Environmental Assessment

Palmer Exploration Project
Constantine North, Inc.
Case File: AA-094088

DOI-BLM-AK-A020-2016-006-EA

Glennallen, Alaska

August 18, 2016

U.S. Department of the Interior
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Acronyms

Term	Definition
4WD	4-wheel-drive
AAC	Alaska Administrative Code
ACEC	area of critical environmental concern
ACS	U.S. Census Bureau American Community Survey
ADCCED	Alaska Department of Commerce, Community, and Economic Development
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish & Game
ADL	Alaska Division of Land
ADNR	State of Alaska, Department of Natural Resources
ADOT&PF	Alaska Department of Transportation and Public Facilities
AFFID	Alaska Freshwater Fish Inventory Database
AHEA	Alaska Hardrock Exploration Application
ANCSA	Alaska Native Claims Settlement Act
ANILCA	Alaska National Interest Lands Conservation Act
ANSI	American National Standards Institute
ANVSA	Alaska Native Village Statistical Area
APE	area of potential effect
APMA	Application for Permits to Mine in Alaska
ARD	acid rock drainage
ARLIS	Alaska Resources Library and Information Services
AS	Alaska Statutes
ATV	all-terrain vehicle
AWC	Anadromous Waters Catalog
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
BMP	best management practice
CDP	census-designated place
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulation
cfs	cubic feet per second
CIA	Chilkoot Indian Association
CIV	Chilkat Indian Village
Constantine	Constantine North, Inc.
DO	dissolved oxygen
DSM	digital surface model
EA	environmental assessment
EO	Executive Order
EPS	economic profile system
ESA	Endangered Species Act
et seq.	and what follows (used in page references: “see Volume 2, p. 4 et seq.”
FLPMA	Federal Land Policy Management Act
FR	Federal Register
GIS	geographic information system
GMU	game management unit
ICP	induced coupled plasma
IFSAR	Interferometric Synthetic Aperture Radar
LUP Handbook	BLM’s *Land Use Planning Handbook*

Term	Definition
MBTA	Migratory Bird Treaty Act
mg/L	milligrams per liter
MOU	memorandum of understanding
MPA	maximum potential acidity
MSHA	Mine Safety and Health Administration
n.d.	no date
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NNP	net neutralization potential
Notice	approved notice of mineral exploration operations (J145690)
NOAA	National Ocean and Atmospheric Administration
NP	neutralization potential
NPFMC	North Pacific Fisheries Management Council
NRCS	Natural Resources Conservation Service
NSF	NSF International
NSRAA	Northern Southeast Regional Aquaculture Association
NTU	nephelometric turbidity units
OHA	Alaska Office of History and Archaeology
OHV	off-highway-vehicle
PFYC	Potential Fossil Yield Classification
P.L.	Public Law
Plan	plan of operations
Preserve	Alaska Chilkat Bald Eagle Preserve
Project	Palmer Exploration Project
PVC	polyvinyl chloride
RC	reverse circulation
RMP	resource management planning
ROP	Bureau of Land Management required operating procedure
SEAK	southeast Alaska
SHPO	State Historic Preservation Office
SPCC	spill prevention control and countermeasure plan
State Forest	Haines State Forest Resource Management Area
SUD	special use designation
SUV	sports utility vehicle
SWPPP	stormwater pollution prevention plan
TPS	technical paper series
TSS	total suspended solids
Trust	Alaska Mental Health Trust Authority
TWC	Takshanuk Watershed Council
TWUA	State of Alaska Temporary Water Use Authorization
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USCB	U.S. Census Bureau
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VMS	volcanogenic massive sulfide
VRM	visual resource management
WSRA	Wild and Scenic Rivers Act

Chapter 1: Introduction

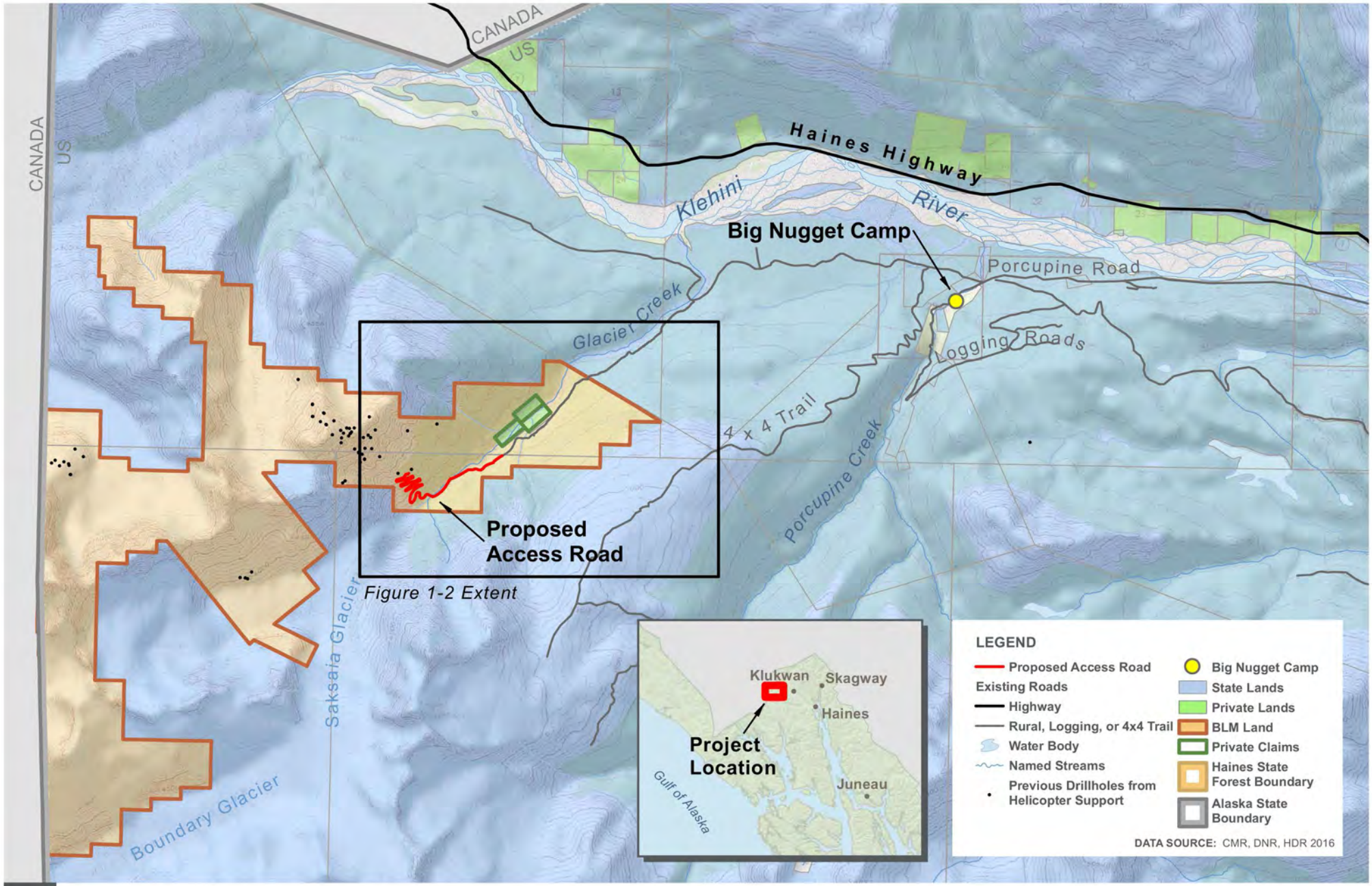
1 Introduction

1.1 Summary of Proposed Project

Constantine North Inc. (Constantine) proposes to expand exploration activities at the Palmer Exploration Project (Project) located 34 miles northwest of Haines, Alaska, on public lands administered by the Bureau of Land Management (BLM) Glennallen Field Office. The Project is located in Sections 19, 29, 30, 31, 32, 33, 34, 35 and 36, Township 28 South, Range 53 East; Sections 1, 2, 3, 10, 11, 12, 14, 15 and 22, Township 29 South, Range 53 East; and Sections 4, 5, 6, Township 29 South, Range 54 East, Copper River Meridian.

The Federal mining claims are on the eastern margin of the Saint Elias mountain range. The western boundary of the Project is coincident with the international border and the province of British Columbia, Canada. The Project is accessed by traveling northwest from Haines on the Haines Highway, then turning south on the Porcupine Road (at 26 mile Porcupine Crossing) and traveling west approximately 10 miles to the Project area. **Figure 1-1** on page 1-2 shows the Project location, access, and land status.

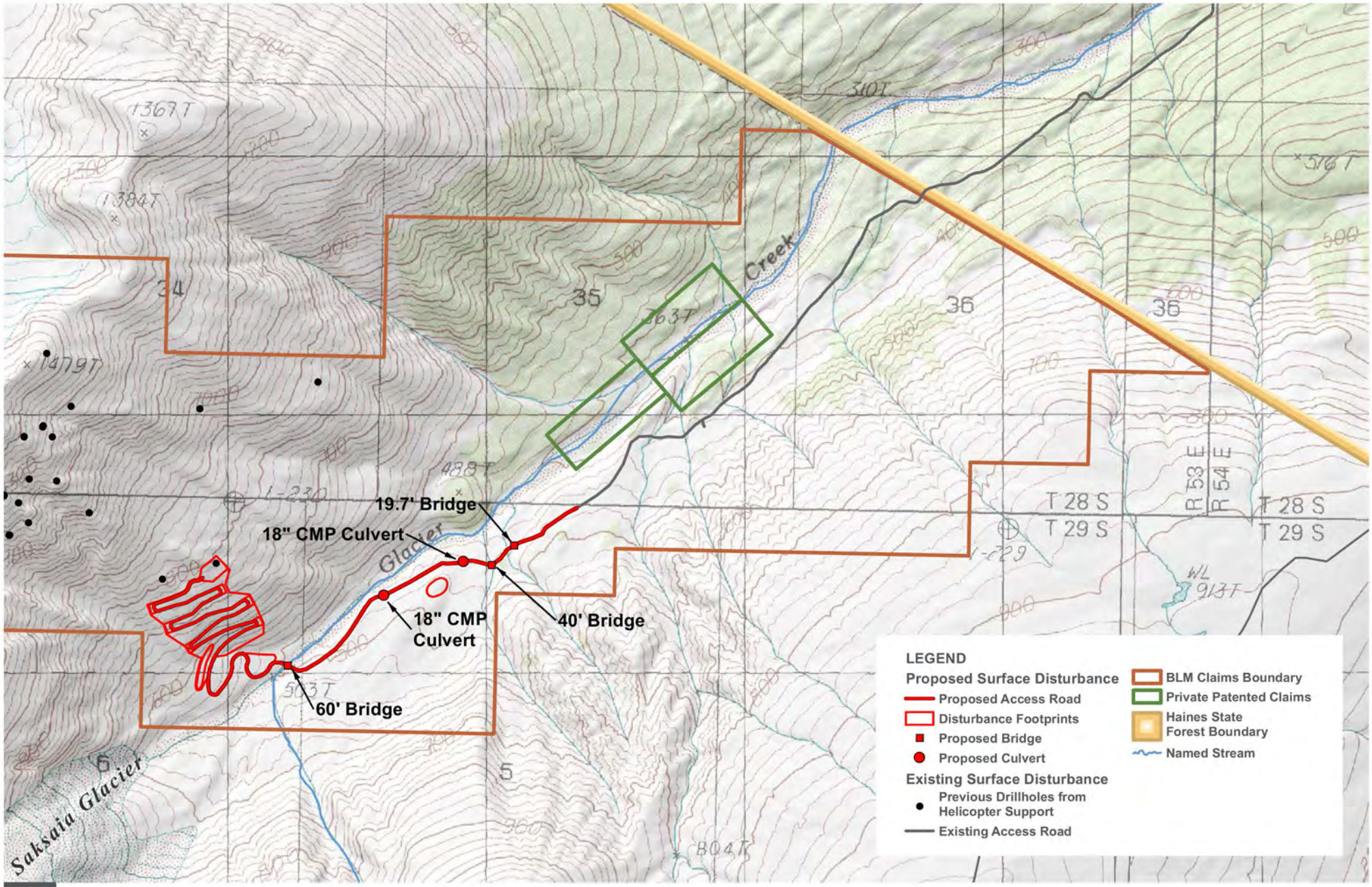
Constantine is requesting an expansion of their existing Notice of Mineral Exploration Operations (Notice), through the use of a plan of operations that would create an estimated 35.9 acres of new surface disturbance over 5 years. **Figure 1-2** on page 1-3 shows the location of existing and proposed Project features.



PALMER PROJECT

ACCESS AND LAND STATUS

FIGURE 1-1



0 Feet 2,000 Contour Interval = 20m

PALMER PROJECT

EXISTING AND PROPOSED SURFACE DISTURBANCE

FIGURE 1-2

The Project consists of a contiguous block of land consisting of 340 Federal, unpatented lode mining claims, which cover an area of approximately 6,765 acres. The BLM claims with proposed surface disturbance for all project activities that include drilling-only disturbance are listed in **Table 1-1** below. Those with road and drilling disturbance are listed in **Table 1-2** on page 1-6. Those with road-only disturbance are listed in **Table 1-3** on page 1-6. Constantine proposes potential disturbance on 111 claims, including 10 claims for road disturbance and the remainder for potential disturbance associated with drilling.

Table 1-1. BLM Claims with Proposed Surface Disturbance: Drilling-only Disturbance

Claim Name	BLM Number
# 1 OF MARMOT MINE	AA27186
# 2 OF MARMOT MINE	AA27187
# 3 OF MARMOT MINE	AA27188
# 4 OF MARMOT MINE	AA27189
M.V.P. MINING CLAIMS #1	AA27190
M.V.P. MINING CLAIMS #1	AA27191
MARMOT #5	AA27192
MARMOT #6	AA27193
MARMOT #7	AA27194
MARMOT #8	AA27195
MARMOT #9	AA27196
MARMOT #10	AA27197
MARMOT #101	AA27213
MARMOT #102	AA27214
MARMOT #103	AA27215
MARMOT #104	AA27216
MARMOT #110	AA27222
MARMOT #111	AA27223
MARMOT #113	AA27225
MARMOT #116	AA27228
MARMOT #117	AA27229
MARMOT #125	AA27237
RAT DAWG #43	AA29575
RAT DAWG #44	AA29576
RAT DAWG #53	AA29577
RAT DAWG #54	AA29578
RAT DAWG #55	AA29579
RAT DAWG #56	AA29580
RAT DAWG #57	AA29581
RAT DAWG #58	AA29582
RAT DAWG #64	AA29583
RAT DAWG #65	AA29584
RAT DAWG #66	AA29585
RAT DAWG #67	AA29586

Claim Name	BLM Number
RAT DAWG #68	AA29587
RAT DAWG #75	AA29588
RAT DAWG #76	AA29589
RAT DAWG #77	AA26590
RAT DAWG #85	AA26591
RAT DAWG #86	AA26592
RAT DAWG #87	AA26593
“HOT DAWG” #21	AA51594
“HOT DAWG” #22	AA51595
“HOT DAWG” #23	AA51596
“HOT DAWG” #24	AA51597
“HOT DAWG” #25	AA51598
“HOT DAWG” #26	AA51599
“HOT DAWG” #27	AA51600
“HOT DAWG” #28	AA51601
KIC #4	AA51561
KIC #5	AA51562
KIC #6	AA51563
KIC #12	AA51569
KIC #13	AA51570
KIC #14	AA51571
MARMOT CLAIM #24	AA27202
MARMOT CLAIM #25	AA27203
MARMOT CLAIM #26	AA27204
MARMOT CLAIM #27	AA27205
MARMOT CLAIM #28	AA27206
MARMOT CLAIM #29	AA27207
MARMOT CLAIM #30	AA27208
MARMOT CLAIM #31	AA27209
MARMOT #32	AA27210
MARMOT #33	AA27211
MARMOT CLAIM #20	AA27198
MARMOT CLAIM #21	AA27199
MARMOT CLAIM #22	AA27200
MARMOT CLAIM #23	AA27201
“ICE” #44	AA51520
“ICE” #45	AA51521
“ICE” #46	AA51522
“ICE” #54	AA51528
“ICE” #55	AA51529

Claim Name	BLM Number
“ICE” #60	AA51532
“ICE” #65	AA51537
“ICE” #66	AA51538
“ICE” #67	AA51539
“ICE” #68	AA51540
“ICE” #69	AA51541
“ICE” #70	AA51542
MARMOT HOLE #4	AA52948
MARMOT HOLE #7	AA52951
Clay #37	AA52671
Clay #38	AA52672
Boundless #1	AA52973
Boundless #2	AA52974
Boundless #3	AA52975
Boundless #4	AA52976
Clay #59	AA52693
Clay #60	AA56694
Boundless #9	AA52981
Boundless #10	AA52982
Boundless #11	AA52983
Boundless #12	AA52984
Boundless #22	AA52994
Boundless #23	AA52995
Boundless #24	AA52996
Boundless #25	AA52997
Boundless #26	AA52998
Boundless #27	AA52999

Table 1-2. BLM Claims with Proposed Surface Disturbance: Road and Drilling Disturbance

Claim Name	BLM Number
MARMOT #112	AA27224
MARMOT #118	AA27230
MARMOT #119	AA27231
MARMOT #121	AA27233
MARMOT #122	AA27234
MARMOT #124	AA27236

Table 1-3. BLM Claims with Proposed Surface Disturbance: Road-only Disturbance

Claim Name	BLM Number
MARMOT #106	AA27218
MARMOT #114	AA27226
MARMOT #115	AA27227
MARMOT #120	AA272232

1.2 Background

Currently, under Notice-level exploration, the BLM has authorized Constantine for up to 5 acres of ground disturbance to carry out exploratory activity under a Notice (Serial #AA-094088 and Alaska Hardrock Exploration Application (AHEA) (Application for Permits to Mine in Alaska [APMA] # J145690/Serial # AA-081333). Existing exploration activity is supported by helicopter transport of drills, timber, equipment, and personnel from Big Nugget camp to drill sites. Exploration drilling is performed by portable drill rigs set on temporary timber-frame drill pads.

Constantine has submitted to the BLM the *Palmer Exploration Project Exploration Plan of Operations* (Plan; Constantine 2015) that would expand their existing exploration disturbance beyond the limits of their current permit. The Plan requires further public, stakeholder, and agency review, including a National Environmental Policy Act (NEPA) analysis.

The Proposed Action would provide Constantine with reasonable and safe access to Federal mining claims, which are located on steep, rocky terrain. The proposed exploration road would provide access for ground-supported exploration activities, and air-supported exploration, and environmental and geotechnical studies in the main mineral resource area by creating a nearby staging area for helicopter. The proposed proximity of the staging area to exploration activities provides increased safety for Constantine personnel and contractors and shorter helicopter flights transporting personnel, equipment, fuel and supplies. Access to the north side of Glacier Creek and lower regions of the Project area provides an additional safety measure for personnel when weather conditions prohibit helicopter use.

1.3 Purpose and Need

The purpose and need statement for an externally-generated action describes the BLM's purpose and need, not that of the applicant (40 Code of Federal Regulations [CFR] 1502.13). It is the BLM action that triggers the NEPA analysis; the purpose and need for action dictates the range of alternatives and provides a basis for the rational for eventual selection of an alternative in a decision.

The need is to provide Constantine safe access for expanded exploration on Federal mining claims. The purpose of the BLM's action is to authorize the road access (including bridges/culverts), staging area, and drill sites for exploration and baseline characterization at the Project in a manner that satisfies the Performance Standards contained in 43 CFR § 3809.420 and prevents unnecessary or undue degradation (43 CFR § 3809.411(d)(2)).

The BLM's action is to approve, approve with changes, or disapprove Constantine's proposed Plan. The General Mining Law of 1872, as amended (30 U.S. Code [USC] 2), the Federal Land Policy Management Act (FLPMA); and the 2008 BLM *Ring of Fire Resource Management Plan* establish the need for BLM's action.

If approved, the BLM will also decide under what terms and conditions the Plan and operator may proceed. The BLM's decision, which could include modifying the Plan or conditions of approval, is based on the following:

1. The ability of the operation/plan to meet the performance standards specified in 43 CFR § 3809.420.
2. The prevention of unnecessary or undue degradation of public lands.

The 2012 BLM *Surface Management Handbook* (H-3809-1) defines "unnecessary or undue degradation" as the

> *…[result] from conditions, activities, or practices that (1) fail to comply with one or more of the following: the performance standards in 43 CFR 3809.420, the conditions of an approved Plan of Operations, operations described in a complete Notice, and other Federal and state laws for environmental and cultural resource protection; (2) are not reasonably incident to prospecting, mining, or processing; or (3) fail to attain a stated level of protection or reclamation required by law in such areas as the CDCA, wild and scenic rivers, BLM-administered portions of the National Wilderness Preservation System, and BLM-administered national monuments and national conservation areas.".*

1.4 Land Use Plan Conformance

Several land and resource management plans are relevant to the Project area, including the *Ring of Fire Resource Management Plan* (BLM 2008a) and the *Haines Borough 2025 Comprehensive Plan* (Haines Borough 2012). Both of these plans recognize mineral exploration and mining activities as important uses of the land and resources within the Project area. Adjacent lands include those managed by the *Haines State Forest Management Plan* (ADNR 2002a) and the surface and mineral estate owned and managed by the Alaska Mental Health Trust Authority (Trust). The Trust is mandated to generate revenue from their lands to support Mental Health Trust programs and the Trust lands adjacent to the Project area were selected specifically for their potential to generate revenue from minerals.

1.4.1 Bureau of Land Management - Ring of Fire Management Plan

The BLM currently manages Federal lands located within the Project area. The major Federal law governing locatable minerals is the Mining Law of 1872, which declared all valuable mineral deposits in lands belonging to the United States to be free and open to exploration and purchase. The BLM's 2008 *Ring of Fire Management Plan* describes the mineral potential within the Project area. The Project area falls within the Haines Planning Block, which is included in the subsequent *Ring of Fire: Draft Resource Management Plan Amendment* (BLM 2012a), but is outside areas of proposed special land use designation.

The specific management decisions from the *Ring of Fire Resource Management Plan* that pertain to this Project include the following:

- **Cultural Resources**
  - *B-1: Goal*

    Preserve key cultural properties listed on the National Register of Historic Places.
  - *B-2: Management Action*

    1. Manage all cultural properties within BLM-managed lands in the planning area for their scientific use (preserved until their research potential is realized).
    2. Manage actions which may impact cultural resources in compliance with the National Historic Preservation Act (NHPA) Sections 106 and 110.

- **Fisheries**
  - *C-1: Goal*

    Maintain and protect fish habitat on public lands and provide for the habitat needs of the fish resources necessary to maintain or restore such populations and to ensure the continued public use, economic and subsistence use of such resources.
  - *C-2: Objective*

    Fish habitat will be managed to meet the goals of the Alaska Department of Fish and Game (ADF&G) management plans, consistent with the master memorandum of understanding (MOU) between the BLM and ADF&G (Appendix K of the proposed resource management plan/final environmental impact statement: http://www.blm.gov/style/medialib/blm/ak/aktest/planning/ROF_proposed_rmp_final_eis.Par.58896.File.pdf/rf_apndxK.pdf) and the current decisions related to Title VIII of Alaska National Interest Lands Conservation Act (ANILCA).
  - *C-3: Management Action*

    1. Support the continued monitoring and assessment of riparian areas in order to develop a baseline used to support maintenance and restoration projects.
    2. Consider all other resource uses and cooperate with other Federal agencies and the state in identifying the need for relocation, closure, or maintenance of off-highway-vehicle (OHV) trails in order to avoid key fish habitat features.
    3. Identify waters on BLM lands that support anadromous fish for inclusion into the ADF&G anadromous waters catalogue.
    4. Identify Federal submerged lands on BLM-managed lands within the Ring of Fire planning area for Federal subsistence priority uses.

- **Hazardous Materials**
  - *G-1: Goal*

    Ensure that all activities occurring on BLM-managed lands within the planning area comply with Federal and state hazardous materials standards and that all Federal and state mandates, laws, regulations, Executive Orders (EOs) and policies are met.

- *G-2: Management Action*

  1. Adverse effects resulting from past hazardous materials management on BLM-managed lands within the planning area will be mitigated subject to the availability of funds.
  2. The BLM will prevent creation of new hazardous material sites through the implementation of best management practices (BMPs) for all permits, leases, rights-of-way, and mining claims and will include pollution prevention measures in all of its authorizations.
  3. The BLM will coordinate and consult with the appropriate regulatory agencies for all cleanup plans and will notify and coordinate hazardous materials activities with specific Native corporations on Native selected lands.

- **Minerals - Locatable and Saleable**
  - *L-1: Goal*

    Manage the lands within the planning to provide opportunities for mineral exploration and development in a manner that prevents undue and unnecessary degradation resulting from the development of locatable and saleable minerals.

  - *L-2: Allocations*

    Approximately 486,000 acres of unselected lands would be available for mineral entry. Selected lands would become available upon the relinquishment or rejection of the selection.

  - *L-3: Management Actions*
    - **L-3a:** All mining of locatable minerals will be subject to the surface management regulations found in 43 CFR 3809.
    - **L-3b:** Surface occupancy will be limited to uses incident to the mining operation per 43 CFR 3715.
    - **L-3c:** Bonding of the operation may be required according to BLM policy.
    - **L-3d:** Specific measures to minimize surface effects and to rehabilitate the area found in the required operating procedures (ROPs) and stipulations will apply as appropriate.
    - **L-3e:** All mining operations will file a plan of operations, which must be approved prior to mining operations beginning.

- **Paleontology**
  - *N-1: Goal*

    Protect and preserve important Paleontological resources within the planning area.

- *N-2: Management Actions*

  Actions that may impact paleontological resources will comply with NEPA, FLPMA, the Antiquities Act, the Federal Cave Resources Protection Act, and the ROPs, stipulations, and standard lease terms intended to mitigate adverse effects to the resource.

- **Soils**
  - *Q-1: Goal*

    Manage and maintain soils to promote healthy, sustainable and fully functioning ecosystems that support a wide range of public values and resources.
  - *Q-2: Management Actions*
    - **Q-2a:** Consider the soils types during the analysis of proposals and mitigate as necessary.
    - **Q-2b:** Assign ROPs and stipulations as appropriate on a case-by-case basis to project proposals to mitigate impacts of compacting of soils, erosion, and slumping of the soils.
- **Vegetation**
  - *S-1: Goal*

    The BLM will take action to minimize impacts on vegetation, and to promote healthy, sustainable, fully functioning ecosystems by maintaining plant communities that support a wide range of public values and uses. Management will be conducted to prevent the spread of invasive plant species including noxious weeds.
  - *S-2: Management Actions*

    Authorized activities will comply with the numerous protective measures for vegetation identified in the ROPs, stipulations, and standard lease terms.

- **Visual Resources**
  - *T-1: Goal*

    Manage visual resources consistent with the multiple use objectives for visual resource management (VRM) classes and the classifications.
  - *T-2: Management Actions*
    - **T-2a:** Manage the Lake Carlanna Municipal Watershed and the Halibut Cove Forest Study Area as VRM Class II.
    - **T-2b:** Manage the Neacola Mountains area of critical environmental concern (ACEC) as VRM Class II.
    - **T-2c:** Manage all other BLM-managed lands within the planning area as VRM Class IV.

- **Water Resources**
  - *U-1 Goal*

    Promote healthy ecosystems and ensure that the activities occurring on BLM lands within the planning area comply with the Federal and state water quality standards.
  - *U-2: Management Actions*
    - **U-2a:** Through management of the water resource and protection of the aquatic habitat, the BLM will support the health objectives of the fisheries program and the recreation program by protecting the water resource.
    - **U-2b:** Require that permittees perform mitigation for all activities that may result in accelerated soil erosion.

- **Wetlands/Riparian**
  - *V-1 Goal*

    Minimize destruction, loss or degradation of wetlands and riparian areas. Preserve and enhance natural and beneficial values. Desired ecological conditions and attainment guidelines are outlined in BLM Instructional Memorandum No. AK 2004-023, Alaska Statewide Land Health Standards (BLM 2004b).

- **Wildlife**
  - *X-1: Goals*

    Manage wildlife habitat to meet BLM's Alaska Statewide Land Health Standards and the ADF&G goals consistent with the master MOU (Appendix K of the proposed resource management plan/final environmental impact statement);

    Maintain or enhance wildlife habitat to sustain or increase populations;

    Perpetuate diversity and abundance of waterfowl by managing wetlands and other habitat and provide suitable habitat for birds of prey through conservation of essential habitat;

    Provide for the continued opportunity for subsistence uses on public lands in compliance with Title VIII of ANILCA.

    Manage to ensure actions are consistent with the requirements of Federal threatened and endangered species mandates.
  - *X-2: Management Actions*

    Within budgetary constraints the BLM will, in cooperation with the ADF&G:

    Conduct habitat assessments for game species with priorities assigned to areas suggested by the Federal Subsistence Game Board;

    Establish and monitor breeding bird survey transects, in conjunction with the protocols established by the interagency Partners in Flight initiatives;

Through the NEPA process, ensure that the authorized activities within the planning area are consistent with the conservation needs of BLM Alaska's special status species and that actions do not contribute to the listing of any species.

1.4.2 Haines Borough Comprehensive Plan

The Project area is located within the administrative boundaries of the Haines Borough. The *Haines Borough 2025 Comprehensive Plan* (Haines Borough 2012) acts as a guide for citizens and civic decision makers concerning land use, growth and development, and the enhancement of the quality of life for residents and visitors to the community. The Haines Borough region has a rich history of mining, and the comprehensive plan highlights mining as an important sector to the local economy:

- Goal 10 of the comprehensive plan is to "Support responsible development of renewable and nonrenewable resources within Haines Borough."
- Economic Development Objective 10A of the comprehensive plan is to "Work with project developers and regulators to achieve responsible development, which is defined as complying with environmental regulations, ensuring fishery resource and riparian zone protection, providing protection of salmon habitat and Bald Eagle Preserve resources, maintaining scenic view sheds, and buffering operations when needed to protect adjacent users and activities."
- The land use designation for the Project area is resource development, which is defined where "resource development, extraction or harvest activities occur or are reasonably expected, including uses such as timber harvest, mineral extraction and quarries. Electrical generation and transmission lines may be here. Resource development is a primary land use here. Depending upon the location, it may be important to pay attention to view shed protection or buffer nearby trails."

1.4.3 Haines State Forest Management Plan

Alaska Statutes (AS) 41.15.300—41.15.330 established the Haines State Forest Resource Management Area (State Forest), and AS 41.21.610—41.21.630 established the Alaska Chilkat Bald Eagle Preserve (Preserve), which is surrounded by the Haines State Forest Resource Management Area. The Project is adjacent and outside of the State Forest and Preserve.

The *Haines State Forest Management Plan* allows for multiple uses, including timber harvest, recreation, mining, traditional uses, fish and wildlife habitat protection, tourism, and others. The type, intensity, and location of these uses was, under AS 38.04.005, to be derived from a planning process that would determine the best balance of these uses. In contrast, the Preserve has "exclusive use" management intent. Its management focuses on the protection of bald eagles and their associated habitat, as well as the spawning and rearing areas of the anadromous fish streams that provide food for the bald eagle population. The traditional lifestyle of the Haines community is recognized as an important value and its continuation is included in the management of the Preserve.

1.5 Other Applicable Laws, Regulations, and Policies

The Proposed Action would be subject to various laws, regulations, and acts, including but not limited to the following:

- National Environmental Policy Act (NEPA) as amended Public Law (P.L. 94-52, 94-83, 97-258, section 4(b)
- Wild and Scenic Rivers Act of 1968 (WSRA) as amended P.L. 98-444, 98 Stat. 1714, 99-663, 100 Stat. 4294,
- Alaska National Interest Lands Conservation Act of 1980 (ANILCA)
- Federal Land Policy Management Act of 1976 (FLPMA) as amended P.L. 94-579, 90 Stat 2743, 43 USC 1701
- Clean Air Act (Air Pollution Control Act; July 14, 1955), 42 USC 7401 et seq., as amended by P.L. 101-549, 104 Stat. 2399
- Clean Water Act, as amended P.L. 92-500 and amended, 33 USC 1251 et seq.
- National Historic Preservation Act of 1966, P.L. 89-655, 80 Stat 915, 16 USC 470, 1966 U.S. Code Cong. And Ad. News 3855; amended; P.L.s 91-243, 93-54, 94-422, 94-458, 96-244 and 96-515
- Endangered Species Act (ESA, 16 USC35 §§1531 et seq. 1988
- Executive Order 12898 (59 Federal Register [FR] 32. 1994
- 43 Code of Federal Regulations Subpart 3715 – Use and Occupancy Under the Mining Laws

Constantine's proposed Plan may also require a site-specific 404 Permit or a General Permit (GP 88-02N) from the U.S. Army Corps of Engineers and a Temporary Water Use Authorization or a Water Right from the State of Alaska, Department of Natural Resources (ADNR).

1.6 Summary of Public Involvement

On November 30, 2015, the BLM published the following notice of Constantine's filed Plan for public review to statewide public media:

http://www.blm.gov/ak/st/en/info/newsroom/2015/november/BLM_Invites_Public_Comment_Constantine_Metal_ResourcesLtd_New_Mining_PO_11302015.html

Chilkat Valley News, *Juneau Empire*, and KHNS-FM radio serving Haines, Skagway and Klukwan, ran the notice. The BLM also published notice on the BLM's ePlanning website platform:

https://eplanning.blm.gov/epl-front-office/eplanning/projectSummary.do?methodName=renderDefaultProjectSummary&projectId=54990

December 1, 2015, the BLM issued a public notice, via postal mail and e-mail, to stakeholders on its current public notice list, and to media outlets, city, state and federal agencies, conservation groups, native villages and corporations, mining groups, and elected officials. The BLM accepted public comment on the plan pursuant to 43 CFR 3809.432(a). The BLM received a total of 173 comments during the public comment period, which began on December 2, 2015, and ended January 8, 2016.

The environmental assessment (EA) was made available to the public for review for 30 days on this same platform from April 27 through May 26, 2016. A total of 58 unique comments were submitted and responded to in the project decision document.

1.7 Issues Identified/Issues Eliminated from Further Analysis

Internal and external scoping revealed the following elements were not considered to be a key issue (issue that would drive an alternative) but are important for providing the Responsible Official and the public with complete information about the effects of the project:

- **Water Quantity and Quality (Surface Water and Groundwater)**
  - How will drilling fluids or drilling waste water from this project affect water quality?
  - How will construction of the road and bridge and operation of the project affect water quality?
  - How will the rock stockpiles from this project affect water quality?
  - How will the project affect water quantity?
- **Wetlands**
  - How will the project affect wetlands and other waters of the U.S. regulated by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act of 1899?
- **Fisheries**
  - Will the construction of this project eliminate, modify or degrade resident or anadromous fish habitat?
  - Will the operation and maintenance of this project eliminate, modify, or degrade resident or anadromous fish habitat?
  - How will the construction and operation of this project indirectly affect resident or anadromous fish habitat?
  - How will the project affect subsistence, recreational, sport and commercial fisheries?
- **Vegetation/non-native invasive species**
  - How will the project affect establishment of non-native, invasive plant species in the area?
  - How will the project affect rare plants and riparian habitat?

- **Wildlife**
  - How will the project affect wildlife and wildlife habitat, particularly big game species that are valuable for hunting/trapping, subsistence, or wildlife viewing?
  - How will the project have an affect on the Chilkat River Bald Eagle Preserve?
  - How will the project affect special status species, including BLM sensitive species, State of Alaska species of greatest conservation need, or birds protected by the Migratory Bird Treaty Act or Bald and Golden Eagle Protection Act?
  - How will the project indirectly affect the distribution or migration of species for subsistence purposes?
- **Geology/Soils/Hazards**
  - How will the project affect geology, soils and natural hazards in the project area?
- **Socioeconomics**
  - How will the project affect the economy of the Haines Borough and local communities including employment opportunities and income, as well as revenue?
  - What social affects will the project have on communities within the Haines Borough including community services, community cohesion, and cultural identity?
- **Environmental justice**
  - Will the project result in disproportionately high human health or environmental effects on minority or low income populations or tribes?
- **Public Health and Safety**
  - How will the project (extended road access and shortened helicopter transport time) affect the health and safety of personnel working on the Project?
- **Visual Resources**
  - How will constructing and using a road on the mountainside affect visual resources from the Haines Highway?
  - How will developing additional drill sites affect visual resources?
- **Recreation and Access**
  - How will the project affect recreation activities and access in the area?

The following issues were identified but eliminated from further analysis for the reasons provided:

- ***Effects to Air Quality***. The BLM eliminated concerns about effects to air quality because the Proposed Action diesel engines on the drilling rigs and support generators or dust created by drilling and driving could have impacts of short duration and are considered to be negligible. Therefore, the impact topic of air quality has been dismissed.

- ***Effects to Waste, Solid or Hazardous***. The exploration and transportation activities would utilize gasoline and other fuels to power its equipment. Stipulations and safety measures built into the Proposed Action mitigate the risk of any wastes being spilled on public lands. If accidents occur, clean up procedures would be undertaken by Constantine.
- ***Effects on Climate Change.*** Climate change effects generally refer to impacts of the project on greenhouse gases, or impacts of climate change on the project's operation. In the first case, any insignificant greenhouse gases produced by the project would be negligible. In the second case, the Proposed Action is temporary and current; therefore, changes in climate are unlikely to alter conditions during the project duration.
- ***Effects to Noise***. The BLM eliminated concerns about noise from the Proposed Action because there is no baseline data available for comparison and no comments were received regarding noise during the public scoping process.
- ***Effects to Federally-threatened and endangered species****.* The BLM eliminated concerns about effects to Federally-threatened and endangered species because there are no known occurrences of Federally-threatened or endangered species or habitat for these species in this area.
- ***Effects to Lands with Wilderness Characteristics.*** The lands associated with the proposed Project do not meet the criteria for Lands with Wilderness Characteristics. Conditions identified in support of this finding include evidence that the existing access was constructed by mechanical means, evidence of regular and continuous motorized use, and determination that the area does not offer outstanding opportunities for solitude or primitive and unconfined recreation. A complete analysis of Lands with Wilderness Characteristics in this area is located on file at the BLM Glennallen Field Office.
- ***Effects to Cultural Resources****.* The BLM eliminated concerns about effects to cultural resources because, in 2014, Constantine contracted with Northern Land Use Research Alaska, LLC, to conduct a cultural resources investigation that did not identify any cultural resources that would be affected by the project. The cultural resources study included a literature review of records available from the Alaska Office of History and Archaeology (OHA) and a field survey of the area of potential effects (APE), including a pedestrian survey, discretionary subsurface testing, and oral history interviews. The total area of the APE is approximately 8.5 acres. A pedestrian survey of approximately 2.1 acres of BLM land was completed. It was not possible to survey the entire APE due to the steepness of the terrain on the north side of Glacier Creek. No cultural resources (archaeological sites, artifacts, architectural remains, or modified landscapes older than 50 years of age) were identified during either the literature review or the field survey within the APE, though cultural resources exist within the vicinity of the project. The 2014 field survey meets the standards of Alaska State Historic Preservation Officer and Alaska Office of History and Archaeology Identification Phase guidelines (OHA 2003). These guidelines are equivalent to BLM Class III guidelines that are defined according to the glossary of terms in the BLM interim guidance on cultural resources management (Section 8100.21) (BLM 2004a).

The BLM discovered no additional concerns about cultural resources during consultation with the Chilkat Indian Village (CIV), Chilkoot Indian Association (CIA), or the Alaska State Historic Preservation Office (SHPO).

- ***Effects to paleontological resources.*** The BLM eliminated concerns about effects to paleontological resources because macroscopic fossils have not been identified by geological mapping in areas of proposed disturbance. The BLM uses the Potential Fossil Yield Classification (PFYC) System to categorize geologic units based on previous geological mapping. The primarily basaltic formations mapped within the project area are categorized by the PFYC as ***Class 1 - Very Low***: Geologic units that are not likely to contain recognizable fossil remains.

  Note: Constantine must follow these Federal guidelines pertaining to cultural and paleontological resources should they encounter them during exploration drilling:

  - Operators shall not knowingly disturb, alter, injure, or destroy any scientifically important paleontological remains or any historical or archaeological site, structure, building or object on Federal lands.
  - Operators shall immediately bring to the attention of the authorized officer any cultural and/or paleontological resources that might be altered or destroyed on Federal lands by his/her operations, and shall leave such discovery intact until told to proceed by the authorized officer. The authorized officer shall evaluate the discoveries brought to his/her attention, take action to protect or remove the resource, and allow operations to proceed within 10 working days after notification to the authorized officer of such discovery.
  - The Federal Government shall have the responsibility and bear the cost of investigations and salvage of cultural and paleontology values discovered after a plan of operations has been approved, or where a plan is not involved.

- ***Effects to subsistence resources and access.*** The BLM is required by Section 810 of ANILCA to consider potential impacts to subsistence activities, resources, or access to subsistence activities from project proposals. A complete analysis of Section 810 findings is located on file at the Glennallen Field Office. There is no reasonably foreseeable significant decrease in the abundance and distribution of harvestable subsistence resources. Salmon are not present in Glacier Creek within 3 miles of the Project. Furthermore, the easement itself is not open to Federal subsistence use. Indirect impacts caused by altering the distribution or migration of species for subsistence purposes is evaluated in Section 3.5, Wildlife on page 3-58.

Chapter 2: Alternatives

2 Alternatives

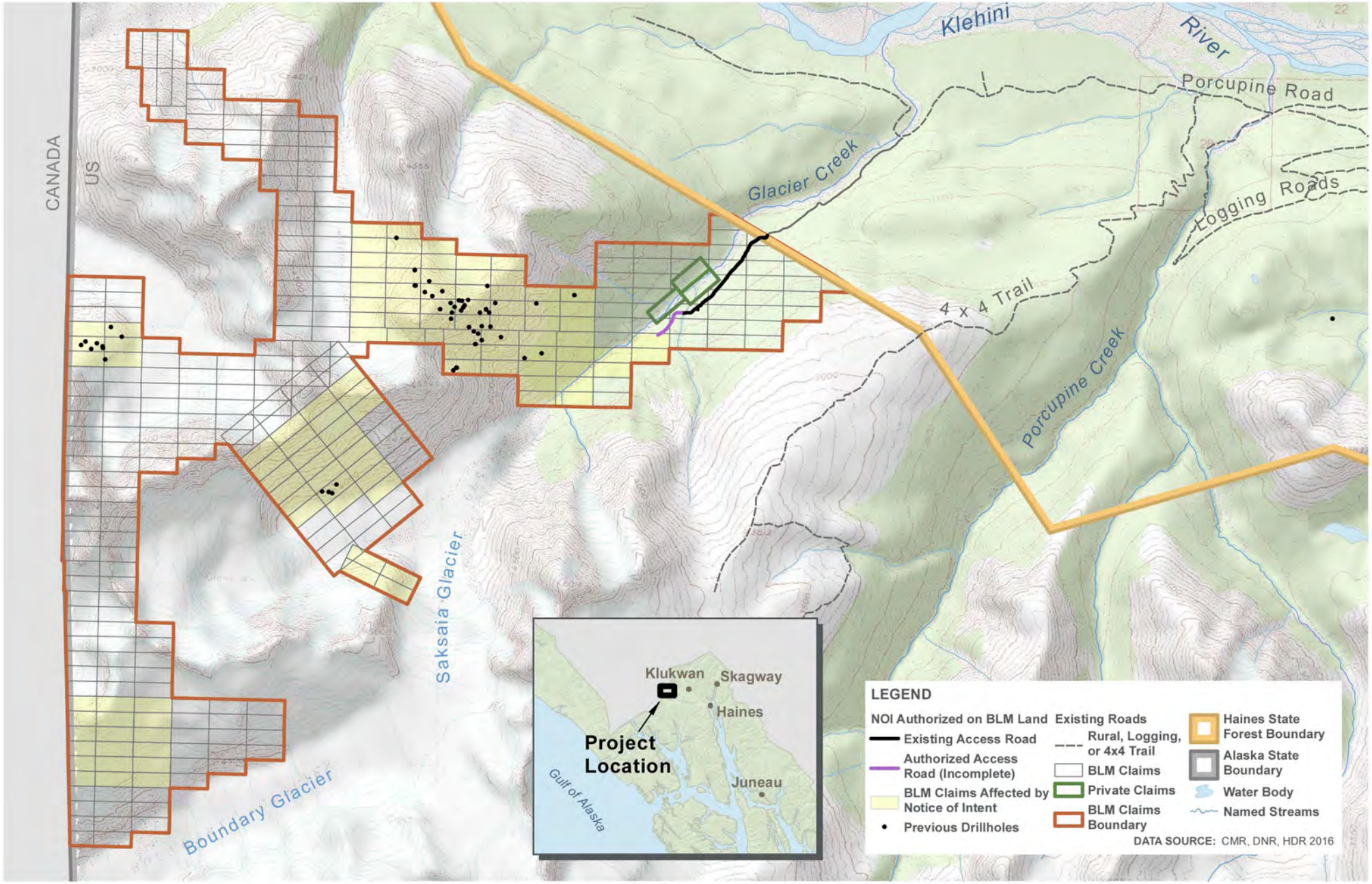
This chapter describes the alternatives considered for implementing the Palmer Exploration Project. The No Action Alternative and Proposed Action Alternative are described in detail along with a comparative analysis and a summary of alternatives that were eliminated from consideration.

2.1 Alternative 1 - No Action Alternative

Under the No Action Alternative, Constantine would continue exploration activities as outlined in the approved notice of mineral exploration operations (Notice; J145690). Under this Notice, which expires at the end of 2018, Constantine is authorized to disturb 4.65 acres, including constructing 1.18 miles of access road. **Table 2-1**, below, displays authorized activities and corresponding authorized and existing disturbance on Bureau of Land Management (BLM)-administered public land. Constantine North, Inc. (Constantine) has disturbed 4.05 acres to date, including 0.9 miles of access road. **Figure 2-1** on page 2-2 displays the existing and potential disturbance associated with the No Action Alternative.

Table 2-1. Disturbance Authorized under Existing Notice

Disturbance Component	Current Authorized under Notice (acres)	Completed under Notice (acres)
Helicopter-Supported Drilling with timber-frame drill pads	0.45	0.25
Linear Exploration Road	3.83	3.00
Equipment Laydown Area	0.11	0.60
Weather Station Area	0	0.10
Road Pullouts	0.19	0.10
Borrow Pits	0.07	0
Total	**4.65**	**4.05**



PALMER PROJECT
AUTHORIZED DISTURBANCE
FIGURE 2-1

The following activities would continue under the No Action Alternative:

- Constantine would continue its multi-year exploration campaign focused on exploration drilling in an effort to define a deposit meeting economic threshold as described in the Notice.
- The base of operations for the work performed would be the Big Nugget lodge/camp located approximately 5 miles (by air) from the closest drilling area.
- All drills, crew, and supplies would be transported to helicopter pads located next to each drill pad site from Big Nugget camp by helicopter.
- No sanitary facilities would be established at the exploration sites because crews would be housed and supported off the property. All solid waste from drill sites would be contained, flown to the operations base, and subsequently disposed of at the local municipal landfill.
- Fuel storage would be limited to 55-gallon barrels and custom-designed 130-gallon fly tanks at each drill and pump site. Total fuel storage at any given drill or pump site would not be expected to exceed 200 gallons. Personnel would be trained in spill prevention and spill response procedures with spill kits located in key areas.
- Constantine would submit new permit applications to the State of Alaska for a temporary water use permit to use water from sources permitted and used in 2013 and 2014.
- With a total of 58 potential drill sites identified, drill pads would be constructed of timber cribbing. Drill pads used in previous seasons that have not been reclaimed could be reused as heli-pads or drill sites. Drill site-related disturbance would remain at 0.45 acres or less from year-to-year. Blasting could be required to construct some proposed drill pad platforms for safety reasons.
- Drill and heli-pad reclamation would be conducted concurrently with drilling operations so that no more than 20 pads would be in use at any given time. Drill site reclamation would include salvaging all timber and removing all construction materials, including associated heli-pads. Drill holes could be lined with polyvinyl chloride (PVC) piping and removable steep caps placed on the hole casings.
- Constantine would not be able to cross Glacier Creek with a surface-driven vehicle, potentially stranding workers at the mountain should inclement weather keep a helicopter from accessing the drill sites.

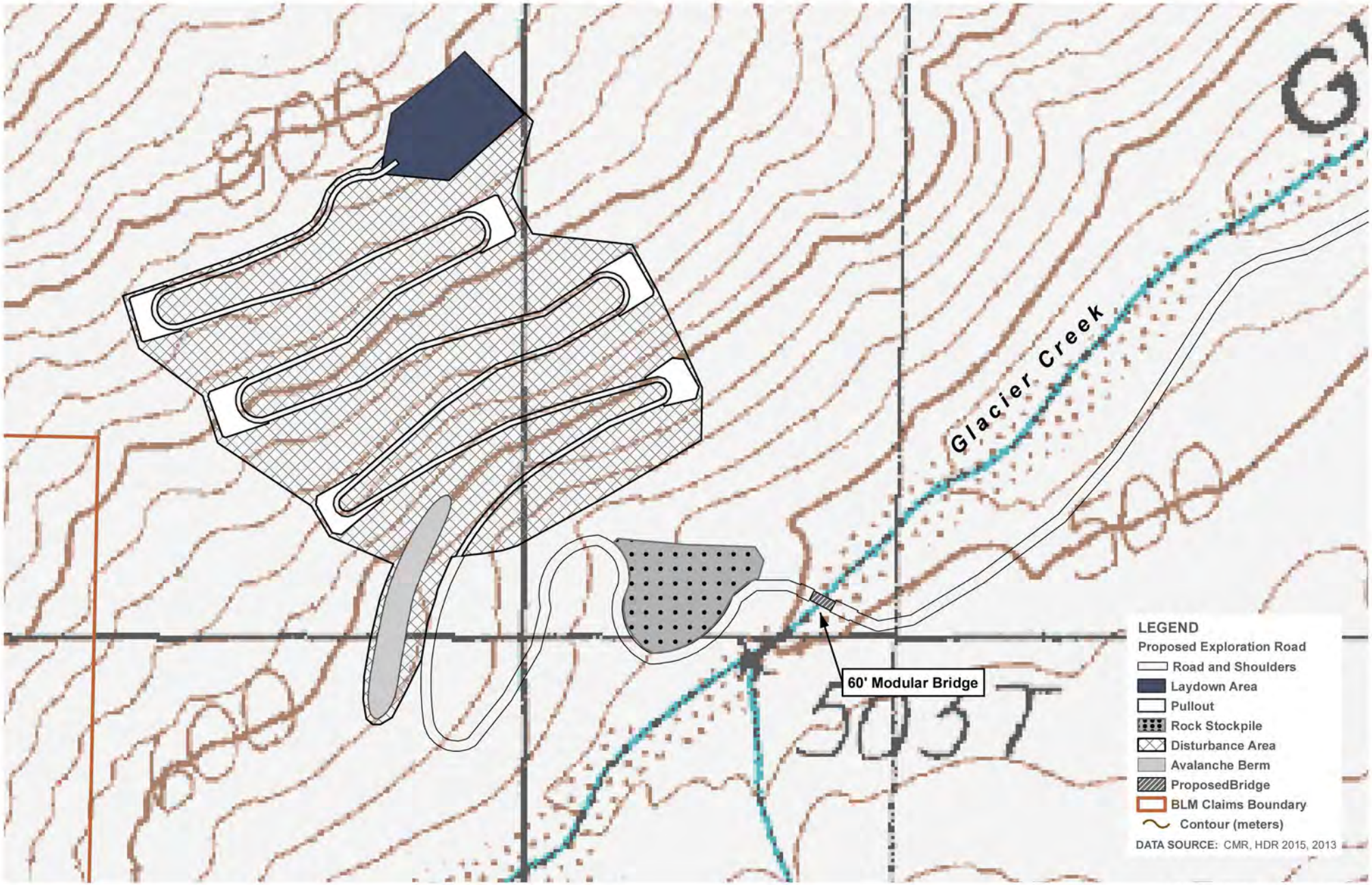
2.2 Alternative 2 - Proposed Action Alternative

The Proposed Action Alternative would expand Constantine's existing Notice-level exploration activities. Constantine is exploring the Palmer base and precious metals deposit of copper, zinc, gold, and silver by core drilling to better define the mineral resource, with the goal of identifying a mineral resource that is economically feasible to develop. The Proposed Action would require an estimated 35.9 acres of new surface disturbance over 5 years for a total Project-related disturbance of 40.0 acres. **Figure 1-2** on page 1-3 shows the location of existing and proposed Project features.

The Proposed Action Alternative includes 2.5 miles of additional road construction, and exploration and environmental drilling at the site. The proposed disturbance would include a linear exploration road with culverts and modular bridge crossings, and a switchback road with rock fall berms, exploration and environmental drilling, and rock stockpiles (**Figure 2-2**, page 2-5 and **Figure 2-3**, page 2-6). The proposed road would provide a staging area for helicopter and ground-supported exploration activities, including seven environmental and geotechnical drill sites and approximately 40 new timber-framed drill pad sites. **Table 2-2**, below, displays the proposed surface disturbance by activity. A large portion of the potential disturbance area is downslope of the switchback portion of the road, where steep slopes may result in uncontrolled rock fall and downslope fill dispersion during construction. Actual disturbance is expected to be substantially less than the total estimated.

