Kensington Mine
2019 Annual Report

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For:
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Table of Contents

Tables

Figures

Attachments

1. Kensington Marine Mammal Report – 2019 Transportation Action Strategy, May 2019, Coeur Alaska, Juneau, AK
2. Terrestrial Wildlife Monitoring Plan – Slate Lakes Basin, January 2019, Coeur Alaska, Juneau, AK
3. Mountain Goat Population Monitoring and movement patterns near the Kensington Mine, Alaska – March, 2019, ADFG
4. 2019 Re-vegetation Test Plot Monitoring Data

References

1. Coeur Alaska, Inc., 2019, Kensington Gold Project NPDES Permit AK-005057-1 Annual Water Quality Monitoring Summary Volume 1: Aquatic Resource Surveys 2019.
2. Coeur Alaska, Inc., 2019, Kensington Gold Project NPDES Permit AK-005057-1 Annual Water Quality Monitoring Summary 2019 Volume 2: Water Quality Data.

Introduction

The Kensington Mine is owned and operated by Coeur Alaska, Inc. (Coeur) a wholly owned subsidiary of Coeur Mining. 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 Figure 1-2). Coeur has prepared this annual report to comply with requirements of the U.S. Forest Service (USFS) Plan of Operations (POO) for the Kensington Mine.

The Kensington Mine 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 issued construction contracts and ground breaking was initiated during July 2005.

Following a suspension of construction activities during the litigation process for the 404 Permit, construction activities at the Tailings Treatment Facility (TTF) that resumed in 2009 were completed in the third quarter of 2010 and operations of the facility began in June of 2010. Gold production operations continued throughout 2019 consistent with the approved POO.

Section 1.0 contains a synopsis of the activities conducted at the Kensington Mine during calendar year 2019, and Section 2.0 contains projections of activities planned for calendar year 2020.

Summary of 2019 Activities

1.0 Public Safety

Public access to the mine 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. Hazards such as truck traffic, blasting, barge and tug operations, and earthwork could result in physical harm to unauthorized visitors.

During 2019, 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

The Tailings Treatment Facility (TTF) Stage 3 construction was completed in 2018 with the exception of the installation of low-level outlet valve on the stage 3 dam which was installed in 2019. Additionally, a second diversion pipeline was installed in 2019.

Construction of a power-house building to house new primary generator engines was completed in 2018. The current generators are planned to be replaced with a new power plant consisting of four (4) new Electro Motive Diesel (EMD) 3728 Kilowatt (kW) diesel-fired engines. One of the four engines will be used as a backup while three operate continuously. Transition from the existing generators to the new EMD generators was completed in the first quarter of 2019.

Graphitic Phyllite that was excavated during the construction of the stage 1 and 2 Tailings Treatment Facility is currently stored in sealed containments at Pit 4 and the Mud dump area. A pug mill plant was commissioned in 2016 and operated in 2019 to help facilitate the mixing of the graphitic phyllite with cement prior to placement into underground open stopes as final disposal of the material. Approximately 14,500 tons of graphitic phyllite was mixed in the pug plant and placed within the underground stopes in 2019.

The majority of the surface disturbance associated with construction was completed in 2005 and 2006 as outlined in the project disturbance summary Table 1. No additional wetlands were filled during 2019. No new disturbance occurred in 2019.

2.1 Storm Water Controls

Operations on both the Jualin and Comet sides of the Kensington Mine were conducted in compliance with the 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, March 2019. Coverage was gained under the new MSGP 2015 general permit number AKR06000 during 2015 and continued in 2019.

Sediment ponds and silt fences were maintained, and existing check dams were also maintained throughout the site. 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.

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. Operational BMP sediment ponds have been implemented throughout the site as described in the site SWPPP.

In addition to SWPPP monitoring and inspections, site receiving water monitoring was also conducted in accordance with the current site APDES permit to further document compliance with state water quality standards. Receiving water sampling data are discussed below under APDES monitoring (section 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 2019 is 77.6 acres. No additional wetland fill occurred in 2019.

2.3 Access Corridors

Road improvements during 2019 were an ongoing priority of the project. Continued road surfacing and interim reclamation seeding were major improvements to the road projects in 2019. The maintenance of storm water BMPs along the Jualin and Kensington access corridors were also a major ongoing priority for 2019.

3.0 Mine Operations

3.1 Ore Production

Mine operations occurred in all 12 months during 2019. Approximately 653,889 tons of ore was mined in 2019.

3.2 Development Rock Production

A total of approximately 276,204 tons of development rock was mined in 2019. Approximately 94,330 tons of development rock was brought to the surface and placed into stockpiles and 181,874 tons were placed underground as backfill. Development rock sample results for 2019 are contained in Table 3.

3.3 Dust Suppression Activities

Road watering was conducted as required via a water wagon to control any fugitive dust. Dust suppression activities occurred on a limited number of occasions during the summer months of 2019.

3.4 Surface and Underground Drilling

A total of 199,347 feet of core drilling was completed in the period of January through December of 2019. The drilling was comprised of production and exploration programs.

The 2019 underground production drilling program included 71,660 feet. This drilling was completed by contracted drilling company using NQ and HQ core drill tooling. This program was accessed in the Kensington up-ramp and down-ramp.

The 2019 underground exploration drilling program total drill footage was 127,687 feet. This was also completed under a drilling contract and used NQ and HQ core tooling. The underground exploration drilling was completed from various exploration drill stations.

The 2019 surface exploration drilling program consisted of seven drill holes for a total drilled footage of 6,365.5 feet. The drilling was completed from three drill pads located on private land.

4.0 Mill Operations

Mill operations occurred in all 12 months during 2019. Approximately 659,957 tons of ore was processed through the mill facility in 2019.

4.1 Gold Production

Approximately 19,169 tons of concentrate was shipped from the Kensington mine to an off-site refinery. Of the 19,317 tons of concentrate shipped off-site, approximately 133,596 ounces of gold was contained.

4.2 Tailing Production

Approximately 273,103 tons of tailings were conveyed to the Tailings Treatment Facility and 333,216 tons of tailings were conveyed to the underground paste plant for disposal in the underground stopes during 2019. Tailings samples were collected in each of the four quarters of 2019 and their results are contained in Table 3.

5.0 Solid/Hazardous Waste Generation and Transport

An Integrated Waste Management and Disposal Plan dated August 2018 provides a description for the disposal of wastes from the Kensington Mine in accordance with the regulations in 18 AAC 60. A Waste Management Permit was issued by ADEC on September 20, 2013 and a three-year administrative extension was issued on November 30, 2018.

Solid waste was generated from the Comet and Jualin sides of the Kensington Mine, including: incinerator ashes, construction debris, worn cable, tires, and scrap metal. This material was managed in accordance with the approved ADEC Waste Management Permit. These materials were shipped to Juneau, then transported to disposal facilities or otherwise managed according to controlling regulations and permits.

Hazardous waste, including Universal waste, generated at the site included:

- Lead/acid, nickel, cadmium, and lithium ion batteries
- Florescent and metal halide lamps
- Paint and paint related waste
- Wastes associated with the assay laboratory
- Water Treatment Plant laboratory waste
- Computer backup power supplies

6.0 Tailings Treatment Facility

Following the favorable decision from the Supreme Court, the Army Corp of Engineers (ACOE) issued Permit Modification POA-1990-592-M6 and lifted the suspension of Permit Modification POA-1190-592-M on August 14, 2009. Construction activities on the tailings treatment facility began after the issuance of the permit modification and continued until the 3rd quarter of 2010 at which time operation of the facility began. Operation of the facility began in June of 2010 and continued throughout 2019.

A Certificate of Approval to Operate a Dam was issued by ADNR on July 23, 2019 for the stage 3 dam raise.

7.0 Compliance

Three Notices of Violations (NOV's) were issued to Coeur Alaska during 2019. All three NOV's were issued by ADEC and were for ARD seepage, APDES discharge, and stormwater discharges. All reporting was completed as required by permit conditions. One component of this document is the reporting of spills. Each spill that occurred during 2019 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 (Table 4).

During the 2019 year, the following four guidelines were updated in various aspects of environmental management at the site to ensure permit compliance:

- Bear Avoidance SOP
- Hazardous and Non-Hazardous Waste Handling SOP
- Spill Response Notification SOP
- Purchasing New Products or Chemicals or Materials SOP

The Intelex tracking system was populated with new and/or revised permit requirements and reminders during 2019. The tracking system sends email reminders to employees responsible for the completion of the permit requirements to ensure site permit compliance.

8.0 Reclamation

No permanent concurrent reclamation was performed in 2019; however, interim seeding stabilization associated with topsoil stockpiles and road ditches was performed as a BMP under the approved SWPPP plan.

Approval was issued by the Forest Service and State of Alaska for the revised reclamation plan dated April 2013. A financial guarantee in the amount of $28,727,011 was submitted and approved by the Forest Service in 2013. An amendment was approved by ADNR for the Pit-4 waste rock stockpile and an additional financial guarantee for $195,988 was posted on October 2, 2017 for the reclamation plan amendment. No amendments were completed in 2019.

8.1 Revegetation Test Plots

Revegetation test plots were constructed in July of 2013 in the Snow-Slide Gulch area to evaluate the reclamation methods proposed in the reclamation and closure plan. Reclamation test plot monitoring was conducted early summer through late fall of 2019. All sites demonstrated stable conditions with slight to no erosion noted. When compared to 2018, in 2019 slightly more coverage occurred. The highest percent coverage in 2019 was 100, whereas in 2018 the greatest percent cover was 95. Plot #3 demonstrated the greatest percent coverage with a peak of 100. However, the majority of the coverage can be attributed to alder establishment. As suspected, Plot #3 also demonstrated the highest consistent stability of the three plots. Plot #1 demonstrated the second highest percentage of grass growth and the second most stable soil. In 2019, Plot #2 exhibited the least amount of grass growth and the least stable soil conditions. These results are consistent with 2018. The monitoring results are contained in attachment 4. On-going monitoring of the test plots are planned for 2020.

9.0 Monitoring

9.1 APDES

The Alaska Pollutant Discharge Elimination System (APDES) permit number AK0050571 was renewed in 2017 with the new permit being issued on August 1, 2017. A modification to the permit was issued on August 5, 2019. Results of the extensive monitoring program are contained in the Kensington Gold Project APDES permit AK-005057-1 Volume 1: Aquatic Resource Surveys and Volume 2: Water Quality Data of the APDES Annual Water Quality Monitoring Summary 2019 (Coeur, 2019). These reports 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 APDES permit are summarized in the Kensington Gold Project APDES Permit AK-005057-1 Annual Water Quality Monitoring Summary 2019 Volume 2. Water Quality Data are inclusive of the requirements under the USFS POO. This report will be submitted to the Forest Service, Juneau and the Alaska Department of Environmental Conservation (ADEC) under separate cover, as the APDES 2019 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 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 APDES Permit AK-005057-1 Annual Water Quality Monitoring Summary Volume 1: Aquatic Resource Surveys 2019.

Adult salmon escapement surveys were performed in 2019 on Sherman, Slate, and Johnson Creeks. Tabulations of these data are presented in the Kensington Gold Project APDES Permit AK-005057-1 Annual Water Quality Monitoring Summary Volume 1: Aquatic Resource Surveys 2019. These reports will be submitted to the Forest Service, Juneau under separate cover.

9.5 Marine

The Forest Service Plan of Operations Appendix 4.d. contains a marine monitoring program for Berners Bay.

Between April 24 and May 14, one hundred and twenty-six marine mammal observation surveys were completed aboard the M/V Majestic Fjord (see Table 2). The official eulachon run transportation regulations as determined by Coeur Alaska and NMFS were put into effect on April 24, 2019. Special measures taken during the eulachon run included: having a marine observer on the vessel during all trips and maintaining a maximum speed of 13 knots within Berners Bay. Regular transit speed is approximately 21-25 knots. Transportation vessel trips during the eulachon run were limited to three trips daily (see Table 1). No more than three round trips per day were conducted during the 2019 eulachon spawning window.

A total of 127 Steller sea lions were counted during the observation period; 97 of these sightings (89.3%) occurred within Berners Bay. The vast majority (99.2%) of the 516 harbor seal sightings also occurred within Berners Bay. Most of these sightings were at pinniped haul out areas, such as the entrance to Slate Cove and Point Saint Mary. Gatherings of over 25 harbor seals on haul outs were observed. Pinniped activity was highest on May 5 through May 10. No recordable encounters with marine mammals occurred during the 2019 eulachon spawning season. Please refer to Attachment 1 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 occurred in 2019.

Archaeological testing, monitoring, and data recovery activities were conducted at the Kensington-Jualin mine during 2013. A final report was submitted in January 2016.

Training was conducted for all new employees as part of the new-hire environmental awareness training program in 2019. Additionally, all contract workers were provided this training as part of the environmental awareness training program. Newly hired employees and contract workers are not allowed to work on-site until they received this training. The training clearly stated Coeur's policy regarding unauthorized collections from private and public lands. Approximately 550 hours of training, which included the Cultural Resource training was conducted in 2019 with employees and contractors.

9.8 Tailings Treatment Facility Ecological Monitoring Plan

The Tailings Treatment Facility Ecological Monitoring Plan was revised in June 2013 and an approval of the plan was received from the Forest Service in June of 2013. The tailings habitability study was commenced in August of 2013 as described in the approved plan. On-going monitoring was conducted by AK Fish and Game in 2019 and results will be presented in the Kensington Gold Project APDES permit AK-005057-1 Volume 1: Aquatic Resource Surveys (Coeur, 2019).

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 located around the 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 1.

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 sample results for 2019 are contained in Table 3. Development rock acid-base accounting results indicate minimal potential to generate acid rock drainage.

Quarterly tailings sample results for acid base accounting is contained in Table 3. Acid-base accounting results indicate that the tailings solids are net-neutralizing, thus minimal potential exists for acid rock drainage.

The following background information is included in the SEIS for the site development rock and tailings:

Waste Rock:
SAIC (1997) compiled ABA results for 108 samples originally reported by Geochemica Inc. and Kensington Venture (1994) and SRK (1996b) (Figure 3-1). Seventy-five samples were representative of waste rock in the expected development area (Group 1A and 1B samples), while the remainder represented waste rock from nearby areas outside the expected development area (Group 2 samples). All samples had NP:AP values exceeding 3, and 42 of the 75 Group 1 samples had NP:AP values greater than 50, indicating minimal potential to generate acid rock drainage.

Tailings:
Acid-base accounting tests showed the tailing solids to be net-neutralizing. As sulfide is removed from the tailings during processing, this material is more strongly neutralizing than waste rock produced during project operations (SRK, 1996b). Montgomery Watson (1996b) determined the total sulfur content to be 0.04 percent, corresponding to an NP: AP of 83, while SRK (1996b) measured total sulfur content of 0.02 percent, corresponding to an NP:AP of 166. As is the case for ore and waste rock characterization, potential acidity was conservatively determined based on total sulfur, rather than sulfide sulfur, concentration.

The ABA results for the current development rock and tailings are consistent with what was seen in the background samples as they all have a very high neutralization potential to acid potential. All samples had NPR values, calculated as NP/AP, exceeding 2. According to the Mine Environment Neutral Drainage Program, samples with an NPR>2 are considered non-acid forming.

9.11 Construction/Excavation Dewatering (Non-Stormwater)

No construction/excavation dewatering (Non-Stormwater) occurred at the site during 2019.

Groundwater intercepted in the mine workings is treated and discharged to Sherman creek. This discharge is authorized under ADEC APDES permit AK-005057-1.

Tailings water was decanted and pumped from the TTF to the TTF Water Treatment Plant (WTP) where it was treated and discharged to East Fork of Slate Creek. This discharge is authorized under ADEC APDES permit AK-005057-1.

9.12 Tailings Treatment Facility Monitoring

Monitoring of the TTF was conducted according to the approved Operation and Maintenance (O&M) manual dated May 31, 2019. The O & M Manual describes procedures for operating the Lower Slate Lake Tailings Dam under normal and extreme reservoir level and flow conditions. Additionally, the O&M manual describes the daily, weekly and quarterly inspections that are required to be conducted at the dam along with any actions and maintenance activities that are necessary as a result of the inspection observations.

9.13 Wildlife

9.13.1 ADFG Goat Monitoring

Mountain goat monitoring in the Lions Head Mountain area associated with the Kensington Mine has been conducted intermittently since the late 1980's, in part to help determine potential future mine impacts on this population. The latest ADFG goat study is included as Attachment 3. Additionally, ADFG is planning on presenting the results of the study at the annual project meeting.

9.13.2 Terrestrial Wildlife Monitoring – Slate Lakes Basin

Wildlife Monitoring was conducted during 2019 in accordance with the Kensington Project Terrestrial Wildlife Monitoring Plan. This plan was designed to ensure that environmental impacts to wildlife resources in the Slate Lakes basin area are mitigated during both construction and operation of the Kensington Project and that the reclamation process includes a plan to support and encourage use by local wildlife. See Attachment 2 for the 2019 Terrestrial Wildlife Report.

10.0 Avalanche Safety Plan

Coeur Alaska maintains an avalanche hazard awareness and mitigation safety plan during the winter season. A qualified Avalanche Program Coordinator is 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 has been conducted at the site. 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 2019, minimal active control work was required or performed due to the limited quantity of snowfall during the year. During the 2019 reporting period,

- Areas of avalanche risk were placarded
- Crews were informed of avalanche hazards and the appropriate responses to those hazards
- Avalanche rescue equipment was located on-site
- Crews were trained in their role in avalanche rescue operations and the use of the rescue equipment – as appropriate

During the reporting period, site activities were not curtailed as a result of identified avalanche hazards and no personnel were caught or injured in avalanches.

11.0 Dam Safety Oversight Status

A Certificate of Approval to Operate a Dam for the stage 3 dam was issued by Department of Natural Resources (DNR) – Alaska Dam Safety (ADS) on July 23, 2019.

An Annual Performance Report dated October 22, 2019 was prepared by Golder Associates for the Lower Slate Lake Tailings Dam. This report was submitted to DNR - ADS in 2019.

Projected Activities for 2020

Key Issues and Permitting Activities

Graphitic Phyllite that was excavated during the construction of the stage 1 and 2 Tailings Treatment Facility are currently stored in sealed containments at Pit 4 and the Mud dump area. A pug mill plant was commissioned in 2016 and approximately 14,500 tons of graphitic phyllite was mixed with cement and placed in underground stopes in 2019. The remaining graphitic phyllite that is currently being temporarily stored in the sealed containments is planned to be mixed with cement and waste rock in the pug plant and placed into open stopes as backfill.

Four field-scale test cells were constructed in August of 2013 to assess the environmental stability of the graphitic phyllite material. The testing program is aimed at providing an evaluation of the weathering behavior of the graphitic phyllite present at the TTF west abutment under ambient conditions. On-going water quality monitoring of these field cells occurred during 2019.

1.0 Public Safety

No revisions to the Public Access Control Plan are contemplated for 2019.

2.0 Mine Operations

Ore production is planned throughout the entire year of 2020.

On-going construction of the Jualin exploration portal and down ramp will continue throughout 2020 in order to access a mineralized vein system. This vein system lies between the historic Jualin workings developed in the early 1920's, and the existing Kensington portal system. On-going exploration drilling from the exploration development will continue in 2020.

3.0 Mill Operations

Mill Operations are planned to be at full production throughout 2020.

4.0 Tailings Treatment Facility

A Certificate of Approval to Operate a Dam was issued by ADNR on July 23, 2019 for the stage 3 dam raise. The Tailings Treatment Facility (TTF) Stage 3 construction was completed in 2018 with the exception of the installation of low-level outlet valve on the stage 3 dam which was installed in 2019. Additionally, a second diversion pipeline was installed in 2019. No additional construction is planned at the TTF during 2020. On-going monitoring of the facility will continue at the TTF in 2020.

5.0 Access Corridors

Most access road and corridor upgrades were completed in 2006. Road maintenance of the access corridors will continue in 2020.

6.0 Reclamation

No final reclamation is anticipated to occur in 2020. On-going monitoring of the revegetation test plots will continue throughout 2020.

7.0 Surface Exploration

A five-year surface exploration work plan was submitted to the Forest Service in April 2017 for the 2018 through 2022 drilling seasons and an Environmental Assessment was completed in April 2018 for the five drilling seasons. Surface exploration drilling is planned to be conducted during 2020.

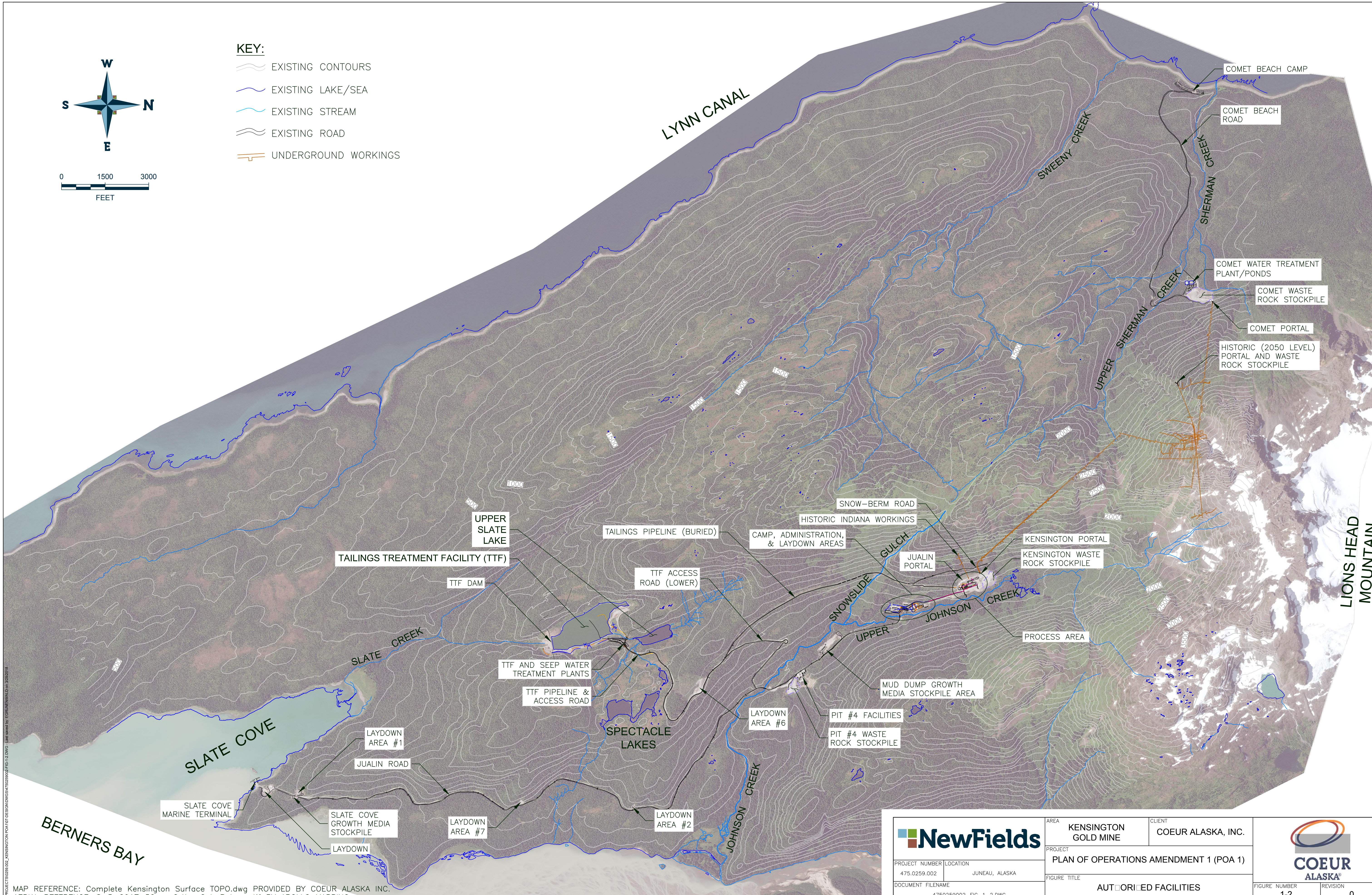
8.0 Proposed Modifications to Monitoring Plans for 2019

No further revisions to the monitoring plans are anticipated for 2020.

9.0 Bonding

A financial guarantee in the amount of $29,607,114 was submitted and approved by the Forest Service in 2013. An additional financial guarantee in the amount of $1,096,894 was posted in January 2019 to account for inflation for the three-year extension of the reclamation plan and cost estimate. No additional modifications to the bond are planned for 2020.

Figures



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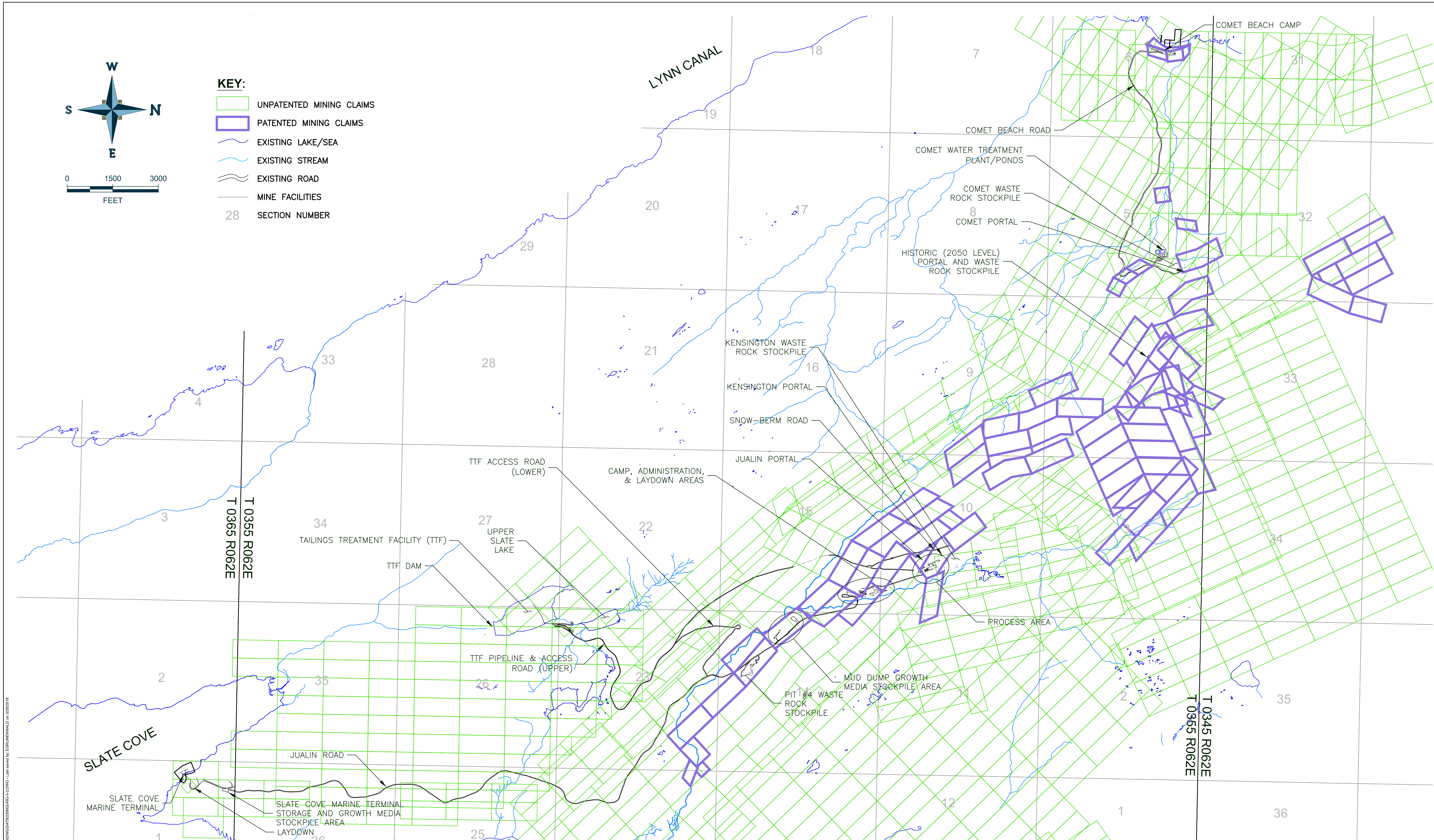
COEUR ALASKA®



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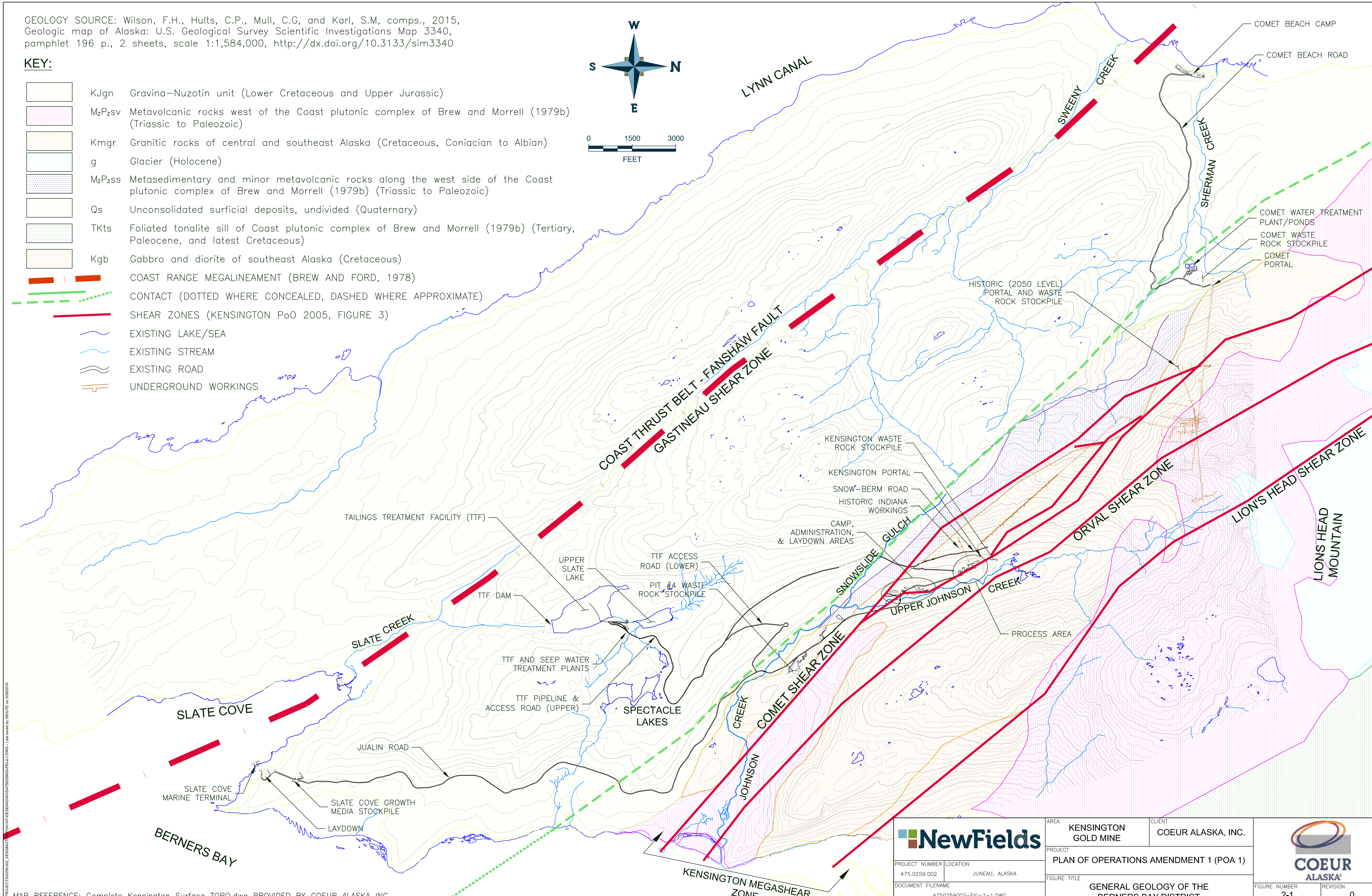

GEOLOGY SOURCE: Wilson, F.H., Hults, C.P., Mull, C.G, and Karl, S.M, comps., 2015, Geologic map of Alaska: U.S. Geological Survey Scientific Investigations Map 3340, pamphlet 196 p., 2 sheets, scale 1:1,584,000, http://dx.doi.org/10.3133/sim3340
KEY:
KJgn Gravina–Nuzotin unit (Lower Cretaceous and Upper Jurassic)
MzPzsv Metavolcanic rocks west of the Coast plutonic complex of Brew and Morrell (1979b) (Triassic to Paleozoic)
Kmgr Granitic rocks of central and southeast Alaska (Cretaceous, Coniacian to Albian)
g Glacier (Holocene)
MzPzss Metasedimentary and minor metavolcanic rocks along the west side of the Coast plutonic complex of Brew and Morrell (1979b) (Triassic to Paleozoic)
Qs Unconsolidated surficial deposits, undivided (Quaternary)
TKts Foliated tonalite sill of Coast plutonic complex of Brew and Morrell (1979b) (Tertiary, Paleocene, and latest Cretaceous)
Kgb Gabbro and diorite of southeast Alaska (Cretaceous)
COAST RANGE MEGALINEAMENT (BREW AND FORD, 1978)
CONTACT (DOTTED WHERE CONCEALED, DASHED WHERE APPROXIMATE)
SHEAR ZONES (KENSINGTON PoO 2005, FIGURE 3)
EXISTING LAKE/SEA
EXISTING STREAM
EXISTING ROAD
UNDERGROUND WORKINGS
W
S
N
E
0
1500
3000
FEET
LYNN CANAL
SWEENY CREEK
COMET BEACH CAMP
COMET BEACH ROAD
SHERMAN CREEK
COMET WATER TREATMENT PLANT/PONDS
COMET WASTE ROCK STOCKPILE
COMET PORTAL
HISTORIC (2050 LEVEL) PORTAL AND WASTE ROCK STOCKPILE
COAST THRUST BELT - FANSHAW FAULT
GASTINEAU SHEAR ZONE
KENSINGTON WASTE ROCK STOCKPILE
KENSINGTON PORTAL
SNOW–BERM ROAD
HISTORIC INDIANA WORKINGS
CAMP, ADMINISTRATION, & LAYDOWN AREAS
SNOWSLIDE GULCH
TAILINGS TREATMENT FACILITY (TTF)
UPPER SLATE LAKE
TTF ACCESS ROAD (LOWER)
PIT #4 WASTE ROCK STOCKPILE
TTF DAM
UPPER JOHNSON CREEK
PROCESS AREA
ORVAL SHEAR ZONE
LION'S HEAD SHEAR ZONE
LIONS HEAD MOUNTAIN
SLATE CREEK
TTF AND SEEP WATER TREATMENT PLANTS
TTF PIPELINE & ACCESS ROAD (UPPER)
SPECTACLE LAKES
COMET SHEAR ZONE
CREEK
JOHNSON
SLATE COVE
JUALIN ROAD
SLATE COVE MARINE TERMINAL
SLATE COVE GROWTH MEDIA STOCKPILE
LAYDOWN
BERNERS BAY
KENSINGTON MEGASHEAR ZONE
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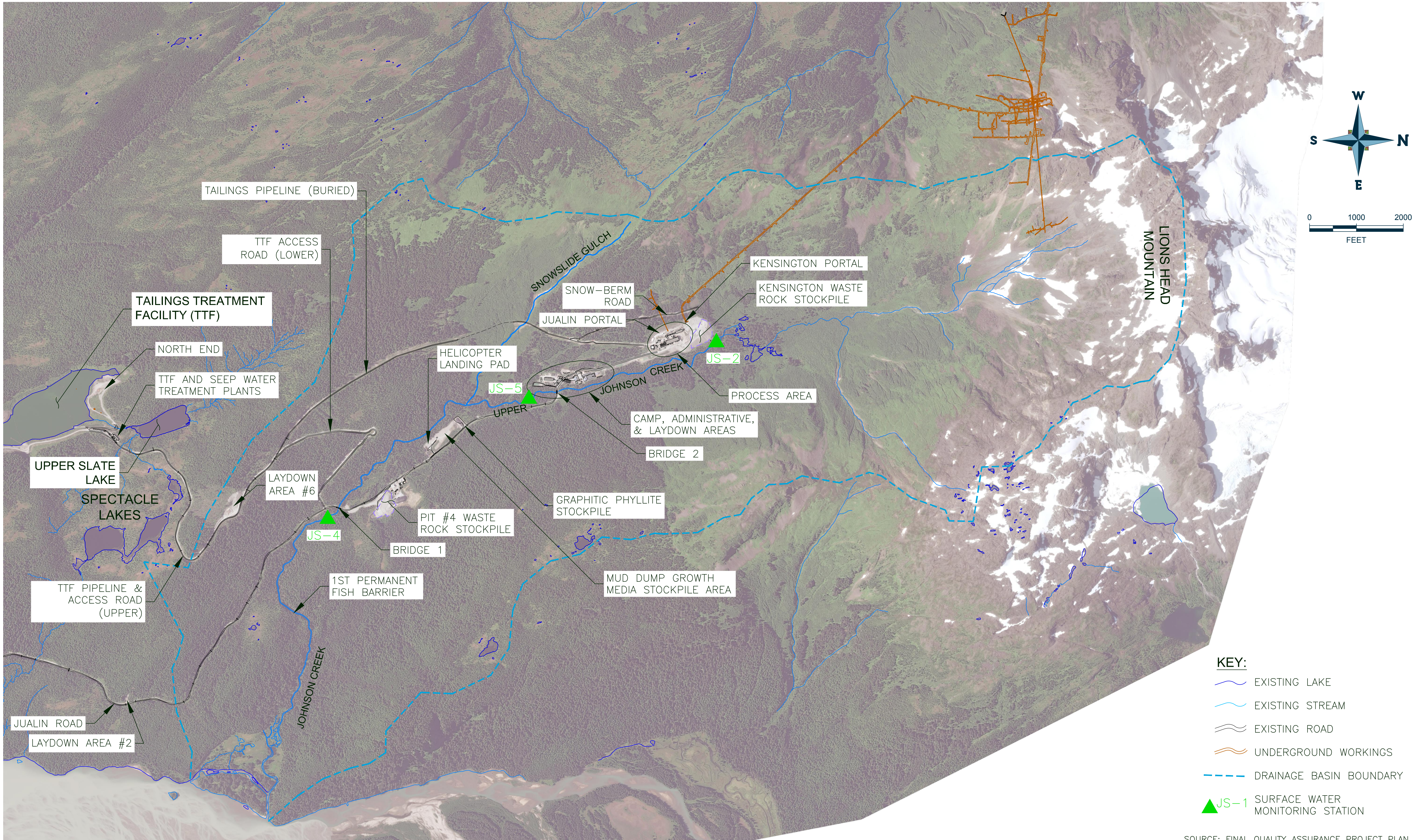
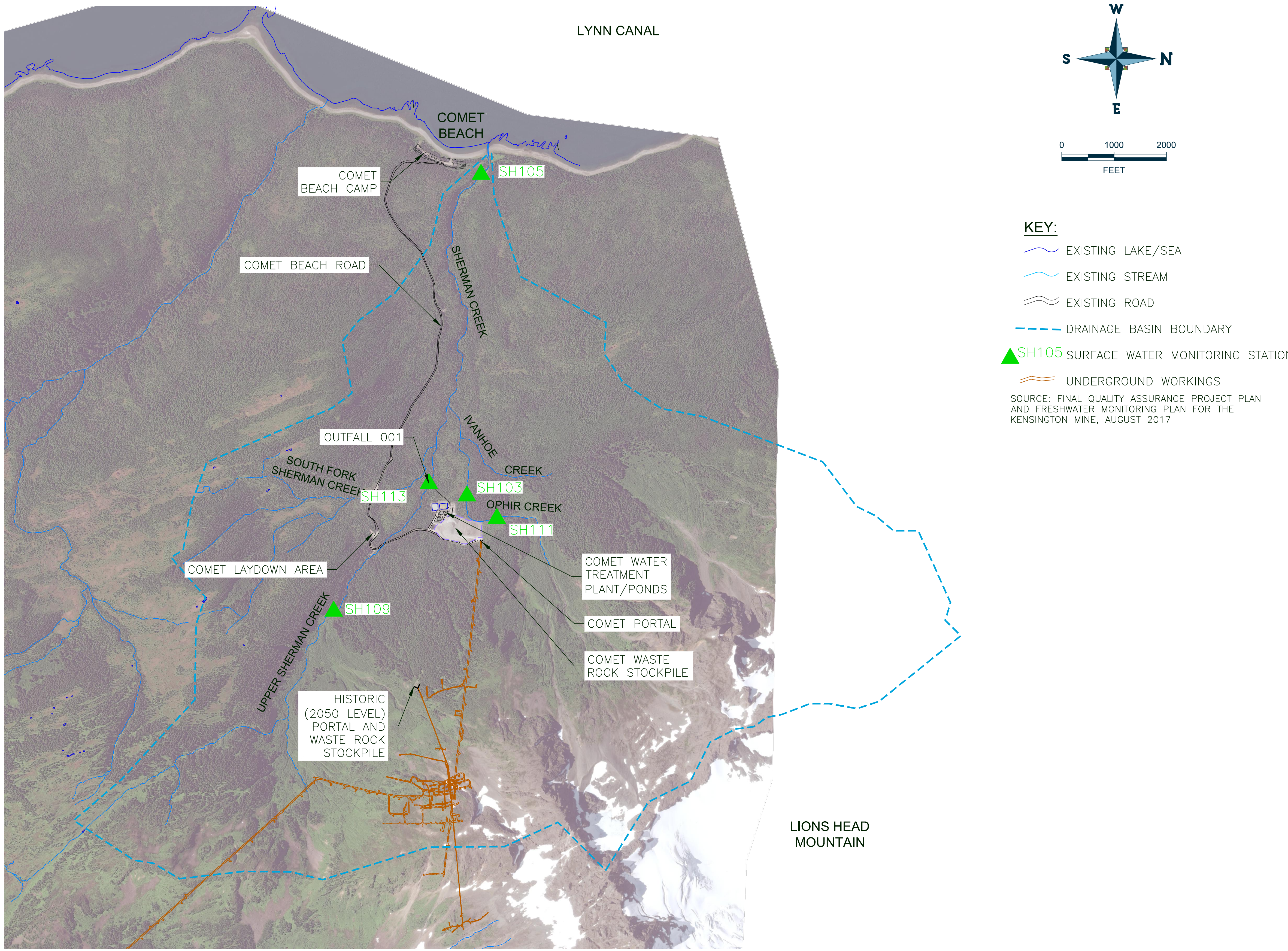
COEUR ALASKA



