Joint Record of Decision and Permit Evaluation
for the Donlin Gold Project

LEAD FEDERAL AGENCY: U.S. Army Corps of Engineers

COOPERATING FEDERAL AGENCY: Bureau of Land Management

APPLICANT: Donlin Gold LLC

APPLICATION REFERENCE NUMBERS:
- POA-1995-120
- BLM Case file (2890) AA 92403

WATERWAY: Crooked Creek

RESPONSIBLE OFFICIALS:
- Colonel Michael Brooks
  District Commander
  PO Box 6898
  JBER, AK 99506-0898

- Joseph Balash
  Assistant Secretary – Land and Minerals Management
  Department of Interior
  1849 C St NW
  Washington, DC 20240

FOR INFORMATION CONTACT:
- David Hobbie (Corps)
  Regional Regulatory Division Chief
  (907) 753-2712

- Bonnie Million (BLM)
  Anchorage Field Office Manager
  907-267-1285
# TABLE OF CONTENTS

1. **Introduction** ................................................................................................................. 1-1
   1.1 **BACKGROUND** ................................................................................................. 1-1
1.2 **AUTHORITIES** ............................................................................................... 1-2
   1.2.1 Corps’ Authority ........................................................................................... 1-2
   1.2.2 BLM’s Authority ....................................................................................... 1-3

2. **Summary of Decision** .............................................................................................. 2-1
   2.1 **CORPS’ DECISION SUMMARY** ................................................................... 2-1
   2.2 **BLM’S DECISION SUMMARY** .................................................................... 2-2
   2.2.1 ANILCA Section 810 Summary ...................................................................... 2-5

3. **Proposed Project** ........................................................................................................ 3-1
   3.1 **PROJECT DESCRIPTION** ................................................................................. 3-1
   3.2 **PROJECT DESIGN REVISIONS** ................................................................. 3-8
   3.3 **PROJECT PURPOSE AND NEED** ............................................................... 3-8
   3.4 **SCOPE OF ANALYSIS** .................................................................................... 3-10

4. **Alternatives** .............................................................................................................. 4-1
   4.1 **ALTERNATIVES CONSIDERED AND CARRIED FORWARD FOR DETAILED ANALYSIS** ........................................................................... 4-1
   4.2 **ALTERNATIVES ELIMINATED DURING THE EIS PROCESS** .................... 4-4
   4.3 **CORPS’ DETERMINATION OF THE LEAST ENVIRONMENTALLY DAMAGING PRACTICABLE ALTERNATIVE (LEDPA)** ........................................... 4-5
   4.4 **BLM’S RATIONALE FOR ADOPTING ALTERNATIVE 2 NORTH OPTION** .... 4-5

5. **Public Involvement** .................................................................................................... 5-1

6. **Means to Minimize, Avoid, and mitigate Adverse Environmental Impact** .......... 6-1
   6.1 **APPLICANT’S PROPOSED MITIGATION (AVOIDANCE, MINIMIZATION, AND MITIGATION)** .......................................................... 6-1
      6.1.1 Avoidance and Minimization ........................................................................ 6-1
      6.1.1.1 Mine Site .................................................................................................... 6-1
      6.1.1.2 Transportation Facilities .......................................................................... 6-2
      6.1.1.3 Natural Gas Pipeline Facilities ............................................................. 6-3
   6.2 **CORPS’ MITIGATION DETERMINATION** .................................................... 6-4
      6.2.1 Compensatory Mitigation Required .............................................................. 6-4
      6.2.2 Mitigation Bank .......................................................................................... 6-4
      6.2.3 In-Lieu Fee Program .................................................................................. 6-5
      6.2.4 Compensatory Mitigation Options ............................................................. 6-5
      6.2.5 Proposed Compensatory Mitigation ............................................................ 6-5
      6.2.5.1 Chuitna PRM Plan .................................................................................... 6-6
6.2.5.2 Upper Crooked Creek PRM Plan ...................................................... 6-9
6.2.5.3 In-lieu Fee Mitigation Plan.............................................................. 6-12
6.2.6 Mitigation Summary ........................................................................... 6-12
6.2.7 Other Mitigative Actions ...................................................................... 6-13
6.2.8 Special Conditions of the Corps Permit ........................................... 6-14

6.3 BLM’S MITIGATION DETERMINATION .................................................. 6-18

6.4 MITIGATION MEASURES REQUIRED BY STATE AGENCIES .............. 6-19

7 Final Agency Decisions ............................................................................. 7-1

7.1 CORPS’ DECISION ................................................................................. 7-1

7.2 BLM’S DECISION .................................................................................... 7-2

7.2.1 Acting Alaska State Director’s Recommendation .............................. 7-2

7.2.2 Approval by the Assistant Secretary .................................................. 7-3

Attachments .............................................................................................................. 1

Attachment A Supporting Documents Pertinent to the Joint Decision .......... A-1

ATTACHMENT A1 PROJECT PLAN .............................................................. A1-1

ATTACHMENT A2 NHPA SECTION 106 PROGRAMMATIC AGREEMENT .... A2-1

Attachment B Corps’ Supporting Analysis and Documentation .................. A-1

ATTACHMENT B1 RESPONSE TO COMMENTS ON SPECIAL PUBLIC NOTICE (SPN-1995-120) ....................................................................... B1-1

ATTACHMENT B2 EVALUATION OF THE DISCHARGE OF DREDGE AND FILL MATERIAL IN ACCORDANCE WITH 404(B)(1) GUIDELINES (40 CFR SECTION 230, SUBPARTS B THROUGH H) ........................................... B2-1

B2.1 Subpart B – Compliance with the Guidelines ...................................... B2-1

B2.1.1 Restrictions on Discharge (Section 230.10) .................................. B2-1

B2.1.2 Factual Determinations (Section 230.11) ..................................... B2-14

B2.1.3 Findings of Compliance or Non-Compliance with the Restrictions on Discharge (40 CFR 230.12) .................................................. B2-23

B2.2 Subpart C – Potential Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem (40 CFR Section 230 Subpart C) ................................................................. B2-23

B2.2.1 Substrate (Section 230.20, Required under Section 230.11[a]) .................... B2-23

B2.2.2 Suspended Particulates/Turbidity (Section 230.21, Required under Section 230.11[c]) ................................................................. B2-24

B2.2.3 Water (Section 230.22, Required under Section 230.11[b]) .. B2-25

B2.2.4 Current Patterns and Water Circulation (Section 230.23, Required under Section 230.11[b]) and Normal Water Fluctuation (Section 230.24, Required under Section 230.11[b]) ........................................................................ B2-26

B2.2.5 Salinity Gradients (Section 230.25, Required under Section 230.11[b]) ................................................................................ B2-27
B2.3 Subpart D – Potential Impacts on biological Characteristics of the Aquatic Ecosystem (40 CFR Section 230 Subpart D) ............................................. B2-28
  B2.3.1 Threatened and Endangered Species (Section 230.30) .......... B2-28
  B2.3.2 Fish, Crustaceans, Mollusks, and Other Aquatic Organisms in the Food Web (Section 230.31) ................................................. B2-34
  B2.3.3 Other Wildlife (Section 230.32) ............................................. B2-34
  B2.3.4 Essential Fish Habitat ......................................................... B2-36

B2.4 Subpart E – Potential Impacts on Special Aquatic Sites (40 CFR Section 230 Subpart E) ............................................................................. B2-39
  B2.4.1 Sanctuaries and Refuges (40 CFR Section 230.40) ......... B2-39
  B2.4.2 Wetlands (40 CFR Section 230.41) ................................. B2-40
  B2.4.3 Mud Flats (40 CFR Section 230.42) ............................... B2-41
  B2.4.4 Vegetated Shallows (40 CFR Section 230.43) ............... B2-41
  B2.4.5 Coral Reefs (40 CFR Section 230.44) ............................ B2-41
  B2.4.6 Riffle and Pool Complexes (40 CFR Section 230.45) .... B2-42

  B2.5.1 Municipal and Private Water Supplies (40 CFR Section 230.50) ......................................................................................... B2-43
  B2.5.2 Recreational and Commercial Fisheries (Section 230.51) ... B2-44
  B2.5.3 Water-Related Recreation (Section 230.52) ....................... B2-45
  B2.5.4 Aesthetics (Section 230.53) ................................................ B2-45
  B2.5.5 Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves (Section 230.54) ................................................... B2-47


B2.7 Subpart H – Actions to Minimize Adverse Effects (40 CFR Section 230, Subpart H) ................................................................. B2-48
  B2.7.1 Actions Concerning the Location of the Discharge (Section 230.70) ......................................................................................... B2-48
  B2.7.2 Actions Concerning the Material to be Discharged (Section 230.71) ......................................................................................... B2-49
  B2.7.3 Actions controlling the Material after Discharge (Section 230.72) ......................................................................................... B2-50
  B2.7.4 Actions Affecting the Method of Dispersion (Section 230.72) B2-51
  B2.7.5 Actions Related to Technology (Section 230.74) ............... B2-52
  B2.7.6 Actions Affecting Plant and Animal Populations (Section 230.75) ......................................................................................... B2-53
  B2.7.7 Actions Affecting Human Use (Section 230.76) ................ B2-53
  B2.7.8 Other Actions (Section 230.77) .......................................... B2-54

ATTACHMENT B3 GENERAL POLICIES FOR EVALUATING SECTION 10 RHA AND 404 CWA PERMIT DECISIONS (33 CFR 320.4) ......................... B3-1
  B3.1 Public Interest Review (33 CFR 320.4[a]) ............................... B3-1
<table>
<thead>
<tr>
<th>Section Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B3.2</td>
<td>Food and Fiber Production (33 CFR 320.4[a])</td>
</tr>
<tr>
<td>B3.3</td>
<td>Effects on Wetlands (33 CFR 320.4[b])</td>
</tr>
<tr>
<td>B3.4</td>
<td>Fish and Wildlife (33 CFR 320.4[c])</td>
</tr>
<tr>
<td>B3.5</td>
<td>Water Quality (33 CFR 320.4[d])</td>
</tr>
<tr>
<td>B3.6</td>
<td>Historical, Cultural, Scenic, and Recreational Values (33 CFR 320.4[e])</td>
</tr>
<tr>
<td>B3.7</td>
<td>Effects on Limits of the Territorial Sea (33 CFR 320.4[f])</td>
</tr>
<tr>
<td>B3.8</td>
<td>Consideration of Property Ownership (33 CFR 320.4[g])</td>
</tr>
<tr>
<td>B3.9</td>
<td>Activities Affecting Coastal Zones (33 CFR 320.4[h])</td>
</tr>
<tr>
<td>B3.10</td>
<td>Activities in Marine Sanctuaries (33 CFR 320.4)</td>
</tr>
<tr>
<td>B3.11</td>
<td>Other Federal, State, and Local Requirements (33 CFR 320.4[i])</td>
</tr>
<tr>
<td>B3.12</td>
<td>Safety of Impoundment Structures (33 CFR 320.4[k])</td>
</tr>
<tr>
<td>B3.13</td>
<td>Floodplain Management (33 CFR 320.4[l]; Executive Order [EO] 11988)</td>
</tr>
<tr>
<td>B3.14</td>
<td>Water Supply and Conservation (33 CFR 320.4[m])</td>
</tr>
<tr>
<td>B3.15</td>
<td>Energy Conservation and Development (33 CFR 320.4[n])</td>
</tr>
<tr>
<td>B3.16</td>
<td>Mineral Needs (33 CFR 320.4[a][1])</td>
</tr>
<tr>
<td>B3.17</td>
<td>Navigation (33 CFR 320.4[o])</td>
</tr>
<tr>
<td>B3.18</td>
<td>Environmental Benefits (33 CFR 320.4[p])</td>
</tr>
<tr>
<td>B3.19</td>
<td>Economics (33 CFR 320.4[q])</td>
</tr>
<tr>
<td>B3.20</td>
<td>Conservation (33 CFR 320.4[m])</td>
</tr>
<tr>
<td>B3.21</td>
<td>General Environmental Concerns (33 CFR 320.4[a])</td>
</tr>
<tr>
<td>B3.22</td>
<td>Mitigation (33 CFR 320.4[r])</td>
</tr>
</tbody>
</table>

**ATTACHMENT B4**  COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS (33 CFR 330.3 RELATED LAWS) | B4-1 |
| B4.1           | Clean Water Act (33 USC Section 1341) Section 401 Certificate of Reasonable Assurance (33 CFR 320.4[d]) | B4-1 |
| B4.2           | Coastal Zone Management Consistency Determination (33 CFR 320.4[h]) | B4-1 |
| B4.3           | Endangered Species Act of 1973 (16 USC 1531) | B4-1 |
| B4.4           | Magnuson-Stevens Fishery Conservation and Management Act | B4-1 |
| B4.5           | National Environmental Policy Act of 1969 (42 USC 4321 – 4347) | B4-2 |
| B4.6           | National Historic Preservation Act of 1966 (16 USC 470 et seq.) | B4-2 |
| B4.7           | Clean Water Act (33 USC 1251 et seq. 404[b][1] Guidelines 40 CFR 230 Subpart B) | B4-2 |
| B4.8           | Rivers and Harbors Appropriation Act of 1899 (33 USC 401, 403, 407) | B4-2 |
| B4.9           | Marine Mammal Protection Act of 1972 (16 USC 1361 et seq., 1401-1407, 1538, 4107) | B4-2 |
| B4.10          | Executive Order 13175 Consultation and Coordination with Indian Tribal Governments | B4-2 |
B4.13 Clean Air Act (42 USC 7401 – 7671 Section 176[c]).................................B4-3
B4.14 Executive Order 12898 (Environmental Justice).................................B4-3
B4.15 Executive Order 11988 (Flood Plain Management)...............................B4-4
B4.16 Executive Order 13112, Invasive Species ............................................B4-4
B4.17 Executive Orders 13212 and 13302, Energy Supply and Availability ..B4-5
B4.18 Other Federal, State and/or Local Authorizations (if issued).................B4-5
B4.19 Significant National Issues (33 CFR 325.2[a][6]) ..............................B4-5

ATTACHMENT B5 APPLICANT’S COMPENSATORY MITIGATION PLAN...........B5-1

ATTACHMENT B6 STATE OF ALASKA CERTIFICATE OF REASONABLE
ASSURANCE FOR THE DONLIN GOLD PROJECT .................................B6-1

Attachment C BLM’s Supporting Analysis and Documentation ..........................C-1

ATTACHMENT C1 BLM SELECTED MITIGATION FROM CHAPTER 5 OF THE
FINAL EIS .......................................................................................................C1-1

ATTACHMENT C2 ANILCA SECTION 810 SUMMARY ...............................C2-1

C2.1 Notice and Hearings ...........................................................................C2-1
C2.2 Alternative 2 North Option – Summary of Findings .............................C2-2
C2.3 Cumulative Case - Findings .................................................................C2-2
C2.4 Significant Restriction of Subsistence Use is Necessary, Consistent
with Sound Management Principles for the Utilization of
Public Lands ..................................................................................................C2-2
C2.5 The Proposed Activity Will Involve the Minimum Amount of Public
Lands Necessary to Accomplish the Purposes of Such Use,
Occupancy or Other Disposition ...............................................................C2-3
C2.6 Reasonable Steps will be taken to Minimize Adverse Impacts upon
Subsistence Uses and Resources Resulting from Such Actions...........C2-3
LIST OF TABLES

Table 1: Alternative 2 North Option – Proposed Structures and Fill in Section 10 Waters of the U.S. ............................................................... 3-3
Table 2: Alternative 2 North Option – Proposed Fill for Waters of the U.S. ................. 3-5
Table 3: Alternative 2 North Option – ROW and Ancillary Facilities on BLM-Managed Lands. 3-7
Table 4: Donlin Gold Project Alternatives ........................................................................... 4-1
Table 5: Compensatory Mitigation Proposed for Wetlands by HGM Class and Cowardin Group (Acres). ........................................................................................................ 6-8
Table 6: Compensatory Mitigation Proposed for Streams in Linear Feet (Miles) ............... 6-9
Table B1: GHG Summary for Life of Mine ....................................................................... B1-4
Table B2: Summary of LEDPA Analysis .......................................................................... B2-6
Table B3: Average Annual Flow Loss – Crooked Creek Tributaries .............................. B2-11
Table B4: Average Annual Flow Loss – Crooked Creek .................................................... B2-11
Table B5: Winter Flow Loss – Crooked Creek Tributaries ............................................. B2-12
Table B6: Winter Flow Loss – Crooked Creek ................................................................. B2-12
Table B7: ESA Threatened, Listed, or Candidate Species Assessed for the Project ....... B2-32
Table C1: BLM Selected Mitigation Measures from Final EIS Chapter 5 ........................ C1-1
Table C2: Donlin Gold Mitigation Measures Relevant to Subsistence Uses and Resources . C2-4
ACRONYMS AND ABBREVIATIONS

AAC   Alaska Administrative Code
ABA   acid-base accounting
ACHP  Advisory Council on Historic Preservation
ADEC  Alaska Department of Environmental Conservation
ADF&G Alaska Department of Fish and Game
ADNR Alaska Department of Natural Resources
ADNR-Water Alaska Department of Natural Resources Division of Water
ANCSA Alaska Native Claims Settlement Act
ANILCA Alaska National Interest Lands Conservation Act
APDES Alaska Pollutant Discharge Elimination System
APE   Area of Potential Effects
ARD   acid rock drainage
ARMP  Aquatic Resources Monitoring Plan
AWQS  Alaska Water Quality Standards
BLM   Bureau of Land Management
BMPs  Best Management Practices
BTC   Birch Tree Crossing
Calista Calista Corporation
CAR   Comment Analysis Report
CEQ   Council on Environmental Quality
CFR   Code of Federal Regulations
CGP   Construction General Permit
CIRI  Cook Inlet Region, Incorporated
CMP   compensatory mitigation plan
COA   core operating area
Corps U.S. Army Corps of Engineers
CR    conservation recommendation
CWA   Clean Water Act
CWD   contact water dam
CZMA  Coastal Zone Management Act
DA    Department of the Army
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATROC</td>
<td>Donlin Advisory Technical Review and Oversight Committee</td>
</tr>
<tr>
<td>DOI</td>
<td>Department of the Interior</td>
</tr>
<tr>
<td>Donlin Gold</td>
<td>Donlin Gold LLC</td>
</tr>
<tr>
<td>Draft EIS</td>
<td>Draft Environmental Impact Statement</td>
</tr>
<tr>
<td>DST</td>
<td>dry stack tailings</td>
</tr>
<tr>
<td>EIS</td>
<td>Environmental Impact Statement</td>
</tr>
<tr>
<td>EFH</td>
<td>Essential Fish Habitat</td>
</tr>
<tr>
<td>EPA</td>
<td>U.S. Environmental Protection Agency</td>
</tr>
<tr>
<td>ESA</td>
<td>Endangered Species Act</td>
</tr>
<tr>
<td>Final EIS</td>
<td>Final Environmental Impact Statement</td>
</tr>
<tr>
<td>FLPMA</td>
<td>Federal Land Policy and Management Act</td>
</tr>
<tr>
<td>FMEA</td>
<td>Failure Modes and Effects Analysis</td>
</tr>
<tr>
<td>FOS</td>
<td>Factors of Safety</td>
</tr>
<tr>
<td>FRA</td>
<td>focused risk assessment</td>
</tr>
<tr>
<td>FWD</td>
<td>freshwater dam</td>
</tr>
<tr>
<td>FWDD</td>
<td>freshwater diversion dam</td>
</tr>
<tr>
<td>GHG</td>
<td>greenhouse gas</td>
</tr>
<tr>
<td>GLT</td>
<td>Great Land Trust</td>
</tr>
<tr>
<td>gpm</td>
<td>gallons per minute</td>
</tr>
<tr>
<td>HGM</td>
<td>hydrogeomorphic</td>
</tr>
<tr>
<td>HHRA</td>
<td>human health risk assessment</td>
</tr>
<tr>
<td>ISPMP</td>
<td>Invasive Species Prevention and Management Plan</td>
</tr>
<tr>
<td>JROD</td>
<td>Joint Record of Decision</td>
</tr>
<tr>
<td>HDD</td>
<td>horizontal directional drilling</td>
</tr>
<tr>
<td>HUC</td>
<td>Hydrologic Unit Code</td>
</tr>
<tr>
<td>INHT</td>
<td>Iditarod National Historic Trail</td>
</tr>
<tr>
<td>LEDPA</td>
<td>least environmentally damaging practicable alternative</td>
</tr>
<tr>
<td>LLDPE</td>
<td>linear low-density polyethylene</td>
</tr>
<tr>
<td>LNG</td>
<td>liquefied natural gas</td>
</tr>
<tr>
<td>LOM</td>
<td>life of mine</td>
</tr>
<tr>
<td>M</td>
<td>magnitude</td>
</tr>
<tr>
<td>mi²</td>
<td>square miles</td>
</tr>
<tr>
<td>MCE</td>
<td>maximum credible earthquake</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>MLA</td>
<td>Minerals Leasing Act</td>
</tr>
<tr>
<td>MMO</td>
<td>marine mammal monitor</td>
</tr>
<tr>
<td>MMT</td>
<td>million metric tons</td>
</tr>
<tr>
<td>MP</td>
<td>milepost</td>
</tr>
<tr>
<td>MSA</td>
<td>Magnuson-Stevens Fishery Conservation and Management Act</td>
</tr>
<tr>
<td>MW</td>
<td>megawatts</td>
</tr>
<tr>
<td>MWMP</td>
<td>meteoric water mobility procedure</td>
</tr>
<tr>
<td>NEPA</td>
<td>National Environmental Policy Act</td>
</tr>
<tr>
<td>NHPA</td>
<td>National Historic Preservation Act</td>
</tr>
<tr>
<td>NMFS</td>
<td>National Marine Fisheries Service</td>
</tr>
<tr>
<td>NNIS</td>
<td>nonnative invasive species</td>
</tr>
<tr>
<td>NRHP</td>
<td>National Register of Historic Places</td>
</tr>
<tr>
<td>O&amp;M</td>
<td>Operations and Maintenance</td>
</tr>
<tr>
<td>pga</td>
<td>peak ground acceleration</td>
</tr>
<tr>
<td>PHMSA</td>
<td>Pipeline and Hazardous Materials Safety Administration</td>
</tr>
<tr>
<td>PN</td>
<td>Public Notice</td>
</tr>
<tr>
<td>PRM</td>
<td>Permittee-Responsible Mitigation</td>
</tr>
<tr>
<td>Project</td>
<td>Donlin Gold Project</td>
</tr>
<tr>
<td>PSO</td>
<td>Protected Species Observer</td>
</tr>
<tr>
<td>RHA</td>
<td>Rivers and Harbors Act</td>
</tr>
<tr>
<td>ROW</td>
<td>right-of-way</td>
</tr>
<tr>
<td>RPM</td>
<td>revolutions per minute</td>
</tr>
<tr>
<td>SHPO</td>
<td>State Historic Preservation Office</td>
</tr>
<tr>
<td>SOC</td>
<td>Statement of Concern</td>
</tr>
<tr>
<td>SPN</td>
<td>Special Public Notice</td>
</tr>
<tr>
<td>SRS</td>
<td>seepage recovery system</td>
</tr>
<tr>
<td>SWPPP</td>
<td>Stormwater Pollution Prevention Plan</td>
</tr>
<tr>
<td>TKC</td>
<td>The Kuskokwim Corporation</td>
</tr>
<tr>
<td>tpy</td>
<td>tons per year</td>
</tr>
<tr>
<td>TSF</td>
<td>tailings storage facility</td>
</tr>
<tr>
<td>U.S.</td>
<td>United States</td>
</tr>
<tr>
<td>USC</td>
<td>United States Code</td>
</tr>
<tr>
<td>USFWS</td>
<td>U. S. Fish and Wildlife Service</td>
</tr>
<tr>
<td>Acronym</td>
<td>Definition</td>
</tr>
<tr>
<td>---------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>WOUS</td>
<td>waters of the United States</td>
</tr>
<tr>
<td>WQS</td>
<td>water quality standards</td>
</tr>
<tr>
<td>WRF</td>
<td>waste rock facility</td>
</tr>
<tr>
<td>Y-K</td>
<td>Yukon-Kuskokwim</td>
</tr>
</tbody>
</table>
1 INTRODUCTION

This document constitutes the Joint Record of Decision (JROD) of the United States (U.S.) Department of the Army (DA) Corps of Engineers (Corps), and the Department of Interior, Bureau of Land Management (BLM), for the Donlin Gold Project (Project) proposed by Donlin Gold LLC (Donlin Gold, Applicant, or Permittee). The One Federal Decision policy mandated by Executive Order 13807 does not expressly apply to the Project, but the Corps and BLM are voluntarily issuing a JROD in the spirit of the Executive Order. This JROD outlines the Corps’ and BLM’s decision, under the National Environmental Policy Act (NEPA), to select Alternative 2 for the Donlin Gold Project, with incorporation of the North Route Pipeline option (herein referred to as the ‘Alternative 2 North Option’); as detailed in the April 2018 Final Environmental Impact Statement [Final EIS] and subject to special conditions and the specified mitigation described below. The Corps authorities are specific to components of the Project proposed to be constructed within waters of the U.S. (WOUS). BLM’s authorities are limited to the components of the Project that occur on BLM-managed federal lands.

