U.S. Department of the Interior
Bureau of Land Management
Eastern Interior Field Office
1150 University Ave
Fairbanks, Alaska 99709

Environmental Assessment

Gilmore Land Use Application
Fairbanks Gold Mining, Inc.

DOI-BLM-AK-F020-2014-0005-EA

Located in:
Fairbanks Meridian, Township 2 North, Range 2 East, sections 7, 8, 17-20

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Prepared: ***September 2014***

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List of Abbreviations

AAC	**Alaska Administrative Code**
ADF&G	**Alaska Department of Fish and Game**
ADNR	**Alaska Department of Natural Resources**
AHRS	**Alaska Heritage Resources Survey**
AKEPIC	**Alaska Exotic Plants Information Clearinghouse**
APMA	**Application for Permit to Mine in Alaska**
A.S.	**Alaska Statute**
BLM	**Bureau of Land Management**
BMP	**best management practices**
CESA	**cumulative effects study area**
C.F.R.	**Code of Federal Regulations**
DML&W	**Division of Mining, Land and Water**
EA	**Environmental Assessment**
EFH	**Essential Fish Habitat**
FASL	**feet above sea level**
FCDAS	**Fairbanks Command and Data Acquisition Station**
FGMI	**Fairbanks Gold Mining, Inc.**
FLPMA	**Federal Land Policy and Management Act**
FMP	**fisheries management plan**
FNSB	**Fairbanks North Star Borough**
g	**gram**
kg	**kilogram**
MSFCMA	**Magnuson Stevens Fishery and Conservation and Management Act**
MTU	**Michigan Tech University**
NEPA	**National Environmental Policy Act**
NESDIS	**National Environmental Satellite, Data, and Information Service**
NLURA	**Northern Land Research Alaska, LLC**
NHPA	**National Historic Preservation Act**
NRHP	**National Register of Historic Places**
NWI	**National Wetland Inventory**
NOAA	**National Oceanic and Atmospheric Administration**
PLO	**Public Land Order**

RFFA	**Reasonably Foreseeable Future Actions**
SDS	**Safety Data Sheets**
SOP	**Standard Operating Procedure**
USACE	**U.S. Army Corp of Engineers**
USFWS	**U.S. Fish and Wildlife Service**
VEC	**valued environmental component**

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1.0 Introduction

1.1 Background, Location, Land Status, and Land Use Plan Conformance

1.1.1 Background

Fairbanks Gold Mining Inc. (FGMI) has submitted a Land Use Application to the Bureau of Land Management (BLM) pursuant to 43 Code of Federal Regulations (C.F.R.) § 2920.5-1 seeking a permit to conduct mineral assessment, including drilling, for gold and other metals, in a manner that the National Oceanic and Atmospheric Administration (NOAA) finds will not interfere with the operation of the Fairbanks Command and Data Acquisition Station (FCDAS). The land use for which FGMI seeks authorization is detailed in the Plan of Use incorporated as a part of the Land Use Application. The lands subject to the Land Use Application are managed by the BLM and subject to a Withdrawal designed to protect the FCDAS (the "Withdrawal"). The Withdrawal, however, does contemplate uses of the lands that NOAA finds will not interfere with the FCDAS.

FGMI submitted a Land Use Proposal to the BLM on January 28, 2014. On February 18, 2014, NOAA advised BLM that it believed that the activities contemplated by FGMI's Gilmore Land Use Proposal would not interfere with the proper operations of the FCDAS. The BLM has completed a Proposal Review in accordance with 43 C.F.R. § 2920.2-5 and published a Notice of Realty Action in accordance with 43 C.F.R. § 2920.4.

In order to approve a Land Use Application from FGMI, the BLM must prepare an Environmental Assessment (EA). This EA presents detailed analysis of alternatives in accordance with the National Environmental Policy Act (NEPA).

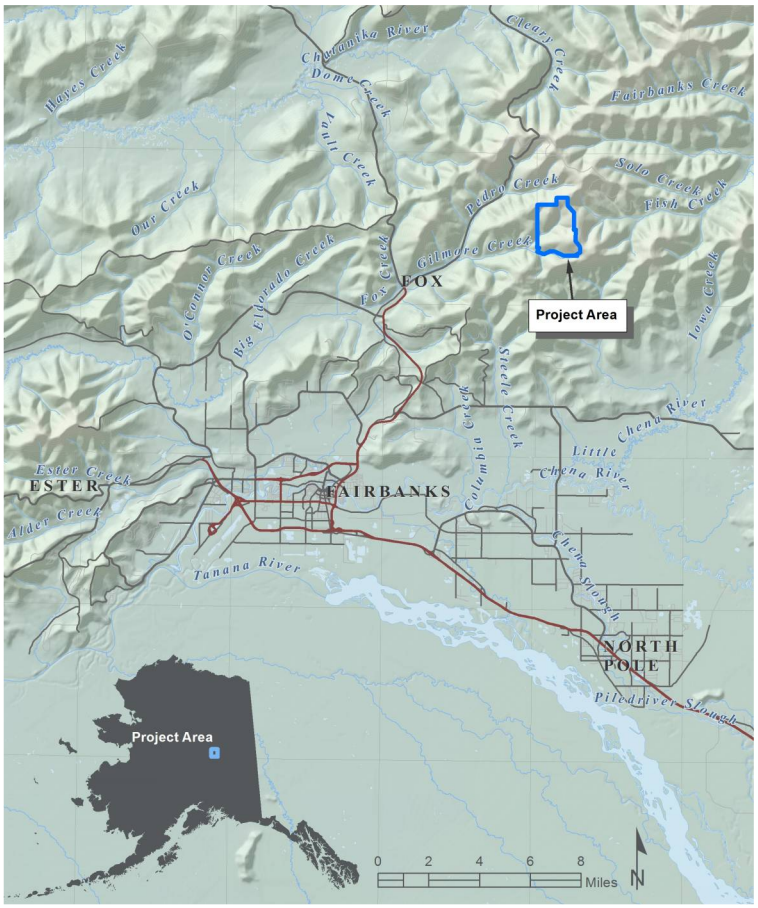


Figure 1. Project location of the Gilmore Land Use Application (EA area of interest).

1.1.2 Location

The proposed action would occur approximately 25 miles northeast of Fairbanks, Alaska (Figure 1) adjacent to the western boundary of the existing Fort Knox Gold

Mine. The lands upon which the use is proposed (the "Lands") are a subset of a larger tract subject to the Withdrawal designed to protect the FCDAS. The Lands are located within the Gilmore Creek drainage, on the ridge separating the NOAA and Fort Knox properties and extending downhill into the Tom Creek drainage. Figure 2 shows a map of the area of proposed action.

1.1.3 Land Status

The legal description of the Lands is:

Fairbanks Meridian, Alaska

T. 2 N., R. 2 E.,

Sec.7, SE¼SE¼;

Sec. 8, SW¼SW¼;

Sec. 17, W½, excepting the land subject to Public Land Order (PLO) No. 7763 (76 FR 23334) (2011));

Sec. 18;

Sec. 19, Lot1; and

Sec. 20, W½E½ and W½, excepting the land subject to PLO No. 7682 (72 FR 71940 (2007))

Excepting ground subject to conflicting valid existing rights pursuant to PLO 3708.

The Lands are: 1) owned by the United States; 2) managed by the BLM; 3) subject to PLO 3708, as modified by PLOs 6709, 7682, 7710, and 7763 (collectively the Withdrawal); 4) have been selected by the State of Alaska pursuant to the Alaska Statehood Act; and 5) are almost entirely covered by State Mining Claims located by an FGMI affiliate pursuant to Alaska Statute (A.S.) 38.05.275 and Alaska Administrative Code (AAC) 11AAC 86.115.

1.1.4 Conformance with Land Use Plans

The proposed action, which specifically requires an affirmative finding by NOAA, is consistent with the Withdrawal, and therefore conforms with all BLM, programs, and policies for the Lands. The proposed action is in conformance with the State of Alaska's management plan.

1.1.5 Relationship to Statues, Regulations, Policies, Plans

Principle laws and regulations pertaining to this analysis include:

- Federal Land Policy and Management Act of 1976
- BLM Mineral Policy
- Mining and Mineral Policy Act of 1970
- Leases, Permits and Easements (43 C.F.R. § 2920)
- Alaska National Interest Lands Conservation Act of 1980, as amended
- Endangered Species Act of 1973, as amended
- National Historic Preservation Act of 1966, as amended
- Alaska Native Claims Settlement Act of 1971

- Archaeological Resources Protection Act of 1979
- The Clean Water Act of 1977, as amended
- Resource Conservation and Recovery Act of 1976, as amended
- Executive Order 11988 of 1977 as amended
- Executive Order 11990 of 1977, as amended
- Executive Order 13112 of 1999

1.2 Purpose and Need

1.2.1 Applicant's Purpose and Need

In light of the blanketing State Mining Claims located pursuant to A.S. § 38.05.275 and 11AAC 86.115 and its adjacent Fort Knox Mine, FGMI has an interest in obtaining increased knowledge of the mineral characterization of the Lands. FGMI has expended substantial time and monies in the development of the Plan of Use incorporated in the Land Use Application.

1.2.2 BLM's Purpose and Need

The purpose for action is driven by the Land Use Application. The need for action is established under the authority of Section 302 of the Federal Land Policy and Management Act (FLPMA) of 1976 and the regulations found in 43 C.F.R. § 2920. The FLPMA authorizes the BLM to regulate the use, occupancy and development of public lands. The purpose of the regulations found in 43 C.F.R. § 2920 is to establish procedures for the orderly and timely processing of proposals for non-federal use of the public lands. The proposed use would result in increased knowledge about the Lands and engender informed land management, which is in the public interest.

1.2.3 BLM Decision to be Made

The BLM will make a decision whether or not to issue FGMI a Land Use Permit to authorize their proposed mineral assessment activities on public lands. If a decision to issue the Land Use Permit is made, the BLM will also determine what mitigation measures may be needed to minimize adverse impacts to the environment pursuant to 43 C.F.R. § 2920.7, in addition to the applicant-committed environmental protection measures (Design Features) included in the Land Use Application (described in Section 2.1.4 of this EA) and those conditions set forth in the enclosure to the February 18, 2014 Letter from NOAA to the BLM (Appendix A).

1.3 Scoping Issues (Potential Issues)

1.3.1 Internal Scoping

Internal scoping involved the BLM Eastern Interior Field Office Interdisciplinary Team. A valued environmental components (VEC) matrix was used to identify issues for analysis.

Of the components evaluated, those identified as having potential issues and warranting further analysis included:

- cultural resources
- invasive, nonnative species
- recreation

- vegetation
- wetlands/riparian areas
- wildlife/aquatic resources

See Section 3, Affected Environment and Environmental Consequences, for analysis of impacts identified and mitigations measures proposed.

1.3.2 External Scoping

Appropriate level of scoping was completed pursuant to the proposed action. The proposed action is not likely to cause public concern or controversy given the long-standing history of mining in the area and the temporary conditions of the exploration program. External scoping included the following:

- Obtaining the February 18, 2014 letter from NOAA.
- Publication of the Notice of Realty Action in accordance with C.F.R. § 2920.4, which included a 30-day public comment period on the proposed action.
- Posting a description of the proposed action on the BLM's National Environmental Policy Act (NEPA) Register. This allowed the public the ability to review the proposed action.

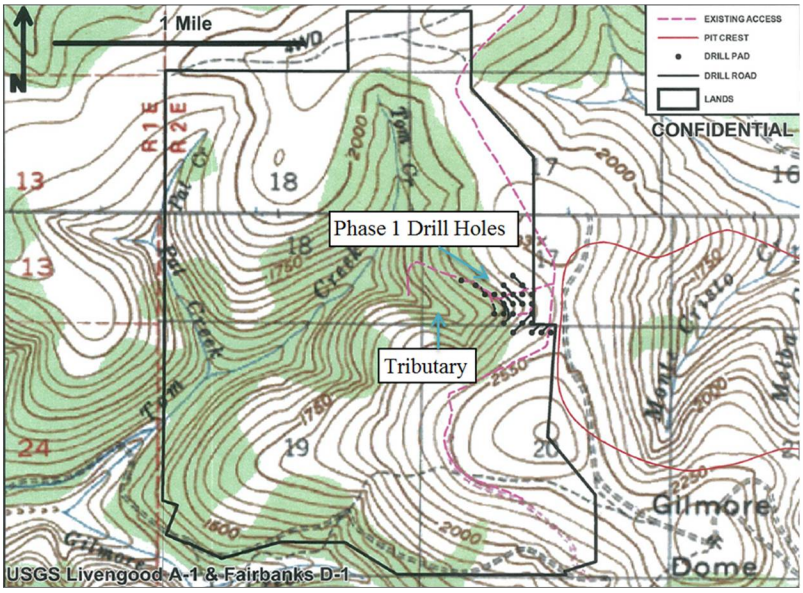
2.0 Proposed Action and Alternatives

2.1 Proposed Action

Under the proposed action, FGMI proposes to conduct mineral exploration activities on public lands administered by the BLM (Figure 2) creating surface disturbance of approximately 25 acres over 3 years.

2.1.1 Description of Project Area

The project area encompasses a subset of NOAA Withdrawal lands, known as the Lands, in the Tom and Pat Creek drainages (Figure 2). The top of each drainage abuts the north boundary of the project area and flows southwest into Gilmore Creek, which roughly defines the south boundary of the project area. The terrain rises to 2,200 feet above sea level (FASL) on the hilltops at the northeast portion of the project area, and drops to 1,300 FASL at the creeks in the southwest corner of the



Source: FGMI

Figure 2. Area of the proposed action

project area. Slopes descending into Pat, Tom, and Gilmore creeks represent the steepest areas in the project area (McGowan 2014). The project area is comprised of approximately 2,000 acres and lies within the U.S. Geological Survey Livengood A1 & Fairbanks D1 topographic quadrangle map areas.

2.1.2 Project Phases and Schedule

The exploration activities would be completed in phases over a three-year permit period. Drilling could take place throughout the year, depending on conditions, but most drilling would be expected to take place from spring to fall. Reclamation would be conducted concurrently; that is, the areas where drilling is finished would be reclaimed by the end of the season. In cases when drilling is completed after freeze-up and full reclamation is not possible, reclamation would be conducted following spring breakup. Phase 1 of exploration would commence as soon as authorization is obtained in the upper region of an intermittent drainage of Tom Creek. Twenty-six (26) drill holes are proposed to be completed in Phase 1. The approximate location of the drill pads and drill trails for Phase 1 is shown on Figure 2. The proposed total area to be disturbed during Phase 1 is 4.3 acres. During Phase 1, equipment would likely cross the valley of an intermittent tributary to Tom Creek, and no activities are currently planned for the Pat Creek drainage during Phase 1. Exploration activities during subsequent years, including total number of drill holes to be drilled and exact location of drill holes, would be determined based upon the results of Phase 1 drilling. FGMI estimates that during the three year period approximately 250 holes would be drilled. The total disturbance during the three years is estimated to be approximately 25 acres. In some cases, multiple drill holes may be drilled from one drill pad. Subsequent tranches (groupings of similar activities) of drilling would occur according to the findings of the previous tranches' results. Disturbance would be concentrated at the eastern section of the property. It is unlikely that drilling would occur within Pat Creek, Tom Creek, and tributaries' stream channels during any phase of the proposed project, since moving water hinders drill pad construction and drilling activities.

2.1.3 Exploration Activities

FGMI proposes to conduct mineral assessment activity consisting of soil sampling and drilling within the project area in order to complete geological mapping of the area. This would be conducted over a three year period. The project area would be accessed by trails originating from the current Fort Knox Mine area. During mineral assessment activities, access would be on a daily basis, as required.

Soil Sampling

Soil sample holes may be excavated using a spade, post-hole digger, or hand-operated screw auger. Depending on the tool, the diameter of the hole may range from 1 to 12 inches. The hole depth would vary by the type of tool used, ground conditions, and targeted horizon/analytical approach. Sampling aimed at targeting weathered bedrock may be up to 20 feet deep. A small sample would be collected from the target horizon, approximately 500 grams (g) to 1 kilogram (kg). The remaining material would be backfilled into the hole, and the retained moss mat plug would be placed back on the backfilled hole.