Table 2-2. Proposed Alternative Acres of Disturbance by Activity

Disturbance Component	Completed under Notice (acres)	Proposed under Proposed Action Alternative (acres)	Total Disturbance for Proposed Action Alternative (acres)
Helicopter-Supported Drilling with timber-frame drill pads	0.25	0.50	0.75
Linear Exploration Road, including Vehicular Modular Bridge	3.00	3.95	6.95
Equipment Laydown Area	0.60	1.47	2.07
Weather Station Area	0.10	0	0.10
Switchback Exploration Road & Shoulders and Rockfall Mitigation Berm	0	25.18	25.18
Road Pullouts	0.10	1.94	2.04
Borrow Pits	0	0.20	0.20
Rock Stockpiles (East and West)	0	2.67	2.67
Total	**4.05**	**35.91**	**39.96**

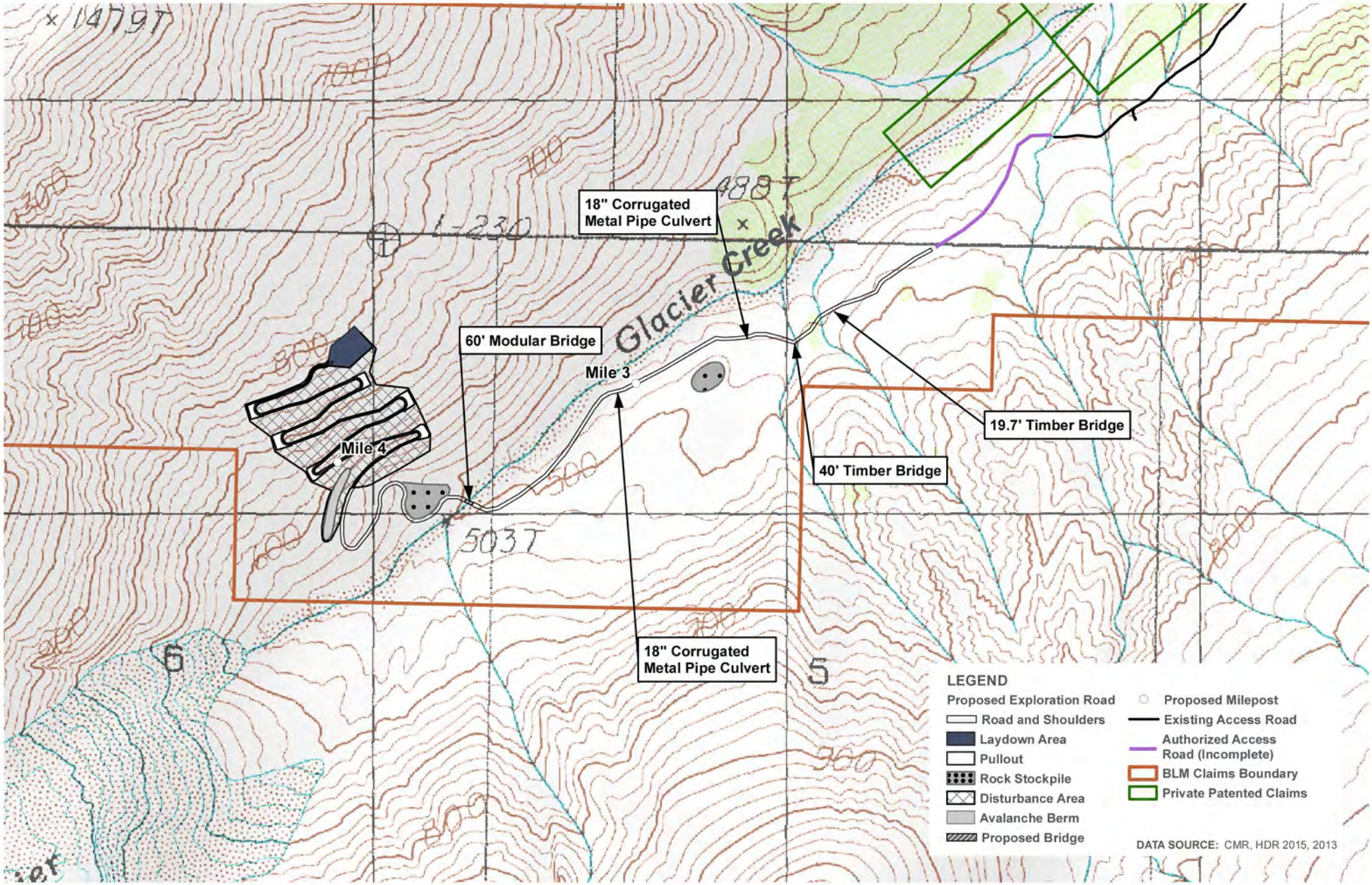


0 Feet 1,000

PALMER PROJECT

PROPOSED SWITCHBACK ACCESS ROAD

FIGURE 2-2



0 Feet 1,000

PALMER PROJECT

PROPOSED EXPLORATION ACCESS ROAD AND BRIDGE CONSTRUCTION

FIGURE 2-3

Twenty of Constantine's timber-constructed drill pads, some associated timber helicopter landing pads ("helipads"), and components of the water supply systems completed under the Notice remain in the Project area. Little surface disturbance exists because materials, equipment, and personnel are transported to and from the drill sites by helicopter. Constantine has not plugged all of its drill holes completed under the Notice, but lined them with PVC pipe in order to use the holes for geophysical, geotechnical, water quality testing and drilling water sources in the future. The total acreage of disturbance from Constantine's exploration activity to date is estimated at 0.25 acres in 20 partially-dismantled or full drill pads and associated helipads and water systems.

In 2014, under the Notice, Constantine proposed constructing 1.18 miles of exploration road along Glacier Creek on BLM claims, generally following the route of an old bulldozer trail. They have built 0.9 miles of that road, meeting state logging road standards and BLM guidelines, including pullouts. Constantine also constructed an authorized laydown yard and an area to support a weather station, both along the access road. The total area of ground disturbance to date under the Notice for the road and related construction on Federal lands is approximately 4.05 acres (**Table 2-2**, page 2-4).

Also under the Notice, felled timber not used in road construction is stacked along the road side. Under the mining law, on post-1955 claims, a miner can use "other resources" to support their exploration/mining activity, but has no authority to sell or dispose of those resources without specific authorization from the Authorizing Officer. Since these claims are post-1955 claims, Constantine has unlimited and exclusive rights to the mineral resources they own, but all other resources on the claims (sand, gravel, timber, etc.) are public resources. Therefore, Constantine can use these timber resources to build bridges or shore up walls, but cannot dispose of it in any fashion without the BLM giving their concurrence (typically a sales contract). To facilitate road construction and comply with reclamation best management practices (BMPs), keeping the timber adjacent to the road is Constantine's simplest action.

Constantine proposes to expand its exploration activities. To improve the safety of exploration activities and expand exploration to include ground-supported drilling, Constantine would complete an access road to the north side of Glacier Creek in the vicinity of the mountainside drilling activities, and construct a laydown area at the road's terminus. The road would allow Constantine to transport workers, equipment, and supplies to the site using highway vehicles and heavy machinery.

Constantine would conduct additional drilling at existing drill pads, construct and concurrently reclaim additional drill pads and helipads, and drill from the switchback access road using a truck-mounted drill. They propose to explore seasonally over a period of approximately 5 years. Operations would occur between May and October each year. They would secure the site against winter damage, and at the close of exploration in approximately year 5, they would remove all structures and reclaim the area.

Expanded exploration activities under the Proposed Action would include the following:

- Constructing 0.8 miles of linear exploration road, including three bridges and two culvert stream crossings.
- Constructing 1.7 miles of switchback exploration road, including rockfall berms and rock stockpiles.
- Constructing an equipment laydown area.
- Installing up to two temporary buildings to serve as an office and equipment storage.
- Constructing timber-frame drill pads and helipads.
- Conducting helicopter-supported and truck-supported mineral exploration drilling 24 hours per day, 7 days per week.
- Conducting truck-mounted, large-diameter baseline environmental drilling 24 hours per day, 7 days per week.
- Drilling using surface water and drill water reuse (continued use and new use).
- Reclaiming the access road, including pullouts, drill pads, laydown areas, rock stockpiles, and berms.

2.2.1 Personnel

Constantine would operate the expanded exploration by continuing to use the support services at the Big Nugget Camp. During typical operations, approximately 25 to 50 workers would be employed, with more than half that number in the Project area during the day shift and less than half in the Project area on the night shift. Constantine anticipates hiring approximately 15 to 20 local workers and an additional 20 to 35 non-local workers. Approximately two-thirds of the locally hired workers would likely commute from their homes to site each day. The remainder would reside in camp and commute at the end of their shift rotation. Eight to ten active, on-site employees would be directly associated with the proposed access road construction; the linear access road is estimated to take 1 to 2 months to complete, and the switchback access road is estimated to take 2 to 3 months to complete.

2.2.2 Equipment

Project personnel would access the Project area via helicopter and four-wheel-drive (4WD) highway vehicles. Constantine would use two or more helicopter-portable, diamond-core drill rigs concurrently for drilling in the Project area; use bulldozers and front-end excavators to construct and eventually reclaim the road, laydown area, and rockfall mitigation berms; and use trucks to haul material.

Constantine could use the following vehicles and equipment:

- Two to six helicopter-portable diamond core drill rigs.
- One truck-mounted, large diameter reverse circulation (RC) drill rig.
- One to two Cat D7E or D8H bulldozer or equivalent.

- One to two Cat 325 L or Cat 350 front-end excavator or equivalent.
- Two to four Volvo A30G rock trucks.
- One to two AS350, AS350 B2, or 206LR helicopters or equivalent.
- Two to eight 4WD pick-up trucks or sport utility vehicles (SUVs) as support vehicles.
- Four to six portable light plant/generators.
- One to two portable rock drill.
- Four to six portable chainsaws.
- Portable gas or diesel generators for electricity to the temporary work trailers and storage containers.
- Portable gas or diesel generator associated with the portable vehicle-washing system.

Constantine would remove all motorized exploration equipment, trailers, and fuel from the Project area during extended periods of non-operation and seasonal closure, and would secure timber-frame pads to eliminate the potential for weather/snow related dispersion.

2.2.3 Gravel and Rock Infrastructure

2.2.3.1 BORROW SITES

Borrow sites would be located along the road corridor at about 0.3-mile intervals. The borrow sites would be located in areas containing suitable materials for use in the road bed, road and laydown area surfacing, and rock fall mitigation berms.

2.2.3.2 ACCESS ROAD AND ROCKFALL MITIGATION BERM

Constantine would construct a single-lane exploration access road extending from the western end of the existing road established in 2014 to a new laydown area part way up the mountain on the north side of Glacier Creek (**Figure 2-2**, page 2-5; **Figure 2-3**, page 2-6). The road would result in approximately 29.13 acres of disturbance and would include constructing and installing the following:

- 0.8 miles of linear exploration road construction along the southern margin of the Glacier Creek valley (the “linear access road”).
- Two 18-inch diameter corrugated metal pipe culverts at two stream crossings.
- One 19.7-foot timber bridge and one 40-foot modular, steel bridge over two creeks.
- One 60-foot modular steel bridge over Glacier Creek.
- 1.7 miles of switchback exploration road construction from the north side of Glacier Creek up to the Glacier Creek Prospect (the “switchback access road”).

The exploration road would provide access for workers and equipment to the Project area to support continued exploration. The expanded access road under the Proposed Action would allow for the following:

- Access exploration and environmental baseline drilling sites by truck-mounted rigs.

- Transport workers, equipment, and supplies to the site using highway vehicles and heavy machinery.
- Give workers the option of mountain decent and creek crossing, using the bridge crossing at Glacier Creek, should inclement weather keep a helicopter from accessing the drill sites.
- Decrease helicopter traffic and reduce flight time for the helicopter-supported drilling operations on the mountain by being able to fly from a laydown area on the north side of Glacier Creek, rather than from its present base of operations (the Big Nugget Camp) 5 miles away near Porcupine Creek and the Klehini River.
- Fly helicopter slung loads a shorter distance, improving safety and decreasing risk, also decreasing risk to water quality associated with helicopter slung loads over the Glacier Creek.
- Enhance efficiency and worker safety by providing access by highway vehicle and foot between the Big Nugget Camp and drilling operations.
- Reduce costs by using the road and laydown area as staging areas for drilling supplies closer to drilling operations.

Before beginning construction, Constantine would install stormwater control BMPs, as described in Appendix 1 of their *Palmer Exploration Project Exploration Plan of Operations* (Plan; Constantine 2015), and maintain them throughout construction and until permanent soil stabilization measures are in place. They would seed all excavations and fills, except the actual road surface, upon construction completion, using a BLM-approved seed mix.

Constantine would construct the linear access road (**Figure 2-3**, page 2-6) using cut-and-fill methods similar to those used to build the access road in 2014, following natural contours and an existing bulldozer trail on the valley bottom. The road surface would be 14 feet wide and the road would include pullouts up to 1,000 feet apart for vehicles to pass (**Figure 2-4**, below). Road surfacing material would be obtained from cut banks and local borrow pits along the road route or from other established local sources.

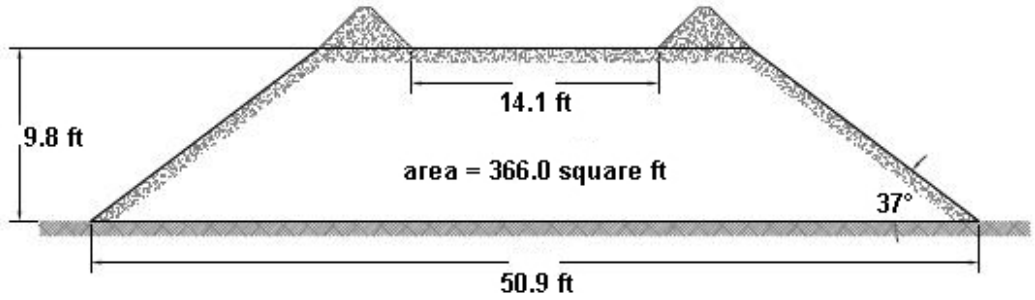


Figure 2-4. Typical Cross-section Showing Full Fill Portion (Fill Slope 37°)

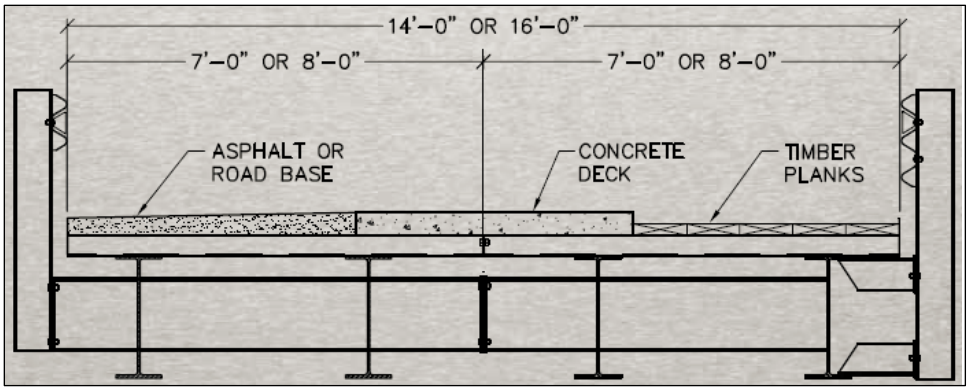
Two 18-inch-diameter, corrugated steel culverts would convey two streams under the linear access road. In addition, bridges would cross two unnamed streams and Glacier Creek. A view of the Glacier Creek crossing is provided in **Photo 2-1** on page 2-11.

Photo 2-1. View of Proposed Glacier Creek Bridge Crossing – Looking West Toward Saksaia Glacier

One bridge would be constructed of locally-sourced timbers; the other two steel bridges would be fabricated off site and delivered to the Project area for installation (**Photo 2-2**, below; **Figure 2-5**, page 2-12; and **Figure 2-6**, page 2-12). Each bridge would have steel decking and a gravel driving surface; the Glacier Creek bridge would have railings 27 inches high.

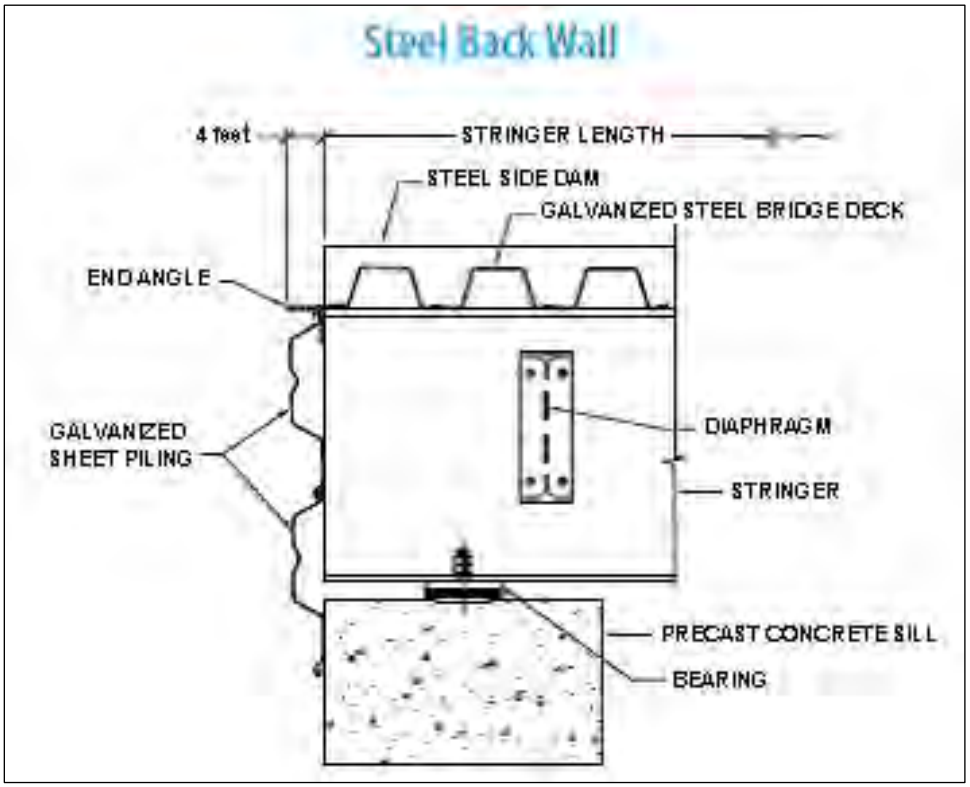
(Courtesy of Big R Bridge)

Photo 2-2. Example of Prefabricated, Modular Steel Vehicle Bridge



(Courtesy of Big R Bridge)

Figure 2-5. Diagram of example Prefabricated Modular Steel Vehicle Bridge



(Courtesy of Big R Bridge)

Figure 2-6. Close-up of Prefabricated Modular Steel Vehicle Bridge Showing Back Wall Support

The proposed switchback exploration access road would extend up a talus slope from the north side of Glacier Creek to its terminus at the Glacier Creek Prospect (**Figure 2-2**, page 2-5). It would include eight switchbacks and gain approximately 1,100 feet in elevation. The road bed would be 14 feet wide with an additional 3 feet for a berm (2 to 3 feet high) on the downhill side of the road intended to prevent vehicles from driving off the road (**Figure 2-7**, page 2-14). The road grade would average 12 percent, only exceeding 15 percent over very limited distances. The grade in the switchbacks range from 2- to 4-percent slopes, and the switchbacks would serve as passing areas.

Constantine would construct the switchback road using full bench cuts, which would minimize fill placement and the extent of surface disturbance. Some blasting could also be needed. Any rock anticipated to be blasted would be sampled and analyzed for acid generation and neutralization potential. Static laboratory testing would include neutralization potential (NP); net neutralization potential (NNP); maximum potential acidity (MPA), paste pH, sulfur, sulfide, sulfate, and leachable sulfate, and inorganic carbon. If the test results indicate high potential for acid generation then Constantine would be required to submit a rock characterization and handling plan, along with appropriate reclamation and bond modifications, in accordance with 43 CFR 3809.430, Plan Modifications. Constantine would use rock from cut portions to construct rockfall mitigation berms and would haul excess excavated material to stockpile areas where it would be stored for use during reclamation (see Section 2.2.3.4, Rock Stockpiles; page 2-15). Cut banks along the access road or other local sources would provide road surfacing material. The estimated acreage of disturbance includes the area that could be disturbed downslope of switchbacks by rock fall and fill dispersion during construction. The actual disturbance area would likely be substantially less than the estimate.

Whenever possible, Constantine would segregate and stockpile topsoil to the uphill margin of the road cut. On steeper slopes, topsoil would be stored as side-cast along the periphery of the road. Topsoil would be thin and difficult to recover on the mountain slope of the switchback road, but where possible, Constantine would segregate topsoil there and use it for concurrent reclamation or store it for future reclamation.

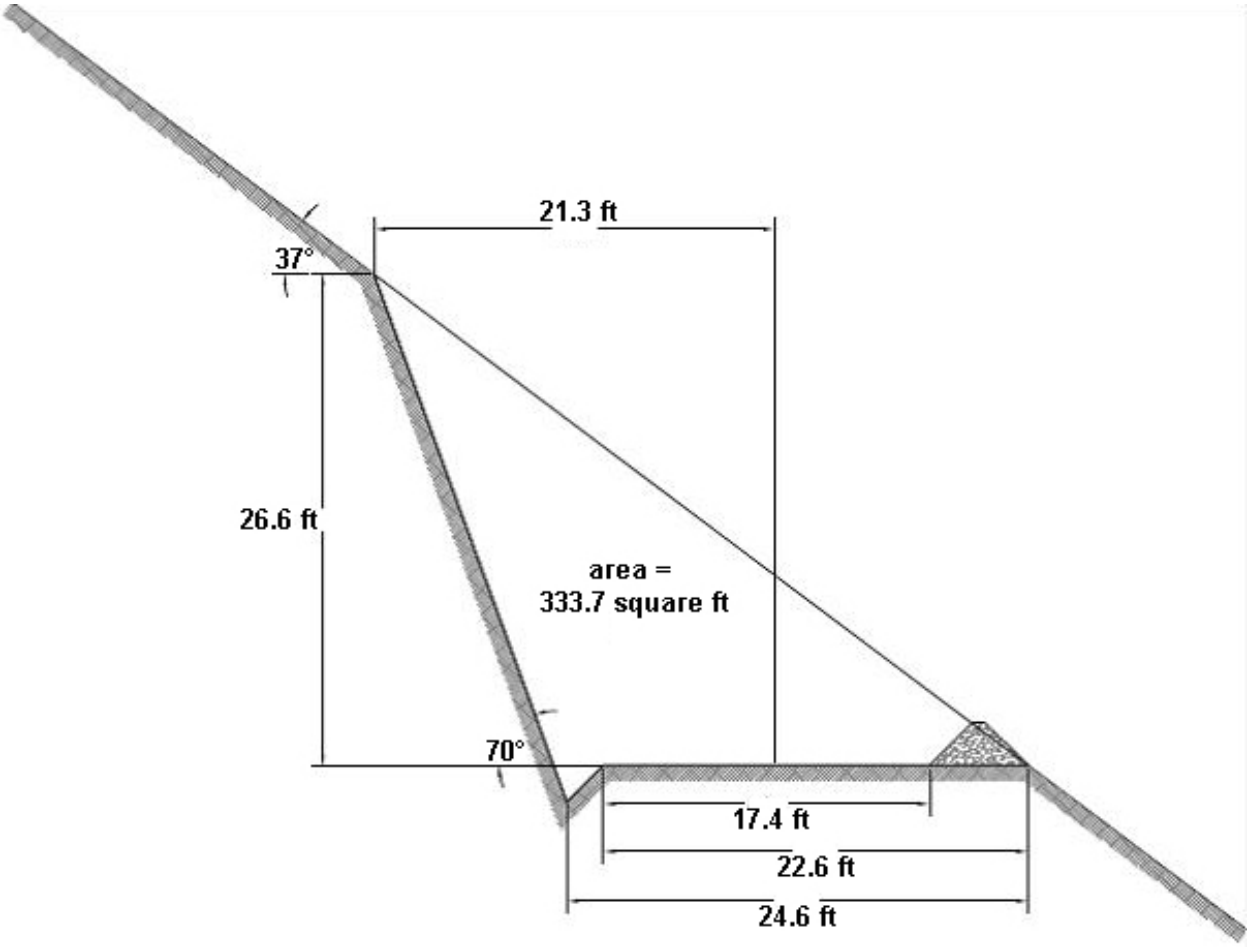


Figure 2-7. Typical Cross-section Showing Full Bench Cut on Cut Slope 70°

During access road construction, Constantine would include ditches along the uphill side of access roads. Ditches would convey water off the ends of each switchback with runoff water expected to infiltrate the overburden and soil downslope and away from the area of road construction. The ditches could extend out beyond the end of the switchbacks to ensure water is adequately routed away. Ditches would include basins near the ends of the switchbacks to facilitate infiltration of runoff water. They would implement BMPs, as described in Appendix 1 of their Plan (Constantine 2015), such as energy dissipaters, check dams, relief culverts, and sedimentation basins, with the intent to control sediment. Slash would be windrowed at the toes of fill slopes. Constantine estimates construction would take 1 to 2 months for the linear access road and 2 to 3 months for the switchback access road. Constantine would maintain the access roads until they are no longer needed, and then reclaim them.

Where the rock fall and avalanche hazard is high near the base of the mountain slope, Constantine would place rock excavated during road construction in a berm 10 to 30 feet high on the upslope side of the switchback road, as noted on **Figure 2-2** on page 2-5, as the “avalanche berm.”

2.2.3.3 LAYDOWN AREA

Constantine would construct an approximately 1.5-acre laydown area near the end of the proposed switchback access road (**Figure 2-2**, page 2-5) to stage personnel, drill equipment and supplies, and fuel to support exploration activities in the South Wall target area. The laydown area would be approximately 328 feet by 131 feet, as displayed in **Figure 2-8** on page 2-16. One or two trailers at the laydown area would serve as an office and for equipment storage, and a portable toilet could be installed; however, the trailers would not be occupied as a camp. No sanitary facilities would be established at the work sites because crews would be housed and supported at the Big Nugget Camp and other rental sites located outside the Project area; they would travel back and forth daily. A portable gas or diesel generator would supply electricity to this site. The helicopter would be based at the laydown area during the day and return to Big Nugget Camp in the evening.

2.2.3.4 ROCK STOCKPILES

Constantine would establish two rock stockpiles, one at the north side of the Glacier Creek bridge crossing on the east side of the road (**Figure 2-2**, page 2-5) and one at linear road marker near Mile 3 (**Figure 2-3**, page 2-6). These would accommodate the estimated 50,000 cubic yards of rock and other excess material removed during the full bench cuts on the switchback portion of the proposed road. Constantine would use these rock stockpiles for future road reclamation and could level them to use them as temporary staging areas during exploration. Total disturbance would be 2.7 acres: 1.0 acre for the east rock stockpile and 1.7 acres for the west rock stockpile.

In the event that blasting is required for road construction, appropriately-trained personnel for Constantine would visually inspect shot rock before placing it on the rock stockpiles. Though not expected, if blasting exposed rock is suspected to have potential for acid rock drainage and metals leaching, Constantine would contact and consult with state and Federal government agencies to develop an appropriate characterization, handling, and storage plan; they would segregate and store the material separately until the plan is developed and approved.

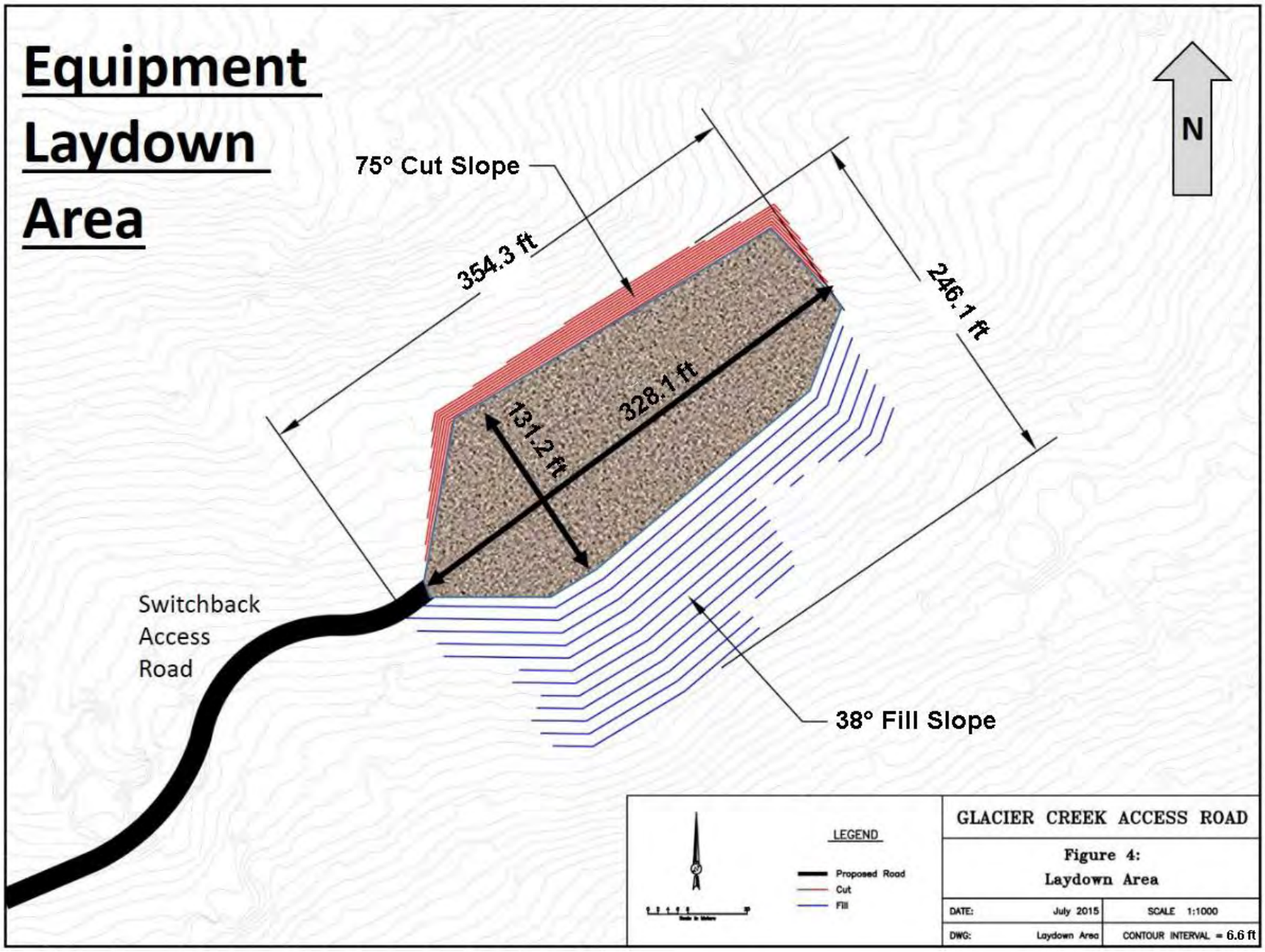
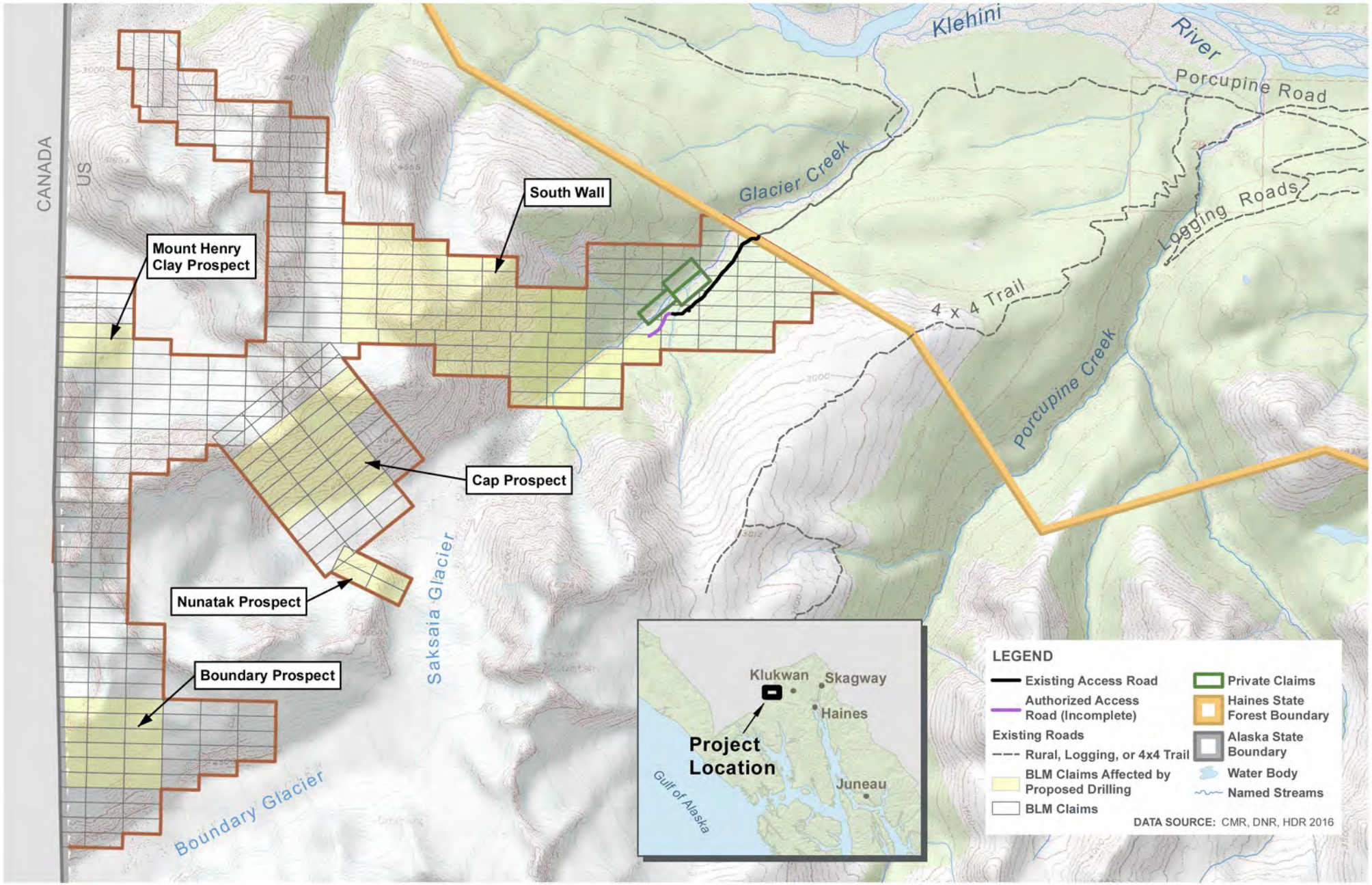


Figure 2-8. Equipment Laydown Area at the End of the Proposed Switchback Exploration Road

2.2.4 Drill Sites and Drilling Operations

Constantine would continue to base its operations for their exploration program at the Big Nugget Camp. A helicopter would be based at the Big Nugget Camp and positioned at the new laydown area during daylight hours to provide daily crew access and supplies to drill sites on the mountain. The exploration drill program would be seasonal with helicopter-supported drill activity typically extending from May until October each year.

Five drilling areas within Federal claims are proposed: South Wall, Mount Henry Clay, Cap, Nunatak, and Boundary (**Figure 2-9**, page 2-18). Drill pad construction and the equipment Constantine used and temporarily stored on the drill pads would conform with the regulatory requirements detailed in 43 Code of Federal Regulations (CFR) 3715, *Use and Occupancy Under the Mining Law*. Typically, Constantine would use individual drill sites for multiple drill holes. They would determine the total number of drill sites, holes drilled, and density of sites within the drilling areas by results of the drilling and budgets.



PALMER PROJECT

PROPOSED DRILLING AREAS

FIGURE 2-9

2.2.4.1 HELICOPTER-SUPPORTED EXPLORATION DRILLING

Constantine is applying for up to 40 new helicopter-supported drill sites, each comprised of a timber-constructed 20-foot by 20-foot drill pad, smaller timber helipad, and drilling water infrastructure (pipes from a water source). Drill pads would be constructed of wood timbers, and in steeper areas, these could be rock-bolted to the ground. While not anticipated, Constantine could perform blasting using minimal explosives to ensure the safest construction methods and bracing design for drill pads conditions at the drill pads on the South Wall area of the Glacier Creek prospect are safe. Any blasting would be performed by a licensed, certified explosives contractor and Constantine would notify the BLM at least 24 hours before blasting on BLM lands. Some drilling could be conducted from pads constructed directly on snow or ice, with sawdust placed as an insulating barrier under the timber pad. Construction and layout of a typical drill pad are shown on **Photo 2-3**, below, and **Figure 2-10** on page 2-20.

Photo 2-3. Slinging Decking Material for Drill Pad Construction

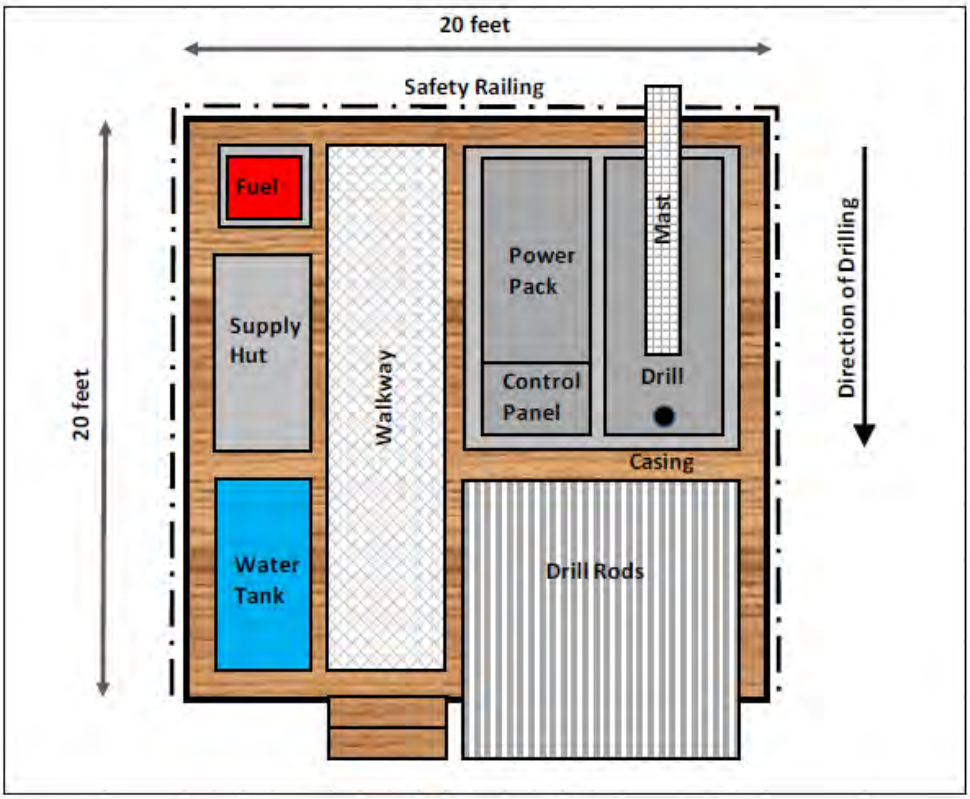


Figure 2-10. Typical Timber-frame Drill Pad Site

In the five proposed drill areas, Constantine would perform exploration core drilling with two to six heli-portable drill rigs. They would drill up to 300 holes from these pads over the course of the multi-year program, ranging in depth from 50 to 3,000 feet. If not intended for reuse, Constantine would concurrently reclaim all new drill pad sites and existing drill pad sites as exploration proceeded. Any drill pads at risk of damage from snow avalanches would be removed upon the completion of drilling. With concurrent reclamation of drill pads and helipads, up to 20 new complete or partially dismantled drill pads and associated helipads could exist at any time, with an approximate total disturbance area of 0.25 acres.

2.2.4.2 TRUCK-MOUNTED EXPLORATION, GEOTECHNICAL, AND ENVIRONMENTAL DRILLING

Constantine would also drill exploration, geotechnical, and baseline environmental holes from up to seven truck-supported drill sites that would support up to 7,000 feet of drilling. Truck-mounted drilling would occur on 40-foot by 40-foot pads located on road shoulders and pullouts (**Figure 2-11**, page 2-21, and **Figure 2-12**, page 2-22). The disturbance for these sites would fall within the disturbance area for the proposed road.

Constantine would install groundwater wells to collect long-term baseline groundwater quality data. The water well drilling rigs would be track- or wheel-mounted and larger and heavier than the helicopter-portable rigs, and would require road access in order to install, sample, maintain, and eventually decommission groundwater monitoring wells.

For the road-based exploration and wells, Constantine would transport drills, crews, and all supplies to and from the drill site by highway vehicles. Drills would operate 24 hours per day,

7 days per week during the operational season. Drill sites would be reclaimed immediately upon completion of the wells or exploration drilling.

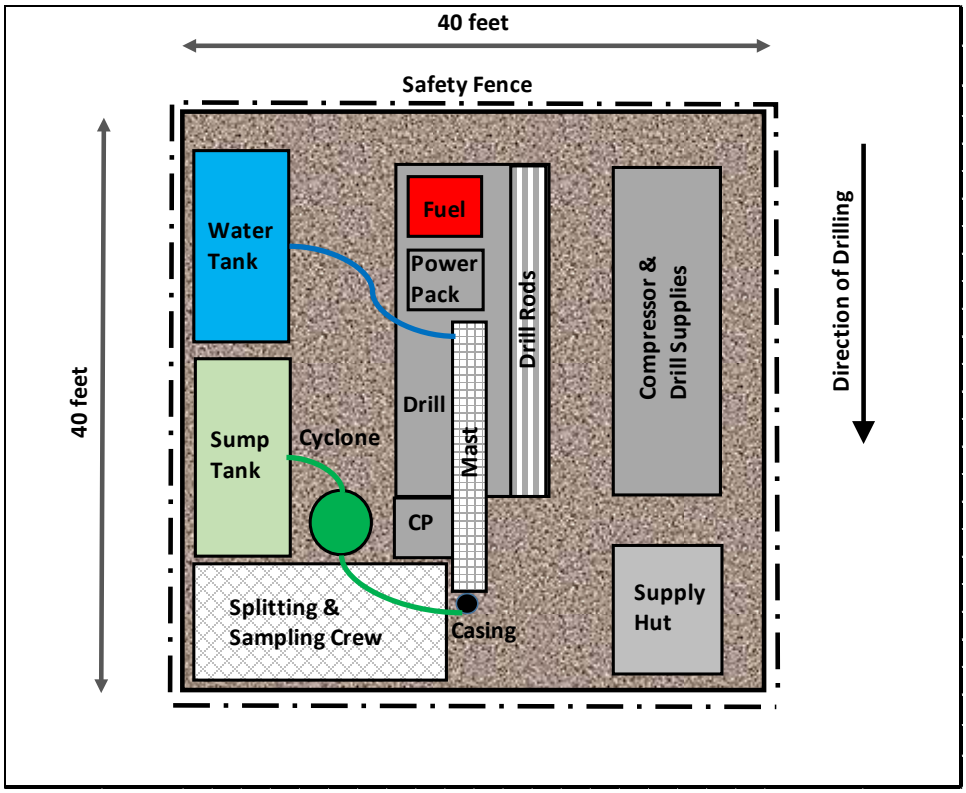
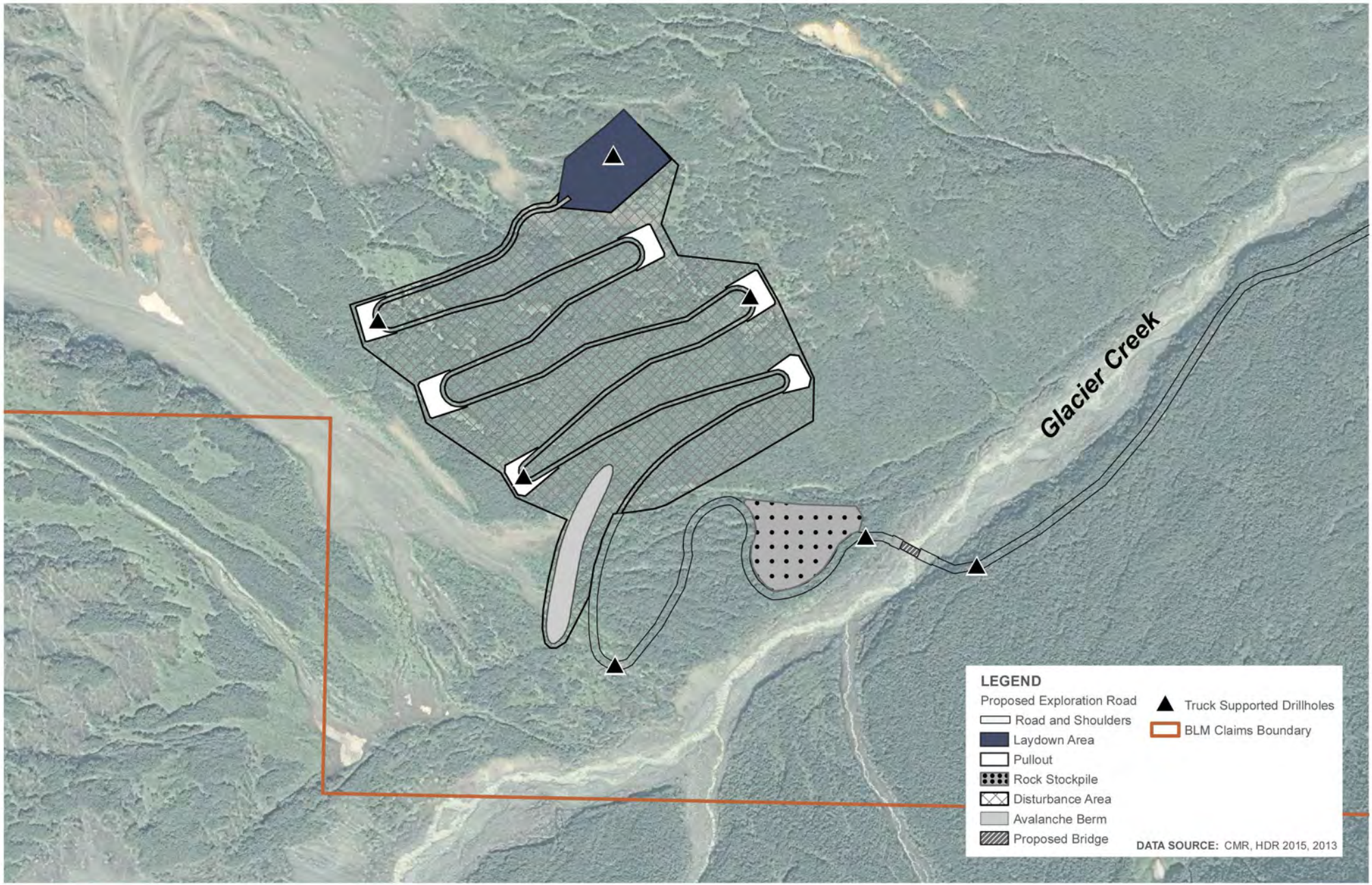


Figure 2-11. Typical Truck-supported Drill Pad Site



0 Feet 1,000

PALMER PROJECT

TRUCK-MAINTAINED DRILLING LOCATIONS

FIGURE 2-12

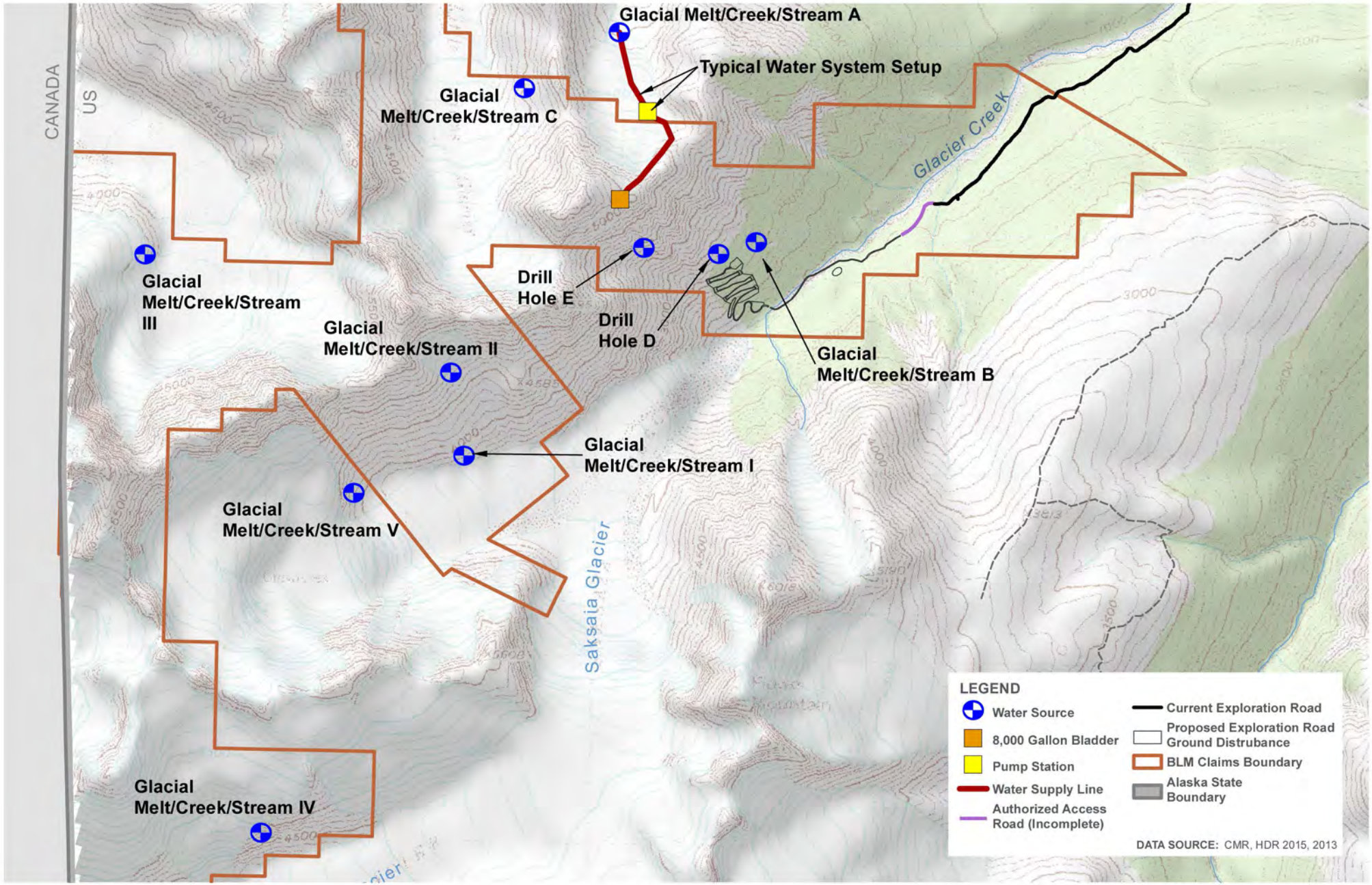
2.2.5 Water Management

Exploration core drilling uses water to cool the drill bit and remove drill cuttings. Constantine has State of Alaska Temporary Water Use Authorizations (TWUA F2014-101 and TWUA F2014-102) for 10 designated water sources distributed throughout the property (**Figure 2-13**, page 2-24). These locations include alpine creeks originating from snow and glacier melt, and existing exploration holes fitted with a submersible pump. Constantine would use a total system containment at surface water intake sites in which the entire pump station (pump, fuel, lubricants, etc.) is contained within a large catchment basin. In this kind of system, flexible rubber hoses would lead up the mountainside to pumping stations and attach to an 8,000-gallon bladder on a timber-frame pad (**Photo 2-4**, below). From the bladder, flexible rubber hoses would gravity feed water to drill pads.

Photo 2-4. Typical water system setup showing collapsible bladders/platform/hose line

The current TWUAs authorize a combined withdraw of up 86,400 gallons of water per day from the designated water sources May 1 to October 31 of each year, at an intake rate of up to 20 gallons per minute per pump, subject to a maximum of three pumps per source.

During drilling, Constantine would use industry-standard drill mud where needed, using water to remove drill cuttings and maintain fluid circulation. Any drill mud would be certified by NSF International Standard/American National Standard (NSF/ANSI) 60 for use in domestic water wells. Constantine would use additives approved for drilling drinking water wells on a preferred basis.



0 Miles 1

PALMER PROJECT
DRILLING WATER SOURCES
FIGURE 2-13

2.2.5.1 WATER QUALITY PROTECTION

Drillers would manage drill cuttings and drill fluids that returned to the surface using sediment traps (sumps) at each drill site or closed-loop centrifuges, or both. Constantine would collect cuttings via centrifuge and dispose of them in pits and bury them, or dispose of them off site. To date, drilling in the Project area has shown little return of drill water and cuttings to the land surface due to fractured bedrock and deep water table.