The findings in the Final EIS are based on an open, collaborative, and robust process among the scientists, resource specialists, and regulatory staff of the Corps, BLM, all other cooperating agencies, the NEPA contractor, and the participating public. This process resulted in a Final EIS that—consistent with NEPA and Executive Order 13807—provides an adequately detailed analysis of the environmental impacts of the Applicant’s proposal, and a reasonable range of alternatives, including the No Action alternative, to inform and support all federal reviews and authorizations of the Corps, BLM, and the other federal cooperating agencies, for the proposed Donlin Gold Project.

The U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration (PHMSA), participated as a cooperating agency during development of the Environmental Impact Statement (EIS); and on June 5, 2018, issued a Special Permit to allow Strain-Based Design of the Pipeline. PHMSA issued its own decision document and is not participating in this JROD.

This JROD is prepared in accordance with NEPA; U.S. Environmental Protection Agency’s (EPA) Section 404(b)(1) Guidelines (40 Code of Federal Regulations [CFR] 230); and the public interest review (33 CFR 320.4), under the authority delegated to the District Commander by 33 CFR 325.8, pursuant to Section 404 of the Clean Water Act (CWA); and Section 10 of the Rivers and Harbors Act (RHA) of 1899.

This JROD is also prepared in accordance with the BLM’s authority under Section 28 of the Mineral Leasing Act, 30 United States Code [USC] 185, Section 302 and Section 304 of the Federal Land Policy and Management Act (FLPMA) (43 USC 1732 and 43 USC 1734), Sections 810 and 906 of the Alaska National Interest Lands Conservation Act (ANILCA), Section 106 of the National Historic Preservation Act (NHPA), and the National Trails Systems Act of 1968 (16 USC 1241-1251).

1.1 BACKGROUND

In July 2012, the Corps – Alaska District, received a DA permit application from Donlin Gold requesting authorization for the placement of fill material into WOUS, including wetlands, in connection with the development of an open-pit, hard-rock gold mine in western Alaska.
The Corps, as the lead federal agency under NEPA, determined that preparation of an EIS was necessary to inform the permit decision on the Project. A Notice of Intent to prepare the Donlin Gold Project EIS was published in the Federal Register on December 14, 2012. Four agencies, the State of Alaska, and six Alaska Native tribal councils with federally recognized tribal government status participated as cooperating agencies during development of the EIS. Those with cooperating agency status included the BLM, PHMSA, EPA, U.S. Fish and Wildlife Service (USFWS), State of Alaska, Village of Crooked Creek, Native Village of Chuathbaluk, Knik Tribal Council, Native Village of Napaimute, Native Village of Aniak, and Native Village of Akiak.

The scoping period extended from December 14, 2012 to March 29, 2013. Following scoping, the Corps and cooperating agencies began developing a Draft Environmental Impact Statement (Draft EIS). Donlin Gold submitted revised DA permit applications in December 2014 and August 2015. In November 2015, the Corps released the Draft EIS and published a Public Notice (PN) advertising the Draft’s availability for public comment. The comment period for the Draft EIS ran initially from November 25, 2015 to April 30, 2016, and was extended until May 31, 2016.

In December 2017, Donlin Gold submitted an updated DA permit application that superseded all previous applications—with revisions and refinements to the Project design and footprint—resulting, in part, from the comments received during the Draft EIS review period. No changes to the Project were made that resulted in significant new circumstances or information related to environmental concerns, and after evaluation of the changes, the Corps determined a Supplemental Draft EIS was not warranted.

A Notice of Availability for the Final EIS was published in the Federal Register on April 27, 2018. A Special Public Notice (SPN) for the Final EIS and the Applicant’s updated compensatory mitigation plan (CMP) (included as Appendices J and M in the Final EIS) was also published on April 27, 2018 (SPN-1995-120). The public review period for the Final EIS and the updated CMP ran from April 27, 2018 through May 29, 2018.

1.2 AUTHORITIES

The Corps, in coordination with cooperating agencies, has prepared a single EIS that includes an adequate level of detail and a reasonable range of alternatives sufficient to inform decisions by all agencies with review or authorization decision authorities.

The BLM hereby adopts the Final EIS for the Donlin Gold Project (available at http://www.donlingoldeis.com/).

Additional supporting documents pertinent to this JROD are included as Attachment A.

1.2.1 CORPS’ AUTHORITY

The Applicant proposes to discharge fill material into WOUS, including wetlands, and to construct structures in and under navigable waters, which require authorization from the Corps (see Tables 1 and 2 below).

This permit action is being undertaken through authority delegated to the District Engineer by 33 CFR 325.8, pursuant to Section 10 of the RHA of 1899 (33 USC 403, and Section 404 of the CWA (33 USC 1344).
• The Corps has authority through Section 404 of the CWA to regulate the discharge of dredged or fill material into WOUS.

• The Corps has authority through Section 10 of the RHA of 1899 to regulate all work or structures in or affecting the course, condition, location, or capacity of navigable waters.

Pursuant to Council on Environmental Quality regulations for implementing NEPA (404 CFR Parts 1500-1508), the Corps has responsibility as the lead federal agency for the EIS. The Corps has reviewed and evaluated the information in the Donlin Gold Final EIS, including all supplemental data subsequently provided, in accordance with 40 CFR 1506.3 and 40 CFR Part 230, and has found them to be sufficient and accurate assessments, and therefore appropriate for the purposes of the public interest review and alternatives analysis required by 33 CFR 320.4(b)(4) and 40 CFR 230.10.

1.2.2 BLM’S AUTHORITY

The BLM is responsible for land use authorizations on certain federal lands. The authority for management of the land and resource development options presented in the EIS comes from several statutes, including NEPA, the FLPMA, the Minerals Leasing Act (MLA), Title VIII of the ANILCA, the Materials Act, the Independent Offices Appropriation Act of 1952 (31 USC 9701), the National Trails System Act, and the Alaska Native Claims Settlement Act (ANSCA). The BLM authorities to implement the actions identified in this record of decision are found under the following regulatory frameworks:

• NEPA – The Council on Environmental Quality regulations (40 CFR 1508.15) provide for the BLM to be a cooperating agency because the BLM has "jurisdiction by law" as a land manager in the proposed area of effect. In addition, BLM has "special expertise" regarding environmental issues, specifically in the matter of subsistence issues as they relate to the Donlin Gold proposal.

• Section 302 of the FLPMA (43 USC 1732) provides the general authority for BLM to manage the use, occupancy, and development of federal public lands\(^1\) under the principles of multiple use and sustained yield, in accordance with the land use plans that BLM develops under FLPMA. Under FLPMA, the Secretary of the Interior has broad authority to regulate the use, occupancy, and development of public lands, and to take whatever action is required to prevent unnecessary or undue degradation of public lands, and manage under the principles of multiple use and sustained yield in accordance with the land use plans that BLM develops under the FLPMA. In accordance with the FLPMA, the BLM manages its Alaska lands and their uses to ensure healthy and productive ecosystems.

• Pursuant to 43 CFR 3601.3, BLM’s authority to dispose of sand, gravel, and other mineral and vegetative materials that are not subject to mineral leasing or location under the mining laws is the Act of July 31, 1947, as amended (30 USC 601 et seq.), commonly referred to as the Materials Act. This authority applies to sale and free use of these materials.

---

\(^1\) Public lands means any lands and interest in lands owned by the United States and administered by the Secretary of the Interior through BLM without regard to how the United States acquired ownership, except lands held for the benefit of Indians, Aleuts, and Eskimos.
• Section 304 of FLPMA (43 USC 1734) and the Independent Offices Appropriation Act of 1952 (31 USC 9701) authorize the U.S. Government to collect fees and to require reimbursement of its costs.

• Under Section 28 of the MLA (30 USC 185), and 43 CFR 2881.11, the BLM has the authority to issue grants for oil or gas pipelines or related facilities to cross federal lands under BLM jurisdiction. Donlin Gold would need to obtain a Right-of-Way Grant and Temporary Use Permits from the BLM for crossing public lands managed by the BLM. Donlin Gold has submitted a Standard Form 299, Application for Transportation and Utility Systems and Facilities on Federal Lands. Pursuant to a ROW grant, BLM would attach appropriate requirements for the construction, operation, maintenance, and reclamation of the proposed Pipeline across BLM lands.

• BLM has reviewed the proposed Public Easement Plan (Final EIS Appendix N) pursuant to the ANCSA 17(b) Easement Management Handbook (IM AK 2007-037). BLM has considered the proposed ANCSA 17(b) easement actions, including five terminations, one relocation by donation, and one corrected quadrangle map, to address public safety and access to public land in the vicinity of the mine core operating area (COA).

• Section 810 of the ANILCA contains procedures for federal agencies to evaluate impacts on subsistence uses and needs, and means to reduce or eliminate such impacts (16 USC 3120). Pursuant to ANILCA Section 810 and BLM Instruction Memorandum 2011-008, BLM evaluated impacts to subsistence uses and resources based on the information provided in the Final EIS (Final EIS Appendix N). BLM determined that the 810 Analysis would address the portion of the Project requiring a BLM authorization (i.e., Pipeline ROW), and all aspects of the Project that are dependent on that authorization and the associated Pipeline, to include mine construction and operations, and river and road transportation aspects of the Project, because those components of the Project would not go forward if not for the Pipeline, and the Pipeline would not go forward if not for those other components. This is consistent with NEPA requirements for evaluation of connected actions.

• Section 906 (l) of the ANILCA (48 USC note prec. 21) established interim provisions for federal agencies to grant ROWs on lands selected by, or granted, or conveyed to the State of Alaska under Section 6 of the Alaska Statehood Act (Public Law 85-508, 72 Stat. 340-43). Because there are lands in the proposed ROW corridor that have been selected by the State of Alaska but have not yet been conveyed, BLM responds to ROW applications under the BLM federal regulatory guidance as other BLM-managed lands.

• Pursuant to the requirements of the National Trails Systems Act of 1968 (16 USC 1241-1251), BLM is the federal administrator for the entire 2,500-mile Iditarod National Historic Trail (INHT) System, and is the lead federal agency charged with facilitating the implementation of the interagency Comprehensive Management Plan for the Trail. The Comprehensive Management Plan was developed in cooperation with the State in the 1980s, and implementation has been guided by a Memorandum of Agreement between the State and BLM since 1988. Implementation of the Comprehensive Management Plan is based on landowner cooperation and collaboration. The BLM does not make land management decisions for the Trail for non-BLM lands.
• Regulatory authority for BLM management of nonnative invasive species (NNIS) is derived from:
  o Executive Order 13112, Invasive Species 1999 directs BLM to “…prevent the introduction of invasive species and provide for their control and to minimize economic, ecological and human health impacts that invasive species cause”.
  o Federal Land Policy and Management Act of 1976 (FLPMA) directs BLM to take any action necessary to prevent unnecessary and/or undue degradation of public lands and authorizes the BLM to enter into cooperative agreements.
  o Federal Noxious Weed Act of 1974, as amended by Sec. 15, Management of Undesirable Plants on Federal Lands, 1990 (Public Law 93-629) authorizes the BLM to “…cooperate with other Federal and State agencies, and others in carrying out operations or measures to eradicate, suppress, control or prevent or retard the spread of any noxious weed.”
2 SUMMARY OF DECISION

2.1 CORPS’ DECISION SUMMARY

A DA permit pursuant to Section 10 of the RHA of 1899 (33 USC 403), and pursuant to Section 404 of the CWA (33 USC 1344), is being issued to Donlin Gold for the discharge of fill material into WOUS, including wetlands, and the construction of structures in and under navigable waters. The DA permit authorizes the Applicant’s proposed action (Alternative 2 North Option), as described in Section 3.0, Proposed Project, and Section 4.0, Alternatives. The impacts as a result of the discharge of fill into WOUS and the construction of structures in and under navigable waters are described in the JROD and Attachment B. This alternative incorporates all practicable avoidance and minimization measures.

The production of gold from the Project requires construction of mine facilities (e.g., open pit, Waste Rock Facility [WRF], and Tailing Storage Facility [TSF], transportation facilities [e.g., port, airstrip, roads], and a natural gas pipeline). The construction of these facilities will require temporary or permanent terrain modifications, and placement of fill. This permit authorizes Project work involving the discharge of dredge and/or fill material in WOUS, including wetlands, and the placement of structures in or work affecting navigable WOUS.

A detailed description of proposed activities involving the discharge of fill in WOUS is included in Block 18 (Nature of Activity) in the December 2017 DA permit application. Affected waterbodies are listed in Tables 13-2 through 13-7 of the DA permit application. These activities include cut-and-fill for construction of roads, airstrips, port facilities, laydown and work areas, Mine Site facilities, material sites, and installation of culverts and bridges at stream crossings, power poles, and the natural gas pipeline. Principal impacts to WOUS resulting from construction of the Project include the placement of 4,368,300 cubic yards of fill in up to 3,416 acres and 226,190 linear feet of WOUS.

The Kuskokwim and Susitna Rivers are listed by the Corps as traditional navigable waterways. The Project would include a port at Jungjuk Creek, abutting and within the Kuskokwim River waterway; two barge landings at the Kuskokwim River; and a Pipeline crossing of Kuskokwim River (using horizontal directional drilling [HDD] methods). Impacts to navigable waters include up to 3 acres and 2,472 linear feet of WOUS.

This authorization requires compensatory mitigation for the direct impacts to WOUS, including wetlands. This authorization also includes special conditions to avoid and minimize potential adverse impacts; to compensate for unavoidable adverse impacts to the aquatic ecosystem; and to ensure that the Project would not be contrary to the public interest. The Corps’ mitigation determination is included in Section 6.2 of this JROD.

All work will be performed in accordance with the attached project plan (Attachment A1), which is composed of the following engineering drawings, dated December 22, 2017:

- Engineering Drawing G001 – General Notes and Sheet Index
- Engineering Drawing G002 – Plan View Overall Project Vicinity Map
- Engineering Drawings MA-200G through MA-214T – Mine Area Drawings
- Engineering Drawings TA-300G through TA-316T – Transportation Area Drawings
• Engineering Drawings PA-100G through PA-177T - Pipeline Area Drawings

The Corps’ supporting analysis for this JROD is included as Attachment B.

2.2 BLM’S DECISION SUMMARY

After an independent review of the Final EIS, the BLM has determined that the Final EIS includes an adequate level of detail and a reasonable range of alternatives sufficient to inform the agency’s decisions regarding the elements of the Project proposed to occur on or impact BLM-managed lands. In addition, the BLM finds that its comments, concerns, and suggestions have been adequately addressed in the Final EIS and in this JROD.

This JROD approves the development of the Donlin Gold’s Alternative 2 North Option on BLM-managed lands; as described in the Final EIS (April 2018), and as detailed in the attached engineering drawings (Attachment A1; see Engineering Drawing G002 for the overall Project vicinity map). The location of the Donlin Gold Natural Gas Pipeline and associated fiber optic cable, temporary access roads, airstrips, ancillary facilities, and material sites are described in the Final EIS Chapter 2, Section 2.3.2.4, and associated Figures and Tables. Approximately 97 miles and 2,329 acres (1,768 acres in ROW corridor, 561 acres for ancillary facilities) of BLM-managed public land would be affected by the natural gas and fiber optic pipeline development.

Actions covered by this Decision include:

• Issuance of a 30-year ROW grant for the construction, operations, maintenance, and termination of a 14-inch buried natural gas pipeline and associated fiber optic cable on BLM-managed lands (Final EIS Sections 2.3 and 3.15).

• Approval of temporary access roads, airstrips, and ancillary facilities necessary for construction of the natural gas pipeline and fiber optic cable on BLM-managed lands (Final EIS Section 2.3).

• Approval of material sales (gravel, rock, and soil) and removal from BLM-managed lands necessary for Pipeline access, construction, operations, and termination (Final EIS Section 2.3).

• Approval of timber sales (merchantable valued) and removal from BLM-managed lands necessary for Pipeline access, construction, operations, and termination (Final EIS Section 3.10).

• Implementation of the Invasive Species Prevention and Management Plan (ISPMP) on BLM-managed lands during Pipeline construction, operations, maintenance, and termination (Final EIS Appendix U).

• Implementation of ANCSA 17(b) easement actions necessary to maintain public access to public lands adjacent to the mine COA to address public safety. This includes five easement terminations (20 miles total), one donation (2 miles) and one corrected easement location map (0.4 mile) (Final EIS Appendix Z).

• Implementation of the approved and executed NHPA Section 106 Programmatic Agreement (Attachment A2).
The BLM has reviewed the Donlin Gold Project proposal, as described in the April 2018 Final EIS, for the natural gas pipeline, associated fiber optic cable, and ancillary facility construction, operation, maintenance, monitoring, and termination where BLM-managed land and resources are involved. The BLM has determined that the Donlin Gold Project proposal is consistent with the MLA direction, and the direction in BLM Policy Manual 2884 – Applying for an MLA Grant or Temporary Use Permit, and is consistent with the BLM Alaska Statewide Land Health Standards. BLM will make a ROW Grant offer to Donlin Gold for the natural gas pipeline and associated fiber optic cable. Upon Donlin Gold’s written acceptance of the ROW Grant terms and conditions, and submittal of rental payment, BLM will issue a decision to grant the ROW. Detailed plans for all aspects of the Pipeline activities will be reviewed by the Authorized Officer prior to issuing a Notice to Proceed according to terms, conditions, and stipulations outlined in an ROW Grant issued to Donlin Gold LLC. The ROW Grant will also specify requirements for Bonding and Liability, reporting, public safety and access, protection of environmental and cultural resources, and the sale of material (gravel, rock, etc.) and merchantable timber necessary for all Pipeline activities on BLM-managed land. Donlin Gold will be required to comply with all of the mitigating measures selected from Final EIS Chapter 5, and identified in this JROD (see Attachment C1), and which are further clarified and defined in the ROW Grant stipulations.

In addition to the ROW Corridor, ancillary facilities will affect approximately 561 acres of BLM lands, including one new airstrip, 22 material sites, two large (300-person) civilian camps, as well as temporary access roads and work spaces. These ancillary facilities necessary to support construction will be decommissioned and the land reclaimed to a natural condition on completion of the construction phase. There is an existing airstrip of approximately 140 acres, the Farewell Airstrip, which would be improved for use during Project Construction but would not be maintained, reclaimed or decommissioned after the Construction Phase. The Pipeline and fiber optic cable will involve 69 stream/river crossings on BLM-managed land: 62 will be open-cut trench, and 7 will be HDD.

On completion of the mining activities, the Pipeline, associated fiber optic cable, and related ancillary facilities would no longer be needed, and would be decommissioned. Aboveground facilities would be removed, and the ROW corridor reclaimed to a natural condition.

The BLM has reviewed and approves the proposed Public Easement Plan (Final EIS Appendix Z) pursuant to the ANCSA 17(b) Easement Management Handbook (IM AK 2007-037). BLM has considered the ANCSA 17(b) easement actions—including five terminations, one relocation by donation, and one corrected quadrangle map—to address public safety and access to public land in the vicinity of the mine COA. Five easement terminations inside the mine COA will prevent public easement user conflict or safety concerns with mining operations in the mine COA; one easement donation outside the mine COA will provide public easement connectivity to other established public easements due to the termination of an easement inside the southwestern corner of the mine COA; and one corrected easement quadrangle map will provide for an identified location of an easement that was otherwise not fully described in detail in the easement legal description, where the Mine Access Road and Angyaruaq (Jungjujuk) Port will be developed near the junction with Kuskokwim River. The combination of BLM ANCSA 17(b) easements, along with the proposed easement actions by the State of ADNR, The Kuskokwim Corporation (TKC), and Calista Corporation (Calista), as proposed in the Public Easement Plan, provide for continued public access to public lands around the mine COA, while providing a safe operational area for Donlin Gold mine activities, and avoiding conflict
with public easements otherwise going through the mine COA. The Public Easement Plan, pursuant to ANCSA provisions, incorporates the legal requirements of the BLM and State of Alaska, as well as the needs of the Native Corporations involved. The approved ANCSA 17(b) easement actions to be implemented are described in detail in the Final EIS (Appendix Z, Public Easement Plan). The 17(b) easements involved with this project are 25- and 50-foot wide trail corridors. BLM will enter into a Memorandum of Agreement with TKC, Calista, and ADNR to implement the Public Easement Plan (Final EIS Appendix Z). Implementing the Public Easement Plan involves administrative actions as well as on-the-ground Certificate of Inspection and Possession (CIP Process) of the donated easement. Implementing the Public Easement Plan will provide for public safety and continued access to public lands across State and private Native Corporation lands outside of the mine COA.

The BLM has reviewed and approves the ISPMP as described in the Final EIS Appendix U, pursuant to the BLM Alaska Invasive Species Management Policy (IM AK-2010-001). The ISPMP is adaptive by design to accommodate new information, such as new NNIS identification, treatment, monitoring tools, technology, and policy. BLM participated in and supports the landscape-management approach across landowner boundaries for addressing NNIS prevention and management in the natural gas pipeline ROW, and associated activities. The outreach, education, and training for Donlin Gold staff and contractors, the use of Early Detection and Rapid Response, Best Management Practices (BMPs), and Hazard Analysis Critical Control Point protocol in the approved ISPMP are consistent with BLM Alaska requirements for preventing the introduction and spread of NNIS.

This JROD documents the Department of the Interior’s (DOI) decision regarding the Donlin Gold Project proposed by Donlin Gold LLC. The decision will allow development of an open-pit, hard-rock gold mine about 10 miles north of the community of Crooked Creek, in southwestern Alaska. This decision adopts Alternative 2 North Option, described in the April 2018 Final EIS for the Donlin Gold Project. The Final EIS analyzed Donlin Gold’s proposal to develop the gold mine, as well as transportation infrastructure and the Pipeline. The BLM decisions in this JROD are limited to federal lands, and only address authorizations under the jurisdiction of the BLM. Access to non-federal lands is subject to landowner approval, and other federal and state agencies will process applications for authorizations under their respective jurisdictions.

The decision made in this JROD emphasizes balanced and environmentally responsible development, and includes protections for physical, cultural, and biological resources. In accordance with the requirements of ANILCA Section 810, the decision also addresses local residents’ concerns regarding protection of their subsistence way of life and the subsistence resources on which they depend, through inclusion of new mitigation measures developed specifically for the Donlin Gold Project (Final EIS Appendix N). At the same time, the decision enables Donlin Gold to reasonably develop the mineral resources from Alaska Native Corporation–owned lands, providing an economic benefit through a subsurface mineral lease with Calista, an Alaska Native regional corporation, a surface use agreement with TKC, an Alaska village corporation, as well as a surface use agreement with Cook Inlet Region, Incorporated (CIRI), for a small portion of the Pipeline on the Cook Inlet side of the Project, while helping to meet America’s mineral development needs. The Donlin Gold Project will also lead to increased revenues to the State of Alaska, resulting from shared royalties, State and local taxes, and other fees. Local residents and communities will benefit indirectly from revenues associated with the development on federal land that would accrue to the State of Alaska.
Royalties received by Calista, TKC, and CIRI will also result in revenues to Alaska Native corporations from shared royalties.

This JROD adopts design features and BMPs analyzed and considered in Chapter 5 of the Final EIS. BLM has selected mitigating measures from Chapter 5 of the Final EIS which are discussed in more detail in Attachment C, Table C1, of this JROD. None of these mitigation measures are compensatory mitigation. Design features, BMPs, and mitigating measures not selected by BLM for inclusion are either out of the BLM’s jurisdiction, or would go beyond what BLM considers reasonable, practicable, and appropriate to prevent undue and unnecessary degradation to public lands.

This JROD completes the required EIS process and NEPA requirements for subsequent issuance of a BLM ROW grant and other authorizations necessary for development of the natural gas pipeline and fiber optic cable on federal lands managed by the BLM, as well as the ANCSA 17(b) easement actions necessary in support of the Donlin Gold mine development.

BLM’s supporting analysis and documentation for this JROD is included as Attachment C.

2.2.1 ANILCA SECTION 810 SUMMARY

Attachment C to this JROD, BLM Supporting Analysis and Documentation, describes in detail the mitigating measures Donlin Gold will undertake to avoid, minimize, and mitigate impacts to resources and subsistence.

