC
Lab Code : K0811798-001DUP
Test Notes :

Units : mg/L
Basis : NA

| Analyte | Analysis Method | MRL | Sample Result | Duplicate Sample Result | Average | Relative Percent Difference | Result Notes |
|---|---|---|---|---|---|---|---|
| Solids, Total Dissolved | SM 2540 C | 5 | 6090 | 5980 | 6040 | 2 | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0811836 |
| **Project Name :** | Coeur Alaska-Kensington | **Date Collected :** | NA |
| **Project Number :** | NA | **Date Received :** | NA |
| **Sample Matrix :** | WATER | **Date Prepared :** | NA |
| | | **Date Analyzed :** | 12/12/08 |

Laboratory Control Sample Summary
Inorganic Parameters

| | | | |
|---|---|---|---|
| Sample Name : | Laboratory Control Sample | Units : | mg/L |
| Lab Code : | K0811836-LCS | Basis : | NA |
| Test Notes : | | | |

| Analyte | Prep Method | Analysis Method | True Value | Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|
| Solids, Total Dissolved | NONE | SM 2540 C | 557 | 544 | 98 | 85-115 | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0811836 |
| **Project Name :** | Coeur Alaska-Kensington | **Date Collected :** | NA |
| **Project Number :** | NA | **Date Received :** | NA |
| **Sample Matrix :** | WATER | **Date Prepared :** | NA |
| | | **Date Analyzed :** | 12/08/08 |

Laboratory Control Sample Summary
Inorganic Parameters

| | | | |
|---|---|---|---|
| Sample Name : | Lab Control Sample | Units : | mg/L |
| Lab Code : | K0811836-LCS | Basis : | NA |
| Test Notes : | | | |

| Analyte | Prep Method | Analysis Method | True Value | Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|
| Solids, Total Dissolved | NONE | SM 2540 C | 557 | 514 | 92 | 85-115 | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

## COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0811836
**Date Collected :** 12/03-05/08
**Date Received :** 12/06/08

Sulfate

Analysis Method : 300.0
Test Notes :

Units : mg/L
Basis : NA

| Sample Name | Lab Code | MRL | Dilution Factor | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|
| Comet-DR (14343) | K0811836-001 | 4.0 | 20 | 12/08/08 | 54.9 | |
| JLN-DR (14344) | K0811836-002 | 0.2 | 2 | 12/08/08 | 4.5 | |
| Comet-DR 3rd Qrtr (14345) | K0811836-003 | 0.2 | 2 | 12/08/08 | 7.9 | |
| JLN-DR 3rd Qrtr (14346) | K0811836-004 | 0.2 | 2 | 12/08/08 | 2.0 | |
| Method Blank | K0811836-MB | 0.2 | 1 | 12/08/08 | ND | |

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0811836
**Date Collected :** 12/3/2008
**Date Received :** 12/6/2008
**Date Prepared :** NA
**Date Analyzed :** 12/08/08

Duplicate Summary
Inorganic Parameters

Sample Name : Comet-DR (14343)
Lab Code : K0811836-001DUP
Test Notes :

Units : mg/L
Basis : NA

| Analyte | Analysis Method | MRL | Sample Result | Duplicate Sample Result | Average | Relative Percent Difference | Result Notes |
|---|---|---|---|---|---|---|---|
| Sulfate | 300.0 | 4.0 | 54.9 | 55.7 | 55.3 | 1 | |

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0811836
**Date Collected :** 12/3/2008
**Date Received :** 12/6/2008
**Date Prepared :** NA
**Date Analyzed :** 12/08/08

Matrix Spike Summary
Inorganic Parameters

Sample Name : Comet-DR (14343)
Lab Code : K0811836-001MS
Test Notes :

Units : mg/L
Basis : NA

| Analyte | Analysis Method | MRL | Spike Level | Sample Result | Spiked Sample Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Sulfate | 300.0 | 4.0 | 40.0 | 54.9 | 95.2 | 101 | 80-120 | |

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0811836 |
| **Project Name :** | Coeur Alaska-Kensington | **Date Collected :** | NA |
| **Project Number :** | NA | **Date Received :** | NA |
| **Sample Matrix :** | WATER | **Date Prepared :** | NA |
| | | **Date Analyzed :** | 12/08/08 |