SOURCE: FINAL QUALITY ASSURANCE PROJECT PLAN AND FRESHWATER MONITORING PLAN FOR THE KENSINGTON MINE, AUGUST 2017

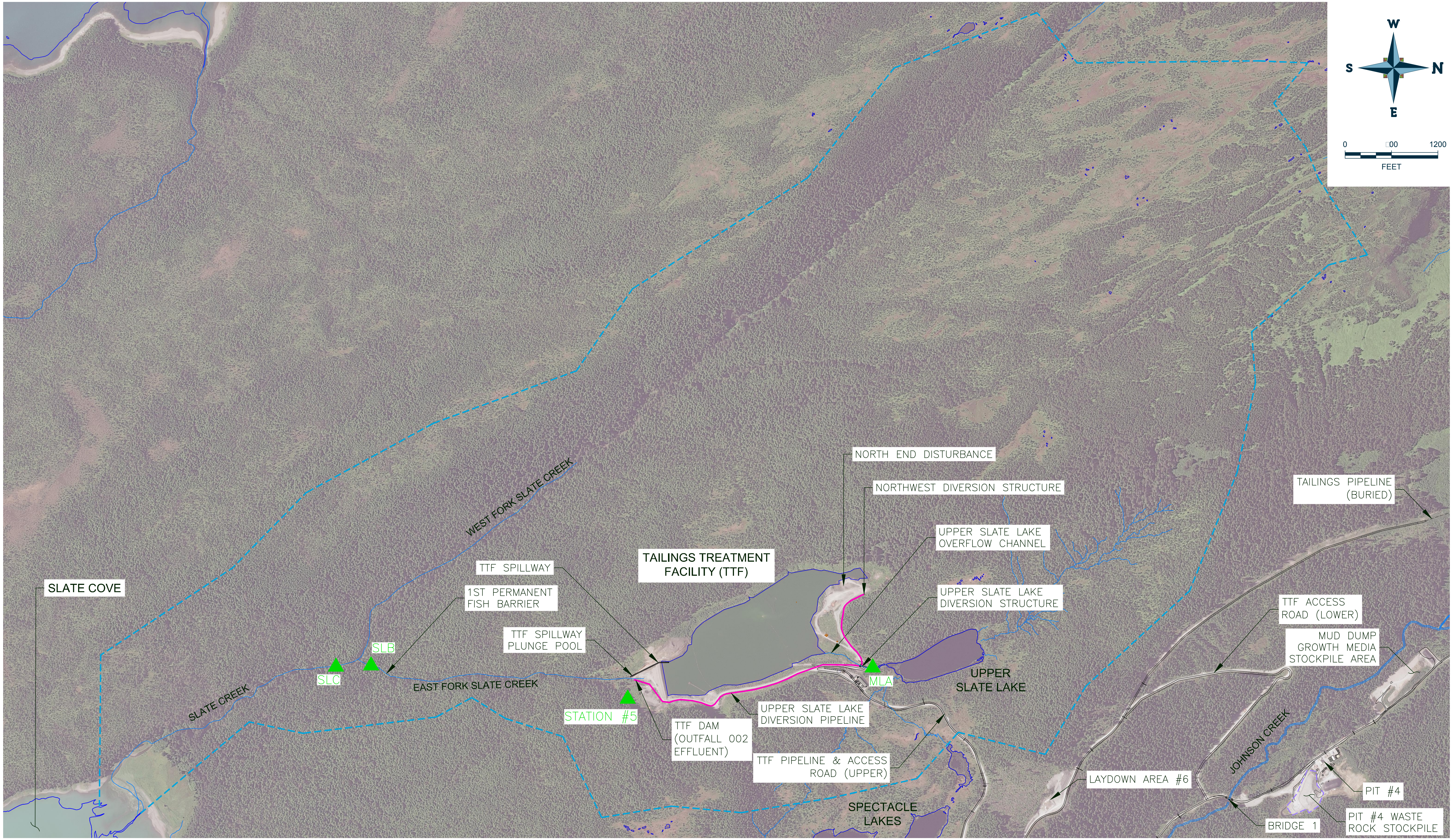
MAP REFERENCE: Complete Kensington Surface TOPO.dwg PROVIDED BY COEUR ALASKA INC.
AERIAL REFERENCE: 8-5-2017_50cm_Ortho_ColorBalance.tif BY APOLLO MAPPING

NewFields		AREA: KENSINGTON GOLD MINE	CLIENT: COEUR ALASKA, INC.	COEUR ALASKA
PROJECT NUMBER: 475.0259.002	LOCATION: JUNEAU, ALASKA	PROJECT: PLAN OF OPERATIONS AMENDMENT 1 (POA 1)		
DOCUMENT FILENAME: 4750259002-FIG-2-2.DWG		FIGURE TITLE: JOHNSON CREEK DRAINAGE MONITORING STATIONS		FIGURE NUMBER: 2-2 / REVISION: 0



MAP REFERENCE: Complete Kensington Surface TOPO.dwg PROVIDED BY COEUR ALASKA INC.
AERIAL REFERENCE: 8-5-2017_50cm_Ortho_ColorBalance.tif BY APOLLO MAPPING

NewFields	AREA: KENSINGTON GOLD MINE	CLIENT: COEUR ALASKA, INC.	COEUR ALASKA
PROJECT NUMBER: 475.0259.002 / LOCATION: JUNEAU, ALASKA	PROJECT: PLAN OF OPERATIONS AMENDMENT 1 (POA 1)		
DOCUMENT FILENAME: 4750259002-FIG-2-3.DWG	FIGURE TITLE: S□ERMAN CREEK DRAINAGE MONITORING STATIONS		FIGURE NUMBER: 2-3 / REVISION: 0



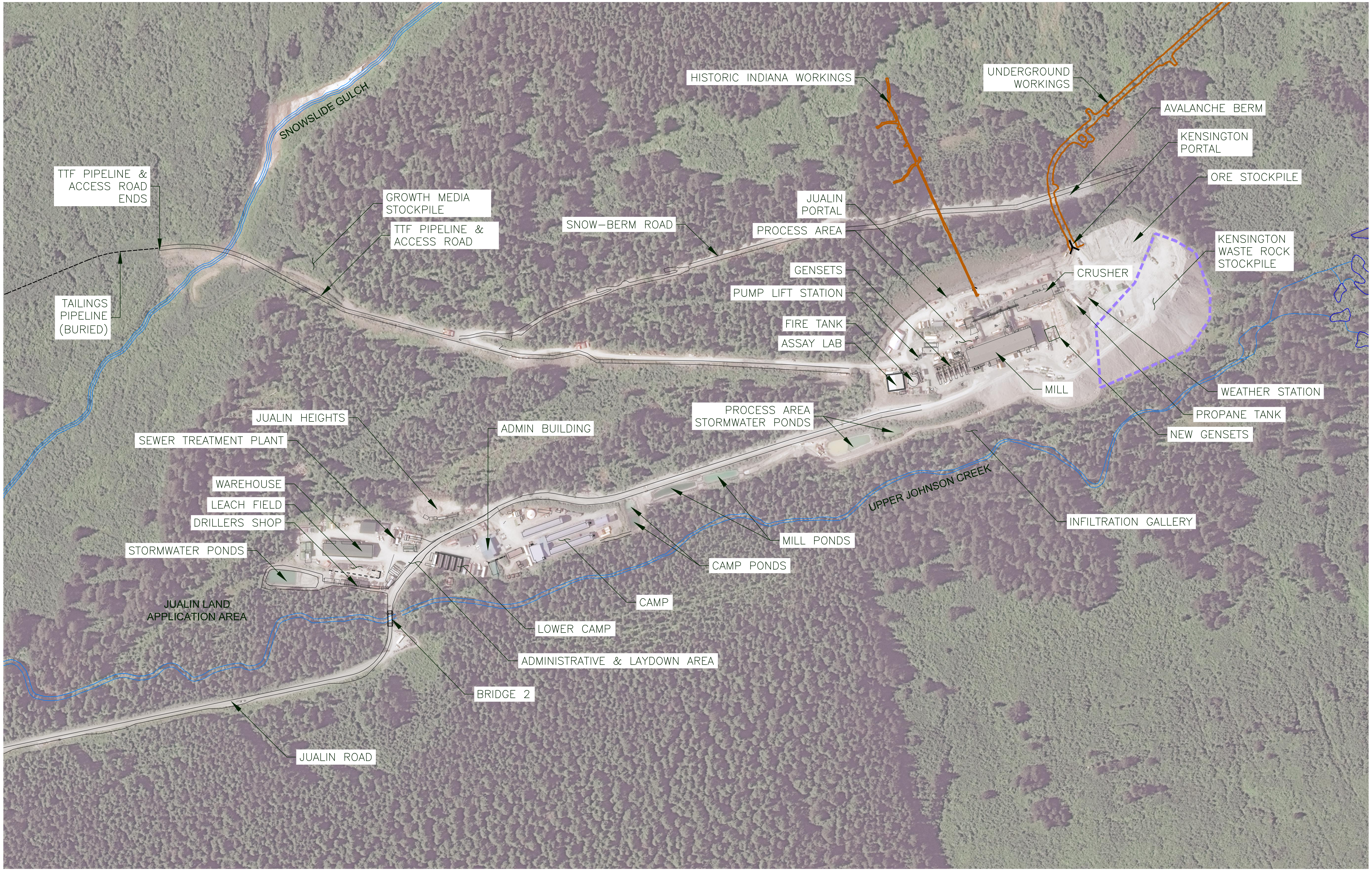
KEY:

- EXISTING LAKE
- EXISTING STREAM
- EXISTING ROAD
- DIVERSION PIPELINE
- DRAINAGE BASIN BOUNDARY
- JS-1 SURFACE WATER MONITORING STATION

SOURCE: FINAL QUALITY ASSURANCE PROJECT PLAN AND FRESHWATER MONITORING PLAN FOR THE KENSINGTON MINE, AUGUST 2017

MAP REFERENCE: Complete Kensington Surface TOPO.dwg PROVIDED BY COEUR ALASKA INC.
AERIAL REFERENCE: 8-5-2017_50cm_Ortho_ColorBalance.tif BY APOLLO MAPPING

NewFields	AREA: KENSINGTON GOLD MINE	CLIENT: COEUR ALASKA, INC.
PROJECT NUMBER: 475.0259.002 / LOCATION: JUNEAU, ALASKA	PROJECT: PLAN OF OPERATIONS AMENDMENT 1 (POA 1)	COEUR ALASKA
DOCUMENT FILENAME: 4750259002-FIG-2-4.DWG	FIGURE TITLE: SLATE CREEK DRAINAGE MONITORING STATIONS	FIGURE NUMBER: 2-4 / REVISION: 0



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KEY:

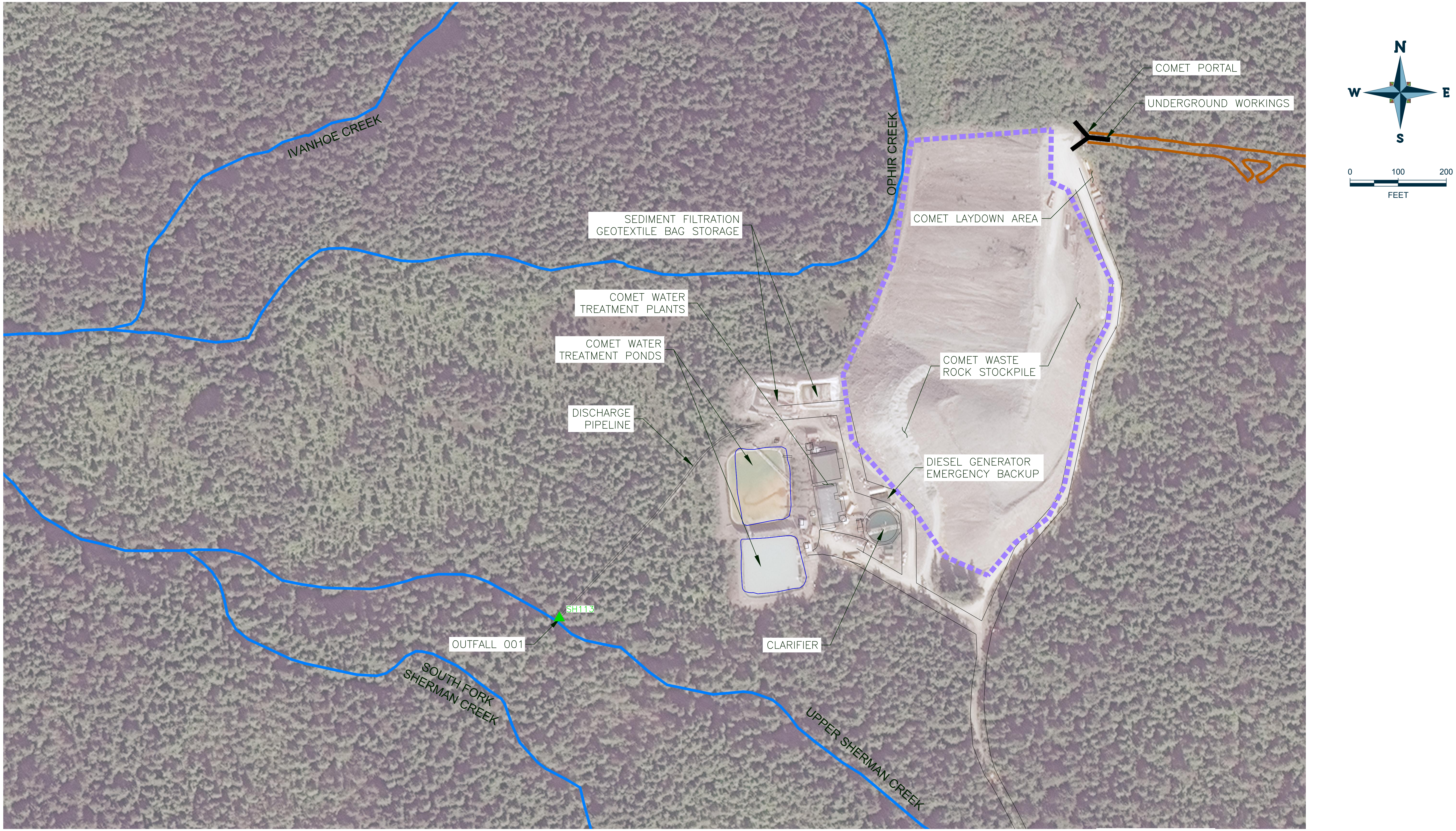
- EXISTING LAKE
- EXISTING STREAM
- EXISTING ROAD
- UNDERGROUND WORKINGS
- WASTE ROCK STORAGE

MAP REFERENCE: Complete Kensington Surface TOPO.dwg PROVIDED BY COEUR ALASKA INC.
AERIAL REFERENCE: 8–5–2017_50cm_Ortho_ColorBalance.tif BY APOLLO MAPPING

NewFields

AREA	KENSINGTON GOLD MINE
CLIENT	COEUR ALASKA, INC.
PROJECT	PLAN OF OPERATIONS AMENDMENT 1 (POA 1)
PROJECT NUMBER	475.0259.002
LOCATION	JUNEAU, ALASKA
DOCUMENT FILENAME	4750259002–FIG–3–1.DWG
FIGURE TITLE	E□ISTING FACILITIES - JUALIN AREA DETAIL
FIGURE NUMBER	3-1
REVISION	0

COEUR ALASKA®



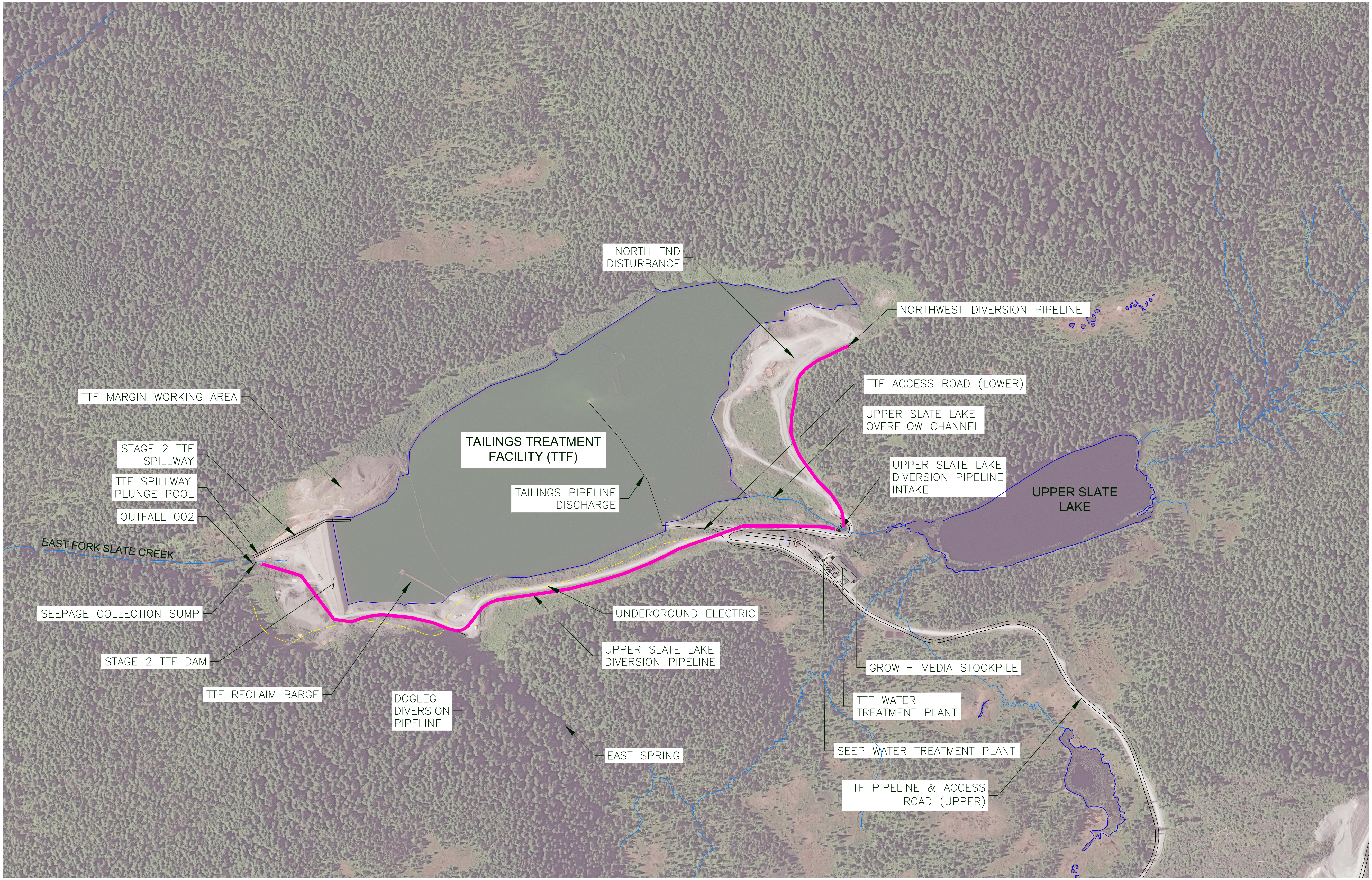
KEY:

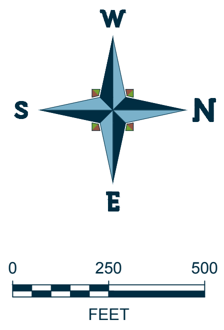
- EXISTING LAKE
- EXISTING STREAM
- EXISTING ROAD
- UNDERGROUND WORKINGS
- WASTE ROCK STORAGE

MAP REFERENCE: Complete Kensington Surface TOPO.dwg PROVIDED BY COEUR ALASKA INC.
AERIAL REFERENCE: 8-5-2017_50cm_Ortho_ColorBalance.tif BY APOLLO MAPPING

NewFields	
AREA	KENSINGTON GOLD MINE
CLIENT	COEUR ALASKA, INC.
PROJECT	PLAN OF OPERATIONS AMENDMENT 1 (POA 1)
PROJECT NUMBER	475.0259.002
LOCATION	JUNEAU, ALASKA
DOCUMENT FILENAME	4750259002-FIG-3-2.DWG
FIGURE TITLE	E□ISTING FACILITIES - COMET AREA DETAIL
FIGURE NUMBER	3-2
REVISION	0

COEUR ALASKA®





KEY:

- EXISTING LAKE
- EXISTING STREAM
- EXISTING ROAD
- EXISTING ALCAN POWERLINE
- EXISTING DIVERSION PIPELINE

MAP REFERENCE: Complete Kensington Surface TOPO.dwg PROVIDED BY COEUR ALASKA INC.
AERIAL REFERENCE: 8-5-2017_50cm_Ortho_ColorBalance.tif BY APOLLO MAPPING

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NewFields	AREA: KENSINGTON GOLD MINE	CLIENT: COEUR ALASKA, INC.	COEUR ALASKA
PROJECT NUMBER: 475.0259.002 / LOCATION: JUNEAU, ALASKA	PROJECT: PLAN OF OPERATIONS AMENDMENT 1 (POA 1)		
DOCUMENT FILENAME: 4750259002-FIG-3-3.DWG	FIGURE TITLE: E□ISTING FACILITIES - SLATE LAKES AREA DETAIL		FIGURE NUMBER: 3-3 / REVISION: 0

KEY:
EXISTING WRS
EXISTING STREAM

MAP REFERENCE: Complete Kensington Surface TOPO.dwg PROVIDED BY COEUR ALASKA INC.
AERIAL REFERENCE: 8-5-2017_50cm_Ortho_ColorBalance.tif BY APOLLO MAPPING

NewFields

AREA: KENSINGTON GOLD MINE	CLIENT: COEUR ALASKA, INC.
PROJECT NUMBER: 475.0259.002	LOCATION: JUNEAU, ALASKA
PROJECT: PLAN OF OPERATIONS AMENDMENT 1 (POA 1)	
DOCUMENT FILENAME: 4750259002-FIG-3-4.DWG	FIGURE TITLE: EXISTING FACILITIES - PIT #4 DETAIL
FIGURE NUMBER: 3-4	REVISION: 0

COEUR ALASKA

AERIAL REFERENCE: 8-5-2017_50cm_Ortho_ColorBalance.tif BY APOLLO MAPPING

NewFields	AREA: KENSINGTON GOLD MINE	CLIENT: COEUR ALASKA, INC.	COEUR ALASKA	
PROJECT NUMBER: 475.0259.002	LOCATION: JUNEAU, ALASKA	PROJECT: PLAN OF OPERATIONS AMENDMENT 1 (POA 1)		
DOCUMENT FILENAME: 4750259002-FIG-3-5.DWG		FIGURE TITLE: E□ISTING FACILITIES - SLATE CO□E MARINE TERMINAL DETAIL	FIGURE NUMBER: 3-5	REVISION: 0

Tables

Table 1 Kensington Mine - Surface Disturbance

Mine Facilities		Existing Parcel Disturbance Area
Parcel Number	Name	Acres
1	Comet Beach Camp	1.8
2	Comet Beach Road	5.9
3	Comet Laydown Area	0.4
4	Comet Waste Rock Stockpile	9.5
5	Comet Water Treatment Plant/Ponds	3.2
7	Historic 2050 Level Portal Development and Waste Rock Storage	1.5
8	Process Area	14.5
8A	Snow Berm Road	3.2
9	Kensington Waste Rock Storage	4.7
11	Storm Water Ponds	2.5
12	Pumphouse	0.1
13	Jualin Road & Ponds	25.6
14	Bulk Fuel Depot	0.8
15	Warehouse Area	3.4
16	Jualin Laydown #3	0.5
17	Administration Area	3.4
18	Laydown Area #1	2.1
19	Laydown Area #2	0.5
20	Pit #4 Waste Rock Stockpile	11.1
22 & 23	TTF Access Road (Upper and Lower)	14.2
24	Tailings Treatment Facility (TTF)	60.2
25	TTF Margin Working Area	15.9
27	TTF Pipeline & Access Road	13.2
28	TTF Dam Plunge Pool Area & Graphitic Phyllite Remediation	7.2
29A	Slate Creek Cove Marine Terminal Storage and Growth Media Stockpile Area	4.2
29B	Slate Cove Marine Terminal	0.7
31	Mud Dump Growth Media Stockpile Area	6.9
32	Laydown Area #6	2.7
33	Laydown Area #7	0.5
34	Slate Cove Growth Media Stockpile	1.8
36	TTF and Seep Water Treatment Plants (WTPs)	1.4
38	Land Application Area	15.7
Total Acres		**239.3**

Note:

Parcel 38 for land application area covers 15.7 acres but that acreage is not disturbed.

Table 2 - Kensington Gold Project – Wetlands Disturbance

Area	Description	Status 2018	Permitted Acres of Fill in Waters of the U.S. per 2005 Permit Table 1	Actual Waters of U.S. Acres Filled as of December 2019	Requested Acres of Total Fill in Waters of the U.S. 2009 update	Fill Volume (Cubic Yards)	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	0	0	NA
3	Kensington Borrow Pit #1	Not built	0.3	0	0	0	NA
4	Kensington Development Rock Stockpile Expansion	Existing / Permitted	5.1	4.5	4.5	220,000	8
5	Kensington Water Treatment Plant & Ponds and Expansion Area	Existing / Permitted	2.6	2.9	3.5	85,000	3.5
6	Kensington Snow / Topsoil Stockpile	Existing / Permitted	2.1	0	2.1	10,000	2.1
7	Kensington 2050 Level Portal Dev. Rock Storage	Existing / Permitted	0	0	0	0	0
8	Jualin Process Area	Built	1.1	2.0	2.0	97,000	NA
8A	Jualin Avalanche Berms & Road	Partially built		0.3	0.3	23,000	NA
9/9A	Jualin Development Rock Storage	Mostly Built	4.3	2.5	2.5	121,000	1.7
10	Jualin Storm Water Treatment Pond	Built	0	0.1	0.1	1,500	NA
11	Jualin Process Area Snow/Topsoil Stockpile	Built	0	0.2	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	7.7	7.7	37,000	0.6
14	Jualin Laydown #1	Built	0.4	0	0	0	NA
15	Jualin Laydown #2	Built	3.5	0	0	0	NA
16	Jualin Laydown #3	Built	0.8	0	0	0	NA
17	Jualin Admin. Area	Built	2.5	0.1	0.1	1,500	2.5
18	Jualin Borrow Source #1	Built	0	0	0		0.2
19	Jualin Borrow Source #2	Built	0.1	1.1	1.1	10,500	
20	Jualin Borrow Source #3	Built	2.4	1.2	1.2	11,500	6.0
21	Jualin Borrow Source #4	Not built	0.7	0	0	0	NA

Area	Description	Status 2018	Permitted Acres of Fill in Waters of the U.S. per 2005 Permit Table 1	Actual Waters of U.S. Acres Filled as of December 2019	Requested Acres of Total Fill in Waters of the U.S. 2009 update	Fill Volume (Cubic Yards)	Acres to be Reclaimed as Wetlands or Waters
22	LSL Tailings Pipeline & Access Road (Upper)	Built	4.7	4.3	4.3	41,500	4.3
23	LSL Tailings Facility Access Road (Lower)	Built	0.3	1.4	1.4	13,500	2.8
24	LSL Tailings Lake (tailings as fill)	Occupied	23.5	23.5	23.5	3,920,000	(23.5)
25	LSL Tailings Lake Margin Working Area	Partially occupied	8.5	10.9	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	0.4	0.4	3,500	2.2
28	LSL Tailings Dam & Plunge Pool Area	Built	5.9	6.1	6.1	236,000	2.4
29	Slate Creek Cove Marine Terminal	Built	1.9	0.5	0.5	12,000	3.2
30	Slate Creek Cove Snow/Stockpile Area	Built	0.2	0	0	0	0.5
31	Jualin Topsoil Stockpile	Built	0	6.8	6.8	300,000	6.8
32	Jualin Borrow Source #6	Partially built	0	0.1	0.1	1,500	0
33	Jualin Borrow Source #7	Not Built	0	0	0	0	NA
34	Jualin Reclamation Material Area	Built	0	0	0	0	0
36	LSL Tailings Area Topsoil Stockpile	Not built	0	0.6	0.6	14,500	0.6
	TOTALS		**83.4**	**77.6**	**80.3**	**5,168,500**	**110.0**

Table 3

2013/2014/2015/2016/2017/2018/2019 Development Rock MWMP Results	TDS (mg/L)	pH	NH_3 (mg/L)	Al (ug/L)	As (ug/L)	Cd (ug/L)	Cr (ug/L)	Cu (ug/L)	Fe (ug/L)	Pb (ug/L)	Hg (ug/L)	Ni (ug/L)	Se (ug/L)	Ag (ug/L)	Zn (ug/L)	Nitrate as N (mg/L)	Sulfate as SO4 (mg/L)
2013 Development Rock 1st Quarter	91	7.98	0.71	96	ND	ND	ND	1.02	ND	ND	ND	ND	ND	ND	ND	3.76	25.2
2013 Development Rock 2nd Quarter	174	8.42	1.15	314	ND	ND	ND	ND	ND	ND	ND	1.09	ND	ND	ND	13.1	38.8
2013 Development Rock 3rd Quarter	221	7.58	1.00	114	ND	ND	ND	1.36	ND	ND	ND	ND	ND	ND	ND	5.27	97.6
2013 Development Rock 4th Quarter	97	7.45	1.07	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.28	37.2
2014 Development Rock 1st Quarter	73	7.58	0.9	81	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.37	17.0
2014 Development Rock 2nd Quarter	164	7.65	2.95	ND	ND	ND	ND	1.23	ND	ND	ND	1.00	ND	ND	ND	7.27	64.8
2014 Development Rock 3rd Quarter	ND	7.30	0.31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.59	1.7
2014 Development Rock 4th Quarter	80	7.52	1.87	ND	ND	ND	ND	ND	ND	ND	ND	1.71	ND	ND	ND	6.77	7.81
2015 Development Rock 1st Quarter	134	7.58	1.09	ND	ND	ND	ND	2.31	ND	ND	ND	1.00	ND	ND	ND	7.76	43.9
2015 Development Rock 2nd Quarter	71	7.88	1.09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.22	4.19
2015 Development Rock 3rd Quarter	48	7.66	0.59	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.28	ND
2015 Development Rock 4th Quarter	48	7.48	1.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2016 Development Rock 1st Quarter	82	7.78	0.81	90	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.04	23.0
2016 Development Rock 2nd Quarter	159	8.11	1.96	190	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.26	44.4
2016 Development Rock 3rd Quarter	85	7.47	0.593	ND	ND	ND	ND	1.04	ND	3.89	ND	ND	ND	ND	ND	2.90	25.3
2016 Development Rock 4th Quarter	52	7.39	3.59	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.03	9.0
2017 Development Rock 1st Quarter	112	7.7	1.08	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.96	45.2
2017 Development Rock 2nd Quarter	212	7.84	0.824	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.71	89.7
2017 Development Rock 3rd Quarter	140	7.4	0.39	ND	ND	ND	ND	ND	ND	ND	ND	1.90	ND	ND	ND	4.34	65.1
2017 Development Rock 4th Quarter	258	8	1.66	310	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.72	133.0
2018 Development Rock 1st Quarter	224	7.8	2.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	16.90	45.0
2018 Development Rock 2nd Quarter	214	8.2	0.648	90	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.45	121.0
2018 Development Rock 3rd Quarter	106	7.4	0.24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.65	40.3
2018 Development Rock 4th Quarter	119	7.8	0.225	410	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	36.2
2019 Development Rock 1st Quarter	67	7.6	0.154	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.14	19.1
2019 Development Rock 2nd Quarter	125	8.4	0.754	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.10	22.8
2019 Development Rock 3rd Quarter	117	7.7	0.467	ND	ND	ND	ND	1.61	ND	ND	ND	ND	ND	ND	ND	4.77	49.0
2019 Development Rock 4th Quarter	31	7.5	1.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.95	1.8

2013/2014/2015/2016/2017/2018/2019 Development Rock ABA Results	*Sulfur,*	*Sulfur Forms (Acid Extractable and Non-extractable Sulfur) 3.2.6*			*Acid*	*Neutralization*	*Acid - Base*
	Total				*Potential*	*Potential*	*Accounting*
	3.2.4	*Sulfate*	*Pyritic*	*Non-extractable*	*1.3.1*	*3.2.3*	*1.3.1*
	wt%	*wt%*	*wt%*	*wt%*	*t CaCO3/1000t*	*t CaCO3/1000t*	*t CaCO3/1000t*
2013 Development Rock 1st Quarter	0.15	ND	0.16	0.16	4.9	39.2	34.3
2013 Development Rock 2nd Quarter	0.03	0.03	ND	ND	ND	85.9	85.9
2013 Development Rock 3rd Quarter	0.04	0.02	0.02	ND	0.5	9.3	8.8
2013 Development Rock 4th Quarter	0.15	0.07	0.09	ND	2.7	91.2	88.5
2014 Development Rock 1st Quarter	0.03	0.03	ND	ND	ND	78.4	78.4
2014 Development Rock 2nd Quarter	0.17	0.03	0.14	ND	4.4	71.1	66.7
2014 Development Rock 3rd Quarter	0.02	0.02	ND	ND	ND	65.3	65.3
2014 Development Rock 4th Quarter	0.07	0.04	0.03	ND	0.8	65	64.2
2015 Development Rock 1st Quarter	0.115	0.07	0.05	ND	1.4	115	113.6
2015 Development Rock 2nd Quarter	0.15	0.06	0.09	ND	2.9	96.1	93.2
2015 Development Rock 3rdQuarter	0.09	0.07	0.02	ND	0.6	71.9	71.3
2015 Development Rock 4th Quarter	0.08	0.04	0.03	ND	1.1	111	109.9
2016 Development Rock 1st Quarter	0.08	0.02	0.06	ND	2.0	78.7	76.7
2016 Development Rock 2nd Quarter	0.03	0.03	ND	ND	ND	89.8	89.8
2016 Development Rock 3rd Quarter	0.04	0.01	0.03	ND	1.0	90.6	89.6
2016 Development Rock 4th Quarter	0.08	0.03	0.04	ND	1.3	70.4	69.1
2017 Development Rock 1st Quarter	0.09	ND	0.01	ND	3.2	77.5	74.3
2017 Development Rock 2nd Quarter	0.09	0.04	0.04	ND	1.3	94.9	93.6
2017 Development Rock 3rd Quarter	0.33	0.17	0.16	ND	4.9	70	65.1
2017 Development Rock 4th Quarter	0.09	0.02	0.07	0.07	2.1	101	98.9
2018 Development Rock 1st Quarter	0.07	0.07	ND	ND	ND	94.9	94.9
2018 Development Rock 2nd Quarter	0.13	0.11	0.01	ND	0.4	97.9	97.5
2018 Development Rock 3rd Quarter	0.16	0.09	0.07	ND	2.2	106	103.8
2018 Development Rock 4th Quarter	0.05	ND	0.04	ND	1.4	47.1	45.7
2019 Development Rock 1st Quarter	0.22	0.09	0.12	ND	3.9	115	111
2019 Development Rock 2nd Quarter	0.16	0.09	0.06	ND	1.9	125	123
2019 Development Rock 3rd Quarter	0.07	0.07	ND	ND	ND	115	115
2019 Development Rock 4th Quarter	0.2	0.13	0.07	ND	2.3	79.9	77.6

Table 3

2013/2014/2015/2016/2017/2018/2019 Tails MWMP Results	TDS (mg/L)	pH	NH_3 (mg/L)	Al (ug/L)	As (ug/L)	Cd (ug/L)	Cr (ug/L)	Cu (ug/L)	Fe (ug/L)	Pb (ug/L)	Hg (ug/L)	Ni (ug/L)	Se (ug/L)	Ag (ug/L)	Zn (ug/L)	Nitrate as N (mg/L)	Sulfate as SO4 (mg/L)
2013 Tails 1st Quarter	2380	7.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	18.3	ND	ND	ND	5.26	1580
2013 Tails 2ndQuarter	1720	7.84	0.52	489	ND	ND	ND	1.07	ND	ND	ND	16.2	31.8	ND	ND	ND	1240
2013 Tails 3rd Quarter	1700	7.53	0.28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.11	1120
2013 Tails 4th Quarter	2440	7.52	0.14	ND	ND	ND	ND	ND	ND	ND	ND	16.3	ND	ND	ND	4.50	1690
2014 Tails 1st Quarter	2360	7.44	9.53	ND	ND	ND	ND	ND	ND	ND	ND	21.2	ND	ND	ND	5.47	1710
2014 Tails 2nd Quarter	316	7.92	1.16	ND	ND	ND	ND	ND	ND	ND	ND	2.46	ND	ND	ND	ND	190
2014 Tails 3rd Quarter	891	7.87	0.47	ND	ND	ND	ND	ND	ND	ND	ND	6.3	ND	ND	ND	11.00	543
2014 Tails 4th Quarter	1240	7.72	1.72	ND	ND	ND	ND	ND	ND	ND	ND	0.81	ND	ND	ND	4.98	829
2015 Tails 1st Quarter	1160	7.78	2.67	ND	ND	ND	ND	ND	ND	ND	ND	7.00	ND	ND	ND	7.58	698
2015 Tails 2ndQuarter	1560	7.99	1.26	ND	ND	ND	ND	ND	ND	ND	ND	13.20	ND	ND	ND	3.36	1030
2015 Tails 3rd Quarter	947	7.78	2.43	ND	ND	ND	ND	ND	ND	ND	ND	6.60	ND	ND	ND	3.85	577
2015 Tails 4th Quarter	567	7.74	2.76	ND	ND	ND	2.3	ND	ND	ND	ND	3.40	ND	ND	ND	3.79	337
2016 Tails 1st Quarter	739	7.64	1.51	ND	ND	ND	2.3	ND	ND	ND	ND	ND	ND	ND	ND	6.15	451
2016 Tails 2nd Quarter	1160	7.73	2.23	ND	ND	ND	1.79	ND	ND	ND	ND	ND	ND	ND	ND	8.09	680
2016 Tails 3rd Quarter	1020	7.94	2.51	ND	ND	ND	ND	ND	ND	ND	0.22	ND	ND	ND	ND	3.57	685
2016 Tails 4th Quarter	1110	7.60	3.96	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.75	684
2017 Tails 1st Quarter	1600	7.69	5.73	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.27	1090
2017 Tails 2nd Quarter	844	8.04	ND	ND	ND	ND	ND	2.5	ND	ND	ND	ND	ND	ND	ND	4.74	522
2017 Tails 3rd Quarter	1630	7.59	ND	ND	3.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.31	1060
2017 Tails 4th Quarter	1200	7.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.62	792
2018 Tails 1st Quarter	2170	7.6	4.36	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.24	1460
2018 Tails 2nd Quarter	995	7.8	0.65	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	15.2	610
2018 Tails 3rd Quarter	1030	7.5	ND	ND	ND	ND	ND	1.18	ND	ND	ND	ND	ND	ND	ND	10.3	674
2018 Tails 4th Quarter	853	7.6	0.728	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.97	533
2019 Tails 1st Quarter	1210	8.0	ND	ND	9.84	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	15.0	746
2019 Tails 2nd Quarter	983	7.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.9	634
2019 Tails 3rd Quarter	742	7.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	11.6	454
2019 Tails 4th Quarter	773	7.7	1.55	ND	ND	ND	ND	0.00191	ND	ND	ND	ND	ND	ND	0.0041	3.8	449

2013/2014/2015/2016/2017/2018/2019 Tails ABA Results	*Sulfur, Total*	*Sulfur Forms (Acid Extractable and Non-extractable Sulfur) 3.2.6*			*Acid Potential*	*Neutralization Potential*	*Acid - Base Accounting*
	3.2.4	*Sulfate*	*Pyritic*	*Non-extractable*	*1.3.1*	*3.2.3*	*1.3.1*
	wt%	*wt%*	*wt%*	*wt%*	*t CaCO3/1000t*	*t CaCO3/1000t*	*t CaCO3/1000t*
2013 Tails 1st Quarter	0.16	0.14	0.02	0.02	0.5	110	110
2013 Tails 2ndQuarter	0.54	0.24	0.3	ND	9.3	88.9	79.7
2013 Tails 3rd Quarter	0.09	0.08	0.01	ND	0.3	115	115
2013 Tails 4th Quarter	0.22	0.18	0.03	ND	1.1	121	120
2014 Tails 1st Quarter	0.14	0.14	ND	ND	ND	120	120
2014 Tails 2nd Quarter	0.05	0.05	ND	ND	ND	93.5	93.5
2014 Tails 3rd Quarter	0.05	0.05	ND	ND	ND	116	116
2014 Tails 4th Quarter	0.18	0.11	0.07	ND	2.2	95.6	93.3
2015 Tails 1st Quarter	0.11	0.05	0.05	ND	1.7	103	101.3
2015 Tails 2nd Quarter	0.07	0.06	0.01	ND	0.4	123	122.6
2015 Tails 3rd Quarter	0.13	0.09	0.04	ND	1.3	111	109.7
2015 Tails 4th Quarter	0.26	0.09	0.17	ND	5.3	104	98.7
2016 Tails 1st Quarter	0.09	0.05	0.04	ND	1.3	127	125.7
2016 Tails 2nd Quarter	0.06	0.06	ND	ND	ND	118	118
2016 Tails 3rd Quarter	0.04	0.04	ND	ND	ND	98.1	98.1
2016 Tails 4th Quarter	0.11	0.09	0.02	ND	0.6	160	159.4
2017 Tails 1st Quarter	0.14	0.06	0.08	ND	2.4	120	117.6
2017 Tails 2nd Quarter	0.09	0.06	0.03	ND	1	128	127
2017 Tails 3rd Quarter	0.09	0.07	0.01	ND	0.3	120	119.7
2017 Tails 4th Quarter	0.17	0.1	0.07	ND	2.2	112	110
2018 Tails 1st Quarter	0.15	0.15	ND	ND	ND	155	155
2018 Tails 2nd Quarter	0.05	0.05	ND	ND	ND	118	118
2018 Tails 3rd Quarter	0.06	0.06	ND	ND	ND	125	125
2018 Tails 4th Quarter	0.05	0.05	ND	ND	ND	94	94
2019 Tails 1st Quarter	0.08	0.08	ND	ND	ND	147	147
2019 Tails 2nd Quarter	0.05	0.05	ND	ND	ND	93.7	93.7
2019 Tails 3rd Quarter	0.03	0.03	ND	ND	ND	97.2	97.2
2019 Tails 4th Quarter	0.05	0.05	ND	ND	ND	111	111

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
ANNUAL SPILL LOG

FACILITY NAME, ADDRESS & Phone #: **REPORT MONTH/YR:** 2019 Summary

Coeur Alaska - Kensington Gold Mine, (907) 523-3337

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
1/7/2019	3:30 AM	Hydraulic Oil	5 gallons	Ore Surface Stockpile	Hydraulic line broke on a underground haul truck (UH 20).	Ore Surface Stockpile	Cleaned up with Adsorbent pads. Spill occurred on frozen ground. Spent adsorbent pads are planned to be sent to Clean Harbors for disposal.	Yes, Reported in Site Monthly Report
1/11/2019	2:00 PM	Hydraulic Oil	5 gallons	Underground - 255 level collar	Sandvik haul truck (UH 20) blew a steering hose in articulation while pulling out of 255 level	Underground - 255 level collar	Cleaned up with Adsorbent pads. Spill occurred on solid rock within the underground mine. Spent adsorbent pads are planned to be sent to Clean Harbors for disposal.	Yes, Reported in Site Monthly Report
1/13/2019	4:00 PM	Hydraulic Oil	5 gallons	Underground - 1560 production level	Sandvik haul truck (UH 20) blew a steering hose in articulation while pulling out of 1560 production level	Underground - 1560 production level	Cleaned up with Adsorbent pads. Spill occurred on solid rock within the underground mine. Spent adsorbent pads are planned to be sent to Clean Harbors for disposal.	Yes, Reported in Site Monthly Report
1/22/2019	11:35 AM	Hydraulic Oil	3 gallons	Pit -2	Grader (SG01) lost power while traveling to Pit -2, pulled over to inspect and identfied a leaking hydraulic line. Deployed spill kit adsorbents and placed duck pond under the leak.	Pit -2	Cleaned up with Adsorbent pads. Spill occurred on frozen ground. Spent adsorbent pads are planned to be sent to Clean Harbors for disposal.	Yes, Reported in Site Monthly Report
2/28/2019	11:00 PM	Hydraulic Oil	9.5 gallons	Ore - Pad	A haul truck was dumping a load of ore onto the ore pad when a hydraulic hose blew spilling hydrulic fluid onto the ground.	Ore - Pad	Adsorbent pads were placed onto the ground to adsorb the standing hydraulic oil. A grader broke up the ice and dirt and approximately 2 yards of soil was excavated. The spend adsorbent pads and contaminated soil will be sent to Clean Harbors for disposal.	Yes, Reported in Site Monthly Report

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
3/1/2019	8:30 PM	Hydraulic Oil	8 gallons	Fuel bay located on the mill bench to Jualin Portal	After fueling the underground mucker operator drove the machine back to the Jualin portal unaware that there was a leaky hydraulic hose. The spill area covered was roughly 900 ft long by 0.5 foot wide.	Fuel bay located on the mill bench to Jualin Portal	Adsorbent pads were placed on the road to adsorb the free liquid. Approximately 2 cubic yards of contaminated ice and rock was excavated on the road. The road was frozen so the spilled hydraulic oil remained on the surface. The spend adsorbent pads and contaminated soil is planned to be shipped to Clean Harbors for final disposal.	Yes, Reported in Site Monthly Report
3/2/2019	12:30 PM	Diesel Fuel	2 gallons	In front of the Port Generator container	While filling the generator located at the port, the operator had one of the valves in the wrong position, causing fuel to back fill into the second tank, over filling the tank.	In front of the Port Generator container	Adsorbent pads were placed onto the ground to adsorb the standing hydraulic oil. One barrel (55 gallons) of contaminated soil was excavated and placed into a barrel for offsite disposal. The spend adsorbent pads and contaminated soil will be sent to Clean Harbors for disposal.	Yes, Reported in Site Monthly Report
3/3/2019	3:00 PM	Engine Oil	100 gallons	Inside the EMD generator building	While attempting to change the EMD1 primary oil filters, the pre-lube pump came on causing a oil spill of approx. 100gals. The switch was in the off position, and the spill was contained inside the powerhouse	Inside the EMD generator building	Adsorbent pads were placed onto the floor of the power house to adsorb the spilled engine oil.The spend adsorbent pads will be sent to Clean Harbors for disposal.	Yes, Reported to SPAR on 3-4-2019 at 9:15 AM.
3/14/2019	7:00 AM	Urea Solution	170 gallons	Inside the EMD generator building and into the Oil/Water separator	Urea solution spilled onto the power-house building floor as the result of a leaking pipe on the urea system. During the clean-up of the spilled urea solution within the power-house building, approximately 100 gallons of urea solution was pumped from the power house building floor sump to the oil/water separator which is located adjacent to the power-house	Inside the EMD generator building and into the Oil/Water separator	The oil/water separator was opened up after discovering that a portion of the urea had been pumped to the unit and the liquid solution within the unit was removed and placed into totes. Urea solution that was captured in the floor sump was pumped into two 55 gallon drums (70 gallons of urea solution). The urea will be shipped to Clean Harbors for final disposal.	Yes, Reported to SPAR on 3-14-2019 at 4:15 PM.