The ANILCA Section 810 analysis concluded a positive finding for Alternative 2 North Option of a significant restriction to subsistence for the communities of Bethel, Tuntutuliak Napakiak, Napaskiak, Oscarville, Kwethluk, Akiachak, Akiak, Tuluksak, Upper and Lower Kalskag, Aniak, Chuathbaluk, Napaimute, and Crooked Creek due to a substantial reduction in the opportunity to continue uses of subsistence resources on the Kuskokwim River. Barging on the Kuskokwim River during construction and operation of the mine may cause extensive interference with access to the Kuskokwim River by subsistence users from villages along the river. It may cause a major redistribution of salmon, rainbow smelt, and whitefish, which are important subsistence resources for those villages. The analysis also concluded a positive finding for Alternative 2 North Option of a significant restriction to subsistence use for the communities of McGrath, Takotna, and Nikolai due to a substantial increase in competition for subsistence resources along the natural gas pipeline at the Farewell Airstrip due to increased activity and access that may increase disturbance to important subsistence resources by recreational sport hunters and commercial outfitters.

BLM has determined the significant restriction of subsistence use is necessary, consistent with sound management principles for the utilization of public lands. The proposed activity will involve the minimum amount of public lands necessary to accomplish the purposes of such use, occupancy or other disposition. Reasonable steps will be taken to minimize adverse impacts upon subsistence uses and resources resulting from such actions. Further discussion of the ANILCA 810 analysis findings is included in Attachment C2 of this JROD. The mitigating measures Donlin Gold has agreed to undertake to avoid and minimize impacts to subsistence are described in Table C2 of Attachment C2.
3 PROPOSED PROJECT

3.1 PROJECT DESCRIPTION

Donlin Gold proposes the development of an open-pit, hard-rock gold mine in the Kuskokwim River watershed, 277 miles west of Anchorage, 145 miles northeast of Bethel, and 10 miles north of the community of Crooked Creek. There is no existing overland year-round access to the site, or a utility service to supply the mine. Calista selected the mineral rights at the Donlin Gold site under the ANCSA because of the site's known gold potential. TKC owns the majority of the surface estate at the Donlin Gold site. Calista wishes to develop the mineral resources at Donlin Gold for the benefit of Calista's shareholders, and the shareholders of other Alaska Native corporations that benefit from natural resource development through ANCSA 7(i) and (j) revenue distribution requirements. Donlin Gold operates the Donlin Gold Project under a mineral lease with Calista and a surface use agreement with TKC.

The Project would have an average process throughput of 59,000 tons of ore per day, an estimated operational life of 27 years, and would produce approximately 30 million ounces of gold. Construction of the Project would take 3 to 4 years.

Major Project components include the proposed Mine Site, Transportation Corridor, and Pipeline. A brief summary of these Project components is provided in the sections below. See the Donlin Gold Final EIS Section 2.3.2, Alternative 2 – Donlin Gold’s Proposed Action, for a detailed description of the Project.

Proposed Mine Site Facilities: The Mine Site would occupy a total area of approximately 14 square miles (9,000 acres). The primary Project subcomponents of the Mine Site include two open pits, a WRF, a TSF, water treatment plants, hydrologic control features (freshwater diversion dams, diversion trenches, settling ponds, contact water dams, and a freshwater reservoir), and other mining facilities. See Engineering Drawings MA-200G through MA-214T for plan views of the Mine Site area (Attachment A1).

Mine Site development in the COA would require the BLM to take actions relating to ANCSA 17(b)—public easements necessary to address public safety and maintain access to public land. These ANCSA 17(b) public easement actions include five terminations, one donation, and one corrected easement quadrangle map. The State of Alaska, in cooperation with Donlin Gold and the ANCSA Corporations, would provide for access to public lands west of the COA in lieu of the FAS (Federal-Aid Secondary) Route No. 231 prior to BLM terminating existing easements. The BLM would enter into a Memorandum of Agreement with Calista, TKC, and Alaska Department of Natural Resources (ADNR) to implement these actions to move existing public easements out of the COA, as well as defining the location of an easement at the proposed Angyaruaq (Jungjuk) Port, thereby avoiding coincidence with the port and mine access road.

Proposed Transportation Corridor Facilities: The proposed Transportation Corridor includes a port facility at Angyaruaq (Jungjuk), a 30-mile mine access road from the port, a 5,000 foot airstrip, and other transportation facilities to support movement of cargo to the mine. See Engineering Drawings TA-300G through TA-316T for plan views of the Transportation Corridor (Attachment A1).

Proposed Pipeline Facilities: Donlin Gold proposes to construct a 14-inch-diameter steel Pipeline to transport natural gas approximately 316 miles from an existing 20-inch gas pipeline
tie-in near Beluga, Alaska to the Mine Site power plant. Natural gas would be supplied to the Pipeline from existing Cook Inlet infrastructure. The Pipeline would require one compressor station at Milepost (MP) 0.4. See Engineering Drawings PA-100G through PA-177 for plan views of the Pipeline (Attachment A1). An associated fiber optic line has also been proposed in the ROW corridor parallel to the natural gas pipeline for operational needs and communications. At the Mine Site, natural gas would be used primarily as a fuel source for generating electricity and for space heating.

Based on comments on the Draft EIS from agencies and the public, one route option (Alternative 2 North Option) was included in the Pipeline component for the evaluation to address concerns due to Pipeline crossings of the INHT. The North Option realigns a segment of the natural gas pipeline crossing to the north of the INHT in the Happy River Valley. The North Option alignment is slightly shorter and reduces the number of INHT crossings and the length that the Pipeline would be physically collocated with the INHT historic route. Alternative 2 North Option was adopted by Donlin Gold as part of their proposed action, with submittal of their revised DA application in December 2017, and is incorporated into this Project description.

Summary of Impacts to WOUS: Construction of Project facilities would require temporary or permanent terrain modifications, and placement of fills in WOUS. Planned reclamation activities for temporary disturbance areas are fully described in the 2017 Plan of Operations Reclamation and Closure Plan: Volume 4 (SRK 2017B). For the purposes of this JROD, the duration of fill is defined using the terms below:

- **Temporary**: Project areas where fill is placed into wetlands for a brief period to facilitate construction activities, then removed concurrent with construction activities, or as soon as construction is complete. The fill may be in place for a matter of days; up to 3 years for the Pipeline; or up to 5 years for the Mine Site and Transportation Corridor construction period.

- **Permanent**: Project areas where fill is placed for the duration of the mine life (estimated to be between 27 and 30 years), and permanent fill to WOUS that remains after Project closure.

Direct impacts to WOUS from the discharge of dredged or fill material, along with fill volumes, are shown in the tables below. Table 1 presents impacts that fall under Section 10 jurisdiction. The impacts are broken down into major subcomponents of the Project; Table 2 presents impacts that fall under Section 404 jurisdiction.

**Note:** Information in the following tables is based on wetlands field survey data and calculations in the Preliminary Jurisdictional Determination (Michael Baker 2017a, 2017b, 2016). These data were used to develop impact summary tables in the Final EIS Section 3.11, Wetlands. Differences in numbers in the following tables compared to the Final EIS were due to:

- Reporting by Project phase in the Final EIS (Construction or Operations);
- Including non-fill-related impacts such as vegetation clearing in the Final EIS totals;
- Applying different duration (temporary or permanent) assessment criteria in the Final EIS; and
- Not separating Section 404 and Section 10 jurisdiction impacts in the Final EIS.
Table 1: Alternative 2 North Option – Proposed Structures and Fill in Section 10 Waters of the U.S.

<table>
<thead>
<tr>
<th>Component</th>
<th>Navigable Waterbodies Impacted¹</th>
<th>Type of Material</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Temporary</td>
<td>Permanent</td>
</tr>
<tr>
<td></td>
<td>Acres</td>
<td>Linear Feet</td>
</tr>
<tr>
<td>Transportation Corridor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angyaraqua (Jungjuk Port)²</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pipeline</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HDD Crossing – South Fork Kuskokwim River³</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total for all Facilities</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Notes:
1. Includes direct impacts from fill and placement of structures in and under navigable WOUS.
2. Includes the amount of fill and linear feet of sheetrock placed below the ordinary high water mark of the Kuskokwim River.
3. Includes the linear feet of pipeline installed under the South Fork Kuskokwim River (within the bounds of ordinary high water mark of the river).

HDD = horizontal directional drilling
WOUS = waters of the U.S.

This page intentionally left blank.
Table 2: Alternative 2 North Option – Proposed Fill for Waters of the U.S.

<table>
<thead>
<tr>
<th>Component</th>
<th>Waters of the U.S. Impacted¹</th>
<th>Fill Volume Cubic Yards</th>
<th>Type of Material</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Temporary</td>
<td>Permanent</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>Acres</td>
<td>Linear Feet</td>
<td>Acres</td>
</tr>
<tr>
<td>Mine Site</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Donlin-Jungjuk Road (East of Crooked Creek)</td>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Laydown Areas</td>
<td>0</td>
<td>0</td>
<td>140</td>
</tr>
<tr>
<td>Mine Internal Roads</td>
<td>0</td>
<td>0</td>
<td>119</td>
</tr>
<tr>
<td>North Overburden Stockpile</td>
<td>0</td>
<td>0</td>
<td>209</td>
</tr>
<tr>
<td>Open Pit</td>
<td>0</td>
<td>0</td>
<td>550</td>
</tr>
<tr>
<td>Snow Gulch Freshwater Reservoir</td>
<td>0</td>
<td>0</td>
<td>42</td>
</tr>
<tr>
<td>South Overburden Stockpile</td>
<td>0</td>
<td>0</td>
<td>71</td>
</tr>
<tr>
<td>Tailings Storage Facility</td>
<td>0</td>
<td>0</td>
<td>526</td>
</tr>
<tr>
<td>Treated Water Discharge Facility</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Material Sites &amp; Stockpiles²</td>
<td>0</td>
<td>0</td>
<td>464</td>
</tr>
<tr>
<td>Waste Rock Facility</td>
<td>0</td>
<td>0</td>
<td>442</td>
</tr>
<tr>
<td>Total for Mine Site</td>
<td>0</td>
<td>0</td>
<td>2,572</td>
</tr>
<tr>
<td>Transportation Corridor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Airstrip</td>
<td>0</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Airstrip Spur Road</td>
<td>0</td>
<td>0</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Donlin-Jungjuk Road (West of Crooked Creek)</td>
<td>0</td>
<td>0</td>
<td>48</td>
</tr>
<tr>
<td>Angyaraq (Jungjuk Port)³</td>
<td>0</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Material Sites⁴</td>
<td>0</td>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td>Total for Transportation Corridor</td>
<td>0</td>
<td>0</td>
<td>105</td>
</tr>
</tbody>
</table>

¹ Temporary and permanent fills are calculated for each component and then summed to form the total fill for each component.
² Includes stormwater left over and water from old water treatment plant.
³ Includes material from old storage.
⁴ Includes material from old storage and historic fill.

Note: The fill volume for the Mine Site and Transportation Corridor are calculated by summing the fill volumes for all components within each category.
Table 2: Alternative 2 North Option – Proposed Fill for Waters of the U.S.

<table>
<thead>
<tr>
<th>Component</th>
<th>Temporary</th>
<th>Permanent</th>
<th>Total</th>
<th>Fill Volume Cubic Yards</th>
<th>Type of Material</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acres</td>
<td>Linear Feet</td>
<td>Acres</td>
<td>Linear Feet</td>
<td>Acres</td>
</tr>
<tr>
<td>Pipeline</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access Routes^5</td>
<td>14</td>
<td>2,568</td>
<td>0</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>Airstrips</td>
<td>12</td>
<td>2,065</td>
<td>0</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Block Valves</td>
<td>0</td>
<td>0</td>
<td>&lt;1</td>
<td>0</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Camps</td>
<td>&lt;1</td>
<td>136</td>
<td>0</td>
<td>0</td>
<td>&lt;1</td>
</tr>
<tr>
<td>HDD Workspace</td>
<td>4</td>
<td>898</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Material Sites</td>
<td>10</td>
<td>1,291</td>
<td>0</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Pipe Storage Yards</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Pipeline</td>
<td>494</td>
<td>46,326</td>
<td>200</td>
<td>0</td>
<td>694</td>
</tr>
<tr>
<td>Water Extraction Sites</td>
<td>1</td>
<td>62</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Work Pads</td>
<td>0</td>
<td>0</td>
<td>&lt;1</td>
<td>0</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Total for Pipeline</td>
<td>538</td>
<td>53,346</td>
<td>200</td>
<td>0</td>
<td>738</td>
</tr>
<tr>
<td>Total for All Facilities</td>
<td>538</td>
<td>53,346</td>
<td>2,877</td>
<td>172,844</td>
<td>3,415</td>
</tr>
</tbody>
</table>

Notes:
Numbers are rounded.
1. Includes direct impacts from cut/fill in WOUS. Impacts to wetlands are presented in acres. Impacts to streams/rivers are presented as linear feet.
2. Includes TSF Material Site-06/TSF Stockpile 2, TSF Material Site-07/TSF Stockpile 3, and TSF Stockpile 1.
3. Includes fill above the ordinary high water mark of Kuskokwim River.
4. Includes: MS-01, MS-05, MS-08, MS-10, MS-12, and MS-16. Discharge volume associated with MS-08, MS-10, and MS-16.
5. Includes: Cut/fill for construction access, shoofly access, and winter access routes.

HDD = horizontal directional drilling
WOUS = waters of the U.S.

Summary of Impacts to BLM-Managed Lands: Of the 316-mile proposed Pipeline corridor, approximately 97 miles and 2,329 acres of largely remote and undisturbed BLM-managed public land are affected. The BLM would offer a ROW Grant to Donlin Gold LLC for the construction, operation, maintenance, and termination of the proposed 14-inch underground natural gas pipeline and associated fiber optic cable, and related ancillary facilities. There would be a 150 foot-wide temporary construction corridor, and a 51-foot-wide operational corridor for the Pipeline ROW. During the 3-year construction period, there would be ancillary facilities affecting approximately 561 acres, including one existing and one new airstrip, 22 material sites, two large (300-person) civilian camps, as well as temporary access roads and work spaces. These ancillary facilities, which are necessary to support construction, would be decommissioned (except for the existing Farewell Airstrip, which would be improved during Construction and not decommissioned); and the land reclaimed to a natural condition on completion of the construction phase. The Pipeline and fiber optic cable would involve 69 stream/river crossings on BLM-managed land: 62 would be open-cut trench, and 7 would be HDD. During the 27-year operations and maintenance period, the 51-foot-wide, 97-mile-long natural gas pipeline and fiber optic cable corridor would affect approximately 601 acres. During operations and maintenance, the Pipeline would be accessed via helicopter rather than via temporary construction-phase roads and airstrips. The ROW Grant term would be for 30 years. On completion of the mining activities, the Pipeline and associated fiber optic cable and related ancillary facilities would no longer be needed, and would be decommissioned. Aboveground facilities would be removed, and the ROW corridor reclaimed to a natural condition.

Table 3 presents the miles and acres of impacted BLM-managed lands for both the temporary construction and operational ROW. Acres shown vary from Table 2.3-14 of the Final EIS because those acreage figures represented a 300-foot-wide planning corridor instead of the 150-foot-wide construction corridor that will be part of the BLM ROW Grant. Post-construction, the operations corridor will be 51 feet wide on BLM-managed lands.

### Table 3: Alternative 2 North Option – ROW and Ancillary Facilities on BLM-Managed Lands

<table>
<thead>
<tr>
<th>Construction Corridor and Ancillary Facilities (Acres)</th>
<th>Operations Corridor and Facilities (Acres)</th>
<th>Approximate Length (miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporary 150-foot Construction ROW</td>
<td>Ancillary Facilities¹</td>
<td>51-foot ROW</td>
</tr>
<tr>
<td>Pipeline (Alternative 2 North Option)</td>
<td>1,768</td>
<td>561</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. Includes access and shoofly roads, winter access routes, work pads, pipe storage yards, HDD workspace, water extraction sites, airstrips, material sites, and campsites. Includes entire footprint, including vegetation clearing areas on BLM-managed land. Estimated acres may be over-estimated due to overlapping components.

Source: Donlin Gold 2017g
3.2 PROJECT DESIGN REVISIONS

Changes since the Corps Public Notice: The 2017 permit application, which was updated after the Corps’ PN (published in November 2015 with release of the Draft EIS), includes revisions and refinements to the Project design and footprint that resulted, in part, from the NEPA process review. Notable changes included in the updated application were:

- Modified natural gas pipeline alignment to include the “North Route” option through the Alaska Range, which was adopted as part of the Applicant’s proposed Project to address concerns from agencies and the public regarding impacts to the INHT; resulting in:
  - Reduction of the overall construction impacts by about 65 acres; including about 6 acres less direct temporary impacts to wetlands and streams;
  - Reduction of the number of crossings (intersections) between the INHT historic route and the proposed Pipeline ROW (a reduction from 14 crossings to 5 crossings);
  - Reduction in the length that the Pipeline ROW would be collocated (within 100 feet) with the INHT historic route (from 2.5 miles to 0.2 miles);
  - Reduction in the length that the Pipeline ROW would be in proximity (within 1,000 feet) of the INHT historic route (from 14.3 miles to 5.3 miles);
  - Reduction in the overall length of shoofly roads (less than one mile difference);
  - Elimination of the HDD crossing of Happy River (note: while two unnamed tributaries of the Happy River would be crossed with HDD, the HDD crossing of Happy River itself would be eliminated);

- Updated calculations of the Project’s impacts to WOUS using Corps’ preliminary determined wetlands data; and

- Inclusion of an updated CMP.

In response to comments on the CMP, and through discussion with and feedback from the Corps, EPA, and USFWS regarding the CMP, Donlin Gold submitted a revised CMP in July 2018. See Section 6.0 of this JROD for a discussion of mitigation.

3.3 PROJECT PURPOSE AND NEED

Applicant’s Stated Purpose and Need: Donlin Gold’s stated purpose and need for the Project is (see Donlin Gold Final EIS Section 1.3.1) is to profitably produce gold from ore reserves owned by Calista, an ANCSA corporation, utilizing open-pit mining methods and proven ore processing methods suitable for application in remote western Alaska. The need for the proposed Project is to enable Calista and TKC to realize economic benefits for their shareholders and other ANCSA shareholders from lands with mineral potential selected and conveyed to them under ANCSA, by producing gold to meet worldwide demand. Gold is an established commodity with international markets.

The purpose of the Donlin Gold natural gas pipeline is to provide a long-term stable supply of natural gas to meet energy needs for the Project. The proposed Pipeline is designed as a
privately owned facility to support the proposed mine operation. Natural gas supplied by the Pipeline would be used to generate electricity for mine operations and heat for buildings. Donlin Gold has determined that the use of natural gas supplied via the proposed Pipeline is the most practicable, cost effective, and environmentally acceptable means of providing a reliable long-term energy source for the Project.

Donlin Gold’s need for the Pipeline is driven by the remote location of the Mine Site. There are no existing or readily useable resources that can provide sufficient energy to power the development and operation of the mine within Donlin Gold’s timeframe. The remote location does not have sufficient, naturally occurring gas resources, or other energy sources of the magnitude necessary to support mine development and operations. No existing transportation or utility infrastructure services are available to the proposed Mine Site or surrounding area. Access to the Mine Site is seasonal via the Kuskokwim River, or by aircraft, as weather conditions allow.

**Corps’ Determination of Basic Project Purpose:** The Corps has determined that the basic Project purpose [40 CFR 230.10(a)(3)] is to extract and process gold. Extracting and processing gold is not a water-dependent activity. The Project is partially sited in a special aquatic site, jurisdictional wetlands; therefore, pursuant to 40 CFR 230.10(a)(3), practicable alternatives not involving special aquatic sites are presumed to be available, and are presumed to have less adverse impacts on the aquatic ecosystem, unless clearly demonstrated otherwise. Alternatives are discussed below in Section 4.0.

**Corps’ Determination of Overall Project Purpose:** The overall Project purpose is used in the determination of practicable alternatives necessary to be evaluated under the CWA Section 404(b)(1) Guidelines. Practicable is defined as: “available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall project purpose” [40 CFR 230.10(a)(2)]. Although the definition of overall project purpose is the Corps’ responsibility, it must take into consideration the Applicant’s stated need for the project and the type of project being proposed (July 1, 2009, Updated Standard Operating Procedures for the U.S. Army Corps of Engineers Regulatory Program, page 15). The overall project purpose should be specific enough to define the Applicant’s needs, but not so restrictive as to constrain the range of alternatives that must be considered under the Guidelines.

The Corps has determined that the overall Project purpose is to produce gold from the Donlin deposit ore reserves using mining processes, infrastructure, logistics, and an energy supply(s) practicable for application in remote western Alaska.

**BLM Purpose and Need for Action:** The BLM actions under consideration is a 30-year ROW Grant for a natural gas pipeline and associated fiber optic cable, including related Temporary Use Permits, under the MLA, as amended (30 USC 185). The need to evaluate Donlin Gold’s proposal is established by the BLM’s responsibility under the MLA to respond to requests to transport oil or gas across public lands via pipeline. Consistent with 43 CFR 2881.2, the BLM’s objective or purpose in considering this action is to provide legal access across public lands in a manner that protects the natural resources associated with federal and adjacent lands, whether private or administered by a government entity; prevents unnecessary and undue degradation to public lands; promotes the use of ROW in common (where applicable); and coordinates, to the fullest extent possible, with State and local governments, interested individuals, and appropriate quasi-public entities.
The BLM decision to be made is whether or not to authorize the requested 30-year ROW Grant and associated Temporary Use Permits; and if authorized, what terms and conditions would apply to the authorizations. BLM would decide whether or not to authorize material sales necessary to provide gravel resources necessary to support the construction of the Pipeline via the Materials Act; and if authorized, what terms and conditions would apply to the material sales.

The BLM’s decision will also consider the proposed ANCSA 17(b) easement actions to address public safety concerns at the COA while providing public access to public lands in the vicinity of the mine COA (Final EIS Appendix Z).

Conformance with BLM Land Use Plans: In addition to the agency-specific guidance regarding purpose and need, the BLM has determined the Project is in conformance with two land use plans. The Ring of Fire Record of Decision and Approved Management Plan of March 2008, and the Southwest Planning Area, Management Framework Plan of November 1981 provide the overall long-term management direction for BLM-managed lands encompassed by the Donlin Gold Project.

3.4 SCOPE OF ANALYSIS

Scope of Analysis for Corps’ Jurisdiction:

The Corps’ federal involvement for a project proposed by a private actor is normally limited to a DA permit decision informed by an appropriate NEPA evaluation and public interest review, issued for activities and in areas over which the Corps has jurisdiction. However, the Corps is required to determine the scope of analysis for a NEPA document to address the impacts of both the specific activity over which the Corps has jurisdiction, and those portions of an entire project over which the Corps has sufficient control and responsibility to warrant federal review. In this instance, due to the configuration of streams and wetlands on the Project site, the regulated activities comprise a substantial portion of the Project so as to extend cumulative federal control and responsibility. Additional federal control and responsibility by the BLM and PHMSA extend to the Pipeline component. On these bases, the NEPA scope of analysis is the entire Project Area.

The substantive evaluation requirements of the CWA are outlined in guidelines developed by the Administrator of the EPA, in conjunction with the Secretary of the Army, and published in 40 CFR Part 230 (See Attachment B2). The fundamental precept of the Guidelines, which are binding regulations, is that discharges of dredged or fill material into WOUS, including wetlands, should not occur unless it can be demonstrated that such discharges, either individually or cumulatively, will not result in unacceptable adverse effects on the aquatic ecosystem. The Guidelines state that only the least environmentally damaging practicable alternative (LEDPA) can be permitted. Additional evaluation requirements are contained in the Corps’ public interest review (33 CFR Part 320.4(a)).

The Corps’ Section 404 jurisdiction for this Project is over the placement of fill into WOUS, including wetlands, for the proposed construction of the Mine Site components, Transportation Corridor components, and Pipeline components. The fill amount and surface area of impacts of each Project component are outlined in Tables 1 and 2 above.
Section 10 of the RHA of 1899 applies to the construction of any structure in, under, or over any navigable WOUS, the excavating from or depositing of material in such waters, or the accomplishment of any other work affecting the course, location, condition, or capacity of such waters. The substantive evaluation criteria for this authority is the Corps’ public interest review (33 CFR Part 320.4(a)).

The Corps’ Section 10 geographic jurisdiction for the Project is over all activities that occur in the Kuskokwim River. This work includes the sheet piles and fill associated with the Kuskokwim River Angyaraq (Jungjuk) Port and the South Fork Kuskokwim River HDD Crossing.