Laboratory Control Sample Summary
Inorganic Parameters

| | | | |
|---|---|---|---|
| Sample Name : | Lab Control Sample | Units : | mg/L |
| Lab Code : | K0811836-LCS | Basis : | NA |
| Test Notes : | | | |

| Analyte | Prep Method | Analysis Method | True Value | Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|
| Sulfate | NONE | 300.0 | 5.0 | 5.1 | 102 | 90-110 | |

## COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0811836
**Date Collected :** 12/03-05/08
**Date Received :** 12/06/08

Nitrate+Nitrite as Nitrogen

Analysis Method : 353.2
Test Notes :

Units : mg/L
Basis : NA

| Sample Name | Lab Code | MRL | Dilution Factor | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|
| Comet-DR (14343) | K0811836-001 | 0.05 | 1 | 12/09/08 | 0.12 | |
| JLN-DR (14344) | K0811836-002 | 0.05 | 1 | 12/09/08 | 0.14 | |
| Comet-DR 3rd Qrtr (14345) | K0811836-003 | 0.05 | 1 | 12/09/08 | 0.19 | |
| JLN-DR 3rd Qrtr (14346) | K0811836-004 | 0.05 | 1 | 12/09/08 | 0.19 | |
| Method Blank | K0811836-MB | 0.05 | 1 | 12/09/08 | ND | |

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0811836
**Date Collected :** 12/3/2008
**Date Received :** 12/6/2008
**Date Prepared :** NA
**Date Analyzed :** 12/09/08

Duplicate Summary
Inorganic Parameters

Sample Name : Comet-DR (14343)
Lab Code : K0811836-001DUP
Test Notes :

Units : mg/L
Basis : NA

| Analyte | Analysis Method | MRL | Sample Result | Duplicate Sample Result | Average | Relative Percent Difference | Result Notes |
|---|---|---|---|---|---|---|---|
| Nitrate+Nitrite as Nitrogen | 353.2 | 0.05 | 0.12 | 0.11 | 0.12 | 8 | |

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0811836
**Date Collected :** 12/3/2008
**Date Received :** 12/6/2008
**Date Prepared :** NA
**Date Analyzed :** 12/09/08

Matrix Spike Summary
Inorganic Parameters

Sample Name : Comet-DR (14343)
Lab Code : K0811836-001MS
Test Notes :

Units : mg/L
Basis : NA

| Analyte | Analysis Method | MRL | Spike Level | Sample Result | Spiked Sample Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Nitrate+Nitrite as Nitrogen | 353.2 | 0.05 | 2.00 | 0.12 | 1.98 | 93 | 90-110 | |

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0811836 |
| **Project Name :** | Coeur Alaska-Kensington | **Date Collected :** | NA |
| **Project Number :** | NA | **Date Received :** | NA |
| **Sample Matrix :** | WATER | **Date Prepared :** | NA |
| | | **Date Analyzed :** | 12/09/08 |

Laboratory Control Sample Summary
Inorganic Parameters

| | | | |
|---|---|---|---|
| Sample Name : | Lab Control Sample | Units : | mg/L |
| Lab Code : | K0811836-LCS | Basis : | NA |
| Test Notes : | | | |

| Analyte | Prep Method | Analysis Method | True Value | Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|
| Nitrate+Nitrite as Nitrogen | NONE | 353.2 | 1.70 | 1.84 | 108 | 90-110 | |

## COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0811836
**Date Collected :** 12/03-05/08
**Date Received :** 12/06/08

Ammonia as Nitrogen

Analysis Method : SM 4500-NH3 G
Test Notes :