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
3/22/2019	8:30 AM	Diesel Fuel	3 gallons	Comet Portal	The cap on the tank that is located in the back of the surface pickup truck was inadvertently left off. Diesel fuel splashed out of the tank onto the bed of the pick-up truck and dripped onto the ground.	Comet Portal	The majority of the diesel fuel was captured on the bed of the pick-up truck but there was some that leaked off the bed onto the frozen ground. The diesel fuel was cleaned up with adsorbent pads. The spent adsorbent pads are planned to be shipped to Clean Habors for final disposal.	Yes, Reported in Site Monthly Report
3/14/2019	9:30 AM	Wastewater Sewage	1 gallon	Isocontainer located inside the containment at the Port laydown	While transferring sewage from the vacuum truck to the isocontainer located at the port, the isocontainer was over-filled and approximatley 1 gallon of sewage was spilled onto the ground.	Isocontainer located inside the containment at the Port laydown	The area was immediately flagged-off to prevent access to the area. The spilled material was vacuumed up utilizing a second vacuum truck.	Yes, Reported to ADEC Compliance and Enforcement Hotline on 3/26/2019 at 8:00 AM.
4/29/2019	7:00 AM	Coolant	1 gallon	Jualin Portal Pad	UH-20 leaked anti-freeze onto the ground as the result of coolant filter coming loose. The coolant leak was identified during the pre-shift inspection by the operator and a bucket was placed under the leak to capture the leaking coolant.	Jualin Portal Pad	The majority of the coolant was captured in a bucket. The spilled coolant was cleaned up with adsorbent pads. The spent adsorbent pads are planned to be shipped to Clean Habors for final disposal.	Yes, Reported in Site Monthly Report
4/29/2019	7:00 AM	Coolant	1.5 gallons	Jualin Portal Pad	UH-22 leaked anti-freeze onto the ground as the result of coolant filter coming loose. The coolant leak was identified during the pre-shift inspection by the operator and a bucket was placed under the leak to capture the leaking coolant.	Jualin Portal Pad	The majority of the coolant was captured in a bucket. The spilled coolant was cleaned up with adsorbent pads. The spent adsorbent pads are planned to be shipped to Clean Habors for final disposal.	Yes, Reported in Site Monthly Report
5/3/2019	4:30 PM	Hydraulic Oil	2 gallons	Underground - 900 level	The right rear tire blew out on a haul truck while in operation. Two hydraulic hoses were damaged as a result of the blown truck tire.	Underground - 480 level	The spilled hydraulic oil was cleaned up with adsorbent pads. The spill occurred underground on solid rock thus no excavation of soil was required as part of the clean-up. The spent adsorbent pads are planned to be shipped to Clean Habors for final disposal.	Yes, Reported in Site Monthly Report

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
5/5/2019	11:30 AM	Hydraulic Oil	3 gallons	Underground - 480 level	Hydraulic brake line ruptured on UH-20 haul truck	Underground - 480 level	The spilled hydraulic oil was cleaned up with adsorbent pads. The spill occurred underground on solid rock thus no excavation of soil was required as part of the clean-up. The spent adsorbent pads are planned to be shipped to Clean Habors for final disposal.	Yes, Reported in Site Monthly Report
6/9/2019	10:15 AM	Hydraulic Oil	5 gallons	Mill Bench - NE corner of Lineout office	Tilt cylinder hose inside the boom burst causing a spill of hydraulic oil	Mill Bench - NE corner of Lineout office	The spilled hydraulic oil was cleaned up with adsorbent pads and approximately 2 cubic yards of soil was excavated. The spent adsorbent pads and contaminated soil is planned to be shipped to Clean Habors for final disposal.	Yes, Reported in Site Monthly Report
6/18/2019	8:24 AM	Wastewater Sewage	1.5 gallon	Sewer Treatment Plant (STP)	Upon mid shift rounds and doing a backflush; STP plant A started foaming over out of the membrane tank. Foaming occurred for about 10 minutes. The majority of the foam went into the plant containment while the remainder (1.5 gallons) went over the back wall of the plant and onto the ground.	Sewer Treatment Plant	The area was immediately flagged-off to prevent access to the area. The spill area was disinfected with a 5% chlorine solution.	Yes, Reported to ADEC Compliance and Enforcement Hotline on 6/24/2019 at 2:15 PM.
7/10/2019	9:00 AM	Sludge material from Comet water treatment plant	15 gallons	Comet Mine Water Treatment Plant	The sludge recirculation line from the plant to the clarifier started leaking at the Comet Mine Water Treatment Plant (Outfall 001). The sludge leaked out of the pipe at about 5 gallons per hour, thus a total of approximately 15 gallons of sludge spilled onto the ground below the leaking pipe.	Comet Water Treatment Plant	The spilled sludge was recovered from the ground and was placed back into the water treatment plant.	Yes, Reported to ADEC Compliance and Enforcement Hotline on 6/11/2019 at 8:30 AM.

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
7/23/2019	9:30 AM	Hydraulic Oil	5 gallons	North end of mill in front of pebble reject bunker and grind bay door	Skid steer loader blew a hydraulic line while moving reagents	North end of mill in front of pebble reject bunker and grind bay door	The spilled hydraulic oil was cleaned up with adsorbent pads and 0.75 yards of soil was excavated as part of the spill clean-up. The spent adsorbent pads and contaminated soil is planned to be shipped to Clean Habors for final disposal.	Yes, Reported in Site Monthly Report
8/9/2019	9:05 AM	Hydraulic Oil	2 gallons	Portal Bench - Ore Pad	UL 14 underground loader had a blown break line on the portal pad	Portal Bench - Ore Pad	The spilled hydraulic oil was cleaned up with adsorbent pads and 5 gallons of contaminated soil was excavated as part of the spill clean-up. The spent adsorbent pads and contaminated soil is planned to be shipped to Clean Habors for final disposal.	Yes, Reported in Site Monthly Report
9/20/2019	7:30 AM	Hydraulic Oil	10 gallons	100 foot north of fuel station at the lower end of the waste rock stockpile	Failed hydraulic hose on a steering cylinder of UR-08	100 foot north of fuel station at the lower end of the waste rock stockpile	The spilled hydraulic oil was cleaned up with adsorbent pads and 5 gallons of contaminated soil was excavated as part of the spill clean-up. The spent adsorbent pads and contaminated soil is planned to be shipped to Clean Habors for final disposal.	Yes, Reported in Site Monthly Report
9/27/2019	4:30 AM	Hydraulic Oil	5 gallons	Underground; Elmira drift off of the 850 level	While a bolter machine was bolting the heading a hydraulic hose failed and oil was spilled on the floor of the underground mine.	Underground; Elmira drift off of the 850 level	The spilled hydraulic oil was cleaned up with adsorbent pads. The spill occurred underground and on solid rock thus no soil excavation was done as part of the clean-up efforts. The spent adsorbent pads are planned to be shipped to Clean Harbors for final disposal.	Yes, Reported in Site Monthly Report

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
9/28/2019	11:30 AM	Hydraulic Oil	9 gallons	Underground - Raven 430 Level Access	While mucking and loading a haul truck the lift cylinder O-ring failed, oil was released from the underground mucker (loader) on the floor of the underground mine.	Underground - Raven 430 Level Access	The spilled hydraulic oil was cleaned up with adsorbent pads. The spill occurred underground and on solid rock thus no soil excavation was done as part of the clean-up efforts. The spent adsorbent pads are planned to be shipped to Clean Harbors for final disposal.	Yes, Reported in Site Monthly Report
10/10/2019	11:00 AM	Hydraulic Oil	20 gallons	Underground -900 main in front of 910's entrance	Underground Haul Truck (UHO2) was traveling down the ramp, turned the corner onto the 900 main and the steering pump hose failed which caused 20 gallons of hydraulic oil to be spilled onto the floor of the underground mine.	Underground - 900 main in front of 910's entrance	The spilled hydraulic oil was cleaned up with adsorbent pads. The spill occurred underground and on solid rock thus no soil excavation was done as part of the clean-up efforts. The spent adsorbent pads are planned to be shipped to Clean Harbors for final disposal.	Yes, Reported to SPAR on 10/11/19 at 8:30 AM
10/15/2019	10:30 AM	Hydraulic Oil	2 gallons	Underground - Raven 295/240	While drilling, the employee noticed a oil leak on UD14. The maintenance shop was notified and came to the drill and fixed the leak.	Underground - Raven 295/240	The spilled hydraulic oil was cleaned up with adsorbent pads. The spill occurred underground and on solid rock thus no soil excavation was done as part of the clean-up efforts. The spent adsorbent pads are planned to be shipped to Clean Harbors for final disposal.	Yes, Reported in Site Monthly Report
10/15/2019	1:30 PM	Hydraulic Oil	8 gallons	Underground -180 level access	Underground Haul Truck (UHO2) was pulling into the 180 foot level to get a load of ore when a hydraulic line failed. Approximatley 8 gallons of hydraulic oil spilled onto the floor of the underground mine.	Underground - 180 level access	The spilled hydraulic oil was cleaned up with adsorbent pads that were contained in the spill kit on the underground haul truck. The spill occurred underground and on solid rock thus no soil excavation was done as part of the clean-up efforts. The spent adsorbent pads are planned to be shipped to Clean Harbors for final disposal.	Yes, Reported in Site Monthly Report

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
10/16/2019	2:30 AM	Hydraulic Oil	10 gallons	Underground -105 level of the 228 heading	While bolting in the 228 heading a hydraulic hose ruptured leaking oil on the floor of the underground mine.	Underground - 105 level of the 228 heading	The spilled hydraulic oil was cleaned up with adsorbent pads. The spill occurred underground and on solid rock thus no soil excavation was done as part of the clean-up efforts. The spent adsorbent pads are planned to be shipped to Clean Harbors for final disposal.	Yes, Reported in Site Monthly Report
10/16/2019	11:30 PM	Hydraulic Oil	7 gallons	Underground -160 Laydown	Underground Haul Truck (UHO2) was at the underground 160 laydown when a hydraulic hose failed which caused 7 gallons of hydraulic oil to be spilled onto the floor of the underground mine.	Underground - 160 Laydown	The spilled hydraulic oil was cleaned up with adsorbent pads. The spill occurred underground and on solid rock thus no soil excavation was done as part of the clean-up efforts. The spent adsorbent pads are planned to be shipped to Clean Harbors for final disposal.	Yes, Reported in Site Monthly Report
10/23/2019	1:30 PM	Used Oil	5 gallons	Pit-4	While cleaning the Pit 4 area of scrap steel, an old tank rolled over and used oil leaked out of the tank and onto the ground. The equipment operator utilized the excavator to stand the tank back up to prevent further leakage of used oil from the tank.	Pit-4	The spilled used motor oil was cleaned up with adsorbent pads and approximately 6 yards of soil was excavated. The spent adsorbent pads and contaminated soil is planned to be shipped to Clean Harbors for final disposal.	Yes, Reported in Site Monthly Report
10/24/2019	4:30 AM	Hydraulic Oil	4 gallons	Underground - Raven 520 level	Underground loader (UL11) had a hydraulic hose fail while mucking in the Raven which caused 4 gallons of hydraulic oil to be spilled onto the floor of the underground mine.	Underground - Raven 520 level	The spilled hydraulic oil was cleaned up with adsorbent pads. The spill occurred underground and on solid rock thus no soil excavation was done as part of the clean-up efforts. The spent adsorbent pads are planned to be shipped to Clean Harbors for final disposal.	Yes, Reported in Site Monthly Report

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
11/16/2019	2:00 AM	Hydraulic Oil	40 gallons	Portal Pad - Southeast side of the Ore Pad	The Excavator (SE-02) lost a drive seal on the track which caused hydraulic fluid to leak onto the track frame and then about onto the ground. A total of 40 gallons of hydraulic fluid leaked out of the machine, but approximately 20 gallons of the total was captured on the track frame and approximatley 20 gallons leaked onto the ground.	Portal Pad - Southeast side of the Ore Pad	The spilled hydraulic oil was cleaned up with adsorbent pads and 10 tons of soil was excavated. The spent adsorbent pads and contaminated soil is planned to be shipped to Clean Harbors for final disposal.	Yes, Reported to SPAR on 11/17/19 at 6:05 PM
11/24/2019	7:15 AM	Hydraulic Oil	2 gallons	Portal Pad	The hydraulic tank on UH14 was filled while the ejector bed was all the way out so it was not showing the correct level in the tank, and when the mechanic's went to drive it to the shop they ran the ejector bed in and doing this it over flowed the hydraulic tank out the breather, causing a spill of approximately 2 gallons on the ground.	Portal Pad	The spilled ferric chloride occurred on frozen ground. The spilled hydraulic oil was cleaned up spill mats.	Yes, Reported to ADEC-SPAR in site monthly report.
11/26/2019	1:30 PM	Ferric Chloride	5 gallons	Comet Water Treatment Plant	Operator put a fork through a tote of Ferric Chloride. The tote was placed on its side to stop the leak. The spill occurred on frozen ground.	Comet Water Treatment Plant	The spilled ferric chloride occurred on frozen ground. The contaminated snow and ice was removed and placed into the Comet Water Treatment plant for re-use in the plant.	Yes, Reported to ADEC-SPAR in site monthly report and on 12/2/19 at 10:45 AM.
11/28/2019	9:00 AM	Diesel Fuel	20 gallons	Tank Farm at Port Facility	Faulty valve on the fuel truck which caused 20 gallons of diesel fuel to leak onto the ground. The spill occurred on frozen ground.	Tank Farm at Port Facility	The spilled diesel fuel was cleaned up with adsorbent pads and booms. The spill occurred on frozen ground. Approximately 3 cubic yards of contaminated gravel/soil was removed as part of the clean-up of the spilled diesel. The spent adsorbent pads and contaminated soil is planned to be shipped to Clean Harbors for final disposal	Yes, Reported to ADEC-SPAR on 11/28/19 at 1:15 PM.

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
12/2/2019	3:30 PM	Gear Oil	7 gallons	Access Road near Bridge 2	A spill of 7 gallons of gear oil occurred on the surface grader (SG 01) as the result of the axle lock for rear wheel coming loose which resulted in gear oil leaking out of the wheel bearing seal.	Access Road near Bridge 2	The spilled Gear Oil was cleaned up with adsorbent pads and booms. The spill occurred on frozen ground. Two 55 gallons drums of contaminated soil/snow/ice was removed as part of the clean-up of the spilled gear oil. The spent adsorbent pads and contaminated soil is planned to be shipped to Clean Harbors for final disposal	Yes, Reported to ADEC-SPAR in site monthly report.
12/18/2019	9:45 AM	Ferric Chloride	50 gallons	Comet Water Treatment Plant	Operator put a fork through a tote of Ferric Chloride. The tote was placed on its side to stop the leak. The spill occurred on frozen ground.	Comet Water Treatment Plant	The spilled ferric chloride occurred on frozen ground. Three rolls of pink adsorbent pads were utilized to clean-up the spilled ferric chloride. The contaminated snow and ice was removed and placed into the Comet Water Treatment Plant for re-use in the plant.	Yes, Reported to ADEC-SPAR in site monthly report and on 12/18/19 at 2:50 PM.
12/21/2019	12:30 PM	Transmission oil	10 gallons	Underground Mine - Kensington Main at Cross-cut #4	A spill of approximately 10 gallons of transmission oil occurred on the underground haul truck (UH 02) as the result of the failure of an O-ring on the transmission filter causing oil to be spilled onto the floor of the underground mine.	Underground Mine - Kensington Main at Cross-cut #4	The spilled transmission oil was cleaned up with adsorbent pads. The spill occurred underground and on solid rock thus no soil excavation was done as part of the clean-up efforts. The spent adsorbent pads are planned to be shipped to Clean Harbors for final disposal.	Yes, Reported to ADEC-SPAR in site monthly report.

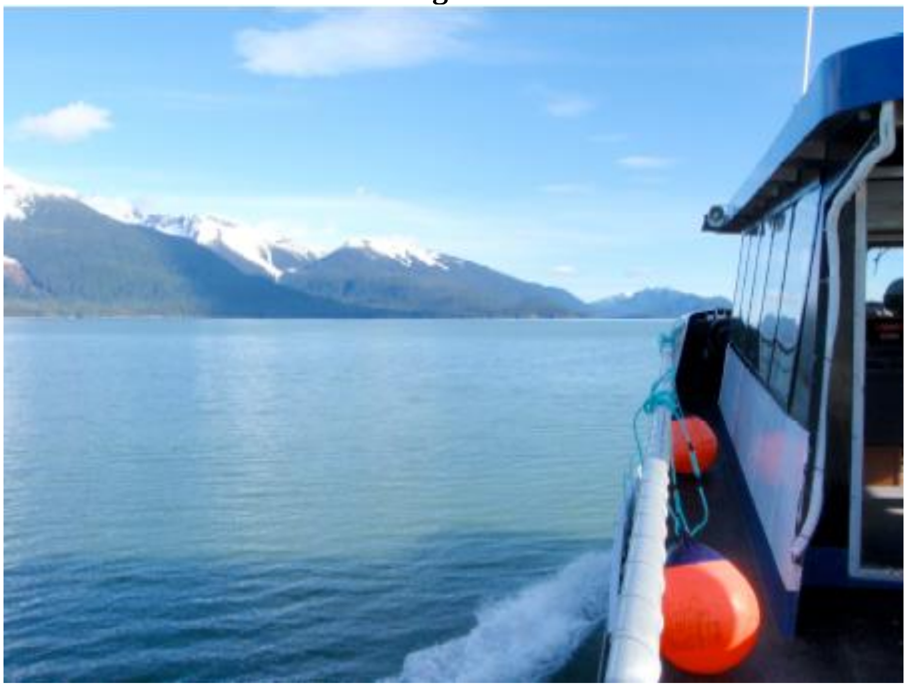
Attachment 1

Marine Mammal Monitoring Report - 2019

2019 Transportation Action Strategy

Marine Mammal
Survey Report

Coeur Alaska
Kensington Mine



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May 2019

Introduction

Coeur Alaska's Berners Bay/Lynn Canal Transportation Plan (September 2004) includes the adoption of standard operating guidelines to ensure minimal disruption of marine mammals in the area from marine traffic. Some guidelines are designed to minimize impacts throughout the year, while others are specific to the spring eulachon and herring spawning runs when marine mammals congregate in large groups within Berners Bay. This report describes monitoring activities conducted during the April/May 2019 eulachon spawning season. The Coeur Alaska crew transportation vessel during this period was the M/V Majestic Fjord, a 65ft catamaran with four inboard diesel jet engines and crew of three people that transited between Yankee Cove and Slate Cove daily (Figure 1). A one-way trip from Yankee Cove to Slate Cove takes approximately 40 minutes and consumes around 55-60 gallons of fuel (personal comm. Clint Songer, F/V Majestic Fjord captain).

Methods

Designation of the eulachon spawning season requires some information to be gathered regarding marine mammal activity within Berners Bay as this is a good indicator that eulachon migration is underway. One source of this information is the ADFG herring spawning aerial survey data for Lynn Canal posted on the internet. These updates usually include a brief summary of the location of marine mammal concentrations. Coeur also conducts marine based surveys to monitor marine mammal numbers within Berners Bay. These surveys are undertaken by Coeur environmental personnel or contractors with marine mammal observation experience. Survey results were emailed to the NMFS Office of Protected Resources within 48 hours. When Coeur's marine mammal surveys and ADFG herring surveys show a substantial increase in marine mammals within Berners Bay the eulachon spawning season is declared to have commenced.

During the eulachon spawning run a marine mammal observer accompanies the Coeur transportation vessel on all crew transfers to help adjust the daily routing into Slate Cove to avoid congregations of fish and marine mammals. The marine observer keeps watch from the bridge of the vessel and uses binoculars as needed to identify marine mammals.

Vessel trips are also kept to no more than three per day (except for emergency environmental or safety situations), and the vessel is required to maintain a maximum speed of 13 knots within the bay (with Berners Bay designated as the area inside of Point St. Mary and Point Bridget, see Figure 1). Fuel and, if possible, concentrate shipments by barge are also restricted during the eulachon spawning period. The spawning period typically occurs approximately April 15 to May 15, typically about 2-3 weeks. Marine mammal observations are categorized into two zones: Berners Bay and outside Berners Bay. All observations, including date, time, observer, weather, visibility, wave height/conditions, and counts of marine mammals, are recorded on a data sheet (see Figure 2). Each one-way trip is recorded on its own sheet.

Results

Between April 24 and May 14, one hundred and twenty-six marine mammal observation surveys were completed aboard the M/V Majestic Fjord (see Table 2). The official eulachon run transportation regulations as determined by Coeur Alaska and NMFS were put into effect on April 24, 2019. Special measures taken during the eulachon run included: having a marine observer on the vessel during all trips and maintaining a maximum speed of 13 knots within Berners Bay. Regular transit speed is approximately 21-25 knots. Transportation vessel trips during the eulachon run were limited to 3 trips daily (see Table 1). No more than 3 trips per day were conducted during the 2019 eulachon spawning window.

The majority of pinniped activity was observed inside Berners Bay (see Table 3). A total of 127 Steller sea lions were counted during the observation period; 97 of these sightings (76.4%) occurred within Berners Bay. The vast majority; (99.2%) of the 516 harbor seal sightings occurred within Berners Bay. Most of these sightings were at pinniped haulout areas, such as the entrance to Slate Cove and Point Saint Mary. Gatherings of over 25 harbor seals on haulouts were observed. Pinniped activity was highest on May 5 through May 10.

Aside from humpback whales, the majority of cetaceans were observed outside of Berners Bay with 104 humpback whale, 105 Dall's porpoise, and 21 killer whale sightings (50.7%, 86.8% and 51.2% of the total sightings respectively). Humpback sightings were fairly consistent through the observation period, with at least one humpback being spotted most days. Killer whales were first seen on April 24 and were most commonly seen moving alone or in small groups of 2-5.

Porpoise sightings were inconsistent and sporadic, ranging in group size from 2-6 for most of the season. No recordable encounters with marine mammals occurred during the 2019 eulachon spawning season.

Discussion

Historic records showed eulachon arriving in the Berners Bay area usually in late April and early May (Harris et al 2005).

The three week restrictions were placed at the right time in 2019 to cover the greatest marine mammal activity surrounding the herring run. Careful observation of marine mammals and birds from the end of March is necessary in order to prepare for the official three-week period of transportation restrictions and ensure the goal of minimizing marine mammal encounters is achieved. The speed restriction is based on NMFS recommendations for Coeur Alaska vessels and may minimize potential impacts to marine mammals. The population of humpback whales in the North Pacific increased at around 7% per year since commercial whaling ceased in 1966 (Calambokidis et al 2008), but they are still considered endangered species owing to a worldwide population estimate being at only 8% of the historical population size (NMFS 1991). The Steller sea lion population east of Cape Suckling is not considered endangered, but vessel operations must still comply with the Marine Mammal Protection Act of 1972. The measures taken under Coeur's Transportation Action Strategy are designed to ensure compliance with this Federal law.

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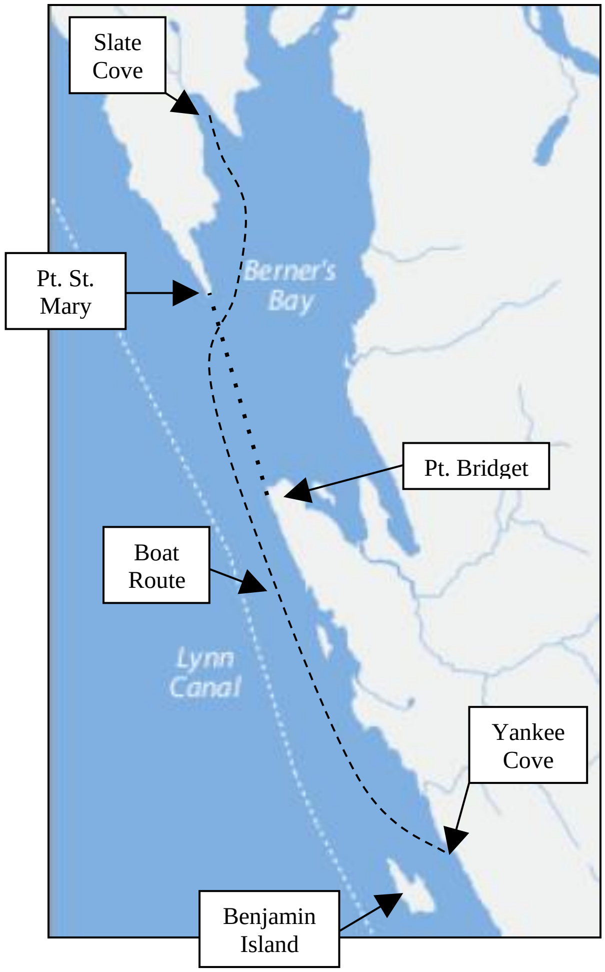

Figure 1: Boat route to Slate Cove from Yankee Cove. Line between Pt Bridget and Pt St Mary defines the area inside which the 13 knot speed limit applies.

Table 1: M/V Majestic Fjord Schedule, Spring/Summer 2019

Day	Morning Boat Departure	Evening Boat Departure 1st Run	Evening Boat Departure 2nd Run	Departure	Total trips
Monday	05:35	16:05	17:45	Yankee Cove	3
Tuesday	05:35	16:05	17:45	Yankee Cove	3
Wednesday	05:35	16:05	17:45	Yankee Cove	3
Thursday	05:35	16:05	17:45	Yankee Cove	3
Friday	05:35	16:05	17:45	Yankee Cove	3
Saturday	05:35	16:05	17:45	Yankee Cove	3
Sunday	05:35	16:05	17:45	Yankee Cove	3

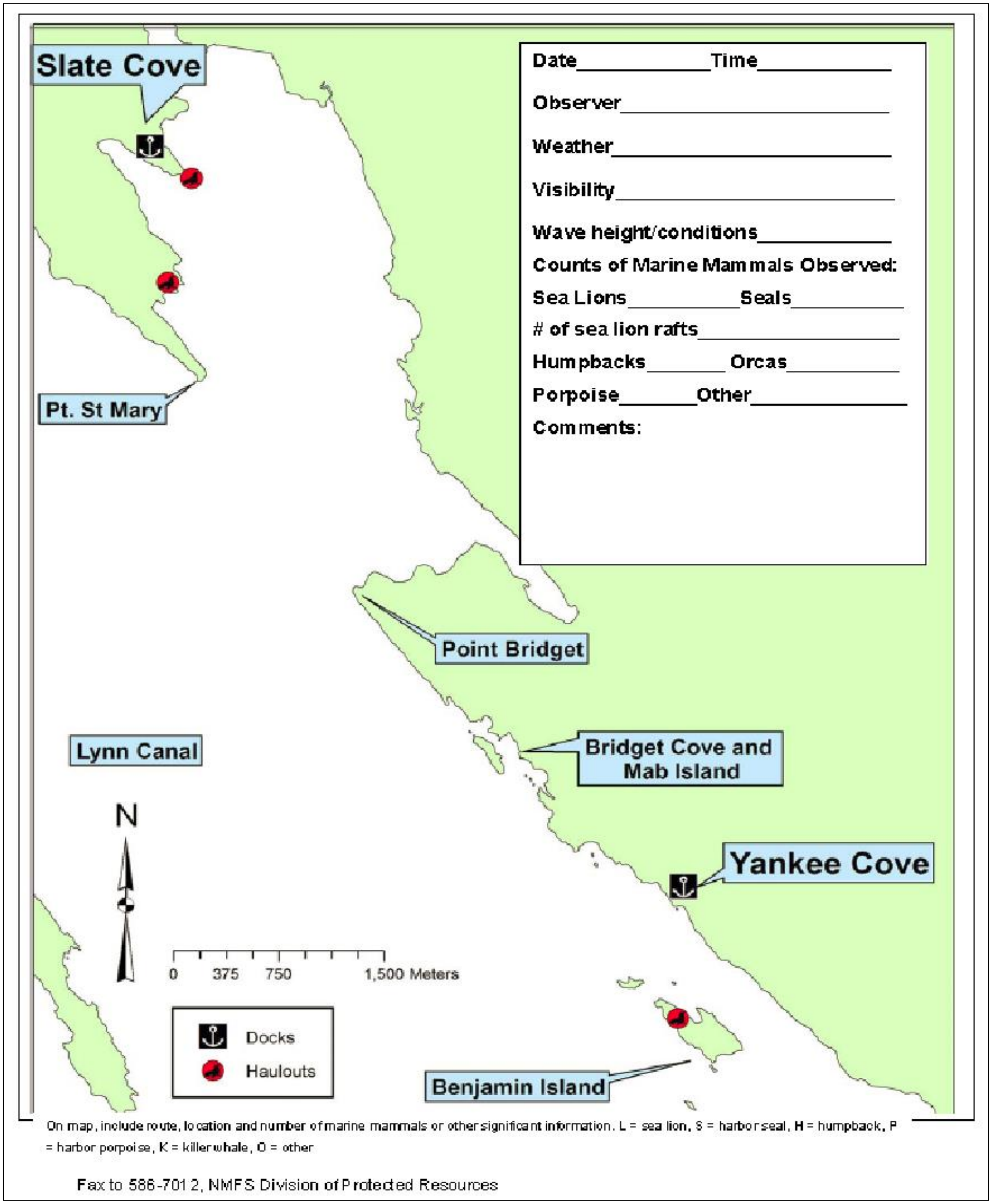

Figure 2: Data sheet

Table 2: Summary of Marine Mammal Observations

No.	Date	Time	Observer	Vessel	Route	Weather	Visibility (mi)	Wave Ht (ft.)
1	4/24/2019	0536	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	snow	3	0-1.
2	4/24/2019	0625	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	partly cloudy	5-15	0-3.
3	4/24/2019	1605	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	mostly sunny	15	NA
4	4/24/2019	1700	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	partly sunny	15	0-2.
5	4/24/2019	1750	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	partly sunny	15	0-1.
6	4/24/2019	1835	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	partly sunny	15	0-2.
7	4/25/2019	0535	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	partly sunny	15	0-3.
8	4/25/2019	0625	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	partly cloudy	15	0-3.
9	4/25/2019	1606	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	overcast	5	0-1.
10	4/25/2019	1705	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	overcast	5-15	0-1.
11	4/25/2019	1755	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	raining	5	0-1.
12	4/25/2019	1833	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	overcast	5	0-1.
13	4/26/2019	0534	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	overcast	5-15	0-3.
14	4/26/2019	0625	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	overcast	5-15	0-3.
15	4/26/2019	1601	Cassandra Joos	Majestic Fjord	Yankee Cove to Slate Cove	partly cloudy and wind	10+	3
16	4/26/2019	1701	Cassandra Joos	Majestic Fjord	Slate Cove to Yankee Cove	partly cloudy and wind	10+	0-1., 3ft in LC
17	4/26/2019	1749	Cassandra Joos	Majestic Fjord	Yankee Cove to Slate Cove	partly cloudy and wind	10+	3
18	4/26/2019	1832	Cassandra Joos	Majestic Fjord	Slate Cove to Yankee Cove	partly cloudy	10+	0-1. (2 in LC)
19	4/27/2019	0530	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	sunny, clear	15	0-1.
20	4/27/2019	0615	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	sunny, clear	15	0-1.
21	4/27/2019	1611	Cassandra Joos	Majestic Fjord	Yankee Cove to Slate Cove	clear, calm	10+	0-1.
22	4/27/2019	1701	Cassandra Joos	Majestic Fjord	Slate Cove to Yankee Cove	clear, calm	10+	0-1.
23	4/27/2019	1746	Cassandra Joos	Majestic Fjord	Yankee Cove to Slate Cove	clear, calm	10+	0-1.
24	4/27/2019	1828	Cassandra Joos	Majestic Fjord	Slate Cove to Yankee Cove	clear, calm	10+	0-1.
25	4/28/2019	0530	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	clear, sunny	15+	0-1.
26	4/28/2019	0615	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	clear, sunny	15+	0-1.
27	4/28/2019	1602	Cassandra Joos	Majestic Fjord	Yankee Cove to Slate Cove	clear, calm	10+	0-1.
28	4/28/2019	1700	Cassandra Joos	Majestic Fjord	Slate Cove to Yankee Cove	clear, calm	10+	0-1.
29	4/28/2019	1746	Cassandra Joos	Majestic Fjord	Yankee Cove to Slate Cove	clear, calm	10+	0-1.
30	4/28/2019	1832	Cassandra Joos	Majestic Fjord	Slate Cove to Yankee Cove	clear, calm	10+	0-1.
31	4/29/2019	0535	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	clear, sunny	15+	0-1.
32	4/29/2019	0630	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	sunny	15+	0-1.
33	4/29/2019	1620	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	sunny, clear	15+	0-1.
34	4/29/2019	1700	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	sunny, clear	15+	0-1.
35	4/29/2019	1750	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	sunny, clear	15+	0-1.
36	4/29/2019	1835	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	sunny, clear	15+	0-1.
37	4/30/2019	0536	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	clear, sunny	15+	0-1.
38	4/30/2019	0623	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	sunny, clear	15+	0-1.
39	4/30/2019	1625	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	sunny,clear	15+	0-1.
40	4/30/2019	1710	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	sunny, clear	15+	0-1.
41	4/30/2019	1754	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	sunny, clear	15+	0-1.
42	4/30/2019	1840	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	sunny, clear	15+	0-1.
43	5/1/2019	0535	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	sunny, clear	15+	0-1.
44	5/1/2019	0622	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	clear, sunny	15+	0-1.
45	5/1/2019	1604	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	clear, sunny	15+	0-1.
46	5/1/2019	1703	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	clear, sunny	15+	0-2.
47	5/1/2019	1747	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	sunny, clear	15+	0-2.
48	5/1/2019	1830	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	sunny, clear	15+	0-2.
49	5/2/2019	0535	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	overcast	10	0-1.
50	5/2/2019	0620	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	overcast	10	0-1.
51	5/2/2019	1600	Cassandra Joos	Majestic Fjord	Yankee Cove to Slate Cove	overcast, light rain	10+	1, lightchop

Table 2: Summary of Marine Mammal Observations

No.	Date	Time	Observer	Vessel	Route	Weather	Visibility (mi)	Wave Ht (ft.)
52	5/2/2019	1703	Cassandra Joos	Majestic Fjord	Slate Cove to Yankee Cove	overcast,no rain	10+	1-2.
53	5/2/2019	1748	Cassandra Joos	Majestic Fjord	Yankee Cove to Slate Cove	overcast, no precip.	10+	0-2.
54	5/2/2019	1829	Cassandra Joos	Majestic Fjord	Slate Cove to Yankee Cove	overcast, no precip.	10+	0-2.
55	5/3/2019	0534	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	overcast	3-8	0-3.
56	5/3/2019	0619	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	overcast	3-8	0-4.
57	5/3/2019	1600	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	overcast, high clouds	10	0-2.
58	5/3/2019	1702	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	overcast, high clouds	10+	0-2.
59	5/3/2019	1747	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	overcast, high clouds	7-10	0-3.
60	5/3/2019	1830	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	overcast	10+	0-3.
61	5/4/2019	0528	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	overcast	10	0-3.
62	5/4/2019	0620	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	overcast	6-10	0-3.
63	5/4/2019	1555	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	overcast, raining	6	0-2.
64	5/4/2019	1700	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	raining, overcast	8	0-2.
65	5/4/2019	1743	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	overcast, raining	6-8	0-2.
66	5/4/2019	1825	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	raining, overcast	6-8	0-2.
67	5/5/2019	0534	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	overcast, raining	6	0
68	5/5/2019	0618	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	overcast	6	0
69	5/5/2019	1608	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	overcast	10	0-1.
70	5/5/2019	1659	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	overcast, raining	6	0-2.
71	5/5/2019	1745	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	raining, overcast	4-6	0-2.
72	5/5/2019	1827	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	overcast	6	0-2.
73	5/6/2019	0535	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	overcast	5	0-3.
74	5/6/2019	0623	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	overcast	6-8	0-3.
75	5/6/2019	1605	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	overcast	6	0-2.
76	5/6/2019	1700	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	overcast	6-8	0-3.
77	5/6/2019	1748	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	overcast	6	0-3.
78	5/6/2019	1833	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	overcast, rainy	6	0-3.
79	5/7/2019	0536	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	overcast, rainy	6	0-1.
80	5/7/2019	0622	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	overcast, raining	4-6	0-1.
81	5/7/2019	1610	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	overcast	4-8	0-1.
82	5/7/2019	1702	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	light rain, overcast	4-7	0-2.
83	5/7/2019	1752	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	overcast	5-7	0-1.
84	5/7/2019	1836	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	overcast	6-10	0-1.
85	5/8/2019	0537	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	overcast, rainy	0-2	0-1.
86	5/8/2019	0623	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	overcast, raining	4	0-1.
87	5/8/2019	1611	Theresa Soley	Majestic Fjord	Yankee Cove to Slate Cove	overcast	6-9	0-1.
88	5/8/2019	1702	Theresa Soley	Majestic Fjord	Slate Cove to Yankee Cove	overcast	6-8	0-1.
89	5/8/2019	1749	Lynn Spencer	Majestic Fjord	Yankee Cove to Slate Cove	overcast	6-9	0-1.
90	5/8/2019	1840	Lynn Spencer	Majestic Fjord	Slate Cove to Yankee Cove	overcast, rain, fog	8-10	0-1.
91	5/9/2019	0535	Lynn Spencer	Majestic Fjord	Yankee Cove to Slate Cove	overcast, rain	<5	0-1.
92	5/9/2019	0620	Lynn Spencer	Majestic Fjord	Slate Cove to Yankee Cove	overcast, rain	<5	0-1.
93	5/9/2019	1600	Lynn Spencer	Majestic Fjord	Yankee Cove to Slate Cove	sunny	15+	0-1.
94	5/9/2019	1700	Lynn Spencer	Majestic Fjord	Slate Cove to Yankee Cove	sunny	15+	0

Table 2: Summary of Marine Mammal Observations

No.	Date	Time	Observer	Vessel	Route	Weather	Visibility (mi)	Wave Ht (ft.)
95	5/9/2019	1746	Lynn Spencer	Majestic Fjord	Yankee Cove to Slate Cove	sunny	15+	0-1.
96	5/9/2019	1829	Lynn Spencer	Majestic Fjord	Slate Cove to Yankee Cove	clear, sun	15+	0-1.
97	5/10/2019	0534	Lynn Spencer	Majestic Fjord	Yankee Cove to Slate Cove	fog, overcast	<1	0-1.
98	5/10/2019	0620	Lynn Spencer	Majestic Fjord	Slate Cove to Yankee Cove	clear, some fog	5	0-1.
99	5/10/2019	1605	Lynn Spencer	Majestic Fjord	Yankee Cove to Slate Cove	high overcast	15+	0-1.
100	5/10/2019	1702	Lynn Spencer	Majestic Fjord	Slate Cove to Yankee Cove	high overcast	10+	1-2.
101	5/10/2019	1748	Lynn Spencer	Majestic Fjord	Yankee Cove to Slate Cove	high broken	10+	1-2.
102	5/10/2019	1831	Lynn Spencer	Majestic Fjord	Slate Cove to Yankee Cove	high broken	15+	1-2.
103	5/11/2019	0533	Lynn Spencer	Majestic Fjord	Yankee Cove to Slate Cove	high overcast	10+	0-1.
104	5/11/2019	0616	Lynn Spencer	Majestic Fjord	Slate Cove to Yankee Cove	high overcast	10+	2
105	5/11/2019	1608	Lynn Spencer	Majestic Fjord	Yankee Cove to Slate Cove	high sunny	15+	0-1.
106	5/11/2019	1700	Lynn Spencer	Majestic Fjord	Slate Cove to Yankee Cove	sunny	15+	1-2.
107	5/11/2019	1744	Lynn Spencer	Majestic Fjord	Yankee Cove to Slate Cove	sunny	15+	0-1.
108	5/11/2019	1827	Lynn Spencer	Majestic Fjord	Slate Cove to Yankee Cove	high overcast	15+	0-2.
109	5/12/2019	0534	Lynn Spencer	Majestic Fjord	Yankee Cove to Slate Cove	scattered/clear	15+	0-1.
110	5/12/2019	0618	Lynn Spencer	Majestic Fjord	Slate Cove to Yankee Cove	clear	15+	0-1.
111	5/12/2019	1606	Lynn Spencer	Majestic Fjord	Yankee Cove to Slate Cove	clear	15+	0-1.
112	5/12/2019	1701	Lynn Spencer	Majestic Fjord	Slate Cove to Yankee Cove	clear	15+	0-1.
113	5/12/2019	1748	Lynn Spencer	Majestic Fjord	Yankee Cove to Slate Cove	clear	15+	0-1.
114	5/12/2019	1832	Lynn Spencer	Majestic Fjord	Slate Cove to Yankee Cove	clear, sun	15+	0-1.
115	5/13/2019	0537	Lynn Spencer	Majestic Fjord	Yankee Cove to Slate Cove	clear	15+	0-1.
116	5/13/2019	0627	Lynn Spencer	Majestic Fjord	Slate Cove to Yankee Cove	clear	15+	0-2.
117	5/13/2019	1608	Lynn Spencer	Majestic Fjord	Yankee Cove to Slate Cove	sun	15+	0-1.
118	5/13/2019	1701	Lynn Spencer	Majestic Fjord	Slate Cove to Yankee Cove	haze	15+	0-1.
119	5/13/2019	1748	Lynn Spencer	Majestic Fjord	Yankee Cove to Slate Cove	high broken	15+	0-1.
120	5/13/2019	1830	Lynn Spencer	Majestic Fjord	Slate Cove to Yankee Cove	haze overcast	10+	0-1.
121	5/14/2019	0536	Lynn Spencer	Majestic Fjord	Yankee Cove to Slate Cove	high scattered	15+	0-1.
122	5/14/2019	0624	Lynn Spencer	Majestic Fjord	Slate Cove to Yankee Cove	high scattered	15+	0-1.
123	5/14/2019	1606	Lynn Spencer	Majestic Fjord	Yankee Cove to Slate Cove	overcast	6-10	0-1.
124	5/14/2019	1702	Lynn Spencer	Majestic Fjord	Slate Cove to Yankee Cove	overcast	6-10	1-2.
125	5/14/2019	1752	Lynn Spencer	Majestic Fjord	Yankee Cove to Slate Cove	overcast	6+	2-3.
126	5/14/2019	1840	Lynn Spencer	Majestic Fjord	Slate Cove to Yankee Cove	overcast	6+	2-3.