Scope of Analysis for the BLM’s Jurisdiction: The BLM scope of analysis describes which portions of the overall Project the BLM will evaluate, pursuant to NEPA, as the area under the BLM management control and responsibility.

The BLM’s involvement for the Project involves three actions:

1) ANILCA 810 analysis

For any project requiring an authorization from BLM, pursuant to ANILCA Section 810, the BLM is responsible for conducting the ANILCA Section 810 analysis for the Project. Based on ANILCA Section 810 and BLM Instruction Memorandum 2011-008, BLM determined that the 810 Analysis will address the portion of the Project requiring a BLM authorization (i.e., Pipeline ROW and all aspects of the Project that are dependent on that authorization and the associated Pipeline, to include mine construction and operations and river and road transportation aspects of the Project, because those components of the Project would not go forward if not for the Pipeline; and the Pipeline would not go forward if not for those other components. This is consistent with NEPA requirements for evaluation of connected actions.

2) ROW Grant

The BLM is required to respond to the ROW Grant application from Donlin Gold, pursuant to Section 28 of the Mineral Leasing Act (30 USC 185), and 43 CFR 2881.11 for the natural gas pipelines and related fiber optic cable that would cross federal lands under BLM jurisdiction. The BLM jurisdiction for this Project is limited to BLM-managed lands in the proposed Pipeline ROW corridor and necessary ancillary facilities, involving 97 miles and 2,329 acres of BLM-managed lands.

The BLM has reviewed the proposed ROW action pursuant to NEPA and other applicable federal laws and regulations, including the Endangered Species Act (ESA) and the NHPA. The Pipeline ROW would not be necessary if the construction and development of the proposed open-pit gold mine were not to occur. Therefore, for the BLM, the Pipeline is an interdependent part of the proposed mine development—a larger action—and depends on that larger action for its justification. Therefore, the development of the proposed Mine Site and the requested Pipeline ROW are—by definition—connected actions; and therefore must be analyzed as such in the BLM’s NEPA review and decision-making process (40 CFR 1508.25(a)(1).

3) ANCSA 17(b) public easements

ANCSA 17(b) public easements are rights reserved to the United States. They take the form of 60-foot wide roads, 25- and 50-foot wide trails, and one-acre sites for short-term uses. These rights are reserved when the BLM conveys land to a Native corporation under the Alaska Native Claims Settlement Act (ANCSA).
BLM is responding to Donlin Gold’s proposal (Final EIS Appendix Z) to relocate public access routes that currently go through the mine COA to access public land. Existing ANCSA 17(b) public easements inside the COA need to be moved and relocated outside the COA to avoid easement user conflict with mine development and operations. In addition, one easement quadrangle map needs to be corrected to clearly define a 17(b) easement route near the Jungjuk Port. This will avoid any potential public access conflicts with development of the mine access road leading from the Jungjuk Port area on the Kuskokwim River to the mine COA. These actions are pursuant to the ANCSA 17(b) Easement Management Handbook (IM AK 2007-037).

BLM has reviewed the proposed ANCSA 17(b) easement actions, including five terminations, one relocation by donation, and one corrected quadrangle map, to address public safety and access to public land in the vicinity of the mine COA and the Angyaruaq (Jungjuk) Port. The ANCSA 17(b) actions are necessary because the mine development cannot move forward without the actions proposed in the Public Easement Plan.

**Scope of Analysis for National Historic Preservation Act:** Section 106 of the NHPA requires each federal agency, prior to any federal or federally assisted or funded undertaking, to take into account the effect of its proposed undertaking on any property included in or eligible for inclusion in the National Register of Historic Places (NRHP) (hereafter called historic properties).

The Corps, BLM, State Historic Preservation Officer (SHPO), and Advisory Council on Historic Preservation (ACHP) have determined that a Programmatic Agreement for the Project is appropriate, because the effects on historic properties cannot be fully identified and mitigated prior to agency permit decisions, and historic properties may be discovered during Project implementation; and to record the terms and conditions agreed on to resolve potential adverse effects of the Project on historic properties, pursuant to 36 CFR 800.14(b). The Programmatic Agreement is included as Attachment A2 of this JROD.

The Corps, as the lead federal agency for Section 106 obligations under the NHPA, and in consultation with the BLM, the SHPO, ADNR, the ACHP, and Donlin Gold, has established the undertaking’s Area of Potential Effects (APE), as defined in 36 CFR 800.16(d), which encompasses direct and indirect effects on historic properties for alternatives carried forward for detailed analysis in the Final EIS. The APE applies to all lands, regardless of management status that may be affected by the Mine Site, Pipeline Corridor, transportation system, staging areas, access roads, borrow areas, or other related infrastructure to the Project undertaking. The APE is defined and documented in Appendix A of the Programmatic Agreement (see Attachment A2).

Section 106 consultation is further discussed in Attachment B3, Section B3.6 of this JROD.

**Scope of Analysis for Endangered Species Act of 1973 (ESA):** The ESA provides for conservation of fish, wildlife, and plant species considered to be at risk of extinction (threatened or endangered) in all or a substantial portion of their ranges, and to conserve ecosystems and habitats on which they depend. The USFWS and the National Marine Fisheries Service (NMFS) share regulatory authority for implementing ESA for the threatened and endangered species potentially affected by the Project.

Section 7 of the ESA requires all federal agencies to consult with the USFWS and/or NMFS when any action undertaken, funded, or permitted through the agency may affect an ESA-listed species or critical habitat. The determined scope for ESA is the Action Area, which means all
areas to be affected directly or indirectly by the federal action, and not merely the area that falls directly under the Corps’ regulatory jurisdiction. The Action Area may be larger than the scope for NEPA, Section 404 and Section 10.

The Action Area established by the Corps in consultation with the USFWS and NMFS includes the following proposed Project components: Mine Site; natural gas pipeline; access road; Angyaruaq (Jungjuk) Port; river transportation route; and the marine bargeing routes in the Bering Sea and Cook Inlet. Only the marine bargeing routes are addressed, because they are the only Project component intersecting habitat used by species under the ESA. The Bering Sea marine bargeing routes extend from Unimak Pass to Bethel (supply), and Dutch Harbor to Bethel (fuel). The Cook Inlet marine bargeing route runs between Beluga and Anchorage, and/or Beluga and Nikiski.

Biological Assessments were developed and are included in Appendix O of the Final EIS. ESA Section 7 consultation conclusions are summarized in this JROD as Attachment B2, Section B2.3.1; and Attachment B4, Section B4.3.

*Scope of Analysis for Magnuson-Stevens Fishery Conservation and Management Act:* Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires federal agencies to consult with the NMFS on any action authorized, funded, or undertaken that may adversely affect Essential Fish Habitat (EFH).

The Donlin Gold Project includes three primary components: 1) Mine Site; 2) natural gas pipeline; and 3) transportation infrastructure to include an access road, the Jungjuk Port, river transportation route, and marine bargeing routes in the Bering Sea and Cook Inlet. The Bering Sea marine bargeing routes extend from Unimak Pass to Bethel (supply), and Dutch Harbor to Bethel (fuel). The Cook Inlet marine bargeing route (supply) runs between Beluga and Anchorage, and/or Beluga and Nikiski. These three components define the Project Area, potentially affecting EFH.

The Mine Site facilities would be within Crooked Creek drainage, which flows into the Kuskokwim River at the village of Crooked Creek. Major Project components would be constructed in American Creek, Anaconda Creek, and Snow Gulch Basin.

An EFH Assessment was developed for the Project and is included in Appendix Q of the Final EIS. EFH consultation conclusions are discussed in Attachment B2, Section B2.3.4 of this JROD.
4 ALTERNATIVES

4.1 ALTERNATIVES CONSIDERED AND CARRIED FORWARD FOR DETAILED ANALYSIS

As described in Chapter 2 of the Final EIS, the Corps completed a rigorous and comprehensive process to identify and evaluate alternatives to the Project, as proposed by Donlin Gold. After careful study, seven alternatives were evaluated in the Final EIS (see Table 4 below). The action alternatives carried forward for analysis in the EIS vary from the proposed action in key engineering design, siting, and operational features, which address concerns raised in scoping, and provide a reasonable range of alternatives for comparison. For example, in one alternative, the Mine Site and the Pipeline components remain the same as in the proposed action, but two variants (Alternative 3A and Alternative 3B) are evaluated to reduce the amount of barging on the Kuskokwim River. The following sections provide a brief summary of alternatives.

Table 4: Donlin Gold Project Alternatives

<table>
<thead>
<tr>
<th>Alternative 1 – No Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative 2 – Donlin Gold’s Proposed Action</td>
</tr>
<tr>
<td>Includes One Option:</td>
</tr>
<tr>
<td>• North Option (Alternative 2 North Option)</td>
</tr>
<tr>
<td>Alternative 3A – Reduced Diesel Barging: Liquefied Natural Gas Powered Haul Trucks</td>
</tr>
<tr>
<td>Alternative 3B – Reduced Diesel Barging: Diesel Pipeline</td>
</tr>
<tr>
<td>Includes Two Options:</td>
</tr>
<tr>
<td>• Port MacKenzie Option</td>
</tr>
<tr>
<td>• Collocated Natural Gas and Diesel Pipeline Option (Collocated Pipeline Option)</td>
</tr>
<tr>
<td>Alternative 4 – Birch Tree Crossing Port</td>
</tr>
<tr>
<td>Alternative 5A – Dry Stack Tailings</td>
</tr>
<tr>
<td>Includes Two Options:</td>
</tr>
<tr>
<td>• Unlined Option</td>
</tr>
<tr>
<td>• Lined Option</td>
</tr>
<tr>
<td>Alternative 6A – Modified Natural Gas Pipeline Alignment: Dalzell Gorge Route</td>
</tr>
</tbody>
</table>

**No Action Alternative:** The No Action Alternative would result from the Corps not issuing required permits under Section 404 of the CWA and Section 10 of the RHA; and the BLM not granting the requested MLA ROW permits. There would be no Mine Site development, no new transportation facilities, and no Pipeline or fiber optic cable in areas over which the Corps or BLM exercise jurisdiction. The future of the existing camp, airstrip, and related facilities would be decided at the discretion of the land owners: Calista and TKC. The No Action Alternative represents a baseline for comparison of effects between the Proposed Action (Alternative 2) and the other action alternatives. Current ocean and river barging traffic would be expected to continue at similar levels. The No Action Alternative does not meet the purpose and need of the Project.
Alternative 2 – Applicant’s Proposed Action: Donlin Gold’s proposed action would establish an open-pit, hard-rock gold mine in southwestern Alaska on land leased from Calista. TKC has granted surface use rights to Donlin Gold. Donlin Gold also has legal control of approximately 13 acres in the Snow Gulch area, per a lease agreement with Lyman Resources in Alaska, Inc. The three main Project components include (see Section 3.1 above for additional information on the proposed Project):

- **Mine Site.** This component would include the pits, processing facility, WRF, TSF, and power plant.

- **Transportation Corridor.** This component would include a third party to transport fuel and other supplies to the Project site from Dutch Harbor or other locations outside Alaska; a dedicated new fleet of river barges and tugs; the Annyaruaq (Jungjuk) Port; a 30-mile access road; and a 5,000-foot dedicated airstrip.

- **Pipeline.** This component would include an approximately 316-mile-long, 14-inch-diameter, buried natural gas pipeline to support power generation at the Mine Site, built from Cook Inlet to the Mine Site. Based on comments on the Draft EIS from agencies and the public, one route option (Alternative 2 North Option) was included in the Pipeline component for evaluation to address concerns due to Pipeline crossings of the INHT. The North Option realigns a segment of the natural gas pipeline crossing to the north of the INHT in the Happy River Valley. The North Option alignment is slightly shorter, and reduces the number of INHT crossings and the length that the Pipeline would be physically located in the INHT ROW. Alternative 2 North Option was adopted by Donlin Gold as part of their proposed action, with submittal of their revised DA application in December 2017.

Alternative 3A – Reduced Diesel Barging: LNG-Powered Haul Trucks: Alternative 3A would use primarily liquefied natural gas (LNG) to fuel the large (300-plus-ton payload) trucks that would move waste rock and ore from the open pits. These large trucks would account for approximately 75 percent of the total annual diesel consumption under Alternative 2. Trucks hauling cargo and fuel on the mine access road from Annyaruaq (Jungjuk) Port would not be converted to LNG.

The primary differences between Alternative 3A and Alternative 2 would be the addition of a 220,000-gallon-per-day LNG plant and storage tanks near the processing plant; reduced consumption of diesel; reduced barge trips; reduced on-site diesel storage; and increased natural gas consumption. Currently, LNG-powered haul trucks are not in full commercial production. The technology to use natural gas products (such as LNG or compressed natural gas) in other industrial applications is proven, and equipment manufacturers are actively developing dual-fuel (diesel and natural gas) options for the mining industry.

Alternative 3B – Reduced Diesel Barging: Diesel Pipeline: Under Alternative 3B, an 18-inch-diameter diesel pipeline would be constructed from Cook Inlet to the Mine Site to virtually eliminate the need for Project-related diesel barging on the Kuskokwim River during Operations, and reduce the overall number of barge trips. The natural gas pipeline proposed for Alternative 2 would not be constructed, and natural gas would not be used. The power plant would be fueled only with diesel.

The diesel pipeline would traverse 334 miles, and would be buried in the same corridor proposed for the natural gas pipeline described under Alternative 2. This design would require
an additional segment between the Tyonek North Foreland Facility and the natural gas pipeline corridor start. This additional segment would cross the Beluga River using HDD. There would be improvements to the existing Tyonek North Foreland Barge Facility and transportation of diesel fuel in Cook Inlet. The Pipeline alignment crossing the Castle Mountain and Denali-Farewell faults would be constructed above grade, similar to the natural gas pipeline in Alternative 2.

Two options to Alternative 3B were added based on Draft EIS comments from agencies and the public:

- **Port MacKenzie Option** - This option would use the existing Port MacKenzie facility to receive and unload diesel tankers, instead of the Tyonek facility considered under Alternative 3B. A pumping station and tank farm of similar size to the Tyonek conceptual design would be provided at Port MacKenzie. A Pipeline would extend northwest from Port MacKenzie, route around the Susitna Flats State Game Refuge, cross the Little Susitna and Susitna Rivers, and connect with the Alternative 3B alignment at approximately MP 28.

- **Collocated Natural Gas and Diesel Pipeline Option** - This option (Collocated Pipeline Option) would add the 14-inch-diameter natural gas pipeline proposed under Alternative 2 to Alternative 3B. Under this option, the power plant would operate primarily on natural gas instead of diesel, as proposed under Alternative 3B. The diesel pipeline would deliver the diesel that would be supplied using river barges under Alternative 2; and because it would not be supplying the power plant, could be reduced to an 8-inch-diameter Pipeline. The two pipelines would be constructed in a single trench that would be a slightly wider trench, work space, and permanent ROW than proposed under either Alternative 2 or Alternative 3B. This option could be configured with either the Tyonek or Port MacKenzie dock options.

**Alternative 4 – Birch Tree Crossing Port**: Alternative 4 would move the port site to Birch Tree Crossing (BTC), about 75 river miles below the Angyaruaq (Jungjuk) Port site, and 124 river miles upstream from Bethel, reducing the barge distance for freight and diesel to the Mine Site. The same volume of cargo and diesel fuel would be transported by barge as in Alternative 2, and there would be no other substantive changes to other Project components.

The 65-acre BTC Port site would be situated on the Kuskokwim River, and would consist of an onshore pad with areas for general storage, fuel storage, a warehouse truck shop, and living accommodations; and a filled area on the riverbank to allow container barges to dock. An approximately 76-mile-long, 30-foot-wide, all-season gravel access road (46 miles longer than the mine access road in Alternative 2) would link the BTC Port to the Mine Site to transport fuel and cargo.

**Alternative 5A – Dry Stack Tailings**: Alternative 5A would use the dry stack tailings (DST) method instead of the subaqueous tailings method that would be used under Alternative 2. This alternative was developed to avoid the potential for accidental releases from the tailings dam, proposed under Alternative 2.

Under Alternative 5A, tailings would be dewatered in a filter plant using specialized equipment to produce a partially saturated, compactable filter cake. This material would be delivered to the TSF by truck, then spread and compacted in thin layers using bulldozers. Residual process water removed from the tailings would be transported to an operating pond via pipeline, and
reclaimed water from the pond would be pumped back to the processing plant for reuse. The main dam, upper dams, and operating pond would be fully lined with a 60-milliliter (1.5-millimeter) linear low-density polyethylene (LLDPE) liner.

This alternative includes two options:

- **Unlined Option** – The TSF would not be lined with an LLDPE liner. The area would be cleared and grubbed, and an underdrain system placed in the major tributaries under the TSF and operating pond to intercept groundwater base flows and infiltration through the DST, and convey it to a Seepage Recovery System. Water collecting in the Seepage Recovery System would be pumped to the operating pond, lower contact water dam, or directly to the processing plant for use in process.

- **Lined Option** – The DST would be underlain by a pumped overdrain layer throughout the footprint, with an impermeable LLDPE liner below. The rock underdrain and foundation preparation would be completed in the same manner as the Unlined Option.

**Alternative 6A – Modified Natural Gas Pipeline Alignment: Dalzell Gorge Route:** Alternative 6A was the Applicant’s original proposed pipeline alignment through the Alaska Range. In December 2013, Donlin Gold revised their Plan of Development in favor of the currently proposed alignment, which avoids Dalzell Gorge. Alternative 6A would realign the natural gas pipeline west between MP 106.5 to MP 152.7, traversing Dalzell Gorge. The route would deviate from the Alternative 2 alignment at approximately MP 106.5, trend west, and parallel the Happy River for approximately 5 miles before trending northwest at Pass Creek and through Rainy Pass and Dalzell Gorge.

The terrain through the gorge is steep; the route through Rainy Pass starts at an elevation of 2,500 feet above mean sea level, and climbs to 3,327 feet mean sea level over about 6 miles. Approximately 34 miles of this route would be in the immediate vicinity of, or cross, the INHT.

## 4.2 ALTERNATIVES ELIMINATED DURING THE EIS PROCESS

Alternative options eliminated from further analysis are presented in the Final EIS in Section 2.4, Alternatives Considered but Eliminated from Detailed Analysis. Appendix C of the Final EIS includes tables that explain in detail why each option was considered, and provides rationale for their elimination. Over 300 alternative options were evaluated in Appendix C, including alternative mining methods, alternative water management and treatment, alternative infrastructure, and alternative locations for Project component facilities.

Overall, few options were eliminated because they did not meet the screening test for Purpose and Need. The technical and economic feasibility (including logistics in some cases) were evaluated carefully, and these factors were more often the basis for eliminating options. Environmental impacts were assessed at a screening level; some options were eliminated because they would not reduce environmental impacts when compared with the corresponding components of the Applicant’s proposed action. Others were not carried forward as options because they were more properly characterized as potential mitigating measures.

**Other Location Alternatives:** The Corps has determined that the overall Project purpose is to produce gold from the Donlin deposit ore reserves using mining processes, infrastructure, logistics, and an energy supply(s) practicable for application in remote western Alaska. Other
locations would not meet the overall purpose to produce gold from the Donlin deposit, and are not practicable.

4.3 CORPS’ DETERMINATION OF THE LEAST ENVIRONMENTALLY DAMAGING PRACTICABLE ALTERNATIVE (LEDPA)

The DA permit application evaluation requires compliance with the 404(b)(1) Guidelines. Under Subpart B of the 404(b)(1) Guidelines, the Corps’ evaluation of the proposed Project is required to address four tests that the Project must meet to receive a Section 404 permit. One of these tests results is the identification of the LEDPA. See Attachment B2 – Evaluation of The Discharge of Dredge and Fill Material in Accordance with 404(b)(1) Guidelines.

While making a compliance determination, the Corps may gather information sufficient to support and make its decisions by soliciting comments from other federal, tribal, state, and local resource agencies and the public. The Corps, however, is solely responsible for reaching a decision on the merits of the permit application, including determination of the Project purpose, the extent of the alternatives analysis, which alternatives are practicable, the LEDPA, the amount and type of mitigation that is to be required, and all other aspects of the decision making process.

With inclusion of the measures and special conditions discussed in Section 6.0, and based on the evaluation of the environmental impacts of the Applicant’s proposed action (see Attachments B2 – B4), the Corps concludes that Alternative 2 North Option is the LEDPA. This alternative meets the overall Project purpose; is practicable in consideration of costs, logistics, and existing technology; and has the least total direct impacts (excavation, fill, and vegetation clearing) and potential indirect impacts (dust, dewatering) to WOUS of the practicable alternatives (see Final EIS Section 3.11, Wetlands). Table B2 in Attachment B2 summarizes the analysis for determining the LEDPA.

4.4 BLM’S RATIONALE FOR ADOPTING ALTERNATIVE 2 NORTH OPTION

Among the alternatives evaluated in the Final EIS, the Alternative 2 North Option will result in fewer overall environmental impacts than Action Alternatives 3A, 3B, 4, 5A and 6A, and therefore is considered by BLM to be the environmentally preferred alternative.

The Draft EIS included the Applicant’s proposal, Alternative 2, to co-locate the natural gas pipeline with approximately 4 miles of the INHT, and involved 13 crossings, and was otherwise in 1,000-foot proximity of the INHT for 10.5 miles. The Final EIS (April 2018) includes a revised Applicant proposal, Alternative 2 North Option, to reduce the coincidence with the INHT to a total of just 4 crossings; and only 0.1 mile of Pipeline will be physically located in the 400-foot easement of the INHT. Overall construction impacts with Alternative 2 North Option will be about 65 acres less than construction of the originally proposed Alternative 2. The North Option segment of the Pipeline crosses only State lands along the INHT; no BLM-managed lands coincidental with the INHT will be impacted.

Alternative 2 North Option provides for less disturbance and less potential for environmental damage in the ROW corridor as compared to Alternative 3B co-located natural gas and diesel pipeline. Alternative 3B, co-located natural gas and diesel pipelines, would involve 19
additional miles in the length and 5 additional feet in the width of the ROW corridor to accommodate the diesel pipeline. This would increase the overall disturbance footprint on BLM-managed land. The diesel pipeline would increase potential for environmental damage in the case of a diesel pipeline rupture in the otherwise remote and undeveloped terrain. Alternative 3B would provide the need to retain new airstrips and gravel access roads during operations for diesel spill response capacity and would result in greater long-term ROW corridor and ancillary facilities footprint impacts to BLM-managed lands. The long-term need for the airstrips and gravel access roads in Alternative 3B would result in greater competition for subsistence resources due to increased access to the otherwise remote and undeveloped region. The increased helicopter surveillance of the diesel pipeline would also provide for greater disturbance to subsistence activities.

Alternative 2 North Option provides for less visual and direct physical disturbance to the INHT corridor as compared to Alternative 6A, Modified Natural Gas Pipeline Alignment: Dalzell Gorge Route. Alternative 6A involves the ROW corridor coincidence with the INHT in the Alaska Range through Rainy Pass and Dalzell Gorge, and the ROW corridor being closer to the BLM-managed Rohn Public Shelter Cabin. Alternative 2 involves the ‘Jones alignment’ which avoids the INHT in this area of the Alaska Range all together, as well as avoiding proximity to the Rohn Public Shelter Cabin.
5 PUBLIC INVOLVEMENT

Chapter 6 of the Final EIS describes consultation and coordination with agencies and public involvement opportunities for the EIS. A timeline and summary of milestones for the Project are included in the Section 1.1 (Background) of this document.

A public involvement plan was developed prior to scoping to provide the basis for the Corps and cooperating agencies to provide guidance for public outreach activities. The Project website (http://www.DonlinGoldEIS.com) was launched at the onset of the Project, and a Project newsletter was sent out that explained the NEPA/EIS process and how to participate. The Corps held numerous well-attended meetings, hearings, and public outreach presentations; and discussions with potentially affected tribal governments occurred throughout the NEPA process. Detailed information on public outreach activities, tribal coordination, and government-to-government consultation, including summary tables for meetings, are included in Chapter 6 of the Final EIS. The Corps’ initiation of government-to-government consultation with federally recognized tribes is included in Appendix P of the Final EIS. Following public scoping, the Corps and cooperating agencies selected substantive impact issues identified during public and agency scoping for further analysis, and eliminated non-substantive issues from evaluation. Selected issues are listed in Table 2 of the Executive Summary of the Final EIS, and documented as Statements of Concern (SOCs) in the Scoping Report (Final EIS, Appendix B). SOCs are summary statements capturing a single substantive point that may have been expressed in a number of individual comments.