Constantine would employ BMPs, as described in Appendix 1 of their Plan (Constantine 2015), during construction, operation, and reclamation to minimize erosion and sedimentation from disturbed areas. They would develop and follow a Project-specific stormwater pollution prevention plan (SWPPP). (An example SWPPP, developed by Constantine's road contractor for the 2014 access road construction, is included in Appendix 5b of the Plan.) Sediment control structures could include fabric or certified weed-free straw bale filter fences, siltation or filter berms, sumps, and downgradient drainage channels. The access road would be properly ditched with cross-drain culverts placed at drainage channel locations as specified in the BLM roads manual (BLM 2015, 2011b). Monitoring would include periodic visual inspections of all work sites during exploration road construction, drill pad construction, drill operations, and reclamation.

2.2.6 Solid and Septic Waste

Constantine would contain solid waste from drill pads in barrels or nets and fly it to the laydown area or base of operations, where they would transport it to the municipal landfill. When practicable, Constantine would recycle materials; no refuse would be disposed of on site.

Self-contained, portable, chemical toilets could be used for septic waste. A contractor would service toilets and transport sludge to an approved disposal facility.

2.2.7 Hazardous Materials

Hazardous and regulated materials used at the Project would include diesel fuel, aviation fuel, gasoline, lubricating grease and oil, and cleaning solutions. Constantine would use a 5,000-gallon diesel fuel storage tank and a 3,000-gallon aviation fuel storage tank at the equipment laydown area. Fuel service providers would regularly fill these. Spill containment measures in the fuel tank area would meet or exceed state and Federal regulations. Constantine would label, store, and handle all containers of hazardous substances in accordance with state and Federal requirements.

Constantine would develop a site-specific spill prevention control and countermeasure (SPCC) plan, which would prescribe proper storage, transfer, and maintenance procedures; employee training; and documentation of regular inspections. They will have onsite and available the SPCC plan before using bulk fuel storage facilities. Constantine would follow these guidelines:

- All fuel storage containers larger than 55 gallons would be double-walled or stored within secondary containment capable of holding at least 110 percent of the largest container within the containment.
- Smaller containers would be stored in containment where practicable.
- Fuel transfer would take place within containment or over drip pans where practicable.

- Absorbent pads and spill kits would be readily available at fuel storage sites.
- Fuel for the drill sites and water pump station would be transported and stored in custom tanks designed for safe, efficient transport of fuel.
- Fuel storage containers would be double-walled or stored within appropriate secondary containment.
- Lubricating grease at drill rigs would also be stored in secondary containment.
- Pumps, fuel containers, and refueling equipment at water pump stations would be contained within an impermeable structure.

Constantine personnel would be trained in spill prevention and spill response procedures; spill kits would be located in key areas. Select Constantine personnel would complete training in fuel handling, fuel storage, and fuel transferring procedures. Appropriately trained personnel would regularly check fuel storage containers, components of fueling systems, containments, and spill kits.

If hazardous or regulated materials were spilled, Constantine would contain the spill and notify the BLM, Alaska Department of Environmental Conservation (ADEC), and the Emergency Response Hotline, as required. After clean up, the oil, fluids, or chemicals and any contaminated material would be removed from the site and disposed of at an approved facility.

2.2.8 Reclamation

Reclamation would be completed according to the requirements and performance standards in 43 CFR 3809, state statute, and would meet the reclamation objectives outlined in the BLM's *Solid Minerals Reclamation Handbook (#H-3042-1;* BLM 1992) and *Surface Management Handbook (#H-3809-1;* BLM 2012c). Reclamation would be designed to achieve post-exploration land uses.

2.2.8.1 SCHEDULE OF RECLAMATION

Constantine would reclaim truck-mounted drill sites concurrently with exploration activities, beginning as soon as practicable. Operators would regrade sites between June and October within 1 year, and seed in September or October within 1 year, of ceasing exploration activity, depending on weather and site conditions. Reclamation would last up to 4 years from the time final reclamation begins and would be initiated within 2 years after the completion of exploration activities. Constantine would monitor the progress of revegetation annually between June and October for 3 years after seeding or until reclamation met the success criteria.

2.2.8.2 DRILL SITE RECLAMATION

Constantine would reclaim all drill holes, removing drill hole casings or cutting them off at or below ground elevation, and plugging all drill holes with bentonite holeplug or equivalent slurry, following State of Alaska plugging regulations. If artesian conditions are encountered, Constantine would contact and consult with the appropriate state and Federal agencies prior to abandoning the hole. Constantine could line some drill holes with PVC or steel casing for future survey or monitoring, and would place removable caps on the casings until the holes were plugged as described above. A maximum of 40 holes would remain open at any given time.

Constantine would remove all drill sites, helipads, water infrastructure, buildings, equipment, and non-earthen materials, excluding timber bridge abutments, from the Project area at the end of the exploration program. Reclaiming drill sites would include salvaging timber and removing all materials, including helipads and water infrastructure. At drill pads intended to be reused during the exploration program, Constantine would partially or fully remove the timber structures, secure the remaining structures, remove all refuse and scrap, and leave the hole casings in place.

Helicopter-supported drill sites would cause minor surface disturbance and would not require regrading. If recontouring were necessary, Constantine would shape them using hand tools.

2.2.8.3 GRAVEL INFRASTRUCTURE RECLAMATION

Constantine would reclaim the access road, rockfall mitigation berm, laydown area, and rock stockpiles when they are no longer needed for exploration. They would regrade and reshape the linear access road and the lower part of the switchback road, as well as the laydown area, to approximate original contours and place salvaged topsoil on the surface. They would reshape creek banks to pre-construction contours. Constantine would also reshape drainageways to pre-construction contours, to the extent possible, to have the same capacity as upstream and downstream reaches, and stabilize them against erosion as necessary. Constantine would remove bridges, culverts, and timber from bridge abutments. They would dispose of non-timber materials outside of the Project area and crush and scatter timber in a manner to reduce soil erosion.

Constantine would fill the road cuts of the switchback road with stockpiled rock and recontour the disturbed areas to blend with the existing talus slope. They would spread fines over the backfill to promote revegetation. Areas between switchbacks beyond the reach of an excavator would not be recontoured.

2.2.8.4 REVEGETATION

Constantine would roughen recontoured surfaces prior to seeding, which they would perform with hand-held broadcast seeders (severe slopes) or an electric broadcast seeder and chain-drag-mounted on an all-terrain vehicle. They would seed the site using the BLM-approved reclamation seed mixture and application rates, using only certified, weed-free seed. If noxious weeds or other invasive species the BLM considers detrimental are found, Constantine would develop an appropriate treatment plan in consultation with a BLM weed specialist and would implement the plan. Weed control measures would comply with applicable state and Federal regulations. Weed treatments could include using herbicides, but only those that are BLM-approved for use on public lands. With the exception of revegetation monitoring, Constantine would complete all reclamation work no later than 2 years after exploration activities ceased.

Reclamation standards for quantitative measurements of revegetation will be specified through the BLM-Alaska standards outlined in the 2016 Uplands Revelation for Mining Claims documents. Constantine will implement these revegetation criteria once they are finalized through the BLM-Alaska State Office.

2.2.9 Post-closure Management

After completing reclamation on an area, Constantine would begin post-closure management, which would extend until the BLM and the State of Alaska, Department of Natural Resources (ADNR) accept the reclamation. After reclamation, Constantine would inspect the Project area annually to document the success of the revegetation; they would inspect between June and October for 3 years or until meeting revegetation success criteria. Constantine would submit annual reports of reclamation progress to the BLM and ADNR.

2.2.10 Schedule

Project activities would occur over 5 years according to the following approximate schedule**:**

Year 1

- February through April: Program planning and resource studies
- March through June: Engineering studies
- May through October: Helicopter-supported exploration drilling and environmental studies
- November through December: Program data review and reporting

Year 2

- January: Program data review and reporting
- February through April: Program planning
- May through October: Helicopter-supported exploration drilling, exploration road construction, environmental studies, and engineering studies
- November through December: Program data review and reporting

Year 3

- January: Program data review and reporting
- February through April: Program planning and resource studies
- May through October: Helicopter-supported exploration drilling, ground-based exploration and def drilling, environmental studies, and engineering studies
- November through December: Program data review and reporting

Year 4

- January: Program data review and reporting
- February through April: Program planning
- May through October: Helicopter-supported exploration drilling, ground-based exploration and def drilling, environmental studies, and engineering studies
- November through December: Program data review and reporting

Year 5

- January: Program data review and reporting
- February through April: Program planning and resource studies
- May through October: Helicopter-supported exploration drilling, ground-based exploration and def drilling, environmental studies, and engineering studies

2.2.11 Applicant-Committed Environmental Protection Measures

Constantine has committed to the following environmental protection measures and BMPs to prevent unnecessary or undue degradation during construction, operation, and reclamation of the Project. These BMPs are also listed in Appendix 1 of Constantine's Plan (2015).

2.2.11.1 WATER QUALITY

Constantine will use BMPs to limit erosion and sediment transport from proposed facilities and disturbed areas during construction and operation, in accordance with the Alaska General Storm Water Permit and the SWPPP. Following construction activities and in accordance with BLM requirements, Constantine will seed areas, such as growth media stockpiles, as soon as practical and safe. They will conduct concurrent reclamation to accelerate stabilization of disturbed areas. In addition to completing the BMP inspections and reporting, Constantine will conduct an annual evaluation in order to prepare a written report documenting the following:

- Inspection of areas contributing to storm water discharges containing pollution (i.e., sediment or product spills/leaks).
- Evaluation of BMPs for their effectiveness in reducing storm water pollutant loads.
- Schedule for modifying the BMPs and revisions to the SWPPP, if practical reductions of pollutants can be achieved.

2.2.11.2 MIGRATORY BIRDS

According to Section 6.8.3 of Constantine's Plan, the following BLM sensitive birds may nest in the mature coniferous forests and upland shrubland vegetation communities within the Project area: olive-sided flycatcher, gray-cheeked thrush, and Townsend's warbler. However, per the BLM's instructional memorandum (No. AK-2010-018), only the olive-sided flycatcher is classified as BLM-sensitive, while the gray-cheeked thrush and Townsend's warbler are on the BLM's watch list (BLM 2010).

In addition, numerous other bird species also federally protected under the Migratory Bird Treaty Act (MBTA) may nest within the Project area.

Constantine will conduct any land clearing or other surface disturbance associated with Project-related activities outside of the avian breeding season (April 15 to July 15), to avoid potentially destroying active bird nests or young birds in the area. If this is not feasible, Constantine will perform avian nest surveys prior to surface disturbance to determine the presence/absence of ground- or shrub-nesting birds. Constantine will avoid all active nests identified during these surveys during the avian breeding season in order to avoid a violation of the MBTA, or coordinate with U.S. Fish and Wildlife Service (USFWS) staff to determine possible mitigating measures.

2.2.11.3 CULTURAL AND PALEONTOLOGICAL RESOURCES

Pursuant to 43 CFR 10.4, Constantine will notify the BLM authorized officer, by telephone, and with written confirmation , immediately upon the discovery of human remains, funerary objects, sacred objects, or objects of cultural patrimony (as defined in 43 CFR 10.2). Further pursuant to 43 CFR 10.4 (c) and (d)(2), they will immediately stop all activities in the vicinity of the discovery and not commence again for a maximum of 30 days or when notified to proceed by the BLM authorized officer.

Constantine will not knowingly disturb, alter, injure, or destroy any historical or archaeological site, structure, building, or object. If Constantine discovers any cultural resource that might be altered or destroyed by operations, the discovery will be left intact and reported to the authorized BLM officer. In the event that previously undiscovered paleontological resources are discovered in the performance of any surface disturbing activities, the item(s) will be left intact and immediately brought to the attention of the authorized BLM officer. If significant paleontological resources are found, Constantine will avoid the area, record the location, and recover data.

2.2.11.4 FIRE MANAGEMENT

Constantine will comply with applicable Federal and state fire laws and regulations and will take reasonable measures to prevent and suppress fires in the area of operations. Constantine and contractors will carry fire extinguishers, hand tools, or backpack-type water pumps in their vehicles to suppress small fires.

2.2.11.5 HAZARDOUS MATERIALS MANAGEMENT

Constantine will develop a site-specific SPCC plan, which will prescribe proper storage, transfer, and maintenance procedures; employee training; and documentation of regular inspections. They will provide the SPCC plan to the BLM for review and approval before using bulk fuel storage facilities. Constantine will follow these guidelines:

- All fuel storage containers larger than 55 gallons will be double-walled or stored within secondary containment capable of holding at least 110 percent of the largest container within the containment.
- Smaller containers will be stored in containment where practicable.
- Fuel transfer will take place within containment or over drip pans where practicable.
- Absorbent pads and spill kits will be readily available at fuel storage sites.

2.2.11.6 PUBLIC SAFETY AND ACCESS

In accordance with 43 CFR 3715, *Use and Occupancy Under the Mining Law*, Constantine will maintain public safety throughout the duration of the Project and maintain all equipment and Project components in a safe and orderly condition. They will place signs warning the public that the area is an active exploration site and heavy equipment traffic might be present. They will secure any identified public hazards, such as open historic mine workings, per state and Federal regulations.

In 2014, under their Notice, Constantine built an access road to mineral claims, and in consultation with Haines State Forest personnel, they installed a steel gate along the access

road, which is located on State Forest lands. Constantine currently controls access to the exploration road for safety, security, and to minimize impacts; they will continue to control access for the following reasons:

- Minimizes degradation of the road; for example, public travel on the road during spring melt could result in deep ruts that require considerable expense to repair.
- Helps achieve the BLM's recommended BMPs, including requirements for invasive, non-native plant species prevention and mitigation, by minimizing the potential for vehicles to track invasive species into the Project area.
- Ensures security of fuel storage facility at the laydown area.
- Prevents unauthorized firewood collectors from taking of the timber cleared within the right of way of the road and decked for future sale by Haines State Forest.
- Minimizes potential for trash, vandalism and theft of sensitive instrumentation associated with baseline data collection (e.g. weather station).
- Minimizes public access to active work areas with heavy equipment and helicopter activity taking place at the laydown area.
- Minimizes concerns with public safety and liability.
- Minimizes public vehicle interference with reclamation efforts (e.g. reseeding).

Constantine would comply with all applicable state and federal fire laws and regulations and all reasonable measures would be taken to prevent and suppress fires in the Project area. Constantine would take steps to prevent fires by ensuring fire extinguishers and hand tools are readily available.

2.2.11.7 AIR QUALITY

Constantine will apply water to the road surface with a water truck for dust suppression if necessary. Alternately, they will apply gravel to the road surface to control dust.

2.2.11.8 INVASIVE WEEDS

Constantine will develop and follow a site-specific invasive species management plan. To control the spread of invasive species, vehicles used in access, construction, maintenance, and operations of the Project will be thoroughly cleaned prior to entering BLM lands. This includes high-pressure washing to treat the inside of bumpers, wheel wells, undercarriages, inside belly plates, excavating blades, buckets, tracks, rollers, drills, buckets, shovels, etc., to remove potential weeds, seeds, soil carrying weed propagules, and vegetative material. Constantine will consult with the BLM to identify an appropriate location for a vehicle washing station.

After construction, Constantine will begin reclaiming the site as soon as possible, using only native topsoil and seeding with BLM approved seed mix. To prevent and control the introduction and spread of noxious weeds within the Project area, Constantine will implement the following prevention and control practices:

- Minimize soil disturbance to the extent practicable, consistent with Project objectives, stockpiling growth media (topsoil) for use in reclamation.

- Revegetate disturbed sites as soon as practicable when exploration work is complete.
- Use only straw bales that are certified as weed-free.
- Identify and remove any noxious weeds in the Project area.
- Exclude noxious weeds from disturbed areas until reclamation is accepted and bond is released.
- Ensure that all equipment is "weed-free" before traveling to and from the Project area so that noxious weeds will not be spread to new locations.
- Create a noxious weed inventory.

2.2.11.9 RIPARIAN MITIGATION

Constantine will keep abutments for vehicular modular bridge crossing at Glacier Creek to the minimum size necessary and construct them using local cut timbers and stone where possible. They will remove all bridge abutments when no longer needed, and reshape the Glacier Creek channel to pre-construction contours.

2.2.12 Use and Occupancy Under the Mining Laws

Constantine will be conducting activities that require them to comply with the requirements detailed in 43 CFR 3715, Use and Occupancy Under the Mining Laws. Use and Occupancy includes activities such as erecting access gates, posting signs to notify employees and public of site conditions and the placement of equipment and structures on the claims that support the exploration operations. Constantine will be using an access gate for the road that leads to the drill sites; however, this gate is located on a portion of the road that is on State Forest land. Additionally, the access gate has been address in this EA in section 2.3.2 on page 2-33, 2.2.11.6 on page 2-30, 3.9.3 on page 3-98, and 3.11.3 on page 3-113. The use of equipment on the mining claims will directly support exploration operations. Constantine will store and use fuel tanks, storage containers, drill pipe, and other ancillary equipment that support drilling operations in the laydown area and the drill pad areas. The use of this equipment and storage of it on the mining claims has been address in further detail within this EA in sections 2.2.2 on page 2-8, 2.2.7 on page 2-25, 2.2.11.6 on page 2-30, and 3.1.4.1.2 on page 3-8.

2.3 Alternatives Considered But Not Analyzed in Detail

The following is a discussion of the alternatives, some identified by the public through the scoping process and some identified by the BLM internally, which the BLM has considered (relative to the criteria in Section 2.2, Alternative 2 – Proposed Action Alternative (page 2-4), and the BLM's *Environmental Policy Act Handbook* (#H-1790-1; BLM 2008b), but ultimately eliminated from detailed consideration in this EA.

2.3.1 Unreclaimed Access Road Alternative

During public scoping, a member of the public submitted a comment asking to keep the proposed road open for recreational access to the area, which resulted in review of this alternative. The alternative would leave the proposed access road unreclaimed by Constantine, opening the area up for public access where access was previously limited to Porcupine Road.

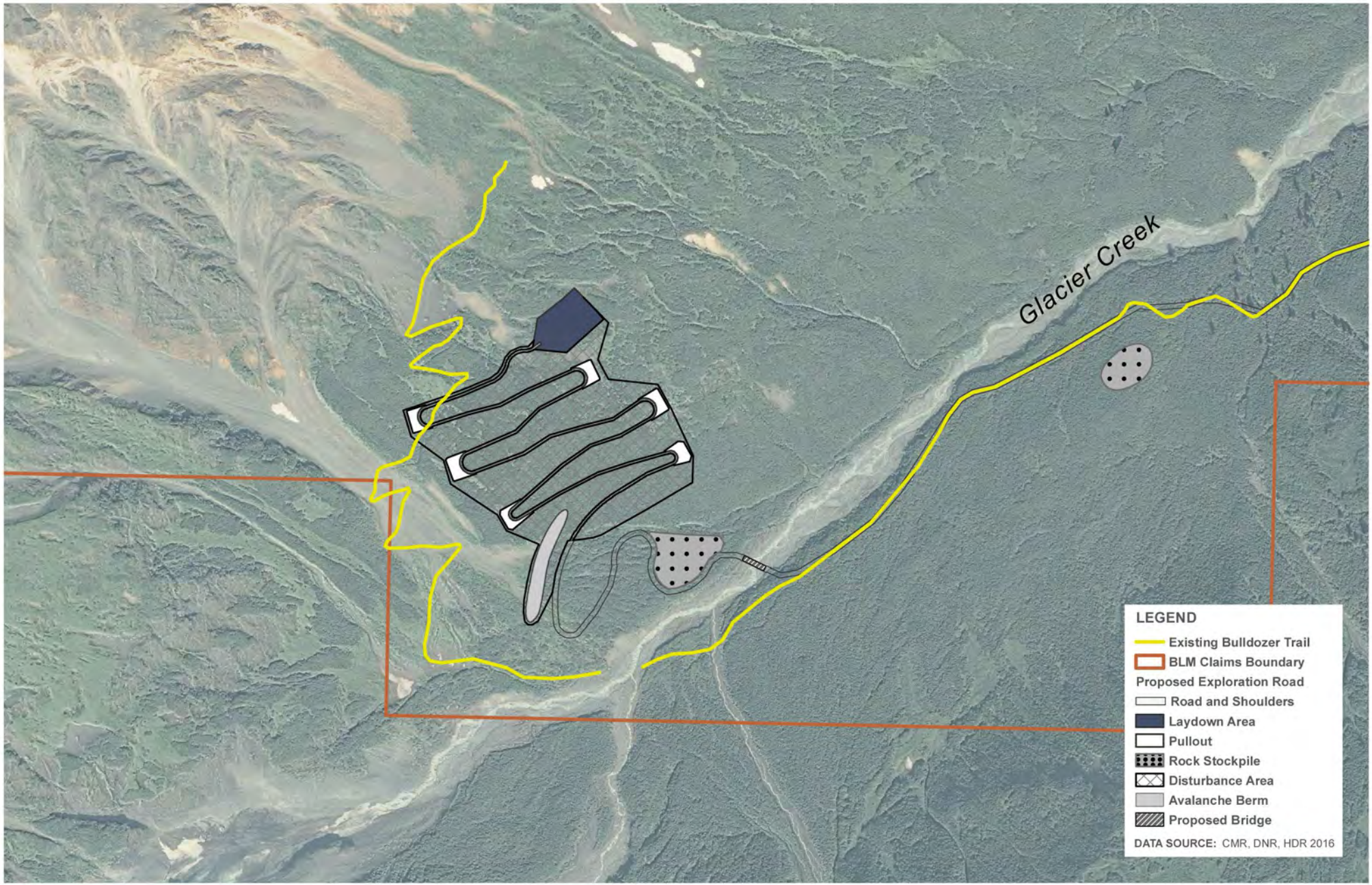
The BLM currently has no method for maintaining the road after the Project is complete. Therefore, after preliminary analysis in the early stages of preparing this EA, the BLM eliminated the alternative to keep the road open from further analysis in this EA.

2.3.2 Existing Cat Trail Alternative

The proposed linear access road on the south side of Glacier Creek follows a pre-existing road bed that was permitted and built in 1977. The original road, which was constructed as a narrow Cat trail, has become overgrown with vegetation, and all stream crossings are washed out. An existing bulldozed trail, located west of the proposed access road switchbacks, had switchbacks up the slope to an elevation of 2,900 feet (near the terminus of the proposed action road) (**Figure 2-2**, page 2-5). Natural processes have partially to fully-reclaimed the Cat trail and it is no longer usable for vehicle traffic. No crossing of Glacier Creek exists currently.

During the alternatives development meeting for this EA, and discussions about using an existing disturbance in the area, the BLM considered an alternative that would upgrade the naturally-reclaimed Cat trail into a switchback access road, construct a bridge crossing at the creek, and extend the linear access road south of Glacier Creek farther up the valley to meet the base of the Cat trail. The Cat trail is located in a rockfall and avalanche chute as delineated in **Figure 2-14** on page 2-34. There is a significant safety risk that would result from vehicular traffic and drilling along a road in the avalanche and rockfall chute. Construction of an upgradient berm would only partially mitigate the safety hazard presented by drill pads, vehicle traffic, personnel working outside, and equipment storage being located within the chute. In addition, the exploration and environmental drilling that is located along the access road switchbacks would be located farther west than in the Proposed Action, potentially missing the targets proposed by Constantine. Therefore, after preliminary analysis in the early stages of preparing this EA, the BLM eliminated the alternative to use the existing Cat trail as the switchback access road from further analysis in this EA.

Therefore, after preliminary analysis in the early stages of preparing this EA, the BLM eliminated the alternative from further analysis in this EA.



0 Feet 2,000

PALMER PROJECT

EXISTING BULLDOZER TRAIL

FIGURE 2-14

2.3.3 Switchbacks Alternative

During the alternatives development meeting for this EA, and discussions about using an existing disturbance in the area, the BLM considered an alternative that would end the proposed access road in a laydown yard on the north side of Glacier Creek, eliminating the switchback portion of the road going up the steep slope. The option would eliminate approximately 25 acres of disturbance, but would allow for a creek crossing, providing a pathway off the mountain and across Glacier Creek for personnel on the helicopter-supported drilling areas in an emergency. This alternative would eliminate access for truck-supported drilling for exploration, geotechnical, and environmental drilling.

The truck-supported drilling is a critical component of continued exploration of the property, and would greatly impact exploration progress. Therefore, this alternative does not respect Constantine's purpose and need for the Project. Because this alternative is a portion of the Proposed Action Alternative and does not include new components or disturbance, impact analysis associated with this alternative will be analyzed under the Proposed Action Alternative.

Chapter 3: Affected Environment and Environmental Consequences

3 Affected Environment and Environmental Consequences

3.1 Issue 1: Surface Water and Groundwater Resources

This section inventories surface water and groundwater resources, and development rock, in the Project area and vicinity, and evaluates the potential impacts of the proposed Project on water resources to address issues identified during scoping. Scoping issues include the following (numbers correspond to scoping comments in *Scoping Summary Report* [BLM 2016]):

- How will drilling fluids or drilling waste water from this project affect water quality? (80)
- How will construction of the road and bridge and operation of the project affect water quality? (72, 78, 125, 127, 152)
- How will the rock stockpiles from this project affect water quality? (72, 78, 117, 120, 123, 125, 127, 142, 156, 173)
- How will the project affect water quantity? (117)

3.1.1 Literature Review

There are several existing documents and data sources available to develop an understanding of the baseline surface hydrology and water quality conditions. Reviewed data sources include the following:

- Watershed maps and aerial imagery

  These show the drainage basins, the topography, land cover, and how the streams connect.

- Surface water background monitoring results (Integral Consulting 2014)

  This report presents the analytical results from project-area water samples.

- Evaluation of Potential for Acid Rock Drainage memorandum (Green 2016d) and *Exploration Plan of Operations* (Plan; Constantine 2015)

  This memorandum and sections of the Plan identify locations in the Project area that rock samples were collected from the surface or drill hole locations that rock core was collected from for geochemical characterization. The analytical report tables for acid base accounting are provided.

- *Palmer VMS Project Preliminary Aquatic Investigation* (Tetra Tech 2013)

  This describes some of the creeks in the project vicinity.

- Glacier Creek investigation trip report memorandum (ADF&G 2014)

  This report describes Alaska Department of Fish and Game (ADF&G) habitat biologists' investigation of fish presence along the proposed road alignment.

- *Porcupine Area Salmon Assessment* (Takshanuk Watershed Council [TWC] (n.d.))

  This describes results of fish presence and water quality investigations in the project vicinity.

- Temporary Water Use Authorizations issued to Constantine North, Inc. (Constantine) by the State of Alaska

  These are two State of Alaska authorizations for Constantine withdrawal of water from surface water and groundwater specific source locations for use in exploration drilling.

- State of Alaska Drinking Water Protection Map (ADEC 2016) and Alaska water quality standards

  The State of Alaska Drinking Water Protection Map displays the locations of public and private water rights. The State of Alaska has adopted water quality criteria that are contained in two documents: (1) Water Quality Standards and (2) Water Quality Criteria Manual for Toxics. These documents provide specific values for constituent concentrations for surface waters in Alaska.

- U.S. Geological Survey online surface water monthly statistics and watershed boundary dataset

  These show watershed boundaries, gaging stations, stream gage data, and locations for which water quality data are available.

3.1.2 Study Methodology

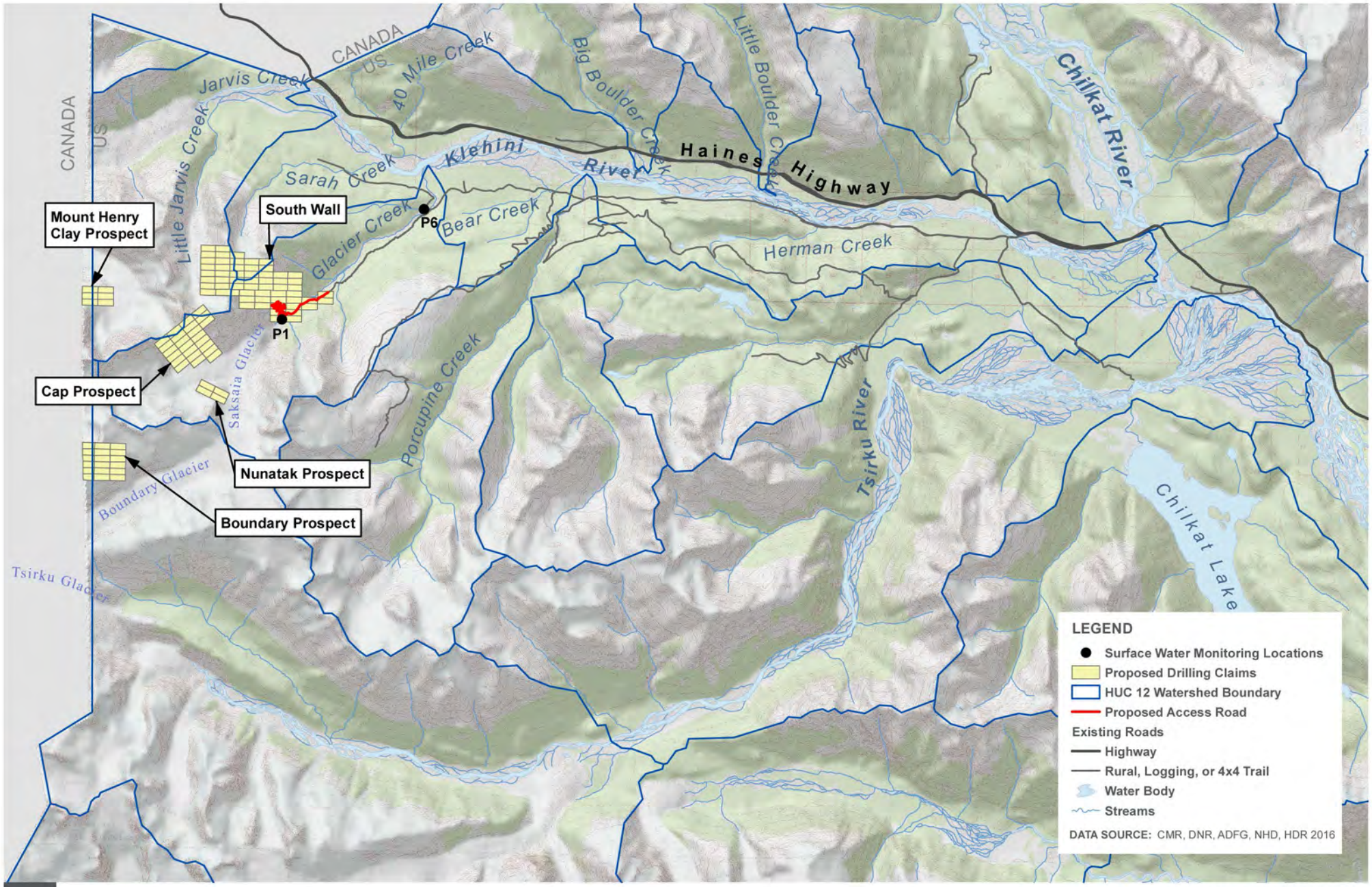
By compiling information gleaned during the literature review; reviewing public scoping comments; and using professional experience and judgment, this analysis:

- identifies the activities that could affect water quality and quantity;
- summarizes Constantine's commitments and the Bureau of Land Management's (BLM) recommended measures to protect against potential adverse impacts; and
- discusses the likely effects of the two alternatives on surface water and groundwater.

3.1.3 Affected Environment

3.1.3.1 SURFACE WATER

The areas of proposed construction, operations (including drilling and water withdrawal), and reclamation are located in the headwaters of Glacier Creek, Sarah Creek, Little Jarvis Creek (tributary of Jarvis Creek), Jarvis Creek, and along Glacier Creek itself (**Figure 3-1**, page 3-3). Jarvis, Sarah, and Glacier creeks, all glacial in origin, flow into the Klehini River, which discharges to the Chilkat River. The Chilkat River empties to the sea at Chilkat Inlet. The Boundary prospect is in the watershed of Boundary Glacier, a tributary of the Tsirku Glacier, which becomes the Tsirku River and discharges to the Chilkat River immediately downstream of where the Klehini River discharges to it.



PALMER PROJECT

WATERSHED AND SURFACE WATERS

FIGURE 3-1

PATH: Z:\453144 CONSTANTINE NORTH, INC\272610 PALMER EA\GIS\MAP_DOCS\PALMEREA_FIG3-X_WATERSHED.MXD - USER: SGROSENI - DATE: 3/21/2016

Table 3-1,below, lists the approximate lengths and watershed sizes of the main streams potentially affected by the project, not including the tributaries of Glacier Creek.

Table 3-1. Characteristics of Potentially Affected Streams

Project Area Stream	Approximate stream length (miles)	Approximate drainage area* (square miles)	Glacially fed
Klehini River (at Porcupine Road crossing)	42	285	Yes
Glacier Creek	5	16	Yes
Sarah Creek	4	3	Yes
Little Jarvis Creek	2	3	Yes
Jarvis Creek	5	40	Yes
Tsirku River	25	230	Yes

*Approximate drainage area sources: Bugliosi (1988), USGS (2016a,b), direct measure in GIS.

3.1.3.1.1 Klehini River

The Klehini River originates in glaciers on the south and west sides of its northwest-east-trending valley and presently-unglaciated mountains at the valley's northwestern reaches in Canada. Where Glacier Creek discharges into it, the braided river flats are approximately one-third mile wide. The average monthly discharge at its mouth near Klukwan ranged between 222 cubic feet per second (cfs) in March and 4,150 cfs in July, during the 1981 to 1993 period of gaging record (USGS 2016a).

3.1.3.1.2 Glacier Creek

Glacier Creek originates in the Saksaia Glacier, which terminates approximately one-half mile upstream of Constantine's proposed road crossing. Its drainage basin constitutes approximately 6 percent of the Klehini River watershed. The Glacier Creek channel near the proposed bridge crossing is 10 to 30 feet wide and the greater outwash plain is 80 to 100 feet wide (Constantine 2015). Aerial imagery and site photos show a slightly braided channel. ADF&G scientists measured channel gradients between 4 and 14 percent. The substrate is boulders, cobbles, gravel, and silt (Constantine 2015).

Constantine collected and analyzed water samples from Glacier Creek eight times between 2008 and 2014, capturing a range of conditions, including initial snowmelt, mid-summer, and late-summer. They collected samples upstream of the proposed bridge crossing (Site P1) and downgradient of the proposed linear road alignment (Site P6) along Glacier Creek (**Figure 3-1**, page 3-3). The sample sites are separated by 3.25 creek miles. ALS Environmental Laboratory analyzed the water quality samples for conventional parameters as well as anions, nutrients, and total and dissolved metals (Constantine 2015).

Comparing Glacier Creek water quality (2008 to 2014) to Alaska surface water chronic aquatic life standards, upgradient and downgradient stations showed exceedances for aluminum. Aluminum also routinely exceeded the Alaska acute aquatic life criteria at both upgradient and downgradient sample sites. There were no other exceedances of Alaska surface water quality standards in baseline sampling.

The Glacier Creek analytical results show high total suspended solids (TSS), ranging between 9 and 2,470 milligrams per liter (mg/L) at both sample sites (Constantine 2015). Results indicate that baseline TSS concentrations randomly vary between the stations, increasing between sample sites on some events, and decreasing on other events. Concentrations of TSS vary as much as 250 percent between the up and downstream stations. June 2011 marks the highest observed TSS concentration (2,470 mg/L), with significantly lower TSS at the downstream station (708 mg/L). Similarly, turbidity at Glacier Creek upgradient and downgradient sites is high, ranging between 34 and 2,760 nephelometric turbidity units (NTUs) at the upstream site, and 18 and 665 NTUs at the downstream site. The high turbidity and TSS concentrations are expected for a glacial creek and sample stations near the glacier. Surface water pH values fluctuate between 6.59 and 8.33, with no apparent seasonal or condition trend. Nutrients, arsenic and other metals are below detection limits or very low in concentration. A complete listing of all analytical results can be found in Appendix 6a of Constantine's Plan.

TWC collected water samples from Glacier, Sarah, and Little Jarvis creeks, and from the Klehini River upstream of the Jarvis Creek outlet to the river and 11 miles downstream of the Glacier Creek outlet near the Porcupine Road bridge (TWC n.d.). They sampled quarterly between November 2011 and August 2012 and analyzed the samples for total and dissolved metals, sulfate, TSS, and alkalinity. Iron exceeded the Alaska chronic aquatic life standard in August 2012 in Glacier and Little Jarvis creeks and the Klehini River (TWC n.d.).

3.1.3.1.3 Glacier Creek Tributaries

East side. Fish and wetland biologists documented seven streams crossing the existing road on BLM land, two of which are intermittent. These range between 1 to 6 feet wide and have gradients of 10 to 40 percent (Tetra Tech 2013; ADF&G 2014).

Two streams cross the proposed road alignment within the segment authorized under Constantine's notice of mineral exploration operations (Notice; J145690), but not yet constructed. Christmas Creek has a gradient of 10 to 25 percent, is 3 to 10 feet wide, and has a substrate of gravel to boulders. Another unnamed ephemeral stream, has a 25 to 30 percent slope and is less than 3 feet wide (Tetra Tech 2013; ADF&G 2014).

The proposed road alignment would cross one perennial stream and three to five ephemeral streams between the end of the road authorized under the Notice and the proposed bridge over Glacier Creek. These tributaries to Glacier Creek have gradients between 22 to 30 percent and widths from less than 3 to 10 feet. The perennial creek is deeply incised and has a cobble and boulder substrate (Tetra Tech 2013; ADF&G 2014).

West side. Two small tributaries flow into Glacier Creek southeast of the proposed laydown area, and a larger one descends the mountainside northeast of the proposed laydown area. Fish scientists estimated the gradients to be more than 40 percent (Tetra Tech 2013).

3.1.3.1.4 Jarvis Creek, Little Jarvis Creek, and Sarah Creek

Under the proposed Project, drilling water would continue to be pumped from Sarah Creek and melt water tributary to Jarvis Creek, as previously authorized under Temporary Water Use Authorization F2014-102. Constantine would contact both BLM and the State of Alaska prior to

pumping. There is no proposed change to operations for these creeks. TWC reported that iron exceeded the Alaska chronic aquatic life standard in August 2012 in Little Jarvis Creek (TWC n.d.). All other parameters measured in Jarvis, Sarah, and Little Jarvis creeks were below Alaska surface water quality standards.

3.1.3.1.5 Tsirku River

Flow measurements in the Tsirku River from 1981 to 1983 showed discharges at the mouth ranging between 142 and 5,390 cfs (Bugliosi 1988). It is glacial in origin and highly turbid. It discharges into the Chilkat River across a wide fan immediately downstream of the Klehini River outlet.

3.1.3.2 GROUNDWATER

There are no drinking water wells within the Project vicinity. The closest drinking water well to the Project area is near the mouth of the Tsirku River drainage, 11 miles east of proposed Project area. There are no water protection designations or water rights within the Glacier Creek, Jarvis Creek, Little Jarvis Creek, or Sarah Creek drainages (ADEC 2016).

3.1.3.3 DEVELOPMENT ROCK

The Glacier Creek valley bottom is filled with Quaternary alluvium and glacial drift. The drift cover is deep, as evidenced by road cuts and incised creek beds. During construction of the existing access road, Constantine did not encounter any bedrock and do not anticipate encountering bedrock during construction of the proposed access road in the valley bottom.

Surface overburden and bedrock that Constantine could encounter during construction and blasting for the switchback portion of the proposed access road is entirely underlain by hanging wall rock composed of basalt. In order to understand the potential for acid rock generation from rock stockpiled from road construction, Constantine collected and characterized rock samples representative of talus and bedrock shot rock material that they could excavate during switchback road construction for acid rock drainage potential. They presented their analysis results in a memorandum, Evaluation of Potential for Acid Rock Drainage (Green 2016d), which is summarized in the following sections.

As part of the geochemical characterization program, Constantine completed the following:

- Collected 29 drill core samples representative of encountered rock material;
- Collected 17 surface rock samples representative of encountered rock material;
- Sent samples to ALS Laboratory for static laboratory testing, including multi-element analysis using fouracid digest and induced coupled plasma (ICP) analysis, neutralization potential (NP); net neutralization potential (NNP); maximum potential acidity (MPA), paste pH, sulfur, sulfide, sulfate, and leachable sulfate, and inorganic carbon. Constantine selected these static tests to address the samples' total acid generation or neutralization potential and concentration of constituents in leachates derived from the material.

The following are the two main considerations of this baseline environmental geochemical characterization:

- Acid generation due to oxidation of sulfide minerals, which can potentially lead to development of acid rock drainage (ARD); and
- Potential for leaching of salts (e.g., sulfate).

Geochemical analytical results indicate that rock units sampled have large positive NNP.

- NNP values range from 26 to 594 (Constantine 2015; Green 2016d). Net neutralizing potential is equal to the NP minus the MPA. MPA is calculated by multiplying the total sulphur value by the constant 31.25.
- The neutralizing potential ratio (NP/MPA) values from sampled rock demonstrate an excess of neutralizing capacity, with NP/MPA ratios ranging from a low of 2.65 to a high of 844.8 (Constantine 2015; Green 2016d). This low does not include two of the surface samples that have NP/MPA ratios less than 1.0 (0.05 and 0.64) because Constantine collected these samples from the footwall quartz-sericite alteration zone, located well outside the area of proposed construction and are not representative of the rock types that could be encountered during construction.
- Total sulfur, total sulfate, and leachable sulfate is very low in samples (0.01-1.37, 0.01-0.14, 0.01-0.18 percent, respectively) (Constantine 2015; Green 2016d).

Acid base accounting results indicate that the rock material from the proposed road construction has low potential to generate acid and the rocks have a high neutralizing capacity. Therefore, the proposed rock stockpiles and berms are predicted to be non-acid generating and would not degrade water quality.

3.1.4 Direct and Indirect Effects from Alternative 1 – No Action Alternative

3.1.4.1 SURFACE WATER

3.1.4.1.1 Access Road Construction and Reclamation

The No Action Alternative would entail construction of up to 0.3 miles of authorized road, including two stream crossings, and use of approximately 1.4 miles of existing unpaved access road crossing approximately nine streams on BLM land. Constantine would install a culvert, which would likely have a minor impact on the unnamed creek flow characteristics. However, Constantine would remove the culvert during reclamation; therefore, effects would be temporary. Constantine has also committed to the following measures:

- Implement a Stormwater Pollution Prevention Plan (SWPPP)
- Implement existing operational performance standards

These measures would reduce erosion and sedimentation of stormwater runoff by routing stormwater around the authorized access road and sediment control ponds to protect downgradient surface water quality. Constantine would seed areas such as cut and fill slopes as soon as practicable to provide vegetation cover that would also reduce wind and water erosion potential. Reclaiming the road would entail regrading and revegetating disturbed areas.

Constantine would maximize concurrent reclamation to the extent practicable to accelerate the revegetation of disturbed areas, and they would periodically inspect and repair stormwater best management practices (BMPs) as necessary.

Based upon the implementation of committed operational performance standards, BMPs, reclamation activities, impacts to surface water resources caused by the No Action Alternative would be minimized.

3.1.4.1.2 Use of Fuels, Lubricants, Cleaning Solutions

Under the No Action Alternative, Constantine would continue to operate equipment on BLM land that requires fuel, lubricants, and cleaners. As indicated in the Notice, approximately 1,200 gallons of fuel would be stored in 55 gallon drums or larger containers maintained within impermeable containment with greater than or equal to 110-percent capacity of the drums or tanks (Constantine Metal 2014). Constantine would transport fuel in 55-gallon drums or 130-gallon fly tanks. The total fuel volume stored at any given site would not exceed 200 gallons. Under the No Action Alternative, Constantine would continue to helicopter-sling fuel, lubricants, drilling supplies, and cleaning solutions from Big Nugget Camp to helicopter-supported drill sites and water withdrawal sites, and remove them from BLM property at the close of each drilling season. Transporting such materials, particularly via repeated helicopter slinging of fuel over Glacier Creek, entails a low probability risk of accidental fuel spill into Glacier Creek or its tributaries. Constantine would helicopter transport fuel in 130-gallon fly tanks or smaller volume containers. A fuel spill into Glacier Creek of 130-gallons or less would be rapidly diluted by Glacier Creek. Constantine would transport fuel in accordance with Alaska and U.S. Department of Transportation regulations, and handle and store it as required by state and Federal petroleum product storage and handling laws and regulations.

Constantine's commitment to implement operational performance standards, including a Spill Prevention Control and Countermeasures (SPCC) Plan and training personnel in spill prevention and response, would minimize the potential of a fuel spill and contamination to surface water caused by the No Action Alternative.

3.1.4.1.3 Drilling Water Withdrawal

Constantine obtains water for drilling by pumping from alpine meltwater and from exploration drill holes authorized by Temporary Water Use Authorizations (TWUAs) issued by the State of Alaska. There are two TWUAs, described in Chapter 2 and Appendix 8 of the Plan, for 10 sources of water. The current TWUAs authorize a combined withdraw of up 86,400 gallons of water per day from the designated water sources from May 1 to October 31 of each year, at an intake rate of up to 20 gallons per minute per pump, subject to a maximum of three pumps per source. The locations of withdrawal are at glacial meltwater, high alpine reaches unlikely to be used by fish; however, permits have conditions intended to protect fish against entrainment or impingement. Constantine is not authorized to alter the waterbodies (dam or divert) to accomplish the withdrawal and must maintain adequate flow and water levels in the source waters to support indigenous aquatic life and fish passage. The authorized withdrawal from the surface water sources is both temporary and a negligible fraction of the total flow from these watersheds. The BLM assumes that the State of Alaska has completed an impact assessment

for the withdrawal of the surface water prior to issuing the authorizations. Water quality would not be affected (except see discussion of fuel use above).

3.1.4.1.4 Drilling Operations

Exploration drilling requires water to cool the drill bit and remove cuttings. Constantine would use industry-standard drill mud, where needed, with water to remove drill cuttings and maintain fluid circulation. Any drill mud would be certified NSF International/American National Standards Institute (NSF/ANSI) 60 for use in domestic water wells. They would use additives approved for drilling drinking water wells on a preferred basis. The rock into which drilling at the site is advanced is highly fractured, therefore drilling water rarely returns to the surface. Constantine has committed to collecting drill cuttings and drilling fluids that return to the surface in a storage tank or sump and dispose of them by burial or off-site. It is unlikely that discharge of water from drilling operations would have more than minimal adverse effects on water quality, and these would be temporary.

Constantine's commitment to implement operational performance standards regarding drilling water collection would minimize and make unlikely impacts to surface water resources under the No Action Alternative.

3.1.4.2 GROUNDWATER

3.1.4.2.1 Drilling Water Withdrawal

As previously described in Section 3.1.4.1.3, Surface Water – Drilling Water Withdrawal (page 3-8), Constantine obtains water for drilling by pumping from alpine meltwater and from exploration drill holes authorized by TWUAs. The pumping rate of the groundwater withdrawal would be significantly limited by the small diameter of the core holes being maintained as potential water sources; therefore, surface water sources are more commonly used. The authorized withdrawal from the groundwater sources is both temporary and an inconsequential rate of withdrawal on the groundwater resource of a watershed with high precipitation and recharge. The BLM assumes that the State of Alaska has completed an impact assessment for the withdrawal of the groundwater prior to issuing the authorizations. Water quality would not be affected except potentially by fuel use; see discussion in Section 3.1.4.1.2, Use of Fuels, Lubricants, Cleaning Solutions (page 3-8).

3.1.4.2.2 Drilling Operations

Due to the fractured nature of the near-surface bedrock and low groundwater table in the areas where Constantine proposes to drill, there is typically no surface return of drill water and cuttings. If drill cuttings and drill fluids did return to surface, Constantine would manage them using sediment traps (sumps) at each drill site, and/or closed-loop centrifuges. They would dispose of and bury any cuttings collected via centrifuge in pits, or at an appropriate disposal facility off site.

Drilling fluid that is not returned to the surface of a borehole can migrate through fractured bedrock into the groundwater. The drilling fluid is typically composed of the water used to mix the drilling mud (make-up water), small amounts of very fine bentonite particles, and small amounts of drilling additives. The make-up water would be groundwater from the same Project area as the exploration hole being drilled, or glacial-melt water that would likely have water

quality similar to or superior to the groundwater encountered in a borehole. Therefore, no impacts are anticipated to groundwater quality from the mixing of groundwater with make-up water sources.

Constantine would use drilling additives on a preferred basis that are non-toxic, biodegradable and certified NSF/ANSI Standard 60 for use in domestic water supply wells. Mixing two chemically different waters, such as mud filtrate and groundwater, will produce chemical reactions. Some of the properties that may differ between the drilling fluid and groundwater are pH, dissolved oxygen (DO), cation exchange capacity, biochemical oxygen demand, total organic carbon, suspended solids, dissolved ions, and bacteria. The literature on water quality changes resulting from filtrate/groundwater mixing is very sparse. Campbell and Grey (1975) discuss a multitude of physical, chemical, and biological processes involved in mixing drilling fluids and conclude that "…the mobility of drilling fluids in the groundwater system is clearly of very limited extent because of a variety of physical, chemical, and biological factors." Due to the minimal volume of fluid filtrate anticipated to be associated with each drill hole, groundwater impacts would be very limited in extent and duration, and rapidly diluted. The small quantities of water that are likely to mix as a result of drilling, the net effect to the receiving aquifer can be viewed as neutral.

3.1.5 Direct and Indirect Effects from Alternative 2 – Proposed Action Alternative

3.1.5.1 SURFACE WATER

3.1.5.1.1 Access Road and Laydown Area Construction and Use

Under the Proposed Action Alternative, the impacts would be similar to those of the No Action Alternative, but greater in magnitude because the proposed access road would be longer, borrow sites would be larger, more material would be moved to construct the road, part of the road would be on steeper ground, and traffic volume would be higher. In addition to the stream crossings under the No Action Alternative, the Proposed Action Alternative would include installing three bridges, plus culverts, to cross approximately five to seven additional streams, including Glacier Creek, some of which flow only seasonally. The Glacier Creek bridge would be approximately 60 feet long, which exceeds the width of the creek at ordinary high water based on examination of aerial photographs, and none of the bridges would have piers within the creek. The bridges could potentially affect flow downstream and immediately upstream during unusual flood events. Impacts of the road on surface hydrology would be minor and temporary.

The Proposed Action Alternative could result in more erosion and sedimentation into creeks than the No Action Alternative, particularly the switchback access road, which would ascend a substantial slope above Glacier Creek. However, these impacts would be temporary, and in the context of turbid Glacier Creek, they would be minor.

The Proposed Action would incorporate design elements, including a SWPPP and implementation of BMPs to ensure that water quality would be protected as a result of the Project activities. Constantine has also committed to the following measures:

- Implement a SWPPP.
- Implement existing operational performance standards.

These measures would reduce erosion and sedimentation of stormwater runoff by routing stormwater around the authorized access road and sediment control ponds to protect downgradient surface water quality. Constantine would seed areas such as cut and fill slopes as soon as practicable to provide vegetation cover that would also reduce wind and water erosion potential. Road reclamation would entail regrading and revegetating disturbed areas. Constantine would maximize concurrent reclamation to the extent practicable to accelerate the revegetation of disturbed areas, and they would periodically inspect and repair all erosion and sediment control BMPs as necessary.

Based upon the implementation of committed operational performance standards, BMPs, reclamation activities, impacts to surface water resources caused by the Proposed Action Alternative would be minimized.

3.1.5.1.2 Use of Fuels, Lubricants, Cleaning Solutions

Under the Proposed Action Alternative, Constantine would continue to operate equipment on BLM land that require diesel fuel, aviation fuel, gasoline, and lubricating grease in larger quantities than required under the No Action Alternative. Constantine would use and/or store these materials at the water pumps, at the drill sites, on highway vehicles and heavy equipment, at the vehicle wash site, on the helicopter, and at the laydown area at the end of the proposed access road. Constantine would transport these materials to the laydown area by highway vehicle, and from there to drill and pump sites by helicopter. The length of transport of fuels by helicopter sling would be substantially less than under the No Action Alternative because the slinging to drill sites would be from the proposed laydown area rather than the Big Nugget Camp, greatly reducing or eliminating the number of sling loads of fuel over Glacier Creek. Constantine would transport fuel in accordance with Alaska and U.S. Department of Transportation regulations, and handle and store it as required by state and Federal petroleum product storage and handling laws and regulations.

Based upon the implementation of committed operational performance standards, including implementing a SPCC plan and training personnel in spill prevention and response, the likelihood of a fuel spill and contamination to surface water caused by the Proposed Action Alternative would be minimized, and represent lower risk than the No Action Alternative.

3.1.5.1.3 Drilling Water Withdrawal

Under the Proposed Action Alternative, impacts due to water withdrawals would be similar to those under the No Action Alternative. Because Constantine would complete more total drilling under the Proposed Action Alternative, the total water withdrawal would be greater; however, the maximum rate of withdrawal would remain the same. Therefore, the effects of drilling water withdrawal on surface water resources would be anticipated to be the same as under the No Action Alternative.