Reverse-circulation Drilling and Diamond Core Drilling

Drilling would be done using reverse circulation and diamond core truck/track mounted drill rigs to depths of up to 1,500 feet. Two models of drill rigs would be used: LF 900 (34 feet tall) and

Versa 2000 (27 feet tall). The self-contained machines would be driven to the proposed location and, if necessary, a drill pad would be prepared by a bulldozer to level the drill. A wheeled or tracked water carrier vehicle would be driven to the pad to supply water to the drill. Any water encountered during the drilling would be pumped to a shallow sump located within or adjacent to the drill pad and re-circulated with the drilling water until drilling is complete. Drill cuttings not required for samples would be returned into the hole upon completion of drilling. The hole would be plugged with a bentonite slurry material in accordance with the State of Alaska abandonment stipulations. The drill and water carrier would move to the next drill hole location while the bulldozer reshapes the abandoned drill pad. The disturbed area would be reseeded and fertilized as needed.

Drill holes would measure up to 5-1/4 inches in diameter. Reverse-circulation drill cuttings would be collected in 5-foot intervals by a geologist or geotechnician at each drill hole. Samples would be collected in a wet state. Wet sample cuttings would be fed into a cyclone that deposits a stream of sample and drilling fluid into a splitter with a variable speed hydraulic motor that rotates a set of vanes that can be covered to control the volume of split sample. A split sample would be collected into a 5-gallon bucket and set in a wash tub to collect and settle out the cuttings. Occasionally, a flocculant would be added to the bucket to aid in the settling of the sample. Once the sample has been collected, it would be placed in a pre-numbered polyethylene or Tyvex bag and transported to FGMI's core facility in the back (bed) of the geologist's pickup truck. The individual samples would be placed in bulk bags and sealed with wire ties. The bulk bags would then be picked up by staff from a commercial laboratory sample preparation facility in Fairbanks.

Depending on the results of the reverse-circulation drilling, diamond core drills may be used to drill holes to obtain core samples. Diamond core drill rigs take continuous core samples that are up to 3-1/4 inches in diameter to the target depth of the hole. The whole core samples of variable length would be taken from all diamond drill holes. The whole core samples would be placed in 5-gallon buckets, and each sample would be weighed at a commercial sample preparation facility prior to crushing.

Drill Pad and Trails Construction

Travel to and from the project area would be through the Fort Knox Mine and onto a series of existing user-established trails (Figure 3). There would be no closure of existing access trails associated with construction or equipment travel. Trail maintenance would be done on existing trails if necessary, but it is not expected

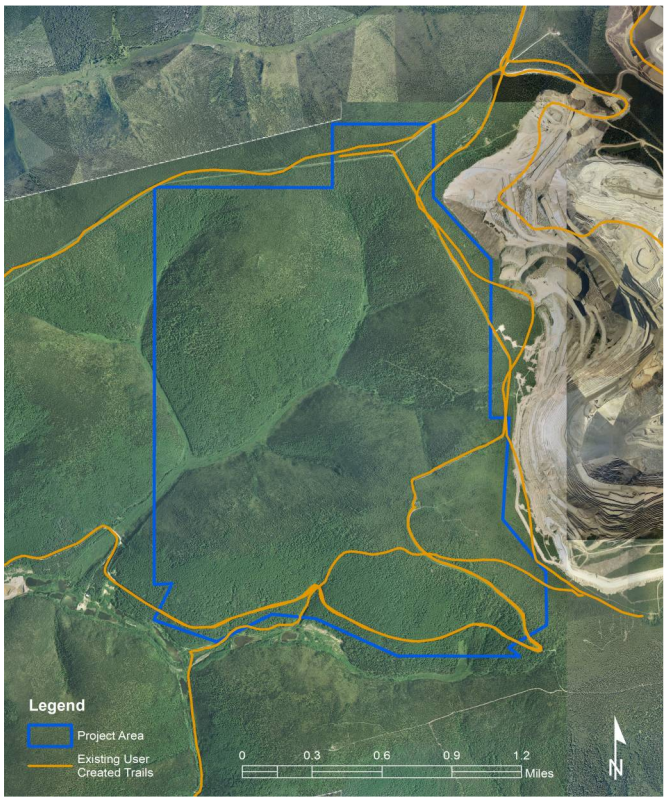


Figure 3. Existing user-established trails in the project area.

Note: This figure is based on current available data, but there may be more trail information that is not readily available.

that existing trails would need to be improved. Track mounted equipment would typically be used to limit disturbance. When travel is planned where an existing trail does not exist, new trails would be constructed by bulldozer, by pushing organics to the side and stockpiling for reclamation. New trails would extend from the existing trail network to the drill pad. New trails would be approximately 10-20 feet wide. Length would vary based on the desired location of the drill pads. These new trails and pads would be closed to unauthorized users during construction, operation, and reclamation activities.

Drill pads would be constructed using a bulldozer. A drill pad would consist of native overburden that has been pushed over to clear an area. The bulldozer would be transported to the site using a "lowboy" tractor-trailer rig. A typical drill pad would measure 50 feet by 50 feet or approximately 2,400 square feet (0.05 acre) in area. Overburden disturbed during construction would be placed along the edges of the drill pad. This would create a berm preventing the water runoff and soil erosion.

FGMI has performed similar exploration activities at the Fort Knox Mine area. Typical drill pad and access trails described in this proposed action would be similar to those constructed at the Gil Project, which is located in an area with similar environmental conditions to the project area, as shown in the photographs in Figures 4 and 5.

Source: FGMI

Figure 4. Typical access trail

Source: FGMI

Figure 5. Typical drill pad with drill rig and water truck

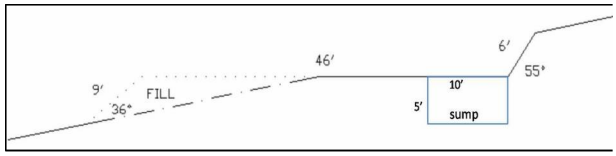
Water Use and Management

Reverse-Circulation Drilling: During reverse-circulation drilling, the drilling fluid is circulated to the drill bit face from the surface and the drill cuttings are removed from the drill hole by the drilling medium inside of the drill pipe. Reverse-circulation drilling uses fresh water as a drilling fluid.

Water used for the drilling would be delivered in 1,000-gallon truck/track water carriers, and the water source would be from the Fort Knox Mine dewatering system. No process water would be used. The amount of water used for one reverse-circulation rig would vary, depending upon rock conditions, with a potential range of between 2,000 and 4,000 gallons per day per drill. No

individual rig would exceed 8,000 gallons per day. A total of approximately 28,000 gallons per drilling day would be estimated for the multiple holes and multiple rigs.

On each drill pad, water used during the drilling process from the drill holes would be retained in a sump, which is an unlined surface excavation (Figure 6). Sumps would be approximately 10 feet wide by 10 feet long by 5 feet deep and hold approximately 4,000 gallons. The volume of water entering the sumps per day would be considerably less than the maximum usage of 8,000 gallons per day. Sumps with a 4,000 gallon volume would be sufficient for containing drilling water. The sumps are sized to accommodate an influx of water from typical rain events to avoid overfilling, breaching, and potentially draining into nearby streams. It is anticipated that water from typical drilling operations and precipitation would infiltrate into the ground from the unlined sump. Should the overflow of a sump become a concern, water would be removed and trucked to Fort Knox. Upon completion to its target depth, the drill hole would be abandoned per regulatory requirements set forth by the Alaska Department of Natural Resources (DNR) Application for Permit to Mine in Alaska (APMA) (see Drill Hole Abandonment in Section 2.1.5, Design Features), and the sump would be reclaimed.



Source: Source FGMI

Figure 6. Line drawing of drill pad and sump used for both reverse-circulating and diamond core drilling

Diamond Core Drilling: Diamond core drill rigs use drilling fluid consisting of water and non-toxic additives (i.e., bentonite, polymers). Safety Data Sheets (SDS) are available for all drilling fluids used and all are designed for use in potable water well drilling. The SDS for this proposed action are on file with the BLM office and available upon request.

Water used would be delivered in a 1,200-gallon truck/track water carrier, and the water source would be the Fort Knox Mine. Typically, the diamond core rig uses 8,000 gallons per day.

Fluid media from the drill holes would be contained within a small ditch that flows into a sump. The sump would be lined with plastic; the ditch would not be lined. The sump is a surface excavation typically within 10 feet of the drill collar. Sumps are approximately 10 feet wide by 10 feet long by 5 feet deep and hold approximately 4,000 gallons. The volume of water entering the sumps per day would be considerably less than the maximum usage of 8,000 gallons per day. Sumps with 4,000 gallon volume would be sufficient for containing drilling water. The sumps are sized to accommodate an influx of water from typical rain events to avoid overfilling, breaching, and potentially draining into nearby streams. Should the overflow of a sump become a concern, water would be removed and trucked to Fort Knox. Upon completion to its target depth, the drill hole would be abandoned per regulatory requirements set forth by the Alaska Department of Natural Resources, Division of Mining, Land and Water (ADNR, DML&W) (see drill hole abandonment design feature). The drilling fluid would be pumped from the sump and delivered to Fort Knox Mine. The lining would be removed and the sump would be reclaimed.

2.1.4 Reclamation

Disturbance of soil and native vegetation would be kept to a minimum, and reclamation of disturbed sites would be completed as soon as drilling activities are finished before the expiration of the permit. In cases when drilling is completed after freeze-up and weather would not permit

completion of full reclamation activities, reclamation would be conducted when ground conditions are again suitable, following spring breakup. When drill pads and trails are created, topsoil and other organic materials would be stockpiled and stored for use for reclamation activities. Trails that facilitate future drilling would not be reclaimed immediately, but would be reclaimed before the permit expires. The total acres disturbed and not reclaimed would not exceed 10 acres at any point in time.

Upon completion of mineral exploration, all drill holes would be completely backfilled with bentonite slurry. Both a John Deer-450H and John Deere 850J bulldozer would be used to re-grade access trails, drill pads, trenches, and sumps, and to restore native topography. A Komatsu PC200 LC or John Deere 200C tracked excavator would be used for restoring slopes, backfilling sumps, and placing overburden and stockpiled vegetation back onto each drill pad and trail.

On areas with scarce overburden and very little mass of vegetation, seeding and fertilizing would be applied to accelerate re-vegetation of areas. A portable hydro-seeder would be used to spread a seed mix consisting of seeds and fertilizer that have been approved in accordance with all state and federal requirements. Seed mixes would be developed in accordance with Alaska Plant Materials Center guidelines (Czapla and Wright 2012).

To ensure public safety, eliminate potential for soil erosion and invasive plants introduction, and facilitate successful revegetation, FGMI would prevent public motor vehicle access to drilling pads and access trails created for the purpose of the project, during active exploration, reclamation (e.g. through gates or trail blockages), and post reclamation (e.g. via stockpiled trees and brush). FGMI would not close any existing user established trails (Figure 3). All proposed construction, operation, and reclamation would be temporary and located away from existing trails and would not impede trail access.

Conducting the described reclamation activities would prevent subsequent soil erosion, encourage reestablishment of natural vegetation, and prevent the establishment and spread of invasive plant species. Post-reclamation monitoring for native vegetation establishment, soil erosion, and invasive species, as well as prompt corrective actions, would ensure success of reclamation in the project area.

2.1.5 Design Features

Erosion and Water Quality

Precautions would be taken by the geologic staff and contractors to minimize surface disturbance and soil erosion from the construction of drill pads and trails. The Alaska Storm Water Guide (ADEC 2011) details best management practices (BMP) for minimizing and preventing erosion from drill pads and trail construction, and temporary stream crossings. Applicable ADEC BMPs that would be applied in the proposed project are included in Appendix B. In particular, preserving natural vegetation, the use of vegetative buffer strips, rolled erosion control products, brush barriers, and straw wattles, lead-off ditches and temporary stream crossing options would be used to avoid erosion and surface runoff during clearing activities. Exploration activities would be continuously monitored by FGMI personnel to ensure that adequate measures are taken to prevent any turbidity and sedimentation from entering aquatic habitats. All drill pads and actively used trails would be inspected weekly for evidence of soil erosion or sedimentation outside project limits.

FGMI would minimize ground disturbance from the drilling activities. Existing trails would be utilized to the extent practicable. Topsoil and other organic materials would be stockpiled and stored for use for reclamation activities. When practical, low-ground-pressure equipment would be used to limit soil erosion, soil compaction, and impact to permafrost.

Fuel and Hazardous Substances

BMPs for handling and storage of all drilling fluids, spill prevention and control, vehicle maintenance, and construction waste management are included in Appendix B. Containers for non-hazardous solid waste collection would be provided by FGMI for each site. Debris would be collected daily and placed into the solid waste containers and delivered to the Fort Knox landfill. All vehicles would be subject to daily walk-around inspections to identify leaks prior to use. Duck ponds or drip pans would be used for leaky equipment and spill kits would be available for every drill. Secondary containment or a surface liner would be placed under all container or vehicle fuel tank inlet and outlet points, hose connections, and hose ends during fuel or hazardous substance transfers for refueling operations. There would be no storage of hazardous substances on site. All independent fuel and hazardous substance containers would be marked with the contents and the permittee's name using paint or a permanent label.

Fuel storage would not occur at the site. Fuel for refueling equipment would be transported from offsite by contractor truck mounted fuel tanks (up to 500 gallons). Transfer operations would be attended by trained personnel at all times. Lubricants (up to 30 gallons) would be transported from offsite by contractor truck(s). No vehicles or equipment, with the exception of stationary equipment (i.e., drill rigs), would be fueled or serviced within 100 feet of surface water. Fueling and service vehicles would be equipped with adequate materials (i.e., adsorbent pads, booms, etc.) to immediately contain and commence cleanup of spilled fuels and other petroleum products. Spill reporting would be in accordance with Fort Knox spill reporting procedures.

Drill Hole Abandonment

ADNR, DML&W requires that all drill hole casings be removed or cut off at, or below, ground level. All drill holes would be plugged by the end of the exploration season with bentonite holeplug or equivalent slurry, for a minimum of 10 feet within the top 20 feet of the drill hole. The remainder of the hole would be backfilled to the surface with drill cuttings. If water is encountered in any drill hole, a minimum of 7 feet of bentonite holeplug or equivalent slurry would be placed immediately above the static water level in the drill hole. Complete filling of the drill holes, from bottom to top, with bentonite holeplug or equivalent slurry is also permitted and is considered to be the preferred method of hole closure during, unless otherwise specifically approved by the ADNR, DML&W. Compliance with the ADNR, DML&W requirements also meet the Department of Environmental Conservation‘s requirements.

Permafrost

Prompt reclamation and capping with organic material as soon as activities are completed would limit impact to shallow permafrost. Locations of drill holes are planned to have undisturbed vegetation between drill pads, thus decreasing the exposure of open soil and underplaying permafrost to impact from disturbance. Also, considering the small number of drills operating at one time and that reclamation would be promptly completed, impact to permafrost would be minimal.

Fire Management

The project area falls within Full and/or Critical fire suppression areas, and the typical black spruce vegetation could create a threat of fire danger to numerous private and governmental properties. Basic fire management standard operating procedures (SOPs) would be utilized during the summer months to minimize wildfire potential. Fire management practices would include the following:

- No equipment would be driven over vegetated surfaces such as brush or grass, which is a very fine dry fuel that is easily ignited.
- Vehicles would be equipped with fire extinguishers.
- No debris or garbage would be burned at the drill pads. All debris or garbage would be collected daily and placed into the solid waste containers and delivered to the Fort Knox landfill.
- Weather conditions would be monitored and drilling activities may be suspended for the time when high risk conditions exist.

Air Quality

BMPs would be utilized for reducing potential air quality problems including local fugitive dust, equipment noise levels, and equipment emissions. FGMI would ensure that the proposed activity is consistent with the Clean Air Act and any applicable state permit requirements.