During the public comment period for the Draft EIS, the Corps received 529 unique submissions. Three form letters were received. Of these unique submissions, 17 were transcripts of the public meetings. Over 5,000 substantive comments were identified in submissions, which were then grouped into SOCs. A summary of the comment analysis process and tables addressing each SOC by resource area is included in the Comment Analysis Report (CAR), Appendix X of the Final EIS.

The Applicant’s updated CMP (updated December 2017, included as Appendices J and M in the Final EIS) was open for public review and comment from April 27, 2018 through May 29, 2018 (SPN-1995-120). Comments on the Final EIS were received from the EPA, The Kuskokwim Corporation, Calista Corporation, Knik Tribal Council, Donlin Gold, the Center for Science in Public Participation (CSP2), and 13 members of the public. Many of the comments received were duplicative of comments previously received and addressed in the Final EIS, or Appendix X, the CAR. New substantive comments were received and responded to; see Attachment B1 for the Corps’ analysis of these comments.

Additional BLM Public Involvement: The BLM considered public comment throughout the EIS process. BLM participated in public scoping and Draft EIS public meetings conducted by the Corps and Donlin Gold (listed in Chapter 6 of the Final EIS). The BLM also participated in agency scoping meetings that included Native Villages. It was through these public involvement opportunities that the BLM identified public issues of concern to incorporate into the EIS analysis and consequential outcome in the Final EIS.

Pursuant to ANILCA Section 810(a)(1) and (2), the BLM also conducted 12 hearings subsequent to many of the Draft EIS public meetings to hear and gather comments regarding potential impacts to subsistence use resulting from the alternatives considered in the Draft EIS. The ANILCA 810 hearings were conducted in the following communities: Aniak, Crooked Creek,
Anchorage, Bethel, Akiak, Quinhagak, McGrath, Nunapitchuk, Tyonek, Lower Kalskag, Holy Cross, and Chuathbaluk.

The BLM conducted a separate government-to-government inquiry regarding the Project. The BLM sent a letter of notification in August 2014 to the 66 tribes listed in Appendix P of the Final EIS, offering the tribes the opportunity to participate in formal government-to-government consultation with the BLM, apart from the Corps.

The BLM met with Calista and The Kuskokwim Corporation periodically throughout the development of the Donlin Gold Project EIS. The meetings involved consultation and updates on BLM involvement with the Project, and hearing issues or concerns regarding consequences of any potential BLM actions related to the proposal. Discussion topics included the various alternatives being considered, subsistence, the ANILCA 810 subsistence analysis, economics, ANCSA 17(b) public easements, NNIS, and public involvement, as well as our administrative protocol for necessary actions to implement the proposed Donlin Gold Project on BLM-managed lands.
6 MEANS TO MINIMIZE, AVOID, AND MITIGATE ADVERSE ENVIRONMENTAL IMPACT

6.1 APPLICANT’S PROPOSED MITIGATION (AVOIDANCE, MINIMIZATION, AND MITIGATION)

The Applicant provided a comprehensive statement of avoidance, minimization, and compensation in the CMP (revised Block 23, July 2018); included at Attachment B5 of this JROD. The Applicant has planned the proposed Project to avoid and minimize impacts to the WOUS during construction, operations, and closure phases of the Project. Due to the abundance of wetlands in the Project area, avoiding discharges into WOUS is not practicable. Donlin Gold has avoided or minimized fill impacts to wetlands and streams through facility design and optimization. A summary of the Applicant’s measures to avoid and minimize impacts to WOUS is described below. The Applicant’s proposed compensatory mitigation is discussed in Section 6.2.5.

6.1.1 AVOIDANCE AND MINIMIZATION

The following is a summary of the avoidance and minimization measures which are described fully in Block 23 of the final CMP:

6.1.1.1 MINE SITE

The 2017 PJD (Michael Baker 2016, 2017) for the Project shows that ridgetops and hillsides at higher elevations in watersheds are upland, while waters of the U.S. are more prevalent in valley bottoms and hillsides at lower elevations in watersheds. The Proposed Project infrastructure layout maximizes the use of uplands, while minimizing encroachment on WOUS to the extent practicable. Potential mine area impacts were reduced by placing facilities in fewer watersheds and WOUS. Facility placement and design are typically more efficient on flatter ground. However, to avoid WOUS, the facilities were placed on upland ridges as feasible.

The proposed locations of the WRF, TSF, mine facilities, Snow Gulch freshwater reservoir, material sites, and NOB and SOB stockpiles avoid anadromous fish habitat; however, while impacts to resident fish habitat (primarily Dolly Varden char) have been minimized, they could not be completely avoided. The location of the open pit is determined by the presence of ore and geotechnical constraints, which makes it immovable and irreplaceable in nature. Design criteria included access to the mineral resources; minimizing waste rock volumes; maintaining pit wall stability; and minimizing disturbance footprint. Studies were completed to determine the steepest practicable wall slopes to maintain stability, and consequently minimize the surface disturbance of the pit. The impacts to WOUS by the open pit would be unavoidable, and have been minimized to the extent practicable.

Potential locations for storage of waste rock considered placement of all waste rock in the American Creek valley, or splitting the waste rock storage between American Creek and Anaconda Creek or Snow Gulch. Siting the WRF within American Creek watershed provides the most practical option because of the proximity to the open pit to minimize transportation cost, and the ability to use the open pit to control runoff post mine closure. The WRF minimizes WOUS impacts with a compact footprint located in the upper watershed of American Creek.
General design criteria for the mine area facilities included sufficient space to accommodate mine facilities (e.g., crusher, processing facility, power plant, fuel storage, and laydown pads); proximity to the open pit, ore stockpile, and TSF to minimize ore and tailings transportation costs; geometrically designing pads with the lowest volumes of cut and fill; wetlands avoidance through strategic location of facilities; and factors such as hydrology, and soil stability. Locating the process facilities in the middle portion of the American ridge avoids all impacts to WOUS.

Material sites are necessary for the construction of mine facilities and roads. All material site locations were selected outside the floodplain of Crooked Creek to avoid impacts to anadromous fish. The sites identified provide high volume, high quality material, while minimizing access road distances. The amount of aggregate estimated to be required was minimized by designing facilities and roads that would need the least material to construct and maintain. The material site required to construct the Snow Gulch freshwater dam has been sited on a ridgetop where suitable material is present to avoid WOUS. In summary, although some material sites are located in WOUS, they were sited outside of the Crooked Creek floodplain and away from headwater streams.

6.1.1.2 TRANSPORTATION FACILITIES

Engineering design criteria for the mine access road specify a two-lane access road that minimized construction and maintenance costs; used the lowest volumes of fill; minimized drainage crossings and placed crossings perpendicular to flow; and located material sites close to the proposed road to reduce impacts of material site access roads.

Transportation facilities are located on upland ridgetops instead of wetter hillsides and valleys, as practicable, or sited away from WOUS. Examples of this are the Donlin-Jungjuk Road, camp, and airstrip. Transportation facilities require the development of 13 material sites, five of which would impact WOUS. Material site boundaries were adjusted to avoid and minimize impacts to WOUS, as practicable. The location of the transportation facilities limits the number of watersheds disturbed. The airstrip is sited on a ridgetop to minimize the amount of cut and fill in WOUS.

The port location selection criteria included distance to the mine to minimize road footprint and transportation costs; avoidance of WOUS; adequate depth to dock and maneuver barges throughout the summer season without the need to dredge; avoidance of cultural resources; minimization of the amount of onshore grading; minimization of the probability of water or ice jams overtopping the wharf during the freshet; and sizing to fit 1,000 stackable containers. The DA permit application notes that the proposed Angyaruaq (Jungjuk) Port would impact 30.5 acres including 13.5 acres of unavoidable impacts to WOUS. The Angyaruaq (Jungjuk) Port footprint was reduced by planning to store cargo temporarily rather than permanently for transport to and from the mine; transporting cargo in stackable containers; and stacking loaded containers up to three high and empty containers up to six high. Following mine closure, the port will be reclaimed by removing the wharf fills, including sheet pile, and the area will be re-contoured leaving the access road and a “beach-type” landing in place.

Where practicable, facilities will share space or accommodate multiple uses to minimize the project ground disturbance footprint: the proposed camp facilities will be constructed within the disturbance footprint of Material Site-01; non-wetland material sites will be used for the temporary storage of construction equipment, refueling, and overburden storage during
construction; the airport is placed in the closest practicable location to the Donlin-Jungjuk Road and on a ridgeline in predominantly uplands. The Donlin-Jungjuk Road will be used to gain access to the airport with a short spur road. Transmission lines are designed parallel to roads to reduce access route footprints and the number of drainages disturbed.

The Donlin-Jungjuk Road is designed to minimize the number of stream and drainage crossings by following upland ridgelines to the extent practicable (Figure 4). Where stream crossings were unavoidable, the road approaches are designed to be perpendicular to the flow to minimize impacts to WOUS. Bridge structures and/or culverts will be installed at each stream and drainage crossing to facilitate vehicle passage and minimize impacts. Bridge structures will be installed at six major stream crossings where fish presence has been documented. Each bridge is designed to span the width of the creek, either as a steel span or steel span arch, and to account for high-water flow conditions. Riprap will be placed along the length of the arch or wall bases on both the upstream and downstream ends of the structure to protect the arch bases from erosion. Minor stream crossings and drainages will have appropriately sized culverts installed to ensure cross flow and maintain hydrologic connectivity.

6.1.1.3 NATURAL GAS PIPELINE FACILITIES

The proposed pipeline area facilities include a natural gas pipeline and fiber optic cable, compressor station, metering station, pig launcher/receiver site, check valves, and associated construction related support facilities such as construction camps and temporary airstrips, construction access roads, material sites, pipeline storage yards, shoofly roads, HDD workspaces, water extraction sites, work pads, and the pipeline construction ROW.

Design considerations for the proposed pipeline route include selection of the shortest pipeline length possible to minimize project footprint, while avoiding the following to the extent practicable: geotechnical hazards; hydrological hazards; known environmental and cultural sites; the INHT; and potential land use conflict areas. The pipeline route and ROW design also consider seasonal construction schedules; constructability; and avoidance and minimization of impacts to WOUS.

The pipeline has been designed to be installed primarily underground, eliminating the need for road access, which would create permanent roads and long-term impacts along the pipeline route.

All pipeline stream crossings were analyzed for flow, width, and characterization to determine crossing modes to avoid major diversions in rivers. HDD methods are proposed to install the pipeline underneath the Skwentna, Happy, Kuskokwim, George, East Fork George and the North Fork George rivers. Excavated cuttings from HDD sites will not be placed in waterbodies or in drainages. Without HDD crossings, the crossings would likely be aerial and require a larger disturbance footprint for gravel pads necessary for work areas, both of which would create additional potential impacts. Criteria for HDD stream crossing locations include 100-year flood recurrence interval, depth of cover, setbacks for pipe exposure, bank mitigation/restoration to prevent erosion, bank protection, fish habitat and recreation value, and adverse impacts to WOUS.

The pipeline area includes 69 material sites totaling 1,008-acres, of which six of the pipeline area material sites impact wetlands and WOUS (10.4 acres of wetland impacts). Donlin Gold developed a Transportation and Pipeline Area Wetland Impact Minimization Work Plan
detailing the restoration for these areas beyond the reclamation requirements established by the State of Alaska.

Work pads will be the minimum size necessary for equipment and construction activities and will be sited in uplands along the pipeline ROW. Temporary construction camps and airstrips are sited in uplands. Existing winter trails will be integrated into the winter ice routes for transportation of pipeline construction infrastructure. The timing of the construction and use of ice roads eliminates the need for permanent gravel access roads and construction pads. The pig launcher/receiver site is sited in uplands.

Many facilities along the pipeline will be multi-purpose to minimize the extent of the disturbance footprint. These co-located or progressively-located facilities include: material sites, laydown areas, equipment storage, staging areas, fueling areas, pipeline storage yards, material storage sites, camp units, and airstrips.

Erosion control and construction methods will be described in the SWPPP, and will comply with the State of Alaska 2016 Construction General Permit for Stormwater Discharges for Large and Small Construction Activities. BMPs for embankment stabilization, including contouring and seeding will be required project-wide to reduce embankment erosion and potential sediment runoff into WOUS. Construction methods in wetlands will minimize construction related effects on wetlands, including marking wetland boundaries and clearing limits, winter construction to the maximum extent practicable, confining activities to the construction zone to prevent disturbance of surrounding vegetation, maintaining slope stability, controlling erosion, using mats or other ground protection during non-winter months as practicable, maintaining existing wetland hydrology, and constraining permanent facilities to uplands.

Most areas underlain by permafrost will be crossed during winter to minimize disturbance from trenching. A seasonal construction timeline minimizes impacts to WOUS by timing construction activities in lowlands in the winter and in uplands during the summer. Approximately 60 percent of the total pipeline length will be constructed during frozen winter conditions to minimize wetland and soil disturbances from equipment. Snow and ice roads with frost packing will provide a stable surface for equipment to operate.

6.2 CORPS’ MITIGATION DETERMINATION

6.2.1 COMPENSATORY MITIGATION REQUIRED

Is compensatory mitigation required? ☑ yes ☐ no

6.2.2 MITIGATION BANK

Is the impact in the service area of an approved mitigation bank? ☑ yes ☐ no

4.26 acres of wetland impacts would occur within the primary and secondary service area of an approved mitigation bank.

Does the mitigation bank have the appropriate number and resource type of credits available? ☑ yes ☐ no ☐ n/a
6.2.3 IN-LIEU FEE PROGRAM

Is the impact in the service area of an approved in-lieu fee program? □ yes □ no

4.91 acres of wetland impacts would occur within the service area of an approved in-lieu fee program. The 4.26 acres of wetland impacts identified above in Section 6.2.2 overlap with the 4.91-acre area of wetland impacts that would occur within the service area of an approved in-lieu fee program.

Does the in-lieu fee program have the appropriate number and resource type of credits available? □ yes □ no □ n/a

6.2.4 COMPENSATORY MITIGATION OPTIONS

Check the selected compensatory mitigation option(s):

☑ mitigation bank credits
☑ in-lieu fee program credits
☑ permittee-responsible mitigation under a watershed approach
☐ permittee-responsible mitigation, on-site and in-kind
☑ permittee-responsible mitigation, off-site and out-of-kind

6.2.5 PROPOSED COMPENSATORY MITIGATION

Donlin Gold submitted a Conceptual CMP in August 2015. A revised draft CMP was included in the December 2017 DA permit application (Block 23). In response to feedback from the Corps, EPA, and USFWS, Donlin Gold submitted a final CMP in July 2018 (Attachment B5 of this JROD).

The Corps is requiring compensatory mitigation for permanent loss of aquatic resources as a result of fill impacts from the proposed Project totaling 2,877 acres of wetlands, 3 acres of fill below the ordinary high water mark of the Kuskokwim River, and 175,316 linear feet of streams. Mine Site and Transportation Corridor components would permanently fill 2,677 wetland acres, 3 acres of fill below the ordinary high water mark of the Kuskokwim River, and 173,953 linear feet of streams, and the Pipeline would permanently fill 200 wetland acres and 1,363 linear feet of streams.

Pipeline facilities would temporarily impact 538 wetland acres and 53,346 linear feet of stream. These wetlands and streams would be restored prior to finalizing construction and are expected to return to their previous conditions shortly thereafter. Additionally, Pipeline construction would not impact more than 0.03 percent of any watershed it crosses. Therefore, the Corps is not requiring compensatory mitigation for the temporal loss of wetland and stream functions. Some project activities in wetland areas include vegetation clearing, winter roads, and work areas where no placement of fill would occur. For these activities, the Corps is not requiring compensatory mitigation.

All but 4.91 acres of the proposed Project impacts occur outside of the service areas of existing mitigation banks or In-Lieu fee service areas. Therefore, Donlin Gold researched permittee responsible options focusing first on the immediate watershed (HUC-10), and then systematically assessing larger hydrologic units for compensatory mitigation opportunities.
They evaluated six historical mining operations that remediation, restoration and preservation could feasibly be conducted. Donlin Gold considered the sites in terms of practicability including availability, feasibility and cost, land ownership and long term durability, and the potential for ecological enhancement to wetlands areas, streams and riparian areas. Efforts also considered out-of-kind and off-site reclamation and restoration of the Newtok village, community water and wastewater system improvements in the Yukon-Kuskokwim (Y-K) region, solid and hazardous waste management in the Y-K region, erosion control projects in the Kuskokwim River watershed, all-terrain vehicle trail hardening projects in the Y-K region and non-native species plant removal in the Crooked Creek watershed. Donlin Gold proposes two Permittee-Responsible Mitigation (PRM) projects. The proposed compensatory mitigation projects are summarized below.

6.2.5.1 CHUITNA PRM PLAN

The Chuitna PRM Plan would preserve 5,870 acres, of which 3,269 acres are wetlands and ponds, 418 acres of stream and river area (258,056 linear feet), and 2,183 acres of upland and riparian buffers in the Chuitna River watershed. The applicant proposes to protect this area long term through a deed restriction. See Tables 5 and 6 for a summary of acres and miles of proposed compensatory mitigation.

The Chuitna preservation area contains wetlands and aquatic resources that are unique to the area and provide valuable ecosystem functions at the watershed level. The preservation area includes headwater streams flowing through large bogs, connecting to intermediate streams with highly productive salmon and riparian habitat, into the Chuitna River, and to its outlet through an estuarine area into Cook Inlet.

Overall, 99 percent (5,852 acres) of the preservation area is located within the Chuitna River HUC-10 watershed, while less than 1 percent (18 acres), at the mouth of the Chuitna River, is located within the Old Tyonek Creek-Frontal Cook Inlet HUC-10 watershed. The most common wetland vegetation type in the two HUC-10 watersheds is freshwater forested/shrub followed by estuarine habitat, the majority of which is within the Old Tyonek Creek-Frontal Cook Inlet watershed. The most common wetland type in the preservation area is ericaceous shrub bog-string bog and low shrub bogs.

The wetland systems within the preservation area include large areas of slope hydrogeomorphic (HGM) wetlands including ericaceous shrub bog-string bog wetlands, riverine HGM riparian wetlands, estuarine fringe HGM wetlands, and a small number of depressional HGM wetlands.

- **Slope HGM Wetlands** – The largest HGM wetland type in the preservation area is slope HGM. This wetland type covers 2,661 acres, or about 45 percent of the area. Lone Creek, a tributary of the Chuitna River, flows through or near the majority of the slope HGM wetlands in the preservation area. These wetlands contribute to the stream base flow and nutrient outputs, which then flow to the Chuitna River.

- **Ericaceous Shrub Bog-String Bog Wetlands** – A type of slope HGM wetlands also known as patterned fens, these wetlands are a unique wetland type to the area, and only occur in a few very specific places worldwide. 802 acres of the slope HGM wetlands in the preservation area are ericaceous shrub bog-string bog wetlands.
• Riverine HGM Wetlands – Riverine HGM wetlands occur in floodplains and riparian areas. The dominant water sources are overbank flow from the channel or hyporheic flow between the stream and wetlands. The preservation area contains 500 acres of riverine wetlands.

• Estuarine Fringe HGM Wetlands – Estuarine fringe HGM wetlands occur along coastlines and are under the influence of sea water. The preservation area contains 29 acres of estuarine fringe HGM wetlands surrounding the outlet of the Chuitna River into Cook Inlet.

• Depressional HGM Wetlands – 79 acres of the preservation area as depressional HGM wetlands. These wetlands occur in topographic depressions.

The streams and rivers in the preservation area provide habitat for chinook, coho, chum, and pink salmon, as well as limited habitat for sockeye salmon, Dolly Varden, and rainbow trout. The mainstem of the Chuitna River includes Chinook, coho, chum, and pink salmon spawning habitat, and rearing habitat for all five Pacific salmon species. Tributaries to the Chuitna River within the Preservation Area also have documented use by all five Pacific salmon species. Chinook salmon was designated by the Alaska Department of Fish and Game (ADF&G) in 2010 as a stock of concern in the Chuitna River. Chinook salmon escapement in the Chuitna River had dropped to less than 600 fish. ADF&G manages the species to achieve an escapement goal range of 1200 to 2900 fish. In 2016, the escapement of Chinook salmon was documented by ADF&G at 1372 fish. The tributaries and main channel of the Chuitna River contain high-quality fish habitat including large woody debris, gravels, boulders, runs, riffles, and pools for adult salmon spawning and juvenile salmon foraging and resting. Acquisition of the Chuitna River drainage properties would preserve 148,632 linear feet (28.1 miles) of stream channel documented as Pacific salmon habitat including spawning, rearing, and migration habitats in five streams. An additional 47,660 linear feet of anadromous stream channel was identified by Donlin Gold consultants during the July 2018 field assessment of the preservation area. However, these field verified anadromous stream reaches have not been official documented in the ADF&G Anadromous Waters Catalog.

The preservation area includes 104,544 linear feet (19.80 miles) of the mainstem of the Chuitna River, within which, 49,262 linear feet (9.33 miles) of Chinook salmon spawning habitat, 69,115 linear feet (13.09 miles) of coho spawning habitat, 44,088 linear feet (8.35 miles) of chum spawning habitat, and 104,544 linear feet (19.80 miles) of pink spawning habitat are documented. The entire 104,544 linear feet (19.80 mile) reach contains documented rearing for Chinook and coho salmon juveniles. Some reaches of the mainstem are also documented as rearing habitats for other Pacific salmon, including 100,690 linear feet (19.07 miles) for sockeye, 12,514 linear feet (2.37 miles) for chum, and 13,253 linear feet (2.51 miles) for pink salmon.

In addition to the mainstem Chuitna River habitats, the preservation area includes important Pacific salmon habitats in Bass Creek, Middle Creek, Lone Creek and an unnamed anadromous stream (No. 247-20-10010-2020-3008).

While only 317 linear feet (0.06 miles) of Bass Creek fall within the preservation area, juvenile Chinook, sockeye, coho, and chum salmon use this reach for rearing.

The lower 1,426 linear feet (0.27 miles) of Middle Creek fall within the preservation area and are documented spawning habitat for Chinook, coho, and pink salmon, as well as rearing habitat for Chinook and coho. Unspecified pink salmon habitat is also documented in this reach.
Lone Creek has 26,928 linear feet (5.10 miles) and 15,418 linear feet (2.92 miles) of its downstream tributary stream within the preservation area. The entire 26,928 linear feet (5.10 mile) reach of Lone Creek is documented as important Chinook salmon spawning habitat and Chinook and coho rearing habitat. Sockeye, chum, and pink salmon are documented throughout the reach, but habitat uses have not been specified. The entire 15,418 linear feet (2.92 mile) reach of the Lone Creek tributary within the preservation area is documented as important coho salmon rearing habitat.

Salmon smolt populations were estimated for coho salmon in the Chuitna River watershed and specifically for Lone, Middle and Bass creeks in 2008 through 2011. Average Chuitna River populations ranged from 37,424 to 44,794 coho smolt, with Bass Creek accounting for 19 to 31 percent of production and Middle Creek accounting for 12 to 17 percent of total production.

The preservation area also protects buffers and riparian areas adjacent to wetlands and streams. These areas provide important ecosystem functions and values. Buffers and riparian areas can be important for groundwater recharge, sometimes exceeding adjacent wetlands due to more permeable soil. Areas directly adjacent to slope HGM wetlands support groundwater discharge functions, helping to maintain the downgradient wetlands. Upland buffers adjacent to wetlands also protect and maintain wetland function. They act to slow and stop sediment and pollutants entering wetlands, provide organic matter to wetlands, and maintain wildlife habitat and movement corridors.