Units : mg/L
Basis : NA

| Sample Name | Lab Code | MRL | Dilution Factor | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|
| Comet-DR (14343) | K0811836-001 | 0.05 | 1 | 12/08/08 | 0.10 | |
| JLN-DR (14344) | K0811836-002 | 0.05 | 1 | 12/08/08 | 0.05 | |
| Comet-DR 3rd Qrtr (14345) | K0811836-003 | 0.05 | 1 | 12/08/08 | ND | |
| JLN-DR 3rd Qrtr (14346) | K0811836-004 | 0.05 | 1 | 12/08/08 | 0.10 | |
| Method Blank | K0811836-MB | 0.05 | 1 | 12/08/08 | ND | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0811836
**Date Collected :** 12/3/2008
**Date Received :** 12/6/2008
**Date Prepared :** NA
**Date Analyzed :** 12/08/08

Duplicate Summary
Inorganic Parameters

Sample Name : Comet-DR (14343)
Lab Code : K0811836-001DUP
Test Notes :

Units : mg/L
Basis : NA

| Analyte | Analysis Method | MRL | Sample Result | Duplicate Sample Result | Average | Relative Percent Difference | Result Notes |
|---|---|---|---|---|---|---|---|
| Ammonia as Nitrogen | SM 4500-NH3 G | 0.05 | 0.10 | 0.10 | 0.10 | <1 | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Coeur Alaska-Kensington
**Project Number :** NA
**Sample Matrix :** WATER

**Service Request :** K0811836
**Date Collected :** 12/3/2008
**Date Received :** 12/6/2008
**Date Prepared :** NA
**Date Analyzed :** 12/08/08

Matrix Spike Summary
Inorganic Parameters

Sample Name : Comet-DR (14343)
Lab Code : K0811836-001MS
Test Notes :

Units : mg/L
Basis : NA

| Analyte | Analysis Method | MRL | Spike Level | Sample Result | Spiked Sample Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Ammonia as Nitrogen | SM 4500-NH3 G | 0.05 | 2.00 | 0.10 | 2.22 | 106 | 90-110 | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

## COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0811836 |
| **Project Name :** | Coeur Alaska-Kensington | **Date Collected :** | NA |
| **Project Number :** | NA | **Date Received :** | NA |
| **Sample Matrix :** | WATER | **Date Prepared :** | NA |
| | | **Date Analyzed :** | 12/08/08 |

Laboratory Control Sample Summary
Inorganic Parameters

| | | | |
|---|---|---|---|
| Sample Name : | Laboratory Control Sample | Units : | mg/L |
| Lab Code : | K0811836-LCS | Basis : | NA |
| Test Notes : | | | |

| Analyte | Prep Method | Analysis Method | True Value | Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|
| Ammonia as Nitrogen | NONE | SM 4500-NH3 G | 16.9 | 17.3 | 102 | 90-110 | |

SM Standard Methods for the Examination of Water and Wastewater, 20th Ed., 1998.

# Metals

## COLUMBIA ANALYTICAL SERVICES, INC.

**- Cover Page -**
**INORGANIC ANALYSIS DATA PACKAGE**

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Coeur Alaska-Kensington
**Project No. :** NA

**Service Request :** K0811836

| Sample Name : | Lab Code : |
|---|---|
| Batch QC | K0811764-002D |
| Batch QC | K0811764-002S |
| Batch QC | K0811791-002D |
| Batch QC | K0811791-002S |
| Comet-DR (14343) | K0811836-001 |
| Comet-DR (14343) | K0811836-001D |
| Comet-DR (14343) | K0811836-001S |
| JLN-DR (14344) | K0811836-002 |
| Comet-DR 3rd Qrtr (14345) | K0811836-003 |
| JLN-DR 3rd Qrtr (14346) | K0811836-004 |
| Laboratory Control Sample | K0811836-LCS |
| Method Blank | K0811836-MB |

Comments:

Approved By: _____ Date: 12/12/08

## COLUMBIA ANALYTICAL SERVICES, INC.

### Analytical Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0811836 |
| **Project Name :** | Coeur Alaska-Kensington | **Date Collected :** | 12/03/08 |
| **Project No. :** | NA | **Date Received :** | 12/06/08 |
| **Matrix :** | Water | **Date Extracted :** | 12/08,09/08 |