Invasive Non-native Species

FGMI would utilize basic best management practices to minimize the potential for invasive species establishment and spread. Best management practices would include the following:

- Ground disturbance would be kept to a minimum.
- Reclamation on disturbed areas would be completed as soon as drilling activities are finished. In cases when drilling is completed after freeze-up and full reclamation is not possible, reclamation would be conducted following spring breakup.
- Topsoil and other organic materials would be stockpiled, stored, and used for reclamation activities.
- To avoid import of invasive plant seeds, vehicles used in the exploration program would be power washed before initially entering the project area, and periodically throughout the project.
- Certified weed-free seed mixes and soil erosion materials would be used for reclamation to the extent practicable.
- FGMI would conduct post-reclamation monitoring to confirm native vegetation establishment, or identify the need for corrective actions if vegetation establishment fails.

2.2 No Action Alternative

The No Action alternative would be to deny a Land Use Permit for mineral assessment activity and would result in FGMI not being able to pursue mineral exploration as proposed on the Lands.

2.3 Other Alternatives Considered but Eliminated from Detailed Analysis

This section examines the alternative found to be reasonable in reference to the purpose and need for the proposed action. The Winter Only Exploration alternative was carefully explored and evaluated, but was determined to be not practical, feasible, or safe from a technical and economic standpoint and was eliminated from detailed analysis.

2.3.1 Winter Only Exploration

Winter Only Exploration is identical to the proposed action, however it allows for the planned exploration activities to only occur during winter months with considerable snow cover in the project area. The Winter Only Exploration alternative would minimize soil and vegetation disturbance. With adequate snow cover, tree and tall shrub components of the vegetation would be cleared for access, but low and ground-level vegetation would mostly remain intact. Soils would remain largely unaffected, and the potential for erosion would be minimized. Post-exploration vegetation would be little changed, and recovery would be much less variable and would begin immediately following drilling if subsequent use by motorized vehicles is prevented.

Impacts to vegetation, soils, wetlands, hydrology, permafrost, and cultural resources would be less than the proposed action under the Winter Only Exploration alternative. The potential for establishment and spread of invasive plant species and the wildfire potential would be less than the proposed action.

Winter Only Exploration was determined not to be a reasonable alternative due to a combination of safety concerns, operational deficiencies, and impacts on the ability to obtain accurate and useful information. The location of exploration drill holes is tied to preliminarily-identified targets of potential extractable mineral resources. The presence of snow cover largely precludes the identification of specific locations on the ground. Additionally, snow cover of two feet or more impedes efficient transport of the reverse-circulation or diamond drill rig to the target location. Given the slope in the area, a slick snow surface would be especially hazardous for moving heavy equipment. Frozen ground would impede road cuts needed on steep terrain. Maintaining steep trail grades in the winter would require constant maintenance to ensure safe access. Combined with other operational limitations such as freezing temperatures for drilling fluids, Winter Only Exploration would be unproductive and inefficient. It is recognized that some exploration would take place during winter months, but restricting exploration to only winter months would not be a reasonable alternative.

3.0 Affected Environment and Environmental Consequences

This section describes the existing environment and potential impacts resulting from implementation of the proposed action and no action alternatives. Table 1 includes components that represent supplemental authorities that are subject to requirements specified by statute or executive order which must be considered in all BLM documents, as well as other land uses or resources identified in the area of interest. The table also includes an indication of whether the component is present and the rationale as to why a particular component is either not analyzed further in this EA, or was brought forward for further analysis.

Table 1. VEC Matrix

Valued Environmental Components	Identify Issues for Analysis (Refer to Section 6.4 of the BLM NEPA Handbook)			Briefly Describe Rationale for Determination
	Present/ May be Affected	Not Present	Present/Not Affected Negligible*	
Air Quality			X	The project area is a few miles outside of the north boundary of the Fairbanks North Star Borough (FNSB) Environmental Protection Agency particulate matter 2.5 non-attainment air quality area. Best management practices would be utilized to limit fugitive dust, equipment noise levels, and equipment emissions. This component is not further analyzed in this EA.
Areas of Critical Environmental Concern		X		There are no Areas of Critical and Environmental Concern in or near the project area.
Cultural Resources	X			See Section 3.1.
Environmental Justice		X		The proposed project would have no impact upon the human health and environmental conditions in minority and low-income communities. This component is not further analyzed in this EA.
Essential Fish Habitat		X		There is no essential fish habitat (EFH) within the area of the proposed action. See Section 3.5 for a further description. This component is not further analyzed in this EA.
Farm Lands		X		There are no farmlands on or adjacent to the BLM-managed lands that would be affected by this action. This component is not further analyzed in this EA.
Fire Management			X	The proposed action site is within Full and/or Critical fire suppression areas. Typical Black Spruce vegetation in the area could create a threat of fire danger to numerous private and governmental properties within the area. Basic Fire Management SOPs would be attached to the project authorizations permit to mitigate wildfire potential. This component is not further analyzed in this EA.
Floodplains		X		Activities associated with the proposed drilling program would not be expected to adversely affect area floodplains. The proposed action is consistent with Executive Order 11988-Floodplain Management. This component is not further analyzed in this EA.

Table 1. VEC Matrix				
Valued Environmental Components	**Identify Issues for Analysis (Refer to Section 6.4 of the BLM NEPA Handbook)**			**Briefly Describe Rationale for Determination**
	Present/ May be Affected	**Not Present**	**Present/Not Affected Negligible***	
Hydrology		X		ADEC BMPs for minimizing and preventing erosion from drill pads, road and trail construction, and temporary stream crossings would be followed ; therefore, activities associated with the proposed drilling program would not be expected to adversely alter local drainage patterns or runoff rates. This component is not further analyzed in this EA.
Invasive, Nonnative Species	X			See Section 3.2.
Migratory Birds			X	In order to minimize disturbance and mortality of nesting migratory birds, vegetation removal activities would be scheduled to avoid the migratory bird nesting period of May 1 to July 15 specified by U.S. Fish and Wildlife Service (USFWS)[a] This component is not further analyzed in this EA.
Mineral Resources		X		The proposed action would not affect Mineral Resources. This component is not further analyzed in this EA.
Native American Religious Concerns		X		At the time this EA was published, there were no known Native American Religious Concerns regarding the proposed action. However, tribal consultation is ongoing. This component is not further analyzed in this EA.
Paleontological		X		There are no known effects to paleontological resources by the proposed action. This component is not further analyzed in this EA.
Realty/Land Status		X		The proposed activity would take place on BLM-administered lands withdrawn for use by NOAA under PLO 3708; as modified by PLOs 6709, 7682, 7710, and 7763. The BLM has received a letter of non-objection from NOAA as required by these relevant PLOs. The proposed action does not conflict with other existing or proposed land use and realty action. This component is not further analyzed in this EA.
Recreation	X			See Section 3.3.
Socioeconomic			X	The proposed project would have a temporary and small beneficial effect on the socioeconomics of the area. Planning and executing the work would take labor, equipment, and require service which would help stimulate economic activity. Overall, the level of effort expended would be temporary and is not expected to be a significant driver of socioeconomic activity. This component is not further analyzed in this EA.

Table 1. VEC Matrix				
Valued Environmental Components	**Identify Issues for Analysis (Refer to Section 6.4 of the BLM NEPA Handbook)**			**Briefly Describe Rationale for Determination**
	Present/ May be Affected	**Not Present**	**Present/Not Affected Negligible***	
Soils			X	The Natural Resources Conservation Service mapped soils units within the project area. Soils on north-facing slopes consist of Ester and Saulich peats, which are poorly drained with shallow depth to permafrost and are subject to solifluction. Soils on the south-facing slopes consist of well drained Steese and Gilmore silt loams The bottom of the Gilmore Valley has been extensively mined and natural soils have been mostly removed or covered by tailings. Best management practices would be used in mitigating soil erosion and compaction as well as disturbance of permafrost areas. This component is not further analyzed in this EA.
Subsistence			X	Although there may be minor, short-term effects on game species, the area is likely little used by rural residents for harvest of subsistence resources. The project site is close to Fairbanks and within the FNSB. All residents of the FNSB are ineligible for participation in Federal subsistence harvest. This component is not further analyzed in this EA.
Threatened or Endangered Species and Special Status Species		X		There are no species listed as threatened or endangered in or near the project area. No BLM-AK Sensitive plants are likely to occur on the project lands. BLM-AK Sensitive animals which may occur on the project lands include Alaska tiny shrew, olive-sided flycatcher, rusty blackbird, and blackpoll warbler. Most of these species are associated with riparian, wetland, or shrub habitats. The proposed action is unlikely to affect more than a few individuals. No population-level effects are anticipated. Alternatives and actions which reduce impacts to these habitats would reduce potential for affecting individuals of these species. This component is not further analyzed in this EA.
Travel Management			X	Currently this project area is not covered under a travel management plan and travel management restrictions do not exist. This component is not further analyzed in this EA.
Vegetation	X			See Section 3.4.
Visual Resources			X	Equipment staging and surface disturbance activities would take place under this proposed action that may temporarily change the local viewshed. The area is outside an existing land use plan, but a Visual Resources Inventory has been performed and the project area was determined to be within a Class II Visual Resource Management Area according to the BLM Manual (1986). A contrast rating sheet was completed by BLM independent of this EA. Proposed activities meet the Class II visual management objectives. This component is not further analyzed in this EA.
Wastes, Hazardous or Solid			X	No storage of hazardous waste would be permitted onsite. With the implementation of BMPs, no impacts from wastes are anticipated from the proposed action. This component is not further analyzed in this EA.

Table 1. VEC Matrix				
Valued Environmental Components	**Identify Issues for Analysis (Refer to Section 6.4 of the BLM NEPA Handbook)**			**Briefly Describe Rationale for Determination**
	Present/ May be Affected	**Not Present**	**Present/Not Affected Negligible***	
Water Quality – Surface or Ground			X	Best management practices would be utilized to protect surface and ground water quality. Operations would be consistent with the Clean Water Act. This component is not further analyzed in this EA.
Wetlands /Riparian Areas	X			See Section 3.5.
Wild and Scenic Rivers		X		There are no wild, scenic, or recreation rivers in the proposed action area, nor do the tributaries in the area flow into any wild, scenic, or recreation river.
Wilderness Characteristics		X		The proposed action is located within BLM-administered lands that were not previously inventoried. An inventory was conducted for the parcel Steese Highway East inventory unit and the parcel was found to meet size criteria but did not meet naturalness due to man-made features which bisect the parcel. This component is not further analyzed in this EA.
Wildlife/Aquatic	X			See Section 3.6.
Wildlife/ Terrestrial			X	Temporary displacement of wildlife from work sites would occur. Elimination of 25 acres of habitat for a variety of species for a period of one to several years would occur, followed by a change in vegetation during regrowth/maturation and in the long-term. Changes to wildlife habitat, especially factors affecting revegetation, would be addressed in analysis of vegetation issues. See Section 3.3.
Fairbanks Command and Data Acquisition Station (FCDAS)			X	On February 18, 2014, NOAA advised the BLM that it believed that the proposed action would not interfere with the proper operations of the FCDAS, assuming that certain specified conditions are followed (Appendix A). These conditions would be incorporated into any permit authorizing the proposed action, and there would be no impacts to the FCDAS.

[a] USFWS Advisory: Recommended Time Periods for Avoiding Vegetation Clearing in Alaska to Protect Migratory Birds. September 2007

3.1 Cultural Resources

FGMI contracted with Northern Land Use Research Alaska, LLC (NLURA) to conduct cultural resources surveys within the Lands (McGowan 2014: 1). The surveys were conducted in accordance with Section 106 of the National Historic Preservations Act (NHPA) and under the authority of the BLM Archaeological Resources Protection Act (ARPA) field permit number AA-293646. Prior to survey, NLURA conducted an archaeological sensitivity analysis of the entire study area; based on this analysis, survey was organized into "sub-areas" that defined high and low probability. High probability areas were subject to pedestrian survey, and areas where sites were identified or documented were marked "avoidance" until further archaeological

research can be completed. Areas of the study area designated low probability during the sensitivity analysis were not field surveyed (Neely 2014).

3.1.1 Affected Environment

The cultural resource surveys took place in September of 2013, and the subsequent survey report was completed in February of 2014. Michigan Tech University (MTU) completed a cultural resource survey within the study area in 2011 (McGowan 2014). NLURA surveys covered the eastern quarter of the study area, including much of the area proposed for the first tranche; Pat and Tom Creek drainages; the southern quarter of the study area; and the top of the ridge between Pat and Tom Creeks. NLURA also completed a survey of a remaining small strip of unsurveyed land in the project area in September 2014 (Neely 2014). The MTU survey covered the bottom of the Tom and Pat Creek drainages. A literature review for the entire Fort Knox project area, including the study area reviewed in this document, was conducted by NLURA between 1990 and 1992 (Dixon et al 1993). Pedestrian reconnaissance and intensive level cultural resource surveys were also conducted by NLURA in the larger Fort Knox project area in 1990 and 1993, east of the current study area (Dixon et al 1993). Four Alaska Heritage Resources Survey (AHRS) sites were documented in the study area as a result of the surveys: LIV-00727, LIV-00728, FAI-02142, and FAI-02268; and numerous historic features were observed and identified. Additionally, one AHRS site (FAI-00374) is located outside the study area, but adjacent to existing access proposed for use in first tranche drilling. LIV-00727 consists of a 43-acre Cold War-era military training site, LIV-00728 is a small historic prospecting camp on Pat Creek, and FAI-02142 and FAI-02268 are both small prospecting camps on Tom Creek. None of these AHRS sites have been evaluated for listing in the National Register of Historic Places (NRHP). FAI-00374, a concentration of foxholes and associated artifacts, has been determined ineligible for listing in the NRHP.

Historic features identified within the study area but not recorded include foxholes, trash scatters, and other features associated with military training in the area, as well as prospecting pits, trenches, trash scatters, and claim markers associated with historic mining in the area. These features were observed in concentrated areas around LIV-00727 and throughout the southern half of the surveyed study area.

3.1.2 Environmental Consequences

Proposed Action

The cultural resource surveys conducted by NLURA and MTU documented four AHRS sites within the study area and numerous historic features associated with early mineral prospecting or military training (McGowan 2014). FGMI exploration activities within and around these sites and features may directly or indirectly impact cultural resources.

If project access routes and drilling pads are located in the vicinity of historic features or AHRS sites, vegetation removal, pad clearing, pad and sump construction, and drilling would be likely to directly impact historic features and sites. Direct impacts would also be likely to be caused by the movement of drilling equipment over and through AHRS sites and features.

Disturbance associated with drilling crew use of the study area and resulting foot and vehicle traffic may indirectly result in disturbance or loss of surficial artifacts and features at AHRS sites and feature concentrations.

No Action

Under the No Action Alternative, cultural resources would not be impacted because the proposed action would not be taken.

3.1.3 Mitigation and Measures to Minimize Harm

To avoid direct and indirect impacts to documented AHRS sites and undocumented historic features present throughout the study area, FGMI exploration activities would be limited to areas surveyed by NLURA and MTU and found void of cultural resources ("cleared areas"; Figure 7 and unsurveyed areas ("unsurveyed areas," Figure 7). Unsurveyed areas represent a low probability for containing cultural resources, as determined by NLURA though archaeological sensitivity mapping, and have not been recommended for further survey (McGowan 2014). No exploration activities would occur within 25 feet of documented AHRS sites, or avoidance areas ("avoidance areas," Figure 7)

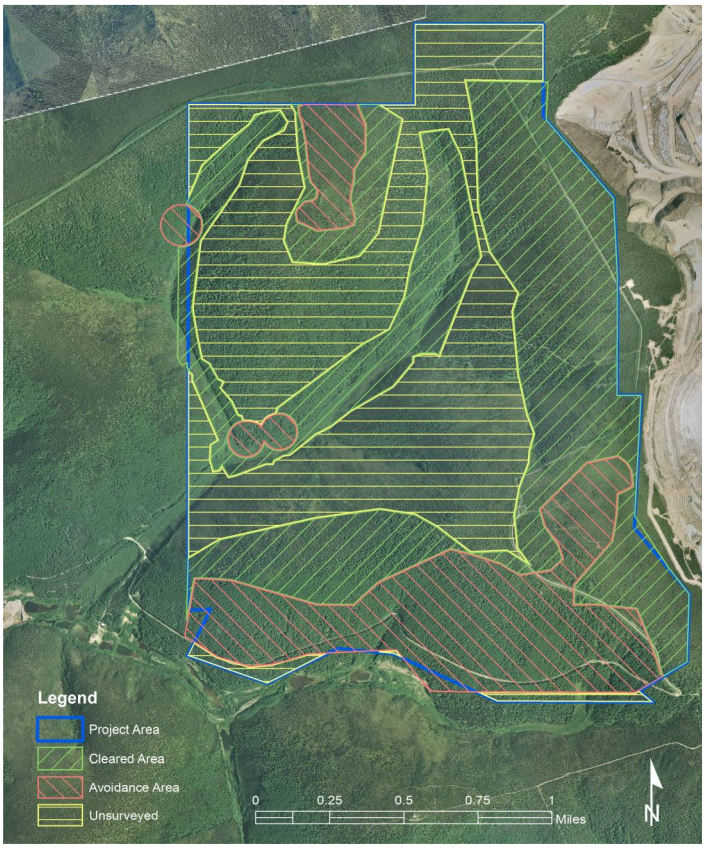


Figure 7. Cultural resource "cleared areas," "avoidance areas," and "unsurveyed areas."