Table 5: Compensatory Mitigation Proposed for Wetlands by HGM Class and Cowardin Group (Acres)

<table>
<thead>
<tr>
<th>Wetland HGM (Cowardin Classes)</th>
<th>Classification</th>
<th>Chuitna Preservation Area</th>
<th>Upper Crooked Creek Restoration</th>
<th>Upper Crooked Creek Preservation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Depressional (PAB, PEM, PFO, PSS, PUB)</td>
<td>79</td>
<td>0</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td>Estuarine Fringe (E2EM, E2US)</td>
<td>29</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Flat (PME, PFO, PSS)</td>
<td>0</td>
<td>0</td>
<td>32.7</td>
</tr>
<tr>
<td></td>
<td>Riverine Non-Anadromous (PME, PFO, PSS, PUB)</td>
<td>76</td>
<td>92.95</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Riverine Anadromous (PME, PFO, PSS, PUB)</td>
<td>424</td>
<td>0</td>
<td>17.9</td>
</tr>
<tr>
<td></td>
<td>Slope (PME, PFO, PSS)</td>
<td>2,661</td>
<td>0</td>
<td>11.6</td>
</tr>
<tr>
<td>Group Totals</td>
<td>Wetlands and Ponds</td>
<td>3,269</td>
<td>92.95</td>
<td>63.8</td>
</tr>
<tr>
<td></td>
<td>Stream and River Area</td>
<td>418</td>
<td>2.75</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td>Upland Riparian and Buffers</td>
<td>2,183</td>
<td>16.8</td>
<td>44.1</td>
</tr>
<tr>
<td></td>
<td>Total of Parcel</td>
<td>5,870</td>
<td>112.5</td>
<td>109</td>
</tr>
</tbody>
</table>
Table 6: Compensatory Mitigation Proposed for Streams in Linear Feet (Miles)

<table>
<thead>
<tr>
<th>HGM</th>
<th>Chuitna Preservation Area</th>
<th>Upper Crooked Creek Restoration</th>
<th>Upper Crooked Creek Preservation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cataloged Anadromous Stream Channel</td>
<td>148,632 (28.1)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Field Reported Anadromous Stream Channel</td>
<td>47,660 (9.1)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Non-Anadromous Stream Channel</td>
<td>61,746 (11.7)</td>
<td>8,982 (1.7)¹</td>
<td>4,036 (0.8)</td>
</tr>
<tr>
<td>Total</td>
<td>258,056 (48.9)</td>
<td>8,982 (1.7)</td>
<td>4,036 (0.8)</td>
</tr>
</tbody>
</table>

Notes:
1. The return of Anadromous salmon to restored streams cannot be accurately predicted. Post-restoration monitoring will verify presence or absence of anadromous fish.
Numbers are rounded.

6.2.5.2 UPPER CROOKED CREEK PRM PLAN

Donlin Gold proposes to restore historical gold placer mined areas in the upper Crooked Creek watershed. Placer tailings and overburden have been deposited in several locations within the various floodplains, causing adverse impacts to aquatic resources. Water diversion ditches were constructed, resulting in the channeling of surface and shallow groundwater flow from the original stream paths. An estimated 8,700 linear feet (1.64 miles) of stream channels have been mined and the abutting wetlands degraded.

The Upper Crooked Creek PRM plan would restore, enhance and preserve 92.95 acres of riverine wetlands and 2.75 acres of stream and river area (8,982 linear feet). This PRM plan would preserve an additional 63.8 acres of existing wetlands, 0.9 acre of existing stream and river area (4,036 linear feet), and 44.1 acres of upland riparian buffer. Combined this PRM plan would encompass a total area of 221.5 acres, which includes 156.8 acres of wetlands and 13,018 linear feet of streams. The applicant proposes to protect this area long term through deed restriction. This project would be initiated at the start of Mine Site construction.

Four distinct restoration projects are described within the 221.5-acre Upper Crooked Creek PRM Plan (Plan) boundary:

1. Restoration of lower Quartz Gulch: The proposed restoration activities include filling the diversion ditch features in Quartz Gulch and the Donlin Creek floodplain, directing the flows in the upper portion of Quartz Gulch to the secondary stream channel along the original stream path, and allowing the backwatered flows to return to Donlin Creek via the abandoned oxbow in the lower end of the system. Elimination of the mining ditch in the upper portion of the gulch will re-establish the historical channel along the valley floor. This movement of the main channel should return the stream to a more stable hydrologic regime and remove the hydraulically losing reach from the system. The removal of both ditch sections will result in expanded floodplain overbank flow function for the re-established stream sections in Quartz Gulch and Donlin Creek.
2. Restoration of lower Snow Gulch: To restore this stream system, a new channel will be constructed between the lower and middle ponds from the substrate materials that originally formed the historical channel. The new channel will exhibit scour and sediment transport properties consistent with the original sediments, geometry, gradients, and resultant flood flow velocities. The new channel will be designed to mimic the parameters of the pre-mining system based on calculations from undisturbed sections of Snow Gulch and from analysis of flood flow hydraulics. Portions of the regionally rare and productive habitat provided by the middle ponds will be retained.

In Snow Gulch, the upper and middle excavated ponds will be enhanced to create additional fish and quiescent water habitat. A portion of the northern end of the middle pond will be filled to gain additional length for the proposed re-constructed channel. Additional length is needed for the created channel to approach the gradient parameter of the original system in the sections that are now flat, open water ponds. A sinuous channel routing will be chosen to minimize cut and fill requirements, following a detailed survey of the area prior to construction. Stream channel substrate will be locally available fill materials with sufficient fines (greater than 20 percent) to sustain surface flows, and may be augmented with larger rock and woody debris features as needed to provide aquatic invertebrate substrate, hydraulic cover, low flow channelization for fish, and grade control to maintain channel stability.

A fish passage conveyance may be required on at least one access route linking the Lyman airstrip, which runs along the east side of Snow Gulch, with the facilities on the southwest side of the middle pond. If the structure is located in the backwater between the middle ponds, a simple, large diameter, round culvert will be sufficient. If this structure is located along the stream channel, the final design will contain provisions for a stream simulation designed conveyance with width equal to 120 percent of the stream bank full width.

The historical connection from Snow Gulch to Donlin Creek is currently blocked by a berm on the west side of the lower pond. To re-establish the connection with the Donlin Creek floodplain, the berm surrounding the west and north ends of the lowest pond will be removed and the current connection from the pond to Donlin Creek will be filled. Removal of the berm will funnel stream flow back into the historical channel west of the pond, and rewater off-channel habitat. The lower pond will be excavated and provide additional settlement area to improve downstream water quality.

3. Restoration of the wash plant tailings area along Crooked Creek, between Snow and Ruby Gulches: The Crooked Creek floodplain under the effluent discharge fan will be reshaped and re-contoured into a condition to restore wetlands back to the area. Materials will be removed down to the underlying organic layers that mark the original vertical extent of the floodplain. The berm along the settlement area will be left to maintain water levels in the restored areas. The coarse-grained tailings pile and other areas will be regraded and re-contoured for stability (minimum 2:1 slopes), and augmented with finer materials to promote vegetation growth. Disturbed areas will be revegetated.

4. Restoration of lower Ruby and Queen Gulches: Restoration activities for Ruby and Queen gulches will include restoring portions of the Ruby Gulch stream channel, removing overburden stockpiles in the Crooked Creek floodplain, filling the drainage ditch in upper Queen Gulch to reroute the stream to the valley floor, reshaping the ponds to provide increased shallow water and deep water habitats, removing constricted areas where beaver activity can easily block fish passage, restoring a floodplain elevation outlet from the ponded area through
abandoned oxbows into Crooked Creek, and filling in the long drainage ditch currently connecting the ponded area to Crooked Creek. Disturbed areas will be re-contoured into shallow slopes running down to the ponds, allowing re-establishment of the floodplain and diverse aquatic habitats. Disturbed areas will be revegetated.

Restoration of Ruby Gulch will be similar to that of Snow Gulch except on a smaller scale. Re-establishing the historical floodplain gradient will involve refilling the area with appropriate substrate, shaping an appropriately sized channel, adding habitat features and grade control, and revegetating disturbed areas. Fish passage structures may be required where Ruby and Queen Gulches are crossed by the existing mining access road.

Reconnection of Ruby and Queen Gulches to the Crooked Creek floodplain is more complex than at Snow Gulch. The pond system fed by the gulches is separated from the Crooked Creek floodplain by a steep-sided berm constructed from the overburden materials removed from placer mining operations. North of the dogleg at the north end of the berm is a large deposit of overburden tailings that will be left substantially intact to prevent the main Crooked Creek channel from shortcutting through the ponds. At the dogleg, additional water is added to the system from a shallow, surface water basin and the tailings deposit is reduced to a simple berm separating the ponds from the floodplain. This berm would be substantially removed south of the dogleg so the pond features would be joined hydraulically with the existing natural oxbows along Crooked Creek. The average elevation of these oxbows (382 feet) appears consistent with the proposed water level in the ponds.

Restoration of Queen Gulch has been developed while considering the predicted drawdown effects from the proposed open pit. Rerouting of flow in Queen Gulch will be similar to Quartz Gulch with available side cast used to refill the ditch, rerouting the flows to the old stream channel location and revegetation of disturbed areas. Expansion of two small ponded areas in the lower reach will enhance resident fisheries habitats. The flows from Queen Gulch will be redirected into the square pond. A fish passage conveyance or low water ford will be provided at the road crossing. Berms around the south and west sides of the square pond will be removed to re-connect this pond with the floodplain and the pond margins will be regraded similar to the more northern ponds. An outfall will be established to an existing oxbow in the northwest corner of the square pond.

Finally, the ditches connecting the northern ponds to the square pond and the diversion ditch, which connects the pond system to Crooked Creek, will be refilled with the side-cast materials and revegetated.

These four restoration projects would increase the function and sustainability of the watershed and its fisheries because they:

- Re-establish and rehabilitate historical stream and wetland functions present prior to placer mining;
- Re-establish historical and establish new stream, pond, and off-channel anadromous and resident fish habitat; and
- Have a high likelihood of success to restore naturally occurring, self-sustaining systems within the Crooked Creek watershed because they are based on a stream functional framework.
All four restoration projects are located in the same 10-digit HUC watershed as the majority of the permanent aquatic resources impacts from the Project.

6.2.5.3 IN-LIEU FEE MITIGATION PLAN

A portion of the pipeline component of the Project would impact 4.91 acres of wetlands within the service area of the Great Land Trust (GLT) in-lieu fee program. Specifically, the project would impact 1.78 acres of riverine type wetlands and 2.76 acres of slope and depression type wetlands within the GLT service area. The applicant has proposed to offset these impacts at a 2:1 ratio by purchasing 9.8 credits from the GLT in-lieu fee program. The GLT does have the appropriate type and amount of released wetland credits for purchase. The applicant proposes to purchase these credits prior to construction.

6.2.6 MITIGATION SUMMARY

The Applicant has avoided and minimized to the maximum extent practicable; however, there would be unavoidable impacts to WOUS as a result of the Project, including:

- Permanent fill impacts to 2,877 acres of wetlands;
- Permanent fill impacts to 3 acres of the Kuskokwim River;
- Permanent fill impacts to 175,316 linear feet of streams; and
- Temporary impacts to 538 acres of wetlands; and
- Temporary fill impacts to 53,346 linear feet of streams.

In accordance with 2008 Mitigation Rule, compensatory mitigation is required to offset unavoidable Project impacts to WOUS. Compensatory mitigation is therefore required for the unavoidable permanent fill impacts listed above. The Corps has worked with Donlin Gold in the development of an appropriate CMP for compensation of unavoidable permanent impacts to WOUS.

Wetland minimization activities, discussed above, include restoring wetlands following placement of fill by removing the fill at the end of pipeline construction and at the end of the mine life, and returning the areas to functioning wetlands similar to pre-pipeline construction and pre-mining conditions. Additionally, no compensatory mitigation is being proposed for vegetation clearing, winter roads, and work areas where no placement of fill would occur in WOUS.

Donlin Gold has evaluated all available and practicable options to assure compliance with the provisions of the 2008 Mitigation Rule and the 1994 Alaska Wetland Initiative (EPA et al. 1994). Donlin Gold evaluated both the Su-Knik Mitigation Bank and the GLT in-lieu fee program. The Pipeline component has higher impacts to wetlands within the GLT service area. In addition, the GLT has the appropriate types of released credits available for purchase. It is appropriate for Donlin Gold to purchase 9.8 released credits from the GLT in-lieu fee provider to offset 4.91 acres of impact as proposed.

As discussed above, the majority of the proposed project impacts occur outside of the service areas of existing mitigation banks and in-lieu fee service areas. Donlin Gold researched PRM alternatives, focusing first on the immediate watershed (HUC-10), and then systematically
assessing larger hydrologic units (e.g., HUC-08, HUC-06, HUC-04) for compensatory mitigation opportunities.

Donlin Gold identified the Upper Crooked Creek PRM Restoration project located in the same watershed of the proposed impact. Implementation is proposed to yield substantive, near-term benefits to aquatic resources resulting in restoration of 92.95 acres of wetland, 8,982 linear feet of stream, 16.8 acres of riparian buffer and would preserve an additional 63.8 acres of existing wetlands, 4,036 linear feet of stream, and 44.1 acres of riparian buffer.

The Chuitna PRM Preservation Plan was determined to yield the optimal ecological increase in functions and services resulting in the preservation of 5,870 acres, of which 3,269 acres are wetland and ponds, 258,056 linear feet of stream and 2,183 acres of riparian buffers.

Overall, the compensatory mitigation described herein would purchase 9.8 released credits from GLT In-Lieu fee provider, restore 92.95 acres of wetlands, 8,982 linear feet of streams, 16.8 acres of riparian buffer and preserve a total of 3,425.75 acres of wetlands and 271,074 linear feet of streams and 2,243.9 acres of riparian buffer. The proposed compensatory mitigation does not deviate from the order of the options presented in §332.3(b)(2)-(6) and is determined to be the environmentally preferable option. Based on the information contained above and evaluated throughout this JROD, the Corps concludes that the Applicant’s proposed mitigation plan adequately compensates for the Projects’ impacts on WOUS and the mitigation described above would be required as outlined in Section 6.2.8 below.

6.2.7 OTHER MITIGATIVE ACTIONS

Mitigation and monitoring measures listed in Sections 5.5 and 5.7 of the Final EIS were developed for consideration by the Corps, BLM, and cooperating agencies to further minimize Project impacts, as reasonable and practicable. However, as noted in Section 5.5 of the Final EIS, mitigation identified in the EIS does not necessarily have to be required by the federal agencies in their RODs. For example, Council on Environmental Quality (CEQ) guidance uses terms such as “reasonable, practicable, and appropriate” when considering potential mitigation and permit conditions. In addition, there may be potential mitigation measures identified in the EIS that are not within the federal agencies’ authority to require as a condition to a permit or are otherwise not reasonably enforceable.

The Corps has reviewed the measures identified in the Final EIS (Table 5.5-1A and 5.7-1A) that were assessed as both effective and reasonable/practicable and that are within the Corps’ authority to require. The Corps has determined that the special conditions identified in Section 6.2.8 below and the compensatory mitigation specified in Section 6.2.5 above are sufficient to avoid and minimize potential adverse impacts and to compensate for unavoidable adverse impacts to the aquatic ecosystem, and to ensure that the Project would not be contrary to the public interest. The intent of the mitigation measures, ascribed to the Corps, identified in Table 5.5-1A and 5.7-1A have been addressed through the Applicant’s proposed CMP, including avoidance and minimization measures, by special conditions outlined below in Section 6.2.8, or adopted as conditions of other state and federal permitting requirements.
6.2.8 SPECIAL CONDITIONS OF THE CORPS PERMIT

In addition, in order to comply with the 404(b)(1) guidelines, and to ensure the Project is not contrary to the public interest, the following special conditions will be carried on in the DA permit:

1. The permittee agrees to provide all contractors associated with construction of the authorized activity a copy of the permit and drawings. A copy of the permit will be available at the construction site at all times.

   Rationale: This special condition is required to ensure compliance with the permit, and to minimize impacts to adjacent wetlands and other WOUS as a result of the permitted project (33 CFR 320.4(b) and 40 CFR 230.41).

2. The permittee shall ensure that the project minimizes alterations to water circulation patterns to the extent practicable. If it is determined by the Corps that the project negatively impacts the hydrology within the wetland, the Permittee may be required to take additional measures (i.e. install additional depressed road beds, culvert(s), or a similar water conduit) beneath the road to re-establish the hydrology of the area to that of pre-construction conditions.

   Rationale: This condition is required to minimize impacts to adjacent wetlands and other WOUS as a result of the permitted project (33 CFR 320.4(b) and (l) and 40 CFR 230.41).

3. Prior to commencement of construction activities within WOUS, the Permittee shall clearly identify the permitted limits of disturbance at the project site with highly visible markers (e.g., construction fencing, flagging, silt barriers). The permittee shall properly maintain such identification until construction is complete and the soils have been stabilized. The permittee is prohibited from conducting any unauthorized Corps-regulated activity outside of the permitted limits of disturbance (as shown on the permit drawings).

   Rationale: This condition is required to minimize impacts to adjacent wetlands and other WOUS as a result of the permitted project (33 CFR 320.4(b) and (l) and 40 CFR 230.41).

4. The permittee shall submit a signed compliance certification to the Corps within 60 days following completion of the authorized work and any required mitigation. The certification will include: 1) A copy of this permit; 2) A statement that authorized work was done in accordance with the Corps authorization, including any general or specific conditions; 3) A statement that any required mitigation was completed in accordance with the permit conditions; 4) The signature of the Permittee certifying the completion of the work and mitigation.

   Rationale: This special condition is required to ensure compliance with the permit and special conditions and required mitigation is being accomplished.

5. The permittee understands and agrees that the DA permit has been issued based upon the Permittee’s intended purpose to produce gold from the Donlin deposit ore reserves using mining processes, infrastructure, logistics, and an energy supply(s) practicable for application in remote western Alaska in accordance with the permitted plans. The permittee recognizes that its commitment to construct and operate the mine pursuant to the Project details described in the DA permit application.

   Rationale: This special condition is required to ensure applicant understands the Corps permit decision was based on the information supplied by the Applicant for the Corps to evaluate.
6. Prior to the initiation of any work authorized by this permit, the Permittee shall install erosion control measures along the perimeter of all work areas to prevent the displacement of fill material outside the authorized work areas into WOUS. Immediately after completion of the final grading of the land surface, all slopes, land surfaces, and filled areas shall be stabilized using sod, degradable mats, barriers, or a combination of similar stabilizing materials to prevent erosion. The erosion control measures shall remain in place and be maintained until all authorized work is completed and the work areas are stabilized.

Rationale: This condition is required to prevent adverse impacts to wetlands and other WOUS outside of the permitted project area (33 CFR 320.4(b) and (d), 40 CFR 230.21(b), and 40 CFR 230.73(c)).

7. No fill material, equipment or construction materials shall be stockpiled or stored on wetlands that do not have DA authorization for those activities, as shown on the project plans.

Rationale: This condition is required to prevent the placement of fill, or anything that may have the effect of fill, outside the permitted area; thereby, minimizing the impacts to wetlands and preventing sedimentation outside of the permitted area [40 CFR PART 230.70 and 40 CFR PART 230.77(a)].

8. The Permittee shall comply with the federal ESA, the Permittee must implement all of the mitigating measures identified in the enclosed USFWS letter of concurrence (FWS 2017-I-0343, dated November 2, 2017) and NMFS letter of concurrence (POA-1995-120, NMFS #AKR-2018-9745, dated March 29, 2018), including those ascribed to the Corps therein. If the Permittee is unable to implement any of these measures, the Permittee must immediately notify the Corps, the USFWS Office, and the NMFS so we may consult as appropriate, prior to initiating the work, in accordance with federal law.

Rationale: This condition is required to reduce the likelihood of adverse impacts to species protected under the Endangered Species Act and to comply with the Act (Section 7 of the ESA and 40 CFR 230.30).

9. The Permittee shall implement the attached Programmatic Agreement, entitled "Programmatic Agreement by and among the U.S. Army Corps of Engineers, U.S. Bureau of Land Management, Advisory Council on Historic Preservation, Alaska State Historic Preservation Officer, Alaska Department of Natural Resources, and Donlin Gold, LLC Regarding the Donlin Gold Project", dated June 28, 2018, in its entirety (see Attachment A2). The Corps has been designated the lead federal agency responsible for implementing and enforcing the Programmatic Agreement as signed. If the Permittee fails to comply with the implementation and associated enforcement of the Programmatic Agreement the Corps may determine that the Permittee is out of compliance with the conditions of the Department of the Army permit and suspend the permit. Suspension may result in modification or revocation of the authorized work.

Rationale: This condition is required to avoid impacts to historic properties/cultural resources and comply with Section 106 of the National Historic Preservation Act. (Section 106 of NHPA, 33 CFR 320.4(e), and 33 CFR 325 Appendix C).

10. Should any other agency require and/or approve changes to the work authorized or obligated by this permit, the Permittee is advised a modification to this permit may be required prior to initiation of those changes. It is the Permittee’s responsibility to request a modification of this permit. The Corps reserves the right to fully evaluate, amend, and approve or deny the request for modification of this permit.
Rationale: This special condition is required to ensure compliance with the permit, and to minimize impacts to adjacent wetlands and other WOUS as a result of the permitted project (33 CFR 320.4(b) and 40 CFR 230.41).

Compensatory Mitigation

11. Mitigation Plan. Prior to initiation of construction activities within WOUS, Donlin Gold shall implement the mitigation plan “Compensatory Mitigation Plan”, dated July 2018, a subpart of Block 23 of the DA application, proposed by Donlin Gold and which is incorporated herein by reference (also included as Attachment B5 of this JROD). The permittee must implement the mitigation in accordance with the plan and any permit conditions. If conflicts occur between this mitigation plan and any permit conditions, the permit conditions shall prevail.

Rationale: This condition is required to compensate for resource losses important to the human and aquatic environment (33 CFR 320.4(r)(1), 33 CFR 332.1, 33 CFR 332.3(a)(1) and (b)(3), and 40 CFR 230.41).

12. Performance Standards. Prior to initiation of construction activities within WOUS, the permittee shall submit for Corps review and approval a draft of the final performance standard parameters and values for restoration and preservation. The performance standards shall be in substantial compliance with 33 CFR 332.5 and the mitigation plan. Corps review and approval must be obtained prior to initiation of construction activities within WOUS.

Rationale: This condition is required to ensure final performance standards are approved by the Corps (33 CFR 320.4(r)(1), 33 CFR 332.1, 33 CFR 332.3(a)(1) and (b)(3), and 40 CFR 230.41).

13. In-Lieu Fee Program. Prior to initiation of construction activities within WOUS, the permittee shall purchase 3.6 Riverine released credits and 6.2 Slope wetland released credits from Great Land Trust In-Lieu Fee Program for the loss of 1.78 acres of Riverine and 2.76 acres of Slope wetlands. You must email the signed credit transaction form to mitigationmanager@usace.army.mil and to the Project Manager via Regulatory Pagemaster at: regpagemaster@usace.army.mil upon completion of credit transaction (see form attached). If the permittee is unable to complete this transaction, the permittee is required to obtain a permit modification prior to commencing the work authorized by this permit for approval of an alternate mitigation method.

Rationale: This condition is required to compensate for resource losses important to the human and aquatic environment (33 CFR 320.4(r)(1), 33 CFR 332.1, 33 CFR 332.3(a)(1) and (b)(3), and 40 CFR 230.41).

14. Site Protection. Prior to initiation of construction activities within WOUS, the permittee shall ensure all compensatory mitigation parcels are provided long-term protection through a restrictive covenant (deed restriction). This site protection instrument must be approved by the Corps prior to the recording of the restrictive covenant. To obtain this approval, the permittee shall submit a draft of the restrictive covenant, including all supporting documentation necessary for the review of the restrictive covenant, e.g. title reports, title insurance, any liens or other encumbrances/interests, surveys and legal descriptions, etc. The restrictive covenant shall be in substantial compliance with 33 CFR 332.7(a). After Corps review and approval, the permittee shall take actions required to record the deed restrictions with the Registrar of Deeds or other appropriate official charged with the responsibility for maintaining records of title to or interest in real property. The permittee shall provide a copy of the recorded document to the
Corps clearly showing a stamp from the appropriate official indicating the book, page and date prior to initiation of construction activities within WOUS.

Rationale: This condition is required to compensate for resource losses important to the human and aquatic environment. (33 CFR 320.4(b), 33 CFR 320.4(r), and 40 CFR 230.41)

15. Financial Assurances. Prior to initiation of construction activities within WOUS, the permittee shall ensure financial assurances are in place. The permittee shall:

(a) Prior to the establishment of the required financial assurances, the permittee shall submit for Corps review and approval detailed cost estimates that include, but are not limited to the cost of providing replacement mitigation, including costs for land acquisition, planning and engineering, legal fees, mobilization, construction, monitoring, and contingencies. These estimates shall be to a sufficient level of detail and take into account the replacement mitigation being conducted by a competent third-party.

(b) Submit for Corps review and approval a draft of the proposed financial assurance. The assurances shall be compliant with 33 CFR 332.3(n) and must be in a form that ensures that the District Engineer will receive notification at least 120 days in advance of any termination or revocation. For third-party assurance providers, this may take the form of a contractual requirement for the assurance provider to notify the district engineer at least 120 days before the assurance is revoked or terminated.

(c) Provide a plan for phasing out required financial assurances once the compensatory mitigation project has been determined by the district engineer to be successful in accordance with its performance standards. The permittee shall submit for Corps review and approval draft performance standards that shall clearly identify the conditions under which the financial assurances are to be released.

Rationale: This condition is required to ensure a high level of confidence that the mitigation project will be successfully completed (33 CFR 332.3(a) and 332.7(c)).