Dissolved Metals

| | | | |
|---|---|---|---|
| **Sample Name :** | Comet-DR (14343) | **Units :** | ug/L (ppb) |
| **Lab Code :** | K0811836-001 | **Basis :** | NA |

| Analyte | Analysis Method | MRL | Date Analyzed | Sample Result | Result Notes |
|---|---|---|---|---|---|
| Aluminum | 200.7 | 50 | 12/09/08 | 195 | |
| Arsenic | 200.8 | 0.5 | 12/09/08 | ND | |
| Cadmium | 200.8 | 0.02 | 12/09/08 | ND | |
| Chromium | 200.8 | 0.2 | 12/09/08 | ND | |
| Copper | 200.8 | 0.1 | 12/09/08 | 0.7 | |
| Iron | 200.7 | 20 | 12/09/08 | ND | |
| Lead | 200.8 | 0.02 | 12/09/08 | ND | |
| Mercury | 7470A | 0.2 | 12/10/08 | ND | |
| Nickel | 200.8 | 0.2 | 12/09/08 | ND | |
| Selenium | 200.8 | 1.0 | 12/09/08 | ND | |
| Silver | 200.8 | 0.02 | 12/09/08 | 0.02 | |
| Zinc | 200.7 | 10 | 12/09/08 | ND | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### Analytical Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0811836 |
| **Project Name :** | Coeur Alaska-Kensington | **Date Collected :** | 12/03/08 |
| **Project No. :** | NA | **Date Received :** | 12/06/08 |
| **Matrix :** | Water | **Date Extracted :** | 12/08,09/08 |

Dissolved Metals

| | | | |
|---|---|---|---|
| **Sample Name :** | JLN-DR (14344) | **Units :** | ug/L (ppb) |
| **Lab Code :** | K0811836-002 | **Basis :** | NA |

| Analyte | Analysis Method | MRL | Date Analyzed | Sample Result | Result Notes |
|---|---|---|---|---|---|
| Aluminum | 200.7 | 50 | 12/09/08 | 150 | |
| Arsenic | 200.8 | 0.5 | 12/09/08 | ND | |
| Cadmium | 200.8 | 0.02 | 12/09/08 | ND | |
| Chromium | 200.8 | 0.2 | 12/09/08 | ND | |
| Copper | 200.8 | 0.1 | 12/09/08 | 1.4 | |
| Iron | 200.7 | 20 | 12/09/08 | ND | |
| Lead | 200.8 | 0.02 | 12/09/08 | ND | |
| Mercury | 7470A | 0.2 | 12/10/08 | ND | |
| Nickel | 200.8 | 0.2 | 12/09/08 | ND | |
| Selenium | 200.8 | 1.0 | 12/09/08 | ND | |
| Silver | 200.8 | 0.02 | 12/09/08 | ND | |
| Zinc | 200.7 | 10 | 12/09/08 | ND | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### Analytical Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0811836 |
| **Project Name :** | Coeur Alaska-Kensington | **Date Collected :** | 12/05/08 |
| **Project No. :** | NA | **Date Received :** | 12/06/08 |
| **Matrix :** | Water | **Date Extracted :** | 12/08,09/08 |

Dissolved Metals

| | | | |
|---|---|---|---|
| **Sample Name :** | Comet-DR 3rd Qrtr (14345) | **Units :** | ug/L (ppb) |
| **Lab Code :** | K0811836-003 | **Basis :** | NA |

| Analyte | Analysis Method | MRL | Date Analyzed | Sample Result | Result Notes |
|---|---|---|---|---|---|
| Aluminum | 200.7 | 50 | 12/09/08 | 261 | |
| Arsenic | 200.8 | 0.5 | 12/09/08 | ND | |
| Cadmium | 200.8 | 0.02 | 12/09/08 | 0.03 | |
| Chromium | 200.8 | 0.2 | 12/09/08 | ND | |
| Copper | 200.8 | 0.1 | 12/09/08 | 1.0 | |
| Iron | 200.7 | 20 | 12/09/08 | ND | |
| Lead | 200.8 | 0.02 | 12/09/08 | ND | |
| Mercury | 7470A | 0.2 | 12/10/08 | ND | |
| Nickel | 200.8 | 0.2 | 12/09/08 | 0.2 | |
| Selenium | 200.8 | 1.0 | 12/09/08 | ND | |
| Silver | 200.8 | 0.02 | 12/09/08 | ND | |
| Zinc | 200.7 | 10 | 12/09/08 | ND | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### Analytical Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0811836 |
| **Project Name :** | Coeur Alaska-Kensington | **Date Collected :** | 12/05/08 |
| **Project No. :** | NA | **Date Received :** | 12/06/08 |
| **Matrix :** | Water | **Date Extracted :** | 12/08,09/08 |