Table 3: Summary of Marine Mammal Counts

			Counts of MM Observed In Berners Bay								Counts of MM Observed Outside Berners Bay								Counts of MM Observed - Total								
No.	Date	Time	L	S	Rafts	H	P	D	K	O	L	S	Rafts	H	P	D	K	O	L	S	Rafts	H	P	D	K	O	Notes
1	4/24/2019	0536	0	0	0	1	0	0	0	0	2	0	0	0	0	5	0	0	2	0	0	1	0	5	0	0	
2	4/24/2019	0625	2	0	0	0	0	0	3	0	0	0	0	2	0	0	0	0	2	0	0	2	0	0	3	0	2H, possibly mother and calf, 3K could be more
3	4/24/2019	1605	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	barge at slate cove
4	4/24/2019	1700	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
5	4/24/2019	1750	3	7	0	1	0	0	0	0	0	0	0	1	0	0	0	0	3	7	0	2	0	0	0	0	sea lions originally documented seperately
6	4/24/2019	1835	3	6	1	1	0	0	0	0	0	0	0	1	0	0	0	0	3	6	1	2	0	0	0	0	congregation seagulls at Pt. St Mary
7	4/25/2019	0535	0	0	0	1	0	0	0	0	1	0	0	2	0	1	0	0	1	0	0	3	0	1	0	0	19.1O only saw small blow. 20.1H, possibly 2 whales. Seagull congregation
8	4/25/2019	0625	2	0	0	2	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	3	0	0	0	0	24.2H 1 humpback near Pt. Bridget, other near echo
9	4/25/2019	1606	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	
10	4/25/2019	1705	7	0	1	0	0	0	0	0	0	0	0	0	0	10	0	0	7	0	1	0	0	10	0	0	all sealions seen in raft, congregation of seagulls at Pt. St Mary
11	4/25/2019	1755	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	
12	4/25/2019	1833	0	0	0	0	0	0	0	0	2	0	0	0	0	14	0	0	2	0	0	0	0	14	0	0	difficult count of porpoises
13	4/26/2019	0534	1	0	0	2	0	0	0	0	0	0	0	0	0	0	4	0	1	0	0	2	0	0	4	0	difficult to count killer whales, congregation of seagulls at Pt. St Mary and slate cove
14	4/26/2019	0625	8	1	1	0	0	0	7	0	1	0	0	1	0	0	0	0	9	1	1	1	0	0	7	0	congregation of seagulls at Pt. St Mary. Captain slowed boat for curious killer whales
15	4/26/2019	1601	0	0	0	1	0	0	0	3	0	0	0	2	0	0	0	0	0	0	0	3	0	0	0	3	other = black bears and otter, birds included in GPS locations
16	4/26/2019	1701	2	0	0	1	0	0	0	0	0	0	0	3	0	0	0	0	2	0	0	4	0	0	0	0	congregation of seabirds at Pt. St Mary (GPS)
17	4/26/2019	1749	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	1	other=otter, birds included on GPS locations
18	4/26/2019	1832	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	lots of birds (GPS)
19	4/27/2019	0530	5	0	1	0	0	0	0	0	1	0	0	4	0	0	0	0	6	0	1	4	0	0	0	0	two separate whales feeding at Pt. Bridget
20	4/27/2019	0615	7	0	1	0	0	0	0	0	0	0	0	2	0	3	0	0	7	0	1	2	0	3	0	0	possible humpback breach on Lynn Canal not included
21	4/27/2019	1611	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	3	0	0	0	0	birds included in GPS locations
22	4/27/2019	1701	3	0	0	2	0	0	0	0	0	0	0	0	0	6	0	2	3	0	0	2	0	6	0	2	

Table 3: Summary of Marine Mammal Counts

			Counts of MM Observed In Berners Bay								Counts of MM Observed Outside Berners Bay								Counts of MM Observed - Total								
No.	Date	Time	L	S	Rafts	H	P	D	K	O	L	S	Rafts	H	P	D	K	O	L	S	Rafts	H	P	D	K	O	Notes
23	4/27/2019	1746	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	birds included in GPS locations
24	4/27/2019	1828	0	0	0	0	0	0	0	0	3	0	0	0	3	4	0	0	3	0	0	0	3	4	0	0	birds included in GPS locations
25	4/28/2019	0530	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	birds congregating on west side of bay
26	4/28/2019	0615	0	0	0	2	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	4	0	0	0	0	92.2H two humpbacks traveling seperately. 93.1H humpback lunge feeding near shore
27	4/28/2019	1602	4	0	0	2	0	0	0	0	2	0	0	1	0	0	0	0	6	0	0	3	0	0	0	0	
28	4/28/2019	1700	2	0	0	2	0	0	0	0	3	0	0	1	0	0	0	0	5	0	0	3	0	0	0	0	
29	4/28/2019	1746	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	1	0	0	0	0	
30	4/28/2019	1832	14	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	
31	4/29/2019	0535	0	0	0	3	0	0	7	0	0	0	0	1	0	0	0	0	0	0	0	4	0	0	7	0	
32	4/29/2019	0630	0	0	0	2	0	0	3	0	0	0	0	1	0	0	0	0	0	0	0	3	0	0	3	0	seagulls near feeding humpback
33	4/29/2019	1620	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	seagulls in slate cove and lowtide sand in Berner's
34	4/29/2019	1700	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
35	4/29/2019	1750	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	
36	4/29/2019	1835	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
37	4/30/2019	0536	4	0	0	2	0	0	0	0	0	0	0	4	0	0	0	0	4	0	0	6	0	0	0	0	Birds along shores in Lynn Cannal, and Slate Cove
38	4/30/2019	0623	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	Forgot to make waypoint for humpback
39	4/30/2019	1625	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	barge at port in Slate Cove at 1656
40	4/30/2019	1710	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	
41	4/30/2019	1754	1	0	0	2	0	0	0	0	0	0	0	3	4	0	0	0	1	0	0	5	4	0	0	0	seagull congregating in different groups across bay
42	4/30/2019	1840	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0	0	0	
43	5/1/2019	0535	0	5	0	4	0	0	0	0	0	0	0	0	0	3	0	0	0	5	0	4	0	3	0	0	
44	5/1/2019	0622	0	3	0	2	0	0	0	0	0	0	0	1	0	5	0	0	0	3	0	3	0	5	0	0	seagulls congregating in cove
45	5/1/2019	1604	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
46	5/1/2019	1703	0	0	0	1	0	0	0	0	0	3	0	0	0	0	0	0	0	3	0	1	0	0	0	0	
47	5/1/2019	1747	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	
48	5/1/2019	1830	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3	0	0	seagulls in Lynn Canal
49	5/2/2019	0535	0	8	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	8	0	2	0	0	0	0	possible humpback in far distance at Lynn Canal
50	5/2/2019	0620	0	12	0	0	0	0	0	0	0	0	0	3	0	5	0	0	0	12	0	3	0	5	0	0	
51	5/2/2019	1600	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	
52	5/2/2019	1703	0	0	0	1	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	4	0	0	0	0	
53	5/2/2019	1748	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	

Table 3: Summary of Marine Mammal Counts

			Counts of MM Observed In Berners Bay								Counts of MM Observed Outside Berners Bay								Counts of MM Observed - Total								
No.	Date	Time	L	S	Rafts	H	P	D	K	O	L	S	Rafts	H	P	D	K	O	L	S	Rafts	H	P	D	K	O	Notes
54	5/2/2019	1829	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	birds included in GPS locations
55	5/3/2019	0534	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	1	0	2	0	0	
56	5/3/2019	0619	0	0	0	1	0	0	0	0	0	0	0	1	0	4	0	0	0	0	0	2	0	4	0	0	
57	5/3/2019	1600	1	10	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	10	0	2	0	0	0	0	
58	5/3/2019	1702	0	12	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	12	0	3	0	0	0	0	seagulls and eagles in slate cove, bridget cove. Seagulls at Pt. St Mary
59	5/3/2019	1747	0	11	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	11	0	3	0	0	0	0	
60	5/3/2019	1830	0	9	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	2	0	0	0	0	
61	5/4/2019	0528	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	Seagulls congregating at Pt. St Mary
62	5/4/2019	0620	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	distant whale activity in lynn canal
63	5/4/2019	1555	0	0	0	1	0	2	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0	2	0	0	Eagles congregate on W. side of Berner's, near expected haul-out. Many scoters floating nearby
64	5/4/2019	1700	0	5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	5	0	1	0	0	0	0	
65	5/4/2019	1743	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	1	0	0	0	0	
66	5/4/2019	1825	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	
67	5/5/2019	0534	0	14	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	14	0	1	1	0	0	0	
68	5/5/2019	0618	0	9	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	9	0	1	0	0	0	0	eagles congregate on rocks of shoreline between Pt. St Mary and Slate Cove. Seagulls at Pt. Bridget
69	5/5/2019	1608	0	20	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	2	0	0	0	0	giant raft of scoters
70	5/5/2019	1659	0	12	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	12	0	2	0	2	0	0	long line of scooters
71	5/5/2019	1745	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	0	0	0	0	0	0	enormous raft of sliders between slate cove and Pt. St Mary
72	5/5/2019	1827	0	16	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	16	0	2	0	0	0	0	
73	5/6/2019	0535	0	31	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	31	0	0	0	6	0	0	
74	5/6/2019	0623	0	15	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	15	0	1	0	0	1	0	
75	5/6/2019	1605	0	1	0	2	0	4	0	0	0	0	0	1	0	0	0	0	0	1	0	3	0	4	0	0	large raft of scoters
76	5/6/2019	1700	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	2	0	1	0	0	number of dahl's poirposes unknown
77	5/6/2019	1748	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	
78	5/6/2019	1833	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	
79	5/7/2019	0536	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	
80	5/7/2019	0622	0	14	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	14	0	0	0	1	0	0	
81	5/7/2019	1610	3	5	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3	5	0	3	0	0	0	0	giant raft of scoters off Pt. St Mary
82	5/7/2019	1702	0	4	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	4	0	4	0	0	0	0	
83	5/7/2019	1752	0	18	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	18	0	2	0	0	0	0	raft of scoters at Pt. St Mary

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No.	**Date**	**Time**	**L**	**S**	**Rafts**	**H**	**P**	**D**	**K**	**O**	**L**	**S**	**Rafts**	**H**	**P**	**D**	**K**	**O**	**L**	**S**	**Rafts**	**H**	**P**	**D**	**K**	**O**	**Notes**
84	5/7/2019	1836	0	29	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	29	0	2	0	0	0	0	bald eagles at Pt. St Mary
85	5/8/2019	0537	0	35	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	35	0	1	0	0	0	0	raft of scoters at Pt. St Mary
86	5/8/2019	0623	0	27	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	27	0	2	0	0	0	0	seagulls and scoters at Pt. St Mary
87	5/8/2019	1611	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	0	2	0	0	0	0	eagles at Pt. St Mary
88	5/8/2019	1702	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	
89	5/8/2019	1749	0	3	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	3	0	2	0	0	0	0	scoters at Pt. St Mary
90	5/8/2019	1840	0	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	2	0	0	0	0	
91	5/9/2019	0535	0	5	0	2	0	0	0	0	0	0	0	1	0	1	0	0	0	5	0	3	0	1	0	0	
92	5/9/2019	0620	0	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	2	0	0	0	0	scoters at Pt. St Mary
93	5/9/2019	1600	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	3	0	0	0	0	raft of scoters near bridget cove and scoters flying everywhere
94	5/9/2019	1700	0	0	0	1	0	0	0	0	2	1	0	1	0	6	0	0	2	1	0	2	0	6	0	0	scoters and mergansers flying
95	5/9/2019	1746	0	28	0	3	0	0	0	0	0	0	0	1	0	0	0	0	0	28	0	4	0	0	0	0	flocks of scoters and mergansers
96	5/9/2019	1829	0	29	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	29	0	4	0	0	0	0	large seabird raft between slate cove and Pt. St Mary
97	5/10/2019	0534	0	6	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	2	0	0	0	0	dense fog, sun above. At 5:55 fog started to lift, then dense fog again at Berners Bay. Clear at Slate Cove.
98	5/10/2019	0620	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	very large scoter raft off of Pt. St Mary. Fog in Lynn Canal. Humpbacks feeding.
99	5/10/2019	1605	0	22	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	22	0	3	0	0	0	0	humpbacks feeding off shelf next to shore
100	5/10/2019	1702	0	24	0	3	0	0	0	0	0	0	0	1	0	0	0	0	0	24	0	4	0	0	0	0	very large scoter raft off of Pt. St Mary.
101	5/10/2019	1748	1	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	1	0	0	0	0	large raft of scoters near Pt. St Mary
102	5/10/2019	1831	1	0	0	1	0	0	0	0	0	0	0	1	0	13	0	0	1	0	0	2	0	13	0	0	large raft of scoters near Pt. St Mary
103	5/11/2019	0533	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	eagles and scoters at Pt. St Mary
104	5/11/2019	0616	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	eagles and scoters at Pt. St Mary
105	5/11/2019	1608	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
106	5/11/2019	1700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	lots of scoters near Pt. St Mary
107	5/11/2019	1744	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	lots of scoters near Pt. St Mary
108	5/11/2019	1827	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	lots of scoters near Pt. St Mary and eagles

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No.	**Date**	**Time**	**L**	**S**	**Rafts**	**H**	**P**	**D**	**K**	**O**	**L**	**S**	**Rafts**	**H**	**P**	**D**	**K**	**O**	**L**	**S**	**Rafts**	**H**	**P**	**D**	**K**	**O**	**Notes**
109	5/12/2019	0534	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	huge raft of scoters near Pt. St Mary
110	5/12/2019	0618	0	0	0	0	0	0	0	0	0	0	0	1	0	0	10	0	0	0	0	1	0	0	10	0	lots of scoters near Pt. St Mary
111	5/12/2019	1606	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0	0	0	eagles and lots of scoters near Pt. St Mary
112	5/12/2019	1701	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0	lots of scoters near Pt. St Mary
113	5/12/2019	1748	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Scoters rafts thousands
114	5/12/2019	1832	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	scoter of rafts
115	5/13/2019	0537	0	5	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	5	0	2	0	0	0	0	large raft of scoters
116	5/13/2019	0627	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	many scoter rafts
117	5/13/2019	1608	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	
118	5/13/2019	1701	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
119	5/13/2019	1748	1	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	1	0	0	0	0	8	0	0	scoter raft, big
120	5/13/2019	1830	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	scoter rafts at Pt. St Mary
121	5/14/2019	0536	0	0	0	0	0	0	0	0	3	0	0	1	0	0	0	0	3	0	0	1	0	0	0	0	scoter rafts at Pt. St Mary
122	5/14/2019	0624	2	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	scoters at Pt. St Mary
123	5/14/2019	1606	0	1	0	1	0	7	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	7	0	0	
124	5/14/2019	1702	1	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	scoter rafts at Pt. St Mary
125	5/14/2019	1752	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	scoter rafts at Pt. St Mary
126	5/14/2019	1840	0	0	0	0	0	3	0	0	1	0	0	0	0	0	6	0	1	0	0	0	0	3	6	0	
			97	512	5	101	1	16	20	4	30	4	0	104	7	105	21	2	127	516	5	205	8	121	41	7	

			Latitude and Longitude Coordinates															
No.	Date	Time	L (Sea Lion)		S (Harbor seal)		Rafts		H (Humpback whale)		D (Dall's porpoise)		P (Harbor porpoise)		K (Killer whale)		O (Other)	
1	4/24/2019	0536	1) 58.5915829706937	-134.916559997946					3) 58.764042975381	-135.008985986933	2) 58.5945270303636	-134.923587972298						
2	4/24/2019	0625	4) 58.7750510126352	-135.012130038812					5) 58.7331949733197	-135.015323041006					6) 58.6951620038598	-135.011024968698		
3	4/24/2019	1605	7) 58.6559369601309 8) 58.758345041424	-134.979450004175 -135.011814963072														
4	4/24/2019	1700	9) 58.7735740374773	-135.010798992589														
5	4/24/2019	1750	13) 58.7798349838703	-135.013046013191	12) 58.7768279761075	-135.012777037918			10) 58.671603994444 11) 58.7550529651343	-134.994682017713 -135.010217037051								
6	4/24/2019	1835	14) 58.7786529678851	-135.012745019048	15) 58.7718740198761	-135.010772002860	14) 58.7786529678851	-135.012745019048	16) 58.7298820260912 17) 58.6751409899443	-135.014819037169 -135.000054985284								
7	4/25/2019	0535	18) 58.5954460222274	-134.922802001237					20) 58.6310889758169 21) 58.6755529604852 22) 58.7293520383536	-134.966803975403 -134.999267002567 -135.013290010392	19) 58.6022890079766	-134.935077968984						
8	4/25/2019	0625	23) 58.7750520184636	-135.010180994868					24) 58.6849069967865 25) 58.6198390368372	-135.009329980239 -134.958466999232								
9	4/25/2019	1606							26) 58.6740889772772	-134.994122022762								
10	4/25/2019	1705	27) 58.7631420046091	-135.010723974555			27) 58.7631420046091	-135.010723974555			28) 58.6971009895205 29) 58.6724899616092	-135.009965999051 -134.997331034392						
11	4/25/2019	1755	30) 58.7683780118823	-135.010458016768														
12	4/25/2019	1833	34) 58.594076000154	-134.921805979683							31) 58.6899799760431 32) 58.6638290248811 33)58.6564660258591	-135.011051958426 -134.995983978733 -134.990320997312						
13	4/26/2019	0534	36) 58.7453840207308	-135.011094035580					37) 58.7623769883066 38) 58.7791029922664	-135.009765001013 -135.014180000871					35) 58.6699980217963	-134.993377961218		
14	4/26/2019	0625	39) 58.7776929885149 41) 58.7542600370943 42) 58.7296699639409	-135.01361397095 -135.012343022972 -135.016648974269	40) 58.7774289585649	-135.013640038669	39) 58.7776929885149	-135.013613970950	43) 58.7272650282829	-135.017387000843					44) 58.6686060391366	-134.999462971463		
15	4/26/2019	1601							45) 58.634488005191 46) 58.6561180092394 50)58.7717689946293	-134.965237984433 -134.965237984433 -135.017714984714							47) 58.7250200193375 48) 58.7322560325264 49) 58.7687739729881 51) 58.7721429951488	-135.012245038524 -135.011028992012 -135.019158013164 -135.017609959468
16	4/26/2019	1701	52) 58.774040993303	-135.012659020721					53) 58.7687840312719 55) 58.633444039151 56) 58.6204810068011	-135.011199982836 -134.96621900238 -134.955232003703							54) 58.7186269741505	-135.020160991698
17	4/26/2019	1749							57) 58.6340420041233 59) 58.7394570093601	-134.967461032792 -135.008880961686							58) 58.726363973692 60) 58.7615559808909	-135.010466985404 -135.009450009092
18	4/26/2019	1832							61) 58.7655630335211 63) 58.6831779778003	-135.011612037196 -135.00612096861							62) 58.7258980236947	-135.018587037920
19	4/27/2019	0530	64) 58.6138879694044 67)58.7743500340729	-134.950277041643 -135.010160962119			67) 58.7743500340729	-135.010160962119	65) 58.6634159646928 66) 58.6766649875789	-134.987270990386 -134.995021987706								
20	4/27/2019	0615	68) 58.7789449933916 69) 58.7714450340718	-135.012693973258 -135.00995401293			68) 58.7789449933916	-135.012693973258	70) 58.6899450235068 71) 58.6737459897994	-135.012322990223 -135.003031985834	72) 58.6518650315701	-134.989258004352						
21	4/27/2019	1611							73) 58.6166420113295 75)58.7736519891768	-134.951770026236 -135.012317961081							74) 58.7497909739613 76)58.7771070096641	-135.006160028278 -135.012547960504
22	4/27/2019	1701	77) 58.7781310267746	-135.012207990512					78) 58.7769950274378	-135.011956030502	80) 58.6879409942775	-135.003412021324					81) 58.6066969670355	-134.942191019654
23	4/27/2019	1746							82) 58.6779899988323 84) 58.7621469888836	-134.997775023803 -135.009225038811							83) 58.7455120123922	-135.006364965811
24	4/27/2019	1828	88) 58.5887779667973	-134.911509985104							87) 58.6384300142526	-134.975801026448	86) 58.6555969901382	-134.989902991801			85) 58.7696150131523	-135.009934986010
25	4/28/2019	0530							89) 58.6726410035043 90)58.7779489718377	-134.994086986407 -135.012044962495								
26	4/28/2019	0615							91) 58.7273319996893 92) 58.6818170081824 93)58.5989789944142	-135.0186459627 -135.009958036243 -134.935371000319								
27	4/28/2019	1602	95) 58.5925759747624 96) 58.6847540270537 100) 58.7678229622542 101) 58.7680810410529	-134.914979003369 -135.000905999913 -135.01089496538 -135.012052003294					94) 58.588439002633 98) 58.7515619862824	-134.907172014936 -135.010624984279							97) 58.7481989990919 99) 58.7574159912765	-135.010776026174 -135.010459022596
28	4/28/2019	1700	102) 58.7680810410529 106) 58.5959699749946	-135.002714982256 -134.922606032341					103) 58.765391036868 104) 58.7622569594532 105) 58.6684710066765	-135.001617958769 -135.000241985544 -134.990878980606								
29	4/28/2019	1746	108) 58.7663100287318	-135.009975973516					107) 58.6619140114635	-134.986932026222							109) 58.7713749613612	-135.010775020346
30	4/28/2019	1832	110) 58.7705490086227 111) 58.7646789941936 112) 58.6968920286744 113) 58.609187984839	-135.010332958772 -135.007990971207 -135.009049018844 -134.942031009122														
31	4/29/2019	0535							115) 58.6617639753967 117) 58.775734975934	-134.988156035542 -135.010406970977					116) 58.6923300102353	-135.009542964398		
32	4/29/2019	0630							118) 58.7689110171049 120) 58.6806309688836 121) 58.6385060381144	-135.009642960503 -135.007200976833 -134.973389972001					119) 58.7383640091866	-134.999695988371		
33	4/29/2019	1620							122) 58.6769659817218 123) 58.7776909768581	-134.998684963211 -135.011913031339								
34	4/29/2019	1700							124) 58.7674320302903	-135.008995961397								
35	4/29/2019	1750							125) 58.7696839962154	-135.008490029722								
36	4/29/2019	1835							126) 58.7765510380268	-135.010224999859								

			Latitude and Longitude Coordinates															
No.	Date	Time	L (Sea Lion)		S (Harbor seal)		Rafts		H (Humpback whale)		D (Dall's porpoise)		P (Harbor porpoise)		K (Killer whale)		O (Other)	
37	4/30/2019	0536	131) 58.7798219919204	-135.013013994321					127) 58.5945560317486 128) 58.5969850234687 129) 58.6378450412303 130) 58.7734319642186	-134.923446988686 -134.927630983293 -134.968991987407 -135.009742034599								
38	4/30/2019	0623	132) 58.779480010271	-135.012969989329			132) 58.779480010271	-135.012969989329										
39	4/30/2019	1625	133) 58.763718008995 135) 58.7766699772328	-135.009907996281 -135.012064995244					134) 58.7734899669885	-135.011570965871								
40	4/30/2019	1710							136) 58.6020350363105	-134.932531965896								
41	4/30/2019	1754	141) 58.7748490087687	-135.010736966505					137) 58.6007009726017 139) 58.6594799906015 140) 58.678604979068 142) 58.7765419855713	-134.932304983958 -134.98798999004 -134.998856959864 -135.01075297594			138) 58.6508199758827	-134.980179984122				
42	4/30/2019	1840							143) 58.6459599807858 144) 58.591650025919	-134.975226027891 -134.913706965744								
43	5/1/2019	0535			148) 58.7623049877583	-135.009087994694			146) 58.7095279991626 147) 58.7301570363342 149) 58.7704299855977	-135.016895988956 -135.011163018643 - 135.010067000985	145) 58.6161629855632	-134.950277963653						
44	5/1/2019	0622			151) 58.7573309987783	-135.008593965321			150) 58.7714860215783 152) 58.7288129981607 153) 58.7112280167639	-135.009597027674 -135.014283014461 -135.019542993977	154) 58.6759989615529	-134.999570008367						
45	5/1/2019	1604							155) 58.7616109661757	-135.008454993367								
46	5/1/2019	1703			157) 58.7321420386433	-135.014713006094			156) 58.7569699902087	-135.010683992877								
47	5/1/2019	1747							158) 58.6000500340014	-134.931073011830								
48	5/1/2019	1830									159) 58.6850010417401	-135.006967959925						
49	5/2/2019	0535			162) 58.7740549910813	-135.010361960157			160) 58.6442609690129 161) 58.6935449671	-134.972724029794 -135.005689971148								
50	5/2/2019	0620			163) 58.7717069685459	-135.010962020605			164) 58.6878000106662 166) 58.6491989996284 167) 58.5898429714143	-135.007859040051 -134.983107028529 -134.913576040416	165) 58.6809639818966	-135.004087015986						
51	5/2/2019	1600	169) 58.7399099674075	-135.021494971588					168) 58.6906630173325	-135.002739960327								
52	5/2/2019	1703							170) 58.686197977513 171) 58.6838920321315 172) 58.6343419924378 173) 58.5939429793506	-135.003850981593 -135.002558995038 -134.965910967439 -134.918221039697								
53	5/2/2019	1748							174) 58.617690000683	-134.951443970203								
54	5/2/2019	1829							175) 58.6849290411919	-135.001995982602							176) 58.5983169917017	-134.926565978676
55	5/3/2019	0534							178) 58.6646060273051	-134.988956004381	177) 58.6449320241808	-134.972844980657						
56	5/3/2019	0619							179) 58.7411199789494 181) 58.5913959704339	-135.01457998529 -134.919257964938	180) 58.6532189603894	-134.984576962888						
57	5/3/2019	1600	185) 58.7790230289101	-135.013874983415	184) 58.7756329681724	-135.012896982952			182) 58.5945810098201 183) 58.7288969848304	-134.923903970047 -135.013242987915								
58	5/3/2019	1702	186) 58.776585990563	-135.012949034571					187) 58.7687400262802 188) 58.7283590342849 189) 58.5882349871098	-135.011616982519 -135.018483018502 -134.901768034324								
59	5/3/2019	1747			193) 58.7756870314478	-135.012567993253			190) 58.5929460357874 191) 58.722257008776 192) 58.7395610287785	-134.923902964219 -135.016367007046 -135.014163991436								
60	5/3/2019	1830			194) 58.7760460283607	-135.013519003987			195) 58.7535759899765	-135.011828038841								
61	5/4/2019	0528							196) 58.7250989768654	-135.015059011057								
62	5/4/2019	0620							197) 58.7317780125886 198) 58.7216469738632	-135.010996973142 -135.019433023408								
63	5/4/2019	1555	199) 58.6162830144166	-134.947180012241					201) 58.7544130068272	-135.014931019395	200) 58.7023560237139	-135.011273995041						
64	5/4/2019	1700			202) 58.7755830120295	-135.011931974440			203) 58.6162960063666	-134.952070014551								
65	5/4/2019	1743			204) 58.7759629637002	-135.010703019797			205) 58.7793550360947	-135.012993039563								
66	5/4/2019	1825			206) 58.775491984561	-135.012304969131												
67	5/5/2019	0534			209) 58.7758959922939	-135.011354964226			207) 58.614989016205	-134.946693023666			208) 58.7088420242071	-135.014920039102				
68	5/5/2019	0618			210) 58.7742979824542	-135.011992994695			211) 58.589475005865	-134.910499965772								
69	5/5/2019	1608			214) 58.7755919806659	-135.009604990482			212) 58.682696018368 213) 58.7592999916523	-135.006852960214 -135.007096035405								
70	5/5/2019	1659			215) 58.7773250229656	-135.012852977961			217) 58.6328459903597	-134.968165028840	216) 58.689483013004	-135.008176965638						
71	5/5/2019	1745			218) 58.7744429893791	-135.011588986963												
72	5/5/2019	1827			219) 58.7752149626612	-135.012250989675			220) 58.7628489732742 221) 58.6748560052365	-135.00760900788 -134.997260961681								
73	5/6/2019	0535			224) 58.7766070291399	-135.011369967833					222) 58.6602650396525 223) 58.6951579805463	-134.986620973795 -135.010071024298						
74	5/6/2019	0623			225) 58.7751270364969	-135.012366995215			226) 58.7322220019996	-135.014057038351					227) 58.6759479995816	-134.998140977695		

			Latitude and Longitude Coordinates															
No.	Date	Time	L (Sea Lion)		S (Harbor seal)		Rafts		H (Humpback whale)		D (Dall's porpoise)		P (Harbor porpoise)		K (Killer whale)		O (Other)	
75	5/6/2019	1605			232) 58.7739069666713	-135.011431993916			229) 58.6762909870594 231) 58.7249610107392	-134.999344032257 -135.013440968468	230) 58.6825100239366	-135.004234034568						
76	5/6/2019	1700							233) 58.730248985812 235) 58.5898429714143	-135.009650001302 -134.91191198118	234) 58.722856985405	-135.013214992359						
77	5/6/2019	1748							236) 58.6746840085834 237) 58.7454319652169	-134.999982984736 -135.007957024499								
78	5/6/2019	1833							238) 58.6721159610897	-134.996043993160								
79	5/7/2019	0536			239) 58.7717320304363	-135.011960975825												
80	5/7/2019	0622			240) 58.7757179606705	-135.011294027790					241) 58.7198830023407	-135.021751960739						
81	5/7/2019	1610	244) 58.7317650206387	-135.013044001534	245) 58.7732359953224	-135.011970028281			242) 58.6191509664058 243) 58.6286699585616	-134.953302992507 - 134.962806981056								
82	5/7/2019	1702			246) 58.7775100115686	-135.014594988897			247) 58.7308190390467 248) 58.6442980170249 249) 58.6244179867208	-135.01082397066 - 134.959169989451 - 134.959169989451								
83	5/7/2019	1752			252) 58.7721549812704	-135.012364983558			250) 58.6123000178486 251) 58.7251750007271	-134.948287010192 -135.011723013594								
84	5/7/2019	1836			253) 58.7747119646519	-135.012390967458			254) 58.7323250155895 255) 58.6644460167735	-135.010465979576 -134.988986011594								
85	5/8/2019	0537			257) 58.7768029980361	-135.011498965322			256) 58.7251549679785	-135.012777037918								
86	5/8/2019	0623			258) 58.7795520108193	-135.012949034571			259) 58.6814679857343 260)58.6069100350141	-135.004613986238 -134.941492974758								
87	5/8/2019	1611			262) 58.7760040350258	-135.010396996513			261) 58.7256479915231	-135.016417969018								
88	5/8/2019	1702							263) 58.7313549779355	-135.013467036187								
89	5/8/2019	1749			266) 58.7764569930732	-135.011566020548			264) 58.7258499953895 265) 58.7332499586045	-135.015667034313 -135.011949995532								
90	5/8/2019	1840			267) 58.7800769694149 268) 58.7755250092595	-135.014167008921 -135.01283403486			269) 58.7383589800447 270) 58.737077973783	-135.012053009122 -135.012264987453								
91	5/9/2019	0535			275) 58.7776599638164	-135.011712033301			271) 58.6375420354306 273) 58.7309659738093 274) 58.7323599681258	-134.967727996408 -135.012547960504 -135.012103971093	272) 58.6392879858613	-134.969586012884						
92	5/9/2019	0620			276) 58.777230978012	-135.011612959206			277) 58.7246050313115 278) 58.7021359987556	-135.020451005548 -135.026668030768								
93	5/9/2019	1600							279) 58.5886349715292 280) 58.6974050011485 281) 58.7033539731055	-134.901669966056 -135.006282990798 -135.009546987712								
94	5/9/2019	1700	282) 58.7264570128172	-135.016928007826	283) 58.7257390189915	-135.017466964200			285) 58.6807449627667 286) 58.6338639724999	-135.002809027209 -134.964850991964	284) 58.6862669605761	-135.006412994116						
95	5/9/2019	1746			288) 58.7732420302927	-135.011972961947			286) 58.6338639724999 (Repeat?) 287) 58.7207170017063	-134.964850991964 (Repeat?) -135.015895022079								
96	5/9/2019	1829			289) 58.7798909749835 291) 58.7294040061533	-135.013268971815 -135.016922978684			290) 58.7338640168309 292) 58.7284669931977 293) 58.6757470015436	-135.017020963132 -135.01661603339 -135.000309962779								
97	5/10/2019	0534			295) 58.7734850216656	-135.013154977932			294) 58.7377460114657	-135.007280018180								
98	5/10/2019	0620							296) 58.7379729934036	-135.013797031715								
99	5/10/2019	1605			300) 58.7799809966236	-135.013501988723			298) 58.7272549699991 299) 58.7464279867708	-135.013151038438 -135.010051997378								
100	5/10/2019	1702			300) 58.7799809966236 (Repeat?)	-135.013501988723 (Repeat?)			301) 58.7518639862537 302) 58.7511190026998 303)58.7318950239568	-135.010159034281 -135.010353997349 -135.016046985983								
101	5/10/2019	1748	305) 58.761001015082	-135.008909963071	306) 58.7697929609566	-135.010226005688			304) 58.7457180395722	-135.010104971006								
102	5/10/2019	1831	307) 58.7566020246595	-135.011296039447					308) 58.7511599902063 309) 58.7223180290311	-135.012146970257 -135.021219961345	310) 58.7160500418394 311) 58.7081119604408 312) 58.666995037347	-135.022494010627 -135.022938000038 -134.992800028994						
103	5/11/2019	0533																
104	5/11/2019	0616							313) 58.6652279645204	-134.991350965574								
105	5/11/2019	1608																
106	5/11/2019	1700																
107	5/11/2019	1744																
108	5/11/2019	1827																
109	5/12/2019	0534																
110	5/12/2019	0618							315) 58.6374530196189	-134.973398018628					314) 58.6884129792451	-135.014492981135		
111	5/12/2019	1606							316) 58.6494930367916	-134.973593987524								
112	5/12/2019	1701									317) 58.6514640413224	-134.978496981784						
113	5/12/2019	1748																

			Latitude and Longitude Coordinates															
No.	Date	Time	L (Sea Lion)		S (Harbor seal)		Rafts		H (Humpback whale)		D (Dall's porpoise)		P (Harbor porpoise)		K (Killer whale)		O (Other)	
114	5/12/2019	1832			318) 58.7752550281584	-135.012471014633												
115	5/13/2019	0537			321) 58.7748129665851	-135.011755032464			319) 58.6603089608252 320) 58.668540995568	-134.987264033406 -134.994614040479								
116	5/13/2019	0627			322) 58.7780339643359	-135.012721968814												
117	5/13/2019	1608							323) 58.6122000217437	-134.960903031751								
118	5/13/2019	1701																
119	5/13/2019	1748	325) 58.6734569817781	-134.992734985426							324) 58.6484120227396	-134.975355025380						
120	5/13/2019	1830																
121	5/14/2019	0536	327) 58.6012130230665	-134.933029012754					326) 58.5898419655859	-134.915022002533								
122	5/14/2019	0624	328) 58.7241150252521 331) 58.5885609593242	-135.018109017983 -134.901685975492														
123	5/14/2019	1606			334) 58.7763989903032	-135.013296967372			333) 58.7661419715732	-135.010084016248	332) 58.7004669941961	-135.005938997492						
124	5/14/2019	1702	335) 58.7272839713841 336) 58.6771770380437	-135.017988989129 -134.996987041085														
125	5/14/2019	1752							337) 58.7599899899214	-135.008262963965								
126	5/14/2019	1840	340) 58.5912770312279	-134.912158995866							338) 58.6853740364313	-135.002664020285			339) 58.6590919923037	-134.982566982507		

Attachment 2

Wildlife Monitoring Report – 2019

2019 TERRESTRIAL WILDLIFE MONITORING REPORT OF THE SLATE LAKES BASIN

Coeur Alaska - Kensington Gold Mine
3031 Clinton Drive Suite 202
Juneau, AK 99801

January 2020

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES & CHARTS

LIST OF APPENDICIES

1.0 Introduction

This report describes the 2019 wildlife monitoring season (May through November) in accordance with the Kensington Project Terrestrial Wildlife Monitoring Plan. Coeur Alaska and resource agencies designed this plan to monitor wildlife resources in the Slate Lakes basin. This monitoring records the effectiveness of mitigation during mine operations that encourages land use by local wildlife.

The Kensington Gold Project Final Supplemental Environmental Impact Statement (FSEIS) (USFS 2004) documented the occurrence of wildlife species in the Slate Lakes basin prior to construction activity. Coeur Alaska conducted a baseline survey in 2005 (Living System Designs 2005). Management indicator species in the Berners Bay area include black and brown bear, Sitka Black-tailed deer, Alexander Archipelago wolf, Bald Eagle, red squirrel, river otter, marten, Red-breasted sapsucker, Brown creeper, and Vancouver Canada goose

Sightings of wildlife or their sign within the Slate Lakes basin include moose, black bear, brown bear, wolf, deer, Canada goose, red squirrels, porcupine, river otter, old beaver cuttings, Bald Eagles, Red-tailed Hawks, Pygmy Owls, Rufous Hummingbirds, Sooty Grouse, bats, wading birds, ducks, passerines, sapsuckers and various mustelid species.

Coeur Alaska monitored wildlife in 2006 and 2007 during the first phase of construction. Due to no construction activity during 2008, no wildlife monitoring was conducted during this period. Wildlife monitoring resumed in early September 2009 at the start-up of construction for the Tailings Treatment Facility (TTF) and continued through 2010 when mine tailings were first placed in the TTF. Monitoring ceased during 2011, but restarted in 2012 and has continued through 2019.

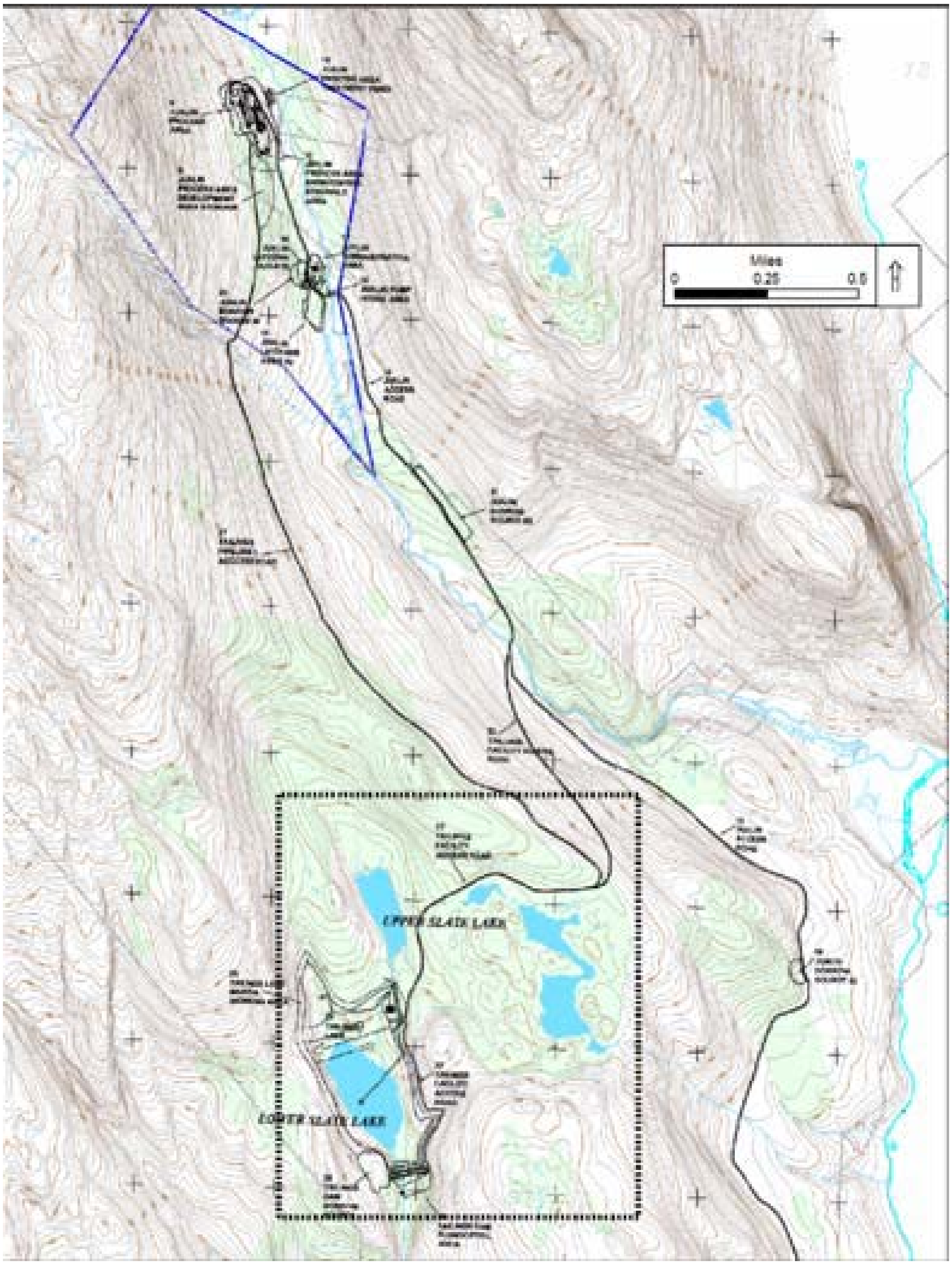

Figure 1: Slate Lakes basin in relation to access roads and the Tailings Treatment Facility (TTF). The access road to the TTF was constructed in 2006. The tailings dam was constructed between August 2009 and August 2010. Construction for the tailings dam raise occurred February – December of 2018.