3.1.5.1.4 Drilling Operations

Under the Proposed Action Alternative, impacts to surface water resources from drilling operations would be similar to those under the No Action Alternative, but greater in magnitude because of proposed additional drilling for exploration, environmental, and geotechnical purposes. Constantine proposes drilling along the proposed switchback road, which is located

closer to Glacier Creek than the helicopter-supported drilling; therefore additional BMPs will be installed in the switchback area to protect against discharge to Glacier Creek from drilling muds and return water overflowing from a sump. However, the rock into which drilling would be advanced is highly fractured; therefore, it is unlikely that drilling water would return to the surface. Constantine would collect drill cuttings and drilling fluids that return to the surface in a storage tank or sump and dispose of them by burial or at an appropriate disposal facility off site. Based upon the implementation of committed operational performance standards regarding drilling water collection, impacts to surface water resources caused by the Proposed Action Alternative are not anticipated.

3.1.5.1.5 Rock Stockpile Geochemistry

Under the Proposed Action Alternative, Constantine proposes two rock stockpile areas to accommodate the estimated 50,000 cubic yards of talus and potential shot rock material removed during construction of the proposed switchback road. They would use the rock stockpiles for the temporary storage of this talus rock material and for reclaiming the switchback road. Constantine could level the talus and shot rock material and use it for temporary staging areas during active work programs or for rock fall berms.

Acid base accounting results indicate that the acid generation potential is low and the neutralizing capacity is high for excavated basaltic talus and shot rock material from the proposed road construction. Therefore, the proposed rock stockpiles and berms are predicted to be non-acid generating and would not degrade surface water quality. The potential for encountering a rock material during proposed activities at depth that has not been sampled is considered very low due to core drilling and sampling conducted at the switchback road.

3.1.5.2 GROUNDWATER

3.1.5.2.1 Drilling Operations

Under the Proposed Action Alternative, impacts to groundwater from drilling operations would be similar to those of the No Action Alternative but larger in magnitude because of proposed additional drilling for exploration, environmental, and geotechnical purposes. Due to the minimal volume of fluid filtrate associated with each drill hole, groundwater impacts would be very limited in extent and duration, and rapidly diluted with a net effect to the receiving aquifer as neutral.

3.1.5.2.2 Rock Stockpile Geochemistry

Precipitation that falls onto the rock stockpiles and berms would infiltrate the stockpile and seep to groundwater. As described in Section 3.1.5.1.5, Surface Water – Rock Stockpile Geochemistry (page 3-12), the rock is predicted to be non-acid generating; therefore, seepage water would not be expected to degrade groundwater. The proposed rock stockpiles would not impact groundwater quality in the Project area.

3.1.6 Cumulative Effects

The National Environmental Policy Act (NEPA) requires analysis of the cumulative impacts from the Proposed Action when added to past, present, future, and reasonably foreseeable future impacts. The possible cumulative impacts that could result from the Proposed Action, the expansion of Constantine's existing Notice-level exploration activities, and the No Action Alternative, are included within each resource section. Under the No Action Alternative,

Constantine would continue exploration activities through 2018 as previously approved, but no additional expansion activities would occur.

A cumulative impact, also commonly referred to as a cumulative effect, is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 Code of Federal Regulations [CFR] 1508.7).

3.1.6.1 CUMULATIVE EFFECTS BOUNDARIES OF THE ANALYSIS

The geographic reference area considered for potential cumulative impacts varies by resource. For examining cumulative impacts to physical resource components, the assessment boundary is generally defined as the Glacier Creek valley.

The temporal boundaries considered for this cumulative impacts assessment extend from 2014 to the year 2019. The year 2014 represents when initial exploration activities began in the Glacier Creek valley. The year 2019 represents 3 years beyond the baseline year of 2016.

3.1.6.2 PAST, PRESENT, AND REASONABLE FORESEEABLE FUTURE ACTIONS

- ***Past Actions*** (i.e., previous cat track construction and exploration activities; forest service plans in the lower valley): Since the preparation of the initial *Haines State Forest Plan* in the mid-1980s, the state has prepared various plans and studies of land status and timber resources.
- ***Present Actions:*** Constantine holds state claims in the Klehini River and Chilkat River drainage; however, Constantine has no application or proposal for activities on those claims. The Alaska Department of Transportation and Public Facilities (ADOT&PF) prepared an environmental assessment and is looking to make improvements to the Haines Highway (2015). These improvements include improving intersections, driveways and recreational turnout accesses, as well as replacing the highway bridge over the Chilkat River.
- ***Reasonable Foreseeable Future Actions:*** Constantine has current approvals to continue exploration activities through 2018. ADOT&PF will continue to make improvements to the Haines Highway, as analyzed and proposed under their recent environmental review process.

Given that there would be no measurable direct or indirect impacts to water resources as a result of the Proposed Action Alternative given implementation of committed operational performance standards and BMPs; therefore, by definition, there is no potential for this alternative to incrementally contribute to cumulative effects. Under the No Action Alternative, the cumulative effects to water resources would be similar to those under the Proposed Action Alternative: no effect is anticipated.

3.1.7 Recommended Mitigation

None identified.

3.2 Issue 2: Wetlands

This section inventories wetlands and waterbodies in the Project area and evaluates the potential impacts of the proposed Project on wetlands and waterbodies.

3.2.1 Literature Review

Two previously-prepared documents identify wetlands and waterbodies within the Project area and the greater vicinity. Reviewed documents include the following:

- *Wetland and Waterbody Jurisdictional Determination Report* (HDR 2013)

  This report identifies locations in the Project area that are subject to U.S. Army Corps of Engineers' (USACE) jurisdiction under authority of Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act of 1899. The report summarizes methods and results and provides maps of the wetlands and waterbodies in the Project area.

- *Expanded Wetland Mapping for the Palmer VMS Project* (HDR 2015)

  This memorandum was completed as an addendum to the *Wetland and Waterbodies Jurisdictional Determination Report* (HDR 2013) and provides wetland and waterbody mapping for a larger area surrounding the switchback road.

3.2.2 Study Methodology

The USACE regulates the discharge of dredged or fill material into jurisdictional wetlands and other waters of the U.S. (waterbodies) under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act of 1899.

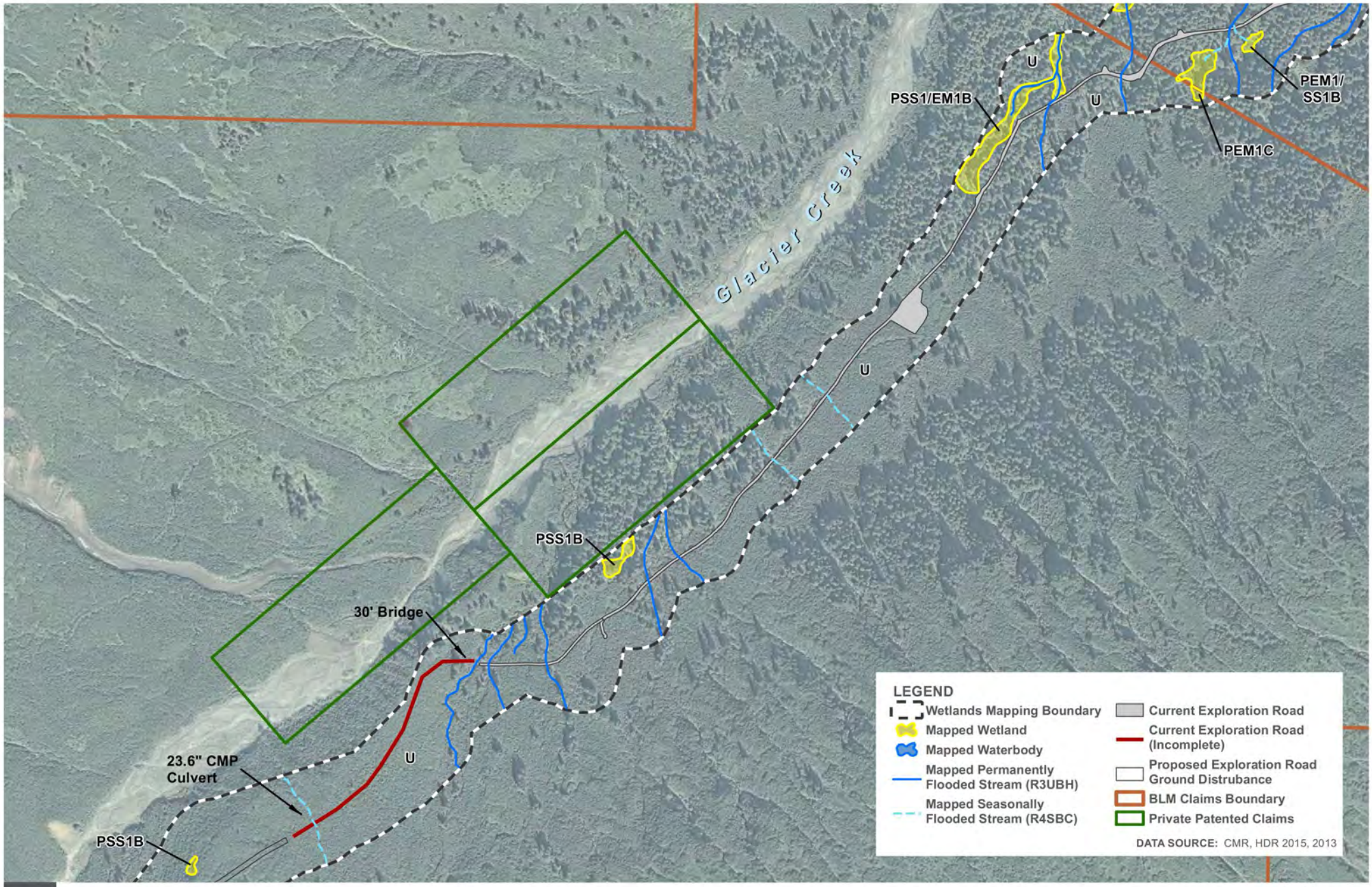
By compiling information on wetlands and waterbodies from baseline study reports, calculating direct impacts to Waters of the U.S. including wetland and waterbodies, and using professional experience and judgment, this analysis:

- identifies the activities that could affect Waters of the U.S. including wetlands and waterbodies;
- summarizes USACE's recommended measures that would mitigate potential adverse impacts; and
- discusses the likely effects of the two alternatives on wetland resources.

Based on specifications in Constantine's 2015 Plan, and using a geographic information system (GIS) to overlay digital files of project components, including rip rap fill required to construct Glacier Creek Bridge, onto the baseline wetland and waterbody footprints previously mapped, this analysis calculates the following:

- Direct impacts to Waters of the U.S. including wetlands and waterbodies;
- Areas of each wetland and waterbody type within the Project footprints;
- Total linear feet of stream that would be placed in culverts at each proposed culvert installation site (using a length of 51 feet represented by the maximum toe of slope of the proposed access road in Constantine's Plan).

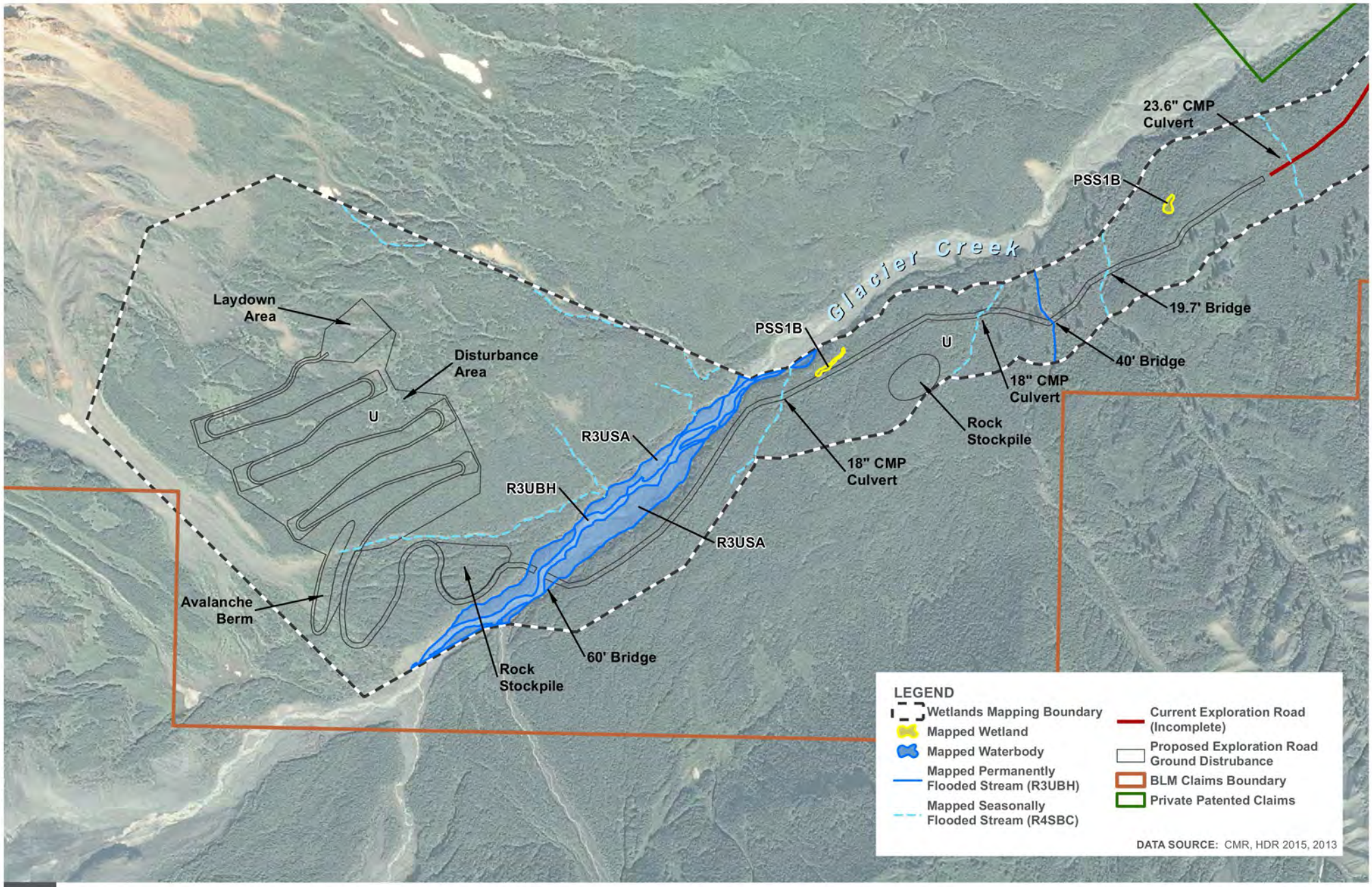
Maps of the project components overlain on the wetland and waterbody mapping are shown on **Figure 3-2** on page 3-15 and **Figure 3-3** on page 3-16.



PALMER PROJECT

WETLANDS MAPPING - LINEAR ROAD

FIGURE 3-2



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PALMER PROJECT

WETLANDS MAPPING - SWITCHBACK ROAD

FIGURE 3-3

PATH: Z:\453144 CONSTANTINE NORTH, INC\272610 PALMER EA\GIS\MAP_DOCS\PALMEREA_FIG3-X_WETLANDSSWITCHBACKROAD.MXD - USER: SNORTON - DATE: 3/25/2016

3.2.3 Affected Environment

Constantine's wetlands consultant, HDR, Inc., mapped wetlands and waterbodies in a 233-acre area in 2013 and an additional 51-acre area in 2015 for an approximately 350-foot-wide corridor along the access road alignment and for a wider area covering the proposed switchback road alignment (**Figure 3-2**, page 3-15, and **Figure 3-3**, page 3-16). The Project area for determining impacts to Waters of the U.S. including wetlands and waterbodies is approximately 206.57 acres and is defined as the limits of the mapping up to the BLM Claims Boundary. All mapped wetlands and waterbodies in the Project area are subject to USACE jurisdiction under Section 404 of the Clean Water Act (HDR 2013, 2015).

Table 3-2, below, lists the wetland and waterbodies mapped in the Project area by National Wetland Inventory code (based on the *U.S. Fish and Wildlife Service Classification of Wetlands and Deepwater Habitats of the U.S.* [Cowardin et al. 1979]) and approximate acreage. The approximately 1.87 acres of wetlands within the Project area include emergent, scrub shrub, and scrub shrub/emergent wetlands. There are an additional 7.14 acres classified as waterbodies which includes Glacier Creek and associated gravel bars. The remaining 197.56 acres are classified as upland.

Table 3-2. Wetlands and Waterbodies Mapped in Project Area

Mapping Code*	Description	Acreage within Project Area
PEM1C	Persistent Emergent Seasonally Flooded Wetland	0.07
PSS1B	Palustrine Deciduous Scrub Shrub Saturated Wetland	0.39
PSS1/EM1B	Palustrine Deciduous Scrub Shrub/Persistent Emergent Saturated Wetland	1.41
N/A	**Total Wetlands:**	**1.87**
R3UBH	Permanently Flooded Upper Perennial Stream (Glacier Creek)	1.85
R3USA	Gravel Bars (Glacier Creek)	5.29
N/A	**Total Waterbodies:**	**7.14**
N/A	**Total Wetlands and Waterbodies:**	**9.01**
U	Upland	197.56
N/A	**Total Area:**	**206.57**

*Mapping code source: Cowardin et al. 1979

Table 3-3, below, lists small streams in the Project area too small to be mapped as polygons: 8 perennial streams totaling 4,988 linear feet and 10 seasonal streams totaling 6,457 linear feet.

Table 3-3. Small Streams Mapped in Project Area

Stream Type*	Description	Number of Streams Mapped	Total Linear Feet
R3UBH	Permanently Flooded Upper Perennial Stream	8	4,998
R4SBC	Seasonally Flooded Intermittent Stream	10	6,457
N/A	**Total:**	**18**	**11,455**

*Stream type source: Cowardin et al. 1979

3.2.4 Direct and Indirect Effects from Alternative 1 – No Action Alternative

Exploration activities would continue under the No Action Alternative. Water withdrawal from waterbodies for drilling activities would be from permitted sources and impacts from drawdown would be considered minimal. Additional ground disturbance and concurrent reclamation would occur at the helicopter-supported drill sites. The drill sites are constructed of wood cribbing and are primarily located on rocky alpine areas lacking wetlands or waterbodies. As of early 2016, Constantine has built about 80 percent of the 3-mile road approved under the current Notice. Constantine could construct the additional 0.3-mile extension of the existing access road under the No Action Alternative. Extending this section of road would include installing one culvert in one intermittent stream, for a total of 51 linear feet of stream placed in a culvert, and constructing one full-span bridge over one perennial stream. No impacts on wetlands would occur under the No Action Alternative.

Following exploration, Constantine would complete the following reclamation activities:

- Remove the drill pads, any new section of constructed road, and an additional 0.9 miles of existing road from Federal property.
- Restore disturbed areas to pre-existing contours and revegetate with an approved reclamation seed mixture.
- Remove all bridges and culverts, restore resulting channels to the same capacity as up and downstream reaches, and stabilize against erosion as necessary.

Reclamation would include removing up to eight culverts and three bridges from stream crossings. Impacts from the No Action Alternative would have minimal adverse effects on waterbodies and would be temporary.

3.2.5 Direct and Indirect Effects from Alternative 2 – Proposed Action Alternative

Under the Proposed Action Alternative, expanded exploration activities that could potentially impact wetlands and waterbodies include construction of a new 0.8-mile linear access road and a 1.7-mile switchback exploration road, including rockfall berms, stockpiles, and equipment laydown areas. Similar to the No Action Alternative, Constantine would withdraw water from waterbodies for drilling activities from permitted sources; impacts from drawdown would be considered minimal. The drill sites are constructed of wood cribbing and are primarily located on rocky alpine areas lacking wetlands or waterbodies. Constantine would locate borrow sites in areas with suitable material and position them to avoid wetlands or waterbodies.

Under the Proposed Action, Constantine would continue the linear access road from the western limits of the existing road, which would involve placing culverts in three intermittent streams, for a maximum of 153 linear feet of stream placed in culverts. They would also construct one 29.8-foot bridge, one 19.7-foot bridge, and one 40.0-foot bridge over three additional streams. The bridges would be full-span bridges constructed of timber or modular steel design and no fill would be placed within the stream channels. Constantine would construct an additional 60-foot modular steel bridge over Glacier Creek, with abutments on both sides of the stream within the outwash plain of the creek. The outwash plain consists of

boulders, cobbles, gravel, and silt. The abutments would be constructed from naturally sourced stone or rip rap fill and would result in a total of 0.07 acres of impact to Glacier Creek.

Constantine would construct the switchback access road from the north side of Glacier Creek up a talus slope to the Glacier Creek Prospect, and components associated with the switchback road, including a rockfall mitigation berm, laydown area, and rock stockpiles. The road and rockfall mitigation berm would cross one intermittent stream located in the disturbance area of the switchback road. Constructing this portion of the road and associated components could potentially fill up to approximately 333 linear feet of intermittent stream.

No impacts on wetlands would occur under the Proposed Action. Impacts to waterbodies are shown in **Table 3-4**, below.

Table 3-4. Impacts to Waterbodies from Proposed Action

Project Component	Impact Type	Waterbody Type*	Description	Number of Streams	Area Affected
Linear Access Road	Culvert	R4SBC	Seasonally Flooded Intermittent Stream	3	153 linear feet
Glacier Creek Bridge	Fill	R3USA	Glacier Creek Gravel Bars	1	0.07 acres
Switchback Road and Disturbance Area	Fill	R4SBC	Seasonally Flooded Intermittent Stream	1	333 linear feet

*Waterbody type source: Cowardin et al. 1979

Following exploration, Constantine would complete the following reclamation activities:

- Remove the drill pads;
- Regrade and reshape the linear access road and the lower part of the switchback road, rockfall mitigation berm, and laydown area, to approximately original contours.
- Remove all bridges and culverts, restore resulting channels to the same capacity as up and downstream reaches, and stabilize against erosion as necessary.
- Reshape other drainageways to preconstruction contours to the extent possible and reclaim similarly.
- Remove the Glacier Creek bridge and abutments and reshape stream banks to pre-construction contours.
- Dispose of non-timber materials outside of the Project area.
- Crush and scatter timber removed from bridge abutments in a manner to help reduce soil erosion.

Reclamation would include removing up to ten culverts and six bridges from stream crossings. Impacts from the Proposed Action Alternative would have minimal adverse effects on waterbodies and would be temporary.

3.2.6 Cumulative Effects

NEPA requires analysis of the cumulative impacts from the Proposed Action when added to past, present, future, and reasonably foreseeable future impacts. The possible cumulative

impacts that could result from the Proposed Action, the expansion of Constantine's existing Notice-level exploration activities, and the No Action Alternative, are included within each resource section. Under the No Action Alternative, Constantine would continue exploration activities through 2018 as previously approved, but no additional expansion activities would occur.

A cumulative impact, also commonly referred to as a cumulative effect, is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7).

3.2.6.1 CUMULATIVE EFFECTS BOUNDARIES OF THE ANALYSIS

The geographic reference area considered for potential cumulative impacts varies by resource. For examining cumulative impacts to physical resource components, the assessment boundary is generally defined as the Glacier Creek valley.

The temporal boundaries considered for this cumulative impacts assessment extend from 2014 to the year 2019. The year 2014 represents when initial exploration activities began in the Glacier Creek valley. The year 2019 represents 3 years beyond the baseline year of 2016.

3.2.6.2 PAST, PRESENT, AND REASONABLE FORESEEABLE FUTURE ACTIONS

- ***Past Actions*** (i.e., previous cat track construction and exploration activities; forest service plans in the lower valley): Since the preparation of the initial *Haines State Forest Plan* in the mid-1980s, the state has prepared various plans and studies of land status and timber resources.
- ***Present Actions:*** Constantine holds state claims in the Klehini River and Chilkat River drainage; however, Constantine has no application or proposal for activities on those claims. ADOT&PF prepared an environmental assessment and is looking to make improvements to the Haines Highway (2015). These improvements include improving intersections, driveways and recreational turnout accesses, as well as replacing the highway bridge over the Chilkat River.
- ***Reasonable Foreseeable Future Actions:*** Constantine has current approvals to continue exploration activities through 2018. ADOT&PF will continue to make improvements to the Haines Highway, as analyzed and proposed under their recent environmental review process.

Given that there would be no long term direct or indirect impacts to wetlands or waterbodies as a result of the Proposed Action Alternative; therefore, by definition, there is no potential for this alternative to incrementally contribute to cumulative effects. Under the No Action Alternative, the cumulative effects to wetlands and waterbodies would be similar to those under the Proposed Action Alternative: no effect is anticipated.

3.2.7 Recommended Mitigation

Federal regulations and guidelines associated with Section 404 of the Clean Water Act require that project proponents eliminate or reduce adverse impacts on wetlands and waters of the U.S. by taking certain specific steps during project planning (33 U.S. Code [USC] 1344, 33 CFR Part 323, 40 CFR Part 230, 23 CFR 777). These steps are as follows:

1. Design the project to avoid adverse impacts.
2. Incorporate measures to minimize adverse impacts.
3. Plan to restore sites that must be temporarily adversely affected by the project.
4. Compensate for unavoidable adverse impacts through preservation, restoration, or creation of wetlands.

Each of the steps listed above is to be implemented to the extent practicable before moving on to the next step. Together, these steps mitigate (i.e., minimize) the overall adverse effects of a project to wetlands and waters of the U.S.

The USACE and the Environmental Protection Agency issued the Final Rule on Compensatory Mitigation on April 10, 2008. The final rule establishes criteria for the use of appropriate and practicable compensatory mitigation for unavoidable functional losses of aquatic resources issued by USACE permits (33 CFR Part 332). As part of the Section 404 permitting process, Constantine would coordinate with the USACE to develop a compensatory mitigation plan to offset impacts to waters of the U.S. in compliance with the 2008 Mitigation Rule, if required.

3.3 Issue 3: Fisheries

This section inventories aquatic resources in the Project area and vicinity and evaluates the potential impacts of the proposed Project on aquatic resources to address issues identified during scoping. Scoping issues include the following (numbers correspond to scoping comments in *Scoping Summary Report* [BLM 2016]):

- Will the construction of this project eliminate, modify or degrade resident or anadromous fish habitat? (21, 25, 30, 32, 37-40, 43-46, 55-56, 58, 61, 64, 69-72, 76, 78-79, 81-109, 111-112, 116-117, 121-122, 130, 132, 136-137, 139-140, 142, 146, 148, 150, 153, 156-157, 162, 166, 168-169, 172-173)
- Will the operation and maintenance of this project eliminate, modify, or degrade resident or anadromous fish habitat? (21, 25, 30, 32, 37-40, 43-46, 55-56, 58, 61, 64, 69-72, 76, 78-79, 81-109, 111-112, 116-117, 121-122, 130, 132, 136-137, 139-140, 142, 146, 148, 150, 153, 156-157, 162, 166, 168-169, 172-173)
- How will the construction and operation of this project indirectly affect resident or anadromous fish habitat? (21, 25, 30, 32, 37-40, 43-46, 55-56, 58, 61, 64, 69-72, 76, 78-79, 81-109, 111-112, 116-117, 121-122, 130, 132, 136-137, 139-140, 142, 146, 148, 150, 153, 156-157, 162, 166, 168-169, 172-173)
- How will the project affect subsistence, recreational, sport and commercial fisheries? (21, 25, 30, 32, 37-40, 43-46, 55-56, 58, 61, 64, 69-72, 76, 78-79, 81-109, 111-112, 116-117, 121-122, 130, 132, 136-137, 139-140, 142, 146, 148, 150, 153, 156-157, 162, 166, 168-169, 172-173)

3.3.1 Literature Review

There are several existing studies that contain baseline information on fish and aquatic habitat in the vicinity of the Project, along with agency databases; state and Federal management reports and technical papers; existing land and resource management plans; other literature available online and/or from the Alaska Resources Library and Information Services (ARLIS) library; and information solicited information from local entities such as the TWC and state and Federal agencies, including the ADF&G and BLM. Key data sources include the following:

- *Glacier Creek Investigation Trip Report* (Kern 2014)

  In 2014, the ADF&G performed a fish inventory using minnow traps and backpack electrofishing in Glacier Creek, several east-side tributary streams, and a west-side tributary stream located within the lower mile of Glacier Creek (Kern 2014). During the surveys, biologists also recorded habitat characteristics such as channel gradient, temperature and conductivity.

- *Palmer VMW Project, Preliminary Aquatic Investigation* (Tetra Tech, 2013)

  In 2013, Tetra Tech identified and characterized east-side tributary streams that would be crossed by the exploration road and set minnow traps in streams where suitable habitat was identified.

- *Porcupine Area Salmon Assessment* conducted for the *West Klehini Watershed Assessment* (TWC n.d.)

  In 2011, the TWC set minnow traps within the lower mile of Glacier Creek and collected samples for water quality analysis.

Results of the three studies above, which serve as the foundation for fish habitat and distribution information specific to Glacier Creek, are summarized in Section 3.3.3, Affected Environment, on page 3-26. Key information from the following sources that characterize fish distribution information for the Klehini and Chilkat River drainages is also summarized in Section 3.3.3, Affected Environment, on page 3-26.

- ADF&G Anadromous Waters Catalog (AWC) (Johnson and Litchfield 2015)

  The AWC is a regulatory tool that identifies waters important for spawning, rearing, or migration of anadromous fish. The AWC identifies anadromous waters that are afforded protection under the Anadromous Fish Act (Alaska Statute [AS] 16.05.871) as well as the Fishway Act (AS 16.05.841).

- ADF&G Alaska Freshwater Fish Inventory Database (AFFID)

  The AFFID houses freshwater fish data sets compiled from a variety of sources to display fish distribution throughout Alaska, in conjunction with the AWC. The AFFID was not designed for use as a regulatory tool but can be used for planning purpose.

- ADF&G fishery data series reports and other technical reports, fishery management plans, management reports, and regional information reports for the subsistence and commercial fishery in southeast Alaska (SEAK)

  The ADF&G Sport Fish and Commercial Fisheries divisions use fishery data series to publish technical results of single projects and groups of closely related projects and fishery manuscripts to present results of several years' work undertaken to address common objectives or specific management goals and/or new or highly technical methods. The special publication series present special subject repots to decision-making bodies, symposia, and workshop proceedings and may be used to discuss techniques and procedure manuals. These three series are intended for fishery or other technical professionals. The Division of Subsistence also publishes special publications and subsistence technical paper series (TPS). The Subsistence TPS is the most complete collection of current information about subsistence in Alaska. The Division of Commercial Fisheries presents preliminary results and raw data or other regional information not reported elsewhere in regional information reports.

- Local, state, and Federal technical papers characterizing aquatic habitat and salmon and/or eulachon distribution in the Chilkat River system

  Various organizations have undertaken studies to characterize aquatic habitat and fish distribution in the Chilkat River system. The U.S. Geological Survey (USGS) published the *Hydrologic Reconnaissance of the Chilkat River Basin* with focus on a ground-water discharge zone along the toe of the Tsirku River alluvial fan (Bulgiosi 1988). The

Southeast Alaska Conservation Assessment, published by Audubon Alaska and the Nature Conservancy, presents a compilation of several scientific papers relative to habitat and fish throughout SEAK. The U.S. Department of Agriculture prepared the *Biological Characteristics and Population Status of Anadromous Salmon in Southeast Alaska* to identify distinct or sensitive stocks that may require special consideration during land-management planning within the Tongass National Forest Service (Halupka et al. 2000).

Other reviewed data sources include:

- *Haines Borough 2025 Comprehensive Plan* (Haines Borough 2012)

  The Comprehensive Plan was developed to guide growth over the next 10 to 20 years and set paths to meet the goals and objectives of the Haines Borough.

- *Ring of Fire: Draft Resource Management Plan Amendment*, Haines Block Planning Area (BLM 2012a)

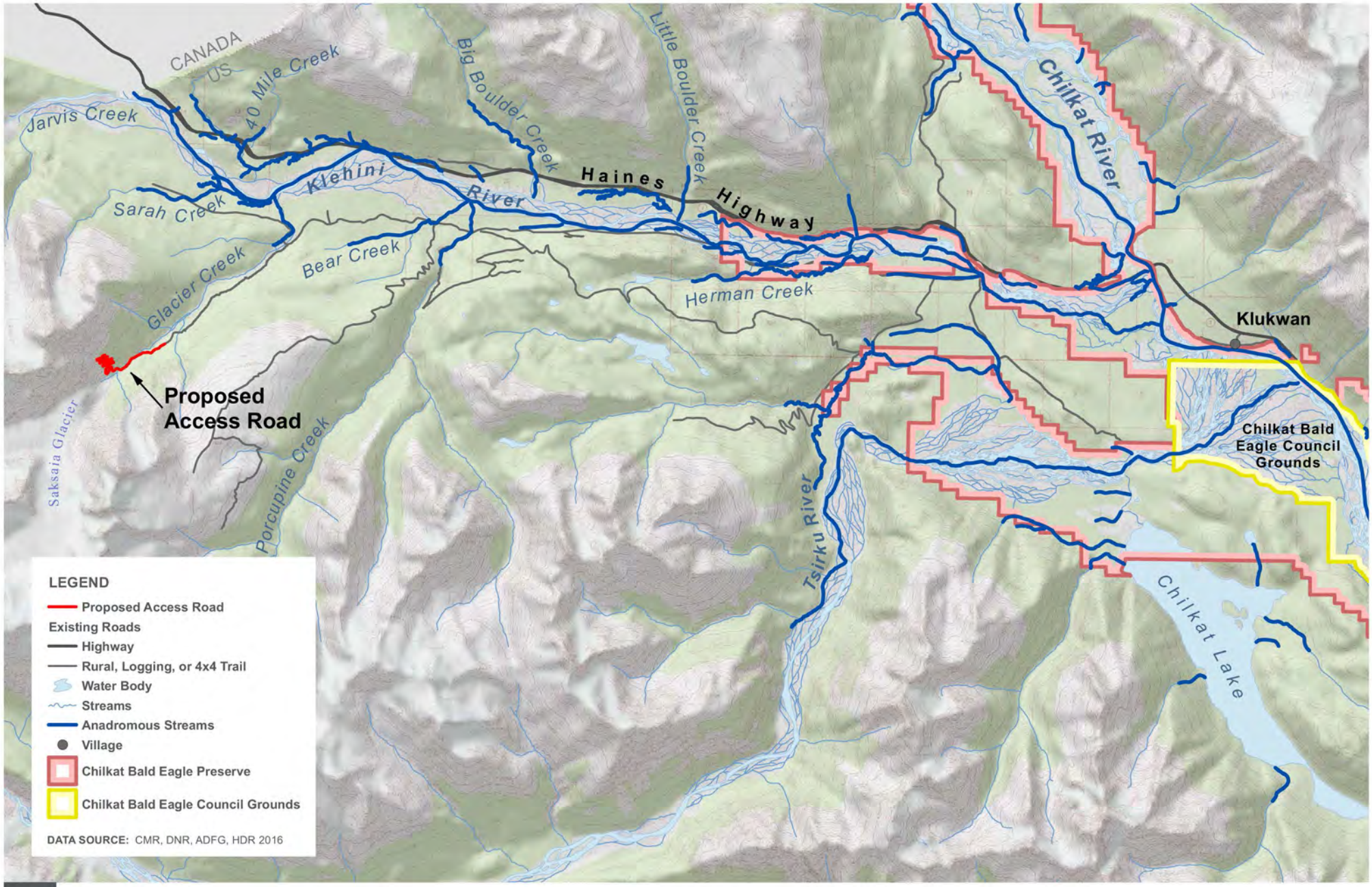
  The Ring of Fire planning area includes 1.3 million acres of BLM-administered public land in southeast and southcentral Alaska, Kodiak Island, and the Aleutian Islands. In 2012, the BLM drafted an amendment to evaluate whether to retain the Special Recreation Management Area in the Haines Block Planning Area. In 2014, the BLM announced a delay in this planning process.

3.3.2 Study Methodology

By compiling information on fish and aquatic habitat, including resident and anadromous fish distribution from the existing literature, and using professional experience and judgment, this analysis:

- identifies the activities that could affect fish and aquatic habitat;
- discusses the likely effects of the two alternatives on fish and aquatic habitat.

The effects analysis focuses on Glacier Creek but also extends downstream to include the Klehini and Chilkat rivers (**Figure 3-4**, page 3-25).



PALMER PROJECT

GLACIER CREEK, KLEHINI RIVER, AND CHILKAT RIVER

FIGURE 3-4

3.3.3 Affected Environment

3.3.3.1 GLACIER CREEK

Glacier Creek originates from the Saksaia Glacier, which sits at the head of the Glacier Creek valley. From the glacier, Glacier Creek flows northeast for approximately 4.5 miles before joining the Klehini River, approximately 2 miles west of Porcupine Creek. Flowing directly from the glacier through steep terrain, it is a cold and fast-flowing stream[1]. Channel gradient throughout Glacier Creek ranges from approximately 4 to 15 percent (Kern 2014). The channel's floodplain is bordered by steep mountains along its west (north) side within its upper drainage and a relatively steep bench along its east (south) side for most of its length. The lower half of the drainage has lower gradients and the floodplain widens as it nears the Klehini River. Glacier Creek, similar to other glacial rivers, exhibits high bedload movement and higher summer flows, which prevent vegetation from establishing. Large boulders, cobbles, and gravels appear to dominate the substrate.

Glacier Creek also receives water input from several small, high-gradient tributary streams and seeps along its east bank and fewer along its west bank. A clear-water tributary stream (Stream No. 115-32-10250-2077-3151-4010) on the west side of lower Glacier Creek, located approximately 0.8 miles upstream from the Klehini River confluence, supports rearing coho salmon (*Oncorhynchus kisutch*), as well as cutthroat trout (*O. clarkii*), and Dolly Varden char (*Salvelinus malma*) (Kern 2014; Johnson and Litchfield 2015). The tributary stream is low gradient and contains several large pools and abundant woody debris and sand, gravel and cobble substrate (Kern 2014). Habitat appears suitable to support rearing coho salmon, cutthroat trout and Dolly Varden. A 1995 survey reported abundant juvenile fish presence in this tributary with no barriers observed in the lower quarter-mile segment (Gaede 1996).

Coho salmon have not been documented farther upstream in the Glacier Creek drainage (Johnson and Litchfield 2015; Kern 2014; Tetra Tech 2013; TWC n.d.). It is assumed that coho salmon primarily use lower Glacier Creek to access suitable habitat in the clear-water, anadromous tributary stream. Therefore, tributary stream (Stream No. 115-32-10250-2077-3151-4010) marks the upstream extent of anadromous fish habitat in Glacier Creek (Johnson and Litchfield 2015; Kern 2014). The AWC identifies the lower (approximate) 0.8-mile portion of Glacier Creek (Stream No. 115-32-10250-2077-3151) as supporting anadromous coho salmon, in addition to cutthroat trout and Dolly Varden char (Johnson and Litchfield 2015). Cutthroat trout presence has also been confirmed within the lower mile of Glacier Creek[2] (TWC n.d.). Glacier Creek is not expected to otherwise support coho salmon or cutthroat trout, based on previous sampling results, species' habitat preferences, and habitat conditions throughout Glacier Creek.

Farther upstream, Glacier Creek has been found to support Dolly Varden (TWC n.d.; Tetra Tech 2013; Kern 2014). Dolly Varden presence has been confirmed in Glacier Creek from its mouth upstream approximately 3 miles, near the mouth of its largest tributary stream, locally

[1] In 2014, water temperature ranged 35.7 degrees Fahrenheit (F) near its headwaters to 45.8 degrees F near the former bridge crossing site farther downstream (Kern 2014).

[2] Traps set overnight in the lower mile of Glacier Creek captured cutthroat trout from four locations in October 2011; no fish were captured in traps set in lower Glacier Creek in August 2011 or May 2012 (TWC, 2012).

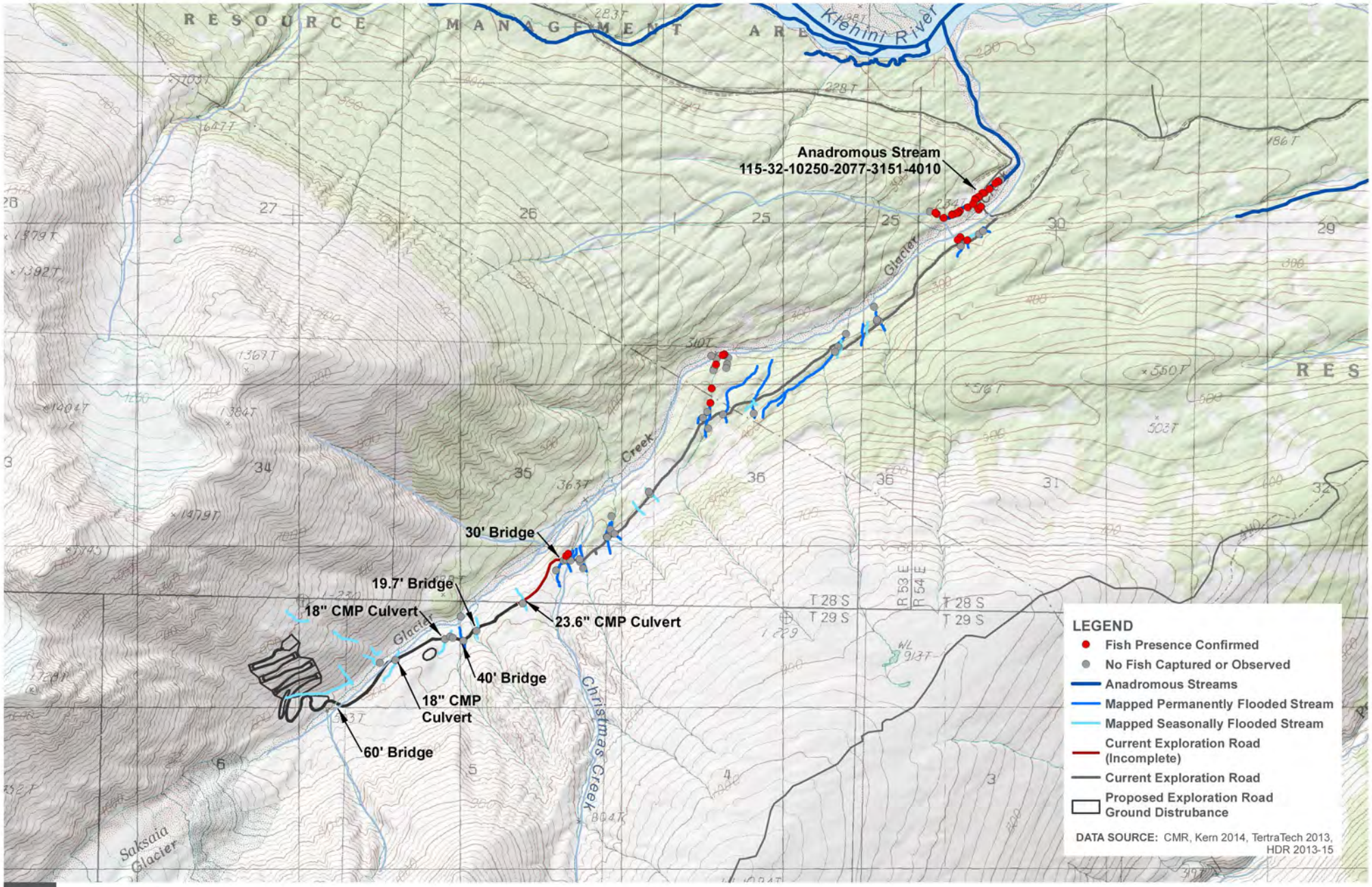
known as Christmas Creek (**Figure 3-6**, page 3-39) (TWC n.d.; Tetra Tech 2013; Kern 2014). In late May 2014, ADF&G set minnow traps in Glacier Creek upstream of the Christmas Creek confluence; they captured no fish from either upstream location (Kern 2014). While electrofishing in lower Glacier Creek in May 2014, biologists captured several Dolly Varden, approximately 0.04 inches (20 millimeters) in length, that appeared to be emerging from fine substrate. Presence of young-of-the-year fish suggests Dolly Varden spawning occurs in the Glacier Creek drainage. Electrofishing also yielded the capture of Ephemeroptera (mayfly) and Plecoptera (stonefly) larvae from Glacier Creek (Kern 2014).

In 2013 and 2014, scientists traversed the steep bench along the east side of Glacier Creek within the proposed road alignment to identify tributary streams and characterize habitat at proposed crossing locations (Tetra Tech 2013; Kern 2014). The surveys captured no fish from tributary streams within the alignment footprint during either year. The survey area included the 0.8-mile segment of road constructed in 2014 and the 0.3-mile segment yet to be constructed along Glacier Creek. Scientists visited fifteen tributary stream channels in July 2013; they sampled for fish presence at six streams deemed suitable for sampling and/or for supporting fish, including Christmas Creek (Tetra Tech 2013). Only one east-side tributary stream, located downstream of Christmas Creek, was found to contain fish in 2013 (**Table 3-7**, page 3-30) (Tetra Tech 2013). Scientists captured ten Dolly Varden from the stream within 50 feet of Glacier Creek; fish passage barriers were noted upstream of this point (Tetra Tech 2013).Though high-gradient tributaries upstream of Christmas Creek were deemed unsuitable for fish; scientists did observe two boreal toads in one dry channel (Tetra Tech 2013). Six of the eight channels within the currently proposed road expansion alignment were dry during the 2014 survey (Kern 2014).

While scientists captured no fish from Christmas Creek in July 2013 (Tetra Tech 2013); biologists did confirm Dolly Varden presence in Christmas Creek in May 2014 and in four other east-side tributary streams located farther downstream in the Glacier Creek drainage[3][4] (Kern 2014). Surveys captured the fish in Christmas Creek approximately 100 feet downstream of the proposed road alignment (Kern 2014). Surveys captured no fish at or upstream of the proposed road alignment; habitat is not considered suitable to support fish (Kern 2014). Fish captured from the other four tributary streams farther downstream were also captured downstream of the alignment, no fish were captured within or upstream of the alignment (Tetra Tech 2013; Kern 2014). **Figure 3-5** on page 3-28 shows fish distribution sampling in Glacier Creek. **Table 3-5** on page 3-29, **Table 3-6** on page 3-29, and **Table 3-7** on page 3-30 summarize fish sampling efforts and capture results for tributary streams on the east bank of Glacier Creek. The tables also provide stream channel gradients of tributary streams, where data are available.

[3] ADF&G identified 23 channels-seeps, ephemeral streams, and perennial streams-within the approximate 1.7 mile-route surveyed east of Glacier Creek during which time six channels were dry; flow in one channel was considered ephemeral while two other channels were identified as ephemeral seeps. Sampling methods were expanded to include electrofishing (Kern 2014).

[4] In July 2013, only one of the four streams sampled downstream of Christmas Creek was found to support fish. Dolly Varden were captured within 50 feet of Glacier Creek; fish passage barriers were noted upstream of this point (Tetra Tech 2013).



PALMER PROJECT

FISH SAMPLING IN GLACIER CREEK

FIGURE 3-5

Table 3-5. Fish Sampling and Habitat Data Summary, Tributary Streams along East Bank of Glacier Creek Located Upstream of Proposed Road Alignment

Channel ID 2014[1]	Channel ID 2013[2]	Gradient[1]	Channel Width[3]	Sampling Method	Sampling Results	Habitat Notes
N/A	15	28-30%	>19 feet[2]	Visual[2]	N/A	Glacial, high gradient and bedload transport, appears unsuitable for fish

Notes: [1]Kern 2014; [2]Tetra Tech 2013; [3]Channel width in Kern 2014 was converted from meters to feet

Table 3-6. Fish Sampling and Habitat Data Summary, Tributary Streams along East Bank of Glacier Creek, Channels Located Within Proposed Road Alignment

Channel ID 2014[1]	Channel ID 2013[2]	Gradient[1]	Channel Width[3]	Sampling Method	Sampling Results	Habitat Notes
A	N/A	N/A	N/A	Visual[1]	dry	Dry (unsuitable for fish)
B	N/A	N/A	N/A	Visual[1]	dry	Dry (unsuitable for fish)
C	N/A	N/A	N/A	Visual[1]	dry	Dry (unsuitable for fish)
D	N/A	N/A	N/A	Visual[1]	dry	Dry (unsuitable for fish)
E	14	22%	4-7 feet	Electrofish[1]	No fish captured	Deeply incised channel, high bedload transport, unsuitable for fish
F	13	25-30%	5-10 feet[2]	Visual[1,2]	dry	Dry (unsuitable for fish); two boreal toads observed in dry channel[2]
G	N/A	N/A	N/A	Visual[1]	dry	Dry (unsuitable for fish)
H	11	10-13%[1] 10-25%[2]	12 feet	Electrofish[1] ; Traps[2]	Dolly Varden[1]	Christmas Creek (largest tributary): cold, fast with variable gradients; gravel and boulder substrate. Dolly Varden captured downstream of proposed crossing location by electrofishing. No fish captured at or upstream of crossing location, habitat deemed not suitable for fish[1,2]

Notes: [1]Kern 2014; [2]Tetra Tech 2013; [3]Channel width in Kern 2014 was converted from meters to feet

Table 3-7. Fish Sampling and Habitat Data Summary, Tributary Streams along East Bank of Glacier Creek, Channels Located Upstream of Proposed Road Alignment

Channel ID 2014[1]	Channel ID 2013[2]	Gradient[1]	Channel Width[3]	Sampling Method	Sampling Results	Habitat Notes
I	10	N/A	N/A	Electrofish[1]	No fish captured	Christmas Creek tributaries
J	N/A	N/A	N/A	Electrofish[1]	No fish captured	Christmas Creek tributaries
K	9	N/A	N/A	Electrofish[1]	No fish captured	Christmas Creek tributaries
L	8	12-16%	6.5 feet	Electrofish[1] Traps[2]	No fish captured	Small stream, no fish captured
M	7	26%	5 feet	Electrofish[1] Traps[2]	No fish captured	Medium-sized stream, no fish captured
N	N/A	12-16%	1.8 feet	Electrofish[1]	No fish captured	Ephemeral stream, unsuitable for fish
O	N/A	N/A	N/A	Visual[1]	N/A	Ephemeral seep, unsuitable for fish
P	6	4-5%	7.5 feet	Electrofish[1]	Dolly Varden[1]	Meandering stream, gravel substrate, Dolly Varden presence confirmed
Q	5	10-14%	3-5 feet	Electrofish[1] Traps[2]	No fish captured	Small incised stream, gravel substrate, downstream barrier precludes passage
R	4	18-19%	N/A	Visual[1,2]	N/A	Braided, ephemeral stream, unsuitable for fish
S	3	10-18%	5-10 feet	Electrofish[1] Traps[3]	Dolly Varden[2]	Small stream, steep bank; Dolly Varden captured below barrier[2]; numerous mayfly larvae captured[1]
T	2	23%	8.5 feet	Electrofish[1] ; Traps[1,2]	No fish captured	Barrier downstream precludes upstream fish passage, no fish at proposed road crossing
U	1	16-18%	1.5 feet	Electrofish and traps[1,2]	Dolly Varden[1]	Steep near crossing, ponds downstream, Dolly Varden captured downstream of barrier
V	N/A	N/A	N/A	Visual[1]	N/A	Small seep, unsuitable for fish
W	N/A	N/A	0.5 feet	Visual[1]	N/A	Very little flow, no fish habitat, drains into pond

Notes: [1]Kern 2014; [2]Tetra Tech 2013; [3]Channel width in Kern 2014 was converted from meters to feet

3.3.3.2 CHILKAT AND KLEHINI RIVERS

The Chilkat River basin is characterized by rugged mountains with steep gradient streams; braided rivers in broad, glaciated valleys, and numerous glaciers (Bugliosi 1988). The Chilkat River is a glacially-fed system that originates in British Columbia, Canada. The river flows through steep mountains and broad floodplains, where channels become braided with large gravel bars, before terminating in Chilkat Inlet in upper Lynn Canal near Haines.

The Klehini and Tsirku rivers, among the Chilkat River's largest tributaries, join the braided Chilkat River in a wide valley approximately 21 miles upstream of the ocean, near the village of Klukwan. The confluence of these rivers is an ecologically important area for salmon and other

fish and wildlife species, due to a large alluvial fan beneath this area. This large alluvial fan essentially stores the rain and meltwater it receives during the spring and summer. As temperatures drop during winter months, the relatively warm water stored in the alluvial fan seeps into the Chilkat River and prevents the river from freezing during times when most of the Chilkat River system has iced up. This area, known as the Bald Eagle Council Grounds, provides high value spawning habitat for late-run fall chum and coho salmon in the winter months. Salmon presence attracts thousands of bald eagles, providing food long after other food sources are no longer available. This area, the site of the largest known bald eagle concentration in the world, is designated as Critical Habitat for bald eagles (ADF&G 2016). An overview of fish habitat and distribution within the Chilkat and Klehini Rivers is provided in the following sections.

3.3.3.2.1 Chilkat River

The Chilkat River (ADF&G #115-32-10250) provides habitat for several anadromous fish species, including coho, Chinook (*O. tshawytscha*), sockeye (*O. nerka*), chum (*O. keta*), and pink (*O. gorbuscha*) salmon; eulachon (*Thaleichthys pacificus*), Pacific lamprey (*Lampetra tridentata*), steelhead trout (*O. mykiss*), cutthroat trout, Dolly Varden, and whitefish species (Johnson and Litchfield 2015). The Chilkat River watershed is ranked as one of the highest value watersheds for salmon habitat in SEAK, as it provides important spawning habitat for five species of Pacific salmon and steelhead (Carstensen et al. 2007; Schoen and Dovichin 2007).