If FGMI intends to conduct activities in avoidance areas, FGMI would work with the BLM to complete compliance with the regulations (36 C.F.R. § 800) of Section 106 of the NHPA. It is recommended that FGMI work with a qualified cultural resource contractor and the BLM to complete documentation of the historic features present in the avoidance areas, and, in consultation with the State Historic Preservation Office (SHPO) and appropriate parties, evaluate the eligibility of all documented cultural resources for listing in the NRHP. If resources are determined eligible, FGMI would work with the BLM, SHPO, and consulting parties to assess effects from FGMI activities to such resources, and develop avoidance, minimization, or mitigation measures to address any adverse effects; thereby completing the Section 106 process. No exploration activities would occur in avoidance areas until the Section 106 process has been completed. If cultural resources are identified in the process of project activities, all work in the immediate vicinity of the discovery will stop and FGMI will contact the BLM archaeologist to discuss further action.

3.2 Invasive Non-native Species

The establishment and spread of invasive non-native plant species in Alaska is an emerging environmental issue that is recognized by federal agencies, private organizations, and local citizens. It is well documented that established invasive plants can pose harm to native ecosystems, cause economic loss, and present a threat to human health. The BLM established a policy concerning the management of invasive species action on public lands within the State (BLM 2010). The objective of the policy is to "[i]ntegrate invasive species prevention, detection and control activities into all on-the-ground activities conducted on BLM-administered land in the State."

3.2.1 Affected Environment

The precise status of invasive, non-native plant populations in the project area is unknown because surveys for invasive plants have not been conducted for the specific project area; however, non-native plants have been well documented in the general region, including the area along the Steese Highway between Fox town and Cleary Summit (Nolen 2002; Cortes-Burns et al. 2008; Lapina et al. 2007; Villano 2008; Villano and Mulder 2008; AKEPIC 2014).

Based on a search of the Alaska Exotic Plants Information Clearinghouse (AKEPIC) database on April 10, 2014, more than 30 locations of 18 non-native plant species were recorded along the Steese Highway between Fox and Cleary Summit. The frequently recorded and most invasive species from the area are white and yellow sweetclover (*Melilotus alba* and *M. officinalis)*, bird vetch (*Viccia cracca*), and smooth brome (*Bromus inermis* ssp. *inermis)*. Table 2 lists the invasive plants recorded in the area with their invasiveness potential. The invasiveness potential indicates the ability of a plant to establish itself in an undisturbed native community and out-compete native vegetation. A plant that is extremely, highly, or moderately invasive poses a major threat to native ecosystems (Carlson et al. 2008).

All these occurrences were found on anthropogenicaly disturbed ground, such as roadsides, trails, parking lots, or construction sites. Spread of seeds is largely facilitated by vehicular or foot traffic. The need for managing invasive non-native species in interior Alaska is widely recognized by federal agencies and local citizens. There are continuous efforts for controlling infestations of highest concerns, especially along the major highways.

Table 2. Most invasive non-native plants species recorded along the Steese Highway between Fox and Cleary Summit

Common Name	Scientific Name	Invasiveness Potential
white sweetclover and yellow sweetclover	*Melilotus alba* and *M. officinalis*	Extremely Invasive
bird vetch	*Vicia cracca*	Highly Invasive
smooth brome	*Bromus inermis* ssp. *inermis*	Moderately Invasive
common dandelion	*Taraxacum officinale* ssp. *officinale*	Modestly Invasive
alsike clover	*Trifolium hybridum*	Modestly Invasive
red clover	*Trifolium pratense*	Modestly Invasive

narrowleaf hawksbeard	*Crepis tectorum*	Modestly Invasive
annual bluegrass	*Poa annua*	Weakly Invasive
bluegrass	*Poa pratensis* ssp. *irrigata*	Modestly Invasive
narrowleaf hawkweed	*Hieracium umbellatum*	Modestly Invasive
perennial ryegrass	*Lolium perenne*	Modestly Invasive
prostrate knotweed	*Polygonum aviculare*	Weakly Invasive
common chickweed	*Stellaria media*	Weakly Invasive
common plantain	*Plantago major*	Weakly Invasive
lambsquarters	*Chenopodium album*	Very Weakly Invasive
pineappleweed	*Matricaria discoidea*	Very Weakly Invasive
common pepperweed	*Lepidium densiflorum*	Very Weakly Invasive

Source: AKEPIC Database 2014

Trails in the project area link the area with existing invasive plant seed sources along the Steese Highway. Local residents have been using existing trails and very likely have been transporting plant seeds into the area. Although there is potential for some invasive non-native plants to exist in the project area, the majority of the project area still remains inaccessible by vehicle and invasive non-native plants have not likely invaded the area.

Natural habitats in the project area have likely remained unaffected by invasion of non-native plant species due to intact native vegetation, limited ground disturbance, and remoteness from invasive seed source.

3.2.2 Environmental Consequences

Proposed Action

The potential for establishment and/or spread of invasive plant species depends in part on two aspects: the availability of suitable habitat and the likelihood of seed transport into the area. Natural plant communities are usually immune to the establishment of non-native species; it takes disturbance that opens up availability of soil nutrients, water, and sunlight for invasive non-native plants to encroach. Invasive plants most commonly spread by hitchhiking with human transportation, equipment, clothes and shoes, packing, or revegetation material.

Increased vehicle and foot traffic would likely increase the potential of spread of invasive species' seeds in the project area. Seeds may be carried from infested areas into the project area on construction equipment, trucks, drilling tracks, and on the boots of the drill crews. Specifically, the likelihood of transporting seeds is higher when vehicles are previously driven on Steese Highway, or when sample bags are picked up by staff from a commercial laboratory's sample preparation facility in Fairbanks.

Indirect effects of the proposed action on the establishment of invasive plants include the creation of suitable invasive habitat, such as open ground, when native vegetation is removed. Sites disturbed by drilling activities would likely be susceptible to invasion and colonization by invasive non-native species until the drill pad or trail is fully revegetated.

In the long term, the proposed action may likely have an indirect effect on the build up of an invasive plants seed bank. Not all imported seeds would result in immediate infestation. The lack of suitable habitat, along with unfavorable weather conditions, may induce seed dormancy. Possible soil erosion and periods of delayed and/or failed reclamation efforts may trigger germination of dormant seeds, creating an infestation. Natural ground disturbances not associated with the proposed action, such as animal diggings, tree falls, permafrost cracks, or wildfire, may also contribute to the emergence of invasive plants from dormant seed banks.

Improving existing trails and constructing new access trails may potentially lead to increase of vehicle and/or foot traffic in the project area, increasing spread of invasive plants. Because FGMI would limit improving existing and construction of new trails to the extent practicable and would discourage trail use during exploration and reclamation activities, the effect is likely to be low.

As result of the proposed action, the establishment and/or spread of invasive plant species is likely to occur in the project area. The effects may lead to an increase in the number of non-native plant species and their abundance in the project area. The establishment of invasive plants would very likely be limited to disturbed ground.

Best management practices integrated into Design Features of the proposed action, such as keeping soil disturbance to a minimum, cleaning and washing vehicles entering the project area to prevent promoting invasion through continued motorized use, and using salvaged vegetative material and certified weed-free seed mixes for reclamation would minimize the potential for invasive species establishment and spread. Therefore, the effect of the proposed action on the spread and establishment of invasive plant species is likely to be minor.

No Action Alternative

Under the No Action Alternative, direct or indirect impacts to introduction and spread of invasive non-native plants would not occur because the proposed action would not be taken.

3.2.3 Mitigation and Measures to Minimize Harm

Because FGMI would implement the invasive species prevention measures outlined in the Design Features of the proposed action, impacts to the establishment and spread of invasive plant species would be minor; no mitigation or measures to minimize harm would be proposed.

3.3 Recreation

3.3.1 Affected Environment

The affected area does not have a recreation management plan or current travel management prescriptions. However, the project area does contain an extensive existing user-established trail system ranging from narrow walking trails to routes that can accommodate an OHV that provide opportunities for recreational activities. It is known that portions of the project area are used occasionally for running, biking, off-road vehicle use, and dog mushing, and for local public events such as running races and off-road vehicle races. The locations of user-established trails are presented in Figure 3; however, other trails not shown on Figure 3 may exist.

3.3.2 Environmental Consequences

Proposed Action

Under the proposed action, FGMI would use existing trails for moving equipment. Equipment moved in may exceed the width of the existing trails and temporarily impede travel for recreational users. To access drill pad and exploration sites, temporary routes will need to be developed in addition to worksite routes. These routes would be outside of the existing recreational trail network and open access by the public may pose a safety risk.

An increase in noise from drilling equipment, earth moving machinery, and the presence of workers has the potential to impact recreational users in the project area. Impacts to recreational users associated with temporary trail closures and increased noise level would be localized, relatively minor, and temporary in nature.

No Action Alternative

Under the No Action Alternative, no changes in recreational use would occur in the project area.

3.3.3 Mitigation and Measures to Minimize Harm

To mitigate and minimize the impacts on public recreational activities and trail use in the project area, FGMI would post signs informing trail users about planned equipment moves. In consideration of public health and safety, sections of the existing trails would potentially be closed to the public when being used to mobilize equipment during the exploratory program. Proposed temporary closures shall be posted during the time the equipment is mobilizing, however, public use of existing trails would likely only be temporarily impeded for short periods of time (i.e., minutes to hours). Posting of temporary closures will also serve to mitigate the effects from increased noise levels associated. Routes created off of existing trails for the purposes of accessing exploration sites will be blocked from public access by signage to protect health and safety of recreational users in the area. These routes will be restored to preexisting conditions per the reclamation plan.

3.4 Vegetation Resources

3.4.1 Affected Environment

No vegetation studies have been conducted in the project area. The vegetation resources description has been compiled using existing data sources, including aerial photography with resolution of 2 feet and 4 feet, National Wetland Inventory (NWI; NWI 2014) mapping, the Cultural Resources Survey Report (McGowan 2014), and the *Environmental Assessment for Extension of Land Withdrawal for National Environmental Satellite, Data, and Information Service* (NESDIS; SRI 2007).

Vegetation in the proposed project area is typical of interior Alaska boreal forest, which is comprised of four vegetative cover types: forested, shrub, herbaceous, and unvegetative. Based on review of existing data, the majority of the project area is comprised of black and white spruce (*Picea mariana* and *P. glauca*) forest or woodland, paper birch (*Betula papyrifera*) forest, and mixed spruce–birch forest. A few isolated stands of quaking aspen (*P. tremuloides*), cottonwood (*Populus balsimifera*), and tamarack (*Larix laricina*) are also present. The forest understory is comprised of rose (*Rosa acicularis*), high bush cranberry (*Viburnum edule*), Labrador tea (*Ledum* sp.), raspberry (*Rubus* sp.), and blueberry (*Vaccinium* sp.). The dominant

forest ground-cover consists of moss, and lichens, with fireweed (*Epilobium angustifolium*), bluejoint grass (*Calamagrostis canadensis*), and horsetails (*Equisetum* sp.) more frequent in wet or disturbed areas.

Shrub communities formed by tall or low willow (*Salix* sp.), alder (*Alnus* sp.), or bog birch (*Betula nana*) occupy steep slopes and the tops of the ridges. Alder, willow, and bluejoint grass colonize sites with past disturbance, such as abandoned trails, prospecting drill pads, and sides of existing trails

Two creeks originate in the project area. Pat Creek flows into Tom Creek. Tom Creek flows southwest across the project area into Gilmore Creek, and eventually into Pedro Creek. Tom Creek has a few unnamed intermittent tributaries. Riparian vegetation is well formed along the channels of both Pat and Tom Creeks. Riparian-wetlands along Tom and Pat Creeks support sedge-cottongrass wet meadows, ericaceous shrub, and low willow shrub communities. Wetland black spruce scrub-shrub occurs on north facing slopes and on areas of permafrost.

Previous use of the land resulted in linear disturbances from constructed trails. However, the vegetation in the project area appears to be largely undisturbed.

3.4.2 Environmental Consequences

Proposed Action

A total area of up to 25 acres, including vegetation and soil would be impacted by the proposed action during the proposed three-year exploration program. Most of the vegetation removed during the first two years would be upland mixed forest, spruce forest, or spruce woodland. Some early successional vegetation, such as shrubs and forbs would be removed from existing trails that have undergone natural revegetation. All areas with removed vegetation and soil would be susceptible to erosion and non-native species establishment until fully revegetated.

Direct impacts from constructing drilling pads and trails would include the temporary removal of soil and vegetation, and modifying natural topography. The potential impact to vegetation resources would be localized by area and short in time, limited to three years of the drilling program. It is estimated that during the three year period a total of approximately 250 holes would be drilled. The locations of the drill pads are contingent upon the results of the first tranche. At this time, it is anticipated that some wetland vegetation would be disturbed by drilling and trails construction.

FGMI is fully committed to performing full reclamation including stabilizing slopes, re-grading sites to native topography, replacing overburden and topsoil, seeding, and fertilizing. All disturbed areas would be fully revegetated until the permit expires. It is anticipated that over time, low and tall shrubs would colonize previously disturbed and reclaimed areas. The impact of the proposed action would be minimal following reclamation activities.

No Action Alternative

Under the No Action Alternative, direct and indirect impacts to the project area vegetation resources would not occur because the proposed action would not be taken.

3.4.3 Mitigation and Measures to Minimize Harm

FGMI is committed to minimizing and preventing adverse effects to the natural vegetation resources occurring within the proposed impact area. By implementing Design Features, impacts to soils and vegetation would be kept to a minimum, and existing trails would be utilized to the

extent practicable. All disturbed areas would be fully revegetated before the permit's expiration date. Therefore, the effect of the proposed actions to natural vegetation would be minor, and no mitigation measures would be proposed.

3.5 Wetlands and Riparian Areas

3.5.1 Affected Environment

By federal law (Section 404 of the Clean Water Act) and associated policy, the presence of wetlands[1] and other regulated waters must be considered. It is necessary to avoid impacts to wetlands wherever practicable and minimize impact where impacts are not avoidable.

A wetland survey was not conducted for the project area. The following wetland type description is based on USFWS's NWI classification system (NWI 2014) and aerial photography with a resolution of 2 and 4 feet. Based on NWI mapping and review of aerial photography, four types of wetlands occur in the project area. NWI wetland classification type, acreage represented, and percentage coverage found in the project area are presented in Table 3.

Table 3. NWI classified wetlands occurring in the project area

Wetland Type	Acres	Percentage of Project Area
Forested needle-leaved, saturated (PFO4B)	25.5	1.3
Scrub-shrub deciduous/ persistent emergent, seasonally flooded (PSS1/EM1C)	32.9	1.7
Scrub-shrub deciduous, saturated or temporarily flooded (PSS1B and PSS1A)	106.6	5.6
Scrub-shrub evergreen/deciduous, saturated (PSS4/1B and PSS1/4B)	113.0	5.9
Total	**278.0**	**14.5**

Note: Wetland classification based on GIS analysis of USFWS NWI data and FGMI-provided project area

According to the NWI classification, 278 acres (14.5%) of the project area is classified as wetlands. Wetlands attenuate floodwater and snow melt, are valuable wildlife habitats used by many vertebrate and invertebrate species, and help maintain high water quality. All wetland types in the project area are non-tidal freshwater wetlands.