Dissolved Metals

| | | | |
|---|---|---|---|
| **Sample Name :** | JLN-DR 3rd Qrtr (14346) | **Units :** | ug/L (ppb) |
| **Lab Code :** | K0811836-004 | **Basis :** | NA |

| Analyte | Analysis Method | MRL | Date Analyzed | Sample Result | Result Notes |
|---|---|---|---|---|---|
| Aluminum | 200.7 | 50 | 12/09/08 | 178 | |
| Arsenic | 200.8 | 0.5 | 12/09/08 | ND | |
| Cadmium | 200.8 | 0.02 | 12/09/08 | ND | |
| Chromium | 200.8 | 0.2 | 12/09/08 | ND | |
| Copper | 200.8 | 0.1 | 12/09/08 | 2.6 | |
| Iron | 200.7 | 20 | 12/09/08 | ND | |
| Lead | 200.8 | 0.02 | 12/09/08 | ND | |
| Mercury | 7470A | 0.2 | 12/10/08 | ND | |
| Nickel | 200.8 | 0.2 | 12/09/08 | 0.3 | |
| Selenium | 200.8 | 1.0 | 12/09/08 | ND | |
| Silver | 200.8 | 0.02 | 12/09/08 | ND | |
| Zinc | 200.7 | 10 | 12/09/08 | ND | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### Analytical Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0811836 |
| **Project Name :** | Coeur Alaska-Kensington | **Date Collected :** | NA |
| **Project No. :** | NA | **Date Received :** | NA |
| **Matrix :** | Water | **Date Extracted :** | 12/08,09/08 |

Total Metals

| | | | |
|---|---|---|---|
| **Sample Name :** | Method Blank | **Units :** | ug/L (ppb) |
| **Lab Code :** | K0811836-MB | **Basis :** | NA |

| Analyte | Analysis Method | MRL | Date Analyzed | Sample Result | Result Notes |
|---|---|---|---|---|---|
| Aluminum | 200.7 | 50 | 12/09/08 | ND | |
| Arsenic | 200.8 | 0.5 | 12/09/08 | ND | |
| Cadmium | 200.8 | 0.02 | 12/09/08 | ND | |
| Chromium | 200.8 | 0.2 | 12/09/08 | ND | |
| Copper | 200.8 | 0.1 | 12/09/08 | ND | |
| Iron | 200.7 | 20 | 12/09/08 | ND | |
| Lead | 200.8 | 0.02 | 12/09/08 | ND | |
| Mercury | 7470A | 0.2 | 12/10/08 | ND | |
| Nickel | 200.8 | 0.2 | 12/09/08 | ND | |
| Selenium | 200.8 | 1.0 | 12/09/08 | ND | |
| Silver | 200.8 | 0.02 | 12/09/08 | ND | |
| Zinc | 200.7 | 10 | 12/09/08 | ND | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### QA/QC Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Coeur Alaska-Kensington
**Project No. :** NA
**Matrix :** Water

**Service Request :** K0811836
**Date Collected :** 12/03/08
**Date Received :** 12/06/08
**Date Extracted :** 12/08/08
**Date Analyzed :** 12/09/08

Duplicate Summary
Dissolved Metals

**Sample Name :** Comet-DR (14343)
**Lab Code :** K0811836-001D

**Units :** ug/L (ppb)
**Basis :** NA

| Analyte | Analysis Method | MRL | Sample Result | Duplicate Sample Result | Average | Relative Percent Difference | Result Notes |
|---|---|---|---|---|---|---|---|
| Aluminum | 200.7 | 50 | 195 | 174 | 185 | 11 | |
| Iron | 200.7 | 20 | ND | ND | ND | - | |
| Zinc | 200.7 | 10 | ND | ND | ND | - | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### QA/QC Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Coeur Alaska-Kensington
**Project No. :** NA
**Matrix :** Water