16. Long-Term Management Plan. Prior to initiation of construction activities within WOUS, the permittee shall ensure long-term management plans for all compensatory mitigation parcels are established. The permittee shall submit for Corps review and approval a draft of the proposed long-term management plans. These long-term management plans must describe how the compensatory mitigation project will be managed after performance standards have been achieved to ensure the long-term sustainability of the resource, including long-term financing mechanisms and the party responsible for long-term management. The long-term management plans shall be in substantial compliance with 33 CFR 332.7(d). The permittee may transfer the long-term management responsibilities of the compensatory mitigation project sites to a land stewardship entity, such as a public agency, non-governmental organization, or private land manager, after review and approval by the Corps.

Rationale: This condition is required to ensure long term sustainability of the mitigation plan (33 CFR 332.3(a) and 33 CFR 332.7(d)).

Section 10 Only

17. Your use of the permitted activity must not interfere with the public’s right to free navigation on all navigable WOUS.
Rationale: Protection of navigation and the general public’s right of navigation on the water surface is a primary concern of the federal government. This condition is required by regulation (33 CFR 320.4(o)(3)).

18. You must install and maintain, at the Permittee’s expense, any safety lights and signals prescribed by the U.S. Coast Guard (USCG), through regulations or otherwise, on the Permittee’s authorized facilities. The USCG may be reached at the following address and telephone number: Commander (oan), 17th Coast Guard District, P.O. Box 25517, Juneau, Alaska 99802, (907) 463-2272.

Rationale: The facility must be lighted to prevent navigation hazards and this condition is required by regulation (33 CFR 320.4(o)(3)).

19. The permittee understands and agrees that, if future operations by the U.S. require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the Permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the U.S. No claim shall be made against the U.S. on account of any such removal or alteration.

Rationale: This condition is required by regulation to protect free navigation and the interests of the United States in existing or future federal projects (33 CFR 320.4(o)(3) and HQ memorandum).

6.3 BLM’S MITIGATION DETERMINATION

Donlin Gold’s proposed design features are listed in the Final EIS; Chapter 5, Section 5.2, Design Features Proposed by Donlin Gold. The BLM views these elements as part of the Project, and considers Donlin Gold’s proposed design measures as inherent to the Donlin Gold proposed action. Additionally, Donlin Gold will follow BMPs and industry standards required to comply with regulations and standard permit requirements that are designed to reduce impacts to the environment (SRK 2016a, 2013b – as cited in Chapter 5 of the Final EIS). Section 5.3 of the Final EIS describes the robust permitting process and regulatory standards for large mine projects in Alaska, and summarizes some of the more prominent BMPs and standard permit conditions that would likely be required for the Donlin Gold Project.

As part of the decision to adopt Alternative 2 North Option in this JROD, the BLM is adopting Donlin Gold’s proposed avoidance, design features, and BMPs from Chapter 5 of the Final EIS. BLM has also selected 41 of the 97 mitigation measures considered in Chapter 5, Table 5.5, and are included as Attachment C1 to this JROD. These mitigating measures avoid, minimize, or reduce impacts identified in the environmental analysis associated with Alternative 2 North Option. Mitigating measures not selected from Chapter 5 of the Final EIS are either not within BLM jurisdiction, not applicable to the Pipeline ROW, are not feasible, or are not practicable. The selected mitigation measures included in Attachment C1 will apply only to lands under BLM jurisdiction and authority (BLM-managed lands). Specific stipulations reflecting these measures will be included and further defined in the BLM ROW Grant Offer to Donlin Gold.

In developing this mitigation package, the BLM considered guidance in the 1981 Southwest Planning Area Management Framework Plan, Alaska Statewide Land Health Standards, BLM
standard ROW Grant stipulations, ANILCA 810 analysis (Final EIS Appendix N) and mitigations incorporated via Project design for Alternative 2 North Option.

In addition to reducing impacts to the Project area as a whole, the Project Design Features in Alternative 2 North Option will serve to avoid impacts to natural and cultural resources, subsistence uses, and resources to the maximum extent practicable. Impacts to historic and cultural resources are addressed in the NHPA Section 106 Programmatic Agreement executed on June 28, 2018 (Attachment A2). For administrative consistency across the mixed-land jurisdictions, the BLM has aligned the natural gas and fiber optic cable ROW Grant stipulations with the State of Alaska ROW Lease requirements along the 316-mile mixed-land jurisdiction Pipeline corridor.

6.4 MITIGATION MEASURES REQUIRED BY STATE AGENCIES

Many of the permits required for Project approval are under the jurisdiction of the State of Alaska. State agencies have clear compliance standards and requirements for monitoring of environmental conditions; future risks associated with unexpected conditions may also be addressed in specific permitting authorizations. Many of the State permits will not be issued until after this Joint Record of Decision is complete; however, it is anticipated that they would contain measures specific to their permit authorities to mitigate unavoidable impacts; and as appropriate, incorporate elements of adaptive management if monitoring results indicate a basis for changes. A list of State permits that have been issued for the Project at the time of this Joint Record of Decision is included in Attachment B4 (Section B4.18) of this Joint Record of Decision. The State water quality agency, Alaska Department of Environmental Conservation, issued their conditioned 401 Water Quality Certification titled “State of Alaska Certificate of Reasonable Assurance for the Donlin Gold Project,” for the placement of the fill material for the Applicant's proposed Project (see Attachment B6).

Donlin Gold has engaged the appropriate State agencies to work within the State permit process to address concerns regarding predicted flow losses in Crooked Creek. The Alaska Department of Natural Resources Division of Water (ADNR-Water) is responsible for managing water in the State, and has the authority to render a decision on whether establishment of a minimum instream flow is necessary to comply with the Anadromous Fish Act (AS 16.05.871-.901) and the Fish Passage Act (AS 16.05.841). The ADF&G, under Alaska’s fish protection statutes specified above, is responsible for protecting freshwater habitat for salmon and other anadromous fish, and for ensuring free passage for all fish in rivers, lakes, and streams throughout the State.

Donlin Gold has committed to specific programs to minimize impacts from the Project (see Final EIS Chapter 5, Section 5.2). Particular programs of note that minimize impacts to aquatic resources are summarized below. These programs were considered in the decision-making process for the Joint Record of Decision, and are expected to be further developed as part of the State permitting process.

Rainbow Smelt Monitoring Program – As specified in the Final EIS Section 5.2 (Design Feature T17), this program would establish additional baseline data for a better understanding of the species’ occurrence, and the character, use, and distribution of spawning habitat along the Kuskokwim River. Survey methodology would likely include documenting sex ratio and age structure of the population; and if possible, fecundity of females. Initially, surveys would be conducted annually to document the age structure of the rainbow smelt population, and further
document spawning patterns. Once an adequate baseline is established, regular sampling would be used to monitor for changes to existing patterns. The frequency of surveys over the long-term would depend on previous results, and whether the data indicate a potential shift.

If rainbow smelt population changes are observed over a defined time period, additional work would need to be undertaken to investigate the reason for those changes. If observed changes were attributed to Project-related activities, Donlin Gold would implement an assessment of measures available to address or mitigate those activities (Donlin Gold 2018a – as cited in Chapter 5 of the Final EIS).

Aquatic Resources Monitoring Plan (ARMP) for Crooked Creek – To be developed under the provisions of Title 16 fish habitat permits administered by the ADF&G and water use permits administered by the ADNR. As specified in the Final EIS Section 5.2 (Design Feature A33), the objectives of the ARMP are to: 1) monitor for major changes to aquatic communities; 2) monitor for smaller-scale and incremental changes to aquatic communities; and 3) guide results-based refinement to the monitoring program. The plan would build on the existing baseline dataset, and include both biological and flow components, including fish presence/abundance, invertebrate and periphyton sampling, and fish metals analysis; flow monitoring and winter surface water sampling to characterize fish habitat/passage and freezedown patterns; sediment sampling; and collection of additional geology and hydrology data to refine understanding of dewatering and groundwater/surface water flow dynamics (Donlin Gold 2018a,b; Owl Ridge 2017c – as cited in Chapter 5 of the Final EIS).

The ongoing data collection would be used in an adaptive management approach to refine the understanding of the dynamics surrounding Crooked Creek flow in winter, as well as the open water seasons; and to identify the most effective measures that can be used to ensure that minimum flows in Crooked Creek are maintained. If the Project results in minimal losses to Crooked Creek flows, adaptive management measures may be unnecessary. If flow losses warrant a response, a range of measures could be considered that include, but would not be limited to, lining or relocating portions of the stream channel; augmenting flows from the Snow Gulch Reservoir; pumping water from the Kuskokwim River, or grouting areas of bedrock demonstrating high flow rates (Donlin Gold 2018a – as cited in Chapter 5 of the Final EIS).

In July 2018, the Applicant prepared a draft ARMP framework document as part of the Plan of Operations – Volume VIIC2. Donlin Gold is using this framework document as a basis for discussions with the State of Alaska (ADF&G and ADNR) to ensure that the ARMP addresses all aspects of monitoring to support fish habitat permits and water withdrawal authorizations. The plan briefly describes the extensive aquatic resources baseline sampling program conducted to date, including an inventory of sites previously sampled, the frequency and duration for which they were sampled historically, and their relevance in supporting future monitoring efforts in advancing the ARMP. Specific methodologies, sample locations, frequencies, analytical methods, and comparative methodologies will be determined in coordination with the ADF&G and ADNR subject matter experts.

The objectives of the draft ARMP framework adds to those specified in Design Feature A33 above; to:

---

• Extend portions of the aquatic life and habitat monitoring initiated during baseline studies to subsequent phases of the Project.

• Collect data suitable for detecting changes to aquatic communities and habitat.

• Identify a range of conditions against which future monitoring results will be evaluated for shifts in species composition, populations, and habitat quality and function.

• Collect information to allow differentiating between naturally occurring changes and Project-related changes.

As stated in the draft ARMP framework document, the ARMP will implement adaptive management as an iterative multi-step process that allows for additional investigation, in response to observed changes from baseline conditions.
7 FINAL AGENCY DECISIONS

7.1 CORPS' DECISION

I find that the issuance of the Corps permit, as described by regulations published in 33 CFR Parts 320 through 332, with the scope of work as described in this document, is based on a thorough analysis and evaluation of all issues set forth in this JROD. There are no less-environmentally damaging, practicable alternatives available to Donlin Gold LLC to construct the Donlin Gold Project, Alternative 2 North Option. The issuance of this permit is consistent with National Policy, statutes, and administrative directives; and on balance, issuance of a Corps' permit to construct the Donlin Gold Project is not contrary to the public interest. As explained above, all practicable means to avoid and/or minimize environmental harm from the selected, permitted alternative have been adopted and required by terms and conditions of this permit.

Approving Official:

[Signature]

Colonel Michael Brooks
District Commander

[Date]
13AVG2018
7.2 BLM'S DECISION

7.2.1 ACTING ALASKA STATE DIRECTOR'S RECOMMENDATION

I recommend approval of this Record of Decision to authorize a 14-inch, underground natural gas pipeline and associated fiber optic cable Right-of-Way grant and associated Temporary Use Permits subject to terms, conditions, stipulations, and environmental protection measures developed by the U.S. Department of the Interior, and identified in this Record of Decision, including attachments, and the Plan of Development by Donlin Gold LLC.

Karen Mouritsen  
Acting State Director, Bureau of Land Management, Alaska

8-13-18  
Date
7.2.2 APPROVAL BY THE ASSISTANT SECRETARY

I hereby approve this Record of Decision to authorize a 14-inch, underground natural gas pipeline and associated fiber optic cable Right-of-Way grant and associated Temporary Use Permits subject to terms, conditions, stipulations, and environmental protection measures developed by the U.S. Department of the Interior, and identified in this Record of Decision, including attachments, and the Plan of Development by Donlin Gold LLC.

My approval of this decision constitutes the final decision of the Department of the Interior.

[Signature]

Joseph Balash
Assistant Secretary – Land and Minerals Management

8/13/18

Date
ATTACHMENTS

The following attachments are included:

- Attachment A (A1 through A2)
- Attachment B (B1 through B6)
- Attachment C (C1 through C2)
ATTACHMENT A   SUPPORTING DOCUMENTS PERTINENT TO THE JOINT DECISION

Attachment A includes the following sections:

- Attachment A1 – Project Plan
- Attachment A2 – NHPA Section 106 Programmatic Agreement
ATTACHMENT A1  PROJECT PLAN

Attachment A1 includes the following documents:

- Engineering Drawing G001 – General Notes and Sheet Index
- Engineering Drawing G002 – Plan View Overall Project Vicinity Map
- Engineering Drawings MA-200G through MA-214T – Mine Area Drawings
- Engineering Drawings TA-300G through TA-316T – Transportation Area Drawings
- Engineering Drawings PA-100G through PA-177T – Pipeline Area Drawings
This page intentionally left blank.
GENERAL NOTES:

1. THE PROPOSED DISTURBANCE LIMIT OF SOME FACILITIES MAY EXTEND OUTSIDE OF THEIR DESIGNED FOOTPRINTS. WHILE THE ADDITIONAL DISTURBANCE AREA MAY NOT BE DIRECTLY IMPACTED AS PART OF THE PROJECT ACTIVITY, IT HAS BEEN INCLUDED AS A DIRECT IMPACT ASSOCIATED WITH POTENTIAL INCURSIONS ON FINAL CONSTRUCTION DESIGN. CONSTRUCTION IMPLEMENTATION NEEDS, POTENTIAL STORAGE OF WASTE FROM VEGETATION CLEARANCE ACTIVITIES, POTENTIAL STORAGE OF SNOW FROM SNOW CLEARING ACTIVITIES, UNDERCUT CONTROL MEASURES THAT MAY BE NEEDED.

2. SPECIFICATIONS OF FILL MATERIAL UTILIZED FOR CONSTRUCTION ACTIVITIES WILL BE DETERMINED AS ENGINEERING OF THE ASSOCIATED FACILITIES ADVANCES.

3. CUT AND FILL SLOPES ARE ASSUMED TO BE 2:1 (HORIZONTAL : VERTICAL) UNLESS OTHERWISE SPECIFIED. SLOPES MAY VARY PENDING SOIL OR ROCK TYPE ENCOUNTERED DURING EXCAVATION.

4. CROSS SECTIONS DEPICTING CUT BELOW EXISTING GROUND AND PROPOSED FILL, ASSUME EXCAVATION TO COMPETENT SOILS FOR CONSTRUCTION OF PADS OR STOCKPILES.

5. EROSION AND SEDIMENT CONTROL WILL BE PROVIDED DURING CONSTRUCTION AND OPERATIONS IN ACCORDANCE WITH THE STORMWATER POLLUTION PREVENTION PLAN.

6. RECLAMATION AND FINAL STABILIZATION OF DISTURBED AREAS WILL BE IN ACCORDANCE WITH THE RECLAMATION AND CLOSURE PLAN.

7. TYPICAL PIPE STORAGE YARD WILL BE PROVIDED DURING CONSTRUCTION AND OPERATIONS.

8. TYPICAL PIPE STORAGE YARD WILL BE PROVIDED DURING CONSTRUCTION AND OPERATIONS.

9. TYPICAL PIPE STORAGE YARD WILL BE PROVIDED DURING CONSTRUCTION AND OPERATIONS.

10. TYPICAL PIPE STORAGE YARD WILL BE PROVIDED DURING CONSTRUCTION AND OPERATIONS.

11. TYPICAL PIPE STORAGE YARD WILL BE PROVIDED DURING CONSTRUCTION AND OPERATIONS.

12. TYPICAL PIPE STORAGE YARD WILL BE PROVIDED DURING CONSTRUCTION AND OPERATIONS.

13. TYPICAL PIPE STORAGE YARD WILL BE PROVIDED DURING CONSTRUCTION AND OPERATIONS.

14. TYPICAL PIPE STORAGE YARD WILL BE PROVIDED DURING CONSTRUCTION AND OPERATIONS.

15. TYPICAL PIPE STORAGE YARD WILL BE PROVIDED DURING CONSTRUCTION AND OPERATIONS.

16. TYPICAL PIPE STORAGE YARD WILL BE PROVIDED DURING CONSTRUCTION AND OPERATIONS.

17. TYPICAL PIPE STORAGE YARD WILL BE PROVIDED DURING CONSTRUCTION AND OPERATIONS.

18. TYPICAL PIPE STORAGE YARD WILL BE PROVIDED DURING CONSTRUCTION AND OPERATIONS.

19. TYPICAL PIPE STORAGE YARD WILL BE PROVIDED DURING CONSTRUCTION AND OPERATIONS.

20. TYPICAL PIPE STORAGE YARD WILL BE PROVIDED DURING CONSTRUCTION AND OPERATIONS.
NOTE: DRAINAGE AND EROSION CONTROLS WILL BE DEVELOPED WITHIN THE WORK AREA FOOTPRINT.

NOTE: ALL GRADING IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

PLAN LEGEND:
- Uplands
- Wetlands
- Waters of U.S.
- Existing 5' Contours
- Proposed 5' Contours
- Existing 25' Contours
- Proposed 25' Contours
- Existing Contours
- Proposed Contours
- Clearing
- Cut/Fill Limit
- Work Area/Vegetation

SECTION VIEW LEGEND:
- Uplands
- Wetlands
- Waters of U.S.
- Existing 5' Contours
- Proposed 5' Contours
- Existing 25' Contours
- Proposed 25' Contours
- Existing Contours
- Proposed Contours
- Clearing
- Cut/Fill Limit
- Work Area/Vegetation

Associated Engineering Drawings
- 11_SOUTH_OVERBURDEN_STOCKPILE_2019.dwg (BGC) JUN 2012
- 11_SOUTH_OVERBURDEN_STOCKPILE_SECTION_A-A'.dwg (BGC) JUN 2012
- 11_SOUTH_OVERBURDEN_STOCKPILE_SECTION_B-B'.dwg (BGC) JUN 2012

DRAWING TITLE:
- SOUTH OVERBURDEN STOCKPILE
- SCALE: 1" = 500'
- HORIZONTAL SCALE: 1" = 250'
- VERTICAL SCALE: 1" = 100'

PRELIMINARY PLAN NOT FOR CONSTRUCTION
1. All existing contour elevations are in feet unless noted otherwise.

2. All proposed elevations and dimensions are in feet unless noted otherwise.
The image contains a detailed engineering diagram labeled "Laydown Area-3 Plan." The diagram includes a scale of 1" = 500' and shows various contour lines, grades, and areas designated for different purposes. The plan also includes a section view labeled "Laydown Area-3 Section A-A'" and "Laydown Area-3 Section B-B'" with horizontal and vertical scales of 1" = 500' and 1" = 100' respectively.

The legend includes symbols for cut/fill limits, unnamed rivers/streems, named rivers/streems, work area/vegetation, and clearing. The diagram also indicates existing ground and proposed grades, with elevations and stations marked. The path to the drawing file is provided as CONSTRUCTION_AREA_LAYDOWN_NO_3.dwg (BGC) JUNE 2012.

The drawing is part of the Donlin Gold Project and is intended for preliminary planning purposes, subject to change prior to final design.
NOTE: DRAINAGE AND EROSION CONTROLS WILL BE DEVELOPED WITHIN THE WORK AREA FOOTPRINT.
ULTIMATE PIT PLAN
SCALE 1" = 2000'

ULTIMATE PIT SECTION A-A'
HORIZONTAL SCALE 1" = 3000'
VERTICAL SCALE 1" = 1500'

ULTIMATE PIT SECTION B-B'
HORIZONTAL SCALE 1" = 3000'
VERTICAL SCALE 1" = 1500'

ULTIMATE PIT SECTION C-C'
HORIZONTAL SCALE 1" = 3000'
VERTICAL SCALE 1" = 1500'

NOTE: ALL GRADING IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

Associated Engineering Drawings
EOP_2036SP_6ft_Project.shp (ARCADIS) JUN 2012

DONLIN GOLD PROJECT
APPLICANT: Donlin Gold, LLC
4720 Business Park Blvd., Suite G-25
Anchorage, Alaska 99503

DATE: 12/22/2017

PRELIMINARY PLAN NOT FOR CONSTRUCTION
NOTES:
1. ALL EXISTING ELEVATIONS ARE IN FEET UNLESS NOTED OTHERWISE.
2. ALL PROPOSED ELEVATIONS AND DIMENSIONS ARE IN FEET UNLESS NOTED OTHERWISE

Associated Engineering Drawings

DONLIN GOLD PROJECT
4720 Business Park Blvd., Suite G-25
Anchorage, Alaska 99503

NOTE: ALL GRADING IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

ULTIMATE PIT - SAFETY BERM DETAIL

SCALE 1" = 5'

PRELIMINARY PLAN NOT FOR CONSTRUCTION
NOTE: AREA TO BE USED AS A BORROW SITE AND LATER PARTIALLY USED AS AN OVERBURDEN STOCKPILE.

NOTE: BORROW LIMIT SUBJECT TO CHANGE PENDING FURTHER GEOTECHNICAL INVESTIGATION.

NOTE: ALL GRADING IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.
NOTE: AREA TO BE USED AS A BORROW SITE AND LATER PARTIALLY USED AS AN OVERBURDEN STOCKPILE.

NOTE: BORROW LIMIT SUBJECT TO CHANGE PENDING FURTHER GEOTECHNICAL INVESTIGATION.
NOTE: AREA TO BE USED AS A BORROW SITE AND LATER PARTIALLY USED AS AN OVERBURDEN STOCKPILE.

NOTE: BORROW LIMIT SUBJECT TO CHANGE PENDING FURTHER GEOTECHNICAL INVESTIGATION.

NOTE: ALL GRADING IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

PLAN LEGEND:
- Uplands
- Wetlands
- Waters of U.S.
- Known River/Stream
- Unnamed River/Stream
- Existing 10' Contours
- Existing 50' Contours
- Proposed 10' Contours
- Proposed 50' Contours
- Cut Area
- Fill Area
- Existing Ground
- Proposed Grade

SECTION VIEW LEGEND:
- Cut/Fill Limit
- Unnamed River/Stream
- Named River/Stream
- Work Area/Vegetation
- Clearing

DONLIN GOLD PROJECT
APPLICANT: Donlin Gold, LLC
4720 Business Park Blvd., Suite G-25
Anchorage, Alaska 99503

DATE: 12/22/2017
SCALE: 1" = 800'

ASSOCIATED ENGINEERING DRAWINGS:
- TERRACE_7.dwg (BGC) JUN 2012
- TSF STOCKPILE 3 PLAN SCALE 1" = 800'
- TSF STOCKPILE 3 SECTION A-A'
- HORIZONTAL SCALE 1" = 800'
- VERTICAL SCALE 1" = 200'
- TSF STOCKPILE 3 SECTION B-B'
- HORIZONTAL SCALE 1" = 800'
- VERTICAL SCALE 1" = 200'

NOTE: PRELIMINARY PLAN NOT FOR CONSTRUCTION
TSF DRAINAGE - STORMWATER DIVERSION TYPICAL SECTION

Scale 1" = 2'

Fill Area
Cut Area
Existing Ground
Proposed Grade

1.5
1.6'
6.6'

EXISTING GROUND

1.6'
6.6'

EXISTING GROUND

1.5
20'
1.6'

NOTE: ALL GRADING IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.
WASTE ROCK
VARIES (66' MIN - 201' MAX)
33' (TYP.)
1.6' (TYP.
ROCK DRAIN
EXISTING GROUND
EXCAVATION
LIMIT
VARIES (160' MIN - 295' MAX)
ROCK DRAIN - DURABLE ROCK (GREYWACKE OR EQUAL)
$D_0 = 1.5'$
$D_10 = 0.67'$
$D_{MAX} = 3.3'$

35°
500'
625'
750'
875'

LONG TERM ORE
STOCKPILE
AMERICAN CREEK
DIVERSION DAM
AMERICAN CREEK
UPPER CONTACT
WATER POND/RESERVOIR
LONG TERM ORE
STOCKPILE

WASTE ROCK FACILITY
FINGER DRAIN (TYP.)

WASTE ROCK FACILITY DRAINAGE SYSTEM
PLAN
SCALE 1" = 2000'

WASTE ROCK FACILITY FINGER DRAIN TYPICAL SECTION A-A'
SCALE 1" = 100'

NOTE: ALL GRADING IS PRELIMINARY AND SUBJECT TO
CHANGE PRIOR TO FINAL DESIGN.

PRELIMINARY PLAN NOT FOR CONSTRUCTION
NOTES:
1. CLEARING LIMITS MIN. 10' BEYOND TOP OF CUT OR TOE OF FILL.
2. SUBBASE GRADING B, TO CONSIST OF 3" MINUS, WELL GRADED, GRANULAR MATERIAL WITH 6 TO 10% PASSING THE 200 SIEVE. MATERIAL TO BE DURABLE.
3. SELECT MATERIAL TYPE B, TO CONSIST OF COARSE ROCK OR GRAVEL, NON-FROST-SUSCEPTIBLE.
4. DEPTH OF FILL WILL VARY DEPENDING ON SOIL TYPE AND CONDITION.
5. TO THE EXTENT POSSIBLE, NATIVE VEGETATION AND GROUND SURFACE TO BE LEFT IN PLACE.
6. SAFETY BERM TO BE CONSTRUCTED TO A HEIGHT EQUAL TO ONE HALF THE TIRE DIAMETER OF THE LARGEST VEHICLE TO TRAVEL ROADWAY.