Scrub-shrub evergreen/deciduous wetland, dominated by dwarf black spruce scrub vegetation, is the most common wetland type in the project area. It covers 113 acres (5.9%) of the project area and occurs on north-facing slopes on saturated soils and on areas of permafrost. Approximately 106.6 acres (5.6%) of deciduous scrub-shrub wetlands (saturated or temporarily flooded) are

[1] Wetlands are defined as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" by the USACE (1987).

mapped on south-facing slopes in the northern portion of the study area. These wetlands appear to have sparse tree cover and a dense layer of low shrubs.

Approximately 32.9 acres (1.7%) within the project area are classified as scrub-shrub deciduous/persistent emergent wetlands. These riparian wetlands are seasonally flooded and occur adjacent to stream channels within the well-formed riparian zones in both the Pat and Tom creek drainages. Riparian areas are important habitats that are characterized by the interactions of vegetation, soils, and hydrology and serve as a transition zone between wetland and upland habitat (BLM 1998). The BLM considers these areas as riparian-wetlands, a wetland subtype that occurs along, adjacent to, or contiguous with perennially and intermittent flowing rivers and streams, glacial potholes, and lake shores with stable water levels (BLM 1998). Riparian-wetlands in the project area correspond to the wetlands mapped as scrub-shrub deciduous/persistent emergent adjacent to the perennial and intermittent portions of steam channels. Vegetation includes species of low willow, ericaceous shrubs, and a variety of sedges and cottongrasses.

Forested needle-leaved wetlands dominated by white spruce are the least common vegetation type found, occupying 25.5 acres (1.3%) in the northernmost portion of the project area.

3.5.2 Environmental Consequences

Proposed Action

During Phase 1 of the drilling program, the proposed project would not impact wetlands; drill pads and access trails would be placed outside of the known wetlands identified in the existing NWI mapping. However, exploratory activities in subsequent years would potentially impact wetlands. The FGMI estimates that a total of up to 0.5 acre of mapped wetlands may be impacted by the placement of drill pads and trails (or 1% of planned disturbance) throughout the duration of the drilling program. Prior to exploratory activities that may impact wetlands, FGMI would request authorization from the U.S. Army Corps of Engineers (USACE) for a Nationwide Permit #6 (Survey Activities) in compliance with the Section 404 of the Clean Water Act. The total direct surface impacts on wetlands would not be anticipated to exceed 0.5 acre, which constitutes less than 0.2% of all wetlands mapped in the project area, during the three-year exploratory drilling program.

It is likely that scrub-shrub evergreen/deciduous, saturated wetlands, the most common type that occurs in the project area, would be the primary wetland type impacted. While it is unlikely that drilling would occur directly within stream channels since moving water hinders drill pad construction and activities, drill pads or trails may impact adjacent riparian-wetlands.

Vegetation would be removed from footprint of pads and trails; organic material and topsoil would be temporarily displaced and stored for reclamation use. The wetland functions would be temporarily lost at these sites, but would still be performed by the surrounding wetland areas of the ecosystem.

Once the drilling is complete, all disturbed wetland areas would be reclaimed using methods outlined in reclamation plan of the proposed action. All wetland function would be restored when all three wetland parameters are again present after reclamation. Wetland functions are the result of combination of three parameters: wetland hydrology, wetland soil, and wetland vegetation. Hydrological components of wetland sites (groundwater discharge, precipitation, channels) would not be altered by the proposed action. Organic material and wetland topsoil

would be salvaged, stored for the duration of drilling, and placed back on the pad and trail. Restoration of wetland functions would depend on the establishment of wetland vegetation. To facilitate restoring vegetation, a mix of grasses would be seeded during reclamation, resulting in initial temporary plant cover that provides favorable habitat for colonization by wetland plants. It is estimated that wetland vegetation would gradually replace seeded grasses, and functions of wetland would be fully restored within a few years.

Although some area of wetlands would be impacted by the proposed action, impacts would be minor, temporary, and limited to the footprint of the drill pad or trail.

No Action Alternative

Under the No Action Alternative, direct and indirect impacts to the project area wetlands would not occur because the proposed action would not be taken.

3.5.3 Mitigation and Measures to Minimize Harm

The proposed action includes Design Features that would minimize impacts to wetlands and other waters of the U.S. Prior to exploratory activities that may impact wetlands, the FGMI would request authorization from the USACE for a Nationwide Permit #6 (Survey Activities) in compliance with the Section 404 of the Clean Water Act. Impacts would be limited to those allowed pursuant to the Nationwide Permit #6. Thus, the effect of the proposed actions on wetlands would be minor, and no mitigation or measures to minimize harm would be proposed. Additional stipulations and mitigation may be required by the USACE.

3.6 Wildlife/Aquatic

3.6.1 Affected Environment

The project area encompasses the headwaters of the Tom and Pat Creek drainages within the Gilmore Creek sub-watershed (Figure 2). Tom Creek is the primary stream drainage in the project area; Pat Creek is a tributary to Tom Creek. Tom and Pat creeks flow south then southwest through the project area before emptying into Gilmore Creek at point roughly 1 mile downstream of the project area. Gilmore Creek, which flows east to west within the Gilmore Valley, is located just south of the project area. Stream width and depth information specific to Tom and Pat creeks is not available. Along its southern boundary, the project area encompasses a small portion of land that drains south, directly into Gilmore Creek upstream of the Tom Creek influence. However, terrain is steep along this boundary and no tributary streams are identified. The Gilmore Creek sub-watershed drains into Goldstream Creek (East Goldstream Creek watershed) and ultimately feeds the Yukon River drainage well downstream of the project area.

Tom Creek drains a relatively steep slope (estimated at 25 degrees) at its headwaters; alder thicket dominates the vegetation (McGowan 2014). Slopes descending into Pat, Tom, and Gilmore creeks represent the steepest areas in the project area. Terrain on the hilltops of the northeast portion corner of the project area rises to roughly 2,200 FASL and drops to roughly 1,300 FASL at the creek beds near the project area's southwest corner (McGowan 2014). The Tom Creek drainage widens from its headwaters downstream and the gradient decreases near its confluence with Pat Creek. Habitat near the convergence of the two creeks was characterized as bog habitat (McGowan 2014).

The Alaska Department of Fish and Game's (ADF&G) Anadromous Waters Catalog and Alaska Freshwater Fish Inventory databases display known anadromous and resident fish habitat throughout the state. Neither database identifies fish presence or absence for Tom, Pat, or Gilmore creeks (ADF&G 2014). The Gilmore Creek drainage historically supported Arctic grayling[2] (*Thymallus arcticus*) and slimy sculpin (*Cottus cognatus*) (Jacobs, personal communication, May 13, 2014; Weber and Robus 1987). However, previous development within the Gilmore Creek drainage has modified aquatic habitat and in some cases the ability for fish to move between drainages[3]. Historical records indicate the presence of resident fish, such as Arctic grayling, slimy sculpin, burbot (*Lota lota*), whitefish species, and potentially longnose sucker (*Catostomus catostomus*) throughout nearby, adjacent watersheds (Weber Scannell and Ott 1994)[4]. While no fisheries resources are currently known to exist in project area streams or within the Gilmore Creek drainage, the presence of resident fish species such as Arctic grayling and sculpin is possible (Jacobs, personal communication, May 13, 2014).

Grayling and sculpin typically spawn just after break-up and hatch roughly three weeks after spawning (Gryska 2007; Mansfield 2004). Grayling commonly spawn in gravel substrate in riffle habitat but have been documented to spawn under a variety of conditions and in various habitats. After spawning, grayling typically move into other areas for summer feeding. Grayling typically move downstream from summer feeding areas to overwintering areas in late summer and fall. Although grayling are capable of migrating long distances, they are not strong swimmers and prefer low to moderate gradient streams (Jacobs, personal communication, May 13, 2014). Grayling would not be expected to ascend the headwaters of the project area streams due to high gradient but would be more likely to occur in the lower gradient habitats farther downstream.

Essential Fish Habitat

Under the Magnuson Stevens Fishery and Conservation and Management Act (MSFCMA), EFH refers to "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The MSFCMA notes that:

> [F]or the purpose of interpreting the definition of EFH, 'waters' include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; 'substrate' includes sediment, hard bottom, structures underlying the waters, and associated biological communities, 'necessary' means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and 'spawning, breeding, feeding, or growth to maturity' covers a species full life cycle.

[2] The Pedro Creek drainage historically supported Arctic grayling (Weber and Robus 1987).
[3] The historic Gilmore Creek mine extended to the mouth of Tom Creek; it is not known if fish passage throughout the drainage was maintained.
[4] The ADF&G has conducted numerous fish studies throughout similar stream drainages within the existing Fort Knox mining operations adjacent to the project area, including baseline data collection prior to mining operations. Streams within adjacent drainages were found to support Arctic grayling, slimy sculpin, burbot, round whitefish and longnose sucker (Weber Scannell and Ott 1994).

Aquatic habitat within the project area is not known to support fish species that are managed under a federal fishery management plan (FMP). The nearest streams known to provide EFH for FMP-managed species, located well outside of the project area, include the Chatanika River to the north, and the Tanana River to the south; both are tributaries to the Yukon River (ADF&G 2014). Since the two stream drainages within the project area do not support FMP-managed species and are therefore not considered EFH, EFH is not discussed further in this document.

3.6.2 Environmental Consequences

Proposed Action

The proposed action is not expected to have substantial adverse impacts to aquatic habitat and fish resources within the project area. The primary activities of the proposed action that have the potential to affect aquatic habitat and fish include moving equipment within or across stream channels (e.g. disturbance to fish or habitat), construction of trails, and direct and indirect impacts to habitats from drilling operations (e.g. removal of riparian vegetation). To avoid and minimize impacts to the extent possible, the proposed action would incorporate measures outlined in Design Features and BMPs. Potential impacts to aquatic resources in consideration of the proposed avoidance and minimization measures are described below.

Stream Crossings and Trails

Stream crossings would be avoided to the extent possible, as disturbance to stream beds can negatively affect water quality by causing increased turbidity and sedimentation downstream. Additionally, equipment within a stream bed can cause direct mortality of fish and aquatic invertebrates. Where stream crossings are necessary, BMPs to minimize impacts would be implemented, as detailed in the Temporary Stream Crossing Options of the Appendix B. During the first phase of exploratory drilling and related operations, equipment would need to cross the valley of an unnamed intermittent tributary within the upper portion of the Tom Creek drainage. Under the proposed action, a temporary crossing structure would be used at this location. Fish presence or absence has not been confirmed within this intermittent drainage. The gradient within the upper portion of the intermittent stream drainage, near the proposed crossing location (as shown in the Land Use Proposal), exceeds 20 percent. Therefore, this portion of the intermittent stream is unlikely to provide a habitat that would support grayling or sculpin given the steep topography. Temporary equipment crossings in the intermittent drainage of Tom Creek are not expected to impact fish or fish habitat.

Seasonal use by Arctic grayling (e.g. spring spawning) or sculpin may be more likely in lower gradient portions of the Tom and Pat creek drainages. The proposed action does not include plans to cross the primary channel of Tom Creek or travel within the Pat Creek drainage during its first phase. However, if additional stream crossings are required in subsequent years, especially those within lower gradient reaches more likely to support fish, fish passage would need to be maintained during the potential fish-use time periods (e.g. spring) per the Fishway Act (or Fish Passage Act; A.S. 16.05.841). These potential crossings would be designed to avoid in-water work during species' critical life stages and minimize disturbance to habitat in accordance with provisions of the Fishway Act. The proposed action would use existing trails during the first phase of drilling activity and maintained existing trails. Any new trails would be designed to minimize impacts to aquatic resources.

Drilling Operations

The proposed action includes drilling activities on an intermittent tributary within the Tom Creek drainage. The location of subsequent drilling activity is dependent upon the results of Phase 1; therefore, drilling may extend into the Pat Creek drainage in later phases. The proximity of disturbance to stream channels is not defined; however, the proposed action would avoid drilling within stream channels. The proposed action includes a grid-based sampling approach; however, if a sampling location falls within a streambed or along a stream bank, that particular sampling location would be modified to avoid drilling directly within the streambed.

The proposed action includes the removal of vegetation prior to drilling and subsequent reclamation of disturbed areas, as discussed above in Section 3.3, Vegetation Resources. Overburden disturbed during drilling would be stockpiled and reserved for reclamation. The proposed action is not expected to affect riparian vegetation during the first phase of drilling. If subsequent phases involve drilling in close proximity to streams, riparian vegetation may be affected. Removing vegetative cover has the potential to result in increased erosion and turbidity levels, and potentially a rise in stream temperatures. It is expected that the project would avoid drilling on stream banks that could not support equipment and therefore minimize the need to remove riparian vegetation. For the most part, increased erosion within stream courses is expected to be fairly minimal due to the relatively small footprint of the proposed action.

Drilling fluids would be impounded at each site with lined sumps and berms to contain the fluid and prevent run-off and thereby minimize the potential for drilling fluids to enter streams. To further minimize potential impacts, the drilling fluid that would be used is non-toxic and designed for use in potable water well drilling. Diamond core drill rigs would use freshwater and non-toxic additives and use plastic-lined sumps to minimize potential impacts. Freshwater would be used as drilling fluid for reverse-circulation drilling, and sumps would be unlined with plastic.

The proposed action would avoid in-water work during species' critical life stages where fish may be present and minimize disturbance to habitat in accordance with provisions of the Fishway Act. Continuous monitoring of exploration activities would be completed to ensure BMPs are being used.

No Action Alternative

Under the No Action Alternative, conditions would exist as they currently do within the project area. Direct or indirect impacts to Wildlife/Aquatic resources would not occur because the proposed action would not be taken.

3.6.3 Mitigation and Measures to Minimize Harm

Best management practices of avoiding and minimizing adverse effects to aquatic resources are summarized in the Design Features of the proposed action. In summary, to avoid and minimize impacts to aquatic resources the proposed action would:

- Avoid drilling in stream channels to minimize impacts (e.g. habitat modification and increased turbidity and run-off) to aquatic resources
- Avoid drilling (or construction of drill pads, roads, and trails, except for stream crossings perpendicular to stream) on stream channel banks to minimize potential erosion and impacts to water quality (e.g. increased turbidity) and run-off and impacts to riparian vegetation

- Avoid creating migration barriers to resident fish to minimize impacts and comply with the Fishway Act
- Avoid introducing toxic materials into nearby stream drainages by using non-toxic drilling fluid during drilling operations
- Avoid in-water work during critical life stages in streams that may support resident fish to minimize impacts to aquatic habitat and resident fish
- Minimize the potential for drilling fluids to enter stream drainages by using plastic-lined sumps to contain drilling fluid associated with diamond core drilling operations

Because FGMI would implement the Design Features of the proposed action, impacts to wildlife/aquatic resources would be minor; no mitigation or measures to minimize harm would be proposed.

4.0 Cumulative Effects

4.1 Introduction

CEQ regulations for the NEPA define a cumulative impact as follows:

> "…the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individual minor but collectively significant actions taken place over a period of time" (40 CFR 1508.7).

As required under the NEPA and the regulations implementing the NEPA, this chapter addresses those cumulative effects on the environmental resources in the cumulative effect study areas (CESAs), which could result from the implementation of the proposed action and reasonable alternatives, past actions, present actions, and reasonably foreseeable future actions (RFFA)s. The extent of the CESA could vary with each resource, based on the geographical or biological limits of that resource. In addition, the length of time for cumulative effects to occur could vary according to the duration of impacts from the proposed action on the particular resource.