The Chilkat River drainage produces the largest run of late fall chum salmon in the region (Halupka et al. 2000 cited in Heinl et al. 2014). Most spawning occurs in mainstem and side channel habitats of the Chilkat River and its major tributary, the Klehini River (Heinl et al. 2014). Spawning in the Chilkat River is concentrated near the confluence of the Klehini and Tsirku rivers at the Council Grounds, where upwelling water and gravels create valuable salmon spawning habitat. A commercial gillnet fishery in Lynn Canal is the primary harvester of the Chilkat River chum salmon (Heinl et al. 2014).

The Chilkat River produces the second largest run of coho salmon in SEAK (Ericksen and Fleischman 2006). Coho salmon spawn throughout the Chilkat River drainage over several months, extending into January. Coho salmon spawn in lakes and streams throughout the watershed but not in dense aggregations (Levi et al. 2015). Data collected during a radio-telemetry study in 2003 identified nine tributaries as major spawning grounds for coho salmon (Ericksen and Chapell 2005). Another study published in 2006 documented spawning in the Chilkat River upstream of river mile 13.7 (river kilometer 22) (Ericksen and Fleischman 2006). The commercial troll fishery in northern SEAK harvests the majority of Chilkat River coho salmon (*references cited in* Ericksen and Fleischman 2006).

The Chilkat River drainage produces the third or fourth largest run of Chinook salmon in SEAK (McPherson et al. 2003). Research indicates that most of the Chilkat River Chinook salmon spawn in the Kelsall and Tahini rivers, two major tributaries both located upstream of the Klehini River (Johnson et al. 1992, 1993, and Ericksen 1996, 1999 *as cited in* Ericksen and Chapell 2006). Chilkat River Chinook salmon also spawn in the Klehini River drainage. Based on a tracking study conducted within the Chilkat River system, approximately 72 percent of the tagged fish that entered the Klehini River spawned in Big Boulder Creek (Ericksen and

Chapell 2006). Marine sport and subsistence fisheries in Lynn Canal as well as sport and commercial net and troll fisheries in northern SEAK harvest adult Chinook salmon returning to the Chilkat River (ADF&G 2016b). The subsistence fishery in the Chilkat River harvest some Chinook salmon, but sport and commercial fishing are not allowed (Chapell 2014).

Sockeye salmon spawn in pools in the upper Chilkat River, Mosquito Lake, and in Chilkat Lake with early and late runs spanning June through October (Levi et al. 2015). Chilkat Lake supports one of the largest sockeye salmon runs in the region, and along with Chilkoot Lake sockeye salmon, provides most of the sockeye salmon harvested in the District 15 Lynn Canal drift gillnet fishery (Heinl et al. 2011). Pink salmon spawn in the lower drainage near Haines and in parts of the upper Chilkat River from August to early September (Levi et al. 2015).

3.3.3.2.2 Klehini River

The Klehini River is a large, glacially-fed system that originates in Canada. The Klehini River delineates the northern boundary of the Chilkat Range. The Klehini River flows east-southeast through braided channels for over 40 miles before joining the Chilkat River, just upstream of the Tsirku River and west of the village of Klukwan. The Klehini River drainage not only contributes a substantial amount of water to the Chilkat River basin downstream, it also supports several anadromous and resident species.

The AWC identifies the Klehini River (ADF&G #115-32-10250-2077) as providing spawning and/or rearing habitat for coho, Chinook, sockeye, chum, and pink salmon; and anadromous cutthroat trout and Dolly Varden (Johnson and Litchfield 2015). The Klehini River drainage is identified as a major contributor of the Chilkat River late-run chum salmon, harvested primarily by the Lynn Canal gillnet fishery (Davidson et al. 2013). The Klehini River also provides valuable spawning and rearing habitat for coho salmon (Ericksen and Fleischman 2006).

Primary tributaries of the Klehini River (in Alaska) from upstream to downstream include Jarvis, Glacier, Porcupine, Big Boulder, Little Boulder, and Herman creeks. Aside from Jarvis Creek, these tributary streams provide habitat for resident and anadromous fish, including Pacific salmon (Johnson and Litchfield 2015). Additionally, the AWC identifies several smaller tributary streams in the Klehini River drainage as supporting Pacific salmon (Johnson and Litchfield 2015). Anadromous tributary streams located in the vicinity of Glacier Creek include Sarah (Stream No. 115-32-10250-2077-3159), Bear (Stream No. 115-32-10250-2077-3113) and Porcupine (Stream No. 115-32-10250-2077-3111) creeks, all of which provide habitat for Chinook and coho salmon (Johnson and Litchfield 2015) and Dolly Varden. Flowing south into the Klehini opposite Bear and Porcupine creeks, 37-mile Creek (Stream No. 115-32-10250-2077-3136) provides spawning habitat for Chinook salmon (Ericksen and Chapell 2006), coho and chum salmon, and Dolly Varden (Johnson and Litchfield, 2015). Cutthroat trout and spawning sockeye salmon have been confirmed in lower 37-mile Creek (Johnson and Litchfield 2015).

Big Boulder Creek is a clear-water stream that flows south into the Klehini River at a point approximately 4 miles downstream of Glacier Creek. Big Boulder Creek (Stream No. 115-32-10250-2077-3098) supports most Chinook salmon that spawn in the Klehini River drainage (Ericksen and Chapell 2006). Big Boulder Creek also provides rearing habitat for Chinook and

coho salmon and Dolly Varden char (Johnson and Litchfield, 2015). Chinook salmon also spawn in lower Little Boulder Creek, located farther downstream, but to a lesser extent as compared to Big Boulder Creek (Ericksen and Chapell 2006).

3.3.3.3 SPECIES DESCRIPTIONS AND LIFE HISTORY

Table 3-8, below, identifies key fish species confirmed to occur in the Chilkat River system, including the Klehini River, Glacier Creek, and tributary streams along the east side of Glacier Creek. Key fish species include those species managed by a Federal management plan that occur within the Chilkat River drainage and species known or suspected to occur in the Glacier Creek drainage. The sections that follow summarize life history information for key fish species and briefly discuss the likelihood of their presence within habitat that may be affected by the project.

Table 3-8. Target Fish Species Distribution in the Chilkat River, Klehini River, and Glacier Creek Drainages

Target Fish Species	Chilkat River	Klehini River	Glacier Creek
Coho salmon	Spawn, rear	Spawn, rear	Not captured from Glacier Creek Confirmed to rear in one anadromous, west-side tributary stream (Stream No. 115-32-10250-2077-3151-4010)
Chinook salmon	Spawn, rear	Spawn, rear	N/A
Sockeye salmon	Spawn, rear	Spawn, rear	N/A
Pink salmon	Spawn	Spawn	N/A
Chum salmon	Spawn	Spawn	N/A
Dolly Varden	Spawn, rear	Spawn, rear	Spawn and rear in Glacier Creek Captured in Glacier Creek from mouth to approximately 3 miles upstream. Captured from three tributary streams on the east side of Glacier Creek (in habitat downstream of proposed road alignment) and from the anadromous, west-side tributary stream (Stream No. 115-32-10250-2077-3151-4010)
Cutthroat trout	Spawn, rear	Spawn, rear	Confirmed to rear within lower mile of Glacier Creek and anadromous west-side tributary stream (Stream No. 115-32-10250-2077-3151-4010)
Eulachon	Spawn	N/A	N/A

3.3.3.3.1 Coho Salmon

Coho salmon occupy more diverse habitats than other anadromous salmonids using freshwater, nearshore, and offshore environments during its lifecycle (ADF&G 2016c). In Alaska, adult coho salmon enter their spawning stream systems between July and November (ADF&G 2016c), usually during periods of high runoff. Adult coho salmon migration in the Chilkat River typically peaks from early August through October and spawning occurs from late September into January (Ericksen and Fleischman 2006). The Chilkat River produces the second largest run of coho salmon in SEAK; it produces 100,000 to 300,000 coho salmon annually (Ericksen and Fleischman 2006).

Timing of juvenile coho salmon out-migration in the Chilkat River typically occurs from early April through late May. Tagging data report that maturing SEAK coho salmon move northward throughout the spring and appear to concentrate in the central Gulf of Alaska in June. The

tagged coho salmon later dispersed towards shore and migrated along the shoreline until reaching their stream of origin (ADF&G 2016c). Coho salmon typically spend about 18 months at sea before returning as full size adults (ADF&G 2016c). Nearly all mature adults return to the Chilkat River after 1 year at sea (Ericksen and Fleischman 2006).

Coho salmon eggs develop during the winter and hatch in early spring, and the embryos remain in the gravel until they emerge in May or June (Bethers et al. 1995). The newly-emerged fish occupy shallow stream margins, usually among submerged woody debris or undercut banks or other slower water habitats (Bethers et al. 1995; ADF&G 2016c). Juvenile coho salmon rear for 1 to 2 years in freshwater after emergence before outmigrating to the Gulf of Alaska to rear (Ericksen and Fleischman 2006).

3.3.3.3.2 Chum Salmon

Chum salmon are abundant and widespread in SEAK. Chum salmon often spawn in small side channels and other areas of large rivers where upwelling springs provide excellent conditions for egg survival. Fall-run chum spawning in the Chilkat River typically occurs from October through December and in the lower Klehini River in September through October (Levi et al. 2015). The confluence of the Klehini and Tsirku and Chilkat rivers provides important spawning habitat for late-run chum salmon where suitable spawning habitat remains ice-free due to the presence of warmer upwelling water within the alluvial fan.

Chum salmon provide the commercial fishery in SEAK with the second highest in numbers and catch vault of all salmon harvested, and are an important subsistence resource (Armstrong and Hermans 2007). The primary fall chum stocks targeted in the Lynn Canal gillnet fishery originate in the Klehini and Chilkat rivers (Davidson et al. 2013). The late-run Chilkat River chum salmon is an especially important resource for other wildlife. Since 1984, the Northern Southeast Regional Aquaculture Association (NSRAA) has employed streamside incubators to increase egg-to-fry survival of wild chum salmon in the Klehini and Chilkat rivers[5] (NSRAA 2015).

Juvenile chum salmon typically out-migrate to sea soon after emerging from the gravel, similar to pink salmon. The timing of this outmigration can occur between February and June, but most fry leave the streams during April and May. Chum salmon tend to linger and forage in the intertidal areas at the head of bays. Chum salmon return to natal streams to spawn after approximately 3 to 5 years at sea.

3.3.3.3.3 Chinook Salmon

Chinook salmon are the least abundant and largest of the Pacific salmon (Heard et al. 2007). Of the 2,000 watersheds in SEAK, fewer than 40 support Chinook salmon (Guthrie and Wilmot 2003). The Chilkat River drainage produces the third or fourth largest run of Chinook salmon in SEAK (McPherson et al. 2003). The inside waters of northern SEAK provide rearing habitat for most of the Chilkat River Chinook salmon; rearing also occurs to a lesser extent in the Gulf of

[5] The Chilkat and Taku river stocks have declined since the 1980s; the reason for the decline could include a combination of natural changes in spawning habitat, over-fishing, interactions with other species of fish, and interactions with the increased production of hatchery fish. From 2002 to 2005, ADF&G conducted in-river mark-recapture studies designed to estimate the spawning population of chum salmon, and relate those estimates to the fish wheel catches and aerial surveys of the primary spawning areas. The total spawning population estimate in 2002 was 206 thousand fish (Bachman 2005), and in 2003 and 2004 estimates were 166 thousand and 329 thousand fish (Randy Bachman, ADF&G unpublished data, as cited in Heinl 2005).

Alaska, Prince William Sound, and Kachemak Bay (*references cited in* Ericksen and Chapell 2006).

Research indicates that the majority of the Chilkat River Chinook salmon spawn in the Kelsall and Tahini rivers, both located upstream of the Klehini River. However, spawning also occurs in the Klehini River drainage, most of which appears to occur in Big Boulder Creek (Ericksen and Chapell 2006). Big Boulder Creek is located approximately 4 miles downstream of Glacier Creek. The presence of adult Chinook salmon has been confirmed throughout the Klehini River drainage, including in Sarah, Bear, Porcupine, and 37-mile creeks as well as farther downstream in Little Boulder Creek (Johnson and Litchfield 2015; Ericksen and Chapell 2006.

Chinook salmon exhibit variable run timing and variable ocean migration patterns. In Alaska, after spending between 1 and 5 years at sea, adults migrate into freshwater to spawn as early as April and as late as July; spawning typically occurs during summer and fall. Adult Chinook salmon appear to ascend the Chilkat River to spawn in June and July. Radio-tagged adult Chinook salmon migrated past a tracking station located at Wells Bridge (near the Klehini River confluence) as early as June 23, 2005; by mid-July most of the tagged fish had passed this point (Ericksen and Chapell 2006). In some cases, a single drainage may experience multiple Chinook salmon runs. For example, in some systems, adult Chinook arriving earlier may spawn in smaller tributary habitats and fish that arrive later may spawn in larger mainstem habitats (ADF&G Chinook Research Team 2013).

Based on the variability in life history strategies observed, researchers often identify Chinook salmon as ”stream-type” and ”ocean-type”. Stream-type fish rear in freshwater for 1 to 2 years before making extensive ocean migrations to feed and mature. Ocean-type fish may leave freshwater within a few months and linger in estuarine habitats. Chinook salmon from the Chilkat River have a “stream-type” life history because nearly all juveniles reside for 1 year in freshwater before emigrating in the spring as smolt (ADF&G Chinook Research Team 2013).

3.3.3.3.4 Sockeye Salmon

Sockeye salmon are considered the most economically important species of salmon in Alaska (ADF&G 2016c). Sockeye salmon occupy freshwater streams on the west coast of North America from the Klamath River in Oregon to Point Hope in Northwestern Alaska and west to waters of Siberia and Japan (ADF&G 2016c).

Sockeye salmon typically spawn in systems containing one or more lakes. Eggs are deposited in gravel nests in rivers, streams, and up-welling areas along lake beaches. Sockeye salmon spawn in pools in the upper Chilkat River, Mosquito Lake, and in Chilkat Lake with early and late runs spanning June through October. Chilkat Lake is one of SEAK’s major sockeye salmon fisheries, producing a target of 70,000 to 150,000 fish, which pass through the Chilkat River (Heinl et al. 2011). Sockeye salmon, considered desirable for its dependable runs, abundance, and suitability for preserving, was historically the most frequently harvested salmon in the Klukwan area (Mills 1982).

Eggs hatch during the winter and fry emerge from gravel nests in the spring. In drainages with lakes, juveniles will spend 1 to 3 years in freshwater before migrating to saltwater in spring as

smolts. In the absence of lakes, fry migrate to the ocean immediately after emergence from the gravel and return 1 to 3 years later to spawn (ADF&G 2016c).

3.3.3.3.5 Pink Salmon

Pink salmon are the most abundant Pacific salmon in North America and the most abundant salmon species in SEAK (Armstrong and Hermans 2007). Typically, most pink salmon spawn relatively low in the drainage (e.g., within a few miles of saltwater) and commonly spawn within intertidal stream channels near the mouth of streams (ADF&G 2016c; Bethers et al. 1995). Favored spawning habitat includes shallow riffles located in both freshwater and intertidal channels, where flowing water breaks over coarse gravel or cobbles, and in downstream ends of pools (ADF&G 2016c). Spawning occurs throughout the lower Chilkat River and in parts of the upper Chilkat River from August to early September (Levi et al. 2015).

Juvenile pink salmon generally outmigrate to coastal waters soon after they emerge in the late winter and spring (ADF&G 2016c; Mortensen et al. 1999). In SEAK, juvenile pink salmon typically move downstream in April and May (Bethers et al. 1995; Mortensen et al. 1999). Throughout the spring and early summer, prior to moving offshore, juvenile pink salmon tend to linger in estuarine habitats for up to several weeks while they adjust to salinity (Mortensen et al. 1999). Juvenile pink salmon tend to follow shorelines during their first weeks at sea, and spend much of their time in shallow water less than an inch deep (NPFMC 1998). Pink salmon tend to migrate along long straight, smooth transition beaches but linger and feed along more protected nursery habitats (Heard et al. 2001).

3.3.3.3.6 Dolly Varden

Dolly Varden occur as lake-resident, stream-resident, and anadromous forms. Dolly Varden mature slowly and are long-lived. Unlike salmon, Dolly Varden are capable of spawning multiple times during their lives, and depending on food availability, adults may skip a year between spawning events. Spawning typically happens in the fall over gravel beds of small headwater streams or in larger rivers. Eggs incubate in the gravel for 4 to 5 months, emerging as fry in the spring, usually April through June. After 2 to 4 years rearing in freshwater, Dolly Varden migrate to the ocean to spend the summer feeding before coming back to freshwater to spawn in the fall and overwintering in the river (ADF&G 2016c). Freshwater habitats of Dolly Varden range from the smallest headwater stream (often less than 3 feet wide) to large deep lakes. Saltwater habitats range from brackish estuaries to fully-marine shoreline environments, and occasionally the open ocean. Entire populations of freshwater-resident Dolly Varden may spend their entire life cycle within a single stream. The Chilkat River system, including the Klehini River and Glacier Creek drainage, supports Dolly Varden.

3.3.3.3.7 Coastal Cutthroat Trout

Cutthroat trout are the most common trout species in the region. Coastal cutthroat trout occur as sea-run (anadromous) or freshwater-resident forms in streams and lakes along the coastal range from lower SEAK to Prince William Sound. Cutthroat trout occur in lower Glacier Creek and throughout the Klehini and Chilkat river systems (TWC n.d.; Kern 2014; Johnson and Litchfield 2015). The freshwater-resident form lives in a wide variety of habitats, from small headwater tributaries and ponds to large lakes and rivers. Anadromous cutthroat trout are usually found in river or streams systems with accessible lakes. In some watersheds, the two

forms are found together. The extent of breeding between the two forms is unknown, and the reason that some fish migrate to sea while other stay in freshwater is not well understood (ADF&G 2016c).

Coastal cutthroat trout grow quite slowly with maturity reached between ages 3 to 7, with males typically maturing earlier than females. Spawning occurs from April to early June and typically takes place over gravel beds in small, isolated headwater streams, although they have been observed spawning in deeper rivers and in gravely upwelling areas of lakes. The selection of these small isolated streams likely results in less interaction with the more aggressive offspring of steelhead trout and coho salmon. Unlike Pacific salmon, cutthroat trout are capable of spawning multiple times during their lives, but they rarely survive to spawn three or more times. Depending on food availability, adults may skip a year or two between spawning events.

Once deposited, fertilized eggs remain in the gravel for 6 to 7 weeks before hatching. Newly-hatched cutthroat trout remain in the gravel living on the contents of their yolk sac for an additional 1 to 2 weeks prior to emerging as free-swimming juveniles. Once emerged from the gravel, juvenile cutthroat trout will disperse to more ideal rearing habitats such as ponds, lakes, and backwater areas.

Research in the Copper River drainage shows that anadromous and resident cutthroat trout enter streams either during fall to overwinter or during the spring just before spawning (Saiget et al. 2007). Anadromous fish migrated to estuarine or marine habitat after spawning while post-spawning movements of resident fish were more variable (Saiget et al. 2007).

3.3.3.3.8 Eulachon

Eulachon, also commonly referred to as hooligan, are seasonally distributed throughout Alaska from SEAK, west to the Copper River Delta, and become less abundant out to the Pribolof Islands (ADF&G 2016c). Eulachon are a small fish that reach up to 10 inches in length, weigh 40 to 60 grams, and are sexually dimorphic (Mecklenberg et al. 2002). Eulachon are a valuable prey species for humans and wildlife in part because of their high lipid content (Hay and McCarter 2000).

Adult eulachon typically spawn at 3 to 6 years of age in glacially-influenced streams. In SEAK, the main spawning migration can occur as early as April and the Chilkat, Alsek, and Copper River drainages have occasional winter runs in January and February when conditions are suitable (ADF&G 2016c; Bishop et al. 1989). The Chilkat River supports one of the larger eulachon runs in SEAK; most spawning occurs within the lower 9 miles of the river (Betts 1994). Males are reported to enter the Chilkat before females (Wilson et al. 2006). A subsistence and personal use fishery in the Chilkat River harvests Eulachon (Wilson et al. 2006).

Research suggests that adults appear to spawn in streams near their natal streams, but do not necessarily home to natal streams like salmon (Hay and McCarter 2000). Eggs are broadcast over the stream bottom and adhere to stream substrates where they incubate for 30 to 40 days prior to emergence; larvae are then carried downstream to the estuary or sea, initially relying on their yolk sac before feeding on zoolplankton (Hart 1973; Stoffels 2001). Eulachon are believed

to leave the estuary within their first year of life and spend 1 to 3 years in the ocean (Cambria Gorton Ltd. 2006).

3.3.4 Direct and Indirect Effects from Alternative 1 – No Action Alternative

Under the No Action Alternative, Constantine could construct the remaining 0.3 miles of exploration road in the approved Notice. The new 0.3 mile road segment would cross Christmas Creek and an unnamed, ephemeral stream (**Figure 3-6**, page 3-39). Neither stream supports fish at the proposed crossing locations (Kern 2014; Tetra Tech 2013). The ADF&G determined that fish habitat permits would not be necessary to construct either crossing because habitat is not suitable to support fish (Kern 2014). No in-water work in fish-bearing waters would occur under the No Action Alternative.

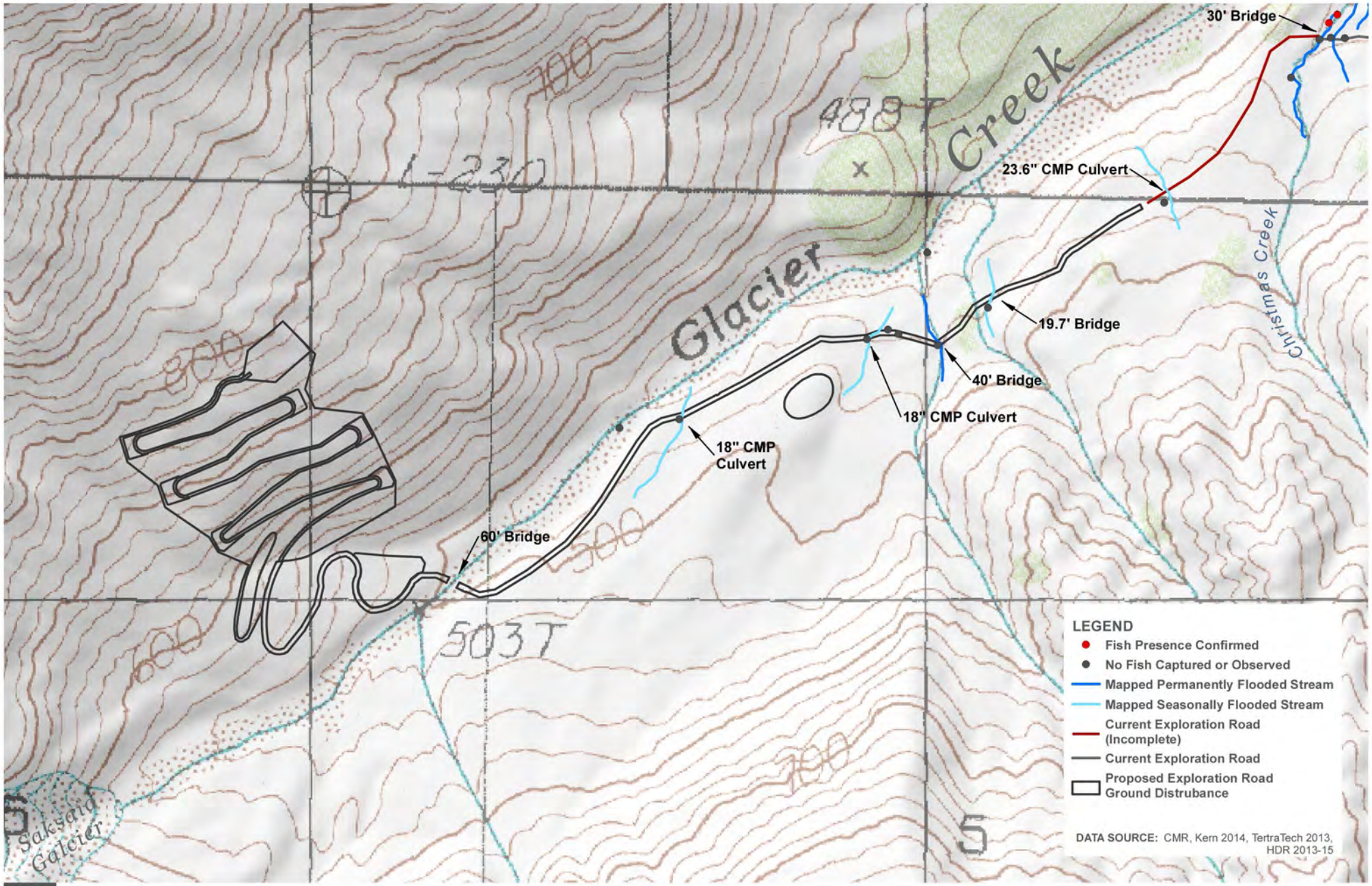
Fish surveys did not capture any fish at the location where Constantine could construct the 30-foot bridge to span Christmas Creek[6], nor upstream of that location; habitat is considered unsuitable to support fish (Tetra Tech 2013; Kern 2014). Downstream of the proposed crossing location, Christmas Creek was found to provide habitat for Dolly Varden (Kern 2014).

Increased erosion and sedimentation during construction could potentially degrade water quality in downstream fish habitat if risk is not properly mitigated. To minimize potential impacts to downstream fish habitat, Constantine would implement BMPs to prevent erosion and runoff from entering aquatic habitat during construction, as outlined in a SWPPP. Stormwater runoff would be routed around the work area and through sediment control ponds to limit erosion and reduce the potential for fine sediment deposition, thereby protecting downgradient surface water quality. Constantine would also provide vegetation cover to stabilize cut and fill slopes as soon as practicable. Construction of the bridge would not eliminate, degrade, or otherwise modify downstream fish habitat in Christmas Creek. Construction of the 18-inch culvert to cross the ephemeral stream would not degrade or modify downstream fish habitat in Glacier Creek.

Operation and maintenance of the expanded 0.3-mile road segment is not anticipated to directly impact fish habitat. Vehicular traffic on the existing (0.8 mile) and expanded (0.3 mile) road segments could potentially impact water quality by introducing additional runoff or leaks from vehicles into downstream fish habitat. Chapter 2 discusses the applicant committed operational performance standards Constantine would implement in order to minimize potential water quality impacts. Potential impacts within the Glacier Creek drainage are anticipated to be negligible; impacts as far downstream as the Klehini River are not anticipated.

Increased access and traffic could potentially increase recreational use of the Glacier Creek drainage, including an increase in unauthorized ATV crossings in fish habitat within Glacier Creek or its fish-bearing tributary streams, or an increase in sport fishing. Glacier Creek is not known to support a sport fishery or subsistence fishery. Potential impacts are anticipated to be relatively minor in magnitude and duration in the Glacier Creek drainage. Impacts are not anticipated for the Klehini and Chilkat rivers; subsistence, sport, and/or commercial fisheries would not be impacted by the No Action Alternative.

[6] Channel bed width measured at the proposed crossing site ranged 3.4 to 3.7 meters (Kern 2014).



PALMER PROJECT

PROPOSED STREAM CROSSINGS

FIGURE 3-6

Under the No Action Alternative, water for drilling activities would continue to be withdrawn from permitted sources. On-site fuel storage would continue to be limited to 55-gallon barrels and custom-designed 130-gallon fly tanks at each drill site. Constantine would continue to helicopter transport fuel from Big Nugget Camp to helicopter supported drill sites in 130-gallon fly tanks or smaller volume containers. Potential impacts to water quality from fueling operations or accidental fuel spills are discussed in Section 3.1, Surface Water and Groundwater Resources, on page 3-1.

The No Action Alternative includes removing the roadway and regrading of the topography after completing exploration. At that time, Constantine would remove culverts and bridges, and regrade and recontour the existing drainage ways to resemble those upstream and downstream. During bridge and culvert removal and subsequent regrading, a temporary increase in runoff could temporarily impact water quality downstream and potentially affect downstream fish habitat. Temporary impacts of increased runoff and surface erosion could include increased turbidity levels, decreased dissolved oxygen levels, and increased fine sediment deposition downstream, if risk is not properly mitigated. Constantine would implement BMPs to limit erosion and runoff from entering aquatic habitat during reclamation, to reduce the risk of impacting downstream fish habitat. Chapter 2 discusses the applicant-committed operational performance standards Constantine would implement in order to minimize potential water quality impacts.

3.3.5 Direct and Indirect Effects from Alternative 2 – Proposed Action Alternative

Under the Proposed Action Alternative, Constantine would construct approximately 2.5 miles of new road, including two additional crossings of perennial streams and three crossings of ephemeral streams or seeps (**Figure 3-6**, page 3-39). Constantine would build bridges to span three streams, and use culverts to convey flow at the other crossing sites.

Aquatic habitat in tributary streams within the proposed road alignment does not support fish (Kern 2014; Tetra Tech 2013). Fish surveys did not capture any fish at crossing locations (or upstream of crossing locations) and habitat is considered unsuitable to support fish (Tetra Tech 2013; Kern 2014). The ADF&G determined that fish habitat permits would not be necessary to construct stream crossing structures along the proposed road alignment because habitat within these locations is not suitable to support fish (Kern 2014).

Constantine would construct a 60-foot modular bridge to span Glacier Creek. The ADF&G determined that a fish habitat permit would not be necessary to construct the bridge across Glacier Creek (Kern 2014). The Proposed Action would not require in-water work in fish-bearing streams. Constructing the proposed road, including bridges and other conveyances, would not eliminate fish habitat in the Glacier Creek drainage.

The Proposed Action Alternative has 2.5 miles of additional road over the No Action Alternative, including a switchback access road that would ascend a substantial slope immediately above Glacier Creek potentially increasing sediment generation. Sediment production is controlled primarily by the road slope, road length, and condition of the surface; and sediment delivery is controlled by distance from the stream, volume of water, and sediment texture (Luce et al. 2001). The slope of the switchback road and proximity to Glacier Creek at the base of the slope

increase the potential for sediment delivery to the creek from the road; however, Constantine would implement operational performance standards and BMPs, as outlined in a SWPPP, to minimize the potential for downstream impacts to fish habitat and water quality during construction and reclamation. During access road construction, Constantine would include ditches along the uphill side of the switchback access road to convey water off the ends of each switchback with runoff water expected to infiltrate the overburden and soil away from the road, minimizing the volume running down the road towards Glacier Creek. They would implement BMPs, such as energy dissipaters, check dams, relief culverts, and sedimentation basins, with the intent to control sediment production and delivery. Stormwater runoff would be routed around the work area and through sediment control ponds to limit erosion and runoff from entering aquatic habitat during construction, thereby reducing the potential for fine sediment deposition to negatively affect downstream fish habitat. Constantine would also provide vegetation cover to stabilize cut and fill slopes as soon as practicable to further minimize erosion potential. Therefore any water quality impacts would be temporary, and in the context of turbid Glacier Creek, they would not be measurable. Potential impacts to fish habitat downstream are anticipated to be negligible.

Operation and maintenance of the new road is not anticipated to directly impact fish habitat. Vehicular use of the road could potentially impact water quality by introducing additional runoff or leaks from vehicles into downstream fish habitat. Chapter 2 discusses the applicant-committed operational performance standards Constantine would implement in order to minimize potential water quality impacts. Potential impacts within the Glacier Creek drainage are anticipated to be negligible; impacts as far downstream as the Klehini River are not anticipated.

Increased access and vehicle traffic could potentially increase recreational use of the Glacier Creek drainage, including an increase in unauthorized ATV crossings in fish habitat within Glacier Creek or its fish-bearing tributary streams, or an increase in sport fishing. Glacier Creek is not known to support a sport fishery or subsistence fishery. Potential impacts are anticipated to be relatively minor in magnitude and duration in the Glacier Creek drainage. Impacts are not anticipated for the Klehini and Chilkat rivers; the Proposed Action would not affect existing subsistence, sport, and/or commercial fisheries.

Under the Proposed Action Alternative, fuel for drilling operations would be transported along the new road by highway vehicles to the laydown area at the end of the access road and stored on-site. Constantine anticipates using a 5,000-gallon tank and a 3,000-gallon tank to store diesel and aviation fuels, respectively. Constantine would then transport fuel by helicopter (130-gallon fly tanks or smaller volume containers) to the drill and pump sites, as needed. Therefore, the length of transport of fuels by helicopter sling would be substantially less than under the No Action Alternative and the number of sling loads of fuel over Glacier Creek would also be greatly reduced. Potential impacts to water quality from fueling operations or accidental fuel or chemical spills are discussed in Section 3.1, Surface Water and Groundwater Resources, on page 3-1.

Following exploration, Constantine would reclaim the roadway and regrade the topography. At that time, they would remove culverts and bridges, and regrade and recontour the existing drainage ways to resembling those upstream and downstream. During bridge and culvert removal and subsequent regrading, a temporary increase in runoff would be anticipated. Increased runoff and surface erosion could temporarily impact downstream water quality by increasing turbidity levels, which could in turn temporarily decrease dissolved oxygen levels. Increased erosion also has the potential to increase fine sediment deposition downstream, which could potentially affect downstream fish habitat, if risk is not properly mitigated. As described previously, Constantine would implement BMPs to limit erosion and runoff from entering aquatic habitat during construction and reclamation, thereby reducing the potential for impacts to downstream fish habitat. Chapter 2 discusses the applicant committed operational performance standards Constantine would implement in order to minimize potential water quality impacts.

3.3.6 Cumulative Effects

NEPA requires analysis of the cumulative impacts from the Proposed Action when added to past, present, future, and reasonably foreseeable future impacts. The possible cumulative impacts that could result from the Proposed Action, the expansion of Constantine's existing Notice-level exploration activities, and the No Action Alternative, are included within each resource section. Under the No Action Alternative, Constantine would continue exploration activities through 2018 as previously approved, but no additional expansion activities would occur.

A cumulative impact, also commonly referred to as a cumulative effect, is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7).

3.3.6.1 CUMULATIVE EFFECTS BOUNDARIES OF THE ANALYSIS

The geographic reference area considered for potential cumulative impacts for fisheries includes the Glacier Creek Valley and surrounding drainages. The BLM requested that the analysis include aquatic habitat in the Klehini River drainage. Therefore, the physical boundary is roughly defined by the Klehini River to the north and the Tsirku River to the south. The temporal boundaries considered for this cumulative impacts assessment extend from 2014 to the year 2019. The year 2014 represents when initial exploration activities began in the Glacier Creek valley. The year 2019 represents 3 years beyond the baseline year of 2016.

3.3.6.2 PAST, PRESENT, AND REASONABLE FORESEEABLE FUTURE ACTIONS

- ***Past Actions*** (i.e., previous cat track construction and exploration activities; forest service plans in the lower valley): Since the preparation of the initial *Haines State Forest Plan* in the mid-1980s, the state has prepared various plans and studies of land status and timber resources.

- ***Present Actions:*** Constantine holds state claims in the Klehini River and Chilkat River drainage; however, Constantine has no application or proposal for activities on those claims. ADOT&PF is looking to make improvements to the Haines Highway and prepared an environmental assessment (2015). These improvements include improving intersections, driveways and recreational turnout accesses, as well as replacing the highway bridge over the Chilkat River.
- ***Reasonable Foreseeable Future Actions:*** Constantine has current approvals to continue exploration activities through 2018. ADOT&PF will continue to make improvements to the Haines Highway, as analyzed and proposed under their recent environmental review process.

3.3.6.3 SUMMARY OF CUMULATIVE EFFECTS

The Proposed Action is not anticipated to have long-term direct or indirect impacts to fish habitat. Temporary impacts to water quality during construction and reclamation activities have the potential to affect downstream fish habitat; however, impacts would be minimal. Therefore, the potential for the Proposed Action to incrementally contribute to cumulative effects is also minimal. Potential impacts would not appreciatively add to direct impacts to fish habitat. The potential for the No Action Alternative to cumulatively impact fish habitat is similarly low; measurable impacts are not anticipated given Constantine would use BMPs to minimize impacts to water quality.

3.3.7 Recommended Mitigation

None identified.

3.4 Issue 4: Vegetation and Non-native Invasive Species

This section addresses vegetation and non-native invasive species present in the Project area, evaluates the potential impacts of the proposed Project on them, and addresses vegetation concerns identified during scoping. Scoping issues include the following (numbers correspond to scoping comments in *Scoping Summary Report* [BLM 2016]):

- Would Constantine's proposed work result in establishment of non-native invasive plant species in the Project area? (117)

3.4.1 Literature Review

There are several existing studies containing baseline information on vegetation and terrestrial habitat in the Project area. Reviewed documents include the following:

- *Existing Conditions Report – Invasive Plant Species* (Hemmera 2015a)

  Hemmera, in cooperation with University of Alaska scientists, performed a desktop review and a field survey to understand the presence of non-native invasive plant species in the Project area, identify sources of such species' dispersal into the Project area, and recommend measures to minimize the potential establishment of such species as a result of Constantine's activities.

- *Terrestrial Wildlife and Habitat Assessment* (Hemmera 2015b)

  Hemmera mapped wildlife habitats at a coarse scale in and around the Project area based primarily on office-available resources.

- *Wetland and Waterbody Jurisdictional Determination Report* (HDR 2013)

  Based on a field investigation, HDR mapped and described wetland and waterbody types in areas proposed for disturbance during exploration to support Constantine's compliance with the Clean Water Act.

- Memo describing wetland mapping for an expanded study area (HDR 2015)

  HDR supplemented the above wetland and waterbody report by extending the mapping to encompass the switchback access road.

- *Landcover Classes and Plant Associations of Glacier Bay National Park and Preserve* (Boggs et al. 2008)

  This report provides additional information on vegetation types likely to be present in the Project area.

- Summer 2000 vascular plant collection list of Vascular plant inventory of selected sites, Haines and vicinity, southeastern Alaska (Parker 2001)

  A Museum of the North botanist inventoried vascular plants at several sites in the Haines area, none in the area that would be directly affected by the project. Only the appendix listing the collected plants was available for review.

- Online query of plant collections (Arctos 2016)

  Database of plant collections that have been made within approximately 50 miles of the mouth of Glacier Creek.

- Conservation data (ACCS 2016a)

  This is the Alaska Center for Conservation Science's (ACCS) database of known locations of plants tracked as potentially rare on a global or state scale.

- Taxa removed from rare vascular plant list (ACCS 2016b)

  This list identifies plant species for which ACCS no longer collects or provides online records because the species have either been determined to not be rare, or they are no longer considered to be distinct species. Some BLM sensitive and watchlist plant species are no longer tracked by ACCS.

- *Inventoried Rare Plants – 2005, Land Status – April 2012, Map 11* (BLM 2012b)

  This map shows the locations of plants that ACCS tracked as potentially rare in 2005. It shows locations of two populations of plant species that BLM has designated as sensitive or watchlist.

- BLM-Alaska Revised Sensitive Species Lists (BLM 2010)

  This memorandum and three attachments list the plant species that BLM designated as sensitive or watchlist in 2010.

3.4.2 Study Methodology

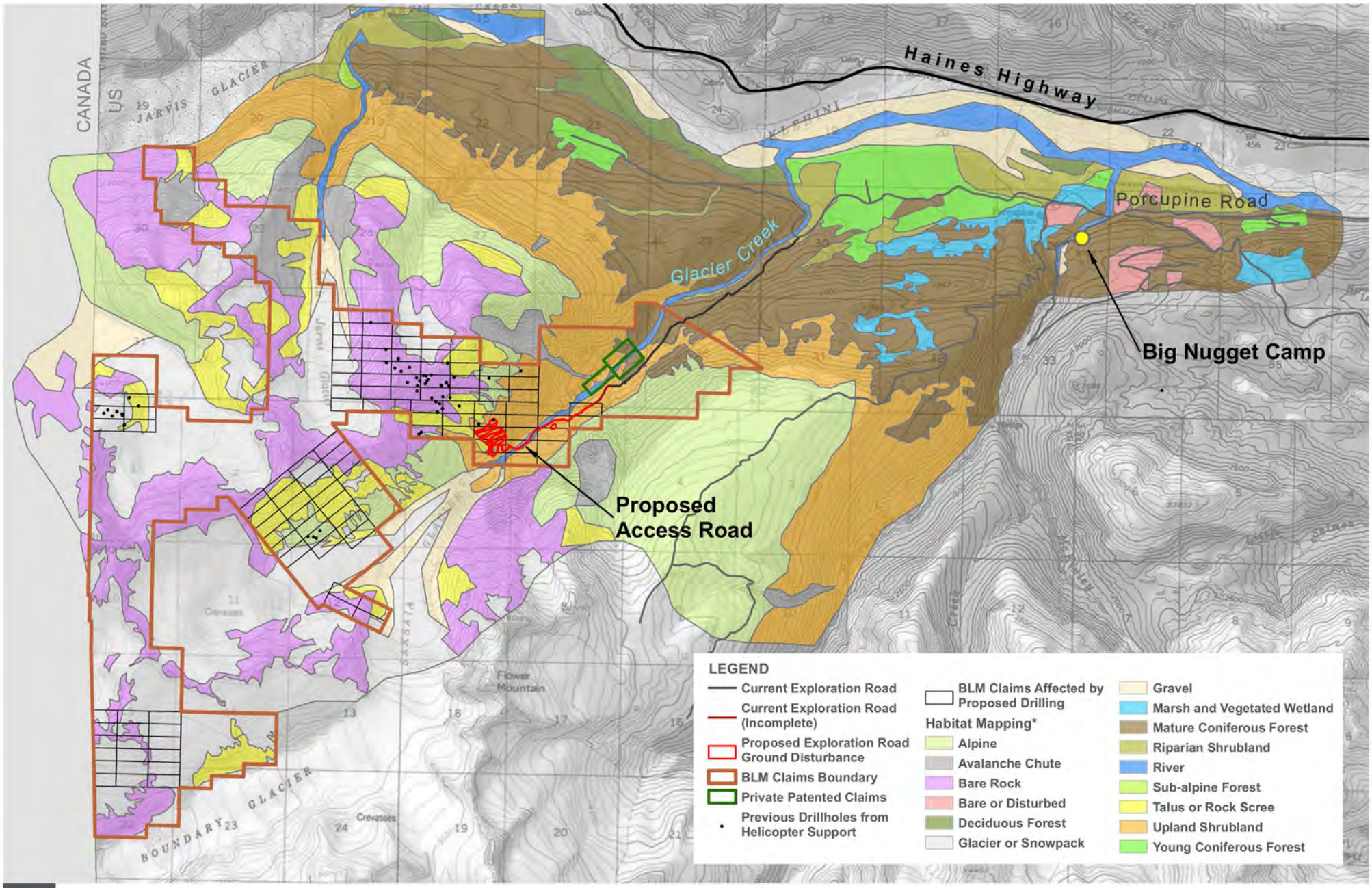
By compiling information on vegetation and terrestrial habitat, including non-native plants and rare plants, from baseline study reports and other sources; and using professional experience and judgment, this analysis

- identifies the activities that could affect vegetation and habitat;
- summarizes Constantine's commitments that would mitigate potential adverse impacts; and
- discusses the likely effects of the two alternatives on vegetation resources.

3.4.3 Affected Environment

3.4.3.1 VEGETATION AND TERRESTRIAL WILDLIFE HABITAT

In 2015, Constantine's wildlife consultant, Hemmera, mapped terrestrial wildlife habitats based on land cover type, vegetation growth form, successional stage, slope, aspect, relative elevation, proximity to streams, and disturbance, and described habitats based on general literature (**Figure 3-7**, page 3-47) (Hemmera 2015b). **Table 3-9** on page 3-48 and **Table 3-10** on page 3-49 list the vegetated and unvegetated habitat types, respectively, with the acreage of each type in the mapped area, along with general landscape positions based on interpretation of aerial imagery, topography, and the wildlife baseline report. The dominant plant species are derived from the non-native invasive plants report (Hemmera 2015a), wetland baseline reports (HDR 2013, 2015), a land cover report on Glacier Bay National Park and Preserve (Boggs et al. 2008), and professional experience. The scale of terrestrial habitat mapping is coarser than that of the wetland mapping discussed in the Section 3.4.3.2, Non-native Invasive Plant Species, on page 3-50; therefore, wetlands identified by field surveys are not shown on **Figure 3-7** on page 3-47.



0 Miles 1

*Note that habitat mapping may not be aligned perfectly relative to project features because the mapping scales differ.

PALMER PROJECT

HABITAT MAPPING

FIGURE 3-7

PATH: Z:\453144 CONSTANTINE NORTH, INC\272610 PALMER EA\GIS\MAP_DOCS\PALMEREA_FIG3-X_HABITATMAPPING_V2.MXD - USER: SNORTON - DATE: 3/4/2016

Table 3-9. Terrestrial Habitats in the Project Area: Vegetated Habitats

Habitat Type	General Landscape Position	Dominant Plant Species and Vegetation Structure[1]	Acreage within the Mapped Area	Percentage of the Mapped Area
Mature coniferous forest	Lower elevations	Multi-aged trees, heterogeneous, multi-layered canopy structure Western hemlock (*Tsuga heterophylla*), mountain hemlock (*Tsuga mertensiana*), Alaska blueberry (*Vaccinium alaskaense*), Devil's club (*Oplopanax horridus*), rusty menziesia (*Menziesia ferruginea*), oak fern (*Gymnocarpium dryopteris*), lady fern (*Athyrium filix-femina*), bunchberry (*Cornus canadensis*), five-leaved bramble (*Rubus pedatus*), twisted stalk (*Streptopus amplexifolius*)	4,986	17%
Young (second-growth) conifer forest	Low elevations	Site information not available. Assumed to be even-aged tree canopy with sparse understory	789	3%
Subalpine forest (conifer-heath-meadow complex)	Moderate elevations, mountain slopes	Open forest canopy. Species assumed similar to mature forest within forest patches, and the plants listed under Alpine heath and meadow	19	0%
Deciduous forest	Along Klehini River	Assumed open canopy and dense shrub layer. Black cottonwood (*Populus balsamifera* ssp. *trichocarpa*), Sitka alder, Barclay willow (*Salix barclayii*), Devil's club, lady fern, fireweed (*Chamaenerion angustifolium*), goatsbeard (*Aruncus dioica*), enchanter's nightshade (*Circaea alpina*), liverleaf wintergreen (*Pyrola asarifolia*), salmonberry (*Rubus spectabilis*), feltleaf willow (*Salix alaxensis*)	396	1%
Riparian shrubland	Low elevations along major creeks and Klehini River	Assumed dense shrub canopy. Barclay, Sitka, and feltleaf willows; Sitka alder, salmonberry, field horsetail (*Equisetum arvense*), Devils club, lady fern	806	3%
Upland shrubland	Moderate elevations, mountain slopes	Dense tall shrub layer. Sitka alder, Devil's club, salmonberry, trailing black currant (*Ribes laxiflorum*), lady fern, wood fern, twisted stalk (*Streptopus amplexifolius*), oak fern, tall fireweed	3,894	13%
Avalanche chute	Steep mountain slopes	Same as above	717	2%

Habitat Type	General Landscape Position	Dominant Plant Species and Vegetation Structure[1]	Acreage within the Mapped Area	Percentage of the Mapped Area
Alpine (heath and meadow)	High elevations	Krummholz hemlock interspersed with heath and meadow. mountain hemlock, western moss heather (*Cassiope mertensiana*), crowberry (*Empetrum nigrum*), Alaska bellheather (*Harrimanella stelleriana*), partridgefoot (*Luetkea pectinata*), Aleutian mountainheath (*Phyllodoce aleutica*), *Vaccinium* species, deer cabbage (*Nephrophyllidium crista-galli*), largeleaf avens (*Geum macrophyllum*), wooly hawkweed (*Hieracium triste*), alpine azalea (*Loiseleuria procumbens*), nootka lupine (*Lupinus nootkatensis*)	4,125	14%
Marsh and vegetated wetland	Low elevations, gentle slopes, toe of slopes, depressions	Unforested; dense, open, or no tall or low shrub canopy. Devil's club, salmonberry, lady fern, slender wood reed (*Cinna latifolia*), American brooklime (*Veronica americana*)	443	2%
		Total Mapped Area	**16,175**	**55%**

[1] Dominant species lists are based on non-native invasive survey data (Hemmera 2015b), wetland report (HDR 2013), Boggs et al. 2008, and professional experience

Table 3-10. Terrestrial Habitats in the Project Area: Unvegetated Habitats

Habitat Type	General Landscape Position	Dominant Plant Species and Vegetation Structure[1]	Acreage within the Mapped Area	Percentage of the Mapped Area
Bare rock (bedrock)	Peaks, cliffs, ridges, generally steep	Sparse vegetation - mosses, liverworts, lichens	4,022	14%
Talus or rock scree	Mountain slopes, chutes; generally steep	Sparse vegetation - mosses, liverworts, lichens	1,438	5%
Gravel	Along larger creeks and Klehini River; flat	Sparse vegetation of pioneering herbaceous species	1,522	5%
River	Glacier Creek, smaller creeks, Klehini River, sloping to flat	None	757	3%
Glacier or snowpack	High mountains, sloping to steep	None	4,855	17%
Bare or disturbed (human-disturbed)	Low elevations, flat	None or weedy herbs	214	1%
		Total Mapped Area	**12,808**	**45%**

[1] Dominant species lists are based on non-native invasive survey data (Hemmera 2015b), wetland report (HDR 2013), Boggs et al. 2008, and professional experience

3.4.3.2 NON-NATIVE INVASIVE PLANT SPECIES

For Constantine, and in cooperation with University of Alaska scientists, Hemmera also conducted a desktop assessment and an on-site survey within and near the Project area to determine the presence of any non-native, invasive terrestrial plant species (Hemmera 2015a). Preventing the introduction and spread of non-native invasive plants is a potential issue for the Project. It is necessary to understand the baseline conditions, potential vectors, and develop mitigations to prevent further introduction and spread of non-native invasive plants.

The State of Alaska regulates noxious weeds under the authority of Alaska Statutes (Title 11, Chapter 34 of the Alaska Administrative Code; 11 AAC 34) by preventing their importation and spread. Noxious weeds are defined as "any species of plants, either annual, biennial, or perennial, reproduced by seed, root, underground stem, or bulblet, which when established is or may become destructive and difficult to control by ordinary means of cultivation or other farm practices" (11 AAC 34.020). The state classifies noxious weeds as prohibited or restricted; restricted noxious weeds are assigned species-specific maximum allowable tolerance levels based on seeds per pound.

- The State of Alaska lists 14 prohibited noxious weeds, and nine restricted noxious weeds: http://plants.alaska.gov/invasives/noxious-weeds.htm
- The BLM has identified five high-priority terrestrial invasive species in Alaska: http://www.blm.gov/ak/st/en/prog/invasive_species/noxweeds/ak_priority_weeds.html,

Two of the BLM-identified species are listed as prohibited noxious weeds in Alaska: orange hawkweed *(Hieracium aurantiacum*) and Canada thistle (*Cirsium arvense)*. Orange hawkweed's invasiveness rank, on a scale of 100 (major threat to native ecosystems) to 0 (no threat to native ecosystems) is 79, and Canada thistle's is 76. Both of these species have been detected along the Haines Highway—hawkweed as near as 23 miles to the north and thistle as near 9 miles to the east from the mouth of Glacier Creek.

Hemmera and University of Alaska biologists conducted the field survey in 2015 along the Haines Borough access road east of the Porcupine Creek Bridge, the Haines State Forest Road west of the Porcupine Creek Bridge and extending up Glacier Creek, and the route of the new road described under the Proposed Action Alternative. They documented observations at regularly-spaced points along transects at set intervals along those roads, and also recorded data on non-native plants observed incidentally between the formal observation points.

The surveyors encountered ten species of invasive plants (**Table 3-11**, page 3-51) in 63 different locations, over 90 percent of which were on the road shoulder. One of the non-native species encountered is an Alaska restricted noxious weed (annual bluegrass; *Poa annua*). None of the species found is on the BLM's list of high-priority invasive species. The species' invasiveness ranks range from 36 to 63 on a scale of 0 (low) to 100 (high). In summary, surveyors found the following:

- White clover has the highest invasiveness rank (59); while it was the non-native plant found most distant from a road, it was within a human-disturbed area.

- Common dandelion and mouse-ear chickweed were found as far as 15 feet from a road, also in disturbed areas.
- Dandelion, clover, and plantain were the most frequent non-native plants.
- Surveyors found no non-native plants along the proposed road alignment.
- Four highly-invasive species not found in the survey area occur within 10 miles of the Project area: white sweetclover (*Melilotus alba*), rugose rose (*Rosa rugosa*), butter-and-eggs (*Linaria vulgaris*), and reed canarygrass (*Phalaris arundinacea*).