**Service Request :** K0811836
**Date Collected :** NA
**Date Received :** NA
**Date Extracted :** 12/08/08
**Date Analyzed :** 12/09/08

Duplicate Summary
Total Metals

**Sample Name :** Batch QC
**Lab Code :** K0811791-002D

**Units :** ug/L (ppb)
**Basis :** NA

| Analyte | Analysis Method | MRL | Sample Result | Duplicate Sample Result | Average | Relative Percent Difference | Result Notes |
|---|---|---|---|---|---|---|---|
| Arsenic | 200.8 | 0.5 | 1.1 | 1.0 | 1.0 | 10 | |
| Cadmium | 200.8 | 0.02 | 0.04 | 0.04 | 0.04 | <1 | |
| Chromium | 200.8 | 0.2 | 0.4 | 0.5 | 0.5 | 22 | |
| Copper | 200.8 | 0.1 | 4.2 | 4.3 | 4.2 | 2 | |
| Lead | 200.8 | 0.02 | 0.44 | 0.46 | 0.45 | 4 | |
| Nickel | 200.8 | 0.2 | 1.0 | 1.1 | 1.1 | 10 | |
| Selenium | 200.8 | 1.0 | ND | ND | ND | - | |
| Silver | 200.8 | 0.02 | ND | ND | ND | - | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### QA/QC Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Coeur Alaska-Kensington
**Project No. :** NA
**Matrix :** Water

**Service Request :** K0811836
**Date Collected :** NA
**Date Received :** NA
**Date Extracted :** 12/09/08
**Date Analyzed :** 12/10/08

Duplicate Summary
Total Metals

**Sample Name :** Batch QC
**Lab Code :** K0811764-002D

**Units :** ug/L (ppb)
**Basis :** NA

| Analyte | Analysis Method | MRL | Sample Result | Duplicate Sample Result | Average | Relative Percent Difference | Result Notes |
|---|---|---|---|---|---|---|---|
| Mercury | 7470A | 0.2 | ND | ND | ND | - | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0811836 |
| **Project Name :** | Coeur Alaska-Kensington | **Date Collected :** | 12/03/08 |
| **Project No. :** | NA | **Date Received :** | 12/06/08 |
| **Matrix :** | Water | **Date Extracted :** | 12/08/08 |
| | | **Date Analyzed :** | 12/09/08 |

Matrix Spike Summary
Dissolved Metals

| | | | |
|---|---|---|---|
| **Sample Name :** | Comet-DR (14343) | **Units :** | ug/L (ppb) |
| **Lab Code :** | K0811836-001S | **Basis :** | NA |

| Analyte | MRL | Spike Level | Sample Result | Spiked Sample Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|
| Aluminum | 50 | 2000 | 195 | 2160 | 98 | 70-130 | |
| Iron | 20 | 1000 | ND | 937 | 94 | 70-130 | |
| Zinc | 10 | 500 | ND | 462 | 92 | 70-130 | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0811836 |
| **Project Name :** | Coeur Alaska-Kensington | **Date Collected :** | NA |
| **Project No. :** | NA | **Date Received :** | NA |
| **Matrix :** | Water | **Date Extracted :** | 12/08/08 |
| | | **Date Analyzed :** | 12/09/08 |

Matrix Spike Summary
Total Metals

| | | | |
|---|---|---|---|
| **Sample Name :** | Batch QC | **Units :** | ug/L (ppb) |
| **Lab Code :** | K0811791-002S | **Basis :** | NA |

| Analyte | MRL | Spike Level | Sample Result | Spiked Sample Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|
| Arsenic | 0.5 | 20 | 1.1 | 20.6 | 98 | 70-130 | |
| Cadmium | 0.02 | 20 | 0.04 | 19.3 | 96 | 70-130 | |
| Chromium | 0.2 | 20 | 0.4 | 19.9 | 98 | 70-130 | |
| Copper | 0.1 | 20 | 4.2 | 22.9 | 94 | 70-130 | |
| Lead | 0.02 | 20 | 0.44 | 19.6 | 96 | 70-130 | |
| Nickel | 0.2 | 20 | 1.0 | 19.7 | 94 | 70-130 | |
| Selenium | 1.0 | 20 | ND | 19.6 | 98 | 70-130 | |
| Silver | 0.02 | 20 | ND | 19.0 | 95 | 70-130 | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### QA/QC Report