For the purposes of this analysis and under federal regulations, "impacts" and "effects" are assumed to have the same meaning and are interchangeable. The cumulative impacts analysis was accomplished through four steps:

- Step 1: Identify, describe, and map a CESA to be evaluated in this chapter;
- Step 2: Define time frames, scenarios, and acreage estimates for cumulative impact analysis. Past and present disturbances and activities include mining operations, infrastructure and transportation development, and recreational use within disturbed areas not reclaimed or unsatisfactorily reclaimed (impacts from those activities are reflected in the current condition and visible in aerial photos). Future scenarios address reasonably foreseeable actions from the following: settlements, business or trade, infrastructure, travel or movement, recreation, and natural resources activities identified in land management plans.
- Step 3: Identify and quantify (if possible) the location of possible specific impacts from the proposed action and judge the significance of these contributions to the overall impacts. The incremental impact of the proposed action is determined by calculating the sum or combination of all the past, present, and RFFAs (excluding the proposed action) and then determining the incremental increase from the proposed action (e.g., if all actions, excluding the proposed action, total 1,000 acres and the proposed action is 10 acres, then the incremental contribution of the proposed action would be one percent); and
- Step 4: Evaluate the combined effects of the information and data identified within the CESA as it relates to the resources brought forward for cumulative impact analysis.

Environmental consequences of the proposed action and the reasonable alternatives were evaluated in Chapter 3 for the various environmental resources. Based upon the analysis of the environmental resources as completed in Chapter 3, the following resources could be impacted by the proposed action and reasonable alternatives: cultural resources; invasive, non-native

species, recreation; vegetation resources; wetlands and riparian areas; and wildlife/aquatic. The above resources are considered to have the potential to be cumulatively impacted by actions within the CESA.

4.2 Cumulative Effect Study Area

The CESA for all evaluated resources is a 5-mile radius around the project area and is based on the assumption that the majority of effects of the project would be within this area. The CESA is 75,022 acres and is shown in Figure 8. The CESA includes the Clearly Summit community to the north, the stretch of the Steese Highway between the communities of Fox and Cleary Summit to the west, and existing Fort Knox Mine facilities to the east. The southern portion of the CESA includes relatively undeveloped valleys with a number of unimproved trails. The same geographic extent was used for each resource evaluated.

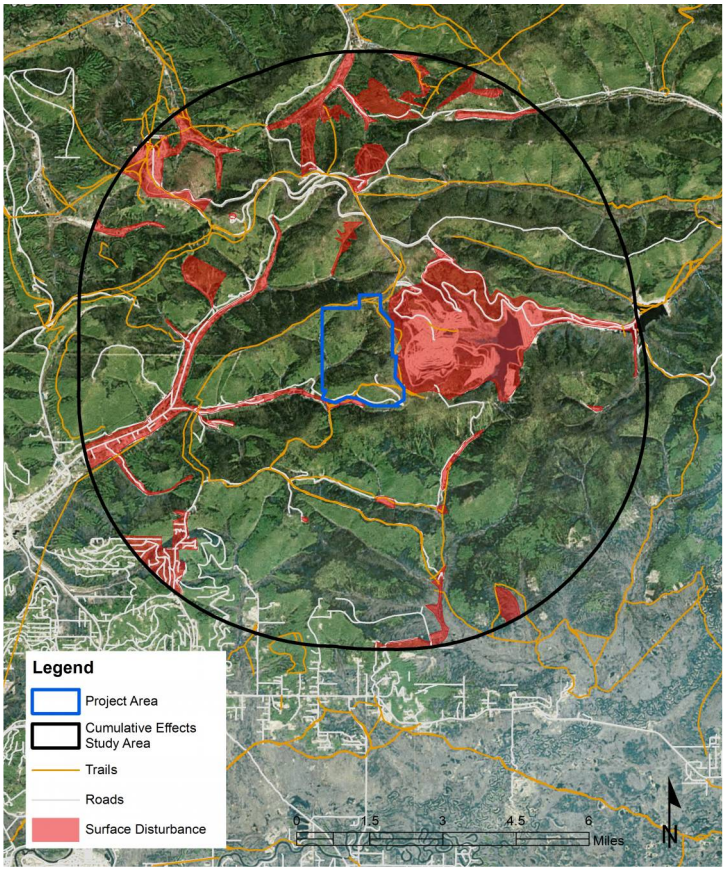


Figure 8. Cumulative Effects Study Area map.

The timeframe for this analysis begins in the mid 1920s when placer mining became more industrialized with dredges and large-scale hydraulic techniques, reworking the ground at Chatham Creek and many other valleys throughout the CESA.

Surface disturbance from past and present actions was delineated using geographic information systems (GIS) by referencing true-color orthorectified aerial photography from September 2011 with the assumption that most major surface disturbance is still detectable in aerial photography. Available roads and trails data from the State of Alaska were incorporated into the analysis as present disturbance, assuming an average road width of 34 feet and trail width of 6 feet. Past and present surface disturbance delineated in GIS was categorized by general disturbance type using photointerpretation, U. S. Geologic Survey topographic maps, and historical accounts. The primary activities in the CESA include the following: mineral development and exploration, transportation and infrastructure; and recreation.

The timeframe for this analysis extends into the year 2024, 10 years beyond the baseline year of 2014. This timeframe extends through the time when hard rock mines came into production and is based on potential future duration of the impacts from the proposed action, including the 3-year permit period and reclamation.

4.3 Past, Present, and Reasonably Foreseeable Future Actions

The cumulative impact assessment must consider the lasting influence of past actions relevant to proposed action, the effects of ongoing present actions, and probable future actions.

4.3.1 Past and Present Actions

An approximate total of 10,251 acres of surface disturbance were identified as past and present actions in the CESA. Mineral development and exploration activities comprise the majority of past and present disturbance. Approximately 8,735 acres were identified as either placer or hard rock development and exploration activities within the CESA. These past and present mining activities include Fort Knox, Chatham Creek, Cleary Hill, and other unidentified mines.

The CESA encompasses portions of headwater streams that ultimately drain into the Chena River to the south, Goldstream Creek to the west, and the Chatanika River to the north. Historically, Arctic grayling, slimy sculpin, burbot, whitefish species, and longnose sucker occurred throughout streams in the CESA (Weber Scannell and Ott 1994). However, historic and present-day mining activities have altered aquatic habitat throughout many of these tributary streams. Habitat alteration in some cases has precluded fish passage between adjacent habitats. For example, the historic Gilmore Creek mine extended to the mouth of Tom Creek; it is not known if fish passage throughout the drainage was maintained. Farther downstream, the Pedro Creek drainage historically supported Arctic grayling (Gilmore Creek sub-watershed) (Weber and Robus 1987).

Infrastructure and transportation are other sources of past and present actions as the land use in the CESA have accommodated fluctuating populations over the years from the gold rush boom towns (early 1920s) to eventual, permanent settlements of the present. Approximately 1,255 acres of surface disturbance within the CESA was associated as either primary roads (an assumed average of 34’ width) or other land use associated with town settlements. Fairbanks was incorporated on December 26, 1903 with a population of 1,000 and in 2012 was recorded in as a city of 32,070. Outlying neighborhoods of Fairbanks are located in western portions of the CESA. Fox, just beyond the western edge of the CESA along the Steese Highway, was established in the early 1900s as a mining camp and has grown to a population of 417, according to 2010 estimates. The Steese Highway, which started as a trail used to carry mail by dogsled, was opened in 1927 and is now a major transportation route within the CESA. The Steese Highway, which connects Fairbanks with the town of Circle, receives periodic improvements from the Alaska Department of Transportation and Public Facilities. Other roads in the CESA include primary and secondary local routes.

An approximate total of 261 acres in the CESA have been disturbed from the development of recreational ski areas and other trails. Cleary Summit has historically had a ski area since the 1950’s and shows approximately 218 acres of disturbance from ski trails and facilities. Recreational trails established throughout the CESA have created approximately 43 acres of disturbance.

4.3.2 Reasonably Foreseeable Future Actions

There are RFFAs with mineral development and exploration activities, infrastructure and transportation, and recreational use within the CESA. The State of Alaska land management plan for the area allows for plans of settlements, business or trade, infrastructure, travel or movement, recreation, and natural resources activities (including subsurface mineral leasing) (ADNR, 1991).

Given the area's mining history and land use planning for mining in the area, mineral development and exploration activities are likely to increase slightly in the future. Infrastructure and transportation activities are likely to increase slightly to accommodate standard improvements for the predicted 7% growth (in 30 years) in population in the Fairbanks North Star Borough (ADLWD, 2014). Recreational use of trails and ski areas is likely to increase slightly with population growth.

4.3.3 Cumulative Impacts for the Proposed Action

Construction of drilling access routes and improvement of existing trails within the study area may result in better access to and increased recreation of the study area. Increased use of the project area may increase visitation to cultural resource sites and feature concentrations, indirectly resulting in the disturbance, loss or theft of surficially evident historic artifacts. Increased use of the study area may also result in increased all-terrain vehicle (ATV) and foot travel through AHRS sites and feature concentrations, likely causing unintentional damage to sites and features. The proposed action would likely add a small level of disturbance relative to that already present in the area as a result of considerable exploration and development and associated disturbance which has occurred at the adjacent Fort Knox Mine. Disturbance created by exploration would likely add a shift in vegetation communities in the area, and increase the likelihood of invasive plant establishment as well as a regional increase in their abundance. The proposed ground disturbance is relatively small in area in comparison to historic and potential nearby disturbances; therefore, the relative contribution to invasive species in the area is likely relatively small.

Eighteen non-native (potentially invasive) plant species now occur in the area, all on lands outside of the proposed action boundaries. Today, natural habitats in the project area very likely remain unaffected by invasion of non-native plant species. Potential spread and establishment of invasive plants during the proposed action would likely facilitate the expansion of the species' outside of their current distribution range. It is not likely that the proposed action would lead to increasing invasive species diversity, thus the number of species in the region would likely be similar or otherwise not adversely affected.

Aquatic and terrestrial habitat throughout the CESA has been previously altered by past and present development activities. Under the proposed action, moving equipment within or across stream channels (e.g. disturbance to fish or habitat), construction of trails, and direct and indirect impacts to habitats from drilling operations (e.g. removal of riparian vegetation) have the potential to affect aquatic habitat and fish in the project area. The proposed action, when considered with past, present, and other future actions, is not expected to have substantial cumulative adverse impacts to fish and wildlife habitat or resources within the project area or CESA.

Overall, the ground disturbance proposed for the proposed action (25 acres) is very small in area in comparison to total past and present disturbances (10,251 acres) and potential increased disturbance created by RFAA. Using a conservative estimate, the overall disturbance from the proposed action would be less than 0.2% of the total disturbance from past, present and RFFA. Likewise, approximately 64,771 acres of the CESA is estimated as undisturbed, and the proposed action (25 acres) would effect less than 0.03% of presently undisturbed lands, Therefore, the proposed action for the Gilmore Land Use Application is not expected to have significant

cumulative adverse effects on cultural resources, invasive non-native species, vegetation resources, wetlands and riparian areas, or wildlife/aquatic.

5.0 Consultation and Coordination

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NOAA

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References

ADEC (Alaska Department of Environmental Conservation). 2011. *Storm Water Guide*. Accessed at: http://dec.alaska.gov/water/wnpspc/stormwater/Guidance.html; viewed July 22, 2014.

ADNR (Alaska Department of Natural Resources). 1991. *Tanana Area Basin Plan for State Lands*. Accessed at: http://dnr.alaska.gov/mlw/planning/areaplans/tanana/pdf/tanana_basin_area_plan_for_state_lands.pdf, viewed July 27, 2014.

ADF&G (Alaska Department of Fish and Game). 2014. *Catalog of Waters Important for Spawning, Rearing or Migration of Anadromous Fishes, 2013* (Anadromous Waters Catalog of Alaska). Accessed at: http://www.adfg.alaska.gov/index.cfm?adfg=maps.interactive; viewed May 8, 2014.

ADLWD (Alaska Department of Labor Workforce Development). 2014. *Alaska Population Projections 2012 to 2042*. Accessed at: http://laborstats.alaska.gov/pop/projected/pub/popproj.pdf; viewed July 24, 2014.

AKEPIC (Alaska Exotic Plants Information Clearinghouse). 2014. *Alaska Exotic Plant Information Clearinghouse database* (http://aknhp.uaa.alaska.edu/maps/akepic/). Alaska Natural Heritage Program, University of Alaska, Anchorage. Accessed April, 10, 2014.

BLM (Bureau of Land Management). 2014. *Land & Mineral Legacy Rehost System*. (http://www.blm.gov/landandresourcesreports/rptapp/criteria_select.cfm?rptId=1&APPCD=2&). Accessed July 23, 2014.

_____. 2010. *BLM – Alaska Invasive Species Management*. BLM, U.S. Department of the Interior, Alaska State Office, Division of Resources, Lands, and Planning. 23 pp.

_____. 1998. *Riparian Area Management.* BLM Technical Reference 1737-9. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver CO. 58 pp.

_____. 1986. *Visual Resources Management, "Visual Resource Contrast Rating,"* BLM Manual, Section 8431:1.

Carlson, M. L, I. V. Lapina, M. Shephard, J. S. Conn, R. Densmore, P. Spencer, J. Heys, J. Riley and J. Nielsen. 2008. *Invasiveness Ranking System for Non-native Plants of Alaska*. USDA Forest Service, R10-TP-143. 218 pp.

Cortes-Burns, H., I. Lapina, S. Klein, M. Carlson, and L. Flagstad. 2008. *Invasive Plant Species Monitoring and Control: Areas Impacted by 2004 and 2005 Fires in Interior Alaska, a Survey of Alaska BLM Lands along the Dalton, Steese, and Taylor Highways*. BLM – BAER Final Report. 162 pp.

Czapla, P. and S. Wright. 2012. Interior Alaska Revegetation and Erosion Control Guide. State of Alaska, Department of Natural Resources, Plant Materials Center. 152 pp.

Dixon, E.J., Sattler, M.S., and A.S. Higgs. 1993. Ft. Knox Project Cultural Resources Survey Final Report. Submitted to Fairbanks Gold Mining Company, Inc. Fairbanks, Alaska. February 1993.

Gryska, Andy. 2007. *Arctic grayling - Species Descriptions*. Alaska Department of Fish and Game. Accessed at: http://www.adfg.alaska.gov/static/education/wns/arctic_grayling.pdf

Jacobs, Laura. 2014. Personal communication between Laura Jacobs (ADF&G) and Erin Cunningham (HDR) regarding fish presence in Pat, Tom, and Gilmore creeks in and adjacent to the project area, May 13, 2014.

Lapina, I., S. Klein, and M. Carlson. 2007. *Non-native Plant Species of the Fairbanks Region: 2005 – 2006 Surveys.* US Forest Service, State and Private Forestry. 50 pp.

Mansfield, Kelly. 2004. *Slimy Sculpin - Species Descriptions*, Alaska Department of Fish and Game. Accessed at: http://www.adfg.alaska.gov/static/education/wns/slimy_sculpin.pdf

McGowan, Sarah, M.A. 2014. *Fort Knox Geotechnical Exploration Area Cultural Resources Survey, Fairbanks, Alaska.* Prepared for Fairbanks Gold Mining Inc. Kinross Fort Knox, by Northern Land Use Research Alaska, LLC, Fairbanks, Alaska. February 2014.

Neely, B. J., 2014. Addendum to the Fort Knox Geotechnical Exploration Area Cultural Resources Survey Report, Fairbanks, Alaska. Letter to Mark Huffington, Fairbanks Gold Mining, Inc. Kinross Fort Knox by Northern Land Use Research Alaska, LLC, Fairbanks, Alaska. September 2014.

NWI (National Wetlands Inventory). 2014. Wetlands Mapper. http://www.fws.gov/wetlands/Data/Mapper.html. Accessed 5/15/2014.

Nolen, A. 2002. *Vetch Infestations in Alaska*. Alaska Department of Transportation & Public Facilities, Alaska plant Material Center, Division of Agriculture, Department of Natural Resources, State of Alaska. FHWA-AK-RD-02-11. 34 pp.

SRI (SRI, International). 2007. *Environmental Assessment Extension of Land Withdrawal for National Environmental Satellite, Data, and Information Service (NESDIS) Fairbanks Command and Data Acquisition Station (FCDAS).* Prepare for NOAA. September 2007. 65 pp.