1.1 Wildlife Monitoring Objective

The objectives of the Kensington Project Wildlife Monitoring Plan are to:

- Supplement the regional resource knowledge base with site-specific data
- Gather new information on specific wildlife habitats and species that could be affected by increased activity at the project site with specific attention to sensitive species
- Identify concentrations of wildlife near specific resources (e.g., stream mouth marshes, anadromous streams, lakes, wetlands, bird nesting/feeding areas, large mammal crossing areas, etc.)
- Conduct wildlife observations along an established route surrounding the Slate Lakes basin on a frequent basis from spring through fall
- Collect data and other information that can be used to shape the subsequent year's studies and long-term monitoring

Figure 2: The Slate Lakes basin in 2005, prior to construction of the access road and the Lower Slate Lake Tailings Treatment Facility.

2.0 Survey Area

The wildlife monitoring survey area lies within the confines of the Slate Lakes basin, an area of approximately two square kilometers, ranging in elevation from 200 meters above sea level at the mouth of Lower Slate Lake, to 300 meters on the ridge to the west of Lower Slate Lake (Figure 1). Water bodies within the basin include Lower and Upper Slate Lakes to the west and the Spectacle Lakes complex to the east. Both Lower and Upper Slate Lake have steep western slopes, but much of the remaining area around Upper Slate Lake is flat with a mild slope to the east. The area around the Spectacle Lakes is also fairly flat. There is drainage from the southeast corner of Lower Spectacle Lake into Berners Bay, while Fat Rat Lake drains into Upper Slate Lake (Figure 2). Upper Slate Lake drains to Lower Slate Lake via Mid-Lake Slate Creek and Lower Slate Lake drains to East Fork Slate Creek.

Prior to construction, terrestrial vegetation types around Upper and Lower Slate Lakes were similar and included mixed spruce and hemlock forest to the west of both lakes and to the southeast of Lower Slate Lake. The north and east shores of both lakes were characterized by wetlands containing sedge meadow and scrub muskeg. The periphery timber of Lower Slate Lake was clear-cut by September 2005 and the TTF access road along the north of Spectacle Lakes was constructed by August 2006. The immediate vicinity of Upper Slate Lake has not been impacted by the project. The vegetation around the Spectacle Lake complex included sphagnum bogs and sedge fens with brushy, scrub forest in elevated areas. All of the lakes contained various species of aquatic vegetation, though not in high volume (Living System Designs 2005).

3.0 Methods

Kate Savage, who conducted wildlife monitoring in 2006, 2007, and 2010 established transects that were used in all surveys, including the 2019 season. There are 20 transects around the basin, each transect is 50 meters long and runs in a north-south direction (see Appendix A). Transects provide a systematic method for recording wildlife sign throughout the survey season. The north, middle, and south end of each transect were marked with stakes and survey flagging. GPS coordinates of each transect were also recorded (see list in Appendix B). Coeur Alaska environmental technicians visited each transect once per week during the 2019 season when possible. Starting at the north end of each transect (zero meters), the technicians walked the length of the transect examining the ground within one meter on both sides, ending at 50 meters. Technicians recorded the location of the sign found along transects (i.e. tracks, scat, digs) by indicating the meter number and whether they lay on the left, center, or right side of the transect. Furthermore, sign was removed from transects by filling in tracks or brushing aside scat. In this way, fresh wildlife sign could be more easily separated from older, previously recorded sign.

Scans with binoculars were also made from the access road and viewpoints between transects to detect the presence of wildlife from afar. This method was most effective for observing waterfowl on the lakes. Lower Slate Lake is easily visible from almost any aspect on the TTF road. Viewing locations were optimum in the Spectacle Lakes area from the western edge of Lower Spectacle Lake, the southern tip of Lower Spectacle Lake, which also afforded a good view of the adjacent southern slough, and the northern tip of upper Spectacle Lake.

Environmental technicians recorded data on wildlife sign along transects to ensure observations and data collection were as standardized and unbiased as possible. Other information collected included weather conditions, visibility, and the time at the start and end of each survey.

Figure 3: Spectacle Lakes basin with access road to the Tailings Treatment Facility (2010)

4.0 Survey Results

During the 2019 survey season, environmental technicians determined the presence of wildlife within the Slate Lakes basin through actual sightings and identification of wildlife sign (tracks, digs, scat, and feathers). In contrast to previous years, motion-sensor cameras were not used within the survey site this season. Data collected during surveys included direct observations of wildlife species with photographs taken when possible, date and time, location, and behavior of wildlife. Specific signs such as digs, tracks, and scat were recorded on field data sheets. Other applicable data and observations were noted on the field data sheets as well. Table 1 through Table 4 summarize wildlife sign by the main species present in the Slate Lakes basin (All species, Bear, Moose, and Goose). Charts 1 through 8 compare data (number of signs observed) collected on these species from 2012 to 2019 by month.

4.1 Black Bear (*Ursus americanus)*

Indications of bear activity included actual sightings, tracks, scat, and digs. Bears were frequently sighted crossing or traveling along the TTF access road and around the TTF throughout the season. Sows with cubs were observed in the survey area this summer. No brown bears were sighted in the area in 2019.

4.2 Moose (*Alces alces*)

Moose sign consisted of tracks, scat and numerous sightings; no bedding sites were observed in 2019. Transect(s) with the highest concentration of signs varies from year to year. Plants such as pond weeds, grasses, and sedges that generally make up part of moose's diet are all abundant within the survey area. Moose tracks can form deep depressions in soft, wet ground that persist for months. A single moose can also leave a large number of signs by simply walking parallel to transects. These factors were taken into consideration when making any conclusions about levels of activity over time.

4.3 Avian Species

The avian species identified through direct sightings or indirectly through songs or calls included both resident and migratory wading birds, non-passerine land birds, passerines and species of special interest, which include waterfowl and raptors.

As with previous survey seasons, Canada geese (Branta Canadensis) have continued to use the area as a summer refuge. Goose signs observed were in the form of scat, tracks left in mud, and feathers. Numerous feathers were often found in one spot which may be an indication of summer molting. As environmental technicians conducted surveys, geese would often be observed swimming in groups on all the lakes of the survey area.

Sooty Grouse with chicks have been observed in the Slate Lakes basin in previous years. In 2019, male Sooty Grouse mating calls could be heard throughout the Slate Lakes basin in the spring. No females were observed.

As with the 2014 through 2018 survey seasons, a pair of Yellowlegs appeared to be nesting in the survey area. No ground nest or signs of chicks were observed, however the pair behaved defensively whenever technicians attempted to survey transects north of Upper and Lower Spectacle Lakes. Ducks appear to make some use of Spectacle Lakes and Upper and Lower Slate Lake continually during summer and fall months. Goldeneyes, Mallards, Loons, Mergansers, and Greater Scaups were observed throughout the season.

Other common bird species observed in the area included Dark-Eyed Juncos, Steller's Jays, American Robins, Varied and Hermit Thrushes, Chestnut-backed Chickadees, American Dippers, Warblers, Sapsuckers, Common Ravens, Pacific Wrens, Ruby-Crowned Kinglets, Tree Swallows, Olive-sided Flycatchers and song sparrows. An avian species list compiled and updated yearly since 2012 by environmental technicians is located in Appendix E.

4.4 Other Sightings

Signs of Alexander Archipelago wolf have been observed in previous years' survey seasons, with numerous images captured on motion-sensor cameras. In 2019, no signs of wolf were recorded during the wildlife survey and no motion-sensor cameras were used. However, water treatment plant operators observed five wolves passing through the survey area on one occasion.

It is likely that smaller mammals are just as active (if not more so) during the survey season, but their sign is more evident in snow. Current surveying practices were not conducive to obtaining representative data on small mammal, weasel, and rodent populations within the Slate Lakes basin.

Both Western Toads and Wood Frogs have not been sighted since 2012 in the survey area. Interestingly, in 2019, technicians observed a Western Toad on two occasions during the survey season. The first was observed in July on T18 and the second was in August at T7.

An increase in Sitka Black-tailed Deer sign was also evident during the 2019 season. Deer sign, in the form of tracks, was observed consistently June through November.

4.5 Human Activity

The access road to the TTF has considerable traffic use at times, and experienced an increase with heavy equipment in 2018 due to construction for the tailing's dam raise. By the 2019 survey season, construction for the damn raise had been completed and traffic levels had returned to normal.

5.0 Discussion

The transects are all located in open bog and fen areas around the lakes, as opposed to thick brush, for ease of finding wildlife sign. Smaller, lighter mammals do not leave visible tracks in firmer ground. This led to some bias with apparent abundance of large mammals relative to smaller mammals.

Bear sign peaked in July and tapered off through fall, with this same trend documented in years 2014 through 2018. This is most likely due to bears' diet transitioning from the berries and roots found in the survey area in early summer, to salmon during the Pink, Chum, and Coho runs beginning early August in Slate and Johnson Creek. Most of the bear sign found was in the form of scat and digs. Bears have continued to use the TTF access road as a corridor for travel and all habitat within the survey site for food. Survey results for 2018 and 2019 have shown less bear sign recorded than previous years. It seems that bears have not been using the survey area the same way as years prior to 2018. One can speculate the construction at the TTF in 2018 played a role and use has yet to return to preconstruction averages. It may also be possible that numbers are down due to natural fluctuations in population cycles.

Moose sign showed a dramatic increase in 2019 after having steadily dropped every year since 2014. High numbers of sign were recorded during every month of the 2019 survey season, May through November, with use peaking in July. Actual sightings where up this season and cows with calves were often seen in the area. It has not been common for technicians to observe moose browse or scat, which indicates that moose are likely using the survey area for travel rather than foraging.

Goose sign counted in 2019 was consistent with previous years' data. Goose were seen at the tailings pond in early May in 2019 and sightings continued throughout the season, peaking in July. High numbers of goose sign were concentrated at T4 and T6. This area is a large, open-flat located in close proximity to Lower Spectacle Lake. Use of the Slate Lakes basin as a refuge for Canada geese has previously been documented in 2000 (ABR 2000), 2004 (USFS 2004), in 2005 (Living System Designs 2005), 2006, 2007 (Savage 2007), and 2012 through 2016 wildlife surveys. The no-fly zone over the Spectacle Lakes basin, instigated through Coastal Helicopters in 2007 to minimize disturbance to geese, continued through 2019.

6.0 Conclusions

Wildlife populations within the Slate Lakes basin generally appear healthy and abundant. Overall, signs and sightings show similar trends to previous years. Comparisons with baseline studies conducted in 2004 and 2005 indicate mining operations have had little impact on the abundance or habits of terrestrial wildlife in the area.

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SURVEY RESULTS

Table 1: Total Wildlife Sign Data

ALL	5/7	5/27	5/30	6/13	6/26	7/4	7/11	7/17	7/24	8/8	8/13	8/28	9/5	9/11	9/17	9/24	10/3	11/6	11/19	
T1			1			1			1				1				1	1		**6**
T2	1	1			1											1				**4**
T3	1	1				1	1	2	1	2	3	3					1			**16**
T4	1				1	3	3	5	3	2	2		1	2	1					**24**
T5	2	1		1	1	3	1	2	1	3	2	6	1	1	1					**26**
T6				1	1	2		2	2		2	1	2	1	2	1	1	1		**19**
T7	1	1		1	3	2	2				2	1						1	2	**16**
T8			1	2	2	2	3	1	1	1	2	1	1			1	1	1	1	**21**
T9		1	1	1	4	3	1	3				1	1		1		2		1	**20**
T10			1	1	1		1	1				1	1	1	1	2	1	1		**13**
T11		1			1		1	1	4			2	1	1	1	1		1	1	**16**
T12	2	1			3	1	2		3			2	2	1	1	1		2	2	**23**
T13	3	1	1		2	2	2	1	1		1		2	2	2	4	2	3	1	**30**
T14		1		1		4	1	1	3	2	1	3	2							**19**
T15	1			1	1	1		1		1	1	2	1	2						**12**
T16		1		1						1		1							1	**5**
T17			1		1	2		1	1	1		1	2		1	2			1	**14**
T18						1	4	1		2	2				1		1	2		**14**
T19					1		2	2	1	1		1		1	1		1	1	2	**14**
T20	1		1	2	1		2	1	1		1		1	1			2		1	**15**
TOTAL	**13**	**10**	**7**	**12**	**24**	**28**	**26**	**25**	**23**	**16**	**19**	**26**	**19**	**13**	**13**	**13**	**13**	**14**	**13**	**327**

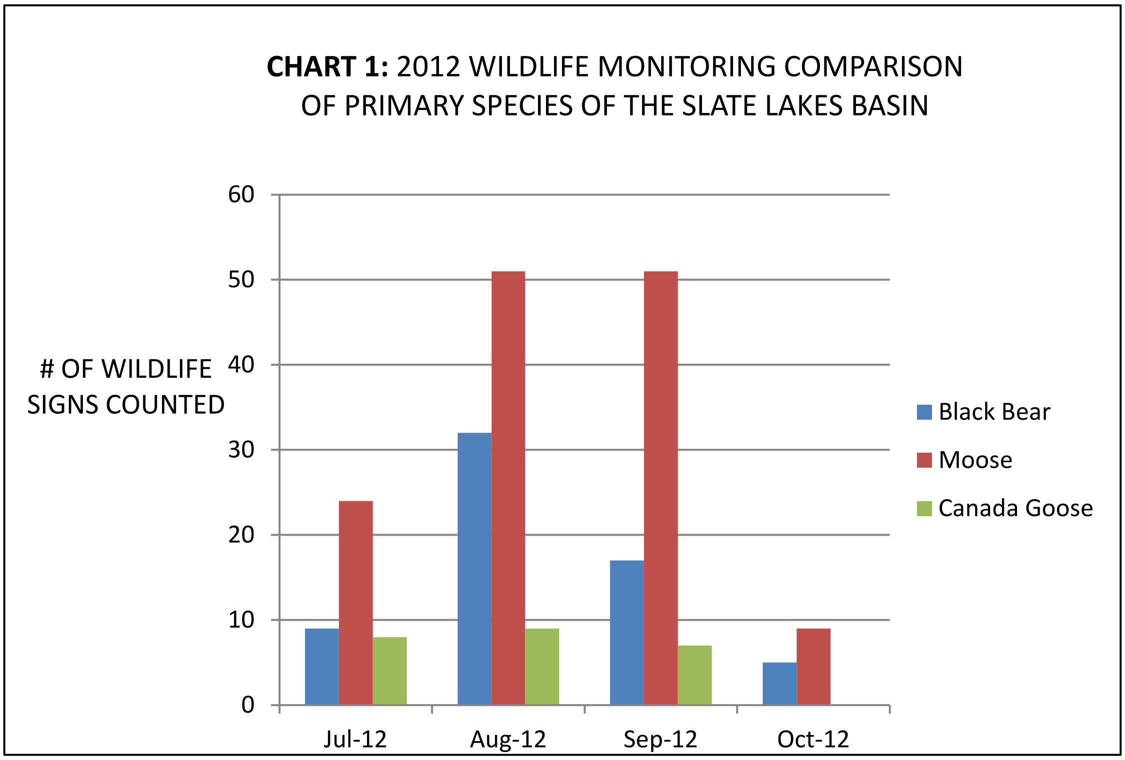
Table 2: Bear Sign Data

BEAR	5/7	5/27	5/30	6/13	6/26	7/4	7/11	7/17	7/24	8/8	8/13	8/28	9/5	9/11	9/17	9/24	10/3	11/6	11/19	
T1						1			1											**2**
T2																				**0**
T3								1												**1**
T4						1										1				**2**
T5										1		2								**3**
T6						1														**1**
T7							1													**1**
T8			1						1											**2**
T9								1												**1**
T10			1		1															**2**
T11									1											**1**
T12	1				1															**2**
T13						1									1					**2**
T14						1						1								**2**
T15																				**0**
T16																				**0**
T17						2														**2**
T18						1														**1**
T19								1												**1**
T20																				**0**
TOTAL	**1**	**0**	**2**	**0**	**2**	**8**	**1**	**3**	**3**	**1**	**0**	**3**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**26**

Table 3: Moose Sign Data																				
MOOSE	5/7	5/27	5/30	6/13	6/26	7/4	7/11	7/17	7/24	8/8	8/13	8/28	9/5	9/11	9/17	9/24	10/3	11/6	11/19	
T1			1										1				1	1		**4**
T2	1	1			1															**3**
T3	1	1				1	1	1	1	1	2	3					1			**13**
T4	1				1	1	2	4	2		1		1							**13**
T5	2	1		1	1	2	1	1		2	1	4	1	1	1					**19**
T6				1	1	1			2			1	2	1		1	1	1		**12**
T7	1	1		1	3	2	1				2	1						1	2	**15**
T8				2	2	2	2	1		1	2	1	1			1	1	1	1	**18**
T9		1	1	1	4	3	1	2				1	1		1		2		1	**19**
T10				1			1	1				1	1	1	1	2	1	1		**11**
T11		1			1		1	1	3			2	1	1	1	1		1	1	**15**
T12	1	1			2	1	2		2			2	2	1		1		2	2	**19**
T13	2	1	1		2	1	2	1	1		1		2	1	1	4	2	3	1	**26**
T14		1		1		2	1	1		2		2	2							**12**
T15	1			1	1	1		1		1	1	2	1	1						**11**
T16		1		1						1		1							1	**5**
T17			1		1			1	1	1		1	2		1	2				**11**
T18										1	1				1		1	2		**6**
T19					1		2	1	1	1		1		1	1		1	1	2	**13**
T20	1		1	2	1		2	1	1		1		1	1			2		1	**15**
TOTAL	**11**	**10**	**5**	**12**	**22**	**17**	**19**	**17**	**14**	**11**	**12**	**23**	**19**	**9**	**8**	**12**	**13**	**14**	**12**	**260**

Table 4:	Goose Sign Data																			
GOOSE	5/7	5/27	5/30	6/13	6/26	7/4	7/11	7/17	7/24	8/8	8/13	8/28	9/5	9/11	9/17	9/24	10/3	11/6	11/19	
T1																				**0**
T2																				**0**
T3											1									**1**
T4						1	1	1	1		1			2	1					**8**
T5						1		1	1	1	1									**5**
T6								2		2	2				2					**8**
T7																				**0**
T8							1													**1**
T9																				**0**
T10																				**0**
T11									1											**1**
T12															1					**1**
T13	1													1						**2**
T14						1			3		1									**5**
T15														1						**1**
T16																				**0**
T17																			1	**1**
T18							4	1		1	1									**7**
T19																				**0**
T20																				**0**
TOTAL	**1**	**0**	**0**	**0**	**0**	**3**	**6**	**5**	**6**	**4**	**7**	**0**	**0**	**4**	**4**	**0**	**0**	**0**	**1**	**41**

CLUSTERED COLUMN CHARTS COMPARING SPECIES 2012 - 2019



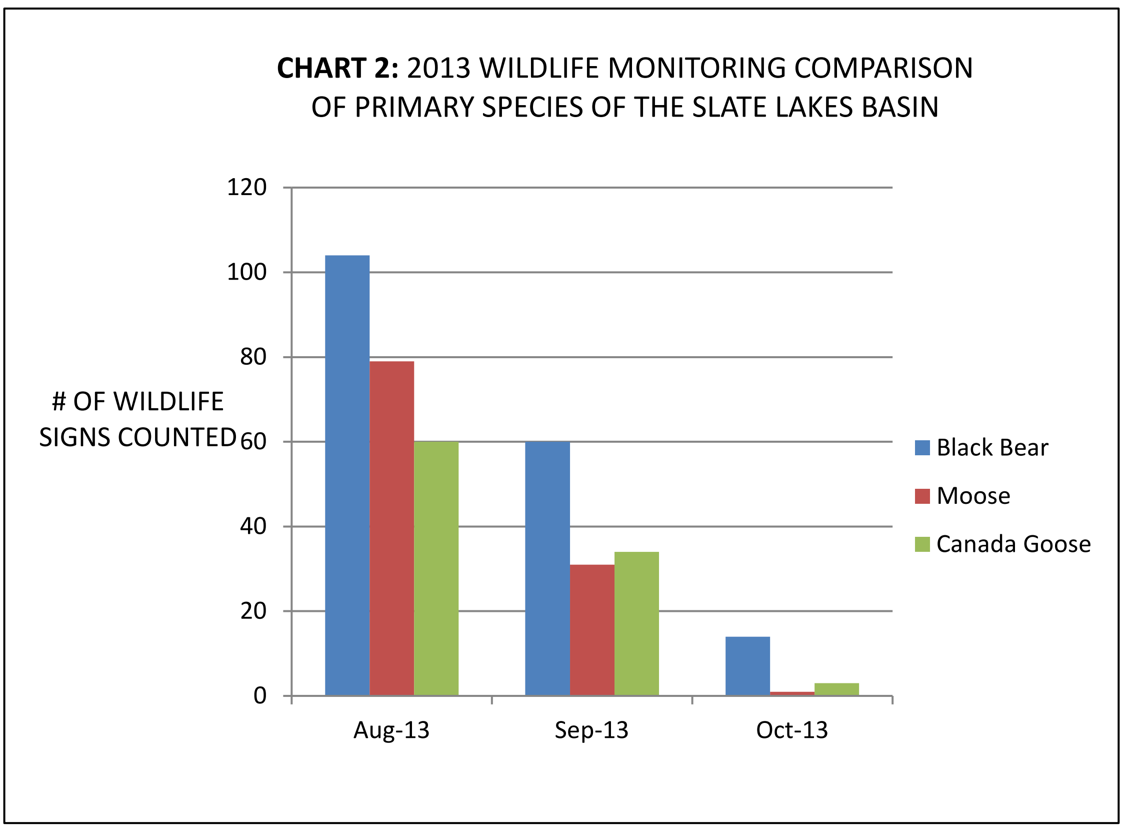


CHART 3: 2014 WILDLIFE MONITORING COMPARISON OF PRIMARY SPECIES OF THE SLATE LAKES BASIN

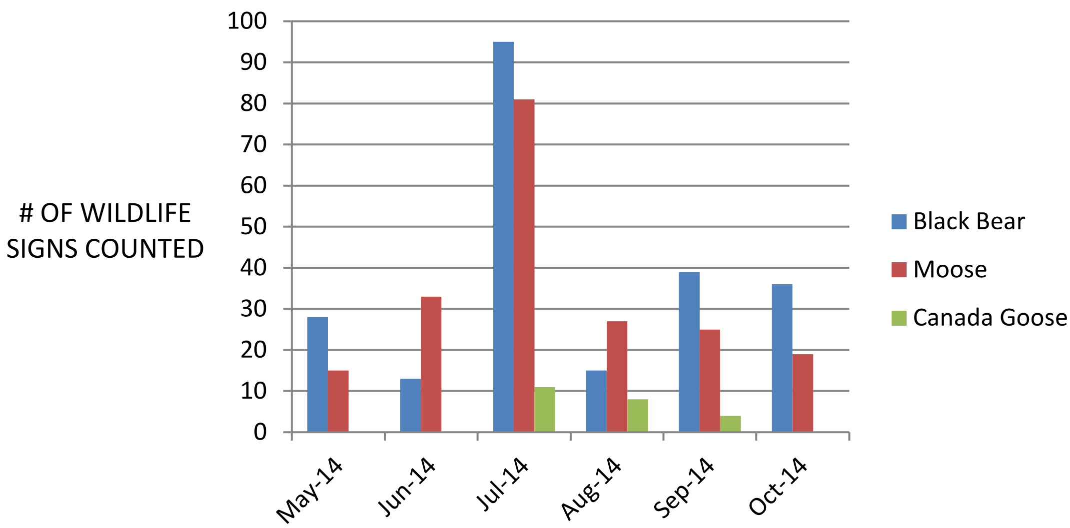
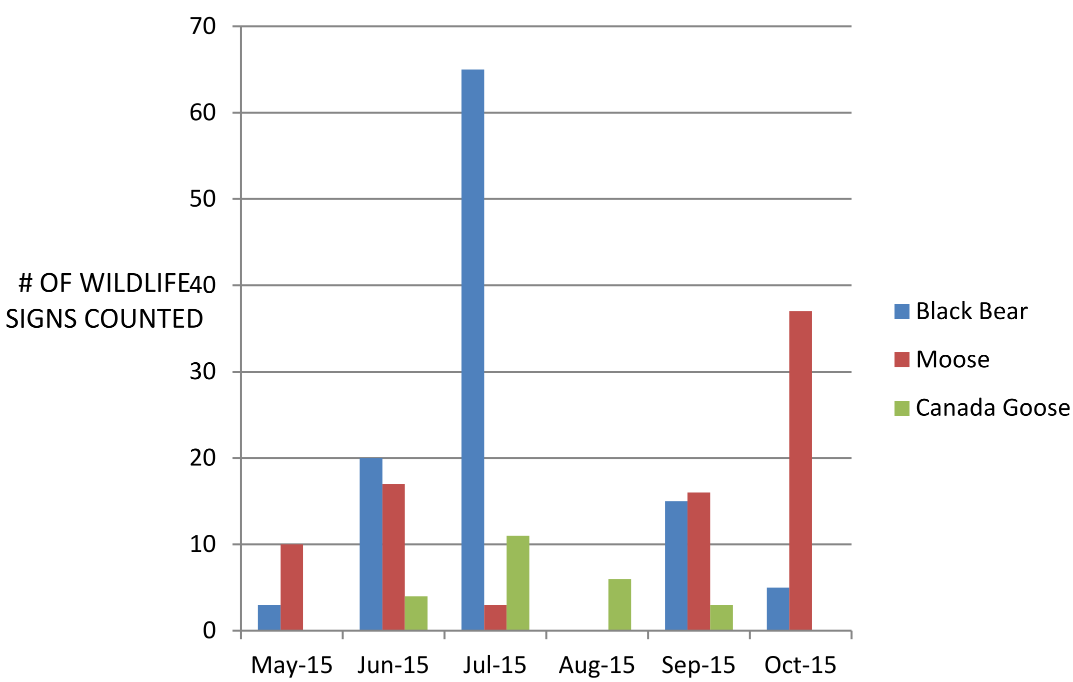


CHART 4: 2015 WILDLIFE MONITORING COMPARISON OF PRIMARY SPECIES OF THE SLATE LAKES BASIN



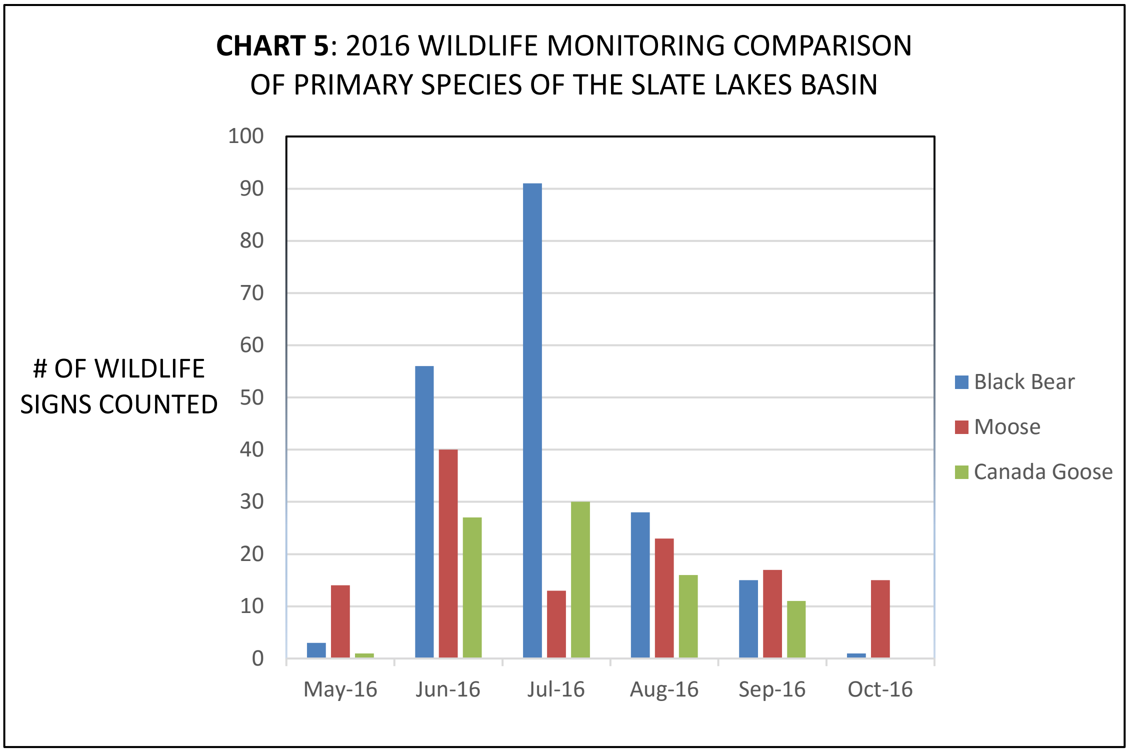


CHART 5: 2016 WILDLIFE MONITORING COMPARISON OF PRIMARY SPECIES OF THE SLATE LAKES BASIN
OF WILDLIFE SIGNS COUNTED
100
90
80
70
60
50
40
30
20
10
0
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Black Bear
Moose
Canada Goose

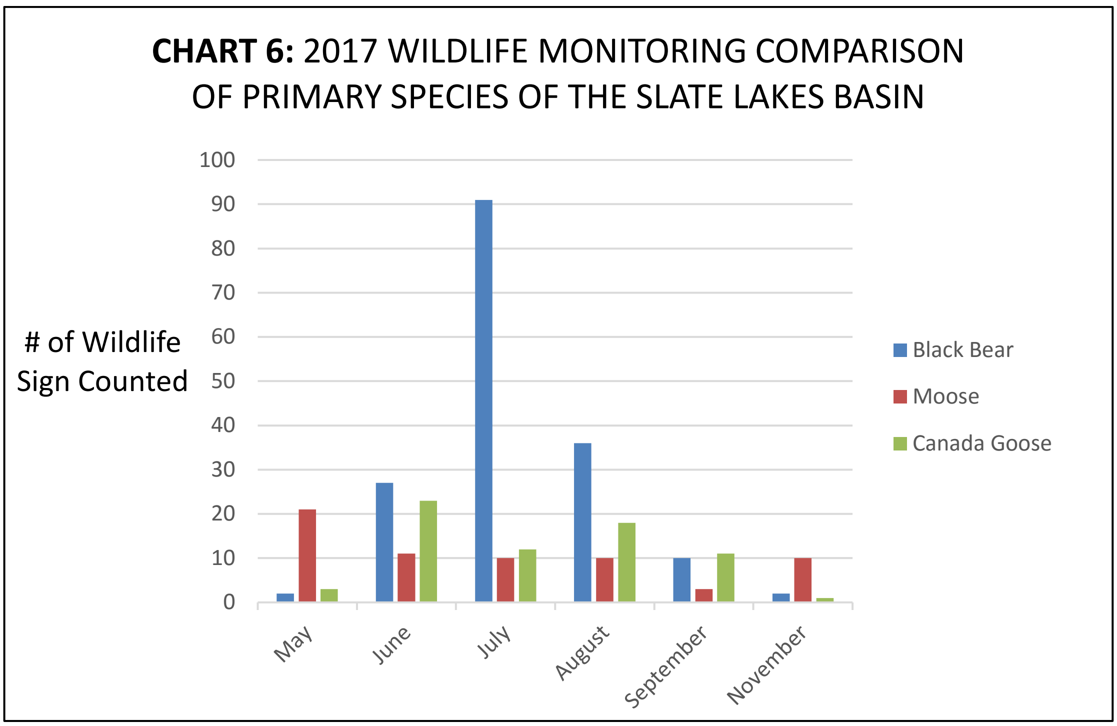


CHART 6: 2017 WILDLIFE MONITORING COMPARISON OF PRIMARY SPECIES OF THE SLATE LAKES BASIN
# of Wildlife Sign Counted
100
90
80
70
60
50
40
30
20
10
0
May
June
July
August
September
November
Black Bear
Moose
Canada Goose

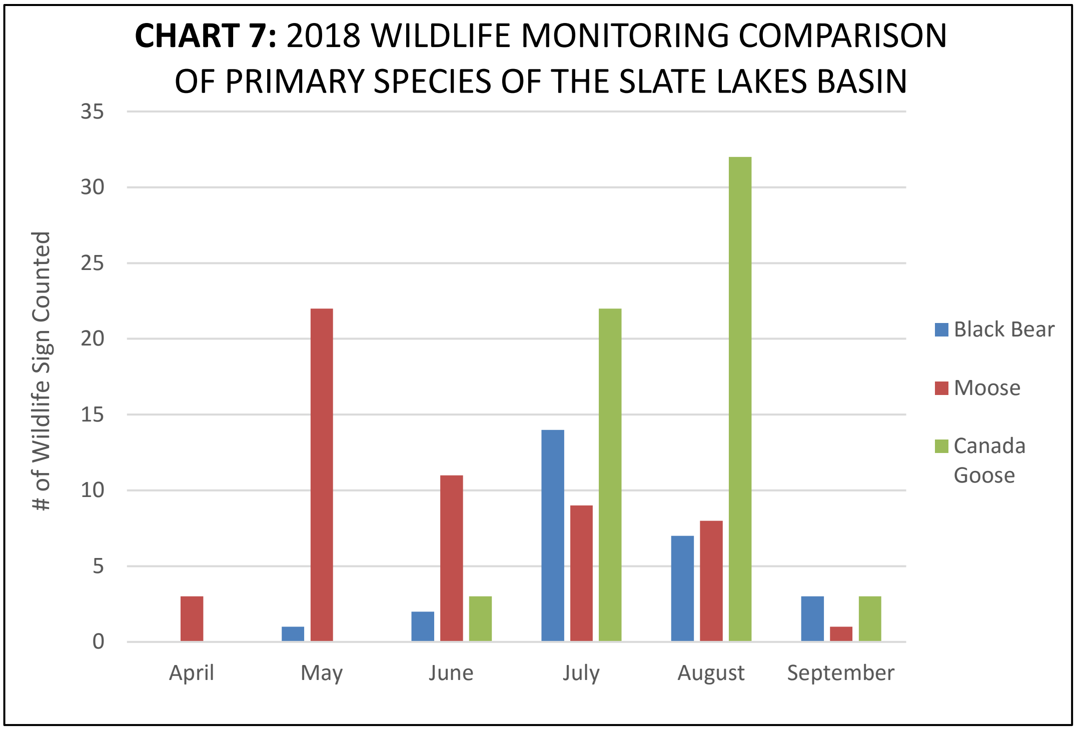


CHART 7: 2018 WILDLIFE MONITORING COMPARISON OF PRIMARY SPECIES OF THE SLATE LAKES BASIN
# of Wildlife Sign Counted
35
30
25
20
15
10
5
0
April
May
June
July
August
September
Black Bear
Moose
Canada Goose

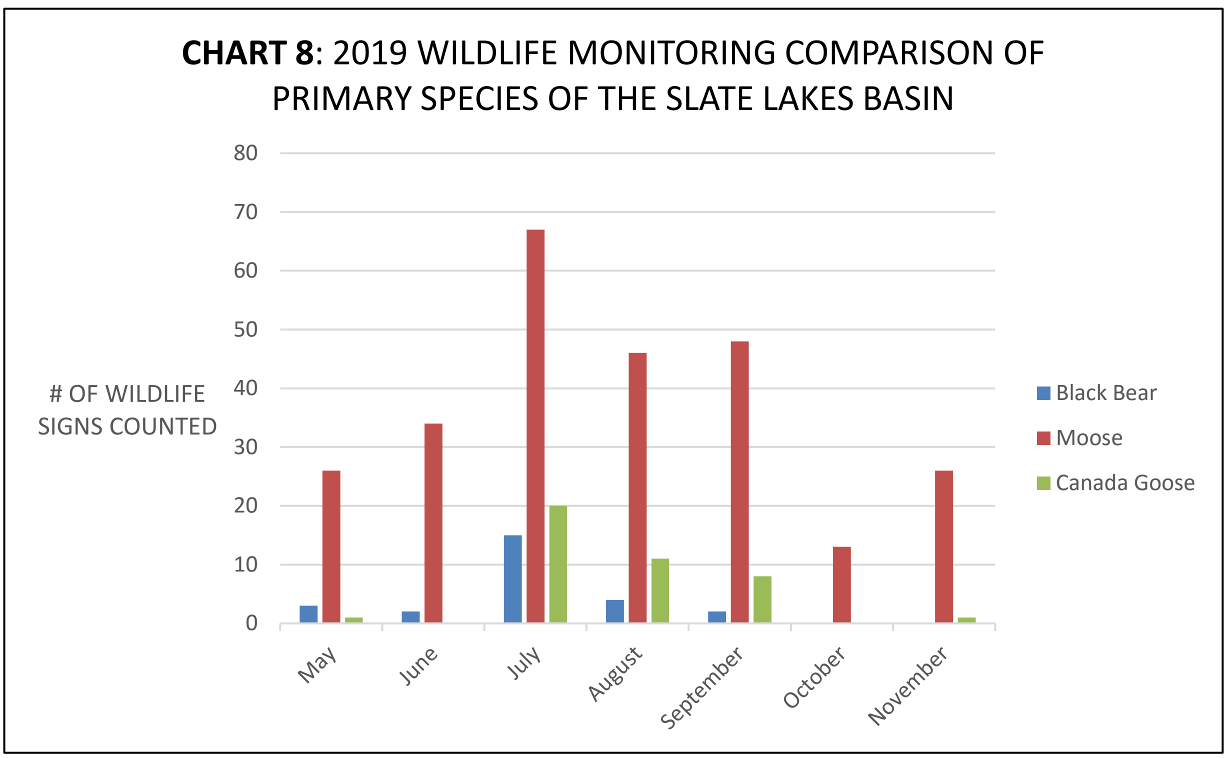
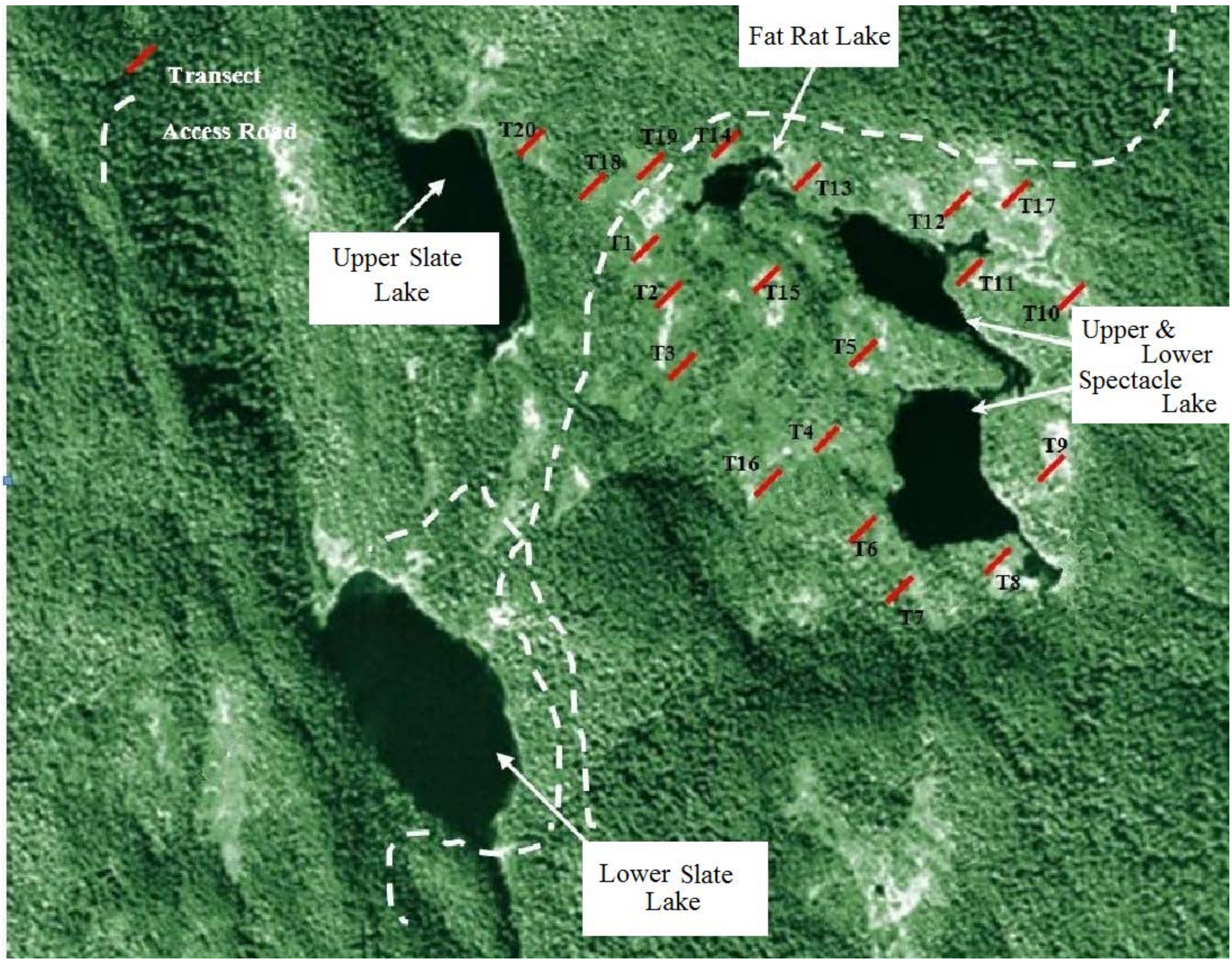


CHART 8: 2019 WILDLIFE MONITORING COMPARISON OF PRIMARY SPECIES OF THE SLATE LAKES BASIN
OF WILDLIFE SIGNS COUNTED
80
70
60
50
40
30
20
10
0
May
June
July
August
September
October
November
Black Bear
Moose
Canada Goose

APPENDIX A: SITE MAP WITH TRANSECTS



APPENDIX B: TRANSECT GPS COORDINATES

(All North End Coordinates)

T1 N 58.81712N/135.03537W
T2 N 58.81631N/135.03036W
T3 N 58.81509N/135.03416W
T4 N 58.81410N/135.03032W
T5 N 58.81537N/135.02911W
T6 N 58.81288N/135.02849W
T7 N 58.81182N/135.02705W
T8 N 58.81250N/135.02471W
T9 N 58.81377N/135.02370W
T10 N 58.81657N/135.02342W
T11 N 58.81678N/135.02596W
T12 N 58.81765N/135.02682W
T13 N 58.81788N/135.03061W
T14 N 58.81834N/135.03325W
T15 N 58.81660N/135.03181W
T16 N 58.81410N/135.03157W
T17 N 58.81782N/135.02492W
T18 N 58.81820N/135.03523W
T19 N 58.81812N/135.03630W
T20 N 58.81844N/135.03839W

APPENDIX C: 2019 WILDLIFE PHOTO LOG

Cow and calf observed on road near T17

Moose observed near T13

Moose observed between T4 & T5

Looking south over the survey site. Eagle in a tree near T13. Eagles have been observed chasing waterfowl on Fat Rat and Upper Spectacle Lake

Coeur Environmental Technicians survey the transects weekly Spring through Fall

APPENDIX D: 2019 DATA SHEETS

Transect Data

Transect: All Date: 5-7-19 Time: 14:00

Personnel: R. Baily P. Straw Weather: Cloudy/Drizzle 48°

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T-13 @ 13	R	Track M	Moose		
@ 21	R	S	Goose		
@ 31	R	T	M		
T-12 @ 24	L	T	M		
@ 26	L	Dig	B		
T-19	—		—		
T-17	—				
T-18	–				
T-11	—				
T-10	—				
T-9	—				
T-8	—				
T-20 @ 23		TRACK	MOOSE		ALL – THRU
T-7 @ 29	R	T	M		
T-6 @ —	—				
T-16 —	—				
T-5 @ 48	L, C, R	T	M		
@ 1	C	T	M		Totals:
T-15 @ 12	L, C, R	T	M		B = 1
T-3 @ 27	L C, R	T x 2	M		M = 11
T-2 @ 28	L	T	M		G = 1
T-4 @ 22	R	T	M		