| | | | |
|---|---|---|---|
| **Client :** | Columbia Analytical Services,Inc. - Desert | **Service Request :** | K0811836 |
| **Project Name :** | Coeur Alaska-Kensington | **Date Collected :** | NA |
| **Project No. :** | NA | **Date Received :** | NA |
| **Matrix :** | Water | **Date Extracted :** | 12/09/08 |
| | | **Date Analyzed :** | 12/10/08 |

Matrix Spike Summary
Total Metals

| | | | |
|---|---|---|---|
| **Sample Name :** | Batch QC | **Units :** | ug/L (ppb) |
| **Lab Code :** | K0811764-002S | **Basis :** | NA |

| Analyte | MRL | Spike Level | Sample Result | Spiked Sample Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|---|
| Mercury | 0.2 | 1.0 | ND | 1.0 | 100 | 78-122 | |

Comments:

## COLUMBIA ANALYTICAL SERVICES, INC.

### QA/QC Report

**Client :** Columbia Analytical Services,Inc. - Desert
**Project Name :** Coeur Alaska-Kensington
**Project No. :** NA
**Matrix :** Water

**Service Request :** K0811836
**Date Collected :** NA
**Date Received :** NA
**Date Extracted :** 12/08,09/08
**Date Analyzed :** 12/09,10/08

Laboratory Control Sample Summary
Total Metals

**Sample Name :** Laboratory Control Sample
**Lab Code :** K0811836-LCS

**Units :** ug/L (ppb)
**Basis :** NA

| Analyte | Analysis Method | True Value | Result | Percent | CAS Percent Recovery Acceptance Limits | Result Notes |
|---|---|---|---|---|---|---|
| Aluminum | 200.7 | 5000 | 4980 | 100 | 85-115 | |
| Arsenic | 200.8 | 20 | 18.3 | 91 | 85-115 | |
| Cadmium | 200.8 | 20 | 18.5 | 92 | 85-115 | |
| Chromium | 200.8 | 20 | 18.2 | 91 | 85-115 | |
| Copper | 200.8 | 20 | 18.4 | 92 | 85-115 | |
| Iron | 200.7 | 2500 | 2490 | 100 | 85-115 | |
| Lead | 200.8 | 20 | 18.6 | 93 | 85-115 | |
| Mercury | 7470A | 5.0 | 4.8 | 95 | 84-117 | |
| Nickel | 200.8 | 20 | 18.3 | 91 | 85-115 | |
| Selenium | 200.8 | 20 | 17.4 | 87 | 85-115 | |
| Silver | 200.8 | 20 | 18.8 | 94 | 85-115 | |
| Zinc | 200.7 | 1250 | 1180 | 94 | 85-115 | |

Comments:

COEUR
ALASKA
KENSINGTON GOLD MINE

January 30, 2009

Mr. Peter Griffin
USDA Forest Service
Tongass Nat'l Forest
Juneau Ranger District
8465 Old Dairy Road
Juneau, AK 99801

**RE: Kensington Gold Project 2008 Plan of Operations Annual Report.**

Dear Mr. Griffin:

Coeur Alaska is pleased to submit the attached Annual Report for calendar year 2008 as partial fulfillment of the requirements of our Plan of Operations.

Should you have any questions or require clarification regarding the document or on any other issue, please contact me at (907) 529-3309.

Best regards,

C. D. Gill

Clyde Gillespie
Operations Manager

Cc: Kenwyn George, ADEC
John Leeds III, ACOE
Tom Crafford, ADNR
Patti McGrath, EPA
Luke Russell, Coeur

Coeur Alaska, Inc.
3031 Clinton Dr., Suite 202
Juneau, Alaska 99801
Telephone 907.523.3344
Facsimile 907.523.3330
www.KensingtonGold.com