USFWS (U.S. Fish and Wildlife Service. 2007. *Advisory: Recommended Time Periods for Avoiding Vegetation Clearing in Alaska to Protect Migratory Birds.* September 2007

Villano, K. L., 2008. *Wildfire Burn Susceptibility to Non-Native Plant Invasions in Black Spruce Forest of Interior Alaska*. Thesis, Master of Science. University of Alaska Fairbanks. 101 pp.

Villano, K. L. and C. P. H. Mulder. 2008. *Invasive Plant Spread in Burned Lands of Interior Alaska.* NASA/NPS/UAF Final Report. 25 pp.

Weber, Phyllis K. and Matthew H. Robus. 1987. *Water quality and aquatic habitat assessments of Goldstream Creek drainage.* Prepared for the Tanana Chiefs Conference, Technical Report 87-3; Alaska Department of Fish and Game, Habitat Division, September 1987.

Weber Scannell, Phyllis and Alvin G. Ott. 1994. *Aquatic habitat of Fish Creek before development of the Fort Knox Gold Mine 1992-1993*. Technical Report 94-5; Alaska Department of Fish and Game, Habitat Division, June 1994.

Appendix A

February 18, 2014 Letter from NOAA to the BLM

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL ENVIRONMENTAL SATELLITE, DATA,
AND INFORMATION SERVICE

February 18, 2014

Ms. Lenore Heppler
Field Manager - Eastern Interior Field Office
Bureau of Land Management
1150 University Ave.
Fairbanks, AK 99709

Dear Ms. Heppler:

This letter concerns a Land Use Application and Permit filed with the Bureau of Land Management (BLM) on April 3, 2012, by Fairbanks Gold Mining, Inc. (FGMI) and a Land Use Proposal subsequently filed by FGMI with BLM on January 28, 2014. FGMI is proposing mineral assessment activities, including exploratory drilling, on public land withdrawn for use by the National Oceanic and Atmospheric Administration's (NOAA) Fairbanks Command and Data Acquisition Station (FCDAS).

As you know, the area proposed for mineral assessment activities is included in the land withdrawn by Public Land Order (PLO) No. 7710 for the purpose of protecting FCDAS operations. The PLO explicitly requires that permits to conduct activities on the withdrawn land may only be issued if NOAA determines that the proposed activities will not interfere with the proper operations of FCDAS.

To better evaluate the potential for impacts to FCDAS operations, NOAA contracted for a study to assess the proposed FGMI activities and, specifically, whether anticipated Radio Frequency (RF) emissions were likely to interfere with FCDAS mission operations. This study was recently completed and delivered to NOAA.

Based on the results of the study and modifications subsequently made by FGMI to its proposal as reflected in FGMI's January 28, 2014 submission to BLM, NOAA believes that the proposed mineral assessment activities will not interfere with the proper operations of FCDAS assuming certain precautions are taken. These precautions are reflected in the enclosed conditions that NOAA is requesting be incorporated in the permit that BLM may issue to FGMI. These conditions are largely the same conditions that were included in the permit issued in 2003 by BLM to FGMI to conduct mineral assessment activities on the lands withdrawn for FCDAS use.

Finally, this letter confirms NOAA's position that full scale mining activities within the public land withdrawn for use by NOAA FCDAS would adversely impact FCDAS operations.

Should you have questions regarding this matter, please contact Mr. Mark S. Paese at (301) 713-2010 or at mark.paese@noaa.gov.

Sincerely,

Mary E. Kicza
Assistant Administrator
for Satellite and Information Service

Enclosure

Cc: Glenn Tallia

NOAA Permit Conditions and Site Specific Stipulations

1. All parties recognize that the National Environmental Satellite, Data and Information Service (NESDIS), of the National Oceanic and Atmospheric Administration (NOAA), has not changed its position that full scale open pit mining activities within the Gilmore Creek Valley withdrawal area would likely adversely impact the Fairbanks Command and Data Acquisition Station (FCDAS). Authorization for access does not obligate NESDIS, the Bureau of Land Management (BLM), or the Fairbanks Gold Mining Inc. (FGMI) to future activities agreements or authorizations.

2. FGMI agrees to abide by the conditions contained herein. These conditions are applicable to FGMI's "Plan of Use" that was included as Exhibit C to its correspondence to the NOAA Under Secretary dated July 20, 2012 as updated and revised by FGMI's Land Use Proposal to BLM dated January 28, 2014 ("Land Use Proposal"), in which it proposes to undertake a three year mineral assessment program consisting of geologic mapping, soil sampling and drilling within the boundary of NOAA's FCDAS in and around the portion that borders FGMI's current open-pit mine operation. These conditions would also be applicable to any BLM authorized mineral assessment activities on existing FGMI unpatented mining claims located within the exterior boundary of the "Lands", as defined in the Land Use Proposal.

3. FGMI agrees to share with the BLM State Director any information or data that it obtains as a result of its mineral assessment activities and BLM agrees to treat such information confidentially to the fullest extent allowed by law.

4. FGMI will utilize equipment specified in its Land Use Proposal. No equipment or machinery, not listed in the Land Use Proposal, will be used in conjunction with the proposed activities without the prior written approval by NOAA.

5. FGMI agrees that it will not utilize any radio equipment except in the event of an emergency. Cellular telephone usage is allowable.

6. All activities must be confined to specific Federal lands, containing approximately 25 acres, and shall not impact valid existing mining claims not owned or controlled by FGMI or a FGMI affiliate. All activities will be conducted so as to avoid or minimize disturbance to the environment, all holes drilled by FGMI will be plugged and reclaimed, and all damage to the FCDAS site caused by FGMI will be reclaimed in

accordance with State of Alaska and Federal law including any additional mitigation or remediation required by approved environmental documentation.

7. FGMI agrees that a BLM geologist may be involved in the drilling program activities; however, participation of a BLM geologist is not mandatory for FGMI to carry out the proposed field activities. Any BLM geologist must be accompanied by FGMI personnel when crossing Fort Knox lands. Any BLM geologist must follow safety and hazard warnings.

8. FGMI agrees that, at the discretion of NESDIS, the field party may be accompanied by security personnel or other persons deemed necessary; however, NESDIS accompaniment is not mandatory for FGMI to carry out the proposed field activities, NESDIS personnel shall not interfere with FGMI employees so long as they are operating within the guidelines of the conditions contained herein. Any NESDIS personnel must be accompanied by FGMI personnel when crossing Fort Knox lands. Any NESDIS personnel must follow safety and hazard warnings.

9. FGMI agrees the ingress and egress to the FCDAS property will be by existing improved and unimproved access roads that connect directly to the Fort Knox mine property which is located east of the FCDAS boundary. Such ingress and egress will occur with at least twenty-four hours advance notice to FCDAS. It is anticipated that ingress will occur on a daily basis during the mineral assessment program. Ingress for most of the larger equipment will occur at the beginning of the drilling operations and egress at the end of the operation. Other equipment may need to be removed or replaced due to mechanical failure or extreme weather.

10. FGMI personnel and FGMI contractors entering the FDCDAS site must be United States citizens or permanent residents ("green card holder") and have a valid photo identification issued by a governmental entity or a valid Alaska driver's license showing their name and permanent address.

11. NESDIS will notify FGMI to stop exploration activities in the event these activities cause interference detrimental to NESDIS FCDAS operation, including degradation and/or loss of the FCDAS data stream, as determined by NESDIS. FGMI agrees to cease work operations immediately when so notified. In the event of interference, NESDIS agrees to work with FGMI to seek viable mitigation alternatives, including, but not limited to, scheduling FGMI operations so they do not cause interference or identifying particular FGMI equipment that is causing interference, or substitutions or modifications to the equipment.

12. FGMI acknowledges the NESDIS will not be responsible for any damage or loss of FGMI property, nor will NESDIS be liable for the acts or omissions of FGMI employees, contractors, or duly authorized representatives while they are involved in mineral assessment activities on FCDAS property.

13. NESDIS and FGMI have specified the following persons as contacts to provide real-time communications between on-site FGMI team(s) and FCDAS:

    Larry Ledlow, Jr.
    FCDAS Station Manager
    Office Phone: 907-451-1274
    Cell Phone: 907-378-2506

    George McAulay
    FCDAS Senior Systems Engineer
    Office Phone: 907-451-1230

    FGMI Project Geologist
    Chris Eckstrom
    Cell Phone: 907-590-2104

    FCDAS Operations Shift Leader – 24-hour emergency POC
    Office Phone: 907-451-1222

14. This authorization is in effect for so long as needed to complete the proposed mineral assessment activities. This authorization can be withdrawn, in writing, should FGMI fail to abide in any material way with the conditions stated herein.

15. FGMI shall provide a schedule of activities to FCDAS for their proposed operations, indicating proposed dates, times, and locations of operations within 10 days of receipt of the BLM approval. No operations shall begin prior to 1 week after receipt of the schedule by FCDAS to enable NESDIS to deploy a monitoring team, should it choose to do so. Schedule changes shall be provided by FCDAS to NESDIS 1 week prior to implementation.

Appendix B

Best Management Practices:

Erosion and Sediment Control,
Fuel and Hazardous Substances Handling and Storing,
Spill Prevention and Control,
Vehicle Maintenance, and
Temporary Stream Crossing Options

Erosion and Sediment Control

Preserving Natural Vegetation

Construction BMP	Alaskan climatic regions				
	Coastal	Southcentral	Western	Interior	Arctic
Preserving Natural Vegetation Feasibility	○	○	○	○	○
Description	The principal advantage of preserving natural vegetation is protecting desirable trees, vines, bushes and grasses from damage during project development. Vegetation provides erosion control, storm water detention, biofiltration and aesthetic values to a site during and after construction activities. Any existing vegetation should be saved unless it is determined to be invasive or otherwise harmful.				
Selection	Designers should be aware of and respond to local climate and other conditions, including project scheduling, that might influence the use of natural vegetative stabilization measures. Before clearing activities begin, clearly mark the vegetation that is to be preserved. Prepare a site map with the locations of trees and boundaries of environmentally sensitive areas and buffer zones to be preserved. Plan the location of roads, buildings and other structures to avoid these areas. This requires careful site management to minimize the impact of construction activities on existing vegetation. Protect large trees near construction zones because damage during construction activities could result in reduced vigor or death after construction has ceased. Extend and mark the boundaries around contiguous natural areas and tree drip lines to protect the root zone from damage.				
Maintenance	Even if workers take precautions, some damage to protected areas might occur. If this happens, repair or replace damaged vegetation immediately to maintain the integrity of the natural system. When planning for new vegetation, choose kinds that enhance the existing vegetation. Ensure that new structures do not harm protected areas.				

Feasibility symbols:

○ Widely feasible
✪ Feasible only with major design adaptation
□ Might be feasible in certain situations
■ Infeasible and not recommended

Temporary Vegetative Buffer Strip

Construction BMP	Alaskan climatic regions				
	Coastal	Southcentral	Western	Interior	Arctic
Temporary Vegetative Buffer Strip Feasibility	○	○	○	○	○
Description	Temporary vegetated buffer strips are areas of natural or established vegetation maintained to protect the water quality of neighboring areas. Buffer strips slow storm water runoff, provide an area where runoff can permeate the soil, contribute to groundwater recharge and filter sediment. Slowing runoff also helps to prevent soil erosion and streambank collapse.				
Selection	Temporary vegetated buffers can be used in any area able to support vegetation. They are most effective and beneficial on floodplains, near wetlands, along streambanks and on unstable slopes. Jurisdictional wetlands cannot be used as vegetated buffer strips unless permitted by the COE.				
Implementation	• Make sure soils are not compacted. • Make sure slopes are less than 5 percent unless temporary erosion control mats are also used. • Determine buffer widths after carefully considering slope, vegetation, soils, depth to impermeable layers, runoff sediment characteristics, type and amount of pollutants, and annual rainfall. • Make sure buffer widths increase as slope increases. • Intermix zones of vegetation (native vegetation in particular), including grasses, deciduous and evergreen shrubs, and understory and overstory trees. • In areas where flows are concentrated and fast, combine buffer zones with other practices such as level spreaders, infiltration areas or diversions to prevent erosion and rilling.				
Maintenance	Keeping vegetation healthy in temporary vegetated buffers requires routine maintenance. Depending on species, soil types, and climatic conditions, maintenance can include weed and pest control, mowing, fertilizing, liming, irrigating and pruning. Inspection and maintenance are most important when buffer areas are first installed. Once established, vegetated buffers do not require maintenance beyond the routine procedures and periodic inspections.				

Feasibility symbols:

○ Widely feasible
✪ Feasible only with major design adaptation
□ Might be feasible in certain situations
■ Infeasible and not recommended

Rolled Erosion Control Products

Construction BMP	Alaskan climatic regions				
	Coastal	Southcentral	Western	Interior	Arctic
Rolled Erosion Control Products Feasibility	○	○	○	○	○
Description	Rolled erosion control products (RECPs) are manufactured, long sheets or coverings that can be unrolled onto unvegetated cut or fill slopes where erosion control or soil stabilization is needed. They are used where temporary seeding and mulching alone are inadequate or where mulch must be anchored and other methods such as crimping or tackifying are infeasible.				
Selection	RECPs function best in providing a protective cover on slopes and channels where the erosion hazard is high and plant growth is likely to be slow, generally on slopes stepper than 3H:1V and greater than 10 feet of vertical relief.				
Implementation	• Follow the manufacturer's recommendations for installation. • RECPs must be anchored; spacing depends on type of material and slope steepness. • Maintain a firm continuous contact between the RECP and soil to prevent erosion below the RECP.				
Maintenance	When RECPs have been installed and anchored properly, little additional maintenance is required during the first few months. After high winds or significant rainstorms have occurred, check the RECP areas for adequate cover and repair if necessary. The RECP must last until vegetation develops to provide an erosion-resistant cover. After any damaged slope or drainage course has been repaired, reinstall the material. • Check that surfaces adhere, fasteners remain secure and covering is in tight contact with the soil surface beneath. • After significant rainstorms, check for erosion and undermining and repair promptly. • Look for and repair washouts.				

Feasibility symbols:

○ Widely feasible
✪ Feasible only with major design adaptation
□ Might be feasible in certain situations
■ Infeasible and not recommended

Brush Barrier

Construction BMP	Alaskan climatic regions				
	Coastal	Southcentral	Western	Interior	Arctic
Brush Barrier Feasibility	○	○	○	○	□
Description	Brush barriers are perimeter sediment control structures constructed of material such as small tree branches, root mats, stone or other non-erodible debris left over from site clearing and grubbing. Brush barriers can be covered with a filter cloth to stabilize the structure and improve barrier efficiency.				
Selection	The drainage area for brush barriers must be no greater than 0.25 acre per 100 feet of barrier length. In addition, the drainage slope leading down to a brush barrier must be no greater than 2:1 and no longer than 100 feet. Brush barriers have limited usefulness because they are constructed of materials that decompose.				
Implementation	It is recommended that brush barriers be covered with a filter fabric barrier to hold the material in place and increase sediment barrier efficiency. The barrier mound should be at least 3 feet high and 5 feet wide at its base. Material with a diameter larger than 6 inches should not be used, because this material might be too bulky and create void spaces where sediment and runoff will flow through the barrier. The edge of the filter fabric cover should be buried in a trench 4 inches deep and 6 inches wide on the drainage side of the barrier. This is done to secure the fabric and create a barrier to sediment while allowing storm water to pass through the water-permeable filter fabric. The filter fabric should be extended just over the peak of the brush mound and secured on the down-slope edge of the fabric by fastening it to twine or small-diameter rope that is staked securely. Install the brush barrier parallel to the contour of the slope and without gaps that would allow runoff to bypass the barrier.				
Maintenance	Inspect brush barriers according to the schedule specified in the SWPPP to ensure their continued effectiveness. If channels form through void spaces, reconstruct the barrier to eliminate the channels. Accumulated sediment should be removed from the uphill side of the barrier when sediment height reaches between one-third and one-half the height of the barrier. When the entire site has reached final stabilization, remove the brush barrier and dispose of it properly.				