T-1 —

T-14 —

Transect Data

Transect: All Date: 5-27-19 Time: 13:00

Personnel: Ryan Bailey Weather: Clear 60°

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T-13 @ 10	R	Tr	M		
T-12 @ 24	L	T	M		
T-11 @ 40	LCR	T	M		
T-17 —					
T-10 —					
T-9 @ 5	L	T	MCL		
T-9 @ 49	L	Feather	Duck		
T-8 @ —					
T-7 @ 12	LCR	T	M		
T-16 @ 47	LCR	T	M		
T-5 @ 27	R	T	M		
T-15 —					
T-3 @ 26	LCR	T	M		
T-2 @ 40	L	T	M		
T-14 @ 50	LCR	T	M		
T-1 —					
T-18 —					
T-19 —					
T-20 —					Totals:
					B = 0
T-4	—	—			M = 10
T-6	—	—			G = 0
					Other = 1 (duck)

Transect Data

Transect: ALL
Date: 05/30/19
Time: 14:05
Personnel: CS, DW
Weather: Partly Cloudy

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T-13 24m	LCR	Track	M		
T-12 45	L	Feather	D		
T-17 30	C	Track	M		
T-11		—	—		
T-10 15	L	Track	B		
T-9 23	R	Track	M		
T-8 21	R	Track	B		
T-7	—	—	—		
T-6	—	—	—		
T-4	zilch				
T-16	—	—	—		
T-5	—	—	—		
T-15	—	—			
T-15	—	—	—		
T-2	—	—	—		
T-3	—	—	—		
T-1 2m	R	Track	M		
T-14	—	—	—		
T-19	—	—	—		
T-18	—	—	—		Totals:
T-20 24m	R	Track	M		B=2
					M=5
					G=0

Other = 1 (duck)

Transect Data

Transect: ALL
Date: 06/13/19
Time: 13:00
Personnel:
Weather: Overcast

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T-13	—	None	—	—	—
T-12	—	None	—	—	—
T-17	—	—	—	—	
T-11	—	None	—	—	—
T-10	R 19	T	M	—	—
T-9	LCR 3	T	M	—	—
T-9	L 26	T	M	—	—
T-8	24 LCR	T	M	—	—
T-7	LCR 35	T	M		
T-6	LCR 35	T	M	—	
T-16	LC 25-30	T	M	—	
T-16	C 18	T	D	—	—
T-5	R 40	T	M	—	—
T-15	LCR 10	T	M		
T-2	—	—	—	—	
T-3	—	—	—	—	—
T-1	—	Nada	—	—	—
T-14	R 20	T	M		Totals:
T-19	—	—	—	—	B=0
T-18	—	—	—	—	M=12
T-20	LCR 20	T	M	—	G=0
T-20	L 20	T	M	—	Other = 1 (duck)

T-4 — —

Transect Data

Transect: ALL
Date: 06-26-2019
Time: 13:30
Personnel: CS, DW, BB
Weather: TOO HOT, Sunny

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T-13 10m	R	track	moose		
T-13 13m-2.5m	R C L	track	moose		
T-12 45m	C	track	moose		
T-12 41m	L C	track	moose		
T-12 10m	L	forrage	bear		
T-17 30m	L	track	moose		
T-11 37m	C	track	moose		
~~T-10~~ 40m	L	forrage	~~moose~~ bear		
T-9 3m	R C L	track	deer		
T-9 10m	L	track	moose		
T-9 24m	L	track	moose		
T-9 26m	L C R	track	moose		
T-9 45m	R C L	track	moose		
T-8 27m	L C R	track	moose		
T-8 45m	R C L	track	moose		
T-7 40m	R C L	track	moose		
T-7 23m	R C L	track	moose		
T-7 10m	R C L	track	moose		
T-6 36m	R C L	track	moose		Totals:
T-4 30m	R C L	track	moose		B= 2
T-16 15m	C	track	duck		M= 22
T-5 48m	L C R	track	moose		G= 0
T-15 8m	L C R	track	moose		Other = 2 (duck) 1 (deer)

page 1 of 2

Transect Data

Transect: ALL
Date: 06-26-2019
Time: 15:00
Personnel: CS, DW, BB
Weather: TOO HOT, Sunny

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
~~T-3~~					
T-2 11m	L	track	moose		
~~T-1~~					
~~T-17~~					
T-19 24m	L C R	track	moose		
T-18 24m	L	scat	duck		
T-20 27m	C R	track	moose		

page 2 of 2

Transect Data

Transect: ALL   Date: 7-4-19   Time: 14:00

Personnel: Ryan B + Nathan Piper   Weather: Sunny 80°

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T-14 @ 28	L	Scat	Goose		
@ 30	L, L, R	T	Moose		
@ 48	L	S	Bear		
@ 49	L, C, R	T	Moose		
T-1 @ 19	L	Dig	Bear		
T-3 @ 45	C	T	Moose		
T-15 @ 7	L, C, R	T	Moose		
T-5 @ 2	R	T	M		
@ 24 + 45	R	S	Goose		
@ 40 + 42	L, C, R	T	Moose		Cow + Calf
T-4 @ 37	R	T	Moose		
7	R	S	Bear		
38	C	S	Goose		
T-6 @ 32	R	T	Moose		
@ 34	L	Dig	Bear		
T-7 @ 21	L, C, R	T	M		
28	L, C, R	T	M		Totals:
32	L, C R	T	Deer		B=8
T-8 45-48	L, C, R,	Tracks	Moose		M=17
31	L, C, R	Track	Moose		G=3
1	R	Dig			Other=1 (Yellowlegs) 1 (Deer)
All over		Dive Bombing	Yellow Leg Birds	w/ giant	beaks

T-2 nothing
T-16 nothing

page 1 of 2

Transect Data

Transect: All   Date: 7-4-19   Time: 14:00

Personnel: Ryan Bailey Nathan Piper   Weather: Sunny 80°

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T-9 @ 48	L	T	M		
26	L C R	T	M		
12	L, C, R	T	M		
T-17 @ 30	L	T	Bear		
45	C	Dig	Bear		
T-12 @ 42-50	L, C, R	T	Moose		
T-13 @ 41	L + R	Digs	Bear		
@ 21	C	T	M		
T-19					
T-18	Bear in	area on	Transect 18 B		
T-20					

T-10 nothing
T-11 nothing

page 2 of 2

Transect Data

Transect: ALL
Date: 7-11-19
Time: 1300-1430
Personnel: DW, CS
Weather: Overcast

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T-13 40m	RCL	T	M	—	—
T-13 43m	LCR	T	M	—	—
T-12 49M	RCL	T	M	—	—
T-12 10m	L	T	M	—	—
T-11 12m	RCL	T dig?			
T-11 30m	R	~~dig~~ T	M	—	—
T-10 15m	LCR	T	M		
T-17	—	—	—	—	—
T-9 3m	RCL	T	M	—	
T-8 35m	RCL	Gaggle live critters	Geese	—	—
T-8 27m	LCR	T	M	—	—
T-8 48m	RCL	T	M	—	—
T-7 24-20	C	T	B	—	—
T-7 10	C	T	M	—	—
T-6 34m	RCL	T	D, not Dylan	—	—
T-16	—	—	—	—	—
T-4 35m	LCR	T	M	—	Totals=
T-4 15m	C	T	Geese	—	B=1
T-4 14m	RCL	T	M	—	M=19
T-5 48m	LCR	T	M	—	G=6
T-15 34m	C	T	D	—	Other=3(deer)
T-2 10m	RCL	T	M	—	—
T-2 4m	C	T	D	—	—
T-1	—	—	—	—	—
T-14	C	T	M	—	—
T-19 27m	RCL	T	M		
T-19 24m	RCL	T	M	—	—
T-18 15m	C	Scat	Goose	—	
T-18 29m	L	Scat	Goose		

T-18 42m C scat goose
T-18 47m C scat T goose M
T-20 15m 25m RCL L T M

Transect Data

Transect: ALL
Date: 7/17/19
Time:
Personnel: CS, DW, BB
Weather: cloudy

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T 13 20m	RCL	Moose tracks	moose		
T 17 49m	R	track	moose		
~~T 12~~					
T 10 2m	LCR	track	moose		
T 11 40m	LCR	track	moose		
T 9 5m	RCL	track	bear		
T 9 12m	RCL	track	moose		
T 9 47m	C	Scat	moose		
T 8 26m	LCR	tracks	moose		
~~T 7~~					
T 6 26m	L	scat	goose		
T 6 28m	LCR	scat	goose		
T 4 38m	R	track	moose		
T 4 36m	RCL	track	moose		
T 4 30m	L	track	moose		
T 4 12m	L	track	moose		
T 4 10m	R	scat	goose		
T 5 43m	LCR	track	moose		Totals:
T 5 10m	L	scat	goose		B=3
T 15 10m	RCL	track	moose		M=17
~~T 2~~					G=5
~~T 1~~					other=none
T 3 15m	LCR	track	moose		

page 1of2

Transect Data

Transect: ALL Date: 7-17 Time: ____

Personnel: CS, DW, BB Weather: ____

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T3 49m	R	track	bear		
T14 38m	L	scat	moose		
T19 14m	RCL	track	moose		
T19 49m	R	track	bear		
T18 40m	L C R	scat	goose		
T20 24m	LCR	track	moose		

page 2 of 2

Transect Data

Transect: ALL Date: 7-24-2019 Time: ____

Personnel: CS, DW Weather: Partly Cloudy, 68°F

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T13, 10m	RCL	T	Moose		
T12, 49m	LCR	T	M		
T12, 38m	LCR	T	M		
T17, 49m	RCL	T	M		
T11, 1m	RCL	T	M		
T11, 8m	C	S	G		
T11, 11m	RCL	T	M		
T11, 30m	LCR	T	Bear		
T11, 35	RCL	T	M		
T10					
T9					
T8, 24m	LCR	T	B		
T7, 27m	RCL	T	Deer		
T6, 30m	LCR	T	M		
T6, 42m	RCL	T	M		
T4, 43m	RCL	T	M		Totals =
T4, 25m	LCR	T	M		B = 3
T4 40m	R	S	Goose		M = 14
T16					
T5, 10m	R	S	Goose		G = 6
T15, 10m	R	T	Deer		Other = Frog/Toad = 1
T2					
T3, 15	LCR	T	M		Deer = 2

page 1 of 2

Transect Data

Transect: ALL Date: 7-24 Time: ___________

Personnel: CS, DW Weather: Partly Cloudy

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T1, 46m	R	Dig	Bear		
T14, 39m	C	S	Goose		
T14, 21m	R	S	Goose		
T14, 1m	R	S	Goose		
T19, 14	LCR	T	M		
T18, 25m	LCR	actual	Frog/Toad?		Wow
T20, 14	LCR	T	M.		

page 2 of 2

Transect Data

Transect: ALL Date: 8-8-2019 Time: ___________

Personnel: CS, DW Weather: Sunny

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T19, 20m	LCR	T	Moose		
T18, 56m	C	S	Goose		
T18, 49m	RCL	T	Moose		
T20, —					
T14, 31m	C	T	Moose		
T1, —					
T2, —					
T3, 22m	LCR	T	Moose		
T15, 35m	LCR	T	Moose		
T5, 5m	L	S	Bear		
T5, 26m	R	S	Goose		
T5, 36m	LCR	T	Moose		
T5, 39m	RCL	T	Moose		
T4, —					
T16, 21m	RCL	T	M		
T6, 11m	L	feathers	Goose		
T6, 22m	C	down	Goose		Totals:
T7, —					B=1
T8, 45m	RCL	T	Moose		M=11
T9, 26m	LCR	T	Deer		G=4
T10, —					Other=1 (deer)
T11, —					
T17, 32m	LCR	T	M		
T13, —					
T14, 24m	LCR	T	M		
T12 —					

page 1 of 1

Transect Data

Transect: All | Date: 8-13-19 | Time: 1000

Personnel: DW, CS, BB | Weather: Sunny 60°F | Page 1 of 2

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T-13 23m	RCL	T	M		
T-12 49m	L	Feathers	Eagle		
T-11	–	–			
T-17	–	–	–		
T-10	–	–	–		
T-9	–	–	–		
T-8 25m	LCR	T	M		
T-8 45m	RCL	T	M		
T-7 20m	LCR	T	M		
T-7 30m	C	T	M		
T-6 35m	RCL	T	D		
T-6 23m	C	Down	G		
T-6 13m	C	Down	Goose		
T-4 11m	LCR	T	M		
T-4 8m	C	Poop	G		
T-16	–	–	–		
T-5 32m	LCR	T	M		
T-5 15m	R	Down	G		Totals:
T-15 15m	LCR	T	Deer		B=0
T-15 25m	R	T	Deers		M=12
T-15 27m	RCL	T	M		G=7
T-3 11m	R	P & T	G		Other = Deer (3)
T-3 26m	LCR	T	M		Eagle (1)

page 1 of 2

Transect Data

Transect: ALL | Date: 8-13-19 | Time: ______

Personnel: DW, CS, BB | Weather: Sunny | Page 2 of 2

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T-3 22m	RCL	T	M		
T-2	–	–	–		
T-1	–	–	–		
T-14 14m	R	Poop	G		
T-14	–	–	–		
T-18 38m	R	Poop	G		
T-18 49m	RCL	T	M		
T-20	LCR	T	M		

page 2 of 2

Transect Data

Transect: ALL Date: 8-13-2019 Time: ____

Personnel: BB, CS, RB Weather: Sunny

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T19, 24m	RCL	Track	Moose		
T18,					
T20,					
T1,					
T14, 17m	L	Track	Bear		
T14, 22m	LCR	Track	Moose		
T14, 32m	LCR	Track	Moose		
T2, 26	RCL	Track	Deer		
T15, 32m	LCR	Track	Moose		
T15, 45m	RCL	Track	Moose		
T3, 23m	LCR	Track	Moose		
T3, 23m	LCR	"	"		
T3, 45m	LCR	"	"		
T5, 5m	L	Scat	Bear		
T5, 27m	RCL	Track	Moose		
T5, 35m	RCL	Track	Moose		
T5, 36m	RCL	Track	"		Totals:
T5, 40m	RCL	Forage	Bear		B = 3
T5, 43m	RCL	Track	Deer		M = 23
T4, 30m	LCR	Track	Deer		G = 0
T5, 35m	RCL	T	Moose		Other = Toad (1)
T6, 48m	LCR	T	Moose		Deer (3)
T6, 29m	RCL	T	Moose		

page 1 of 2

Transect Data

Transect: ALL Date: 7-28-2019 Time: ____

Personnel: CS, RB, BB Weather: Sunny

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T7, 31m	LCR	Track	Moose		
near T7	RCL	Presence	Toad		
T8, 27m	LCR	Track	Moose		
T9, 4m	LCR	T	Moose		
T10, 21m	RCL	Track	Moose		
T17, 50m	RCL	T	Moose		
T11, 41m	RCL	T	"		
T11, 31m	RCL	T	"		
T12, 5m	RCL	Game Line, MCL	"		
T12, 41	R	T	"		
T13,					

page 2 of 2

Transect Data

Transect: AW

Date: 9-5-19

Time: 10:49am

Personnel: DW, CS, GB

Weather: Sunny

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T-19	NA				
T-18	NA				
T-20 27m	LCR	track	moose		
T-14 24m	RCL 24m	track	moose		
T-14 30m	LCR	track	moose		
T-1 35m	C	track	moose		
T-2	NA				
T-15 33m	LCR	track	deer		
T-15 25m	RCL	track	deer		
T-15 pm	LCK	track	moose		
T-3	NA				
T-5 30m	LCR	track	moose		
T-4 4m	LCR	track	moose		
T-4 39m	RCL	track	deer		
T-18 45m	RCL	track	moose		
T-6 3m	R	track	moose		
T-6 32m	RCL	track	moose		
T-7	NA				Totals =
T-8 25m	LCR	track	moose		B = ∅
T-9 5m	LCR	track	moose		M = 19
T-10	NA				G = ∅
T-17 49m	RCL	track	moose		Other = 3 (deer)
T-17 15m	C	scat	moose		

page 1 of 2

Transect Data

Transect: AW

Date: 9-5-19 cont

Time:

Personnel:

Weather: Sunny

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T-12 40m	RCL	track	moose		
T-11 25m	RCL	track	moose		
T-12 41m	C	scat	moose		
T-13 10m	RCL	track	moose		
T-13 24m	RCL	track	moose		

page 2 of 2

Transect Data

Transect: All
Personnel: DW, CS
Date: 9-11-19
Weather: Overcast
Time: ~15:00
page 1 of 1

Location		L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T-13	15	L	T	M		
T-13	30	C	F	G		
T-12	50	LCR	T	M		
T-11	35	RCL	T	M		
T-17	–	–	–	–		
T-10	1	RCL	T	M		
T-9	–	–	–	–		
T-8	28	RCL	T	D		
T-7	–	–	–	–		
T-6	27	RCL	T	M		
T-16	–	–	–	–		
T-4	13	C	S	G		
T-4	9	LC	S	G		
T-5	31	RCL	T	M		
T-15	25	LCR	T	M		
T-3	–	–	–	–		
T-2	–	–	–	–		Totals =
T-14	35	RC	S	G		B = 0
T-1	–	–	–	–		M = 9
T-19	24	LCR	T	M		G = 4
T-18	–	–	–	–		Other = deer(1)
T-20	24	RCL	T	M		

Transect Data

Transect: All
Personnel: CS, DW
Date: 9-17-2019
Weather: Sunny, Damp
Time: 11:00 AM
Page 1 of 1

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T13, 0m	L	Scat	Bear		
T13, 23m	RCL	T	~~Moose~~ Deer		
T13, 37m	R	S	M		
T12, 5m	L	S	Goose		
T17, 24m	LCR	T	M		
T11, 30m	LCR	T	M		
T10, 24m	RCL	T	M		
T9, 26m	LCR	T	M		
T8					
T7					
T6, 26m	R	S	G		
T6, 10m	L	S	G		
T4, 27m	L	S	G		
T16					
T5, 37m	RCL	T	M		
T15					
T2					
T3					Totals =
T14					B = 1
T19, 24	LCR	T	M		M = 8
T8, 49	RCL	T	M		G = 4
T20					Other = 1 (deer)

T1 —

Transect Data

Transect: PARTIAL SURVEY　Date: 9-24-19　Time: [illegible]

Personnel: RB, DW, CS　Weather: Drizzle　Moose w/ Calf @ T13

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T13, 7m	L	S T	M		
T13, 10m	R	S T	M		
T13, 23m	R	T	M		
T13, 39m	L	S	M		
T12, 49m	LCR	T	M		
T12 35	LCR	—	M		
47m	LCR	T	M		
T-10 @ 20	LCR	T	M		
@ 46	RCL	T	M		
T-11 @ 40	RCL	T	M		
T-9	—				
T-8 @ 46	L	T	M		
T-7	—				Totals =
T-6 @ 30	RCL	T	M		M = 12
T-4 @ 15	R	D	Bear		G = Ø
T-16	—				B = 1
					Other = Ø

T1-T2-T3-T5-T14-T15-T18-T19-T20 = Ø　page 1 of 1

Transect Data

Transect: All　Date: 10-3-19　Time: 13:30

Personnel: CS DW　Weather: Partly Cloudy

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T-13 7m	RCL	T	M		
T-13 29m	LCR	T	M		
T-12	—	—	—		
T-11	—	—	—		
T-10 22m	LCR	T	M		
T-17	—	—	—		
T-9 7m	RCL	T	M		
T-9 42m	RCL	T	M		
T-8 49m	LCR	T	M		
T-7 25m	LCR	T	D		
T-6 12m	LCR	T	M		
T-4	—	—	—		
T-16	—	—	—		
T-5	—	—	—		
T-15	—	—	—		
T-3 24m	L	T	M		
T-3 26m	LCR	T	D		Totals =
T-2	—	—	—		B = 0
T-14	—	—	—		M = 13
T-1 1m	LCR	T	M		G = 0
T-19 7m	RCL	T	M		Other = Deer (2)
T-18 38m	LCR	T	M		
T-20 37m	LCR	T	M		
T-20 49m	LCR	T	M		

page 1 of 1

Transect Data

Transect: ALL | Date: 11-6-2019 | Time:
Personnel: CS, DW | Weather: Overcast | page 1 of 1

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T13 - 1m	LCR	T	M		
T13 - 8m	LCR	T	M		
T13 - 46m	RCL	T	M		
T12 - 24m	middle	S	M		
T12 - 15m	RCL	T	M		
T17 - 75m	LCR	T	D		
T16 15m	LCR	T	M		
T11 - 40m	RCL	T	M		
T9 —					
T8 - 14m	LCR	T	D		
T8 - 46m	RCL	T	M		
T7 - 15m	R	S	M		
T 6 77m	LCR	T	M		
T4 - 50m		Present		Actual Moose [illegible]	
T 3 —					
[illegible]					
[illegible]	RCL [illegible]	T	M		
T1 [illegible]		T			
T19 - 5	RCL	T	M		Total =
T19 - [illegible]	RCL	T	[illegible]		B = 0
T18 - [illegible]		[illegible]	[illegible]		M = 14
					G = 0
					other = deer (3)

T5 —
T15 —
T20 —

Transect Data

Transect: ALL | Date: 11-19-2019 | Time: 12:50
Personnel: CS, DW | Weather: Cloudy, Slight Rain | page 1 of 1

Location	L/R	Sign Type (Scat, Track, etc)	Species	Photo(Y/N)	Notes
T13, 10m	R	T	M		
T13, 15m	LCR	T	D		
T12, 49m	LCR	T	M		
T12, 73m	L	S	M		
T17, 75m	R	T	D		
T17, 18m	L	S	Goose		
T11, 38m	LCR	T	M		
T10, 40m	RCL	S	D		
T10, 45m	RCL	T	D		
T9, 25m	RCL	T	M		
T8, 45m	R	T	M		
T7, 10m	R	S	M		
T7, 10m	RCL	T	M		
T6 —					
T16, 35m	RCL	T	M		
T4 —					
T5 —					
T15 —					Totals =
T2, 5m	LCR	T	D		B = 0
T3 —					M = 12
T1 —					G = 1
T14 —					other = 6 (deer)
T18 —					
T19, 35m	RCL	T	M		
T19, 10m	RCL	T	M		
T20, 20m	LCR	T	M		
T20, 49	L	S	D		

APPENDIX E: AVIAN SPECIES LIST

Waterfowl
American Wigeon *(Anas Americana)* **S**
Blue-winged Teal (*Anas discors)*
Canada Goose (*Branta canadensis*) **S, Common**
Common Goldeneye (*Bucephala clangula*) **S**
Common Merganser *(Mergus merganser)* **S, Common**
Greater/ Lesser Scaup (*Aytha marila*) **S**
Hooded Merganser (*Lophodytes cucullatus*)
Mallard (*Anas platyrhynchos*) **S, Common**
Pacific Loon (*Gavia pacifica*) **S, Common**
Ring-necked Duck (*Aythya collaris*)
White-winged Scoter (*Melanitta fusca*)

Raptors
Bald Eagle (*Haliaeetus leucocephalus*) **S, Common**
Northern Harrier *(Circus cyaneus)*
Northern Pygmy Owl (*Glaucidium gnoma*) **S**
Red-tailed Hawk (*Buteo jamaicensis*) **S, Common**
Sharp-shinned Hawk (*Accipiter striatus*)

Other
Belted Kingfisher (*Ceryle alcyon*) **S, Common**
Bohemian Waxwing (*Bombycilla garrulous*)
Cedar Waxwing (*Bombycilla cedrorum*)
Chestnut-backed Chickadee (*Poecile rufescens*) **S, Common**
Common Raven (*Corvus corax*) **S, Common**
Dark-eyed Junco (*Junco hyemalis*) **S, Common**
Great Blue Heron *(Ardea herodias)* **S**
Hermit Thrush (*Catharus guttatus*) **S**
Least Sandpiper (*Calidris minutilla*)
Lesser Yellowlegs (*Tringa flavipes*) **S**
Northwestern Crow (*Corvus caurinus*)
Olive-sided Flycatcher (*Contopus boreal*is) **C**
Orange-crowned Warbler (*Vermivora celata*) **C**
Pine Grosbeak (*Pinicola enucleator*)
Red-breasted Sapsucker (*Sphyrapicus rubber*) **S**
Ruby-crowned Kinglet (*Regulus calendula*)
Rufous Hummingbird (*Selasphorus rufus*) **S, Common**
Savannah Sparrow (*Passerculus sandwichesis*)
Solitary Sandpiper (*Tringa solitaria*)
Song Sparrow *(Melospiza melodia*)
Sooty Grouse (Dendragapus fuliginosus) **S, Common**
Steller's Jay (*Cyanocitta stelleri*) **S, Common**
Tree Swallow (*Tachycineta bicolor*) **S, Common**
Varied Thrush (*Ixoreus naevius*) **S, Common**
White-crowned Sparrow (*Zonotrichia albicollis*)
Wilson's Warbler (*Wilsonia canadensis*)
Pacific Wren (*Troglodytes troglodytes*) **S, Common**

Common = multiple sightings throughout season

S = identified through sighting

C = identified through call or song

Attachment 3

Mountain Goat Population Monitoring near Kensington Mine, Alaska – March 2019

Wildlife Research Annual Progress Report

Mountain goat population monitoring and movement patterns near the Kensington Mine, Alaska

Kevin S. White

March 2019

Alaska Department of Fish and Game Division of Wildlife Conservation

Cover Photo: An adult female mountain goat (LG-151) near Katzehin Lake, September 2011

Mountain goat population monitoring and movement patterns near the Kensington Mine, Alaska

Kevin S. White[1]

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March 2019

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Contents

INTRODUCTION

This report was prepared to meet the annual reporting requirements for Coeur Alaska, Inc.. Funding for this project was made available in September 2005 and this report summarizes activities completed by December 30, 2017.

Background

In 2005, Coeur Alaska, Inc. re-initiated development activities at the Kensington mine site, located a short distance northwest of Berners Bay. In addition, the Alaska Department of Transportation and Public Facilities (ADOT/PF) proposed construction an all-season highway between Echo Cove and the Katzehin River. In the context of these proposed industrial development activities, mountain goats were identified as an important wildlife species likely to be affected by mine development and road construction activities.

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. In 2005, when the mine development activities were re-initiated, the Alaska Department of Fish and Game (ADFG) maintained that many of the same concerns that prompted the Robus and Carney (1995) study were still valid and needed to be addressed. In addition, large-scale plans for development of the Juneau Access road raised new and 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 have potentially important ramifications for management and conservation of the species in the area. Studies 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, Cote et al. 2013, White and Gregovich 2017). Consequently, information about the distribution of mountain goats proximate to the mine and road development corridor is critical for determining the extent to which populations may be affected by associated industrial activities. Information collected by Robus and Carney (1995), White et al. (2012) and White and Gregovich (2017), in the vicinity of Kensington mine, as well as Schoen and Kirchhoff (1982) near Echo Cove, suggest that spatial overlap between mountain goats and industrial activity are most pronounced when goats are over-wintering in low-elevation habitats.

In response to the above concerns, ADFG, with operational funding provided by ADOT/PF, Federal Highway Administration (FHWA) and Coeur Alaska, Inc., 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 has included 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 ADFG with information necessary to appropriately manage mountain goats in the areas of development and provide guidance relative to mitigation measures, to the extent possible.

Implementation of field objectives were initiated in 2005 and consisted of a 5-year monitoring program (2005-2011) jointly funded by ADOT/PF, FHWA, Coeur Alaska, Inc. and ADFG. Beginning in 2007, the ADFG committed additional annual funding for a complementary aerial survey technique development project within and adjacent to the project area. In 2009, the USDA-Forest Service (Tongass National Forest) also began contributing funding to further support aerial survey technique development data collection efforts. And, in 2010, Coeur Alaska, Inc. resumed funding of mountain goat monitoring near the Kensington Mine and adjacent areas (as per the Kensington Plan of Operations, USFS 2005). In 2012, the project components funded by ADOT/PF and associated with the Juneau Access project were completed (see White et al. 2012). Currently, mountain goat monitoring activities are focused on the area surrounding the Kensington mine and north to the Katzehin river, an area considerably smaller than the original Juneau Access/Kensington joint study area.

STUDY OBJECTIVES

Research efforts were designed to investigate the spatial relationships, vital rates, and abundance of mountain goats near the Kensington Mine and upper Lynn Canal. The research objectives were to:

1) determine seasonal movement patterns of mountain goats;

2) characterize mountain goat habitat selection patterns;

3) estimate reproductive success and survival of mountain goats; and

4) estimate mountain goat population abundance and composition.

STUDY AREA

Mountain goats were studied in a ca. 491 km^2 area located in a mainland coastal mountain range east of Lynn Canal, a marine fjord located between Juneau and Haines in southeastern Alaska (Figure 1 and 2). The study area was located in the Kakuhan Range and oriented along a north-south axis and bordered in the south by Berners Bay (58.76N, 135.00W) and the Katzehin River (59.27N, 135.14W) in the north. The Kensington Mine, a hard rock gold mine, is located at the southern end of the study area, immediately south of Lions Head mountain in the Johnson, Slate and Sherman creek watersheds. A majority of above ground mining activity occurs in four principal locations situated between 200–300 meters in elevation. The overall mine "footprint" comprises 56.6 km^2 of patented claims; a significant amount of activity is at low elevation (<300 m) and underground. This study has occurred during both construction and production phases of the mine and possible sources of disturbance to mountain goats in the vicinity included blasting, heavy equipment operation, helicopter operation, and vehicle traffic.

Elevation within the study area ranges from sea level to 2070 m. This area is an active glacial terrain underlain by late cretaceous-paleocene granodiorite and tonalite geologic formations (Stowell 2006). 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. >1200 m) and rugged, broken terrain that descends to a rocky, tidewater coastline. The northern boundary of the area is defined by the Katzehin River, a moderate volume (ca. 1500 cfs; USGS, unpublished data) glacial river system (and putative barrier to mountain goat movement) that is fed by the Meade Glacier, a branch 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 1.4 m and winter temperatures are rarely less than -15° C and average -1° C (Haines, AK; National Weather Service, Juneau, AK, unpublished data). Elevations at 790 m typically receive ca. 6.3 m of snowfall, annually (Eaglecrest Ski Area, Juneau, AK, unpublished data). Predominant vegetative communities occurring at low-moderate elevations (<460 m) include Sitka spruce (Picea sitchensis)-western hemlock (Tsuga heterophylla) coniferous forest, mixed-conifer

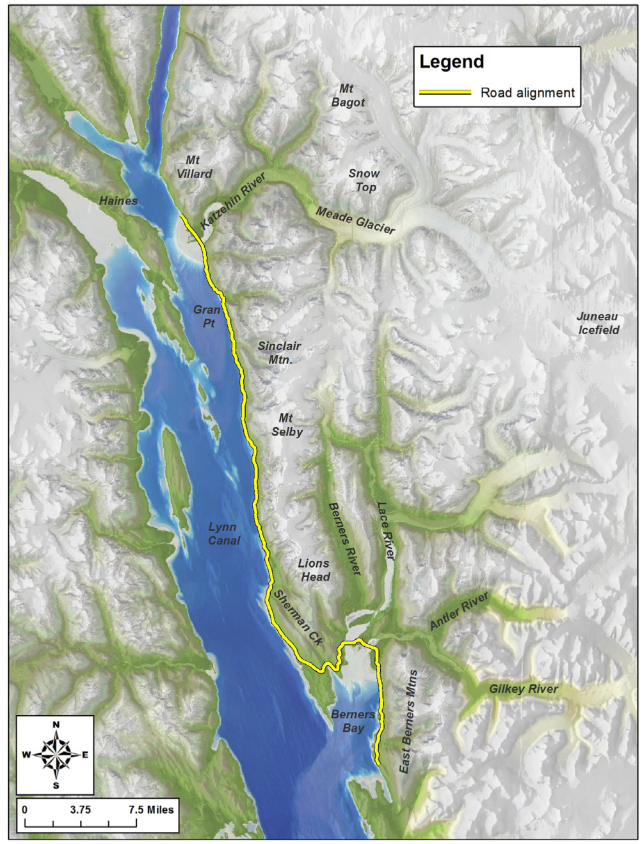

Figure 1: Map of the Lynn Canal and Berners Bay area. Local place names referenced in this report are identified. Mountain goats were studied in this area during 2005-2018.

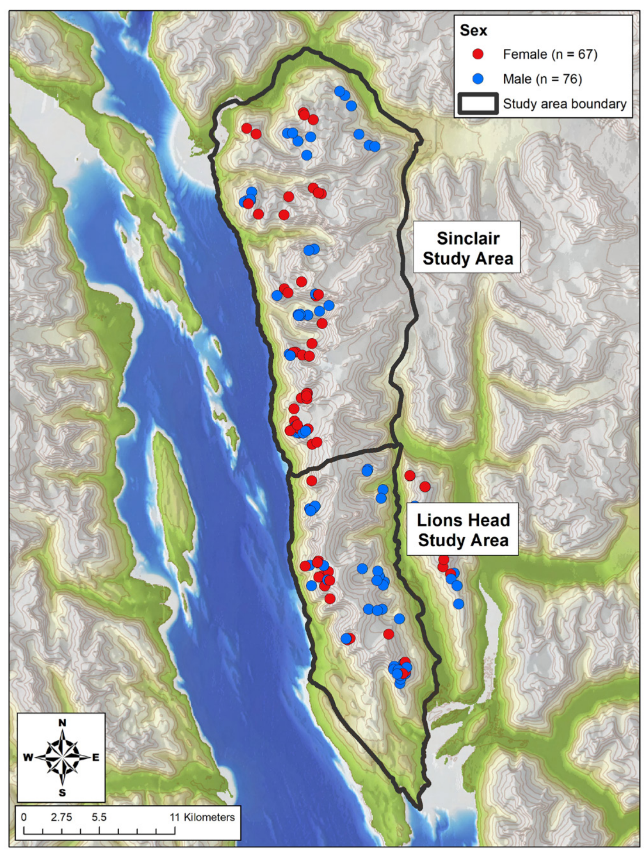

Figure 2: Locations of mountain goats captured and subsequently monitored in the Lynn Canal study area, 2005-2018.

muskeg and deciduous riparian forests. Mountain hemlock (Tsuga mertensiana) dominated 'krummholtz' forest comprises a subalpine, timberline band occupying elevations between ~460–760 meters. Alpine plant communities are composed of a mosaic of relatively dry ericaceous heathlands and moist meadows dominated by sedges, forbs and wet fens. Avalanche chutes are common in the study area and bisect all plant community types and often terminate at sea-level.

METHODS

Mountain Goat Capture

Mountain goats were captured using standard helicopter darting techniques and immobilized by injecting 3.0 - 2.4 mg 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.

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 could be reasonably contained.

GPS Location Data

Telonics TGW-3590 or TGW-4590 GPS radio-collars (Telonics, Inc., Mesa, AZ) were deployed on most animals captured. Telonics MOD-500 VHF radio-collars were been deployed on a subset (n = 23) of animals to enable longer-term monitoring opportunities. During 2009-2016, animals were simultaneously marked with GPS and lightweight (Telonics MOD-410) VHF radio-collars (370 g). Double-collaring animals was conducted to extend the period of time individual animals could be monitored (lifespan, GPS: 3 years, VHF: 6 years), thereby increasing the long-term opportunity to gather mountain goat survival and reproduction data and reducing the frequency that mountain goats must be captured. The combined weight of radio-collars attached to animals comprise 1.2% of average male body weight and 2.0% of average female body weight and is well within the ethical standards for instrument deployment on free-ranging wildlife.

GPS radio-collars were programmed to collect location data at 6-hour intervals (collar lifetime: 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, and/or manually downloaded. 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).

Resource Selection and Movement Patterns

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 reconnaissance and snow surveys. Samples 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 a composite winter sample. Results of these analyses were reported in White et al. (2012).

Activity, Movement Patterns and Resource Selection.—
Analyses of mountain goat GPS location data (i.e. data collected during 2005-2011) to characterize activity, movement and resource selection patterns were summarized in White (2006), Shafer et al. (2012) and White et al. (2012). More recently, White and Gregovich (2017) assessed relationships between mountain goat resource selection and proximity to mine development. In 2017, a collaboration was initiated with BUKO (Andre Fetzer) and Trent University (Joe Northrup) to analyze existing GPS location data to estimate timing of migration. Such analyses will ultimately be useful for quantitatively determining winter and summer range residency periods; information that is useful for determining site-specific "timing windows" relevant for managing industrial activities in the vicinity of mountain goat habitat. In 2018, a new analysis was initiated focused on utilizing mountain goat GPS radio-collar location data to characterize seasonal and sex-specific variation in home range size and site fidelity (sensu Shakeri et al. 2018).

Snow and Winter Severity Monitoring.—
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, in 2006 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. These efforts focused on four sites located in different mountain goat winter ranges in 2007 but consistent annual monitoring was conducted at only one site located on Echo Ridge, near Davies Creek. During 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 (100-200 m) 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 COOP Weather Station).

Reproduction and Survival

Kidding rates and subsequent survival were estimated by monitoring individual study animals during monthly surveys using fixed-wing aircraft (usually a Piper PA-18 Super Cub) equipped for radio-telemetry tracking or via ground-based observations. During surveys, radio-collared adult female mountain goats were observed (typically using 14X image stabilizing binoculars) to determine whether they gave birth to kids and, if so, how long individual kids survived (Figure 3). 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.


Figure 3: Remains of a male mountain goat (LG157, 9 years old) that died in low elevation (300 ft.) old growth forest winter range, east of Lions Head Mountain. The animal appeared to have been scavenged by a wolverine and, based on bone marrow color and consistency, likely died of malnutrition.

Population Abundance and Composition

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-October, 2005-2017. 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)

Figure 4: A group of seven mountain goats, including a GPS radio-collared adult female and attendent kid, seen during an aerial survey in the Yeldagalga Creek Valley during September 2018.

or kids (Figure 4). In addition, each mountain group observed was checked (via 14X image stabilizing binoculars) to determine whether radio-collared animals were present.

Sightability Data Collection.—During aerial surveys, data were simultaneously collected to evaluate group-level sighting probabilities. These data were used to parameterize aerial survey "sightability" models which were subsequently used to convert minimum counts to actual population size (i.e. White et al. 2016). Specifically, we characterized behavioral, environmental and climatic conditions for each radio-collared animal seen and not seen (i.e. missed) during surveys. In cases where radio-collared animals were missed, it was necessary to back-track and use radio-telemetry techniques to locate animals and gather associated covariate information. Since observers had general knowledge of where specific individual radio-collared animals were likely to be found (i.e. ridge systems, canyon complexes, etc.), it was typically possible to locate missed animals within 5-15 minutes after an area was originally surveyed. In most cases, it was possible to completely characterize behavioral and site conditions with minimal apparent bias, however in some cases this was not possible (i.e. animals not seen in forested habitats, steep ravines, turbulent canyons) and incomplete covariate information was collected resulting in missing data.

Evaluation of Population Trends.—In order to assess how mountain goat abundance changed over space and time we delineated nine geographically distinct survey areas and summarized the maximum number of adult and kid mountain goats seen in each area, by year (Appendix 4 and 5). The number of animals seen during aerial surveys is a commonly used metric of mountain goat population abundance; termed the "minimum count". Since the quantity does not account animals "missed" during surveys, the minimum count underestimates actual population size (i.e. by 35-50%). In order to account for variation in survey conditions and mountain goat aerial survey sighting probabilities we used a "sightability" model to derive population estimates based on aerial survey observations and associated covariate values (White et al. 2016). Specifically, the model is based on aerial survey mark-resight data collated in Lynn Canal and other areas of southeastern Alaska. The model accounts for variation in sky condition, group size, terrain and habitat type and converts minimum counts to actual population size (White et al. 2016). To assess population trends, we used simple linear regression to fit equations and determine proportional change in population size and density over time, for each area. We determined the amount of summer range habitat in each area (km^2; based on RSF models in White and Gregovich 2017) in order to convert population size to density; a standardized quantity useful for geographic comparisons and inference.

RESULTS AND DISCUSSION

Mountain Goat Capture and Handling

Capture Activities.—During August 2018, 6 animals (males, n = 3; females, n = 3) were captured in the Lions Head-Mt. Sinclair areas. All animals were simultaneously marked with GPS (TGW-4590) and lightweight VHF (Telonics MOD-410) radio-collars. Since 2005, 142 mountain goats have been radio-marked in the Lions Head and Sinclair Mountain study areas; GPS location data has been compiled for 87 animals within this area. Currently (as of 2/21/2018), 23 animals are marked in these two areas; all other previously deployed collars have either remotely released or animals have died. Annual capture activities are important for maintaining adequate sample sizes and compensating for natural or scheduled collar losses.

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), red blood cells (8 mL), ear tissue, hair and fecal pellets. Whole blood, serum, red blood cells and fecal pellet sub-samples were either sent to Dr. Kimberlee Beckmen (ADFG, Fairbanks, AK) for disease and trace mineral screening or archived at ADFG facilities in Douglas, AK. During 2010 and 2014, nasal and pharyngeal swab samples were collected from 12 animals to index prevalence of respiratory bacteria.

Disease Surveillance.—In 2010 and 2014, a subset of captured animals were tested (Washington Animal Disease Diagnostic Laboratory, Pullman, WA) for prevalence of respiratory bacteria associated with incidence of pneumonia (specifically *Mycoplasma ovipneumoniae*). Results of these analyses were summarized in White et al. (2012) and Lowrey et al. (2018). Further surveillance testing for *Mycoplasma ovipneumoniae* was conducted in 2016, 2017 and 2018 but laboratory results are not yet available.

During 2005-2015, blood serum samples collected from captured animals have been tested each year for a suite of 15 different diseases relevant to ungulates (Appendix 1). Of particular interest was contagious ecthyma (CE), a viral disease previously documented among mountain goats in Juneau, Haines and other areas of southeastern Alaska. Common symptoms of CE include presence of grotesque lesions on the face, ears, and nose which can lead to death of animals, primarily those in young or old age classes; healthy adults commonly survive the disease. Of the 65 animals successfully tested for CE in the Lions Head and Mt Sinclair areas, three animals (5%) tested positive for CE-specific antibodies; a level of prevalence comparable to other southeastern Alaska populations tested.

Trace Mineral Testing.—In 2010-2014, whole blood and serum samples were analyzed to determine trace mineral concentration for 31 mountain goats in order to examine whether mineral deficiencies were prevalent in our study population (Appendix 2a). While experimental data is limited to assess deficiency threshold values for Selenium, a trace mineral that can influence pregnancy, values less than 0.10 ppm are generally considered low. In the Lion Head/Sinclair study areas 32% of animals had blood Selenium values below this threshold (Appendix 2b); a high proportion of deficiencies relative to other mountain goat research study areas in southeastern Alaska. Presumably, deficiencies are related to site productivity and geologic substrate and can provide some level of insight relative to inherent productivity of mountain goat summer range in this area.

Genetic Analyses.—Tissue samples from all mountain goats captured between 2005-2018 have been genotyped by Aaron Shafer (Trent University/University of Alberta). (Duplicate samples are archived at ADFG, Douglas, AK). A subset of these data were analyzed and included in continent-wide analyses of mountain goat population genetics (Shafer et al. 2010). Shafer et al. (2010) indicated that substantial genetic structuring exists among mountain goats in southeastern Alaska (and across the western North American range of the species). More recent analyses indicated that three genetically distinct mountain goat populations occur in our study area [east Berners mountains, Kakuhan range (including Lions Head and Sinclair Mountain), and Mt. Villard]; population boundaries generally

Table 1: Proportion of radio-marked adult female mountain goats observed with kids at heel during parturition in the Lynn Canal study area, 2005-2018. Data are also presented from other study areas, for comparative purposes.