Table 3-11. Invasive Plant Species Found in Project Vicinity

Common Name	Scientific Name	Invasiveness Rank (0-low to 100-high)	Frequency (% of quadrats containing species)	Maximum Distance from Road (feet)
Foxtail barley	*Hordeum jubatum*	63	5	0
White clover	*Trifolium repens*	59	23	30
Common dandelion	*Taraxacum officinale*	58	23	15
Kentucky bluegrass	*Poa pratensis*	52	11	0
Timothy	*Phleum pratense*	52	9	0
Curly dock	*Rumex crispus*	48	2	0
Annual bluegrass	*Poa annua*	46	4	0
Common plantain	*Plantago major*	44	18	0
Common mouse-ear chickweed	*Cerastium fontanum*	36	13	15
Pineappleweed	*Matricaria discoidea*	32	2	0

In order to minimize spreading non-native species, Constantine has committed to the following under the Proposed Action Alternative:

- Thoroughly cleaning all vehicles and transport equipment before such equipment enters BLM lands.
- Reseeding disturbed areas as soon after construction as possible.
- Using topsoil only from within the construction area.
- Monitoring until revegetation has been achieved.
- Controlling weeds before moving material between parts of the Project area (e.g., material from rock stockpiles back to road reclamation areas).
- Using certified weed-free seed and straw bales.
- Excluding noxious weeds from disturbed areas until reclamation has been accepted.

3.4.3.3 RARE PLANT SPECIES

There is only one plant species in Alaska that is listed as threatened or endangered under the Endangered Species Act, and it is known only from the Aleutian Islands, so is unlikely to exist in the Project area. Botanists are not known to have surveyed the Project area for rare plants, including those designated as BLM-sensitive or BLM-watchlist species (BLM 2010). However, a

botanist has inventoried several sites in the Haines vicinity, including sites along the Haines Highway and a site immediately south of the Project area (Parker 2001).

Two BLM sensitive or watchlist species are known in the general Project vicinity, based on a 2005 query of the ACCS's rare plant database (ACCS 2016a; BLM 2012b): Coffee Creek scorpionweed (*Phacelia mollis*) and Arctic pennycress (*Noccaea arctica*, formerly known as *Thlaspi arcticum*). Neither of those plant species' occurrences was in an area that would be affected by the Project. ACCS no longer tracks Arctic pennycress because sufficient information now exists to show it is not rare in Alaska (ACCS 2016b). Coffee Creek scorpionweed is the only BLM sensitive or watchlist plant currently tracked by ACCS that is known to exist within approximately 20 miles of the Project area (ACCS 2016a). It is possible that additional BLM-listed plant species that are not tracked by ACCS (both those outside of Alaska and those that ACCS no longer considers rare) occur in the Project vicinity. The Museum of the North maintains a database of locations from which plant specimens are known to have been collected. A query for BLM-listed plant species within approximately 50 miles of the Project shows only the same Coffee Creek scorpionweed site referenced above (Arctos 2016a).

3.4.4 Direct and Indirect Effects from Alternative 1 – No Action Alternative

3.4.4.1 VEGETATION AND TERRESTRIAL WILDLIFE HABITAT

Under the No Action Alternative, additional ground disturbance and concurrent reclamation would occur at the helicopter-supported drill sites. Up to 0.45 acres would remain unreclaimed at any one time. At the end of the Notice period, Constantine would reclaim all the drill sites as required by the Notice. The helicopter-supported drill sites are primarily in rocky alpine areas that support little vegetation, so vegetation effects would be minimal and slightly altered rocky habitat would remain at the close of exploration.

Also under the No Action Alternative, Constantine could disturb up to 0.60 additional acres authorized under the Notice but not built in 2014 and this would likely be upland shrub habitat dominated by alders. At the end of exploration under the Notice period, Constantine would reclaim any new disturbance and access road and other project components already constructed on BLM land. After recontouring and preparing the surface, Constantine would seed the site with a BLM-approved seed mix. Over time, the disturbed area would be colonized by dense alders and eventually additional understory plants.

The acreage converted from natural habitat to disturbed areas under the No Action Alternative is presented in **Table 3-12**, below. Constantine would reclaim this same area, plus the area already converted to road and pads after exploration, and it would generally become upland shrubland (alder thicket).

Table 3-12. Disturbed Area Under the No Action Alternative

Habitat Type	Approximate Disturbed Acreage
Upland shrubland	0.60
Total	0.60

3.4.4.2 NON-NATIVE INVASIVE PLANT SPECIES

During exploration, non-native plants could potentially become established along the new access road. Because the road and human activity would be in place a relatively short period, infestations are unlikely to be large. Constantine's reclamation seed mix would not include prohibited or restricted noxious weeds. Establishment of non-native invasive species at drill sites is unlikely because wheeled and tracked equipment is not used and the rocky alpine sites are generally not hospitable to plants.

3.4.4.3 RARE PLANT SPECIES

No rare plant species are known to exist within areas that would be disturbed under the No Action Alternative. The remaining area that could be disturbed for construction of road under the Notice is of a habitat type (alder thicket) that is widespread and common, so the likelihood of rare plant species being present there is low. The exact habitat types of the alpine areas where drilling would occur are less well known. Based on the small footprint of the drill and helicopter pads and drilling water supply infrastructure, the likelihood of adverse effects to sensitive or watchlist species is low (BLM 2010, 2012b; Parker 2001).

3.4.5 Direct and Indirect Effects from Alternative 2 – Proposed Action Alternative

3.4.5.1 VEGETATION AND TERRESTRIAL WILDLIFE HABITAT

At the helicopter-supported drill sites, the effects on vegetation and terrestrial habitat would be the same as under the No Action Alternative except that the total number of alpine drill sites could be greater under the Proposed Action Alternative, resulting in disturbance of approximately 0.5 acres of land.

Under the Proposed Action Alternative, Constantine proposes constructing a new road, laydown area, rockfall mitigation berm, and related rock stockpiles, which would replace up to 35.0 acres of mostly tall alder habitat with unvegetated surfaces or grassed slopes and would disturb 0.1 acres of river bar. At the end of exploration—after approximately 5 years—Constantine would reclaim these same areas, plus approximately 1 mile of road it has already constructed on BLM land, restoring much of it to grass meadows that would eventually be colonized by a dense growth of alders. Some of the disturbed substrates would likely be too coarse in texture for rapid colonization, even after seeding, and these would remain as rocky slopes.

The acreage disturbed by the construction of the road, laydown area, rock stockpiles, rockfall mitigation berm, and related disturbed areas under the Proposed Action Alternative is presented in **Table 3-13**, below. Constantine would reclaim this same area after exploration and it would generally become upland shrubland (alder thicket).

Table 3-13. Disturbed Area Under the Proposed Action Alternative

Habitat Type	Disturbed Acreage
Upland shrubland	35.0
Bedrock, talus, alpine heath and meadow.	0.5
River	0.1
Total	35.6

3.4.5.2 NON-NATIVE INVASIVE PLANT SPECIES

Compared to the No Action Alternative, the effects of the Proposed Action Alternative on the establishment and spread of non-native invasive plants would be substantially greater in magnitude, with a higher risk of uncontrolled infestations, because the area disturbed would be eight times greater, and highway and construction vehicle traffic would extend beyond the reach of currently existing roads. During the drilling season, highway vehicles would travel daily between Big Nugget Camp, and perhaps as far as Haines, and the laydown area near the South Wall. In addition, trucks hauling drilling materials, fuel, and truck-mounted drlll rigs would regularly travel as far as the laydown area from Haines.

During the course of exploration, non-native plants could become established along the new access road, at borrow sites, on the laydown area, and on rock stockpiles. The unreclaimed disturbed areas would remain in place for approximately 5 years before reclamation would begin and the road's use for exploration would cease. The larger disturbed area and greater volume of traffic would pose a greater risk of non-native invasive plants becoming established and spreading into undisturbed areas before Constantine reclaimed the site. Some highly invasive plants exist along the Haines highway system. The risk of weeds spreading into undisturbed areas would depend on how rigorously Constantine implemented their detection and eradication measures, both during exploration and after reclamation, as vegetation was becoming reestablished. BMPs can prevent the introduction and spread of unwanted species in the project area (Graziano et al. 2014).

The road's existence would be limited to the period of exploration, at which point Constantine would begin reclaim it. Providing Constantine implemented a rigorous weed control program during exploration and following reclamation, the effects of non-native invasive plant establishment would likely be minor.

Establishment of non-native invasive species at helicopter-supported drill sites is unlikely because Constantine would not use wheeled and tracked equipment at those locations. BMPs—for example, cleaning drill equipment and workers' boot treads prior to mobilizing to the remote drill sites—could further prevent the introduction and spread of non-native invasive species to the remote helicopter-supported drill sites.

3.4.5.3 RARE PLANT SPECIES

No rare plant species are known to exist within areas that would be disturbed under the No Action Alternative. The areas that would be directly disturbed for road and laydown area construction are widespread and common habitat types so the likelihood of rare plant species being present there is low. The exact habitat types of the alpine areas where drilling would occur are less well known. Based on the small footprint of the drill and helicopter pads and drilling water supply infrastructure, the likelihood of adverse effects to sensitive or watchlist species is low (BLM 2010, 2012b; Parker 2001).

3.4.6 Cumulative Effects

NEPA requires analysis of the cumulative impacts from the Proposed Action when added to past, present, future, and reasonably foreseeable future impacts. The possible cumulative impacts that could result from the Proposed Action, the expansion of Constantine's existing

Notice-level exploration activities, and the No Action Alternative, are included within each resource section. Under the No Action Alternative, Constantine would continue exploration activities through 2018 as previously approved, but no additional expansion activities would occur.

A cumulative impact, also commonly referred to as a cumulative effect, is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7).

3.4.6.1 CUMULATIVE EFFECTS BOUNDARIES OF THE ANALYSIS

The geographic reference area considered for potential cumulative impacts to vegetation resources is comprised of the Glacier Creek valley, the valleys of the first-order tributaries that include the proposed drilling sites, and east along the south side of the Klehini River valley bottom to the vicinity of Big Nugget Camp at Porcupine Creek's mouth. This encompasses the area where ground disturbance would occur under the Proposed Action Alternative plus areas where ground disturbance and highway vehicle use have allowed establishment of non-native plants that could also infest the Glacier Creek valley. The temporal boundaries considered for this cumulative impacts assessment extend from the mid-1900s, when active exploration changed the vegetation in ways that are visible today, to the year 2021--the approximate year when reclamation activities would be complete and beyond which specific future actions are not reasonably foreseeable.

3.4.6.2 PAST, PRESENT, AND REASONABLE FORESEEABLE FUTURE ACTIONS

- ***Past Actions***: Actions that have affected vegetation in the cumulative effects analysis area include exploration in the Glacier Creek valley, construction of the forestry road and associated tree cutting near the Klehini River, and construction and use of Porcupine Road.
- ***Present Actions***: Constantine holds State mineral claims within the evaluation area, but has submitted no application or proposal for activities on those claims. ADOT&PF prepared an environmental assessment and is looking to make improvements to the Haines Highway (2015). These improvements include improving intersections, driveways and recreational turnout accesses, as well as replacing the highway bridge over the Chilkat River.
- ***Reasonable Foreseeable Future Actions***: Constantine has current approvals to continue exploration activities through 2018. ADOT&PF will continue to make improvements to the Haines Highway, as analyzed and proposed under their recent environmental review process.

3.4.6.3 VEGETATION AND TERRESTRIAL WILDLIFE HABITAT

Past actions have resulted in disturbed vegetation within the Glacier Creek valley including some road and laydown areas that are unvegetated and some areas dominated by alders. Past road building and logging have resulted in some unvegetated (road) areas, and some areas of

early-successional vegetation that is likely dominated by deciduous shrubs and tree saplings and herbs. Unless re-disturbed, the disturbed areas in the vicinity of the Proposed Action Alternative will return to alder thicket, and the areas in lower Glacier Creek valley and on the Klehini River valley bottom will progress through stages dominated by deciduous tree saplings, then deciduous trees, and gradually to a mixed deciduous-evergreen forest and back to evergreen conifer forest. The total disturbed vegetation acreage in the evaluation area will measure in the range of a few thousand acres, with the effects of either the No Action or Proposed Action Alternative representing a small proportion (less than 5 percent) of that based on a timber harvest map and a timber sale prospectus on the Alaska Division of Forestry website: http://forestry.alaska.gov/Assets/uploads/DNRPublic/forestry/pdfs/timber/haines.

3.4.6.4 NON-NATIVE INVASIVE PLANT SPECIES

Past activities have led to establishment of non-native invasive plant species along the Porcupine Road and the state forestry road. Present and future activities are likely to lead to additional infestations within disturbed areas. Because of the small footprint and limited period of activity, and the monitoring and eradication measures included in the Proposed Action Alternative, neither of the alternatives is likely to have a synergistic effect on establishment of nonnative invasive plants within or beyond the cumulative effects evaluation area.

3.4.6.5 RARE PLANT SPECIES

It is possible but unlikely that past activities have extirpated individual populations of sensitive or watchlist plant species, or that present or reasonably foreseeable future actions will do so (BLM 2010, 2012b; Parker 2001).

3.4.7 Recommended Mitigation

3.4.7.1 VEGETATION AND TERRESTRIAL WILDLIFE HABITAT

No additional measures are recommended.

3.4.7.2 NON-NATIVE INVASIVE PLANT SPECIES

Additional measures are needed to minimize the risk that non-native invasive plants become established:

- While Constantine's Plan cites potentially using sources outside the Project area for road materials, this should be restricted to sources that have been inspected by a qualified person and found to be free of weeds.
- The cleaning process Constantine has committed to for vehicles and transport equipment before they can enter BLM lands should be extended to drilling equipment, work boots, and tools, and should be applied to all vehicles traveling to the Project site on Constantine's behalf.
- Reclamation descriptions refer to exclusion of noxious weeds from the site until revegetation is accepted; that exclusion should be extended to all non-native invasive plants.
- Constantine should integrate additional BMPs into the mine operations to help prevent the introduction and spread of non-native invasive plant species into the Project area. Constantine should employ the Hazard Analysis Critical Control Point methodology

recommended in the non-native plants report (Hemmera 2015a) to control the introduction and spread of non-native invasive species and should use early detection-rapid response methods to address incipient infestations.

3.4.7.3 RARE PLANT SPECIES

As drillers select sites for pads and water supplies, they should avoid locations that support vegetation types that seem unusual to them or that have unusual rock types (BLM 2010, 2012b; Parker 2001).

3.5 Issue 5: Wildlife

This section inventories wildlife present in the Project area, evaluates the potential impacts of the proposed Project on wildlife, and addresses wildlife concerns identified during scoping. Scoping issues include the following (numbers correspond to scoping comments in *Scoping Summary Report* [BLM 2016]):

- How would the proposed Project affect mammals, particularly big game species? (156)
- How would the proposed Project affect nesting birds that are protected by the Migratory Bird Treaty Act or Bald and Golden Eagle Protection Act?
- Would the proposed Project impact bald eagles in the Chilkat River Bald Eagle Preserve? (72, 78,117, 136)
- How would helicopter activity associated with the Project affect mountain goats? (156)
- How would the project indirectly affect the distribution or migration of species for subsistence purposes?

3.5.1 Literature Review

There are several existing studies containing baseline information on wildlife in the Project area, along with the ADF&G species management reports, existing land and resource management plans, wildlife habitat use models, and various other published literature. Reviewed documents include the following:

- *Terrestrial Wildlife and Habitat Assessment* (Hemmera 2015b)

  This report summarizes an evaluation of wildlife habitat and provides an assessment of suitability for species of interest selected by Constantine. This included a desktop review of available literature, habitat mapping, field verification, and a quantification of habitat types.

- *Terrestrial Wildlife: Baseline Studies for Passerines, Mountain Goat, and Cliff-nesting Raptors* (Hemmera 2016)

  Constantine completed baseline surveys for passerines, mountain goats, and cliff-nesting raptors in 2015. This report summarizes the methods and results of avian point-count surveys, aerial mountain goat surveys, and cliff-nesting raptor surveys within and near the Project area.

- *Hunting Maps By Game Management Unit (GMU)* (ADF&G 2016d)

  ADF&G species management reports were compiled for several mammal species found in Game Management Unit (GMU) 1D, which encompasses the northern portion of Lynn Canal, including Skagway, Haines, and Klukwan to the Canadian border.

- *Ring of Fire Record of Decision and Approved Management Plan* (BLM 2008a)

  BLM prepared this land management guidance document for all BLM lands throughout southeast, south-central, and the Aleutian Islands in Alaska.

- *Ring of Fire: Draft Resource Management Plan Amendment*, Haines Block Planning Area. (BLM 2012a)

  The Ring of Fire planning area includes 1.3 million acres of BLM-administered public land in southeast and southcentral Alaska, Kodiak Island, and the Aleutian Islands. In 2012, the BLM drafted an amendment to evaluate whether to retain the Special Recreation Management Area in the Haines Block Planning Area. In 2014, the BLM announced a delay in this planning process.

- *Haines Borough 2025 Comprehensive Plan* (Haines Borough 2012)

  The Comprehensive Plan was developed to guide growth over the next 10 to 20 years and set paths to meet the goals and objectives of the Haines Borough.

- *Mountain Goat Habitat Selection in Southeast Alaska (Griswold et al. 2009)*

  The BLM contracted WEST, Inc. to develop a resource selection function for mountain goat summer habitat quality in the Haines and Skagway area of Alaska. The model was based on aerial transect survey data from 1995 to 2005.

- *Monitoring Mountain Goat Habitat Fidelity and Population Stability in Occupied Habitats with and without Helicopter Supported Commercial Recreation in the Haines-Skagway Area of Alaska: 1995-2005 Data Compilation (Denton 2006)*

  The BLM conducted aerial transect surveys for mountain goats throughout the Haines and Skagway areas of southeast Alaska between 1995 and 2005. The objectives of the study were to determine habitat use and population trends based on recreational helicopter activity.

3.5.2 Study Methodology

By compiling information on wildlife and wildlife habitat from baseline study reports, ADF&G management reports, and other sources, and using professional experience and judgment, this analysis:

- identifies the activities that could affect mammals and birds, or their habitat;
- summarizes Constantine's commitments and BLM's recommended measures that would mitigate potential adverse impacts; and
- discusses the likely effects of the two alternatives on wildlife resources.

3.5.3 Affected Environment

Wildlife habitats in the vicinity of the Project area consist of mature coniferous forest, upland shrubland, alpine, talus/rock scree, bare rock, and freshwater streams (**Figure 3-7**, page 3-47), (Hemmera 2015b). Numerous species of wildlife occupy these habitats and range in abundance from common to rare. The species of interest specific to this project include mountain goat (*Oreamnos americanus*), moose (*Alces alces*), black bear (*Ursus americanus*), brown bear (*Ursus arctos*), wolverine (*Gulo gulo*), Alexander archipelago wolf (*Canis lupus ligoni*), and American marten (*Martes americana*). No Federally-listed threatened or endangered species are likely to occur in or near the Project area. There are three BLM sensitive species that may

occur in the Project area: marbled murrelet (*Brachyramphus marmoratus*), olive-sided flycatcher (*Contopus cooperi borealis*), and golden eagle (*Aquila chrysaetos*).

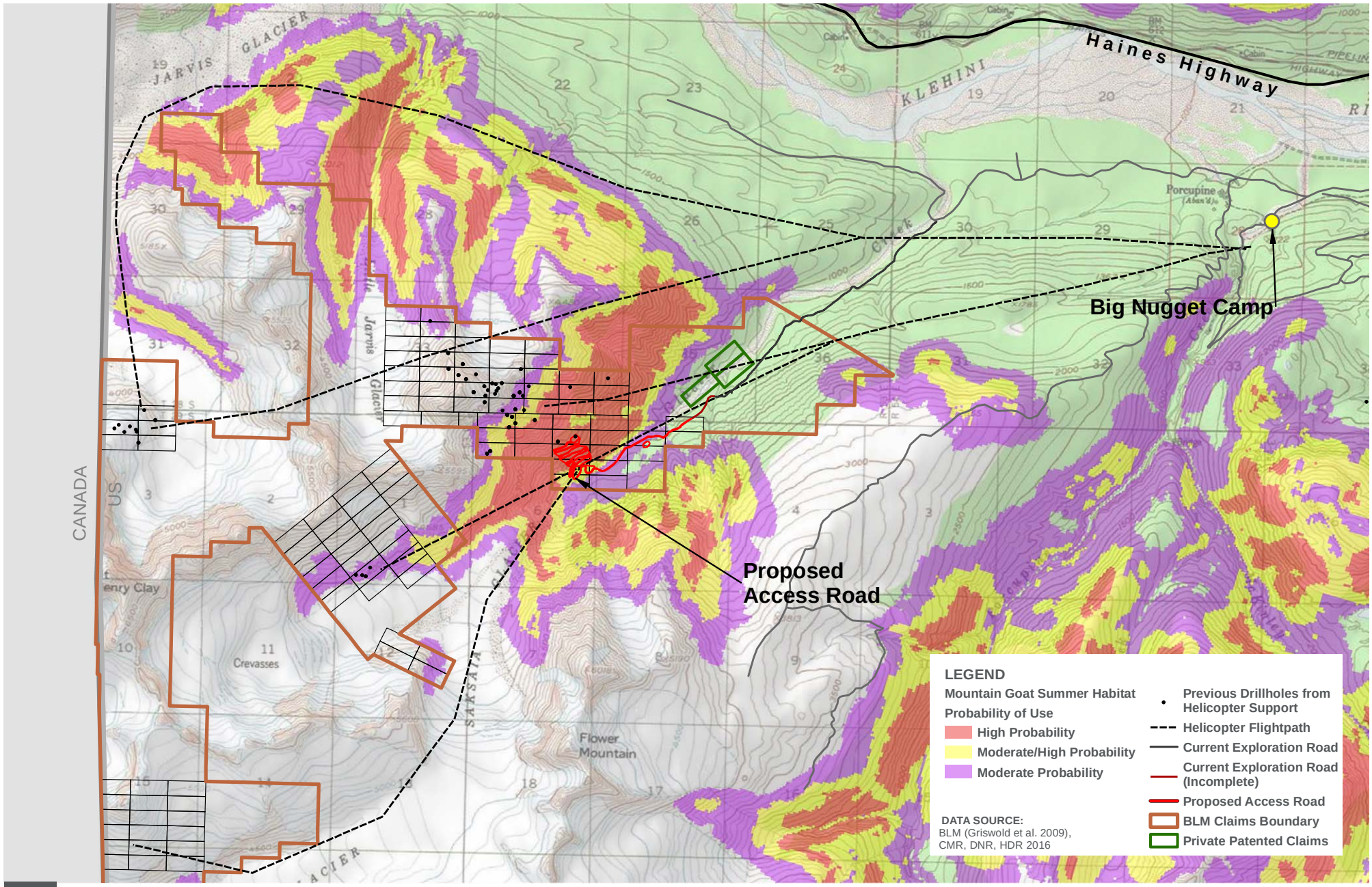
3.5.3.1 MAMMALS

Common mammal species found in the Project area include moose, brown and black bears, mountain goats, wolf, and several species of small mammals. The mature coniferous forests downstream of the Project area and along the south walls of the Chilkat River Valley provide highly productive habitat for mammals. These forests provide a rich and complex system that supports high biodiversity. The thick canopy limits snow cover, making this an important habitat type for winter refuge. Uphill from the coniferous forest is upland shrubland, or subalpine tall shrub, which is an important food source for herbivores and valuable cover for small mammals, but generally receives deep snow in the winter. The bare rock, talus/rock scree, and dwarf shrubs of the alpine are harsh environments where mammalian abundance is relatively low.

3.5.3.1.1 Mountain Goat

Mountain goat habitat, consisting of steep and rocky terrain, is widespread throughout the Project area. Kidding habitat is generally located in dense subalpine vegetation between 1,000 and 2,000 feet in elevation (USFS 2002a). The quality and quantity of winter habitat is the most limiting factor for mountain goats. Preferred winter habitat consists of old growth forests at or just below treeline. Mountain goats prefer areas with thick canopy cover to limit snow fall and provide browse vegetation with quick access to escape terrain, such as steep cliffs (Cote and Festa-Bianchet 2003). Winter survival is highly dependent on pre-winter body condition, as mountain goats tend to select escape terrain with low-quality browse to avoid predators (White et al. 2011b). The current density estimate for mountain goats throughout southeast Alaska is approximately 1.5 goats per square mile (Fox et al. 1989). ADF&G monitoring indicates that mountain goat populations are medium to high in GMU 1D. Hunting pressure is relatively high near the Project area due to availability of road access, particularly on Takhin Ridge to the southeast (Sell 2014a).

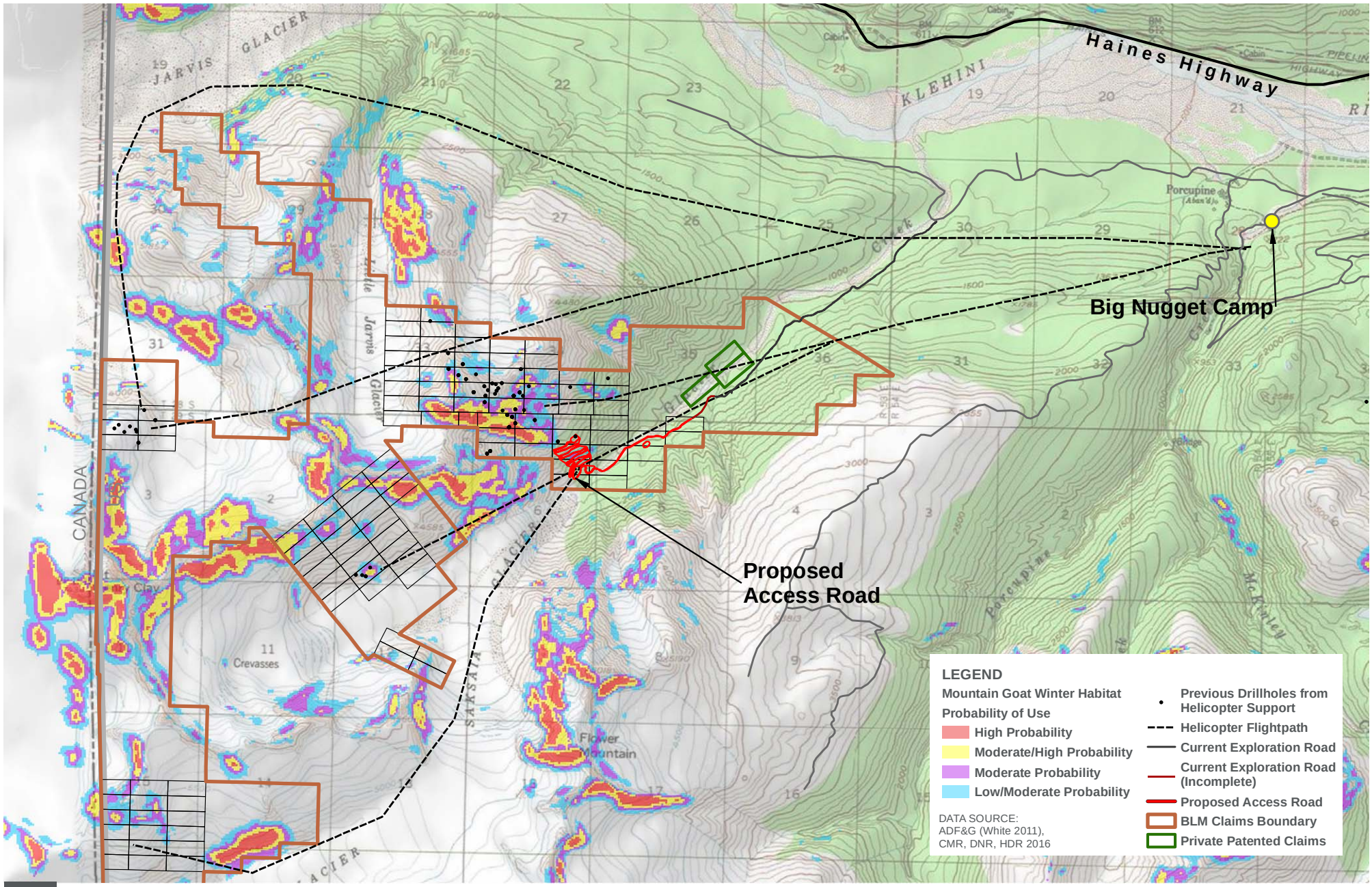
The BLM conducted aerial transect surveys in the western half of GMU 1D each June from 1995 to 2005. Survey transects included Glacier Creek in and near the Project area; however, no mountain goats were observed in the Project area. They made several observations within 5 miles of the Project area to the southwest near Boundary Glacier and to the southeast near Porcupine Creek. The nearest mountain goat observation was approximately 2 miles away at the upper end of Saksaia Glacier (Denton 2006). Habitat modeling based on the surveys between 1995 and 2005 indicates an extensive amount of summer habitat in and near the Project area, which is designated as having a high probability of use by mountain goats (**Figure 3-8**, page 3-61). This model identified the following variables as important to mountain goat habitat use: distance to escape terrain, distance to herbaceous cover, elevation, slope, and aspect. Model validation was supported by the survey data, but bias caused by imperfect detection of mountain goats is possible (Griswold et al. 2009). ADF&G modeled and mapped high-use winter mountain goat habitat based on telemetry data from collared mountain goats in the Kelsall River valley from 1981 to 1983 (White et al. 2011a; **Figure 3-9**, page 3-62). The Project area contains areas of both low and moderate/low probability of use by mountain goats in the winter.



PALMER PROJECT

MOUNTAIN GOAT SUMMER HABITAT MAPPING

FIGURE 3-8



PALMER PROJECT

MOUNTAIN GOAT WINTER HABITAT MAPPING

FIGURE 3-9

To improve upon available data and respond to increasing concern over helicopter impacts, the BLM and ADF&G have initiated a cooperative mountain goat study in the Haines and Skagway area to identify summer and winter habitats. This effort is currently underway and resource selection function modeling is not yet available (White et al. 2014).

In June and September 2015, Hemmera, Constantine's wildlife consultant, conducted aerial surveys for mountain goats within and surrounding the Project area. There were no mountain goats within Glacier Creek valley (near the Project area), and there were almost no mountain goats along or near proposed helicopter flight routes; they observed most individuals in the mountains north and west of the lower Tsirku River (Hemmera 2016). However, Constantine staff observed mountain goats in and adjacent to the Project area on several occasions during the 2014 operations season (Hemmera 2015b).

3.5.3.1.2 Moose

In the early 1930s, moose emigrated from Canada to populate the upper Lynn Canal region (BLM 2008a). In the summer, moose can be found in the upland shrubland where they browse on willow and alder. During the winter, moose transition to lower elevations along the major rivers outside of the Project area, including to designated moose winter range along the Chilkat and Klehini rivers adjacent to the Project area (BLM 2008a). There is approximately 200- to 250-square-miles of summer range in GMU 1D. The current population in GMU 1D is stable between 300 and 400 individuals, with major limiting factors being harsh winters and wolf or bear predation (Sell 2012a). Constantine staff observed moose in the Project area on at least two occasions during the 2014 operations season (Hemmera 2015b).

3.5.3.1.3 Black bear

Black bears may also occur throughout the Project area, but prefer wetlands, meadows, and other openings in the subalpine shrublands and coniferous forests. Diets are generally vegetarian in the spring and carnivorous during salmon runs (Sell 2014b). Populations are likely sustained by productive salmon streams, but they may also be suppressed by brown bears. Past estimates have put maximum black bear density at about 1.3 black bear per square mile, while densities average 3.9 per square mile throughout the rest of southeast Alaska (Sell 2014b; Peacock et al. 2011). Constantine staff regularly observed black bear in or around the Project area during the 2014 operations season (Hemmera 2015b).

3.5.3.1.4 Brown bear

The Chilkat River Valley, located about 15 miles downstream of the Project area, has one of the highest concentrations of brown bear in the world (Miller 1993), and are important for both viewing and hunting opportunities. Brown bear harvest in Unit 1D accounts for about 47 percent of all harvests in mainland southeast Alaska (Sell 2013a). Brown bear are opportunistic creatures and could be found throughout the Project area at almost any time. Generally, however, they prefer south facing slopes for spring foraging, riparian forests during salmon runs, and the subalpine to alpine transition zone when berries are ripe. Brown bears den on steep slopes, often above 1,000 feet in elevation (Goldstein et al. 2010). Constantine staff opportunistically observed brown bear in and around the Project area on nine occasions during the 2014 operations season (Hemmera 2015b).

3.5.3.1.5 Wolverine

Suitable habitat for wolverines is extensive throughout the Project area and surrounding mountains. High quality habitat ranges from alpine tundra to tall shrubs and dense coniferous forest (Hemmera 2015b). Wolverines in and near the Project area have ample opportunities to scavenge on carrion of moose and mountain goat, and also are sustained by salmon runs from late summer through early winter. The local population is probably stable, given the ample suitable habitat, although population estimates are not available (Sell 2013b).

3.5.3.1.6 Wolf

The Alexander Archipelago wolf is a subspecies of wolf endemic to southeast Alaska and an ADF&G Species of Greatest Conservation Need (SGCN). This species is smaller and has a darker coat than the gray wolf found throughout most of Alaska. Wolves are found in all habitat types, but are generally attracted to areas of high moose density or productive salmon streams in autumn. Wolves in southeast Alaska are highly associated with the Sitka black-tailed deer (*Odocoileus hemionus sitkensis*), their primary prey species. The Project area is on the periphery of Sitka black-tailed deer range, so wolves in this area primarily prey on moose, mountain goats, beaver, and salmon. ADF&G has not conducted formal population studies in GMU 1D, but based on harvest reports, the population appears to be stable, but low (Sell 2012b). Prediction models indicate that GMU 1C (mainland southeast Alaska from south end of Stephens Passage through Glacier Bay National Park) and GMU 1D represent only about 5 percent of the total southeast Alaska wolf population (Person et al. 1996).

3.5.3.1.7 American marten

American marten are found in mature and old-growth spruce and hemlock forests, where they primarily prey on voles (*Myodes spp.*) and mice (*Peromyscus spp.*) (Sell 2013b; Baltensperger 2009). Marten are generally solitary and elusive with male home range sizes ranging from 1 to 15 square miles. American marten in the Haines area are an important target of trappers. Populations in GMU 1D are not known, but based on harvest, the population appears to be healthy and well regulated by trapping (Sell 2013b).

3.5.3.2 BIRDS

Numerous bird species may use the Project area for breeding, migration stop-over, or year-round habitat. The convergence of coastal and mountainous zones combined with substantial elevation gradients creates diverse ecotones of avian habitat throughout the Project area and surrounding landscape. Avian point-count surveys in June 2015 identified 51 different species in and near the Project area. The most common species observed were pine siskin (*Spinus pinus*), common redpoll (*Acanthis flammea*), and varied thrush (*Ixoreus naevius*) (Hemmera 2016).

Mature coniferous forests are highly productive and provide important habitat for passerines (perching-birds), raptors (including owls), grouse, woodpeckers, and corvids (ravens and jays).

Upland shrublands provide highly productive habitat, including cover and protection, for a variety of passerines and other bird species. Surveys detected numerous warblers, sparrows, and flycatchers in this habitat type during avian point-count surveys (Hemmera 2016). The transition zones between shrublands and coniferous forests create edge habitats that often have higher avian diversity. Surveys recorded gray-cheeked thrush, olive-sided flycatcher, and

Townsend's warbler in upland shrubland habitat types during surveys in the 2015 breeding season and are likely nesting in or near the Project area (Hemmera 2016).

Several bird species use alpine habitat types for nesting. Surveys in alpine habitat during 2015 identified American pipit (*Anthus rubescens*), savannah sparrow (*Passerculus sandwichensis*), gray-crowned rosy-finch (*Leucosticte tephrocotis*), and three species of ptarmigan (*Lagopus spp.*); these species are likely nesting in or near the Project area (Hemmera 2016).

Waterfowl (or waterbirds) are rare in the Project area; however, harlequin ducks may nest in coniferous forests along high-gradient streams (Robertson and Goudie 1999), such as Glacier Creek. One harlequin duck was identified along Glacier Creek during surveys in 2015, although nesting activity could not be confirmed (Hemmera 2016). Other species that may be found along the creek are American dipper (*Cinclus mexicanus*), and spotted sandpiper (*Actitis macularius*), which were identified during surveys in 2015 (Hemmera 2016) and belted kingfisher (*Megaceryle alcyon*), which Constantine staff identified during the 2014 operations season (Hemmera 2015b).

Aerial surveys for cliff-nesting raptors within and surrounding the Project area, completed in June 2015, identified a red-tailed hawk nest and a golden eagle nest. The red-tailed hawk nest is located in the Porcupine Creek drainage east of the Project area and was active during the 2015 nesting season. The golden eagle nest is within approximately 300 meters of the active drilling area, but was inactive in 2015 and there was no sign of recent use (Hemmera 2016).

While bald eagles are unlikely to occur regularly within the Project area, suitable habitat does occur approximately 3 miles downstream from the Project area. The Alaska Chilkat Bald Eagle Preserve (Preserve) was established to protect the bald eagles that congregate here, their state designated "critical" habitat, and the annual natural salmon runs (ADNR 2016). The Preserve includes the Chilkat, Tsirku, and Klehini rivers, including along the Klehini both upstream and downstream from its confluence with Glacier Creek. The Preserve provides ample perching, roosting, and nesting habitat used by eagles year-round. Each fall, bald eagles congregate in high numbers along these rivers and prey on the abundant salmon run (ADNR 2016).

3.5.3.2.1 BLM Sensitive Bird Species

There are three species of birds listed as sensitive by the BLM that may occur, or are known to occur, within the Project area: marbled murrelet, olive-sided flycatcher, and golden eagle. Marbled murrelets nest in coastal forests of alder or conifer generally within 6.2 km (3.9 miles) inland from shore (Nelson 1997). No marbled murrelets have been identified in or near the Project area. Although suitable nesting habitat exists in the conifer forests near the Project area, marbled murrelets are unlikely to nest so far inland. Olive-sided flycatchers nest in montane and northern coniferous or boreal forests near meadows, edges, or open woodlands (Altman and Sallabanks 2012). Surveys in 2015 identified olive-sided flycatchers within the coniferous forests near the Project area during the breeding season (Hemmera 2016). This species is likely nesting in or near the Project area. Golden eagles breed in a wide variety of habitats and their nests are generally located on cliffs or rock outcrops (Kochert et al. 2002). As discussed above, an inactive golden eagle nest was identified within approximately 300 meters of the active

drilling area during surveys in 2015. A pair of golden eagles was also observed in and near the Project area on at least one occasion, but no active nests were identified (Hemmera 2016).

3.5.3.3 SUBSISTENCE

The Project area is within the traditional territory of the Chilkat Tlingit (Emmons 1991) and is located near Klukwan, a rural Native Alaskan community with significant cultural ties to and a higher reliance on subsistence than the general population. Subsistence fishing, hunting, and trapping are important activities for residents of both Haines and Klukwan (see Section 3.7, Socioeconomics, on page 3-83). Mountain goats, moose, brown bear, black bear, and some furbearers are important subsistence resources, although salmon is the primary subsistence food source in the region. However, none of the lands within the Project area are considered Federal Public Lands as defined in ANILCA Sec. 102(3); therefore, they do not fall under the regulatory authority of the Federal Subsistence Board and Subsistence Management Regulations for the harvest of fish and wildlife.

3.5.4 Direct and Indirect Effects from Alternative 1 – No Action Alternative

Under the No Action Alternative, Constantine would continue exploration activities as described in the Notice. Up to 0.45 acres of disturbance to alpine wildlife habitat would occur as a result of drill site construction and operation. Constantine could also remove up to 0.8 acres of upland shrubland wildlife habitat to construct an additional 0.3 miles of access road under the Notice.

Direct and indirect impacts to wildlife due to habitat loss would be similar to the Proposed Action Alternative, but to a lesser extent. To avoid repetition, a full description of these impacts to mammals and birds is described in Section 3.5.5.1, Direct and Indirect Effects from Alternative 2 – Proposed Action Alternative, on page 3-68.

Under the No Action Alternative, Constantine would use helicopters to access up to 58 different drill site locations. Impacts from helicopter overflights would be similar or greater in extent to the Proposed Action. Again, to avoid repetition, a full description of these impacts to mammals and birds is described in the Section 3.5.5.1, Direct and Indirect Effects from Alternative 2 – Proposed Action Alternative, on page 3-68.

3.5.4.1 MAMMALS

Direct impacts to mammals from the No Action Alternative would be similar to the impacts experienced from past activities permitted under the Notice. The loss of up to 0.8 acres of upland shrubland habitat and 0.45 acres of alpine habitat would remove potential foraging, cover, denning, and other habitats. Direct habitat loss would be highly limited in extent, particularly relative to the available habitat in the surrounding landscape, and would result in negligible impacts to mammals.

Construction and exploration, including helicopter overflights, could degrade wildlife habitat beyond the Project footprint. Mountain goats are particularly vulnerable to disturbance from helicopter overflights (see Proposed Action Alternative on mountain goats, Section 3.5.5.1.1, Mountain Goat, page 3-68).

Current BLM required operating procedures (ROPs) listed in the *Ring of Fire Resource Management Plan* stipulate that helicopters maintain 0.5-mile (2,641 feet) of horizontal and

1,500 feet vertical distance from mountain goats (BLM 2008a). To reduce impacts to mountain goats from helicopter overflights, Constantine has committed to maintain a distance of 1,500 feet or more from mountain goats (and other large mammals such as bear and moose), when safe to do so (Constantine 2015). Biologists have not observed mountain goats in or immediately adjacent to the Project area during surveys between 1995 and 2005 (Denton 2006), nor during surveys in 2015 (Hemmera 2016), suggesting that summer mountain goat abundance is low despite mapped high-use habitat.

Given these avoidance and mitigation measures, impacts to mountain goats, and all other mammals, would be seasonal, short-term, and limited in extent.

3.5.4.2 BIRDS

Under the No Action Alternative, direct habitat loss would remove up to 0.8 acres of upland shrubland bird habitat and up to 0.45 acres of alpine bird habitat. These actions could result in the loss of foraging, breeding, nesting, or migratory stop-over habitat for a variety of bird species. In addition, construction and exploration activities could result in disturbance beyond the footprint of direct habitat loss, potentially displacing birds and degrading the surrounding habitat. However, given the limited extent of direct habitat loss and limited nature of construction and operation activities relative to the available habitat surrounding the Project area, impacts to birds from the No Action Alternative are expected to be minimal.

Ground and shrub-nesting birds are susceptible to direct impacts from removing vegetation and grading associated with the extension of the access road under the Notice. BLM ROPs prohibit vegetation removal during the migratory bird nesting period of April 15 to July 15, when possible, otherwise nesting bird surveys would need to be completed to identify species present and possible avoidance or mitigation measures (BLM 2008a). Constantine has committed to field-based surveys in vegetated zones where proposed disturbance would be located (Section 2.2.11, Applicant-committed Environmental Protection Measures, page 2-29). Given the BLM ROP and applicant-committed measures (Section 2.2.11, Applicant-committed Environmental Protection Measures, page 2-29), it is unlikely that direct impacts to birds would occur from vegetation removal or grading associated with access road construction.

Exploration activities, including helicopter overflights, could disturb other birds nesting in the area (see Proposed Action Alternative on birds, Section 3.5.5.2, Birds, page 3-71). BLM ROPs require that aircraft maintain a minimum altitude of 1,000 feet whenever within 0.5 miles of known bald eagle nests (BLM 2008a). Furthermore, U.S. Fish and Wildlife (USFWS) guidelines recommend a 1,000-foot buffer between operating helicopters and bald eagle nests during the breeding season (USFWS 2007). In compliance with BLM ROPs, Constantine would identify nests of raptors and other sensitive bird species that could be affected by helicopter overflights, and would avoid any active nests by appropriate buffers. Given the ROPs and recommended mitigation (Section 3.5.7, Recommended Mitigation, page 3-74), impacts to nesting birds, including raptors, are not expected.

3.5.4.3 SUBSISTENCE

None of the lands within the Project area are considered Federal Public Lands as defined in ANILCA Sec. 102(3); therefore, they do not fall under the regulatory authority of the Federal

Subsistence Board and Subsistence Management Regulations for the harvest of fish and wildlife. Impacts to Federal subsistence activities would be indirect in nature and minimal in extent. Under the No Action Alternative, these indirect impacts could potentially reduce the abundance or distribution of game in or near the Project area. Construction and exploration activities could also require the closure of public access roads for safety reasons, potentially preventing access to hunting, trapping, or gathering areas. Impacts to subsistence fishing are discussed in Section 3.3, Fisheries, on page 3-22. However, given the relatively small and temporary footprint of the activity, impacts to subsistence resources or subsistence activities would be negligible.

3.5.5 Direct and Indirect Effects from Alternative 2 – Proposed Action Alternative

Direct impacts to wildlife habitat from the Proposed Action would include disturbance to 35 acres of upland shrubland due to road construction (**Table 2-2**, page 2-4; **Figure 3-7**, page 3-47) (Hemmera 2015b) and up to 0.50 acres of alpine habitat (i.e., bare rock, scree, or alpine tundra) from helicopter-supported drill pads. Direct impacts to wildlife could include the loss of habitat for breeding and nesting, foraging, or cover. Indirect impacts as a result of construction and operation activities could impact an unknown and variable amount of wildlife habitat adjacent to the Project area and below the helicopter flight paths, including portions of old-growth coniferous forest and alpine tundra. Indirect impacts could include potentially disturbing and displacing wildlife to adjacent, potentially lower-quality habitat. Other indirect impacts could result from introducing invasive plants or from sedimentation and contamination of local waterbodies. Roads, even when closed to motorized vehicles, can lead to an increase in the number of hunters, trappers, or other recreationists. This could increase stress, result in displacement of resident wildlife, increase harvest of local game species, or increase the potential for poaching. These impacts are likely to be minimal for most wildlife species because impacts would be limited both spatially and temporally and there is substantial high quality habitat surrounding the Project area.

3.5.5.1 MAMMALS

3.5.5.1.1 Mountain goat

The Proposed Action would result in the loss of suitable mountain goat summer and winter habitat. Under the Proposed Action, direct habitat loss would impact approximately 23.7 acres mountain goat summer habitat considered to have high probability of use, and 6.7 acres of habitat considered to have a moderate to moderate/high probability of use (**Figure 3-8**, page 3-61) (Griswold et al. 2009). Additional habitat loss and disturbance would occur at the helicopter-access drill sites in alpine habitat types. The loss of 35 acres of subalpine shrub vegetation could remove potential kidding habitat, although no kidding areas have been identified. Furthermore, escape and summer habitat could be degraded beyond the Project footprint due to disturbance from helicopter overflights, construction, and exploration activities. White and Gregovich (2016) found lower than expected habitat use up to 3,281 feet (1,000 meters) from mining activity in the summer. An additional 434.9 acres of mapped, high-use summer habitat (Griswold et al. 2009) is located within 1,000 meters of proposed construction and exploration activity, including potential helicopter-access drill sites. Disturbance could result in shifts to adjacent habitats where forage is of lesser quality, competition for resources is greater, or

predation risk is higher. However, these impacts would be temporary and seasonal. The Proposed Action would remove approximately 5.3 acres of winter mountain goat habitat considered to have moderate to moderate/low probability of use, as modeled by ADF&G (2016d). No winter habitat considered to have moderate/high or high probability of use would be affected. Given the limited impact on moderate and low quality winter habitat and because exploration activities would only occur in the summer and fall, impacts to mountain goats during the winter would be negligible.

Helicopter activity is of particular concern to this population of mountain goats because summer and winter helicopter-tourism in the Haines and Skagway area has been increasing over the last decade (Goldstein et al. 2005). Mountain goats are particularly vulnerable to disturbance because they have low population growth rates, small home ranges, and their summer habitat is topographically restricted (White et al. 2012; Cote and Festa-Bianchet 2003). Individual reactions may differ based on the distance to disturbance and proximity to or amount of escape cover (Goldstein et al. 2005; Wilson and Shackleton 2001).

As a result of increasing helicopter-tourism and heli-skiing operations, there have been a number of recent studies focused on assessing the impacts of helicopter activity on mountain goats. A multi-year study conducted by the U.S. Forest Service (USFS) on the Juneau Icefield found that goats continued to use habitat below flight paths and productivity did not change despite an increase in helicopter activity (USFS 2002b). A study in the Chilkat Range (located northeast of the Project area) found that disturbance occurred in 38 percent of individuals when the aircraft was within 1,640 feet (500 meters) of mountain goats, and 18 percent when within 3,281 feet (1,000 meters) of mountain goats. Fleeing and hiding reactions were elicited when aircraft were within 1,640 feet and changes in behavior generally occurred at less than 3,281 feet. Cote et al. (2013) only observed a major decrease in disturbance level when approach distance was greater than approximately 4,921 feet (1,500 meters). There is little to no evidence of short-term or long-term habituation by mountain goats to helicopter overflights (Goldstein et al. 2005; Wilson and Shackleton 2001; Cote et al. 2013).

Mountain goats are far more susceptible to negative disturbance from helicopters during the winter, when escape habitat is limited due to snow cover. However, the Proposed Action would not include any winter activities, so impacts to mountain goats during this sensitive period would not occur. Disturbance from helicopters during the summer can cause physiological stress or altered behavior, including interruptions to foraging or resting activity, increased alarm responses, and increased movement and energy expenditure. This could increase exposure to predation, susceptibility to disease, reduce productivity, or decrease pre-winter body condition, potentially reducing overwinter survival of mountain goats (Hurley 2004).

Goldstein et al. (2005) suggests that disturbance reactions from mountain goats vary by location. Within the Chilkat Range, Goldstein et al (2005) recommend an approximately 2,530-foot (771-meter) buffer to maintain less than 25 percent disturbance reactions. The amount and distribution of cliff cover suitable as escape terrain is an important site-specific consideration when planning avoidance measures. Rolling valleys with less cliff cover or very narrow canyons may require increased buffer distances (Hurley 2004). For instance, Cote et al. (2013)

recommend helicopters avoid mountain goat groups in Alberta by 4,921 feet (1,500 meters) and allow a 6,562-foot (2 kilometer) buffer zone around high-use areas. Other studies in portions of Canada with less steep terrain and limited escape habitat have also recommended 6,562-foot (2-kilometer) buffers (Cadsand 2012; Cote 1996; Foster and Rahs 1983).

To reduce impacts to mountain goats from helicopter overflights, Constantine has committed to maintain a distance of 1,500 feet or more from mountain goats, when safe to do so (Constantine 2015). Surveys conducted by the BLM between 1995 and 2005 (Denton 2006) and surveys conducted by Constantine in 2015 (Hemmera 2016) did not identify any mountain goats in or immediately adjacent to the Project area, suggesting that mountain goat abundance is low despite the presence of suitable habitat.

Given the relatively low mountain goat abundance impacts to mountain goats from the Proposed Action are expected to be minimal.

3.5.5.1.2 Moose

Under the Proposed Action, direct habitat loss would impact approximately 35 acres of high-quality moose summer browse habitat in the upland shrubland vegetation community (**Figure 3-7**, page 3-47) (Hemmera 2015b). In addition, construction and exploration activities (including helicopter activity) could degrade the quality of adjacent summer browse habitat beyond the Project footprint. This could result in moose selecting lesser quality habitat where competition is greater or predation risk is higher. These impacts are expected to be minimal due to the relatively small moose population and extensive amount of summer browse habitat available in the surrounding area (**Figure 3-7**, page 3-47). Furthermore, impacts to moose during winter, when they are most susceptible to perturbations, would not occur.

3.5.5.1.3 Black bear

Under the Proposed Action, direct habitat loss would impact approximately 35 acres of black bear habitat. In addition, construction and exploration activities (including helicopter activity) may degrade the quality of adjacent habitat beyond the Project footprint. This could result in bears selecting lesser quality habitats, or areas where competition is greater. These impacts are expected to be minimal due to the extensive amount of black bear habitat available in the surrounding area.

3.5.5.1.4 Brown bear

Under the Proposed Action, direct habitat loss would impact approximately 35 acres of high-quality brown bear habitat (**Figure 3-7**, page 3-47) (Hemmera 2015b). This includes potential subalpine denning areas in upland shrubland on steep slopes. In addition, construction and exploration activities (including helicopter activity) could degrade the quality of adjacent habitat beyond the Project footprint. Activities during late fall when bears are selecting den sites, or in late spring and early summer during pre-den emergence could be particularly detrimental. Disturbances from construction and exploration could result in bears selecting lesser quality habitats, or areas where competition for resources is greater. These impacts are expected to be minimal due to the extensive amount of high quality brown bear habitat available in the surrounding area.

3.5.5.1.5 Wolverine

Under the Proposed Action, direct habitat loss would impact approximately 35.5 acres of high-quality wolverine habitat (**Figure 3-7**, page 3-47) (Hemmera 2015b). In addition, construction and exploration activities (including helicopter activity) could degrade the quality of adjacent habitat beyond the Project footprint. Disturbances from construction and operation could result in wolverines selecting lesser quality habitats. The Proposed Action could reduce the abundance of prey or reduce predation success. Because of the extensive amount of high-quality wolverine habitat found in the region and the naturally low density of wolverines, impacts to wolverines from the Proposed Action are expected to be minimal.

3.5.5.1.6 Wolf

Under the Proposed Action, direct habitat loss would impact approximately 35.5 acres of wolf habitat (**Figure 3-7**, page 3-47). In addition, construction and exploration activities (including helicopter activity) could degrade the quality of adjacent habitat beyond the Project footprint. Disturbances from construction and exploration could result in wolves selecting lesser quality habitats, or areas where competition for resources is greater. The Proposed Action could reduce the abundance of prey or reduce predation success. These impacts are expected to be minimal due to the relatively small local wolf population, extensive amount of high quality wolf habitat available in the surrounding area, and the large range and mobility of wolves.