Feasibility symbols:

○ Widely feasible

✪ Feasible only with major design adaptation

□ Might be feasible in certain situations

■ Infeasible and not recommended

Straw Wattle

Construction BMP	Alaskan climatic regions				
	Coastal	Southcentral	Western	Interior	Arctic
Straw Wattle Feasibility	○	○	○	○	○
Description	Straw wattles, also called fiber rolls, consist of straw, flax or other similar materials bound into a tight tubular roll. When straw wattles are placed at the toe and on the face of slopes, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow and provide removal of sediment from the runoff. By interrupting the length of a slope, straw wattles can also reduce erosion.				
Selection	Straw wattles are appropriate for the majority of construction sites that are not more than moderately sloped. Straw wattles can be used around temporary stockpiles, down-slope of exposed soil areas, along the perimeter of a project, or as grade breaks along a slope.				
Implementation	To be effective, straw wattles must be trenched (2–4 inches deep) and staked. Similar to silt fence, straw wattles should be placed on the contour. On slopes, straw wattles should be placed at intervals depending on the degree of slope.				
Maintenance	Inspect as specified in the SWPPP. Inspect straw wattles to indentify locations that are split, torn, unraveling or slumping. Repair or replace straw wattles in those locations. Remove sediment from behind wattles when it reaches at least one-half the height of the wattle.				

Feasibility symbols:

○ Widely feasible

✪ Feasible only with major design adaptation

□ Might be feasible in certain situations

■ Infeasible and not recommended

Sediment Basin/Sediment Trap

Construction BMP	Alaskan climatic regions				
	Coastal	Southcentral	Western	Interior	Arctic
Sediment Basin/Sediment Trap Feasibility	☐	○	○	○	☐
Description	Sedimentation basins are used to remove large quantities of sediment from runoff. The basin can be designed to remove fine-grained sediments such as clays or silts as well as some chemicals. The basin can also serve an added function for runoff detention. A temporary sediment trap is a small temporary ponding area, with a rock outlet, formed by excavating below grade or by constructing an earth embankment or both. A sediment trap is a temporary structure that is used to detain runoff from small drainage areas so that sediment can settle out.				
Selection	Sedimentation basins are generally used on medium- to large-scale projects, and where sediment discharge would damage environmentally sensitive areas. Sediment traps generally are used for drainage areas less than 5 acres, and sediment basins are used for drainage areas greater than 5 acres. They should be in areas where access can be maintained for sediment removal and proper disposal. Sediment basins are required on construction site drainage areas that are 10 acres or larger, unless infeasible, in which case, equivalent smaller sediment traps must be used.				
Implementation	The sedimentation basin should be installed according to approved plans and specifications, or as required by the SWPPP. Because the facilities are customized for each project, the approved construction plans provide the best source of information on implementation. Sizing of the basins, at a minimum, should meet the ADEC CGP requirement (storage for the volume of runoff from the drainage area for at least a 2-year, 24-hour storm).				
Maintenance	Sediment should be removed from the sedimentation basin yearly or when it accumulates to a depth of one foot, or as specified in the SWPPP. For the sediment trap, remove sediment and restore the trap to its original dimensions when the sediment has accumulated to one-half its design storage capacity. If sediment impairs the function of the outlet structure, clean the trap more frequently. Rocks and washed gravel should be cleaned or replaced when they become filled with sediment. Sediment basins should be maintained to prevent their becoming a pollutant source. If sloughing or erosion of side slopes occurs, repair the sedimentation basin. • Confirm that the construction plans have been followed. • Check that sediment accumulation is within acceptable limits. • Confirm that the outlet structure is functioning properly. • Confirm that sediment is not *passing through* to the downstream end. • Check for accumulations of floating debris. • Check to ensure that the emergency overflow spillway is not obstructed.				

Feasibility symbols:

○ Widely feasible
✪ Feasible only with major design adaptation
☐ Might be feasible in certain situations
■ Infeasible and not recommended

Interception/Diversion Ditch

Construction BMP	Alaskan climatic regions				
	Coastal	Southcentral	Western	Interior	Arctic
Interception/Diversion Ditch Feasibility	○	○	✪	□	■
Description	An interception/diversion ditch is an earthen perimeter control usually consisting of a dike or a combination dike and channel constructed along the perimeter of and within the disturbed part of a site. The interception is typically accomplished with a ridge of compacted soil, often accompanied by a ditch or swale with a vegetated lining, at the top or base of a sloping disturbed area. The primary objective is to control the velocity or route (or both) of run-on water (natural surface water, drainages, storm water runoff or groundwater seeps) and to keep this cleaner run-on water away from disturbed soil and other pollutant sources.				
Selection	The decision to use an interception/diversion ditch depends on the topography of the area surrounding the construction site. When determining the appropriate size and design of an interception/diversion ditch, consider the shape and drainage patterns of the landscape. Also consider the amount of runoff to be diverted, the velocity of runoff in the diversion, and the erodibility of soils on the slope and in the diversion channel or swales.				
Installation	Construct diversion dikes and fully stabilize them before any major land disturbance begins.				
Maintenance	Inspect interception/diversion ditches as specified in the SWPPP to ensure continued effectiveness. Maintain dikes at their original height. Repair any decrease in height due to settling or erosion immediately. To remain effective, earth dikes must be compacted at all times.				

Feasibility symbols:

○ Widely feasible
✪ Feasible only with major design adaptation
□ Might be feasible in certain situations
■ Infeasible and not recommended

Rock Check Dam

Construction BMP	Alaskan climatic regions				
	Coastal	Southcentral	Western	Interior	Arctic
Rock Check Dam Feasibility	○	○	□	○	○
Description	A rock check dam is a temporary measure to protect narrow, erosion-susceptible constructed storm water drainage channels and/or reduce the sediment loads in channeled flows. Check dams are used in series and can be used as permanent measures. Outlet protection should be designed for site specific conditions. Do not install in natural waterways without a COE permit.				
Selection	Check dams can be made of a variety of materials. They are most commonly made of rock, logs, or sandbags. When using rock, the material diameter should be 2 to 15 inches. Logs should have a diameter of 6 to 8 inches. Regardless of the material used, design the check dam carefully to ensure its effectiveness. Check dams need to be properly spaced so that water ponded behind the downstream check dam reaches just above the base of the upstream check dam, like a staircase.				
Installation	Install dams as soon as drainage routes are established. Place rock by hand or mechanical means, distributing smaller rocks to the upstream side to prevent transport. The center of a check dam should always be lower than its edges.				
Maintenance	Inspect check dams as specified in the SWPPP to ensure their structural integrity. Ensure that the center of a check dam is still lower than its edges. Additional stone might be required to maintain the correct height. Check for water flowing around the side of the check dam. During inspection, remove large debris, trash, and leaves. When the sediment has reached a height of approximately one-half the original height of the dam (measured at the center), remove accumulated sediment from the upstream side of the dam. When check dams are removed, be sure to remove all dam materials to ensure proper flow within the channel. If erosion or heavy flows cause the edges of a dam to fall to a height equal to or below the height of the center, repair it immediately. In addition, before removing a check dam, remove all accumulated sediment. Remove a check dam only after the contributing drainage area has been completely stabilized. Stabilize the area from which the dam material is removed.				

Feasibility symbols:

○ Widely feasible

✪ Feasible only with major design adaptation

□ Might be feasible in certain situations

■ Infeasible and not recommended

Fuel and Hazardous Substances Handling and Storing

General Construction Site Waste Management

Construction BMP	Alaskan climatic regions				
	Coastal	Southcentral	Western	Interior	Arctic
General Construction Site Waste Management Feasibility	○	○	○	○	○
Description	Building materials and other construction site wastes must be properly managed and disposed of to reduce the risk of pollution from materials such as surplus or refuse building materials or hazardous wastes. Practices such as trash disposal, recycling, proper material handling, and spill prevention and cleanup measures can reduce the potential for storm water runoff to mobilize construction site wastes and contaminate surface or groundwater.				
Installation	**Solid Wastes:** • Designate a waste collection area on the site that does not receive a substantial amount of runoff from upland areas and does not drain directly to a waterbody. • Ensure that containers have lids so they can be covered before periods of rain, and keep containers in a covered area whenever possible. • If secondary containment is used, include a protocol in the SWPPP and train employees on disposal of accumulated precipitation. • Schedule waste collection to prevent the containers from overfilling. • Clean up spills immediately. For hazardous materials, follow cleanup instructions on the package. Use an absorbent material such as sawdust or kitty litter to contain the spill. • During the demolition phase of construction, provide extra containers and schedule more frequent pickups. • Collect, remove and dispose of all construction site wastes at authorized disposal areas. Contact a local environmental agency to identify these disposal sites. **Hazardous Materials and Wastes:** • Consult with local waste management authorities about the requirements for disposing of hazardous materials. • To prevent leaks, empty and clean hazardous waste containers before disposing of them. • Never remove the original product label from the container because it contains important safety information. Follow the manufacturer's recommended method of disposal, which should be printed on the label. • Never mix excess products when disposing of them, unless specifically recommended by the manufacturer.				

General Construction Site Waste Management *(continued)*

Installation *(continued)*	**Pesticides and fertilizers:** • Follow all federal, state and local regulations that apply to the use, handling or disposal of pesticides and fertilizers. • Store pesticides and fertilizers in a dry, covered area. • Construct berms or dikes to contain stored pesticides and fertilizers in case of spillage. • Follow the recommended application rates and methods. • Have equipment and absorbent materials available in storage and application areas to contain and clean up any spills that occur. **Petroleum Products:** • Store new and used petroleum products in covered areas, where practicable, and place within berms or dikes to contain any spills. • Immediately contain and clean up any spills with absorbent materials. • Have equipment available in fuel storage areas and in vehicles to contain and clean up any spills that occur. **Detergents:** • Use detergents only as recommended, and limit their use on the site. Do not dump wash water containing detergents into the storm drain system; direct it to a sanitary sewer or contain it so that it can be treated at a wastewater treatment plant.
Maintenance	Inspect storage and use areas and identify containers or equipment that could malfunction and cause leaks or spills. Check equipment and containers for leaks, corrosion, support or foundation failure, or other signs of deterioration, and test them for soundness. Immediately repair or replace any that are found to be defective.

Feasibility symbols:

○ Widely feasible	✪ Feasible only with major design adaptation
□ Might be feasible in certain situations	■ Infeasible and not recommended

Spill Prevention and Control

Spill Prevention and Control Plan

Construction BMP	Alaskan climatic regions				
	Coastal	Southcentral	Western	Interior	Arctic
Spill Prevention and Control Plan Feasibility	○	○	○	○	○
Description	Spill Prevention and Control Plans (SPCP) should clearly state measures to stop the source of a spill, contain the spill, clean up the spill, dispose of contaminated materials and train personnel to prevent and control future spills.				
Installation	When developing an SPCP, a construction site operator should identify potential spill or source areas, such as loading and unloading, storage, and processing areas; places where dust or particulate matter is generated; and areas designated for waste disposal. Also, evaluate spill potential for stationary facilities, including manufacturing areas, warehouses, service stations, parking lots and access roads. Conduct this evaluation during the project planning phase, and reevaluate it during each phase of construction. The SPCP should define material handling procedures and storage requirements and outline actions necessary to reduce spill potential and impacts on storm water quality. The SPCP should document the locations of spill response equipment and procedures to be used and ensure that procedures are clear and concise. The plan should include step-by-step instructions for the response to spills at a construction site.				
Maintenance	Update the SPCP regularly to accommodate any changes in the site, procedures, or responsible staff. Conduct regular inspections in areas where spills might occur to ensure that procedures are posted and cleanup equipment is readily available.				

Feasibility symbols:

○ Widely feasible
✪ Feasible only with major design adaptation
□ Might be feasible in certain situations
■ Infeasible and not recommended

Vehicle Maintenance

Vehicle Maintenance and Washing at Construction Sites

Construction BMP	Alaskan climatic regions				
	Coastal	Southcentral	Western	Interior	Arctic
Vehicle Maintenance and Washing at Construction Sites Feasibility	○	○	○	○	○
Description	Ideally, vehicle maintenance and washing occurs in garages and wash facilities, not on active construction sites. However, if these activities must occur on-site, operators should follow appropriate BMPs to prevent untreated nutrient-enriched wastewater or hazardous wastes from being discharged to surface water or groundwater. Wash water must also be prevented from causing erosion of soils and sediment discharges from the construction site.				
Installation	Inspect construction vehicles, and repair any leaks as soon as possible. Dispose of all used oil, antifreeze, solvents and other automotive-related chemicals according to manufacturer instructions. Such wastes require special handling and disposal. Used oil, antifreeze and some solvents can be recycled at designated facilities, but other chemicals must be disposed of at a hazardous-waste disposal site. In rural areas, certain materials will have to be hauled to larger communities for disposal. Local government agencies can help identify such facilities. Designate special paved areas for vehicle repair. To direct washwater to sanitary sewer systems or other treatment facilities, ensure that vehicle washing areas are impervious and are bermed. Use blowers or vacuums instead of water to remove dry materials from vehicles if possible. Because water alone can remove most dirt adequately, use high-pressure water spray without detergents at vehicle washing areas. If using detergents, avoid phosphate- or organic-based cleansers to reduce nutrient enrichment and biological oxygen demand in wastewater. Use only biodegradable products that are free of halogenated solvents. Clearly mark all washing areas, and inform workers that all washing must occur in this area. Do not perform other activities, such as vehicle repairs, in the wash area.				
Maintenance	Vehicle maintenance operations produce substantial amounts of hazardous and other wastes that require regular disposal. Clean up spills and dispose of cleanup materials as soon as possible. Inspect equipment and storage containers according to the schedule specified in the SWPPP to identify leaks or signs of deterioration.				

Feasibility symbols:

○ Widely feasible
✪ Feasible only with major design adaptation
□ Might be feasible in certain situations
■ Infeasible and not recommended

Temporary Stream Crossings Options

FGMI will survey the area of proposed stream crossing and then determine which stream crossing option to use. FGMI would avoid crossing streams when fish are spawning, incubating eggs, or migrating.
Many stream crossing options work best with a proper foundation. Logs, railroad ties, or similar abutments help level the structure. They also minimize stream bed disturbance and make removal easier.

Stream Crossing Options:

- A *culvert* is a pipe or other round or oblong object that diverts water under the crossing. Culverts work well in streams with well-defined, deep channels. Operators can install and remove them quickly. Culverts are very portable. Maintenance includes keeping culverts clear of debris.
- An *ice bridge* consists of packed snow that is iced over with water. It is useful on streams with low water flow. Operators may need to pack and ice the structure for several days to build a strong structure. Maintenance includes re-icing bridges as needed and checking bridge strength and wear during and between uses.
- A *timber bridge* is built from logs, railroad ties, demolition materials, or lumber. To build, cable the materials together and nail over them with lumber. This gives the structure stability, strength, and allows it to control sediment from passing vehicles. Maintenance includes checking bridge strength and wear during and between uses.
- A *ford* is a crossing in which vehicles drive directly through the stream. Use fords only when crossing infrequently or for short periods. Clean rock on top of geotextile can strengthen the ford and the approaches leading up to it.

  Fords may be suitable for low levels of traffic in streams with low flow. The streambed must be able to support the weight of traffic. Local authorities may let operators remove weak soils and replace them with woven geotextile covered with stable fill materials such as gravel. The streambed should contain rock or coarse gravel capable of supporting equipment. Place the ford where the stream is straight. Choose an area where the banks are less than 4 feet high with natural, gentle slope. The finished graded slope from road to stream should not exceed 5h:1v. When building a ford, maintain the natural level of the streambed to let fish pass over the crossing. Keep vehicles constructing and using the ford in good condition to minimize water pollution. Obtain permission to replace weak soils. Use rock or coarse gravel and place on top of geotextile to strengthen and stabilize the streambed. Where necessary, stabilize banks and approached by placing at least 12 inches of clean material such as gravel or crushed rock over a woven geotextile. Geotextiles support the ford and separate it from the soil, making removal easier. Use temporary options such as wood mats, wood panels or pallets, and expanded metal grating to stabilize approaches. Install lead-off ditches or water bars on trails approaching streams to divert water into vegetation away from stream. Reseed bank cuts right away to keep them from eroding into the stream. Remove any temporary surfacing materials used on the approaches when the ford is no longer being used. Fords require very little maintenance. Operators can install them relatively quickly in most cases.