Area	Year	Kids	AdF	Prop	SE
Baranof					
	2010	**4**	**4**	**1.00**	**0.00**
	2011	**5**	**6**	**0.83**	**0.15**
	2012	**3**	**5**	**0.60**	**0.22**
	2013	**5**	**10**	**0.50**	**0.16**
	2014	**9**	**12**	**0.75**	**0.13**
	2015	**7**	**14**	**0.50**	**0.13**
	2016	**8**	**12**	**0.67**	**0.14**
	2017	**4**	**11**	**0.36**	**0.15**
	2018	**8**	**12**	**0.67**	**0.14**
	Total	**53**	**86**	**0.62**	**0.05**
Haines-Skagway					
	2010	**5**	**10**	**0.50**	**0.16**
	2011	**8**	**10**	**0.80**	**0.13**
	2012	**8**	**11**	**0.73**	**0.13**
	2013	**10**	**12**	**0.83**	**0.11**
	2014	**10**	**17**	**0.59**	**0.12**
	2015	**14**	**18**	**0.78**	**0.10**
	2016	**11**	**15**	**0.73**	**0.11**
	2017	**6**	**11**	**0.55**	**0.15**
	2018	**8**	**14**	**0.57**	**0.13**
	Total	**80**	**118**	**0.68**	**0.04**
Lynn Canal					
	2005	**8**	**12**	**0.67**	**0.14**
	2006	**16**	**25**	**0.64**	**0.10**
	2007	**20**	**32**	**0.63**	**0.09**
	2008	**19**	**33**	**0.58**	**0.09**
	2009	**15**	**25**	**0.60**	**0.10**
	2010	**18**	**26**	**0.69**	**0.09**
	2011	**18**	**27**	**0.67**	**0.09**
	2012	**9**	**15**	**0.60**	**0.13**
	2013	**9**	**13**	**0.69**	**0.13**
	2014	**8**	**14**	**0.57**	**0.13**
	2015	**15**	**17**	**0.88**	**0.08**
	2016	**14**	**17**	**0.82**	**0.09**
	2017	**13**	**17**	**0.76**	**0.10**
	2018	**11**	**14**	**0.79**	**0.11**
	Total	**193**	**287**	**0.67**	**0.03**

Table 2: Estimates of mountain goat survival for different sex classes during 2005-2018, Lynn Canal, AK. Data are also presented from other study areas, for comparative purposes.

	Males				Females				Total			
	At Risk	Died	Ŝ	SE	At Risk	Died	Ŝ	SE	At Risk	Died	Ŝ	SE
Baranof Island												
2010/2011	**8**	**1**	**0.88**	**0.11**	**4**	**0**	**1.00**	**0.00**	**12**	**1**	**0.92**	**0.08**
2011/2012	**12**	**0**	**1.00**	**0.00**	**6**	**0**	**1.00**	**0.00**	**18**	**0**	**1.00**	**0.00**
2012/2013	**17**	**3**	**0.82**	**0.09**	**6**	**0**	**1.00**	**0.00**	**23**	**3**	**0.87**	**0.07**
2013/2014	**17**	**3**	**0.82**	**0.09**	**10**	**0**	**1.00**	**0.00**	**27**	**3**	**0.89**	**0.06**
2014/2015	**17**	**3**	**0.82**	**0.09**	**12**	**1**	**0.92**	**0.08**	**29**	**4**	**0.86**	**0.06**
2015/2016	**14**	**0**	**1.00**	**0.00**	**13**	**2**	**0.84**	**0.11**	**27**	**2**	**0.92**	**0.06**
2016/2017	**23**	**3**	**0.85**	**0.08**	**13**	**2**	**0.82**	**0.12**	**36**	**5**	**0.84**	**0.06**
2017/2018	**21**	**5**	**0.76**	**0.09**	**11**	**2**	**0.80**	**0.13**	**32**	**7**	**0.77**	**0.07**
All years	**127**	**18**	**0.85**	**0.03**	**75**	**7**	**0.90**	**0.036**	**202**	**25**	**0.87**	**0.02**
Cleveland Pen.												
2009/2010	**5**	**0**	**1.00**	**0.00**	**2**	**0**	**1.00**	**0.00**	**7**	**0**	**1.00**	**0.00**
2010/2011	**6**	**2**	**0.67**	**0.16**	**6**	**0**	**1.00**	**0.00**	**12**	**2**	**0.83**	**0.10**
2011/2012	**4**	**2**	**0.50**	**0.18**	**6**	**0**	**1.00**	**0.00**	**10**	**2**	**0.80**	**0.11**
2012/2013	**2**	**1**	**0.50**	**0.35**	**6**	**0**	**1.00**	**0.00**	**8**	**1**	**0.88**	**0.12**
2013/2014	**1**	**0**	**1.00**	**0.00**	**6**	**2**	**0.67**	**0.19**	**7**	**2**	**0.71**	**0.17**
All years	**18**	**5**	**0.72**	**0.09**	**26**	**2**	**0.92**	**0.05**	**44**	**7**	**0.84**	**0.05**
Haines-Skagway												
2010/2011	**13**	**4**	**0.69**	**0.13**	**10**	**3**	**0.70**	**0.14**	**23**	**7**	**0.70**	**0.10**
2011/2012	**16**	**2**	**0.87**	**0.09**	**10**	**1**	**0.90**	**0.09**	**26**	**3**	**0.88**	**0.06**
2012/2013	**18**	**2**	**0.89**	**0.07**	**11**	**1**	**0.91**	**0.08**	**29**	**3**	**0.90**	**0.06**
2013/2014	**22**	**2**	**0.91**	**0.06**	**12**	**1**	**0.92**	**0.08**	**34**	**3**	**0.91**	**0.05**
2014/2015	**19**	**2**	**0.89**	**0.07**	**16**	**2**	**0.85**	**0.08**	**35**	**4**	**0.88**	**0.05**
2015/2016	**18**	**5**	**0.72**	**0.10**	**16**	**3**	**0.79**	**0.10**	**34**	**8**	**0.75**	**0.07**
2016/2017	**13**	**6**	**0.56**	**0.13**	**14**	**4**	**0.71**	**0.11**	**26**	**10**	**0.64**	**0.09**
2017/2018	**12**	**3**	**0.73**	**0.12**	**11**	**0**	**1.00**	**0.00**	**23**	**3**	**0.86**	**0.07**
All years	**128**	**26**	**0.79**	**0.03**	**96**	**15**	**0.84**	**0.04**	**224**	**41**	**0.81**	**0.03**
Lynn Canal												
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**	**0.05**
2007/2008	**36**	**7**	**0.77**	**0.08**	**31**	**4**	**0.83**	**0.08**	**67**	**11**	**0.80**	**0.05**
2008/2009	**36**	**10**	**0.66**	**0.09**	**34**	**6**	**0.73**	**0.09**	**70**	**16**	**0.69**	**0.06**
2009/2010	**28**	**4**	**0.86**	**0.07**	**26**	**4**	**0.85**	**0.07**	**54**	**8**	**0.85**	**0.05**
2010/2011	**25**	**3**	**0.88**	**0.06**	**24**	**2**	**0.91**	**0.06**	**49**	**5**	**0.90**	**0.04**
2011/2012	**23**	**6**	**0.72**	**0.10**	**23**	**3**	**0.85**	**0.08**	**46**	**9**	**0.77**	**0.07**
2012/2013	**19**	**8**	**0.59**	**0.10**	**16**	**7**	**0.60**	**0.11**	**34**	**15**	**0.59**	**0.07**
2013/2014	**13**	**3**	**0.75**	**0.13**	**11**	**2**	**0.83**	**0.11**	**24**	**5**	**0.79**	**0.08**
2014/2015	**11**	**5**	**0.57**	**0.14**	**14**	**1**	**0.93**	**0.07**	**25**	**6**	**0.76**	**0.08**
2015/2016	**8**	**1**	**0.86**	**0.11**	**17**	**2**	**0.88**	**0.08**	**25**	**3**	**0.87**	**0.07**
2016/2017	**13**	**6**	**0.54**	**0.14**	**17**	**3**	**0.82**	**0.09**	**30**	**9**	**0.70**	**0.08**
2017/2018	**11**	**1**	**0.91**	**0.09**	**18**	**6**	**0.67**	**0.11**	**29**	**7**	**0.76**	**0.08**
All years	**243**	**67**	**0.73**	**0.03**	**233**	**45**	**0.81**	**0.02**	**474**	**112**	**0.77**	**0.02**

At Risk = maximum number of animals monitored per month (per time period) coincide with our specific study area boundaries (Shafer et al. 2012). These findings indicate that gene flow between our study areas (with the exception of the Lion Head and Sinclair study areas, which are genetically indistinct) is limited. Additional analyses examined the extent to which mountain goat habitat selection characteristics and landscape configuration are linked to genetic relatedness across the study area (Shafer et al. 2012). Results from this analyses indicated that small- (i.e. distance to cliffs, heat load) and large-scale (i.e. river valleys and marine waterways) landscape features are key determinants of mountain goat gene flow across our study area (Shafer et al. 2012). In 2016, a new state-wide mountain goat population genetics project was initiated and will include more spatially extensive analyses that utilize both microsatelite and genomic techniques. This project is funded by ADFG and Trent University but will benefit our knowledge of mountain goat genetics in this study area as well.

GPS Location Data

GPS System Performance.—The performance of GPS radio-collars (Telonics TGW-3590) was evaluated for 124 collars deployed since the beginning of the study (see White et al. 2012). In general, the remote GPS data collection system used in this study worked as expected. Specifically, we did not encounter any significant problems with GPS collar performance, nor did any notable problems occur with remote data download attempts.

Winter Severity and Snow Modeling

Snow Surveys.—Field-based snow surveys were conducted within 5 days of April 1 during 2007-2008, 2010-2018 on Echo Ridge. Analyses of these data quantified the degree to which snow depth differs with increasing elevation between forested and non-forested sites (White et al. 2012). Overall, these data quantify the extent to which snow depth varied relative to elevation and habitat type (i.e. open vs. forest). Specifically, snow depth was 30-40 inches deeper in open relative to forested habitats, on average. Further, snow depth increased 2.3-2.7 inches per 100 foot gain in elevation, on average (White et al. 2012). Importantly, these data provide quantitative information about winter severity in areas representative of where mountain goats in our study area are wintering. Such data will be able to be used as covariates in future analyses of survival, reproduction and resource selection.

Climate Data.—Daily climate data were archived from the National Weather Service database to characterize broader scale climate patterns. Total annual snowfall, average daily temperature during July-August, and total precipitation (summer and annual) were summarized from data collected at the National Weather Service station in Haines, AK (Appendix 3). Total annual snowfall and average temperature during July-August are important predictors of mountain goat survival (White et al. 2011). Mean snowfall in Haines during the study period (2005-2018) was 114% of the long-term normal (i.e. 1950-2018). Overall, snowfall in Haines during 5 of the 7 initial winters of the study was above normal (including 5 of the 10 highest snowfall winters on record; 39 years of data). However, 5 of the last 6 winters have been below average, and included the winter of 2014/2015 which was exceptionally mild (54 inches of total snowfall, or 34% of normal). During the winter of 2017/2018, a total 109 inches (71% of normal) of snowfall was recorded in Haines.

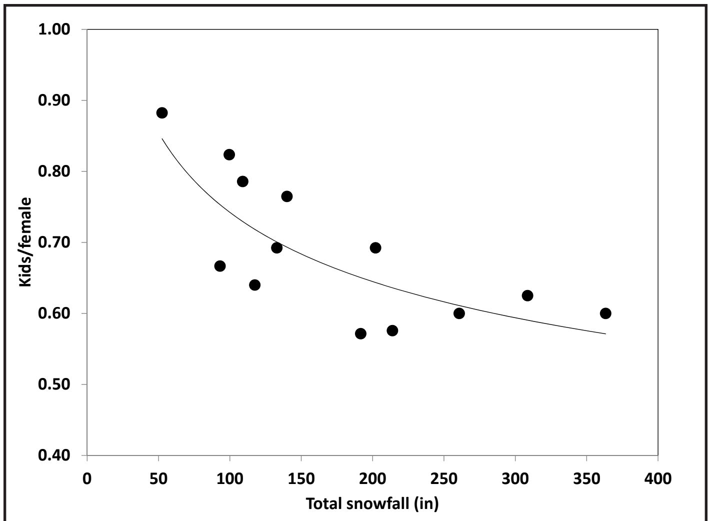

Figure 5. Relationship between total annual snowfall (Haines, AK) and the proportion of radio-marked females with kids during the parturition period during 2006-2018 in Lynn Canal, AK.

Reproduction and Survival

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 (Table 1). 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).

Annual estimates of kid production in Lynn Canal ranged from 57-88% between 2005-2018 (Table 1). During 2017, 79% of radio-marked females (n = 14) had a kid at heel; 12 percent above average (Table 1). As described above, the previous four winters have been particularly mild and likely contributed to the observed increase in reproduction; preliminary analyses suggest that reproduction is negatively related to total snowfall during the preceding winter (Figure 5).

Table 3: Causes of mortality for mountain goats in southeastern Alaska, 2005-2018, with specific emphasis on avalanche caused mortalities. Data are based on field investigations of radio-marked mountain goat mortality events in four study areas.

	Lynn Canal		Haines-Skagway		Baranof		Cleveland Pen		Total	
Cause of death	**n**	**prop**	**n**	**prop**	**n**	**prop**	**n**	**prop**	**n**	**prop**
Avalanche	**27**	**0.24**	**17**	**0.40**	**17**	**0.68**	**4**	**0.57**	**65**	**0.35**
Non-avalanche[1]	**50**	**0.44**	**4**	**0.10**	**1**	**0.04**	**1**	**0.14**	**56**	**0.30**
Unknown	**37**	**0.32**	**21**	**0.50**	**7**	**0.28**	**2**	**0.29**	**67**	**0.36**
All	**114**	**1.00**	**42**	**1.00**	**25**	**1.00**	**7**	**1.00**	**188**	**1.00**

[1]Non-avalanche includes predation (black bear, brown bear and wolf), malnutrition and falls

Survival.—Mountain goats were monitored monthly during fixed-wing aerial telemetry flights and/or via GPS-telemetry. During 2017/2018 biological year, 7 radio-marked animals died. Overall, 76±8% of animals survived during 2017/2018; a relatively low proportion (i.e. 1% lower than the long term average) given that winter snowfall, an important determinant of winter survival (White et al. 2011), was only 71% of average. Interestingly, avalanches were the cause of death in 3 of 7 mortality cases, and an additional animal died from a presumed fall during winter (the remaining 3 radiocollared animals died of unknown, but non-avalanche related, causes). Conditions leading to winter avalanches or falls can be somewhat independent of total winter snowfall amounts and instead more strongly linked to persistent weak layers in the snowpack. The ontogeny and stability of snowpacks can be complex and related to storm cycle sequences and, sometimes, anomalous events such as rain-on-snow and hard freezes. Overall, the higher than usual occurrence of avalanche related mortalities in the study area resulted in lower survival of mountain goats than would be expected based on total winter snowfall. Typically, we would expect relatively shallow snowpacks to improve availability of food resources, reduce costs of locomotion and depletion nutritional reserves leading to increased probabilities of survival. While avalanches represent an important source of mortality in our study area, the overall proportion of mountain goats dying in avalanches is lower than in other areas of southeastern Alaska (Table 3).

Population Abundance and Composition

Aerial Surveys.—During early-October 2018, we conducted three aerial surveys in the Lions Head and Sinclair Mountain study areas and the Berners-Lace ridge area (Appendix 4). The Berners-Lace ridge was surveyed because seasonal movement (albeit limited) by male mountain goats has been documented from the Lions Head study area to this site in past years.

Evaluation of Population Trends.— Geographic and temporal trends were calculated for eight survey areas within the Lions Head and Sinclair study areas, and Berners-Lace ridge (Appendix 4, 5a-c). Analyses were based on population estimates derived using the White et al. (2016) aerial survey sightability model and aerial survey data collected during 2005-2018.

Population densities declined substantially in most areas since 2005/2006 (Table 4). In the Lions Head area, the strongest decline occurred in the Kensington (i.e. -14% per year) and neighboring Met (-21% per year) survey areas, while the lower density West Berners area was largely stable (-1% per year) areas; similar to Berners-Lace Ridge (-3% per year). In the more northerly Sinclair study area, mountain goat populations exhibited stronger declines (Table 4). The peripheral, low density populations adjacent to the icefield appeared stable (but should be interpreted cautiously due to very low total number of animals seen in each areas). Population densities also varied substantially among areas with the highest initial densities occurring on the south and west side of the Kakuhan range (i.e. Kensington, Met, Yeldagalga and S Katzehin). Areas on the east side of the Kakuhan Range, generally had lower densities (and closer proximity to icefields and glaciers).

The general decline in mountain goat populations coincided with succession of severe winters between 2006-2014; total annual snowfall in Haines was greater than average in 6 of the 8 winters during this period (Appendix 3). Winter snowfall can exert strong negative effects of mountain

Table 4: Estimated change in minimum count densities, based on mountain goats observed during aerial surveys during 2005-2018, Lynn Canal, Alaska.

Area	Slope (change/yr)	r^2	Density (est total/km^2) Mean	Max	Min	Area (km^2)	# years
Lions Head							
W Berners	-0.01	0.01	1.4	2.3	0.6	22.0	14
Kensington	-0.14	0.28	2.3	5.9	1.2	19.9	14
Met	-0.21	0.32	5.4	8.2	2.6	15.4	13
Sinclair							
Yeldagalga	-0.19	0.22	4.5	8.2	1.8	25.1	13
S Katzehin	-0.19	0.44	2.6	5.1	1.3	41.6	13
Katzehin Lk	-0.13	0.55	1.1	2.2	0.2	21.2	12
Icefield							
S Meade	0.06	0.14	1.2	2.7	0.4	18.2	13
U Lace	<0.01	<0.01	0.7	1.3	0.2	16.9	13
BL Ridge	-0.03	0.09	1.5	2.0	0.9	30.0	11

goat survival (White et al. 2011) by increasing energetic costs of locomotion and burial of food resources. It is not immediately clear why declines appear to be strongest in the northwestern Kakuhan Range (i.e. Yeldagalga, South Katzehin and Katzehin Lake) and Kensington survey areas. It is possible that snow depths are greater in the northwestern areas; an observation supported by anecdotal information. The northwestern survey areas also had the highest initial population densities and may have been closer to nutritional carrying capacity (and thus more vulnerable to population declines) prior to the severe winters. In the Kensington area, declines appeared stronger than in surrounding areas to the east suggesting that factors other than local variation in winter conditions were important. Recent analyses suggested that mountain goat avoidance of winter range habitats within 1.8 km of Kensington Mine developments has reduced the functional winter range carrying capacity by 42% in the local area (White and Gregovich 2017). Thus, mine related disturbance may have indirectly exacerbated the effects of severe winters in the local mountain goat population. Nonetheless, the analyses and interpretation of the causes of population declines should be considered preliminary.

Population estimates derived from aerial survey data collected in 2016 - 2018 indicated that the mountain goat sub-populations in the Met, Yeldagalga and S Katzehin survey areas may be recovering, following the previously described multi-year decline. In other areas, populations appear to have remained stable over the last four mild (i.e. below average snowfall) winters. Under such winter conditions, population growth is expected and its currently unclear why a stronger population recovery has not occurred. Overall, results should be considered cautiously until additional data are collected in future years and confirm the apparent recovery trend.

Sightability Modeling and Population Estimates.—During all surveys, data were collected for purposes of developing group-level aerial survey sighting probability models (2018, n = 25 trials). In addition, complementary aerial surveys were conducted in areas outside of the study area (Haines, Baranof Island) where mountain goats were marked as part of independent studies. Collection of data in other areas has enabled acquisition of additional sightability data resulting in opportunity to more accurately parameterize sightability models; however, a majority of the data used to develop models was collected in the Lynn Canal/Berners Bay study areas. Details of this modeling effort are summarized in White et al. (2016) however newly acquired data continue to used to further refine models on a annual basis.

FUTURE WORK

The mountain goat population monitoring and assessment work in the vicinity of the Kensington Mine is planned to continue during the operational phase on mining operations. The project area for ongoing mine-related monitoring work encompasses the area between Slate cove and the Katzehin River (i.e. the "Lions Head" and "Sinclair" study areas). In this area study animals (2018/19, n = 28) will continue to be monitored monthly to assess reproductive status and survival. Mortalities will be investigated during April - October, or as conditions allow. GPS location data will be downloaded from radio-collars following field recovery efforts; GPS radio collars automatically release 3 years after capture/deployment (or at the time or mortality). GPS data will be post-processed and appended to the existing GPS location database. During late-summer, 6-8 mountain goats will be captured to ensure scientifically defensible sample sizes are maintained. Three replicate aerial surveys will be conducted in early-fall 2019, weather permitting, in order to estimate mountain goat sightability, population abundance and composition. During 2019-2020, efforts will continue to refine mountain goat aerial survey sightability models and, ultimately, derive population estimates. Results of project activities will be summarized and submitted to Coeur Alaska, Inc. and associated stakeholders as an annual research project report in spring 2020.

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Appendix 1: Incidence of disease prevalence of mountain goats in the Lions Head, Sinclair, Villard and East Berners study areas, 2010-2015. Results are also provided for three other populations in southeastern Alaska in 2010-2015, for comparison. (Kakuhan includes the Lions Head and Sinclair study areas combined).

	Baranof			Cleveland			Haines			Berners			Kakuhan			Villard			Total		
Disease	**n**	**Pos.**	**Prop**	**n**	**Pos.**	**Prop**	**n**	**Pos.**	**Prop**	**n**	**Pos.**	**Prop**	**n**	**Pos.**	**Prop**	**n**	**Pos.**	**Prop**	**n**	**Pos.**	**Prop**
Contagious Ecthyma	40	2	0.05	10	1	0.10	44	3	0.07	20	1	0.05	65	3	0.05	24	0	0.00	203	10	0.05
Chlamydia	16	0	0.00	12	0	0.00	28	1	0.04	27	0	0.00	34	0	0.00	30	1	0.03	147	2	0.01
Q Fever	36	0	0.00	11	0	0.00	50	0	0.00	29	0	0.00	65	3	0.05	32	1	0.03	223	4	0.02
Bluetongue	17	0	0.00	10	0	0.00	20	0	0.00	20	0	0.00	17	0	0.00	18	0	0.00	102	0	0.00
Bovine respiratory synctial virus (BRSV)	17	0	0.00	10	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	16	0	0.00	101	0	0.00
Infectious bovine rhinotrachetis (IBR)	17	0	0.00	10	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	17	0	0.00	102	0	0.00
Parainfluenza-3 (PI-3)	17	0	0.00	10	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	17	0	0.00	102	0	0.00
Epizootic hemorrhagic disease (EHD)	17	0	0.00	9	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	17	0	0.00	101	0	0.00
Caprinae arthritis encephalitis (CAE)	17	0	0.00	9	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	16	0	0.00	100	0	0.00
Malignant cataharral fever-ovine (MCF)	17	0	0.00	9	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	16	0	0.00	100	0	0.00
Leptospirosis cannicola	17	0	0.00	9	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	17	0	0.00	101	0	0.00
Leptospirosis grippo	17	0	0.00	9	0	0.00	20	1	0.05	21	0	0.00	17	1	0.06	17	1	0.06	101	3	0.03
Leptospirosis hardjo	17	0	0.00	9	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	17	0	0.00	101	0	0.00
Leptospirosis ictero	17	0	0.00	9	0	0.00	20	3	0.15	21	2	0.10	17	3	0.18	17	3	0.18	101	11	0.11
Leptospirosis pomona	17	0	0.00	9	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	17	0	0.00	101	0	0.00

Positive titers: PI3>1:120, IBR> 1:64, BRSV >1:32, Leptospirosis sp.>1:100

Appendix 2a: Trace mineral concentration documented for mountain goats in the Lions Head and Sinclair study areas, 2010-2013. Results are also provided for three other populations in southeastern Alaska in 2010-2014, for comparison. (Kakuhan includes the Lions Head and Sinclair study areas combined).

	Se			Mo			Mn			Fe			Cu			Zn		
Area	mean	SE	n	mean	SE	n	mean	SE	n	mean	SE	n	mean	SE	n	mean	SE	n
Baranof	0.31	0.01	36	0.05	0.00	36	0.006	0.000	36	1.64	0.07	36	1.07	0.02	36	0.81	0.03	36
Cleveland	0.26	0.01	5	0.05	0.00	5	0.006	0.000	5	1.71	0.09	5	0.81	0.03	5	0.70	0.04	5
Kakuhan	0.17	0.02	31	0.05	0.00	31	0.006	0.000	31	1.58	0.09	31	1.01	0.05	31	0.81	0.03	31
Haines	0.24	0.02	52	0.05	0.00	51	0.006	0.000	51	1.82	0.07	51	1.06	0.03	51	0.83	0.03	51
Average	0.24	0.01	126	0.05	0.00	125	0.006	0.000	125	1.72	0.04	125	1.04	0.02	125	0.82	0.02	125

Appendix 2b: Selenium concentration for mountain goats in the Lions Head and Sinclair study areas, 2010-2013. Results are also provided for three other populations in southeastern Alaska in 2010-2014, for comparison. (Kakuhan includes the Lions Head and Sinclair study areas combined).

Selenium (ppm)

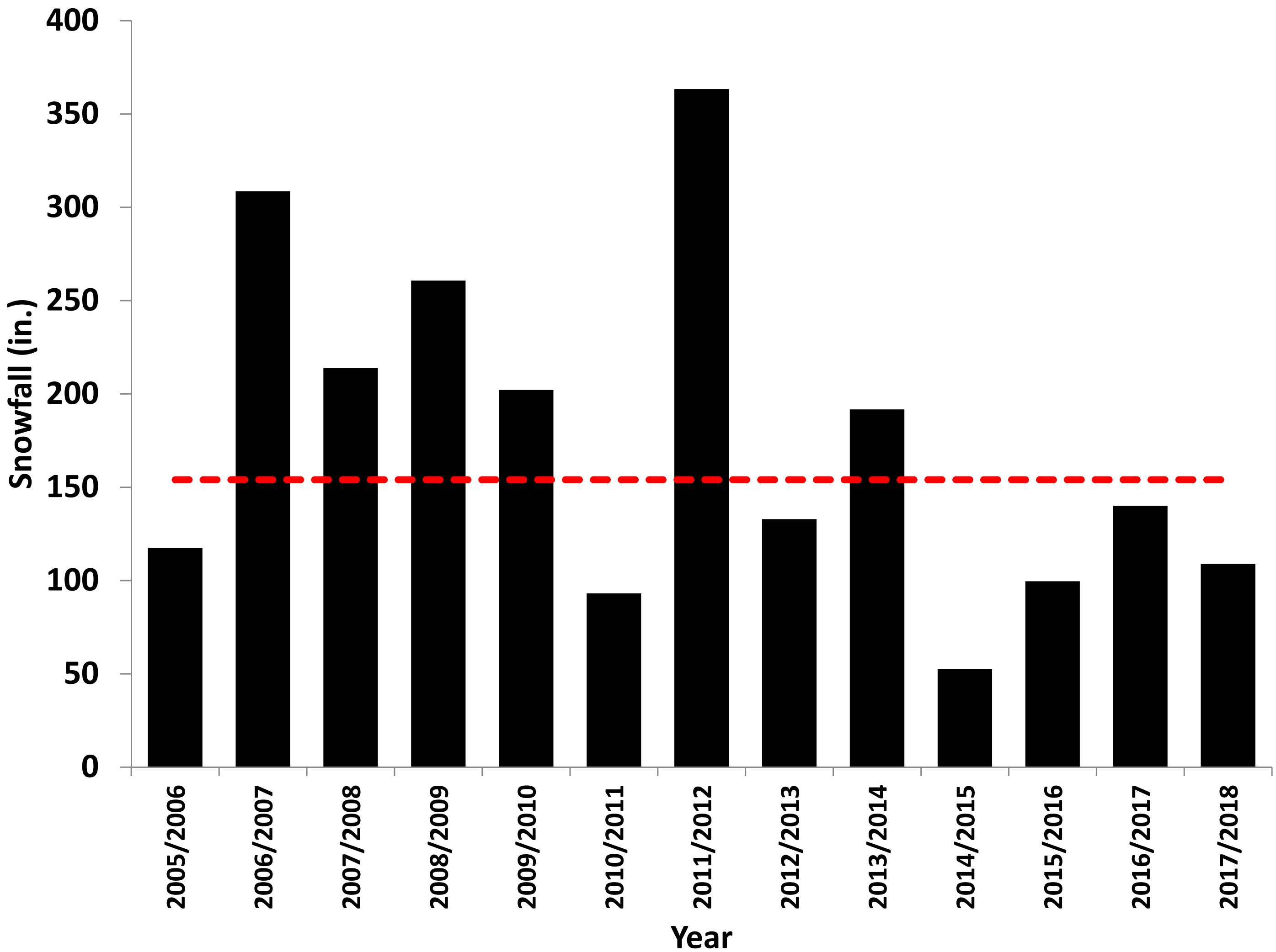
Area	mean	SE	n	Min	Max	# < 0.10	Prop < 0.10
Baranof	0.31	0.01	36	0.19	0.41	0	0.00
Cleveland	0.26	0.01	5	0.22	0.29	0	0.00
Kakuhan	0.17	0.02	31	0.05	0.37	10	0.32
Haines	0.24	0.02	52	0.03	0.73	9	0.17
Average	0.24	0.01	126	0.03	0.73	19	0.15

Appendix 3a: Monthly snowfall (in.) recorded at the Haines 2 COOP NWS Station in Haines, AK between 2005-2018.

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Total	% of normal
2005/2006	0	30	9	40	22	16	0	0	118	76%
2006/2007	0	42	78	81	28	78	3	0	309	200%
2007/2008	0	6	56	78	41	31	3	0	214	139%
2008/2009	22	24	56	62	45	43	9	0	261	169%
2009/2010	0	48	19	68	8	59	0	0	202	131%
2010/2011	0	24	25	19	20	3	3	0	93	60%
2011/2012	0	126	40	121	20	56	0	0	363	236%
2012/2013	4	20	41	21	23	10	14	1	133	86%
2013/2014	0	20	92	22	23	35	1	0	192	124%
2014/2015	0	0	5	14	18	16	0	0	53	34%
2015/2016	0	21	43	18	16	2	0	0	100	65%
2016/2017	13	11	43	22	19	33	0	0	140	91%
2017/2018	0	28	2	27	17	34	0	0	109	71%
Average, Study period	3	31	39	46	23	32	3	0	176	114%
Average, Long-term[1]	3	22	38	38	28	21	3	0	154	100%

[1]Haines Airport (1950-1955, 1973-1998) and Haines COOP NWS Station (1999-2018)

Appendix 3a: Total annual snowfall (in.) recorded at the Haines 2 COOP NWS Station in Haines, AK between 2005-2018. The red dashed line designates the long-term average [Haines Airport (1950-1955, 1973-1998) and Haines 2 COOP NWS Station (1999-2018)].



Appendix 3b: Summer temperature and precipitation (in.) recorded at the Haines 2 COOP NWS Station in Haines, AK between 2005-2018.

	Temperature - July/August						**Precipitation**				
	Farenheit			**Celcius**			**Inches**				
Year	**Mean - 0 ft.**	**Mean - 3000 ft.**[1]	**Departure**	**Mean - 0 ft.**	**Mean - 3000 ft.**[1]	**Departure**	**May/ June**	**July/ Aug**	**May- Aug**	**MA Dep**	**Annual**
2005/2006	**58.30**	**47.61**	**1.05**	**14.61**	**8.67**	**0.59**	**3.2**	**3.8**	**7.0**	**-3.6**	**66.7**
2006/2007	**55.95**	**45.26**	**-1.30**	**13.31**	**7.36**	**-0.72**	**6.4**	**3.6**	**10.0**	**-0.6**	**59.2**
2007/2008	**57.40**	**46.71**	**0.15**	**14.11**	**8.17**	**0.09**	**1.9**	**5.9**	**7.7**	**-2.8**	**58.3**
2008/2009	**54.65**	**43.96**	**-2.60**	**12.58**	**6.64**	**-1.44**	**4.6**	**9.3**	**13.9**	**3.3**	**69.4**
2009/2010	**59.10**	**48.41**	**1.85**	**15.06**	**9.11**	**1.03**	**0.7**	**8.3**	**9.0**	**-1.6**	**62.9**
2010/2011	**56.40**	**45.71**	**-0.85**	**13.56**	**7.61**	**-0.47**	**5.1**	**3.5**	**8.7**	**-1.9**	**67.9**
2011/2012	**56.10**	**45.41**	**-1.15**	**13.39**	**7.45**	**-0.64**	**1.3**	**5.9**	**7.2**	**-3.3**	**65.9**
2012/2013	**55.75**	**45.06**	**-1.50**	**13.19**	**7.25**	**-0.83**	**8.6**	**6.4**	**15.0**	**4.4**	**61.9**
2013/2014	**58.95**	**48.26**	**1.70**	**14.97**	**9.03**	**0.95**	**4.9**	**2.7**	**7.6**	**-3.0**	**57.1**
2014/2015	**56.80**	**46.11**	**-0.45**	**13.78**	**7.84**	**-0.25**	**6.6**	**11.8**	**18.4**	**7.8**	**64.5**
2015/2016	**57.35**	**46.66**	**0.10**	**14.08**	**8.14**	**0.06**	**3.0**	**9.0**	**11.9**	**1.4**	**68.7**
2016/2017	**58.85**	**48.16**	**1.60**	**14.92**	**8.98**	**0.89**	**6.8**	**3.4**	**10.2**	**-0.3**	**65.1**
2017/2018	**56.20**	**45.51**	**-1.05**	**13.44**	**7.50**	**-0.58**	**5.4**	**6.3**	**11.7**	**1.1**	**58.8**
2018/2019	**59.65**	**48.96**	**2.40**	**15.36**	**9.42**	**1.34**	**6.0**	**3.6**	**9.6**	**-0.9**	**53.5**
Average, Study period	**57.25**	**46.55**	**0.00**	**14.03**	**8.08**	**0.00**	**4.6**	**6.0**	**10.6**	**0.0**	**62.8**

[1]Temperature adjusted based on standard lapse rate (-5.941 C/3000 ft)

Appendix 3a: Departure from normal average temperature (F) during July-August recorded at the Haines 2 COOP NWS Station in Haines, AK between 2005-2018.

Appendix 3a: Departure from normal precipitation (in.) during May-August recorded at the Haines 2 COOP NWS Station in Haines, AK between 2005-2018.

Appendix 4: Mountain goat aerial survey areas in the Kakuhan Range (Lions Head, Sinclair and Berners-Lace Ridge study areas). Each area was surveyed by fixed- and/or rotor-wing aircraft during August-October, 2005-2018. Summer range population size and density (mountain goats/km^2) estimates were derived using sightability and RSF modeling and described in associated figures.

Appendix 5a: Summary of mountain goat population composition, minimum count and population estimates based on data collected during aerial surveys on the Lions Head study area (and associated survey areas), 2005-2018. “Minimum counts” represent the number of mountain goats seen during aerial surveys and do not account for variation in sighting probabilities between surveys/years. Population estimates explicitly account for variation in group-level sighting probabilities among surveys/years.

			Minimum Count				Population Estimate					
Study Area	Survey Area	Year	Adults	Kids	Total	Prop. kids	Total	LCI	UCI	Density	# of surveys	Area (km^2)
Lions Head	W Berners	2005	9	0	9	0.00	21	11	20	1.0	2	22.0
Lions Head	W Berners	2006	16	2	16	0.13	47	20	27	2.1	4	22.0
Lions Head	W Berners	2007	18	7	25	0.28	50	17	24	2.3	4	22.0
Lions Head	W Berners	2008	15	1	16	0.06	26	9	15	1.2	2	22.0
Lions Head	W Berners	2009	12	3	15	0.20	23	8	13	1.0	1	22.0
Lions Head	W Berners	2010	9	1	10	0.10	26	13	20	1.2	2	22.0
Lions Head	W Berners	2011	17	4	21	0.19	39	13	18	1.8	1	22.0
Lions Head	W Berners	2012	11	2	13	0.15	25	10	16	1.1	1	22.0
Lions Head	W Berners	2013	16	2	18	0.11	42	17	25	1.9	1	22.0
Lions Head	W Berners	2014	6	1	7	0.14	15	8	13	0.7	1	22.0
Lions Head	W Berners	2015	5	1	6	0.17	14	8	14	0.6	1	22.0
Lions Head	W Berners	2016	7	1	8	0.13	30	18	29	1.3	1	22.0
Lions Head	W Berners	2017	14	1	15	0.07	42	21	32	1.9	1	22.0
Lions Head	W Berners	2018	13	3	16	0.19	39	20	31	1.8	1	22.0
Lions Head	Kensington	2005	21	5	26	0.19	51	17	24	2.5	2	19.9
Lions Head	Kensington	2006	48	8	54	0.15	118	29	36	5.9	4	19.9
Lions Head	Kensington	2007	24	4	27	0.15	43	12	18	2.2	4	19.9
Lions Head	Kensington	2008	17	4	21	0.19	46	17	25	2.3	2	19.9
Lions Head	Kensington	2009	15	5	19	0.26	31	10	15	1.5	2	19.9
Lions Head	Kensington	2010	18	7	25	0.28	45	15	22	2.3	2	19.9
Lions Head	Kensington	2011	25	7	32	0.22	50	13	18	2.5	1	19.9
Lions Head	Kensington	2012	20	3	23	0.13	38	11	17	1.9	1	19.9
Lions Head	Kensington	2013	17	5	22	0.23	53	21	31	2.7	1	19.9
Lions Head	Kensington	2014	16	1	17	0.06	34	13	19	1.7	1	19.9
Lions Head	Kensington	2015	7	2	9	0.22	25	14	21	1.2	1	19.9
Lions Head	Kensington	2016	13	4	17	0.24	47	23	36	2.4	1	19.9
Lions Head	Kensington	2017	10	2	12	0.17	36	19	31	1.8	1	19.9
Lions Head	Kensington	2018	8	1	9	0.11	26	16	26	1.3	1	19.9
Lions Head	Met	2005	35	7	42	0.17	80	22	31	5.2	2	15.4
Lions Head	Met	2006	47	14	61	0.23	125	30	37	8.2	5	15.4
Lions Head	Met	2007	48	5	53	0.09	117	30	37	7.6	4	15.4
Lions Head	Met	2008	39	13	51	0.25	102	26	33	6.6	2	15.4
Lions Head	Met	2009	30	9	39	0.23	56	13	19	3.6	2	15.4
Lions Head	Met	2010	32	14	46	0.30	91	24	32	5.9	2	15.4
Lions Head	Met	2011	42	15	57	0.26	84	16	22	5.5	1	15.4
Lions Head	Met	2012	37	7	44	0.16	74	17	24	4.8	1	15.4
Lions Head	Met	2013	31	11	42	0.26	81	24	34	5.3	1	15.4
Lions Head	Met	2014	30	10	40	0.25	63	15	21	4.1	1	15.4
Lions Head	Met	2015	--	--	--	--	--	--	--	--	0	15.4
Lions Head	Met	2016	17	7	24	0.29	65	27	39	4.2	1	15.4
Lions Head	Met	2017	12	4	16	0.25	39	19	32	2.6	1	15.4
Lions Head	Met	2018	26	8	34	0.24	94	35	45	6.1	1	15.4

Appendix 5b: Summary of mountain goat population composition, minimum count and population estimates based on data collected during aerial surveys on the Mt. Sinclair study area (and associated survey areas), 2005-2018. “Minimum counts” represent the number of mountain goats seen during aerial surveys and do not account for variation in sighting probabilities between surveys/years. Population estimates explicitly account for variation in group-level sighting probabilities among surveys/years.

			Minimum Count				Population Estimate					
Study Area	**Survey Area**	**Year**	**Adults**	**Kids**	**Total**	**Prop. kids**	**Total**	**LCI**	**UCI**	**Density**	**# of surveys**	**Area (km^2)**
Sinclair	Yeldagalga	2005	67	16	83	0.19	134	26	35	5.4	2	25.1
Sinclair	Yeldagalga	2006	95	22	112	0.20	206	36	41	8.2	6	25.1
Sinclair	Yeldagalga	2007	69	15	84	0.18	153	31	38	6.1	3	25.1
Sinclair	Yeldagalga	2008	50	12	62	0.19	114	26	34	4.6	2	25.1
Sinclair	Yeldagalga	2009	--	--	--	--	--	--	--	--	0	25.1
Sinclair	Yeldagalga	2010	25	9	31	0.29	69	22	29	2.7	2	25.1
Sinclair	Yeldagalga	2011	57	15	72	0.21	107	20	26	4.3	1	25.1
Sinclair	Yeldagalga	2012	59	9	68	0.13	95	17	23	3.8	1	25.1
Sinclair	Yeldagalga	2013	34	8	42	0.19	92	29	40	3.7	1	25.1
Sinclair	Yeldagalga	2014	31	9	40	0.23	63	14	20	2.5	1	25.1
Sinclair	Yeldagalga	2015	15	7	22	0.32	45	17	25	1.8	1	25.1
Sinclair	Yeldagalga	2016	49	15	64	0.23	158	43	54	6.3	1	25.1
Sinclair	Yeldagalga	2017	31	11	42	0.26	117	40	51	4.7	1	25.1
Sinclair	Yeldagalga	2018	31	10	41	0.24	97	34	45	3.9	1	25.1
Sinclair	S Katzehin	2005	72	13	85	0.15	155	32	38	3.7	2	41.6
Sinclair	S Katzehin	2006	94	19	113	0.17	211	38	43	5.1	4	41.6
Sinclair	S Katzehin	2007	84	20	104	0.19	184	33	40	4.4	3	41.6
Sinclair	S Katzehin	2008	70	19	89	0.21	131	21	27	3.2	2	41.6
Sinclair	S Katzehin	2009	--	--	--	--	--	--	--	--	0	41.6
Sinclair	S Katzehin	2010	29	7	36	0.19	79	24	31	1.9	2	41.6
Sinclair	S Katzehin	2011	53	14	67	0.21	105	20	26	2.5	1	41.6
Sinclair	S Katzehin	2012	42	6	48	0.13	80	18	25	1.9	1	41.6
Sinclair	S Katzehin	2013	21	4	25	0.16	55	20	31	1.3	1	41.6
Sinclair	S Katzehin	2014	27	6	33	0.18	57	15	21	1.4	1	41.6
Sinclair	S Katzehin	2015	27	8	35	0.23	75	23	31	1.8	1	41.6
Sinclair	S Katzehin	2016	21	6	27	0.22	75	30	41	1.8	1	41.6
Sinclair	S Katzehin	2017	24	2	26	0.08	76	31	42	1.8	1	41.6
Sinclair	S Katzehin	2018	40	13	53	0.25	139	42	53	3.3	1	41.6
Sinclair	Katzehin Lk	2005	23	8	31	0.26	47	13	21	2.2	2	21.2
Sinclair	Katzehin Lk	2006	25	3	27	0.11	44	13	18	2.1	4	21.2
Sinclair	Katzehin Lk	2007	16	2	18	0.11	37	14	22	1.8	3	21.2
Sinclair	Katzehin Lk	2008	15	4	19	0.21	41	16	23	1.9	2	21.2
Sinclair	Katzehin Lk	2009	--	--	--	--	--	--	--	--	0	21.2
Sinclair	Katzehin Lk	2010	14	5	19	0.26	42	17	25	2.0	2	21.2
Sinclair	Katzehin Lk	2011	7	2	9	0.22	16	7	13	0.8	1	21.2
Sinclair	Katzehin Lk	2012	3	0	3	0.00	6	3	8	0.3	1	21.2
Sinclair	Katzehin Lk	2013	2	1	3	0.33	8	5	14	0.4	1	21.2
Sinclair	Katzehin Lk	2014	3	1	4	0.25	7	3	10	0.3	1	21.2
Sinclair	Katzehin Lk	2015	2	0	2	0.00	4	2	10	0.2	1	21.2
Sinclair	Katzehin Lk	2016	7	1	8	0.13	26	16	29	1.2	1	21.2
Sinclair	Katzehin Lk	2017	8	1	9	0.11	25	14	26	1.2	1	21.2
Sinclair	Katzehin Lk	2018	2	0	2	0.00	8	6	18	0.4	1	21.2

Appendix 5c: Summary of mountain goat population composition, minimum count and population estimates based on data collected during aerial surveys on the Meade Icefield and Berners-Lace Ridge study areas (and associated survey areas), 2005-2018. "Minimum counts" represent the number of mountain goats seen during aerial surveys and do not account for variation in sighting probabilities between surveys/years. Population estimates explicitly account for variation in group-level sighting probabilities among surveys/years.