3.5.5.1.7 American marten

The Proposed Action would not result in the direct loss of American marten habitat. However, helicopter flights in support of exploration activities could disturb American marten or degrade the quality of their coniferous forest habitat. Although unlikely, this could result in marten selecting alternative, lower quality habitats or areas where competition for resources is greater. Impacts on American marten are expected to be minimal because helicopter activity would be limited to specific flight routes and aircraft would maintain minimum flight altitudes to avoid disturbance to other wildlife.

3.5.5.2 BIRDS

Direct impacts to birds due to the Proposed Action would include the direct loss of 35 acres of potential nesting or foraging habitat in the upland shrubland vegetation community. Indirect impacts to avian habitat could occur beyond the footprint of the Project due to noise disturbance from human activities, including helicopter activity. Noise and other disturbances could discourage breeding activity or nesting attempts in adjacent habitat, or inhibit successful predation or predator avoidance (Francis et al. 2009). While disturbance to birds from construction and operation is possible, the impacts would be short-term and minor. Most birds in the United States are Federally-protected by the Migratory Bird Treaty Act (MBTA; 16 U.S.C. 703-711) and bald and golden eagles are Federally-protected under the Bald and Golden Eagle Protection Act (BGEPA; 16 U.S.C. 668-668d).

Ground- and shrub-nesting birds are at risk from the removal of vegetation and grading during road construction, which can result in nest abandonment, nest destruction, or mortality of young. Numerous alpine and subalpine nesting birds could be affected by vegetation removal and ground disturbance. BLM ROPs prohibit vegetation removal during the migratory bird nesting period of April 15 to July 15, when possible, otherwise nesting bird surveys would be completed

to identify species present and possible avoidance or mitigation measures (BLM 2008a). Constantine has committed to field-based surveys in vegetated zones where proposed disturbance would be located (Section 2.2.11; Applicant-committed Environmental Protection Measures, page 2-29). Given the BLM ROP and applicant-committed measures (Section 2.2.11, Applicant-committed Environmental Protection Measures, page 2-29), it is unlikely that direct impacts to birds would occur from vegetation removal or grading associated with access road construction.

The Proposed Action would not directly impact the Alaska Chilkat Bald Eagle Preserve. The Project area is approximately 3 miles upstream from the Preserve and Bald Eagle critical habitat is located 15 miles to the east. Helicopter flight routes are proposed within approximately 0.5 miles (2,640 feet) of known nest sites within the Preserve. Constantine would comply with BLM ROPs requiring that aircraft maintain a minimum altitude of 1,000 feet whenever within 0.5 miles of known bald eagle nests (BLM 2008a), and USFWS guidelines recommending a 1,000-foot buffer between operating helicopters and bald eagle nests during the breeding season (USFWS 2007). To prevent disturbance to bald eagle nests and to comply with ROPs, it is recommended that Constantine annually identify known bald eagle nests in the area, either through surveys or consultation with ADF&G and USFWS. Adherence to the ROPs and recommended mitigation (Section 3.5.7, Recommended Mitigation, page 3-74) would minimize the potential for impacts to nesting bald eagles from the Proposed Action.

Increased sedimentation or chemical spills during construction or exploration could potentially contaminate local waterways, subsequently affecting the downstream fisheries and salmon runs on which bald eagles depend. Impacts to fisheries and aquatic resources are discussed in Section 3.3, Fisheries, on page 3-22. Because impacts to fisheries would be minimized through applicant-committed measures (Section 2.2.11, Applicant-committed Environmental Protection Measures, page 2-29), potential impacts to Bald Eagles downstream of the Project area would be minimal.

Other birds nesting in or near the Project area may be affected by human activity and noise disturbance during construction and exploration activities, including due to helicopter overflights. Raptors (including owls) are particularly susceptible to disturbance from helicopters and human activity. Suitable nesting habitat is present for numerous other cliff-nesting species such as golden eagles (Section 3.5.5.2.1, BLM Sensitive Bird Species, page 3-72), red-tailed hawks, and peregrine falcons (Hemmera 2016). To prevent disturbance to active raptor nests, the BLM ROPs require that appropriate buffers around raptor nests be determined based on site-specific analysis. Annual raptor nest monitoring would be necessary to determine the location, species, and level of activity of raptors nesting in or near the Project area. Given the ROPs and recommended mitigation (Section 3.5.7, Recommended Mitigation, page 3-74), impacts to nesting birds, including raptors, are not expected.

3.5.5.2.1 BLM Sensitive Bird Species

Potential impacts to the BLM Sensitive bird species that may occur in or near the Project area would be similar to those described above. Impacts to marbled murrelets are not anticipated as it is unlikely they are actively nesting in or near the Project area. Olive-sided flycatchers nesting in upland shrublands may be at risk from direct impacts due to vegetation removal, or indirect

impacts from habitat loss and disturbance due to human activity. Golden eagles may also experience disturbance due to construction and exploration activity or helicopter overflights. Given the limited nature of the activity, BLM ROPs, applicant-committed measures, and recommended mitigation, these impacts are not expected, or would be minimal.

3.5.5.3 SUBSISTENCE

None of the lands within the Project area are considered Federal Public Lands as defined in ANILCA Sec. 102(3); therefore, they do not fall under the regulatory authority of the Federal Subsistence Board and Subsistence Management Regulations for the harvest of fish and wildlife. Impacts to Federal subsistence activities would most likely be indirect in nature. These indirect impacts could include a reduction in the abundance or distribution of game in or near the Project area. Construction and exploration activities may cause minor alterations in the migration patterns of subsistence wildlife. The closure of public access roads for safety reasons could also prevent access to subsistence hunting, trapping, or gathering areas. However, when not closed, the road could provide improved access opportunities for subsistence use. Given the relatively small and temporary footprint of the activity, impacts to subsistence resources or subsistence activities would be minimal. Impacts to subsistence fishing are discussed in Section 3.3, Fisheries, on page 3-22.

3.5.6 Cumulative Effects

NEPA requires analysis of the cumulative impacts from the Proposed Action when added to past, present, future, and reasonably foreseeable future impacts. The possible cumulative impacts that could result from the Proposed Action, the expansion of Constantine's existing Notice-level exploration activities, and the No Action Alternative, are included within each resource section. Under the No Action Alternative, Constantine would continue exploration activities through 2018 as previously approved, but no additional expansion activities would occur.

A cumulative impact, also commonly referred to as a cumulative effect, is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7).

3.5.6.1 CUMULATIVE EFFECTS BOUNDARIES OF THE ANALYSIS

The geographic reference area considered for potential cumulative impacts for wildlife includes the Glacier Creek Valley and surrounding mountains. This area is roughly defined by the Tsirku River to the south and the Klehini River to the north. It is intended to encompass a sufficient amount of wildlife habitat that could be affected by helicopter overflights and potential downstream impacts from the Proposed Action. Past, present, and reasonable foreseeable future actions that could cumulatively affect wildlife resources include the Proposed Action, past exploration activities by Constantine, and improvements to the Haines Highway.

The temporal boundaries considered for this cumulative impacts assessment extend from 2014 to the year 2019. The year 2014 represents when initial exploration activities began in the Glacier Creek valley. The year 2019 represents 3 years beyond the baseline year of 2016.

3.5.6.2 PAST, PRESENT, AND REASONABLE FORESEEABLE FUTURE ACTIONS

- ***Past Actions*** (i.e., previous cat track construction and exploration activities; forest service plans in the lower valley): Since the preparation of the initial *Haines State Forest Plan* in the mid-1980s, the state has prepared various plans and studies of land status and timber resources.
- ***Present Actions:*** Constantine holds state claims in the Klehini River and Chilkat River drainage; however, Constantine has no application or proposal for activities on those claims. ADOT&PF prepared an environmental assessment and is looking to make improvements to the Haines Highway (2015). These improvements include improving intersections, driveways and recreational turnout accesses, as well as replacing the highway bridge over the Chilkat River.
- ***Reasonable Foreseeable Future Actions:*** Constantine has current approvals to continue exploration activities through 2018. ADOT&PF will continue to make improvements to the Haines Highway, as analyzed and proposed under their recent environmental review process.

Direct impacts to wildlife from the Proposed Action would be minimal and would not appreciatively add to direct impacts to wildlife due to other land use actions in the area. Given the applicant-committed mitigation measures (Section 2.2.11, Applicant-committed Environmental Protection Measures, page 2-29), recommended mitigation (Section 3.5.7, Recommended Mitigation, page 3-74), and BLM ROPs, Proposed Action effects are not expected to appreciatively add to the cumulative direct impacts to wildlife in this area. Indirect impacts to wildlife from the Proposed Action, such as disturbance or displacement of individuals, could combine with impacts from other land use activities. However, given the relatively small cumulative footprint and extensive amount of high-quality wildlife habitat in the area, the combined impacts of the Proposed Action with other land use actions are not expected to negatively impact wildlife resources. Specifically, impacts to mountain goats are not expected from other land uses considered as cumulative impacts in this document.

3.5.7 Recommended Mitigation

The following recommended mitigation measures are intended to avoid or minimize impacts to wildlife resources associated with the Proposed Action. These measures are in addition to, and are intended to insure compliance with, applicant-committed measures (Section 2.2.11, Applicant-committed Environmental Protection Measures, page 2-29), BLM ROPs (BLM 2008a), or ROPs proposed in the Amendment (BLM 2012a).

To prevent impacts to mountain goats from helicopter overflights it is recommended that Constantine do the following:

- avoid designated high-use areas by at least 1,500 feet;
- avoid landing in designated high-use areas; and

- avoid known kidding areas between May 1 and June 15.

To avoid impacts to nesting bald eagles and comply with ROPs, it is recommended that Constantine do the following:

- identify the locations of occupied bald eagle nests within 0.5 miles of helicopter flight routes before beginning construction or operation activities each year; and
- identify nests through surveys (see below) or consultation with ADF&G and USFWS.

To avoid impacts to cliff-nesting raptors and comply with ROPs, it is recommended that Constantine do the following:

- conduct annual cliff-nesting raptor surveys to identify the location, species and level of activity of raptors nesting in or near the Project area; and
- coordinate survey methodology and objectives with the BLM – Glennallen Field Office.

3.6 Issue 6: Geology and Soil/Geologic Hazards

This section addresses the geology, soils, and geologic hazards in the Project area and vicinity, and evaluates the potential impacts of the proposed Project on geology, soils, and geologic hazards to address issues identified during scoping. Scoping issues include the following (numbers correspond to scoping comments in *Scoping Summary Report* [BLM 2016]):

- How will the project affect geology, soils, and geologic hazards in the project area? (5, 43, 72, 76, 78, 80, 117, 123, 125, 127, 136, 142, 148, 150, 152, 156, 173)

3.6.1 Literature Review

There are several existing documents and data sources containing baseline information on geology, soils, and natural hazards in the Project area. Reviewed documents and data sources include the following:

- *Upper Triassic rocks of the Alexander terrane, SE Alaska, and the Saint Elias Mountains of B.C. and Yukon* (Gehrels et al. 1986)
  This publication characterized the geologic setting in Southeast Alaska.
- *Palmer Exploration Project Exploration Plan of Operations* (Constantine 2015)

  Sections of the Plan identify locations in the Project area that rock samples were collected from the surface or drill hole locations that rock core was collected from for geochemical characterization. The analytical report tables for acid base accounting are provided.
- Evaluation of Potential for Acid Rock Drainage memorandum (Green 2016d)

  This memorandum summarizes the analytical results on the geochemical samples collected as described in Constantine's Plan.
- *Geology of Volcanogenic Massive Sulphide Prospects of the Palmer Property, Haines Area, Southeastern Alaska* (Green 2001)

  This graduate thesis describes and characterizes the volcanogenic massive sulphide (VMS) rock found at the Palmer property.
- *Tectonic assemblage map of the Canadian Cordillera and adjacent parts of the United States of America* (Wheeler and McFeely 1991)
- *Geology of the Skagway B-3 and B-4 Quadrangles, Southeastern Alaska* (MacKevett et al. 1974)
- *Preliminary bedrock-geologic map of the Skagway B-4 Quadrangle* (Redman et al. 1985)

  These maps describe the tectonics in the Project area at a large scale.
- *Reconnaissance Engineering Geology of the Haines Area, Alaska, with Emphasis on Evaluation of Earthquake and Other Geologic Hazards* (Lemke and Yehle 1972)

  This publication evaluates earthquake and other geologic hazards in the Haines area and includes geologic maps and descriptions of the Project and surrounding areas.

- Natural Resources Conservation Service *Soil Survey of Haines Area, Alaska* (NRCS 1998)

  This online resource provides soil mapping in an area adjacent to the Project area.

- National Oceanic and Atmospheric Administration climate data (NOAA 2016)

  This online resource provides precipitation data for three weather stations near the Project area.

3.6.2 Study Methodology

Based on information gathered during the literature review, reviewing public scoping comments, and using professional experience and judgment, this analysis:

- Identifies the activities that could affect geology and soils;
- Identifies the geologic hazards that may be present;
- Discusses the likely effects of the two alternatives on geology and soils.

3.6.3 Affected Environment

3.6.3.1 GEOLOGY

The proposed Project is situated in an area characterized by rugged, steep mountains and streams, a glaciated valley (Glacier Creek), and an array of glaciers and glacier-related erosional and depositional features (MacKevett et al. 1974). Elevations range from approximately 1,000 to 5,700 feet. The area was presumably covered by glaciers at least several times, with the last deglaciation occurring approximately 10,000 years ago. Land rebound from glacial melting is still occurring today (Lemke and Yehle 1972). The project area is underlain by volcanogenic massive sulfide (VMS) mineralization, formed during the Triassic from ancient seafloor vents. These rocks are part of a 373-mile-long discontinuous, exposed belt within the Alexander terrane, in which there are several VMS occurrences, prospects, and deposits throughout southeast Alaska and northwest British Columbia (Wheeler and McFeely 1991). Exposures of massive sulphide and barite, and zones of intense hydrothermal alteration are present at several locations throughout the proposed Project site.

Regional mapping in the vicinity of the proposed Project indicates that the area is underlain by Paleozoic and lower Mesozoic metasedimentary and metavolcanic rocks that are locally intruded by Cretaceous and Tertiary granitic plutons (Green 2001). Stratigraphic relationships are poorly understood because paleontological data is sparse and because of structural complexity and extensive glacial cover in the area. The oldest rocks in the area appear to be thin, bedded limestone and massive marble containing fossils of Devonian to Carboniferous age (Green 2001). These are apparently overlain by Porcupine slate, likely of Late Triassic age (MacKevett et al. 1974).

The geology of the South Wall lower slope area is dominated by pillowed basalts that form the hanging wall mineral resource. The basalts are weakly metamorphosed, forming chlorite, and moderately foliated as the result of tectonic deformation, and are generally, except where altered to quartz-sericite-pyrite, weakly to moderately magnetic and calcareous. Locally, the

basalts contain trace disseminated pyrite, with total pyrite content never exceeding 1 percent by volume.

Overlying nearly all areas that are not outcrop exposures is a relatively thick layer of unaltered, coarse, blocky basalt talus. Reflecting the lithologies in the proposed Project area, the talus cover is derived from both local outcrops and the steep slopes above. The area of proposed switchback road construction consists of coarse, unaltered basaltic talus, with the potential to encounter basalt bedrock at shallow depths.

3.6.3.2 SOIL

The Project area is characterized by abundant glacier-related erosional and depositional features. Soil on the mountainsides tends to be shallow and well-drained, whereas the floodplain soil is generally poorly drained and somewhat poorly drained. Though no soil survey has been performed at the Project site, this analysis uses the soil descriptions provided in the 2013 *Wetland and Waterbody Jurisdictional Determination Report* that Constantine's wetlands subconsultant, HDR, completed for the proposed Project, and the *Soil Survey of the Haines Area, Alaska* (NRCS 1998) of an area abutting the proposed Project area. The NRCS soil survey mapped three soil map units (not including fresh water) in the northeast-most portion of the Project area, while the rest of the Project area is outside the soil survey boundaries. Mapped soils are likely very similar to those found within the Project area and are assumed to be similar to those described in the soil survey (**Table 3-14**, page 3-79).

Colluvium derived from metamorphic rock formed the soils, with the soil on steep slopes underlain by residuum weathered from metamorphic rock. Soil on lower slopes tends to be deeper; generally, at a depth greater than 78 inches to bedrock. Soil pH in this area is considered extremely acid, ranging from 3.9 to 4.1. This is fairly typical in alder-dominated systems in Alaska. Acidic soil is often associated with high organic matter in the soil, which in the Project area, is likely between 14 and 17 percent, as was described in similar soils in the NRCS soil survey (1998). Aside from mountain top soil, the soils are moderately susceptible to frost action, mostly due to the water-retention capacity of highly-organic soil. Conversely, the NRCS soil survey did not reach the water table in the area and is recorded at a depth greater than 80 inches. Preliminary characterization of the groundwater regime at the proposed Project site found that groundwater was between 492 and 656 feet below the ground surface (Teller 2014). **Table 3-14** on page 3-79 reflects the erosion hazard rating that the NRCS soil survey assigned to each mapped soil type following disturbance and indicates if soil loss might be expected. Generally, soil on steep slopes is more susceptible to erosion than soil in flatter areas. While the soils in the proposed Project area are considered ideal for reclamation, the depth of topsoil is limited. The soils generally have a shallow to deep silt loam surface layer underlain by rocky silt loam, or at lower elevations, sandy loam with rock inclusions.

Table 3-14. Select Soil Properties Located in the Project Area from 1988 NRCS Soil Survey of the Haines Area, Alaska

Mapped by NRCS within Proposed Project Area	Soil Map Unit ID Number	Soil Name	Hazard of Erosion	Typical Soil Depth (O=depth of organic layer) (OM=percent organic matter)	Average Depth to Lithic Bedrock
No	106	Ferebee-Rock outcrop complex, 5-90% slopes	Severe	12 inches O: 2 inches (15% OM)	14 inches
Yes	115	Kuprenof-Foad comples, 2-20% slopes	Slight	60+ inches O: 2 inches (14% OM)	>78 inches
Yes	117	Kuprenof-Foad comples, 4 0-70% slopes	Very severe	60+ inches O: 2 inches (14% OM)	>78 inches
Yes	130	Tolstoi-Foad complex, 70-100% slopes	Very severe	15 inches Rock outcrop	>78 inches
No	141	Tolstoi, Foad, and Kupreanof silt loams, 20-70% slopes	Severe	19 inches O: 5 inches (17% OM)	21 inches

3.6.3.3 GEOLOGIC HAZARDS

Potential geologic hazards that could affect the proposed Project include seismic activity, avalanches, and rock slides.

3.6.3.3.1 Seismic Activity

The tectonics along the Pacific of North America between Vancouver Island and southcentral Alaska are dominated by the northwest motion of the Pacific plate with respect to the North America plate. In southeast Alaska, plate tectonics are dominated by the Fairweather-Queen Charlotte fault, resulting in earthquakes associated with almost pure dextral strike-slip motion, though occasional earthquakes exhibit significant thrust components such as the 1970 magnitude 6.8 event and the 2012 magnitude 7.8 event (USGS 2016c).

Within the greater Queen Charlotte fault region (excluding the Alaska-Aleutians subduction zone), more than 150 earthquakes of magnitude 5 or greater have occurred between 1973 and 2013. Other local faults include the Denali, Chilkat River, and Chugach-St. Elias faults. Earthquake epicenters are typically offshore in southeast Alaska (USGS 2016c).

The probability of destructive earthquakes at the proposed Project site is unknown because regional tectonics have not been studied in detail. Haines has been identified as having one of the highest rates of microearthquake activity along the Denali fault system between Denali (the mountain) and Haines. Based on the seismic record alone, the largest earthquakes expected in the Haines area would be of moderate size (between magnitude 6 and 7) and only at infrequent intervals. However, because of the high activity of the Fairweather-Queen Charlotte Islands fault system, as well as the presence of other nearby faults, the possibility of an earthquake as great as magnitude 8 cannot be ruled out (Lemke and Yehle 1972). A review of the USGS Earthquakes Archives since 1973 shows only 23 earthquakes have been recorded within a 30-mile radius of the proposed Project site, with the largest being magnitude 4.6, located to the southwest (USGS 2016d). While larger earthquakes have been recorded in southeast Alaska, none were located near the proposed Project site.

Effects from a nearby large earthquake could cause extensive damage at the proposed Project site. Hazards associated with earthquakes include ground shaking, compaction of some medium-grained sediments, liquefaction, landslides, avalanches, changes in groundwater levels, and tsunamis or seiche waves. Although the proposed Project site is extremely unlikely to experience those effects associated with coastal locations (liquefaction, tsunamis, or seiches), there could be indirect impacts to the Project from disruption of travel, communications, and utilities in and around Haines. The proposed Project site sits over hard bedrock, which tends to reduce shaking intensity during an earthquake. Compaction and resulting settlement could cause some damage where infrastructure is built on manmade fill. It is unlikely that groundwater would be greatly affected, although there could be temporary changes in flow for a period of time. Avalanche and landslide hazards are addressed in the following sections.

3.6.3.3.2 Avalanches

Three conditions must be present to start an avalanche:

- slopes between 35 and 50 degrees,
- an unstable snowpack, and
- a trigger (e.g., people, new snow, and wind).

Many of the slopes in the proposed Project area are steeper than 35 degrees and snowfall in the area can be over 200 inches per year (NOAA 2016). Very steep slopes, like those found in much of the proposed Project area fall within the likely slope angle to be susceptible to avalanche. Where regular avalanche tracks have been identified, mitigation measures can be taken to reduce the risk of unexpected release.

3.6.3.3.3 Landslides

Disturbance of the ground surface and earthquake-triggered slides are generally confined to steep slopes and may involve either bedrock or surficial deposits (Lemke and Yehle 1972). In the proposed Project area, an earthquake could trigger a rockslide, talus-slope slide, or landslide, although the Project design includes three times the required capacity against potential sliding failure in rock under potential seismic accelerations. Localized failure of loose fill could occur if not contained under saturated conditions or during a significant seismic event.

3.6.4 Direct and Indirect Effects from Alternative 1 – No Action Alternative

The geologic hazards described in Section 3.6.3.3, Geologic Hazards (page 3-79) – seismic activity, avalanches, and landslides – affect the Project but are not affected by the Project. For this reason, geologic hazards are omitted from discussion of direct and indirect effects.

3.6.4.1 GEOLOGY AND SOILS

Under the No Action Alternative, additional ground disturbance would occur at the helicopter-supported drill sites. The helicopter-supported drill sites are primarily in rocky areas with little or no soil present. Alteration to rock formations would be minimal. At the end of the Notice period, Constantine would reclaim the drill sites as required by the Notice.

Also under the No Action Alternative, Constantine could construct the remaining 0.3 miles of access road extending up Glacier Creek valley authorized under the Notice. Constructing this

road segment would disturb 0.8 acres of surface soils, including potentially excavating soil and/or covering soil with roadbed material. The soil along the Glacier Creek Valley is mostly organic material over silt loam with some sand and gravel. Soil covered by the road could become compacted, lose some of their water-retention properties, and become biologically inactive or less active.

Following exploration under the Notice period, Constantine would reclaim the road, including the segment constructed in 2014 on BLM land. They would recontour and revegetate the surface. Plant growth would eventually result in a re-accumulation of organic matter on the soil surface.

No geology would be affected by construction or reclamation of the road.

3.6.5 Direct and Indirect Effects from Alternative 2 – Proposed Action Alternative

The geologic hazards described – seismic activity, avalanches, and landslides – affect the Project but are not affected by the Project. For this reason, geologic hazards are omitted from discussion of direct and indirect effects.

3.6.5.1 GEOLOGY AND SOILS

Under the Proposed Action Alternative, the impacts on soil at the helicopter-supported drill sites would be the same as under the No Action Alternative, except that the total number of alpine drill sites would be greater. Constructing drill pad sites could require bolting to the rock or blasting rock, which would alter the surface rock configuration to accommodate the drill pads. At the truck-mounted exploration sites, Constantine would drill boreholes and groundwater wells, which would remove the rock within the circumference of the hole. However, this would not propagate to the surrounding geology nor be visible aside from the immediate drilled hole.

Under the Proposed Action Alternative, constructing the road, laydown area, rock fall mitigation berm, and related rock stockpiles would disturb soil and geology. Constructing the linear exploration road would have the same impacts as those in the No Action Alternative. Constantine would construct the switchback exploration road largely in blocky talus by full bench cut type construction. During construction, they would remove soil, which could potentially cause rock fall from the talus, minimally altering the surface topography. To the extent possible, Constantine would use rock removed during construction in fill portions or in the construction of rock fall mitigation berms. They would haul excess excavated rock and soil to a stockpile area and store it for future use during reclamation. The effects on soil and geology by cutting and filling would alter slope topography and relocate some soil and rock.

3.6.6 Cumulative Effects

NEPA requires analysis of the cumulative impacts from the Proposed Action when added to past, present, future, and reasonably foreseeable future impacts. The possible cumulative impacts that could result from the Proposed Action, the expansion of Constantine's existing Notice-level exploration activities, and the No Action Alternative, are included within each resource section. Under the No Action Alternative, Constantine would continue exploration activities through 2018 as previously approved, but no additional expansion activities would occur.

A cumulative impact, also commonly referred to as a cumulative effect, is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7).

3.6.6.1 CUMULATIVE EFFECTS BOUNDARIES OF THE ANALYSIS

The geographic reference area considered for potential cumulative impacts varies by resource. For examining cumulative impacts to geology and soils/hazards, the assessment boundary is generally defined as the Glacier Creek valley.

The temporal boundaries considered for this cumulative impacts assessment extend from 2014 to the year 2019. The year 2014 represents when initial exploration activities began in the Glacier Creek valley. The year 2019 represents 3 years beyond the baseline year of 2016.

3.6.6.2 PAST, PRESENT, AND REASONABLE FORESEEABLE FUTURE ACTIONS

- ***Past Actions*** (i.e., previous cat track construction and exploration activities; forest service plans in the lower valley): Since the preparation of the initial *Haines State Forest Plan* in the mid-1980s, the state has prepared various plans and studies of land status and timber resources.
- ***Present Actions:*** Constantine holds state claims in the Klehini River and Chilkat River drainage; however, Constantine has no application or proposal for activities on those claims. ADOT&PF prepared an environmental assessment and is looking to make improvements to the Haines Highway (2015). These improvements include improving intersections, driveways and recreational turnout accesses, as well as replacing the highway bridge over the Chilkat River.
- ***Reasonable Foreseeable Future Actions:*** Constantine has current approvals to continue exploration activities through 2018. ADOT&PF will continue to make improvements to the Haines Highway, as analyzed and proposed under their recent environmental review process.

Given that there would be no measurable direct or indirect impacts to geology and soils/hazards as a result of the Proposed Action Alternative, by definition, there is no potential for this alternative to incrementally contribute to cumulative effects. Under the No Action Alternative, the cumulative effects to geology and soils/hazards would be similar to those under the Proposed Action Alternative: no effect is anticipated.

3.6.7 Recommended Mitigation

None identified.

3.7 Issue 7: Socioeconomics

This section reviews socioeconomic issues in the Project area and vicinity, and evaluates the potential impacts of the proposed Project on socioeconomic conditions to address issues identified during scoping. Scoping issues include the following (numbers correspond to scoping comments in *Scoping Summary Report* [BLM 2016]):

- What social effects will the project have on communities within the Haines Borough including community services, community cohesion, and cultural identity? (43, 62, 136, 148)
- How will the project affect the economy of the Haines Borough and local communities including employment opportunities and income, as well as revenue? (7, 9, 12, 13, 15, 21, 23, 27, 32, 33, 36, 37, 38, 40, 42, 43, 44, 46, 47, 50, 51, 53, 54, 55, 57, 59, 60, 64, 66, 68, 69, 70, 73, 74, 76, 79, 80, 81, 110, 112, 113, 114, 116, 121, 124, 129, 131, 133, 134, 136, 137, 139, 140, 144, 145, 149,153, 158, 160, 161, 163, 166, 167, 168, 169)

3.7.1 Literature Review

A number of agency documents and data address socioeconomic information specific to the Project area and greater vicinity. Reviewed documents include the following:

- U.S. Census Bureau data (USCB 2016)

  Demographic and income information for the study area.

- Alaska Department of Commerce, Community, and Economic Development data (ADCCED 2016)

  ADCCED maintains a database of Alaskan communities including demographic and community information.

- Alaska Department of Labor and Workforce Development data (ADLWD 2016a)

  ADLWD compiles employment and population data at the borough and community level and publishes through the Alaska Local and Regional Information service.

- *Draft Revised Environmental Assessment for Haines Highway Milepost 3.5 to Milepost 25.3* (Haines Highway EA; ADOT&PF 2015)

  ADOT&PF recently published this draft EA, which covers the same communities affected by the proposed Project and presents recent data pertaining to socioeconomics in the Project area. This EA provides relevant baseline information on the Haines Borough and Klukwan census-designated place (CDP).

3.7.2 Study Methodology

The study area for socioeconomics is the Haines Borough, which includes the City of Haines located 34 miles southeast of the Project, the largest population center in the borough and the home of the Chilkoot Indian Association (CIA); and the Klukwan CDP located 16 miles east of the Project. By compiling information gleaned during the literature review from publicly available data sources and recent NEPA documents; reviewing public scoping comments for the Project

for additional insight on socioeconomic issues within the Project vicinity; and using professional experience and judgment, this analysis

- identifies the existing social and economic conditions; and
- discusses the likely effects of the two alternatives on key social and economic factors, including population and demographics, transportation, housing, community facilities and public services, community characteristics and culture, employment and income, and revenue.

3.7.3 Affected Environment

The Haines Borough is a home-rule consolidated municipal government with a land area of over 2,300 square miles and includes the unincorporated communities of Covenant Life, Haines, Lutak, Mosquito Lake, and Mud Bay. The CIA, a Federally-recognized Tlingit Indian tribe, is composed of approximately 400 members who live interspersed within the larger Haines community (CIA 2008; Cultural Survival 2016). CIA membership is available to all Alaskan Natives and American Indians who are permanent residents of Haines (CIA 2008). Klukwan is a traditional Tlingit settlement and is home to the Chilkat Indian Village (CIV), a Federally-recognized tribe. Klukwan is not within the Haines Borough, but is a separate CDP within the Hoonah-Angoon Census Area. Members of CIA and CIV are represented by the Sealaska Corporation, an Alaska Native Claims Settlement Act (ANCSA) regional corporation. Klukwan, Incorporated is the village corporation associated with the CIV.

3.7.3.1 SOCIAL CONDITIONS

3.7.3.1.1 Population and Demographics

The U.S. Census Bureau American Community Survey (ACS) estimated the population of the Haines Borough at 2,557 and the population of Klukwan at 66 for the 2010 to 2014 period (USCB 2016). Since 2000, net migration (accounting for in- and out-migration) in the Haines Borough has fluctuated, ranging from +74 people in 2009 to 2010 to -76 people in 2012 to 2013, with an average of +3 people per year from 2000 through 2015 (ADLWD 2016b). Migration data specific to Klukwan are not available from ADLWD, but the independent, non-profit research group, Headwaters Economics' Economic Profile System shows a substantial decrease in Klukwan's population from 2000 to 2014. During this time period, the population of Klukwan decreased from 139 to 66 individuals, a 52.5 percent change (Headwaters Economics 2016)[7].

The median age in the Haines Borough is estimated at 43 years, and individuals of Native heritage comprised 13.8 percent of the population for the 2010 to 2014 time period (USCB 2016).[8] In Klukwan, the median age is estimated at 54 years, and approximately 82 percent of the population is composed of individuals of Native heritage (USCB 2016).

[7] Population estimates vary somewhat depending on the data source, but do not alter the analytical findings. Also, estimates for less populated areas tend to have lower accuracies; the ACS reported a margin or error for the Klukwan 2010-2014 population of ±22 (Headwaters Economics 2016).
[8] Native heritage for Haines Borough and Klukwan includes individuals who identify themselves solely as American Indian or Alaska Native, as well as those who identified themselves as American Indian or Alaska Native in combination with one or more other races.

3.7.3.1.2 Transportation, Housing, Community Facilities, and Public Services

The Haines Highway EA (ADOT&PF 2015) provides information on transportation, housing, community facilities, and public services in the Haines Borough and Klukwan. Haines is a northern terminus of the Alaska State Ferry System. Because of its ice-free, deep water port and dock and year-round road access to Canada and Interior Alaska, Haines serves as an important trans-shipment point in Southeast Alaska (ADCCED 2016). Haines has an asphalt airport runway and a landing area for float planes. Klukwan is accessible to the Haines Highway, which allows residents to access ferry, port, and air services in Haines, or road connection to Interior Alaska or Canada.

Within Haines Borough, most residents (68 percent) live in the community of Haines. Housing in Haines Borough and Klukwan is mostly single-family structures (ADOT&PF 2015). Residents of Haines Borough get drinking water from private wells or the borough-operated water treatment and distribution system. Wastewater is treated in private septic systems or by the Haines wastewater treatment system (ADCCED 2016). CIV operates a water treatment system that provides treated drinking water in Klukwan (CIV 2016). Sanitation is provided by septic systems.

Most community facilities and public services in the study area are based in Haines, including fire, emergency services, and police; medical care facilities; and recreation facilities. The Haines School District operates an elementary, middle, and high school in Haines as well as a district-based home school. The Klukwan Health Center provides primary and preventive healthcare services in Klukwan (ADCCED 2016). Klukwan is serviced by the Alaska State Troopers for public safety, and the community operates a volunteer fire department (ADOT&PF 2015). Klukwan is part of the Chatham School District, and the Klukwan School services a small number of students (14 in 2015) (ADCCED 2016).

3.7.3.1.3 Community Characteristics and Culture

The Haines Borough is primarily a rural setting with high accessibility to public lands; the community of Haines serves as the main population center (ADOT&PF 2015). The communities of Haines and Klukwan are both designated as rural subsistence places by the Federal Subsistence Board and the Alaska Joint Board of Fisheries and Game. Many families in the area participate in a mixed subsistence-cash economy. Both the cash economy, supported through employment and income, and the subsistence economy, based on the harvest and sharing of fish, wildlife, and other resources, are important components of social and economic well-being in the area.

As a traditional Tlingit community, Klukwan is the cultural center for the CIV. The continuation of traditional Tlingit cultural practices, including subsistence activities, clan system and moiety structure, and language, are important components of modern-day Klukwan (ADOT&PF 2015; CIV 2016). The new Jilkaat Kwaan Cultural Heritage Center and Bald Eagle Preserve Visitor Center is scheduled to open in May 2016 and is intended to support continuation of Tlingit culture and provide a venue to store and preserve traditional cultural artifacts (Jilkaat Kwaan Cultural Heritage Center 2016). Members of the CIA live in and contribute to the social and cultural characteristics of Haines; the CIA often partners on projects within Haines. Celebrating and continuing cultural heritage and integrating within and contributing to the larger community are included in CIA tribal values, as stated in the *Tribal Strategic Plan 2008-2018* (CIA 2008).

As Federally-recognized tribes, the BLM contacted both CIV and CIA to initiate government-to-government coordination in December 2015, as detailed in the *Scoping Summary Report* (BLM 2016). CIV indicated a desire to participate in government-to-government coordination.

3.7.3.2 ECONOMIC CONDITIONS

3.7.3.2.1 Employment and Income

The main employment sectors in the Haines Borough are government (state and local); trade, transportation, and utilities; educational and health services; and leisure and hospitality. Employment in these sectors remained consistent between 2010 and 2014 (**Table 3-15**, below). The Haines Highway EA provides details on the role of the main employment sectors in the Haines economy (ADOT&PF 2015). Total wages collected in the 2010 to 2014 time period ranged from $26,382,850 in 2010 to $29,778,637 in 2014. The average number of people employed in the third quarter (July-September) of 2015 in the Haines Borough was 1,480, with $3,202 in average monthly wages in the same period (ADLWD 2016a). The annual average unemployment rate (not seasonally adjusted) in Haines ranged from 9.9 to 10.6 percent from 2010 to 2014, and the number of unemployment insurance claimants ranged from 183 in 2014 to 245 in 2010 (ADLWD 2016a).

Table 3-15. Employment by Industry in Haines Borough, 2010 and 2014

Industry	2010 Number[a]	2010 Percent[b]	2014 Number[a]	2014 Percent[b]
Natural Resources and Mining	30	3	47	4.7
Construction	92	9.2	74	7.3
Manufacturing	23	2.3	26	2.6
Trade, Transportation and Utilities	193	19.2	195	19.3
Information	20	2	17	1.7
Financial Activities	22	2.2	23	2.3
Professional and Business Services	39	3.9	43	4.3
Educational and Health Services	137	13.6	139	13.8
Leisure and Hospitality	138	13.7	138	13.7
State Government	89	8.9	96	9.5
Local Government	189	18.8	183	18.1
Other	32	3.2	27	2.7
Total	**1,004**	**100**	**1,008**	**100**

Source: ADLWD 2016a

Notes:

[a] Number of residents employed

[b] Percent of total employed

Local and state government is the largest employment sector in Klukwan, with almost 57 percent of employed individuals in Klukwan working in government in 2014, primarily in local government (**Table 3-16**, page 3-87). Total wages collected in the 2010 to 2014 time period ranged from $714,573 in 2012 to $834,988 in 2013. The number of unemployment insurance claimants in Klukwan ranged from 9 in 2014 to 20 in 2010 (ADLWD 2016a).

Table 3-16. Employment by Industry in Klukwan, 2010 and 2014

Industry	2010 Number[a]	2010 Percent[b]	2014 Number	2014 Percent
Natural Resources and Mining	0	0	0	0
Construction	1	1.8	8	9.8
Manufacturing	1	1.8	0	0
Trade, Transportation and Utilities	2	3.6	3	7.3
Information	1	1.8	0	0
Financial Activities	8	14.3	0	0
Professional and Business Services	3	5.4	0	0
Educational and Health Services	6	10.7	4	9.8
Leisure and Hospitality	4	7.1	6	14.6
State Government	2	3.6	2	4.9
Local Government	27	48.2	22	53.7
Other	1	1.8	0	0
Total	**56**	**100**	**42**	**100**

Source: ADLWD 2016a
Notes:
[a] Number of residents employed
[b] Percent of total employed

Median household income in the Haines Borough and Klukwan, as well as per capita income in Klukwan, is lower than in the State of Alaska as a whole, while per capita income in the Haines Borough is similar to that of the state (**Table 3-17**, below). A lower percentage of individuals in Haines are estimated to be below the poverty level than in the state as a whole, while a higher percentage of individuals in Klukwan are estimated to be living below the poverty level. Wages comprise the largest source of income in the study area; other sources include Native corporation dividends for shareholders, retirement and social security benefits, and other benefits.

Table 3-17. Income and poverty level in Haines Borough, Klukwan, and Alaska

Area	Per capita income[a]	Median household income[a]	Percent of individuals below poverty level
Haines Borough	$32,312	$57,551	7.7
Klukwan	$27,812	$46,250	10.6
State of Alaska	$33,129	$71,829	10.1

Source: USCB 2016, 2010-2014 ACS 5-year estimates
[a] 2014 inflation-adjusted dollars.

3.7.3.2.2 Revenue

The Haines Borough levies a property tax (2015 mill rate was 10.47), a 5.5 percent sales tax, and a 4 percent hotel bed tax. Total tax revenue in 2015 was $5.6 million, of which $2.8 million was in sales tax, $2.7 million was in property tax on $328 million in assessed property value, and $95 thousand was in bed taxes (ADCCED 2016). As an unincorporated community in an unorganized borough, Klukwan does not have taxation authority.

3.7.4 Direct and Indirect Effects from Alternative 1 – No Action Alternative

Under the No Action Alternative, social and economic conditions in Haines, the Haines Borough, and Klukwan would remain unchanged as related to the Project. While social and economic conditions in a region and in individual communities are dynamic and affected by a number of factors, potential changes related to the Project would not occur under the No Action Alternative.

3.7.5 Direct and Indirect Effects from Alternative 2 – Proposed Action Alternative

3.7.5.1 SOCIAL CONDITIONS

3.7.5.1.1 Population and Demographics

The Proposed Action Alternative would not result in appreciable changes to the population and demographics of Haines, the Haines Borough, or Klukwan. Approximately 20 to 35 non-local workers (employees and contractor staff) are anticipated to support the Project. Non-local workers are anticipated to reside at Big Nugget camp, as well as at other rental accommodation within the area (rental houses, boarding rooms, etc.), and to leave the area upon Project completion. The temporary addition of non-resident workers to the Project area would be minor relative to the total population (see Section 3.7.3.1.1, Population and Demographics, page 3-84).

3.7.5.1.2 Transportation, Housing, Community Facilities, and Public Services

The Proposed Action Alternative would not result in appreciable change to transportation, the availability of housing, or the burden on community facilities and public services within the Haines Borough and Klukwan. Non-local workers are anticipated to reside at the Big Nugget camp, as well as at other rental accommodations in the area.

Project employees could use community facilities and public services, such as medical facilities or emergency response services, on an occasional basis over the course of the Project. However, given the relatively small number of new individuals entering the area for the Project, this is not expected to put a substantial burden on community facilities or public services. Effects on other public services, such as education, would be negligible.

3.7.5.1.3 Community Characteristics and Culture

Given the strong ties of the Tlingit culture to subsistence activities, impacts on the abundance, accessibility, or availability of subsistence resources would affect community characteristics and cultural identity, particularly in Klukwan, but also for other subsistence users in the Haines Borough. The degree to which impacts to community characteristics and cultural identity occur as related to subsistence would depend on the level of impact to subsistence. Effects on subsistence wildlife resources are discussed in Section 3.4, Wildlife (page 3-44), and effects on subsistence fisheries are discussed in Section 3.3, Fisheries (page 3-22). Given the relatively

small and temporary footprint of the activity, impacts to subsistence resources or subsistence activities would be minimal. As such, effects on community characteristics and culture as related to subsistence would also be minimal.

Because the Project would not result in an appreciable change to community population or demographics, other effects to community characteristics or culture would be minimal. It is noteworthy, however, that several letters received during scoping indicated concern that without substantial economic and employment opportunities in the Haines Borough area, residents, particularly younger residents, may migrate out of the area to seek employment opportunities in other places.[9] This sort of out-migration could affect community cohesion. To the extent that the Project provides local employment opportunities (see Section 3.7.5.2, Economics, page 3-89), it is possible that it could have positive effects on community cohesion. However, given that this is a temporary exploration project, the Project's effects on patterns of migration would be minimal.

Constantine has a history of donating to organizations that support community characteristics and culture, with over $14,000 in local donations or support of fundraising events since 2013 (Green 2016c). Organizations supported include athletic clubs and events, educational programs, community events, service organizations, and a cultural heritage center. A similar level of support is expected to continue under the Proposed Action.

3.7.5.2 ECONOMICS

3.7.5.2.1 Employment and Income

The Proposed Action Alternative would directly and indirectly generate employment opportunities for the duration of the Project. These would include local and non-local jobs and would involve a mix of seasonal and year-round positions. Constantine estimates hiring approximately 25 to 50 seasonal (May to October) workers for the 5 or more years of exploration identified in the Plan (Green 2016a), of which 15 to 20 local employees are anticipated (Green 2016b). Additionally, they anticipate hiring local residents for one full-time and three part-time year-round jobs, and hiring four full-time positions for technical and managerial staff likely based elsewhere (Green 2016b). The road construction planned under the Proposed Action Alternative, estimated to cost $500,000 to $1,500,000, is anticipated to take 5 to 6 months to complete and to require 8 to 10 employees on-site directly associated with road construction (Green 2016a). Additional employment opportunities would likely be associated with contracts awarded to local firms or contractors who hire local employees. Constantine has a history of working in the Project area and hiring local residents to support exploration activities. For example, they hired or contracted 15 Haines-based workers to support the 2014 summer field program, with payroll totaling $406,000 (Constantine 2015). Their total Haines payroll from 2013 to 2015 was over $1.08 million (Green 2016b).

Indirect impacts of the Proposed Action Alternative on employment and income include increased demand for goods and services from local vendors and service industry establishments as well as use of the Haines Port for shipment of Project equipment and materials. Constantine maintains a policy to buy locally to the extent possible; their payments to Haines businesses from 2013 to 2015 totaled almost $2 million. At the state level, Constantine

[9] Scoping letters 9, 13, 37, 38, 57, 62, and 74.

paid an additional $3 million to other Alaska businesses during the same time period (Green 2016b). It is anticipated that a similar level of demand for local goods and services would continue under the Proposed Action Alternative. Marine transport is the primary means for bringing supplies and materials into Haines; groceries, fuel, hardware, heavy equipment, etc., all arrive via the Haines Port. Constantine indicated that, to date, it has incurred several tens of thousands of dollars in direct marine transportation costs for shipment of heavy equipment and drilling supplies, such as drills, drill rods, and bentonite mud (Green 2016c). While Constantine typically does not pay port related fees or tariffs directly, the shipment of materials into the Haines Port indirectly contributes to the port.

3.7.5.2.2 Revenue

Because this is an exploration project, the Proposed Action Alternative is not expected to result in a change from existing conditions of local and state revenue.

3.7.6 Cumulative Effects

NEPA requires analysis of the cumulative impacts from the Proposed Action when added to past, present, future, and reasonably foreseeable future impacts. The possible cumulative impacts that could result from the Proposed Action, the expansion of Constantine's existing Notice-level exploration activities, and the No Action Alternative, are included within each resource section. Under the No Action Alternative, Constantine would continue exploration activities through 2018 as previously approved but no additional expansion activities would occur.

A cumulative impact, also commonly referred to as a cumulative effect, is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7).

3.7.6.1 CUMULATIVE EFFECTS BOUNDARIES OF THE ANALYSIS

The geographic reference area considered for potential cumulative impacts varies by resource. The geographic reference area for socioeconomic resource components generally encompasses the Haines Borough and Klukwan CDP.

The temporal boundaries considered for this cumulative impacts assessment extend from 2014 to the year 2019. The year 2014 represents when initial exploration activities began in the Glacier Creek valley. The year 2019 represents 3 years beyond the baseline year of 2016.

3.7.6.2 PAST, PRESENT, AND REASONABLE FORESEEABLE FUTURE ACTIONS

- ***Past Actions*** (i.e., previous cat track construction and exploration activities; forest service plans in the lower valley): Since the preparation of the initial *Haines State Forest Plan* in the mid-1980s, the state has prepared various plans and studies of land status and timber resources.
- ***Present Actions:*** Constantine holds state claims in the Klehini River and Chilkat River drainage; however, Constantine has no application or proposal for activities on those

claims. ADOT&PF prepared an environmental assessment and is looking to make improvements to the Haines Highway (2015), including improving intersections, driveways and recreational turnout accesses, as well as replacing the highway bridge over the Chilkat River.

- ***Reasonable Foreseeable Future Actions:*** Constantine has current approvals to continue exploration activities through 2018. ADOT&PF will continue to make improvements to the Haines Highway, as analyzed and proposed under their recent environmental review process.

While Constantine holds state claims in the Klehini and Chilkat drainages, it has no application or proposal for activities on those claims, so no cumulative effects from additional mining claims are identified. The Haines Highway project would have a beneficial economic effect in the Haines Borough through employment opportunities and support services, and the effects of the proposed action along with this action would result in cumulative economic beneficial impacts. Cumulative effects to subsistence could occur as a result of the Haines Highway project and the Proposed Action Alternative, but these effects would be minor and temporary. Other effects to social conditions identified in the Haines Highway EA are largely related to temporary changes in travel time along the Haines Highway and long-term changes to safety along the highway and access to recreation sites. These effects do not overlap with the effects of the Proposed Action Alternative and would not result in cumulative impacts.

3.7.7 Recommended Mitigation

None.

3.8 Issue 8: Environmental Justice

Environmental justice entails the fair treatment and meaningful involvement of all people regardless of race, age, gender, national origin, education, or income level in the development, implementation, and enforcement of environmental laws, regulations, and policies. Under Executive Order (EO) 12898, Federal agencies are required to consider impacts on minority and low-income populations and determine if a project would result in "disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations."

This section reviews environmental justice issues in the Project area and vicinity, and evaluates the potential impacts of the proposed Project on environmental justice to address issues identified during scoping. Scoping issues include the following (numbers correspond to scoping comments in *Scoping Summary Report* [BLM 2016]):

- *Will the project result in disproportionately high human health or environmental effects on minority or low income populations or tribes? (136, 173)*

3.8.1 Literature Review

A number of agency documents and data address environmental justice evaluation methods and environmental justice-related information specific to the Project area and greater vicinity. Reviewed documents include the following:

- *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ Guidance; CEQ 1997)

  The Council on Environmental Quality (CEQ) offers guidance on meeting agency obligations under EO 12898.

- *Land Use Planning Handbook* (LUP Handbook; BLM 2005)

  The BLM's LUP Handbook provides guidance on meeting agency obligations under EO 12898.

- U.S. Census Bureau data (USCB 2016)

  Demographic and income information for the study area.

- Alaska Department of Commerce, Community, and Economic Development data (ADCCED 2016)

  ADCCED maintains a database of Alaskan communities including demographic and community information.

- Headwaters Economics, Economic Profile System (EPS) (Headwaters Economics 2016)

  BLM's Land Use Planning Handbook (2005) suggests using environmental justice data available from the independent, non-profit research group, Headwaters Economics. The EPS provides demographic and socioeconomic data at several geographic levels compiled from the ACS and other sources.

- *Draft Revised Environmental Assessment for Haines Highway Milepost 3.5 to Milepost 25.3* (Haines Highway EA; ADOT&PF 2015)

  The Haines Highway EA covers the same communities affected by the proposed Project and presents recent data pertaining to environmental justice communities in the Project area. Because the baseline information presented in the Haines Highway EA is current and covers Project area communities, this document is used for baseline information except where otherwise noted.

3.8.2 Study Methodology

Environmental justice minority populations are minority populations that exceed 50 percent of an affected area, or minority populations whose percentage of the study area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis (CEQ 1997). The CEQ Guidance indicates low-income populations should be identified with the annual statistical poverty thresholds from the Bureau of the Census' Current Population Reports, Series P-60 on Income and Poverty.

Environmental justice evaluations require consideration of an action's human health and environmental effects, and effects relative to a minority or low-income population's distinct patterns of living, including patterns of subsistence use of fish, wildlife, and other resources (CEQ 1997).

The study area for environmental justice is the Haines Borough and the Klukwan CDP. The Haines borough includes the community of Haines, which is home to most of the borough's population as well as to members of the CIA. Where information specific to CIA is required for this analysis, data is examined for the Chilkoot Alaska Native Village Statistical Area (ANVSA), a statistical entity that represents the densely settled extent of an Alaska Native village and is delineated by officials of the Native village or the appropriate regional corporation. Headwaters Economics' EPS provides data for the Chilkoot ANVSA. As discussed in Section 3.7, Socioeconomics, on page 3-83, Klukwan is not within the Haines Borough, but is a separate CDP within the Hoonah-Angoon Census Area.

Both the CEQ Guidance and BLM's LUP Handbook specify that providing opportunities for full involvement of minority populations, low-income communities, and tribes is an essential part of environmental justice consideration. During the scoping process and Project development, the BLM and Constantine gathered input on issues of concern to affected communities and tribes within the study area, including minority and low income populations, through community and tribal outreach and government-to-government coordination.

The BLM initiated government-to-government coordination with tribal entities and native corporations within the project area in December 2015, as detailed in the *Scoping Summary Report* (BLM 2016). Of the three tribal entities contacted (CIV of Klukwan, CIA of Haines, and Skagway Village), one entity, CIV, requested government-to-government coordination. CIV indicated it would coordinate with the BLM during review of the Draft EA.

During the Project development phase throughout 2015, Constantine coordinated with stakeholders and conducted public outreach, including tribal outreach. Coordination with CIA and CIV included the following:

- A presentation at a CIA council meeting (April 27, 2015)
- Site tours attended by CIA employees and council members (August 28 and September 11, 2015) and initiations for site tours for CIV
- Discussions with CIA and CIV regarding UAS Job Training and specific job opportunities
- Attendance by Constantine employees at a CIV cultural seminar (August 7, 2015), cultural tour (August 24, 2015), and fundraising event (October 17, 2015)
- Communications notifying entities of Project development milestones, specifically availability of the Plan for comment

By compiling information gleaned during the literature review; reviewing public scoping comments for the Project for additional insight on environmental justice issues occurring within the Project vicinity; and using professional experience and judgment, this analysis

- identifies activities that could affect environmental justice populations, and
- discusses the likely effects of the two alternatives on environmental justice populations.

3.8.3 Affected Environment

General demographic information for Haines Borough and Klukwan CDP is provided in Section 3.7, Socioeconomics (page 3-83). The Klukwan CDP has a minority population of just under 82 percent (USCB 2016). This includes individuals who identified themselves as American Indian or Native Alaskan (59 percent) and those who identified themselves as two or more races (23 percent). As identified in the Haines Highway EA, Klukwan meets the definition of a minority population (ADOT&PF 2015). With a minority population of just over 19 percent (USCB 2016), the Haines Borough does not meet the definition of a minority population.