			Minimum Count				Population Estimate					
Study Area	Survey Area	Year	Adults	Kids	Total	Prop. kids	Total	LCI	UCI	Density	# of surveys	Area (km^2)
Icefield	S Meade	2005	6	1	6	0.17	10	4	11	0.5	2	18.2
Icefield	S Meade	2006	19	3	22	0.14	43	14	21	2.4	2	18.2
Icefield	S Meade	2007	3	1	4	0.25	8	4	10	0.4	1	18.2
Icefield	S Meade	2008	5	1	5	0.20	9	4	10	0.5	2	18.2
Icefield	S Meade	2009	--	--	--	--	--	--	--	--	0	18.2
Icefield	S Meade	2010	4	2	6	0.33	14	8	15	0.8	2	18.2
Icefield	S Meade	2011	10	3	13	0.23	24	10	15	1.3	1	18.2
Icefield	S Meade	2012	7	0	7	0.00	15	8	14	0.8	1	18.2
Icefield	S Meade	2013	10	1	11	0.09	25	12	20	1.4	1	18.2
Icefield	S Meade	2014	5	3	8	0.38	14	6	11	0.7	1	18.2
Icefield	S Meade	2015	5	2	7	0.29	16	9	16	0.9	1	18.2
Icefield	S Meade	2016	12	2	14	0.14	49	26	39	2.7	1	18.2
Icefield	S Meade	2017	9	1	10	0.10	32	18	29	1.7	1	18.2
Icefield	S Meade	2018	8	1	9	0.11	27	16	26	1.5	1	18.2
Icefield	U Lace	2005	9	0	9	0.00	22	12	18	1.3	1	16.9
Icefield	U Lace	2006	1	0	1	0.00	3	2	9	0.2	1	16.9
Icefield	U Lace	2007	8	1	9	0.11	16	7	12	1.0	1	16.9
Icefield	U Lace	2008	6	1	6	0.17	10	4	11	0.6	2	16.9
Icefield	U Lace	2009	--	--	--	--	--	--	--	--	0	16.9
Icefield	U Lace	2010	2	1	2	0.50	4	2	8	0.2	2	16.9
Icefield	U Lace	2011	6	4	10	0.40	14	4	10	0.8	1	16.9
Icefield	U Lace	2012	9	3	12	0.25	19	7	14	1.1	1	16.9
Icefield	U Lace	2013	2	0	2	0.00	6	4	12	0.4	1	16.9
Icefield	U Lace	2014	6	3	9	0.33	12	3	9	0.7	1	16.9
Icefield	U Lace	2015	7	1	8	0.13	17	9	16	1.0	1	16.9
Icefield	U Lace	2016	3	0	3	0.00	13	10	22	0.8	1	16.9
Icefield	U Lace	2017	3	2	5	0.40	12	7	19	0.7	1	16.9
Icefield	U Lace	2018	4	2	6	0.33	13	7	19	0.8	1	16.9
BL Ridge	BL Ridge	2005	10	0	10	0.00	33	17	25	1.1	1	30.0
BL Ridge	BL Ridge	2006	--	--	--	--	--	--	--	--	0	30.0
BL Ridge	BL Ridge	2007	25	4	29	0.14	57	18	26	1.9	1	30.0
BL Ridge	BL Ridge	2008	19	3	22	0.14	49	18	26	1.6	1	30.0
BL Ridge	BL Ridge	2009	--	--	--	--	--	--	--	--	0	30.0
BL Ridge	BL Ridge	2010	--	--	--	--	--	--	--	--	0	30.0
BL Ridge	BL Ridge	2011	26	9	35	0.26	60	16	23	2.0	2	30.0
BL Ridge	BL Ridge	2012	24	3	27	0.11	43	12	17	1.4	1	30.0
BL Ridge	BL Ridge	2013	13	2	15	0.13	40	18	27	1.3	1	30.0
BL Ridge	BL Ridge	2014	16	3	19	0.16	36	13	18	1.2	1	30.0
BL Ridge	BL Ridge	2015	18	4	22	0.18	54	20	28	1.8	1	30.0
BL Ridge	BL Ridge	2016	13	2	15	0.13	31	14	22	1.0	1	30.0
BL Ridge	BL Ridge	2017	17	5	22	0.23	49	21	33	1.7	1	30.0
BL Ridge	BL Ridge	2018	11	2	13	0.15	27	16	26	0.9	1	30.0

Appendix 6: Summary of mountain goats captured and monitored in the Lions Head and Mt. Sinclair study areas during 2005-2018, Lynn Canal, AK.

Mtn Goat ID	Date - Capture	Year	Sex	Est. Age	Kid	Weight (lbs.)	Fate	Date - Fate	Days Monitored
LG001	9/26/05	2005	M	9	--	308	Died	4/17/06	203
LG002	9/26/05	2005	F	11	1	140	Died	4/16/06	202
LG003	9/26/05	2005	F	7	1	180	Died	4/10/07	561
LG004	9/26/05	2005	F	7	1	196	Release	8/15/07	688
LG005	9/26/05	2005	M	9	--		Died	5/9/07	590
LG006	10/2/05	2005	M	8	--	347	Died	2/10/06	131
LG007	10/2/05	2005	M	2	--	163	Release	8/15/07	682
LG008	10/2/05	2005	F	5	0	171	Died	7/8/13	2836
LG008	8/15/10	2010	F	7	1	172	Died	7/8/13	1058
LG009	10/2/05	2005	F	10	0		Release	8/15/07	682
LG010	10/3/05	2005	F	7	?	187	Release	8/15/07	681
LG011	10/3/05	2005	M	9	--	335	Died	2/11/07	496
LG016	10/14/05	2005	M	5	--	273	Release	8/15/07	670
LG019	10/15/05	2005	M	5	--	273	Died	6/26/06	254
LG020	10/15/05	2005	M	8	--	285	Release	8/15/07	669
LG021	10/15/05	2005	F	4	0	194	Release	8/15/07	669
LG022	10/15/05	2005	F	8	?		Release	8/15/07	669
LG023	10/15/05	2005	M	9	--	221	Release	8/15/07	669
LG024	7/28/06	2006	M	3	--	134	Died	7/13/08	716
LG025	7/28/06	2006	F	6	?	130	Died	5/11/07	287
LG026	7/28/06	2006	M	6	--	251	Died	11/17/06	112
LG027	7/28/06	2006	M	10	--	274	Died	12/31/07	521
LG028	7/28/06	2006	M	8	--		Died	7/18/07	355
LG029	7/28/06	2006	F	7	?	160	Release	9/11/08	776
LG030	7/28/06	2006	F	8	?		Died	4/25/07	271
LG036	7/29/06	2006	M	6	--	308	Release	9/11/08	775
LG037	7/29/06	2006	M	4	--	216	Died	2/18/08	569
LG038	7/29/06	2006	F	4	?	141	Release	9/11/08	775
LG039	8/29/06	2006	F	10	0	165	Died	5/10/07	254
LG040	8/29/06	2006	M	8	--		Died	4/24/12	2065
LG040	9/24/08	2008	M	10	--	309	Died	4/24/12	1308
LG041	8/29/06	2006	F	5	1		Release	9/11/08	744
LG045	9/25/06	2006	F	6	0	185	Release	9/11/08	717
LG050	10/7/06	2006	M	8	--	250	Died	4/17/07	192
LG051	10/7/06	2006	F	2	0	145	Release	9/11/08	705
LG052	10/7/06	2006	F	3	0	160	Release	9/11/08	705
LG053	10/7/06	2006	M	3	--	171	Release	9/11/08	705
LG060	10/13/06	2006	M	5	--	287	Release	9/1/08	689
LG061	10/13/06	2006	M	10	--	350	Died	5/15/09	945
LG061	8/18/08	2008	M	12	--	301	Died	5/15/09	270
LG062	10/13/06	2006	M	10	--	310	Release	9/1/08	689

Appendix 6 (continued): Summary of mountain goats captured and monitored in the Lions Head and Mt. Sinclair study areas during 2005-2018, Lynn Canal, AK.

Mtn Goat ID	Date - Capture	Year	Sex	Est. Age	Kid	Weight (lbs.)	Fate	Date - Fate	Days Monitored
LG078	8/2/07	2007	F	9	1	175	Release	9/11/08	406
LG079	8/2/07	2007	M	11	--	269	Died	8/24/07	22
LG080	8/2/07	2007	M	6	--	281	Release	9/11/08	406
LG081	8/2/07	2007	M	4	--	217	Release	9/11/08	406
LG083	8/3/07	2007	M	5	--	258	Died	6/11/11	1408
LG084	8/3/07	2007	M	4	--	180	Died	4/12/11	1348
LG086	8/11/07	2007	M	4	--	223	Died	10/7/08	423
LG087	8/11/07	2007	M	5	--	233	Died	2/21/10	925
LG088	8/11/07	2007	F	8	0	160	Died	11/1/09	813
LG089	8/11/07	2007	M	4	--	240	Died	11/1/09	813
LG090	8/11/07	2007	F	3	0	157	Release	9/11/08	397
LG097	8/16/08	2008	F	5	1	151	Release	6/7/11	1025
LG098	8/16/08	2008	M	6	--	279	Died	2/15/14	2009
LG098	8/16/12	2012	M	10	--	302	Died	2/15/14	548
LG099	8/18/08	2008	M	6	--	266	Release	6/7/11	1023
LG100	8/18/08	2008	F	10	1	163	Died	10/6/08	49
LG101	8/18/08	2008	M	5	--	277	Died	10/8/09	416
LG102	8/18/08	2008	M	7	--	328	Died	4/3/13	1689
LG103	8/18/08	2008	F	7	0	185	Died	10/14/12	1518
LG103	9/10/11	2011	F	10	0		Died	10/14/12	400
LG104	8/18/08	2008	F	6	0	192	Release	6/7/11	1023
LG106	8/19/08	2008	M	5	--	242	Died	4/17/10	606
LG112	9/21/08	2008	F	11	1	199	Died	2/4/09	136
LG117	9/24/08	2008	F	3	0	170	Release	6/7/11	986
LG118	9/24/08	2008	F	3	0	166	Release	6/7/11	986
LG119	9/24/08	2008	M	4	--	237	Release	10/31/18	3689
LG120	9/24/08	2008	F	5	1	175	Died	3/22/09	179
LG124	8/5/09	2009	M	5	--	291	Died	3/2/12	940
LG125	8/5/09	2009	F	4	0	150	Died	4/11/14	1710
LG126	8/5/09	2009	F	6	1	175	Died	10/15/12	1167
LG127	8/5/09	2009	F	11	1	182	Died	3/9/10	216
LG128	8/5/09	2009	F	6	0	170	Died	7/27/10	356
LG136	9/1/09	2009	F	2	0	131	Died	10/18/09	47
LG137	9/1/09	2009	M	9	--	342	Died	6/19/12	1022
LG141	8/15/10	2010	M	7	--	307	Died	1/15/15	1614
LG143	8/15/10	2010	F	6	1	175	Died	5/7/13	996
LG144	8/15/10	2010	F	6	1	163	Died	6/14/11	303
LG145	8/15/10	2010	F	6	1	192	Release	9/20/17	2593
LG146	8/15/10	2010	M	2	--	134	Died	7/12/12	697
LG147	9/10/11	2011	F	3	0	145	Died	10/11/12	397
LG148	9/10/11	2011	F	6	0	182	Died	9/11/17	2193
LG149	9/10/11	2011	F	6	0	164	Died	8/28/12	353
LG150	9/10/11	2011	M	5	--	234	Died	5/19/13	617
LG151	9/10/11	2011	F	5	1	180	Died	6/24/12	288
LG152	9/10/11	2011	M	11	--	296	Died	5/21/12	254
LG153	9/10/11	2011	M	5	--	243	Died	11/8/16	1886
LG154	8/16/12	2012	F	2	0	151	Died	8/7/17	1817

Appendix 6 (continued): Summary of mountain goats captured and monitored in the Lions Head and Mt. Sinclair study areas during 2005-2018, Lynn Canal, AK.

Mtn Goat ID	Date - Capture	Year	Sex	Est. Age	Kid	Weight (lbs.)	Fate	Date - Fate	Days Monitored
LG155	8/16/12	2012	F	12	0	186	Died	5/8/13	265
LG156	8/16/12	2012	M	6	--	265	Died	1/24/14	526
LG157	8/16/12	2012	M	4	--	282	Died	1/18/18	1981
LG158	8/16/12	2012	M	4	--	192	Died	1/5/14	507
LG159	8/16/12	2012	M	3	--		Died	10/11/14	786
LG160	10/10/12	2012	F	2	0	172	Alive	2/11/19	2315
LG161	10/10/12	2012	F	3	0	160	Alive	2/11/19	2315
LG162	8/15/13	2013	M	8	--	325	Died	1/7/17	1241
LG163	8/15/13	2013	M	3	--	170	Died	7/7/15	691
LG164	8/15/13	2013	F	7	1	180	Died	2/10/17	1275
LG166	8/15/13	2013	M	2	--		Died	6/29/14	318
LG167	8/20/14	2014	F	11	0	208	Died	1/17/17	881
LG168	8/20/14	2014	F	5	1	193	Alive	2/11/19	1636
LG169	8/20/14	2014	F	9	0	155	Died	10/15/16	787
LG170	8/20/14	2014	M	7	--	254	Died	11/7/14	79
LG172	8/20/14	2014	M	3	--	174	Died	8/3/18	1444
LG173	8/20/14	2014	M	6	--	268	Died	11/19/16	822
LG174	8/20/14	2014	F	10	1		Died	11/7/17	1175
LG175	8/25/15	2015	F	4	0	202	Alive	2/11/19	1266
LG176	8/25/15	2015	M	6	--		Alive	2/11/19	1266
LG177	8/25/15	2015	F	11	1	211	Alive	2/11/19	1266
LG178	8/25/15	2015	M	6	--	300	Alive	2/11/19	1266
LG179	8/25/15	2015	F	4	1		Release	7/5/18	1045
LG180	8/25/15	2015	F	1	0		Died	4/15/16	234
LG181	9/2/16	2016	M	7	--	295	Died	12/28/16	117
LG182	9/2/16	2016	M	6	--	331	Died	4/5/17	215
LG183	9/2/16	2016	F	9	1	191	Died	10/10/17	403
LG184	9/2/16	2016	M	5	--	321	Died	12/2/18	821
LG185	9/2/16	2016	F	5	0	193	Died	8/7/17	339
LG186	9/2/16	2016	F	7	1	200	Alive	2/11/19	892
LG187	9/2/16	2016	M	5	--		Died	10/23/16	51
LG188	9/2/16	2016	M	4	--		Alive	2/11/19	892
LG189	8/10/17	2017	M	4	--	321	Alive	2/11/19	550
LG190	8/10/17	2017	M	3	--		Alive	2/11/19	550
LG191	8/10/17	2017	F	6	1	170	Alive	2/11/19	550
LG192	8/10/17	2017	F	6	1	172	Alive	2/11/19	550
LG193	8/10/17	2017	M	9	--		Alive	2/11/19	550
LG194	8/10/17	2017	F	8	1	179	Alive	2/11/19	550
LG195	8/10/17	2017	F	3	0	156	Alive	2/11/19	550
LG196	8/10/17	2017	M	4	--	209	Alive	2/11/19	550
LG197	7/31/18	2018	M	4	--	261	Alive	2/11/19	195
LG198	7/31/18	2018	F	4	0		Alive	2/11/19	195
LG199	7/31/18	2018	M	2	--		Alive	2/11/19	195
LG200	7/31/18	2018	F	5	1	172	Alive	2/11/19	195
LG201	8/1/18	2018	M	2	--	168	Alive	2/11/19	194
LG202	8/1/18	2018	F	7	0	170	Alive	2/11/19	194

Attachment 4

2019 Re-vegetation Test Plot Monitoring Results

KC HARVEY
ENVIRONMENTAL, LLC

6/3/19
Qualitative Monitoring

Site Name: PLOT [illegible] 3 (SOUTH) Date: [illegible]

Data Collector(s): D. STROW Slope(%)/Aspect: /

Vegetation

	Reclamation Trial					Reference Site				
	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover
Grass	10									
Forb										
Shrub	80									
Total		–	–	–	–		–	–	–	–
Weed										
Cover Crop		–	–	–	–	–	–	–	–	–
Rock	10	–	–	–	–		–	–	–	–
Litter		–	–	–	–		–	–	–	–
Bare Ground		–	–	–	–		–	–	–	–

ALDE –

Other Species: (Reclamation Trial)	Other Species: (Reference Site)
Grass	Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Relative % Cover ________ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))

Additional Monitoring Methods

Seedling Count ☐Yes ☑No

Canopy Cover ☐Yes ☐No

Mulch
☐ None
☐ Fiber

Grazing
☐ Wildlife
☐ Livestock
☐ Both

Severity
☐ None 0-5%
☐ Low 5-40%
☐ Moderate 40-60%
☐ Heavy 60-100%

2019

SURFACE STABILITY EVALUATION

Date 6/3/19 Data Collector(s) P. STROW

Site Data

Location Name: PLOT 3 (SOUTH)		Photographs taken: (circle one)	(Y) N
Aspect:	Slope (degree):	Photograph notes:	
Comments:			

Site Stabilization Data

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	y	3	14
Surface Litter	y	0	14
Surface Rock Fragments	y	0	14
Pedestals	y	0	14
Flow Patterns	y	0	15
Rills	y	0	14
Gullies	y	0	15
TOTAL		3	100

Procedure: (refer to Erosion Condition Classification System publication if needed)

1) Observe the total sample area and determine the average condition.
2) Determine if each item is potentially present. Only the potentially present items will be considered in the total calculation (cross out pre-entered possible factor # if it is not potentially present).
3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF: (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below.

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: STABLE

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

KC HARVEY ENVIRONMENTAL, LLC

KC HARVEY
ENVIRONMENTAL, LLC

Qualitative Monitoring

Site Name: PLOT 2 (MIDDLE) Date: 6/3/15

Data Collector(s): P. STRONG Slope(%)/Aspect: /

Vegetation

	Reclamation Trial					Reference Site				
	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover
Grass	10									
Forb	20									
Shrub	15									
Total	45	–	–	–	–		–	–	–	–
Weed										
Cover Crop		–	–	–	–	–	–	–	–	–
Rock	30	–	–	–	–		–	–	–	–
Litter	15	–	–	–	–		–	–	–	–
Bare Ground	10	–	–	–	–		–	–	–	–

MOSS – (beside Forb)
ALDER – (beside Shrub)

Other Species: (Reclamation Trial)	Other Species: (Reference Site)
Grass	Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Relative % Cover ______ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))

Additional Monitoring Methods

Seedling Count ☐ Yes ☑ No

Canopy Cover ☐ Yes ☐ No

Mulch
☑ None
☐ Fiber

1 SPRUCE SAPLING

Grazing
☐ Wildlife
☐ Livestock
☐ Both

Severity
☐ None 0-5%
☐ Low 5-40%
☐ Moderate 40-60%
☐ Heavy 60-100%

SURFACE STABILITY EVALUATION

Date 6/3/19 Data Collector(s) P-STROW

Site Data

Location Name: PLOT 2 MIDDLE		Photographs taken: (circle one) (Y) N
Aspect:	Slope (degree):	Photograph notes:
Comments:		

Site Stabilization Data

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	y	3	14
Surface Litter	y	2	14
Surface Rock Fragments	y	5	14
Pedestals	y	0	14
Flow Patterns	y	0	15
Rills	y	0	14
Gullies	y	0	15
TOTAL		10	100

Procedure: (refer to Erosion Condition Classification System publication if needed)

1) Observe the total sample area and determine the average condition.
2) Determine if each item is potentially present. Only the potentially present items will be considered in the total calculation (cross out pre-entered possible factor # if it is not potentially present).
3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF: (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below.

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: 10% - STABLE

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

KC HARVEY ENVIRONMENTAL, LLC

KC HARVEY
ENVIRONMENTAL, LLC

Qualitative Monitoring

Site Name: PLOT 1 (NORTH) Date: 6/3/19

Data Collector(s): P. STROW Slope(%)/Aspect: /

Vegetation

	Reclamation Trial					Reference Site				
	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover
Grass	10									
Forb (MOSS OR LICHEN –)	15									
Shrub (ALDER –)	35									
Total	60	–	–	–	–		–	–	–	–
Weed										
Cover Crop		–	–	–	–	–	–	–	–	–
Rock	30	–	–	–	–		–	–	–	–
Litter	5	–	–	–	–		–	–	–	–
Bare Ground	5	–	–	–	–		–	–	–	–

Reclamation Trial – Other Species:	Reference Site – Other Species:
Grass	Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Relative % Cover ________ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))

Additional Monitoring Methods

Seedling Count ☐ Yes ☑ No

Canopy Cover ☐ Yes ☑ No

Mulch
- ☐ None
- ☑ Fiber

1 SPRUCE SAPLING

Grazing
- ☐ Wildlife
- ☐ Livestock
- ☐ Both

Severity
- ☐ None 0-5%
- ☐ Low 5-40%
- ☐ Moderate 40-60%
- ☐ Heavy 60-100%

SURFACE STABILITY EVALUATION

Site Data

Date 6/3/19 Data Collector(s):

Location Name: PLOT 1 NORTH		Photographs taken: (Y) (circle one)
Aspect:	Slope (degree):	Photograph notes:
Comments:		

Site Stabilization Data

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	y	3	14
Surface Litter	y	3	14
Surface Rock Fragments	y	2	14
Pedestals	y	0	14
Flow Patterns	y	0	15
Rills	y	0	14
Gullies	y	0	15
TOTAL		8	100

Procedure: (refer to Erosion Condition Classification System publication if needed)

1) Observe the total sample area and determine the average condition.
2) Determine if each item is potentially present. Only the potentially present items will be considered in the total calculation (cross out pre-entered possible factor # if it is not potentially present).
3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below.

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: 8% - STABLE

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

KC HARVEY ENVIRONMENTAL, LLC

KC HARVEY
ENVIRONMENTAL, LLC

Qualitative Monitoring

Site Name: PLOT 3 (SOUTH)　　Date: 7/28/19

Data Collector(s): D. STROW　　Slope(%)/Aspect: /

Vegetation

	Reclamation Trial: Total Foliar Cover	Reclamation Trial: Species 1/ % Cover	Reclamation Trial: Species 2/ % Cover	Reclamation Trial: Species 3/ % Cover	Reclamation Trial: Species 4/ % Cover	Reference Site: Total Foliar Cover	Reference Site: Species 1/ % Cover	Reference Site: Species 2/ % Cover	Reference Site: Species 3/ % Cover	Reference Site: Species 4/ % Cover
Grass										
Forb										
ALDER — Shrub	~100									
Total	100	–	–	–	–		–	–	–	–
Weed	0									
Cover Crop	0	–	–	–	–	–	–	–	–	–
Rock	0	–	–	–	–		–	–	–	–
Litter	0	–	–	–	–		–	–	–	–
Bare Ground	8	–	–	–	–		–	–	–	–

Reclamation Trial: Other Species	Reference Site: Other Species
Grass	Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Relative % Cover ______ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))

Additional Monitoring Methods

Seedling Count ☐ Yes ☑ No

Canopy Cover ☑ Yes ☐ No

Mulch
☑ None
☐ Fiber

Grazing
☐ Wildlife
☐ Livestock
☐ Both

Severity
☐ None 0-5%
☐ Low 5-40%
☐ Moderate 40-60%
☐ Heavy 60-100%

SURFACE STABILITY EVALUATION

Date 7/28/15 Data Collector(s) P. Strom

Site Data

Location Name: PLOT 3 (SOUTH)		Photographs taken: (circle one)	(Y) N
Aspect:	Slope (degree):	Photograph notes:	
Comments:			

Site Stabilization Data

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	Y	0	14
Surface Litter	Y	0	14
Surface Rock Fragments	Y	0	14
Pedestals	Y	0	14
Flow Patterns	Y	0	15
Rills	Y	0	14
Gullies	Y	0	15
TOTAL		0	100

Procedure: (refer to Erosion Condition Classification System publication if needed)

1) Observe the total sample area and determine the average condition.
2) Determine if each item is potentially present. Only the potentially present items will be considered in the total calculation (cross out pre-entered possible factor # if it is not potentially present).
3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF: (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below.

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: ~~[illegible]~~ 0% 1-20% STABLE

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

KC HARVEY ENVIRONMENTAL, LLC

KC HARVEY
ENVIRONMENTAL, LLC

Qualitative Monitoring

Site Name: PLOT 2 (MIDDLE) Date: 7/28/13

Data Collector(s): P. STROW Slope(%)/Aspect: /

Vegetation

	Reclamation Trial					Reference Site				
	Total Foliar Cover	Species 1/ %Cover	Species 2/ %Cover	Species 3/ %Cover	Species 4/ %Cover	Total Foliar Cover	Species 1/ %Cover	Species 2/ %Cover	Species 3/ %Cover	Species 4/ %Cover
Grass	15									
Forb										
ALDER – Shrub	35									
Total	50	–	–	–	–		–	–	–	–
Weed										
Cover Crop	.	–	–	–	–	–	–	–	–	–
Rock	30	–	–	–	–		–	–	–	–
Litter	5	–	–	–	–		–	–	–	–
Bare Ground	15	–	–	–	–		–	–	–	–

Other Species: (Reclamation Trial)	Other Species: (Reference Site)
Grass	Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Additional Monitoring Methods

Seedling Count ☐Yes ☑No

Canopy Cover ☐Yes ☑No

Mulch
- ☑ None
- ☐ Fiber

Grazing
- ☐ Wildlife
- ☐ Livestock
- ☐ Both

Severity
- ☐ None 0-5%
- ☐ Low 5-40%
- ☐ Moderate 40-60%
- ☐ Heavy 60-100%

Relative % Cover ________ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))

SURFACE STABILITY EVALUATION

Date 7/28/15 Data Collector(s) P.S.-Trow

Site Data

Location Name: PLOT 2 (MIDDLE)

Photographs taken: (circle one) (Y) N

Aspect: Slope (degree):

Photograph notes:

Comments:

Site Stabilization Data

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	Y	3	14
Surface Litter	Y	3	14
Surface Rock Fragments	Y	0	14
Pedestals	Y	0	14
Flow Patterns	Y	0	15
Rills	Y	0	14
Gullies	Y	0	15
TOTAL	Y	6	100

Procedure: (refer to Erosion Condition Classification System publication if needed)

1) Observe the total sample area and determine the average condition.
2) Determine if each item is potentially present. Only the potentially present items will be considered in the total calculation (cross out pre-entered possible factor # if it is not potentially present).
3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF: (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below.

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: 6% - STABLE

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

KC HARVEY ENVIRONMENTAL, LLC

KC HARVEY
ENVIRONMENTAL, LLC

Qualitative Monitoring

Site Name: PLOT 1 NORTH Date: 7/28/19

Data Collector(s): P. STROW Slope(%)/Aspect: /

Vegetation

	Reclamation Trial					Reference Site				
	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover
Grass	5									
~~Forb~~ MOSS	15									
Shrub	50									
Total		—	—	—	—		—	—	—	—
Weed										
Cover Crop		—	—	—	—	—	—	—	—	—
Rock	25	—	—	—	—		—	—	—	—
Litter		—	—	—	—		—	—	—	—
Bare Ground	5	—	—	—	—		—	—	—	—

ALDER — (beside Shrub row)

Reclamation Trial – Other Species	Reference Site – Other Species
Grass	Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Relative % Cover ________ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))

Additional Monitoring Methods

Seedling Count ☐ Yes ☑ No

Canopy Cover ☐ Yes ☑ No

Mulch
- ☐ None
- ☑ Fiber

Grazing
- ☐ Wildlife
- ☐ Livestock
- ☐ Both

Severity
- ☐ None 0-5%
- ☐ Low 5-40%
- ☐ Moderate 40-60%
- ☐ Heavy 60-100%

SURFACE STABILITY EVALUATION

Date 7/28/19 Data Collector(s) D. Strong

Site Data

Location Name: PLOT 1 (NORTH)	Photographs taken: (Y) N (circle one)
Aspect: / Slope (degree):	Photograph notes:
Comments:	

Site Stabilization Data

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	Y	3	14
Surface Litter	Y	3	14
Surface Rock Fragments	Y	0	14
Pedestals	Y	0	14
Flow Patterns	Y	0	15
Rills	Y	0	14
Gullies	Y	0	15
TOTAL	Y	6	100

Procedure: (refer to Erosion Condition Classification System publication if needed)

1) Observe the total sample area and determine the average condition.
2) Determine if each item is potentially present. Only the potentially present items will be considered in the total calculation (cross out pre-entered possible factor # if it is not potentially present).
3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF: (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below.

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: 6% – STABLE

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

KC HARVEY ENVIRONMENTAL, LLC

KC HARVEY
ENVIRONMENTAL, LLC

Qualitative Monitoring

Site Name: PLOT B SOUTH Date: 9/30/15

Data Collector(s): P. STROW Slope(%)/Aspect: /

Vegetation

	Reclamation Trial					Reference Site				
	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover
Grass	20									
Forb										
ALDER — Shrub	70									
Total		—	—	—	—		—	—	—	—
Weed										
Cover Crop		—	—	—	—	—	—	—	—	—
Rock		—	—	—	—		—	—	—	—
Litter	10	—	—	—	—		—	—	—	—
Bare Ground		—	—	—	—		—	—	—	—

Reclamation Trial	Reference Site
Other Species: Grass	Other Species: Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Additional Monitoring Methods

Seedling Count ☐ Yes ☑ No

Canopy Cover ☐ Yes ☑ No

Mulch
- ☑ None
- ☐ Fiber

Grazing
- ☐ Wildlife
- ☐ Livestock
- ☐ Both

Severity
- ☐ None 0-5%
- ☐ Low 5-40%
- ☐ Moderate 40-60%
- ☐ Heavy 60-100%

Relative % Cover ________ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))

SURFACE STABILITY EVALUATION

Date 9/30/15 Data Collector(s) P. Sitton

Site Data

Location Name: PLOT 3 SOUTH		Photographs taken: (circle one) Ⓨ N	
Aspect:	Slope (degree):	Photograph notes:	
Comments:			

Site Stabilization Data

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	Y	0	14
Surface Litter	Y	0	14
Surface Rock Fragments	Y	0	14
Pedestals	Y	0	14
Flow Patterns	Y	0	15
Rills	Y	0	14
Gullies	Y	0	15
TOTAL	Y	0	100

Procedure: (refer to Erosion Condition Classification System publication if needed)

1) Observe the total sample area and determine the average condition.
2) Determine if each item is potentially present. Only the potentially present items will be considered in the total calculation (cross out pre-entered possible factor # if it is not potentially present).
3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF: (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below.

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: 1-20% STABLE

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

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Qualitative Monitoring

Site Name: PLOT 2 MIDDLE Date: 9/30/15

Data Collector(s): P. SUTTON Slope(%)/Aspect: /

Vegetation

	Reclamation Trial Total Foliar Cover	Reclamation Trial Species 1/ % Cover	Reclamation Trial Species 2/ % Cover	Reclamation Trial Species 3/ % Cover	Reclamation Trial Species 4/ % Cover	Reference Site Total Foliar Cover	Reference Site Species 1/ % Cover	Reference Site Species 2/ % Cover	Reference Site Species 3/ % Cover	Reference Site Species 4/ % Cover
Grass	5									
Forb										
Shrub (ALDER ⇐)	35									
Total		–	–	–	–		–	–	–	–
Weed										
Cover Crop		–	–	–	–	–	–	–	–	–
Rock	50	–	–	–	–		–	–	–	–
Litter	10	–	–	–	–		–	–	–	–
Bare Ground		–	–	–	–		–	–	–	–

Reclamation Trial Other Species:	Reference Site Other Species:
Grass	Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Relative % Cover ________ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))

Additional Monitoring Methods

Seedling Count ☐ Yes ☑ No

Canopy Cover ☐ Yes ☑ No

Mulch
- ☑ None
- ☐ Fiber

Grazing
- ☐ Wildlife
- ☐ Livestock
- ☐ Both

Severity
- ☐ None 0-5%
- ☐ Low 5-40%
- ☐ Moderate 40-60%
- ☐ Heavy 60-100%

SURFACE STABILITY EVALUATION

Date 9/30/19 Data Collector(s) P. Sutton

Site Data

Location Name: PLOT 2 (MIDDLE)	Photographs taken: (Y) N (circle one)
Aspect: Slope (degree):	Photograph notes:
Comments:	

Site Stabilization Data

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	Y	3	14
Surface Litter	Y	3	14
Surface Rock Fragments	Y	0	14
Pedestals	Y	0	14
Flow Patterns	Y	0	15
Rills	Y	0	14
Gullies	Y	0	15
TOTAL	Y	6	100%

Procedure: (refer to Erosion Condition Classification System publication if needed)

1) Observe the total sample area and determine the average condition.
2) Determine if each item is potentially present. Only the potentially present items will be considered in the total calculation (cross out pre-entered possible factor # if it is not potentially present).
3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF: (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below.

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: 1-20% STABLE

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

KC HARVEY ENVIRONMENTAL, LLC

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Qualitative Monitoring

Site Name: PLOT 1 (NORTH) Date: 9/30/19

Data Collector(s): P. STPOW Slope(%)/Aspect: ______ / ______

Vegetation

	Reclamation Trial Total Foliar Cover	Reclamation Trial Species 1/ % Cover	Reclamation Trial Species 2/ % Cover	Reclamation Trial Species 3/ % Cover	Reclamation Trial Species 4/ % Cover	Reference Site Total Foliar Cover	Reference Site Species 1/ % Cover	Reference Site Species 2/ % Cover	Reference Site Species 3/ % Cover	Reference Site Species 4/ % Cover
Grass	5									
Forb										
ALDER – Shrub	65									
Total		–	–	–	–		–	–	–	–
Weed										
Cover Crop		–	–	–	–	–	–	–	–	–
Rock	25	–	–	–	–		–	–	–	–
Litter	5	–	–	–	–		–	–	–	–
Bare Ground		–	–	–	–		–	–	–	–

Reclamation Trial Other Species:	Reference Site Other Species:
Grass	Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Additional Monitoring Methods

Seedling Count ☐ Yes ☑ No

Canopy Cover ☐ Yes ☑ No

Mulch
- ☐ None
- ☑ Fiber

Grazing
- ☐ Wildlife
- ☐ Livestock
- ☐ Both

Severity
- ☐ None 0-5%
- ☐ Low 5-40%
- ☐ Moderate 40-60%
- ☐ Heavy 60-100%

Relative % Cover ______ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))

SURFACE STABILITY EVALUATION

Date 9/30/15 Data Collector(s) P. Strand

Site Data

Location Name: PLOT 1 NORTH		Photographs taken: (Y) N (circle one)
Aspect:	Slope (degree):	Photograph notes:
Comments:		

Site Stabilization Data

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	Y	0	14
Surface Litter	Y	0	14
Surface Rock Fragments	Y	0	14
Pedestals	Y	0	14
Flow Patterns	Y	0	15
Rills	Y	0	14
Gullies	Y	0	15
TOTAL	Y	0	100

Procedure: (refer to Erosion Condition Classification System publication if needed)

1) Observe the total sample area and determine the average condition.
2) Determine if each item is potentially present. Only the potentially present items will be considered in the total calculation (cross out pre-entered possible factor # if it is not potentially present).
3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF: (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below.

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: 1-20% STABLE

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

KC HARVEY ENVIRONMENTAL, LLC

SURFACE STABILITY EVALUATION

Date 10/21/19 Data Collector(s) P. Strow

Site Data

Location Name: PLOT 3 (SOUTH)		Photographs taken: (Y) N (circle one)
Aspect:	Slope (degree):	Photograph notes:
Comments:		

Site Stabilization Data

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	Y	0	14
Surface Litter	Y	0	14
Surface Rock Fragments	Y	0	14
Pedestals	Y	0	14
Flow Patterns	Y	0	15
Rills	Y	0	14
Gullies	Y	0	15
TOTAL	Y	0	100

Procedure: (refer to Erosion Condition Classification System publication if needed)

1) Observe the total sample area and determine the average condition.
2) Determine if each item is potentially present. Only the potentially present items will be considered in the total calculation (cross out pre-entered possible factor # if it is not potentially present).
3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF: (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below.

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: 1 – 20% STABLE

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

HEAVILY COVERED W/ ALDER

KC HARVEY ENVIRONMENTAL, LLC

KC HARVEY
ENVIRONMENTAL, LLC

Qualitative Monitoring

Site Name: PLOT 3 (SOUTH) Date: 10/21/15

Data Collector(s): P. STROW Slope(%)/Aspect: /

Vegetation

	Reclamation Trial					Reference Site				
	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover
Grass	10									
Forb										
Shrub										
Total	80	—	—	—	—		—	—	—	—
Weed										
Cover Crop		—	—	—	—	—	—	—	—	—
Rock		—	—	—	—		—	—	—	—
Litter	10	—	—	—	—		—	—	—	—
Bare Ground		—	—	—	—		—	—	—	—

Reclamation Trial	Reference Site
Other Species: Grass	Other Species: Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Relative % Cover ______ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))

Additional Monitoring Methods

Seedling Count ☐ Yes ☑ No

Canopy Cover ☐ Yes ☐ No

Mulch
☑ None
☐ Fiber

Grazing
☐ Wildlife
☐ Livestock
☐ Both

Severity
☐ None 0-5%
☐ Low 5-40%
☐ Moderate 40-60%
☐ Heavy 60-100%

SURFACE STABILITY EVALUATION

Date 10/21/19 Data Collector(s) P. Stron

Site Data

Location Name: PLOT 2 (MIDDLE)		Photographs taken: Y N (circle one)
Aspect:	Slope (degree):	Photograph notes:
Comments:		

Site Stabilization Data

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	Y	0	14
Surface Litter	Y	3	14
Surface Rock Fragments	Y	0	14
Pedestals	Y	0	14
Flow Patterns	Y	0	15
Rills	Y	0	14
Gullies	Y	0	15
TOTAL	Y	3	100

Procedure: (refer to Erosion Condition Classification System publication if needed)

1) Observe the total sample area and determine the average condition.
2) Determine if each item is potentially present. Only the potentially present items will be considered in the total calculation (cross out pre-entered possible factor # if it is not potentially present).
3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF: (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below.

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: 3%

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

KC HARVEY ENVIRONMENTAL, LLC

KC HARVEY
ENVIRONMENTAL, LLC

Qualitative Monitoring

Site Name: PLOT 2 (MIDDLE) Date: 10/21/19

Data Collector(s): P. STROW Slope(%)/Aspect: /

Vegetation

	Reclamation Trial					Reference Site				
	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover
Grass	10									
Forb										
Shrub	25									
Total		—	—	—	—		—	—	—	—
Weed										
Cover Crop		—	—	—	—	—	—	—	—	—
Rock	40	—	—	—	—		—	—	—	—
Litter	25	—	—	—	—		—	—	—	—
Bare Ground		—	—	—	—		—	—	—	—

Reclamation Trial	Reference Site
Other Species: Grass	Other Species: Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Additional Monitoring Methods

Seedling Count ☐Yes ☐No

Canopy Cover ☐Yes ☐No

Mulch
☐ None
☐ Fiber

Grazing
☐ Wildlife
☐ Livestock
☐ Both

Severity
☐ None 0-5%
☐ Low 5-40%
☐ Moderate 40-60%
☐ Heavy 60-100%

Relative % Cover ________ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))

SURFACE STABILITY EVALUATION

Date 10/21/15 Data Collector(s) P. Strom

Site Data

Location Name: PLOT 1 (NORTH)

Photographs taken: (circle one) Y (circled) N

Aspect:

Slope (degree):

Photograph notes:

Comments:

Site Stabilization Data

EROSION FEATURE	POTENTIALLY PRESENT (Yes or No)	IDENTIFIED FACTORS	POSSIBLE FACTOR
Soil Movement	Y	0	14
Surface Litter	Y	0	14
Surface Rock Fragments	Y	0	14
Pedestals	Y	0	14
Flow Patterns	Y	0	15
Rills	Y	0	14
Gullies	Y	0	15
TOTAL		0	100

Procedure: (refer to Erosion Condition Classification System publication if needed)

1) Observe the total sample area and determine the average condition.
2) Determine if each item is potentially present. Only the potentially present items will be considered in the total calculation (cross out pre-entered possible factor # if it is not potentially present).
3) For items potentially present, review the Erosion Condition Class (Soil Surface Factor) sheet and assign a numerical value to each erosion feature.
4) Total both the weighted values and the possible values.
5) Calculate the Total percent SSF: (identified factors / possible factors) x 100
6) Write the total percent and corresponding condition class in the box below.

SSF Range	Class
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

SSF % and Class: 1-20% STABLE

Comments (when applicable, include information on width, depth, uniformity, number per m^2 or height):

KC HARVEY ENVIRONMENTAL, LLC

KC HARVEY
ENVIRONMENTAL, LLC

Qualitative Monitoring

Site Name: PLOT 1 (NORTH) Date: 10/2/19

Data Collector(s): P. STROW Slope(%)/Aspect: /

Vegetation

	Reclamation Trial					Reference Site				
	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover	Total Foliar Cover	Species 1/ % Cover	Species 2/ % Cover	Species 3/ % Cover	Species 4/ % Cover
Grass	10									
Forb										
Shrub	20									
Total		—	—	—	—		—	—	—	—
Weed										
Cover Crop		—	—	—	—	—	—	—	—	—
Rock	15	—	—	—	—		—	—	—	—
Litter	55	—	—	—	—		—	—	—	—
Bare Ground		—	—	—	—		—	—	—	—

Reclamation Trial	Reference Site
Other Species: Grass	Other Species: Grass
Forb	Forb
Shrub	Shrub
Weed	Weed

Additional Monitoring Methods

Seedling Count ☐Yes ☑No

Canopy Cover ☐Yes ☐No

Mulch
- ☐ None
- ☑ Fiber

Grazing
- ☐ Wildlife
- ☐ Livestock
- ☐ Both

Severity
- ☐ None 0-5%
- ☐ Low 5-40%
- ☐ Moderate 40-60%
- ☐ Heavy 60-100%

Relative % Cover ________ (Disturbed Total (Grass+Forb+Shrub))/(Undisturbed Total (Grass+Forb+Shrub))