The Haines Highway EA did not identify either the Haines Borough or Klukwan CDP as meeting the definition of a low-income population based on U.S. Department of Health and Human Services poverty guidelines using median household income (ADOT&PF 2015). However, BLM received scoping letters indicating Klukwan is a low-income population (BLM 2016). Therefore, this analysis sought further clarification. Headwaters Economics' EPS data show that 10.6 percent of individuals and 17.6 percent of families in Klukwan are living below the poverty rate, compared to just 7.7 percent of individuals and 3.8 percent of families in Haines Borough, and 10.1 percent of individuals and 7 percent of families for the State of Alaska. Based on these higher poverty rates in Klukwan, the BLM identifies Klukwan as a low-income population. For the Chilkoot ANVSA, 13 percent of individuals and 9 percent of families are reported below the poverty level (Headwaters Economics 2016), so CIA is also considered a low-income population.

As discussed in Section 3.7, Socioeconomics (page 3-83), traditional subsistence practices and use of subsistence resources is an important component of the Alaskan Native community of

Haines and Klukwan. As such, effects on subsistence are tied to environmental justice considerations.

3.8.4 Direct and Indirect Effects from Alternative 1 – No Action Alternative

Under Alternative 1 – No Action, the environmental and human health conditions of the minority population would remain unchanged related to the Project.

3.8.5 Direct and Indirect Effects from Alternative 2 – Proposed Action Alternative

Under Alternative 2 – Proposed Action Alternative, impacts disproportionately experienced by the community of Klukwan or by the CIA would be considered environmental justice impacts. Potential impacts considered include human health; public safety; social, cultural, and economic impacts; visual impacts; and impacts to subsistence.

As this is an exploration project that would generate limited waste, and stipulations and safety measures built into the Proposed Action would mitigate the risk of waste spills, human health impacts are expected to be minimal (see Section 1.7, Issues Identified/Issues Eliminated from Further Analysis, page 1-15). Potential safety impacts related to workers on the Project are discussed in Section 3.9, Public Health and Safety (page 3-98). Given the distance of the Project area to human populations, including Klukwan, impacts on public safety are expected to be minimal and would not disproportionately affect minority or low-income populations. Impacts to visual resources are discussed in Section 3.10, Visual Resources (page 3-103), and would be temporary and only discernible at the background distance zone from the Haines Highway. No disproportionate effects on the minority or low-income population would occur.

Economic effects, discussed in Section 3.7, Socioeconomics (page 3-83), would be primarily beneficial and would include employment opportunities and indirect economic effects. Economic effects are not anticipated to disproportionately affect the minority community. Because Haines is the economic hub of the area and is expected to be the main base of goods and services purchased for the Project, Klukwan may experience fewer economic effects, including beneficial effects, than Haines.

As discussed in Section 3.7, Socioeconomics (page 3-83), impacts to community characteristics and culture, including influx of non-resident workers or displacement of individuals or businesses, are expected to be negligible to minor. Within Haines, these impacts are not expected to disproportionately affect the CIA. As with economic effects, because it is anticipated that Haines would be the main center of goods and services for the Project, Klukwan is not anticipated to experience disproportionate effects on community characteristics. However, because Klukwan has significant cultural ties to and a higher reliance on subsistence than the general population, impacts to subsistence could disproportionately affect the population of Klukwan. As identified in Section 1.7, Issues Identified/Issues Eliminated from Further Analysis, on page 1-15, BLM is required by Section 810 of Alaska National Interest Lands Conservation Act (ANILCA) to consider potential impacts to subsistence activities, resources, or access to subsistence activities from Project proposals. Subsistence is discussed in Section 3.4, Wildlife (page 3-44), and Section 3.3, Fisheries (page 3-22). In general, impacts to subsistence could include a reduction in the abundance or distribution of game in or near the Project area; however, given the relatively small and temporary footprint of the activity, impacts to

subsistence resources or subsistence activities would be minimal (see Section 3.4, Wildlife; page 3-44).

3.8.6 Cumulative Effects

NEPA requires analysis of the cumulative impacts from the Proposed Action when added to past, present, future, and reasonably foreseeable future impacts. The possible cumulative impacts that could result from the Proposed Action, the expansion of Constantine's existing Notice-level exploration activities, and the No Action Alternative, are included within each resource section. Under the No Action Alternative, Constantine would continue exploration activities through 2018 as previously approved but no additional expansion activities would occur.

A cumulative impact, also commonly referred to as a cumulative effect, is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7).

3.8.6.1 CUMULATIVE EFFECTS BOUNDARIES OF THE ANALYSIS

The geographic reference area considered for potential cumulative impacts varies by resource. The geographic reference area for socioeconomic resource components, including environmental justice, generally encompasses the Haines Borough and Klukwan CDP.

The temporal boundaries considered for this cumulative impacts assessment extend from 2014 to the year 2019. The year 2014 represents when initial exploration activities began in the Glacier Creek valley. The year 2019 represents 3 years beyond the baseline year of 2016.

3.8.6.2 PAST, PRESENT, AND REASONABLE FORESEEABLE FUTURE ACTIONS

- ***Past Actions*** (i.e., previous cat track construction and exploration activities; forest service plans in the lower valley): Since the preparation of the initial *Haines State Forest Plan* in the mid-1980s, the state has prepared various plans and studies of land status and timber resources.
- ***Present Actions:*** Constantine holds state claims in the Klehini River and Chilkat River drainage; however, Constantine has no application or proposal for activities on those claims. ADOT&PF prepared an environmental assessment and is looking to make improvements to the Haines Highway (2015), including improving intersections, driveways and recreational turnout accesses, as well as replacing the highway bridge over the Chilkat River.
- ***Reasonable Foreseeable Future Actions:*** Constantine has current approvals to continue exploration activities through 2018. ADOT&PF will continue to make improvements to the Haines Highway, as analyzed and proposed under their recent environmental review process.

While Constantine holds state claims in the Klehini and Chilkat drainages, it has no application or proposal for activities on those claims, so no cumulative effects from additional mining claims

are identified. The Haines Highway EA identified impacts in several resource categories that could disproportionately affect the minority population of Klukwan. These include right-of-way acquisition, social impacts related to temporary changes in travel time along the Haines Highway as a result of construction, temporary subsistence impacts, temporary noise impacts, and temporary impacts to air quality (ADOT&PF 2015). Many of the impacts identified in the Haines Highway EA would not occur under the Proposed Action Alternative (e.g., right-of-way acquisition; construction noise) and therefore would not contribute to cumulative effects. There could be a cumulative effect to subsistence as a result of the Haines Highway project and the Proposed Action that may affect minority and low-income populations, but impacts would be temporary and minor.

3.8.7 Recommended Mitigation

None proposed, pending discussion of reasonable mitigation with the affected environmental justice population.

3.9 Issue 9: Health and Safety

This section addresses health and safety issues in the Project area, evaluates the potential impacts of the proposed Project on them, and addresses health and safety concerns identified during scoping. Scoping issues include the following (numbers correspond to scoping comments in *Scoping Summary Report* [BLM 2016]):

- How will the project (extended road access and shortened helicopter transport time) affect the health and safety of personnel working on the Project? (2, 6, 10-11, 21-22, 25-26, 31-33, 37-40, 42, 44, 46, 47, 53, 55-56, 59-60, 63-64, 66, 68, 70-71, 74, 77, 79, 113-114, 116, 118-119, 120, 124, 132-133, 135, 137, 138-141, 144, 153, 155, 157, 160-161, 163-164, 167- 169)

3.9.1 Literature Review

No literature review was conducted for this analysis.

3.9.2 Study Methodology

No existing health and safety studies have been completed in the Project area. Using professional experience and judgment, this analysis

- identifies the activities that could affect the health and safety of personnel working on the Project and the general public;
- summarizes Constantine's commitments that would mitigate potential adverse impacts on health and safety; and
- discusses the likely effects of the two alternatives on health and safety.

3.9.3 Affected Environment

As discussed in Chapter 2, Alternatives, public access and use of the Project area is limited and Constantine controls vehicle access to the existing linear exploration road with a gate for security and to minimize concerns with public safety and liability. The public can access the Project area on foot and by snow machine, ski, and snowshoe.

Because public vehicle access is restricted, health and safety concerns primarily pertain to the personnel working for Constantine in the Project area. General hazards associated with mining exploration in remote areas include the potential for the following:

- traumatic injury from large equipment;
- vehicular accidents;
- danger associated with helicopter operation, transport, and slinging;
- personnel being stranded at a remote drill site during an emergency or due to inclement weather;
- slipping or falling on uneven ground or slippery surfaces;
- being exposed to hazardous materials while not wearing proper personal protective equipment;

- being exposed to loud noises while not wearing hearing protection;
- danger associated with wildfires.

To date, Constantine has not had any recordable health or safety incidents over more than 6 seasons on the Project. However, the risk of stranding of Constantine personnel at the drill sites during inclement weather is high as the drill sites are only accessible by helicopter and are separated from the base of operations at the Big Nugget Camp by Glacier Creek, which cannot be crossed on foot. This limited ground access creates additional risk for Project personnel as it could complicate and compromise response in the event of an emergency, such as medical evacuation of on-site personnel.

Constantine has committed to maintaining public safety during the Project, which includes the following actions:

- Maintaining all equipment and Project components in a safe and orderly condition.
- Placing signs warning the public that the area is an active exploration site and heavy equipment traffic might be present.
- Securing any identified public hazards, such as open historic mine workings, per state and Federal regulations.
- Complying with all applicable state and Federal fire laws and regulations to prevent and suppress fires in the Project area, including ensuring fire extinguishers and hand tools are readily available.
- Complying with all requirements required by the Mine Safety and Health Administration (MSHA).

3.9.4 Direct and Indirect Effects from Alternative 1 – No Action Alternative

Under the No Action Alternative, health and safety concerns for the public and for Project personnel would remain unchanged from present conditions. Constantine would continue to control vehicle access to the existing linear exploration road. Access to drill sites would continue to be restricted to helicopter access from the base of operations at Big Nugget Camp with no ground access across Glacier Creek. Constantine would also continue to adhere to state and Federal occupational safety regulations, internal Constantine standards, and existing commitments listed in Section 3.9.3, Affected Environment (page 3-98), to minimize risk from these hazards.

3.9.5 Direct and Indirect Effects from Alternative 2 – Proposed Action Alternative

Under the Proposed Action Alternative, Constantine would continue to control vehicle access to the Project area via the gate on the existing linear exploration road. Constantine would also continue to adhere to state and Federal occupational safety regulations, internal Constantine standards, and existing commitments listed in Section 3.9.3, Affected Environment (page 3-98). These measures would minimize public access to active work areas including those with heavy equipment and helicopter activity and minimize concerns with public safety and liability. As a result, no change to public health and safety concerns is anticipated.

Under the Proposed Action Alternative, many of the general hazards associated with mining exploration in remote areas would remain for Project personnel; however, the proposed linear exploration and switchback access road would reduce Project personnel health and safety hazards in the following ways:

- Reducing the distance that materials need to be slung and personnel need to be transported by helicopter by moving the equipment and helicopter staging area closer to drill sites.
- Providing workers a secondary egress point from drill sites in inclement weather or during emergencies by providing ground access across Glacier Creek.

The proposed linear exploration and switchback access road would allow Constantine to transport workers, materials, and equipment by road to a new equipment laydown area near the end of the switchback road. The new equipment laydown area would be significantly closer to drilling operations than the current base of operations at the Big Nugget Camp. During daylight hours, helicopter access to the drill sites would be staged from the new equipment laydown area, substantially reducing the distance and helicopter flying and slinging time needed to transport workers and materials to drill site locations. In addition, the closer proximity of the equipment staging area to drill sites would allow Constantine to better monitor and take advantage of weather windows and gain access to drill sites during times of low visibility conditions due to fog or cloud cover. Overall, the Proposed Action Alternative would decrease the distance that materials and personnel would need to be transported by helicopter and decrease helicopter flying and slinging time, reducing risk and improving safety for pilots and personnel being transported.

The proposed bridge crossing of Glacier Creek would provide Project personnel working at the remote drill sites with a secondary egress point, allowing ground-based access to and from drill sites when weather conditions prohibit helicopters from accessing the drill sites. In cases of limited helicopter access, workers at the end of their shifts would have the option to hike down to the equipment laydown area and drive back to the base of operations. In the event of an emergency, such as a life-saving medical evacuation, ground-based access across Glacier Creek and to the drill sites could be critical in facilitating a timely evacuation regardless of weather. The increased ground access provided by the Glacier Creek bridge would improve safety conditions for Project personnel working on remote drill sites by allowing safe egress when helicopter transport is limited.

Under the Proposed Action, the proposed linear exploration and switchback access road could increase vehicular traffic associated with the Project, marginally increasing the potential for vehicle accidents and posing health and safety risks to drivers and passengers. However, the increased risk to Project personnel associated with additional vehicle traffic to and from the new staging area would be more than offset by the decrease in risk due to the reduction in time and distance personnel would need to be transported by helicopter. Health and safety risks associated with increased vehicle traffic would also be minimized as a result of Constantine's continued adherence to state and Federal occupational safety regulations, internal Constantine standards, and existing commitments listed in Section 3.9.3, Affected Environment (page 3-98).

3.9.6 Cumulative Effects

NEPA requires analysis of the cumulative impacts from the Proposed Action when added to past, present, future, and reasonably foreseeable future impacts. The possible cumulative impacts that could result from the Proposed Action, the expansion of Constantine's existing Notice-level exploration activities, and the No Action Alternative, are included within each resource section. Under the No Action Alternative, Constantine would continue exploration activities through 2018 as previously approved but no additional expansion activities would occur.

A cumulative impact, also commonly referred to as a cumulative effect, is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7).

3.9.6.1 CUMULATIVE EFFECTS BOUNDARIES OF THE ANALYSIS

The geographic reference area considered for potential cumulative impacts varies by resource. For examining cumulative impacts to health and safety, the assessment boundary is generally defined as the Glacier Creek valley.

The temporal boundaries considered for this cumulative impacts assessment extend from 2014 to the year 2019. The year 2014 represents when initial exploration activities began in the Glacier Creek valley. The year 2019 represents 3 years beyond the baseline year of 2016.

3.9.6.2 PAST, PRESENT, AND REASONABLE FORESEEABLE FUTURE ACTIONS

- ***Past Actions*** (i.e., previous cat track construction and exploration activities; forest service plans in the lower valley): Since the preparation of the initial Haines State Forest Plan in the mid-1980s, the state has prepared various plans and studies of land status and timber resources.
- ***Present Actions***: Constantine holds state claims in the Klehini River and Chilkat River drainage; however, Constantine has no application or proposal for activities on those claims. ADOT&PF prepared an environmental assessment and is looking to make improvements to the Haines Highway (2015). These improvements include improving intersections, driveways and recreational turnout accesses, as well as replacing the highway bridge over the Chilkat River.
- ***Reasonable Foreseeable Future Actions***: Constantine has current approvals to continue exploration activities through 2018. ADOT&PF will continue to make improvements to the Haines Highway, as analyzed and proposed under their recent environmental review process.

There would be no measurable adverse direct or indirect impacts to health and safety as a result of the Proposed Action Alternative; therefore, by definition, there is no potential for this alternative to incrementally contribute to adverse cumulative effects. Under the No Action

Alternative, the cumulative effects to health and safety would be similar to those under the Proposed Action Alternative: no effect is anticipated.

3.9.7 Recommended Mitigation

None identified.

3.10 Issue 10: Visual Resources

Visual resources are a composite of basic topography, geologic features, water features, vegetative patterns, and land-use effects that typify an area and influence the visual appeal that an area might have to viewers. Visual resources or scenic impacts are generally defined in terms of a project's physical characteristics and potential visibility as well as the extent to which the project's presence would change the perceived visual character and quality of the environment surrounding it.

The intent of a visual quality analysis is to identify and document positive and negative visual impacts that could result if each of the proposed Project alternatives is implemented, based on distance zones – foreground, middleground, and background. The zones describe distance relationships between an observer and viewshed; the distinguishing characteristic that separates these three zones is the relative amount of detail viewers normally perceive.

This section evaluates the potential impacts of the proposed Project on visual resources to address issues identified during scoping. Scoping issues include the following (numbers correspond to scoping comments in *Scoping Summary Report* [BLM 2016]):

- What visual impacts from the Haines Highway would result from constructing and using a road on the mountainside? (127)
- What visual impacts would result from extending the road, disturbing more land, and developing additional drill sites? (148)

3.10.1 Literature Review

A number of documents address visual resources evaluation methods and visual resources information specific to the Project area and greater vicinity. Reviewed documents include the following:

- *Manual H-8410-1: Visual Resource Inventory* (BLM 1986)

  This manual discusses the visual resource inventory process and provides BLM managers with a means for determining visual values. The inventory involves evaluating scenic quality, analyzing sensitivity level, and delineating distance zones, and then using those three factors to assign one of four visual resource inventory classes to BLM-administered land. These inventory classes represent the relative value of the visual resources: classes I and II are the most valued, Class III represents moderate value, and Class IV is of least value. The inventory classes provide the basis for considering visual values during resource management planning (RMP). The RMP process establishes visual resource management (VRM) classes for all BLM-administered lands; adjusts class boundaries as necessary to reflect the resource allocation decisions; and establishes visual management objectives for each class.

- *Manual 8400: Visual Resource Management* (BLM 1984)

  The Federal Land Policy and Management Act (FLPMA) of 1976 require the BLM to protect the quality of scenic values on public land (43 USC 1701). The BLM's VRM analytical process identifies, sets, and meets objectives for maintaining scenic values

and visual quality in order to meet the BLM's basic stewardship responsibility to identify and protect visual values on all BLM lands.

The BLM has reemphasized this policy in various other internal directives as well, including the following:

- Information Bulletin No. 98-135

  http://www.blm.gov/style/medialib/blm/wo/Information_Resources_Management/policy/directives_archives/1998.Par.83601.File.dat/IB1998-135.pdf

- Information Bulletin No. 98-135 Attachment 1

  http://www.blm.gov/style/medialib/blm/wo/Information_Resources_Management/policy/directives_archives/1998.Par.76671.File.dat/IB1998-135_a1.pdf

- Instruction Memorandum No. 98-164

  http://www.blm.gov/style/medialib/blm/wo/Information_Resources_Management/policy/directives_archives/1998.Par.86725.File.dat/IM98-164.pdf

- Instruction Memorandum No. 2009-167

  http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/2009/IM_2009-167.html

- *Ring of Fire Record of Decision and Approved Management Plan* (BLM 2008a)

  This record of decision approves the BLM's proposal to manage public lands within the Anchorage Field Office and the Ring of Fire planning area as presented in the RMP. Due to subsequent boundary adjustments, the Glennallen Field Office is now the administering office within the proposed project area. The management plan discusses the BLM's visual resources goal to manage visual resources consistent with the multiple use objectives for VRM classes and classifications. The BLM will manage lands within the planning area as VRM Class IV, which allows for management activities that make major modifications to the existing character of the landscape; change may be very high and while reflecting the basic elements of the landscape, may dominate the view.

- *Ring of Fire: Draft Resource Management Plan Amendment*, Haines Block Planning Area. (BLM 2012a)

  This draft amendment to the 2008 *Ring of Fire Record of Decision and Approved Management Plan* evaluates which, if any, designation and associated management practices and implementation actions best fulfill the resource needs and multiple-use demands within the Haines Planning Area. The amendment proposes no changes to the classification of lands within the planning area: VRM Class IV.

3.10.2 Study Methodology

NEPA of 1969 requires Federal agencies such as the BLM to "assure for all Americans … aesthetically pleasing surroundings." Additionally, NEPA requires agencies to "utilize a systematic, interdisciplinary approach which would ensure the integrated use of … environmental design in the planning and decision-making process."

Using the NEPA guidance and methodologies discussed in the literature; reviewing public scoping comments for the Project for additional insight about concerns related to visual resources occurring within the Project vicinity; and conducting a GIS viewshed delineation, this visual quality analysis

- identifies the activities that could affect visual resources; and
- discusses the likely effects of the two alternatives on visual resources.

Using ArcGIS 10.3 Spatial Analyst Surface Viewshed geo-processing tool, the GIS viewshed analysis illustrates the areas from which local residents or viewers traveling the Haines Highway would have a clear line of sight of the activities under the proposed Project alternatives. The following comprise the data input for the viewshed analysis tool:

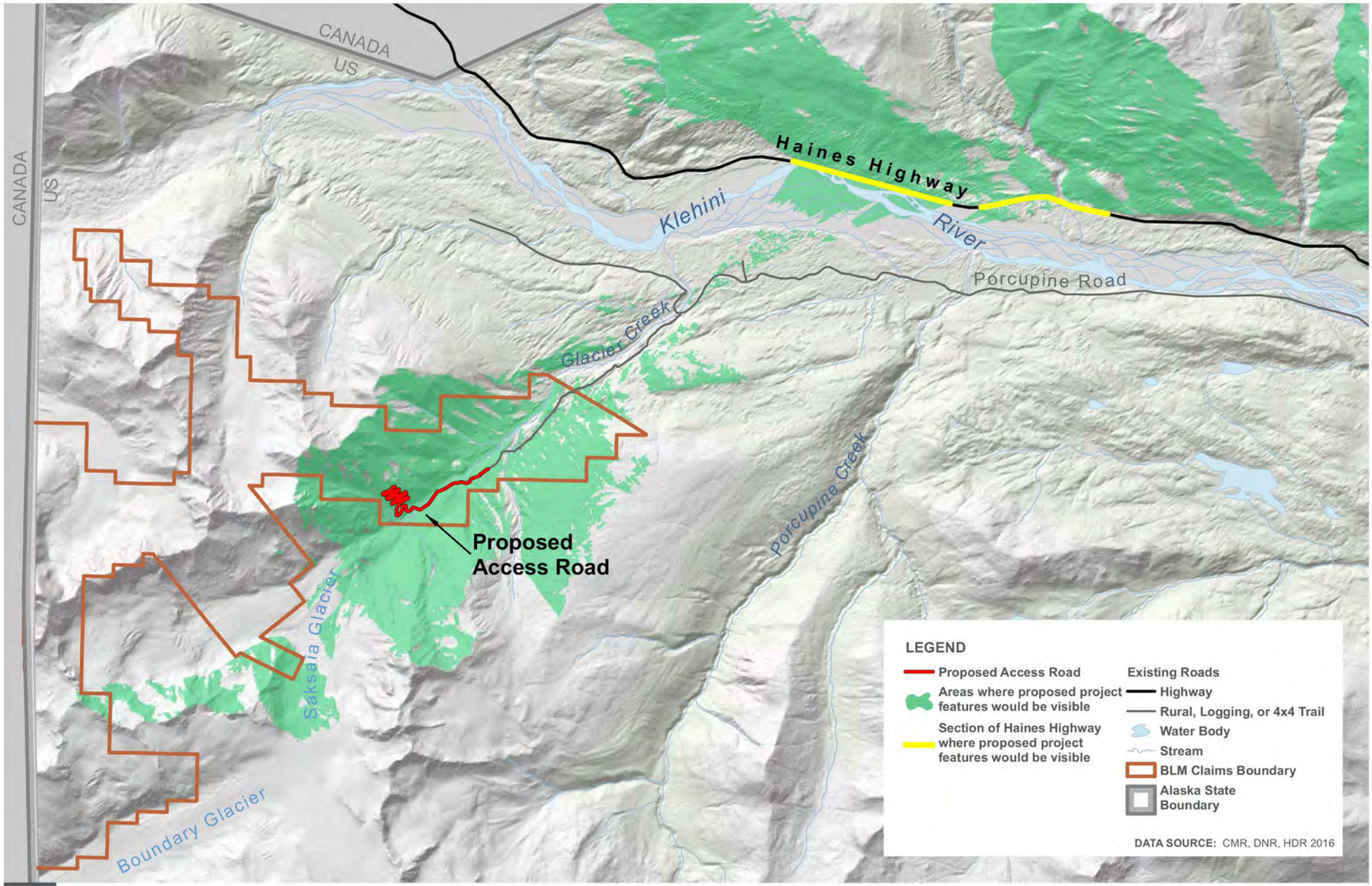
- An Interferometric Synthetic Aperture Radar (IFSAR) digital surface model (DSM) created by Fugro EarthData, Inc.
    - Publication date: 9/10/2014.
    - Data collection dates: Between 8/14/2012 and 9/14/2013.
    - Downloaded from the Alaska Division of Geological & Geophysical Surveys online map “Elevation Datasets in Alaska” http://maps.dggs.alaska.gov/elevationdata/.
- Proposed Project features as the input observer features resulting in an output viewshed raster layer that represents all areas on the DSM surface where the proposed Project features would be visible.

The sections of Haines Highway that intersect this viewshed raster layer are the sections of the highway where the proposed Project features would be visible.

3.10.3 Affected Environment

The Project setting includes steep rugged mountains rising above a narrow valley that contains Glacier Creek. The Project area is covered by thick coniferous overstory vegetation consisting of mature coniferous forest, upland shrub land, alpine, talus/rock scree, bare rock, and freshwater streams and steep, unvegetated rock outcrops

The U.S. Secretary of Transportation designated the Haines Highway the Valley of the Eagles National Scenic Byway in 2009. There are two reaches of this highway that have a view of the Project area (**Figure 3-10**, page 3-106). The view distance from the highway to the Project area ranges from about 5.2 miles to 7.5 miles, which is considered the background distance zone. The view distance is similar for one resident who has expressed concern about Project-related visual impacts (**Figure 3-11**, page 3-107). **Photo 3-1** on page 3-108 shows the view of the project area as seen from the Haines Highway.

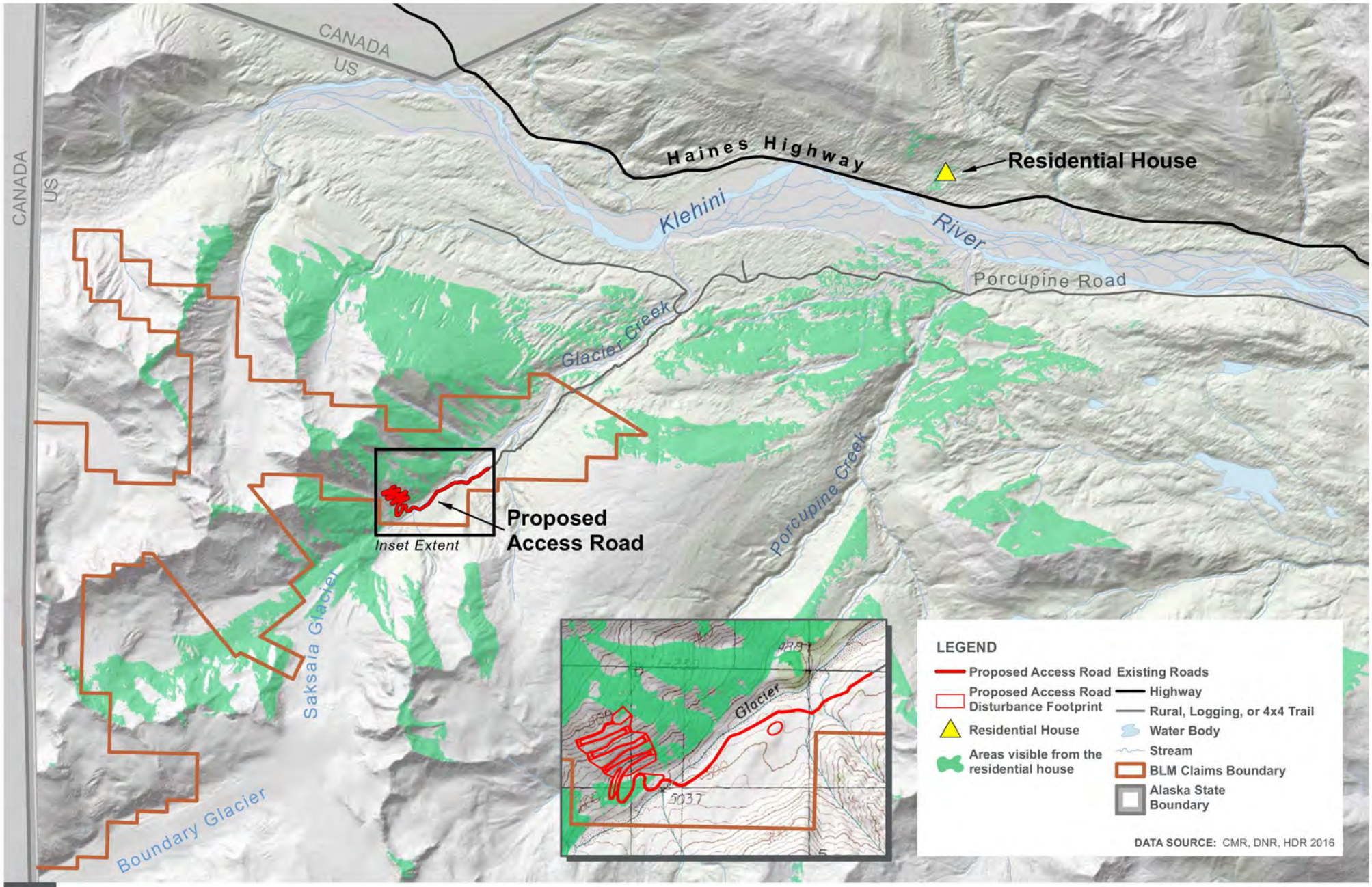


PALMER PROJECT

PROPOSED ROAD VIEWSHED

FIGURE 3-10

PATH: Z:\453144 CONSTANTINE NORTH, INC\272610 PALMER EA\GIS\MAP_DOCS\PALMEREA_FIG3-X_VIEWSHED.MXD - USER: SNORTON - DATE: 2/24/2016



PALMER PROJECT

RESIDENTIAL HOUSE VIEWSHED

FIGURE 3-11

Photo 3-1. View of Project Area from Haines Highway

The Project area is located in a VRM Class IV area (the least restrictive class) (BLM 2008a). The objective of VRM Class IV is to provide for management activities that result in major modification of the landscape. These management activities may dominate the view and become the focus of viewer attention. However, every effort should be made to minimize the impact of these projects by carefully locating activities, minimizing disturbance, and designing the projects to conform to the characteristic landscape.

3.10.4 Direct and Indirect Effects from No Action Alternative

Under the No Action Alternative, Constantine would disturb additional ground, but conduct concurrent reclamation at the helicopter-supported drill sites. Up to 0.45 acres would remain disturbed at any one time. At the end of the exploration period, Constantine would reclaim all the drill sites as required by the Notice. The helicopter-supported drill sites are primarily in rocky alpine areas and would be hard for viewers to discern at the background distance zone.

The No Action Alternative would not noticeably affect any current views of or from the Project area:

- Access road users would continue to experience the same landscape views.

- Local and Haines Highway travelers would see relatively the same landscape views at the background distance.
- Porcupine Road and Haines Highway travelers could potentially see helicopters during exploration activities.
- Local travelers would see drill platforms in the background distance until Constantine removes them and reclaims the area.

The effects of the No Action Alternative on visual resources would be consistent with VRM Class IV management objectives.

3.10.5 Direct and Indirect Effects from Alternative 2 – Proposed Action Alternative

Under the Proposed Action Alternative, Constantine would construct a new road, laydown area, rockfall mitigation berms, and related rock stockpiles. At the end of exploration—after approximately 5 years—Constantine would reclaim these same areas, plus approximately 1 mile of road it has already constructed on BLM land, restoring much of it to grass meadows that would be colonized by a dense vegetation growth. On a clear day, local residents and Haines Highway travelers could potentially see indications of minor landscape modifications at the background distance of 5 to 7.5 miles; at that distance, the modifications would not dominate the landscape and would not be discernible in the background.

After exploration, Constantine would reclaim, recontour, and revegetate the disturbed landscape, improving the visual resources. The effects of the Proposed Action on visual resources would be consistent with VRM Class IV management objectives; there would be no long-term impacts.

3.10.6 Cumulative Effects

NEPA requires analysis of the cumulative impacts from the Proposed Action when added to past, present, future, and reasonably foreseeable future impacts. The possible cumulative impacts that could result from the Proposed Action, the expansion of Constantine's existing Notice-level exploration activities, and the No Action Alternative, are included within each resource section. Under the No Action Alternative, Constantine would continue exploration activities through 2018 as previously approved, but no additional expansion activities would occur.

A cumulative impact, also commonly referred to as a cumulative effect, is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7).

3.10.6.1 CUMULATIVE EFFECTS BOUNDARIES OF THE ANALYSIS

The geographic reference area considered for potential cumulative impacts varies by resource. For examining cumulative impacts to visual resources, the assessment boundary is generally defined as the Glacier Creek valley and surrounding slopes within the project area.

The temporal boundaries considered for this cumulative impacts assessment extend from 2014 to the year 2019. The year 2014 represents when initial exploration activities began in the Glacier Creek valley. The year 2019 represents 3 years beyond the baseline year of 2016.

3.10.6.2 PAST, PRESENT, AND REASONABLE FORESEEABLE FUTURE ACTIONS

- ***Past Actions*** (i.e., previous cat track construction and exploration activities; forest service plans in the lower valley): Since the preparation of the initial *Haines State Forest Plan* in the mid-1980s, the state has prepared various plans and studies of land status and timber resources.
- ***Present Actions:*** Constantine holds state claims in the Klehini River and Chilkat River drainage; however, Constantine has no application or proposal for activities on those claims. ADOT&PF prepared an environmental assessment and is looking to make improvements to the Haines Highway (2015). These improvements include improving intersections, driveways and recreational turnout accesses, as well as replacing the highway bridge over the Chilkat River.
- ***Reasonable Foreseeable Future Actions:*** Constantine has current approvals to continue exploration activities through 2018. ADOT&PF will continue to make improvements to the Haines Highway, as analyzed and proposed under their recent environmental review process.

Given that there would be no measurable direct or indirect impacts to visual resources as a result of the Proposed Action Alternative; therefore, by definition, there is no potential for this alternative to incrementally contribute to cumulative effects. Under the No Action Alternative, the cumulative effects to visual resources would be similar to those under the Proposed Action Alternative: no cumulative effect is anticipated.

3.10.7 Recommended Mitigation

None identified.

3.11 Issue 11: Recreation/Access

This section inventories recreation resources and access in the Project area and vicinity (see **Figure 3-12**, page 3-112), and evaluates the potential impacts of the proposed Project on recreation and access to address issues identified during scoping. Scoping issues include the following (numbers correspond to scoping comments in *Scoping Summary Report* [BLM 2016]):

- How will the project affect recreation activities and access in the area? (70, 72, 76)

3.11.1 Literature Review

Recreation information specific to the Project area is limited. However, a number of previously-prepared documents identify and assess recreation activities occurring within the Project area and the greater vicinity. Reviewed documents include the following:

- *Haines Borough 2025 Comprehensive Plan* (Haines Borough 2012)

  Chapter 8 of this comprehensive plan covers recreation. The plan cites two proposed trails in the immediate project vicinity (Glacier Creek Trail and Jarvis Creek Trail).

- *Haines Highway Corridor Partnership Plan* (Haines City and Borough 2007)

  Chapter 4 of this plan discusses the road and transportation system, including project vicinity access points specifically within the Klehini River valley. This plan also provides an existing conditions inventory of the Haines Highway by mile post and discusses recreation resources and access within the greater vicinity.

- *Haines Tourism Management Plan* (McDowell Group 2002)

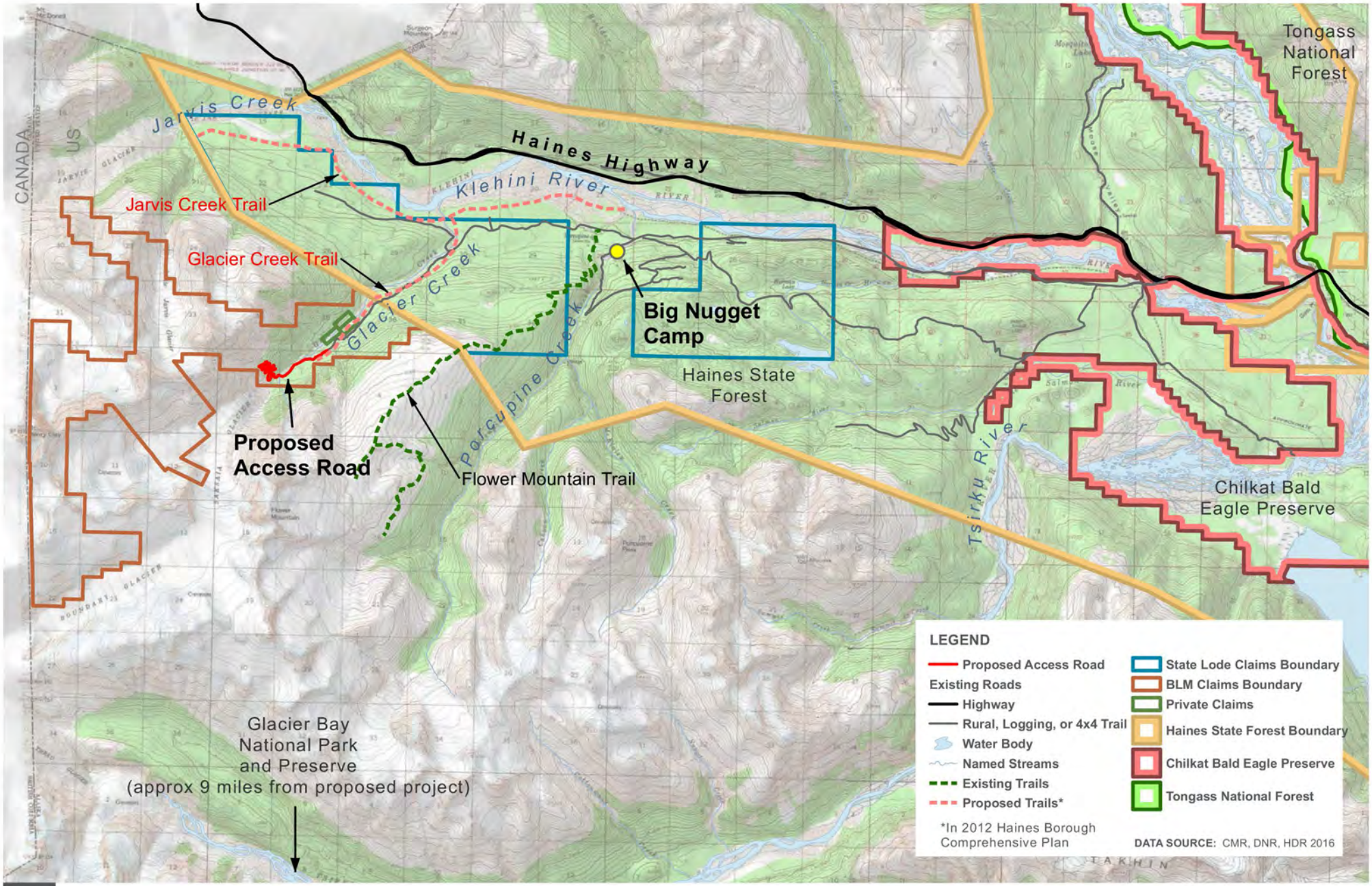
  A section in this plan discusses tourism-related visitor uses and activities in the greater Haines vicinity, which includes recreation. This plan described the Porcupine area, the valley adjacent to the Glacier Creek valley, as having some amount of recreational-related tourism activity, though it is a relatively low amount.

- *Haines Winter Visitor Industry: Economic Impact and Market Assessment* (McDowell Group 2015)

  This study assesses the market and economic impact of winter visitors in the Haines area, particularly recreational visitors. The study discusses recreational uses and activities in the greater vicinity, particularly the heli-ski industry and its operators.

- *Haines Borough 2014 Commercial Ski Tour Area Map* (Haines Borough 2013)

  This Haines Borough map depicts the locations of commercial ski tour boundaries for 2014. The map indicates a portion of the terrain in the Glacier Creek valley as being an approved area for commercial ski tours.



PALMER PROJECT

RECREATION

FIGURE 3-12

- *Haines State Forest Management Plan* (ADNR 2002a)

  Chapter 2 of this plan describes land management policies and resource uses on the Haines State Forest lands. The plan discusses recreation uses such as personal use timber, trails, and other recreation activities occurring adjacent to the Project area and in the greater vicinity.

  The plan discusses public access and states access to the state forest shall be provided to the public, but may be limited or curtailed at certain times to protect public safety, allow special uses, and prevent harm to the environment. The plan cites two Alaska Statutes (AS) regarding public access that must be considered when contemplating use restrictions; these include restrictions of easement and right-of-way use (AS 38.04.058) and restrictions of traditional means of access (AS 38.04.200).

- *Northern Southeast Area Plan* (ADNR 2002b)

  Appendix F in this plan discusses the designation of special use lands (for commercial helicopter operations) within the Haines State Forest and surrounding general state lands. Appendix F contains Alaska Department of Land (ADL) 106939, which identifies the Special Use Designation (SUD) and establishes specific areas and dates for heli-skiing operation and sets standards for these operations on the state lands. The appendix also contains a map indicating allowed areas for heli-skiing, which includes a portion of terrain in the Glacier Creek valley.

3.11.2 Study Methodology

By compiling information gleaned during the literature review; reviewing public scoping comments for the Project for additional insight on recreational activities occurring within the Project vicinity; and using professional experience and judgment, this analysis

- identifies the activities that could affect recreation and access;
- summarizes Constantine's commitments and the BLM's recommended measures to mitigate potential adverse impacts; and
- discusses the likely effects of the two alternatives on recreation and access.

3.11.3 Affected Environment

The Haines Highway provides one of the primary means of access to lands for recreation activities in the greater Project vicinity. The Project is located in the Glacier Creek valley, nearly 14 miles off of the Haines Highway at the dead end of a previously-constructed, 3-mile Project-related linear exploration access road. (Note: As of early 2016, Constantine has built about 80 percent of the 3-mile road, of which about 60 percent of the roadway is located on state lands and 40 percent on BLM lands. The affected environment assumes Constantine will construct the remaining 20 percent of this previously-approved, 3-mile access road.) The existing access road is connected to the Porcupine Road (approximately 11.4 miles long) that then connects to the Haines Highway.

3.11.3.1 RECREATION

Due to the Project area's remoteness and its location at the end of the existing access road, recreation use in the Project area is limited, compared to more accessible adjacent and surrounding valleys. During scoping, members of the public commented that while the existing access road provides access into the Glacier Creek valley, the valley is little used by the public and does not have high recreation, fish, or wildlife values.

Year-round recreation activity in adjacent and surrounding valleys within the greater Project vicinity include camping, mountain biking, fishing, hunting, trapping, berry picking, boating, rafting, skiing, snowmachining, all-terrain vehicle (ATV) use, timber harvesting, firewood collecting, and other dispersed recreation activities like wildlife viewing and hiking. Guided raft tours take place on the Klehini River, but those start near the Haines Highway, well outside the Project area some 14 miles away. Heli-skiing is extremely popular and occurs throughout the greater vicinity. The 33 Mile Roadhouse, located along the Haines Highway, well outside of the Project area, contains a heli-pad and has become a launching off point for many heli-ski trips in the vicinity.

Recreation in the Glacier Creek valley, where the proposed Project is located, likely consists primarily of dispersed, non-motorized recreation activities, such as hiking and berry picking. Heli-skiing also occurs in the Glacier Creek valley and is concentrated from mid- February through April.

The Haines Borough has approved some areas within the Glacier Creek valley for commercial ski tour operations; the Project area falls within one of these areas, according to the *Haines Borough 2014 Commercial Ski Tour Map* (Haines Borough 2013). The *Haines State Forest Management Plan* also identifies the Project area as a location for commercial heli-skiing. The BLM does not permit heli-ski activities within the mineral exploration area where the Project is located. BLM-permitted ski activities primarily occur south of the Project area. Helicopter landings on BLM lands are authorized by the BLM Glennallen Field Office through special recreation permits. Alaska Mountain Guides and Temsco are the only operators who are currently BLM-permitted, air tour operators. The Haines Borough cites three companies as heli-ski permit holders for 2016 within the borough: Alaska Heliskiing, Southeast Backcountry Adventurers, and Alaska Mountain Guides (Haines Borough 2016).

Flower ridge is located southeast of the Project area, between the Glacier Creek and Porcupine Creek drainages; it is accessed by an old mine road, which is considered a 4 x 4 trail. This trail provides access for backcountry mountaineering by the outfitter Alaska Mountain Guides. Alaska Mountain Guides also recently submitted a permit application to the state to provide ATV tours in the project vicinity. This trail is the most used and closest formally-recognized trail to the Project area.

3.11.3.2 ACCESS

The Project is adjacent to but outside of the Haines State Forest. The existing 3-mile access road goes through the Haines State Forest Subunit 3e (for Jarvis/Glacier Creeks). The *Haines State Forest Management Plan* states mining operations and minerals extraction are allowed in the subunit; the plan also cites habitat, recreation, and scenic values as being present

(ADNR 2002a). The state manages the lands adjacent to the Porcupine Road for forest, mining, and recreation uses. For state lands, such as the Haines State Forest, the State of Alaska, Department of Natural Resources (ADNR) Division of Mining, Land, and Water manages certain forms of commercial helicopter operation within the Haines area under SUDs ADL 106939 and ADL 106858 (ADNR 2002b). ADNR re-evaluates the SUDs every 5 years and establishes specific areas and dates for heli-skiing operations on state land.

Constantine currently provides maintenance on the 3-mile, existing access road and State Forest Road (i.e., Porcupine Road) into the Project area. The roadway is not plowed in the winter. This maintenance benefits all road users, including Constantine, the state, and others accessing lands in the general area to recreate.

In 2014, Constantine built the access road to state and Federal mineral claims entirely held by Constantine. In consultation with Haines State Forest personnel, they also installed a steel gate along the 3-mile access road, which is located on State Forest lands. Currently, the State Forest office and Constantine have keys to the gate. Vehicle access is generally restricted to State Forest personnel, Constantine, its contractors, and others who have legitimate reasons to gain vehicle access (i.e., state field surveyors, timber harvest work, etc.). This controlled access is primarily to provide for safety and security, and to minimize impacts. The gate does restrict public vehicle access; however, prior to the road's construction, the public's only access was by foot, and foot traffic is still possible with the gate in place. The gate has had little impact on winter recreation activities. Snow machine, ski, and snowshoe access use still occurs and are not controlled by the gate.

3.11.4 Direct and Indirect Effects from Alternative 1 – No Action Alternative

Under the No Action Alternative, the proposed 2.5-mile linear exploration access road and associated switchbacks would not be constructed. Additionally, the streams along this stretch would continue to block access for Constantine since there would be no bridge or culvert installed. The limited amount of dispersed recreation activities and use of or access to the area would continue under current conditions, as described under Section 3.11.3, Affected Environment (page 3-113). This includes dispersed recreation activities such as hiking. Access to mineral exploration activities would occur as it presently does. Ground-supported exploration activities would continue to occur, but would be limited, based on existing access. Because practical access to most of the property is by helicopter, longer helicopter flights would still occur compared with the shorter helicopter flights that would occur under the Proposed Action.

3.11.5 Direct and Indirect Effects from Alternative 2 – Proposed Action Alternative

Recreation uses and activities within the Project area are likely to remain relatively the same under the Proposed Action. Under this alternative, the Project would construct an additional 2.5 miles of access road, including linear and switchback exploration road construction. Extending the existing access road would provide access further into the Glacier Creek valley and access to Jarvis Glacier by bridging Glacier Creek and providing access to the north side of Glacier Creek. However, the Project would retain the gate along the existing access road to limit public access for the same reasons it is currently gated (safety, security, and minimizing environmental impacts, as discussed in Section 2.2.11.6, Public Safety and Access, page 2-30).

Constantine would install signs at the gate to explain the reasons for controlled access. As necessary, signs would also be placed warning the public that the area is an active exploration site, heavy equipment traffic might be present, and they may hear and see exploration activities that are not part of the natural recreation environment.

The public could potentially use these access roads to recreate when exploration activities are complete, or when operations are not occurring and Constantine personnel are not present to deter recreational users. However, this use would likely be minimal due to the remoteness of the location in addition to the minimal amount of recreation occurring there currently.

3.11.6 Cumulative Effects

NEPA requires analysis of the cumulative impacts from the Proposed Action when added to past, present, future, and reasonably foreseeable future impacts. The possible cumulative impacts that could result from the Proposed Action, the expansion of Constantine's existing Notice-level exploration activities, and the No Action Alternative, are included within each resource section. Under the No Action Alternative, Constantine would continue exploration activities through 2018 as previously approved, but no additional expansion activities would occur.

A cumulative impact, also commonly referred to as a cumulative effect, is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7).

3.11.6.1 CUMULATIVE EFFECTS BOUNDARIES OF THE ANALYSIS

The geographic reference area considered for potential cumulative impacts varies by resource. For examining cumulative impacts to physical resource components, the assessment boundary is generally defined as the Glacier Creek valley.

The temporal boundaries considered for this cumulative impacts assessment extend from 2014 to the year 2019. The year 2014 represents when initial exploration activities began in the Glacier Creek valley. The year 2019 represents 3 years beyond the baseline year of 2016.

3.11.6.2 PAST, PRESENT, AND REASONABLE FORESEEABLE FUTURE ACTIONS

- ***Past Actions*** (i.e., previous cat track construction and exploration activities; forest service plans in the lower valley): Since the preparation of the initial *Haines State Forest Plan* in the mid-1980s, the state has prepared various plans and studies of land status and timber resources.
- ***Present Actions:*** Constantine holds state claims in the Klehini River and Chilkat River drainage; however, Constantine has no application or proposal for activities on those claims. ADOT&PF prepared an environmental assessment and is looking to make improvements to the Haines Highway (2015). These improvements include improving intersections, driveways and recreational turnout accesses, as well as replacing the highway bridge over the Chilkat River.

- ***Reasonable Foreseeable Future Actions:*** Constantine has current approvals to continue exploration activities through 2018. ADOT&PF will continue to make improvements to the Haines Highway, as analyzed and proposed under their recent environmental review process.

Given that there would be no measurable direct or indirect impacts to recreation and access as a result of the Proposed Action Alternative; therefore, by definition, there is no potential for this alternative to incrementally contribute to cumulative effects. Under the No Action Alternative, the cumulative effects to recreation and access would be similar to those under the Proposed Action Alternative: no effect is anticipated.

3.11.7 Recommended Mitigation

None identified.

Chapter 4: Consultation and Coordination

4 Consultation and Coordination

The BLM consulted with or received contributions from the following agencies and personnel on this mine plan environmental review:

- *Alaska Department of Natural Resources Office of Project Management and Permitting*
    - Kyle Moselle, Large Mine Project Manager
- *U.S. Fish and Wildlife Service*
    - Steve Brockman, Wildlife Biologist

The BLM met with Chilkat Indian Village and Chilkoot Indian Association for government-to-government consultations and meetings on April 26, 2016.

Chapter 5: List of Preparers

5 List of Preparers

The lead agency preparing this environmental assessment (EA) for the Palmer Exploration Project is the U.S. Department of the Interior, Bureau of Land Management, Glennallen Field Office. HDR, Inc. (HDR) assisted in the preparation under a third-party agreement between the BLM and Constantine North, Inc.

Table 5-1, below, lists the entities and personnel who developed, advised and reviewed this EA, showing each person's resource area and predominant role(s).

Table 5-1. List of Preparers

Name	Affiliation	Role
Dennis Teitzel	BLM – Glennallen Field Office	Field office manager
James Whitlock	BLM – Anchorage Field Office	Project Manager
April Rabuck	BLM - BLM – Anchorage District Office	NEPA planner
Mike Sondergaard	BLM – Glennallen Field Office	Associate field manager
Jesse Hankins	BLM – Glennallen Field Office	Wildlife specialist/subsistence reviewer
Tim Sundlov	BLM – Glennallen Field Office	Fisheries biologist reviewer
Brenda Becker	BLM – Glennallen Field Office	Realty specialist
Denton Hamby	BLM – Glennallen Field Office	Recreation/visual resource management reviewer
Cory Larson	BLM – Glennallen Field Office	Recreation reviewer
Laurie Thorpe	BLM – Anchorage Field Office	Vegetation/non-native invasive species reviewer
Roy Draper	BLM – Anchorage Field Office	Mining compliance
Rick Tankersley	BLM – Anchorage Field Office	Mining compliance
Stewart Allen	BLM – Zoned staff	Socioeconomic/Environmental justice reviewer
Marnie Graham	BLM – Glennallen Field Office	Public affairs
John Jangala	BLM – Glennallen Field Office	Archeology
Christine Whittaker, RLA	HDR, Inc., Boise Office	Project manager Visual resources principal author
Molly Reeves, CPG	HDR, Inc., Anchorage Office	Deputy project manager Surface water and groundwater resources principal author
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Name	Affiliation	Role
Zachary Halstead, PWS	HDR, Inc., Anchorage Office	Wetlands principal author
Anne Leggett Billman, PWS	HDR, Inc., Anchorage Office	Vegetation principal author
Lorene Lynn	HDR, Inc., Anchorage Office	Geology, soil and hazardous materials principal author
Leslie Robbins, AICP	HDR, Inc., Anchorage Office	Recreation principal author
Molly Odell, PhD	HDR, Inc., Anchorage Office	Health and safety principal author
Dawn Ramsey	HDR, Inc., Anchorage Office	Cultural resources
Scott Norton	HDR, Inc., Anchorage Office	GIS/Mapping
Meghan Cornelison	HDR, Inc., Anchorage Office	Socioeconomic/ Environmental justice principle author
Lesley Thode	HDR, Inc., Boise Office	Technical writer/document control

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