NOTES:
1. CLEARING LIMITS MIN. 10' BEYOND TOP OF CUT OR TOE OF FILL.
2. SUBBASE GRADING B, TO CONSIST OF 3" MINUS, WELL GRADED, GRANULAR MATERIAL WITH 6 TO 10% PASSING THE 200 SIEVE. MATERIAL TO BE DURABLE.
3. SELECT MATERIAL TYPE B, TO CONSIST OF COARSE ROCK OR GRAVEL, NON-FROST-SUSCEPTIBLE.
4. DEPTH OF FILL WILL VARY DEPENDING ON SOIL TYPE AND CONDITION.
5. BACKSLOPES WILL VARY DEPENDENT UPON SOIL TYPES OR ROCK CHARACTERISTICS.
   TYPICAL:
   3.0 : 1 FOR WET SILTY COLLUVIAL SOIL
   2.0 : 1 FOR WELL DRAINED SILT AND SILTY GRAVEL
   1.5 : 1 FOR WELL DRAINED SILT AND SILTY GRAVEL UP TO 1.0 : 1 FOR ROCK
6. ACCOMMODATE EXCESS EXCAVATION AND WASTE DISPOSAL BY FLATTENING AND/OR EXTENDING INSLOPE. EXTENT TO BE DETERMINED BY FIELD ENGINEER.
7. SAFETY BERM TO BE CONSTRUCTED TO A HEIGHT EQUAL TO ONE HALF THE TIRE DIAMETER OF THE LARGEST VEHICLE TO TRAVEL ROADWAY.

FAC_ID   Facility Name   W (ft)
35   Junguk-Dorlin Road, Crooked Creek Bridge to Pit Access Road   28
36   Junguk-Dorlin Road, Pit Access Road to Mill/Plant Site   28
39   Plant Site Crusher Facility Access Road & Parking   20
40   Fleet Service Access Road   33
55   Snow Suck Pond Access Road   16
60   AN Storage Access Road   16
69   Upper TSF Access Road - A   16
70   Upper TSF Access Road - B   16
115   Plant Site Waste Rock Facility Access Road   80
126   Waste Rock Storage Area Access Road   16
133   American Ridge Access Road   16

NOTE: ALL GRADING IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.
EXISTING GROUND  

PROPOSED GRADE

TYPICAL CROSS SECTION FOR 1-WAY SMALL CONSTRUCTION FLEET HAUL ROAD

TYPICAL CROSS SECTION FOR 2-WAY SMALL CONSTRUCTION FLEET HAUL ROAD

Associated Engineering Drawings

DONLIN GOLD PROJECT

APPLICANT: Donlin Gold LLC
4740 Business Park Blvd., Suite G-25
Anchorage, Alaska 99503

SCALE 1" = 10'

DATE: 12/22/2017

Preliminary Plan Not for Construction

PRELIMINARY PLAN NOT FOR CONSTRUCTION
TYPICAL CROSS SECTION FOR LIGHT VEHICLE ACCESS ROAD - HEAVY USE

TYPICAL CROSS SECTION FOR LIGHT VEHICLE ACCESS ROAD - OCCASIONAL USE
DONLIN GOLD PROJECT
APPLICANT: Donlin Gold, LLC
4720 Business Park Blvd., Suite G-25
Anchorage, Alaska 99503

ACAD-CADJungjuK Alignment and toes.dxf (Recon)

PLAN VIEW
ACCESS ROAD
WETLANDS MAP

FILE NO.
POA-1995-120
TA-306A

SCALE:
PATH: D:\Dropbox\181202_010_Mapping_404_Support\Revision_A\TA_3XXA_Road_MB_ABR_20171110.mxd

DATE: 12/22/2017

NAD 1983 UTM Zone 4N
1 inch = 1,000 feet

APPLICANT: Donlin Gold, LLC
4720 Business Park Blvd., Suite G-25
Anchorage, Alaska 99503

Associated Engineering Drawings

PRELIMINARY PLAN NOT FOR CONSTRUCTION
APPLICANT: Donlin Gold, LLC
4720 Business Park Blvd., Suite G-25
Anchorage, Alaska 99503

DONLIN GOLD PROJECT
APPLICANT: Donlin Gold, LLC
4720 Business Park Blvd., Suite G-25
Anchorage, Alaska 99503

Associated Engineering Drawings
ACAD-Donlin Jungjuk Alignment and toes off (Recon)

FILE NO.
POA-1995-120

TA-307A
POA-1995-120

PLAN VIEW
ACCESS ROAD
WETLANDS MAP

PRELIMINARY PLAN NOT FOR CONSTRUCTION

SCALE:
1 inch = 1,000 feet

PATH: D:\Dropbox\181202_010_Mapping_404_Support\Revision_A\TA_3XXA_Road_MB_ABR_20171110.mxd

DATE:
12/22/2017

NAD 1983 UTM Zone 4N
NOTES:

1. TOPOGRAPHY PROJECTION IS UTM, ZONE 4, NAD83 AS EXPRESSED IN METERS. VERTICAL DATUM IS NAVD88 APPROXIMATED USING GEOID12B.
2. ALL ELEVATIONS, STATIONING, AND COORDINATES ARE IN METERS UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS ARE IN FEET UNLESS NOTED OTHERWISE.
4. Guardian Left & Right 500' from bridge centerline each direction.
5. RFP RAP CLASS II is placed to 0' below thalweg to extents to be determined by field engineer/hydrologist.
6. Bridge structure supplied by Big R Bridge. Type: Supercor Galvanized Corrugated Structural Steel Plate.
8. Treeline typically at OHW or BSW.
9. Temporary construction access road to be 16' width single lane clear span temporary bridge with timber pad abutments, field located by the engineer. No construction below OHW.

LEGEND:
- Uplands
- Wetlands
- Waters of U.S.
- Visitor Area/Vegetation Clearing
- Cut/Fill Limit
- Work Area/Vegetation
- Embankment

PRELIMINARY PLAN NOT FOR CONSTRUCTION
NOTES:

1. TOPOGRAPHY PROJECTION IS UTM, ZONE 4.
2. HAZARDS AS EXPRESSED IN METERS.
3. VERTICAL DATUM IS NAVD88 APPROXIMATED USING GEOID12B.
4. ALL ELEVATIONS, STATIONING, AND COORDINATES ARE IN METERS UNLESS NOTED OTHERWISE.
5. ALL DIMENSIONS ARE IN FEET UNLESS NOTED OTHERWISE.
6. GUARDRAIL LEFT & RIGHT 30M FROM BRIDGE CENTERLINE EACH DIRECTION.
7. RIP RAP CLASS II PLACED TO 0.5' BELOW THALWEG TO EXTENTS TO BE DETERMINED BY FIELD ENGINEER/HYDROLOGIST.
8. BRIDGE STRUCTURE SUPPLIED BY BIG R BRIDGE.
9. GUARDRAIL (TYP) APPROXIMATE LIMITS OF RIP RAP.
10. HIGH HIGH WATER (HHW) BASED ON FIELD OBSERVATION. FLOOD ELEVATIONS TO BE DETERMINED DURING FINAL HYDRAULICS ANALYSIS.

GUARDRAIL

TOE EMBANKMENT FILL

APPROXIMATE LIMITS OF RIP RAP

2:1
MSE WALL

JUNGJUK CREEK, UPPER CROSSING BRIDGE

POA-1995-120

Associated Engineering Drawings

DONLIN GOLD PROJECT

APPLICANT: Donlin Gold, LLC
4720 Business Park Blvd., Suite G-25
Anchorage, Alaska 99503

DATE: 12/22/2017

SCALE: AS SHOWN

NOTE: ALL GRADING IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

PRELIMINARY PLAN NOT FOR CONSTRUCTION
NOTES:
1. Topography projection is UTM, Zone 4, NAD83 as expressed in meters. Vertical datum is NAVD88 approximated using GEOID12B.
2. All elevations, stationing, and coordinates are in meters unless noted otherwise.
3. All dimensions are in feet unless noted otherwise.
4. Guardian, left & right 30m from Bridge centerline each direction.
5. RIP rap class A placed to 0.5 below thalweg to extents to be determined by field engineer/hydrologist.
6. Bridge structure supplied by Big R Bridge. Type: Super Cor Galvanized Corrugated Structural Steel Plate.
7. Welded wire MSE retaining walls installed as needed to contain road embankment fill, as manufactured by VIST-A-WALL. See general specifications on sheet 2.
8. Tree/brush line typically at OHW or BSW.
9. Temporary construction access road to be 18 width single lane clear span temporary bridge with timber piers abutments. Field located by the engineer. No construction below OHW.
10. Culvert end locations shall be verified and staked in the field by the engineer. Culvert inlet and outlet inverts to be set 0.2 x diameter below natural ground surface.

LEGEND:
- Uplands
- Wetlands
- Waters of U.S.
- Work Area/Vegetation Clearing
- Cut/Fill Limit

NOTE: All grading is preliminary and subject to change prior to final design.
LEGEND:

- TEST HOLE LOCATION

NOTES:

1. TOPOGRAPHY PROJECTION IS UTM, ZONE 4, NAD83 AS EXPRESSED IN METERS. VERTICAL DATUM IS NAVD88 APPROXIMATED USING GEOID12B.
2. ALL ELEVATIONS, STATIONING, AND COORDINATES ARE IN METERS UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS ARE IN FEET UNLESS NOTED OTHERWISE.
4. GUARDRAIL LEFT & RIGHT 30M FROM BRIDGE CENTERLINE EACH DIRECTION.
5. RIP RAP CLASS 2 PLACED TO 0.5' BELOW THALWEG TO EXTENTS TO BE DETERMINED BY FIELD ENGINEER/HYDROLOGIST.
6. BRIDGE STRUCTURE SUPPLIED BY BIG R BRIDGE TYPE: SUPER-COR GALVANIZED CORRUGATED STRUCTURAL STEEL PLATE.
7. WELDED VARIED MSE RETAINING WALLS INSTALLED AS NEEDED TO CONTAIN ROAD EMBANKMENT FILL.
8. TREE/BRUSH LINE TYPICALLY AT OHW OR BSW.
9. FULL TEST HOLE LOG INFORMATION IS AVAILABLE IN THE SOIL REPORT.
10. HIGH HIGH WATER (HHW) BASED ON FIELD OBSERVATION. FLOOD ELEVATIONS TO BE DETERMINED DURING FINAL HYDRAULICS ANALYSIS.

NOTE: ALL GRADING IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.
**MATERIAL SITE 12 PLAN**

**SCALE 1" = 200'**

**HORIZONTAL SCALE 1" = 200'**
**VERTICAL SCALE 1" = 40'**

**DRAWING TITLE:**
MATERIAL SITE 12

**FILE NO.:**
TA-303D

**DATE:**
12/22/2017

**SCALE:**

**NOTE:** ALL GRADING IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.
MATERIAL SITE 10 SECTION B-B'

HORIZONTAL SCALE 1" = 600'
VERTICAL SCALE 1" = 100'

Fill Area
Cut Area
Uplands
Wetlands
Waters of U.S.

Proposed Drainage Direction
Overburden And Growth Media Stockpile
Temporary Fuel Storage
Existing Ground

SITE LIMITS
TO MINE SITE
JUNGJUK ROAD
ALIGNMENT (MILE 16.3)
FUEL STORAGE
OVERBURDEN AND GROWTH MEDIA STOCKPILE
FUEL STORAGE
JUNGJUK ROAD
ALIGNMENT (MILE 16.3)
EXISTING GROUND
EXISTING GROUND
PROPOSED GRADE
3:1
1%

NOTE: ALL GRADING IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.
NORTH FORK GETMUNA CREEK BRIDGE

LEGEND:
- Cut/Fill Limit
- Work Area/Vegetation
- Clearing
- Uplands
- Wetlands
- Waters of U.S.
- Rip RAP Class II placed to 0.5 below thalweg to extents to be determined by field engineer/hydrologist.
- Bridge structure supplied by Big R Bridge.
- Type: Super-Cor Galvanized Corrugated Structural Steel Plate.
- Welded wire MSE walls installed as needed to contain road embankment fill as manufactured by Vist-A-Wall.
- Treebrush line typically at OHW or BSW.
- Temporary construction access road to be 18’ width single lane clear spans temporary bridge with timber pad abutments, field located by the engineer. No construction below OHW.
- Culvert end locations shall be verified and staked in the field by the engineer. Culvert inlet and outlet inverts to be set 0.2 x diameter below natural ground surface.

CULVERT TABLE

<table>
<thead>
<tr>
<th>CULVERT NAME</th>
<th>MIN. DIAMETER (IN)</th>
<th>LENGTH (FT)</th>
<th>LENGTH (M)</th>
<th>START STATION</th>
<th>OFFSET</th>
<th>END STATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>29+607</td>
<td>36” (914)</td>
<td>80” (203.2)</td>
<td>80” (203.2)</td>
<td>29+607</td>
<td>12.0m R</td>
<td>29+687.5 12.0m R</td>
</tr>
</tbody>
</table>

NOTE: CULVERTS ARE NOT TO BE USED IN ACTIVE CHANNELS AND ARE LOCATED FOR INTERMITTENT DRAINAGE AND FLOOD RELIEF.

NOTE: ALL GRADE IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

ASSOCIATED ENGINEERING DRAWINGS

APPLICANT: Donlin Gold, LLC
4720 Business Park Blvd., Suite G-25
Anchorage, Alaska 99503

DATE: 12/22/2017

SCALE: NAD 1983 UTM Zone 4N (Meters)

NOTE: ALL ELEVATIONS, STATIONING, AND COORDINATES ARE IN METERS UNLESS NOTED OTHERWISE.

DRAWING TITLE: NORTH FORK GETMUNA CREEK BRIDGE PLAN & PROFILE

FILE NO.: TA-304D2a

NOT FOR CONSTRUCTION
NORTH FORK GETMUNA CREEK BRIDGE

NOTE:

1. FORWARD PROJECTION IS UTM, ZONE 4.
2. ALL ELEVATIONS, STATIONING, AND COORDINATES ARE IN METERS UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS IN FEET UNLESS NOTED OTHERWISE.
4. GUARDRAIL LEFT & RIGHT 30M FROM BRIDGE CENTERLINE EACH DIRECTION.
5. RIP RAP CLASS II PLACED TO 0.5' BELOW THALWEG TO EXTENTS TO BE DETERMINED BY FIELD ENGINEER/HYDROLOGIST.
6. BRIDGE STRUCTURE SUPPLIED BY BIG R BRIDGE. TYPE: SUPER-COR GALVANIZED CORRUGATED STRUCTURAL STEEL PLATE.
7. WELDED WIRE MSE RETAINING WALLS INSTALLED AS NEEDED TO CONTAIN ROAD EMBANKMENT FILL, AS MANUFACTURED BY VIST-A-WALL. SEE GENERAL SPECIFICATIONS ON SHEET 2.
8. TREE/BRUSH LINE TYPICALLY AT OHW OR BSW.
9. FULL TEST HOLE LOG INFORMATION IS AVAILABLE IN THE SOIL REPORT.
10. HIGH HIGH WATER (HHW) BASED ON FIELD OBSERVATION. FLOOD ELEVATIONS TO BE DETERMINED DURING FINAL HYDRAULICS ANALYSIS.

APPROXIMATE LIMITS OF RIP RAP

LEGEND:

- TEST HOLE LOCATION

TEST HOLE gp-1006 LOG

NOTES:

- PHYSICAL DATA IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

ASSOCIATED ENGINEERING DRAWINGS

APPLICANT: Donlin Gold, LLC
4730 Business Park Blvd., Suite G-25
Anchorage, Alaska 99503
12/22/2017

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NOTES:

- PHYSICAL DATA IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NOTES:

- PHYSICAL DATA IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NOTES:

- PHYSICAL DATA IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NOTES:

- PHYSICAL DATA IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NOTES:

- PHYSICAL DATA IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NOTES:

- PHYSICAL DATA IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NOTES:

- PHYSICAL DATA IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NOTES:

- PHYSICAL DATA IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NOTES:

- PHYSICAL DATA IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NOTES:

- PHYSICAL DATA IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NOTES:

- PHYSICAL DATA IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NOTES:

- PHYSICAL DATA IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NOTES:

- PHYSICAL DATA IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NOTES:

- PHYSICAL DATA IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NOTES:

- PHYSICAL DATA IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NOTES:

- PHYSICAL DATA IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NOTES:

- PHYSICAL DATA IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NORTH FORK GETMUNA CREEK BRIDGE SECTIONS & DETAILS

ASSOCIATED ENGINEERING DRAWINGS

NOTES:

- PHYSICAL DATA IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.
NOTES:
1. Topography projection is UTM, Zone 4, NAD83 as expressed in meters. Vertical datum is NAVD88 approximated using GEOID12B.
2. All elevations, stationing, and coordinates are in meters unless noted otherwise.
3. All dimensions are in feet unless noted otherwise.
4. Guardrail left & right 30m from bridge centerline each direction.
5. Rip rap class is placed to 0.5 below thalweg to extents to be determined by field engineer/consultant.
7. Welded wire mesh retaining walls installed as needed to contains road embankment fill, as manufactured by Vert-a-Wall. See General Specifications on Sheet 2.
8. Tree/Brush line typically at CHW or RSW.
9. Temporary construction access road to be 16' width single lane clear span temporary bridge with timber pad abutments, field located by the engineer. No construction below CHW.
10. Culvert end locations shall be verified and staked in the field by the engineer. Culvert inlet and outlet invert to be set 0.3+ diameter below natural ground surface.

LEGEND:
- Upstream
- Wetlands
- Waters of U.S.
- Black Area (Vegetation)
- Clearing
- Cut/Fill Limit
- Work Area
- Vegetation

CUTS/FILLS

CROSS SECTION

SOUTH FORK GETMUNA CREEK BRIDGE PLAN & PROFILE

PRELIMINARY PLAN NOT FOR CONSTRUCTION

Associated Engineering Drawings

DONLIN GOLD PROJECT
APPLICANT: Oeste LLC
4720 Business Park Blvd, Suite C-29
Anchorage, Alaska 99503

DREW, Bridge (12/22/17) Oct 2018

SOUTH FORK GETMUNA CREEK CROSSING AERIAL

NOTE: ALL GRADING IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

POA-1995-120

REVISION: 12/22/2017

PRELIMINARY PLAN NOT FOR CONSTRUCTION
LEGEND:
- BSW: Bottom of Existing Waterway
- OHW: Ordinary High Water
- TOE: Embankment Toe
- MSE WALL: MSE Wall (Typ)
- GUARDRAIL: Guardrail

NOTES:
1. Topography projection is UTM, Zone 4, NAD83 as expressed in meters. Vertical datum is NAVD88 approximated using GEOID12B.
2. All elevations, stationing, and coordinates are in meters unless noted otherwise.
3. All dimensions are in feet unless noted otherwise.
4. Guardrail left & right 30m from bridge centerline in each direction.
5. Riprap class II placed to 0.5' below thalweg to extents to be determined by field engineer/hydrologist.
6. Bridge structure supplied by Big R Bridge. Type: Super Cor Galvanized Corrugated Structural Steel Plate.
7. Welded wire MSE retaining walls installed as needed to contain road embankment fill. As manufactured by Vist-A-Wall. See General Specifications on Sheet 2.
8. Tree/brush line typically at OHW or BSW.
9. Full test hole log information is available in the soil report.
10. High high water (HHW) based on field observation. Flood elevations to be determined during final hydraulics analysis.

TEST HOLE LOG INFORMATION IS AVAILABLE IN THE SOIL REPORT. VERTICAL DATUM IS NAVD88 APPROXIMATED USING GEOID12B. ALL ELEVATIONS, STATIONING, AND COORDINATES ARE IN METERS UNLESS NOTED OTHERWISE. ALL DIMENSIONS ARE IN FEET UNLESS NOTED OTHERWISE. TOPOGRAPHY PROJECTION IS UTM, ZONE 4, NAD83 AS EXPRESSED IN METERS.
GETMUNA TRIBUTARY BRIDGE

NOTES:
1. TOPOGRAPHY PROJECTION IS UTM, ZONE 4, NAD83.
2. ALL ELEVATIONS, STATIONING, AND COORDINATES ARE IN METERS UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS ARE IN FEET UNLESS NOTED OTHERWISE.
4. GUARDRAIL LEFT & RIGHT 30M FROM BRIDGE CENTERLINE EACH DIRECTION.
5. THALWEG
6. MSE WALL
7. ENDPOINT COORDINATE
N: 22505139.9228
E: 1739713.1801
8. ENDPOINT COORDINATE
N: 22505070.1820
E: 1739719.2839
9. GUARDRAIL
10. TREE/BRUSH LINE TYPICALLY AT OHW OR BSW.
11. BRIDGE STRUCTURE SUPPLIED BY BIG R BRIDGE. TYPE: SUPER-COR GALVANIZED CORRUGATED STRUCTURAL STEEL PLATE.

FULL TEST HOLE LOG INFORMATION IS AVAILABLE IN THE SOIL REPORT.

VERTICAL DATUM IS NAVD88 APPROXIMATED USING GEOID12B.

ALL  ELEVATIONS, STATIONING,  AND COORDINATES ARE IN METERS UNLESS NOTED OTHERWISE.

TOPOGRAPHY PROJECTION IS UTM, ZONE 4, NAD83 AS EXPRESSED IN METERS.

NOTE: ALL GRADING IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.

PRELIMINARY PLAN NOT FOR CONSTRUCTION
NOTES:
1. Topography projection is UTM, Zone 4.
   NAVD as expressed in meters.
   Vertical datum is NAVD88 approximated
   using GEOID12B.
2. All elevations, stationing, and
   coordinates are in meters unless noted
   otherwise.
3. All dimensions are in feet unless
   noted otherwise.
4. Guardrail Left & Right 30m from Bridge
   Centreline in each direction.
5. Rip Rap Class II placed to 0.5' below Thalweg
   to extents to be determined by field
   Engineer/Hydrologist.
6. Welded wired MSE retaining walls installed
   as needed to contain road embankment fill.
   As manufactured by VIST-A-WALL. See General
   Specifications on Sheet 2.
7. Tree/Brush line typically at OHW or BSW.
8. Temporary Construction access road to be
   16' width single lane clear span temporary
   bridge with timber piling abutments, field
   located by the Engineer. No construction
   below OHW.
9. Bridge design from AMEC drawing
   #A1-150866-10-13-201, Dated 9/10/08. Welded
   wired MSE retaining walls have replaced
   the rock basket gabions used in the
   original AMEC design.
10. Culvert end locations shall be verified and
    staked in the field by the Engineer. Culvert
    inlet and outlet inverts to be set 0.2 x
    diameter below natural ground surface.
    see figure no. 46.6' span, single lane
    see construction sheet TA-314T
    84.6' span, single lane

CULVERT TABLE

<table>
<thead>
<tr>
<th>CULVERT NAME</th>
<th>INNER DIAMETER (Ft)</th>
<th>LENGTH (Ft)</th>
<th>START STATION</th>
<th>OFFSET END STATION</th>
<th>OFFSET</th>
</tr>
</thead>
<tbody>
<tr>
<td>4+024</td>
<td>72'' CMP</td>
<td>87</td>
<td>4+018.12</td>
<td>4+024</td>
<td></td>
</tr>
<tr>
<td>4+087</td>
<td>48'' CMP</td>
<td>80</td>
<td>4+087.12</td>
<td>4+087</td>
<td></td>
</tr>
</tbody>
</table>

Note:
Culverts are not in active channels and are located for intermittent drainage and flood relief.

NOTE:
All grading is preliminary and subject to change prior to final design.
NOTES:
1. TOPOGRAPHY PROJECTED IN UTM, ZONE 4, NAD88 AS EXPRESSED IN METERS. VERTICAL DATUM IS NAVD88 APPROXIMATED USING GEOID12B.
2. ALL ELEVATIONS, STATIONING, AND COORDINATES ARE IN METERS UNLESS NOTED OTHERWISE.
3. ALL DISTANCES ARE IN FEET UNLESS NOTED OTHERWISE.
4. GUARDRAIL LEFT & RIGHT 30M FROM BRIDGE CENTERLINE EACH DIRECTION.
5. 85-100% CLASS II PLACED TO 0.5' BELOW THALWEG TO EXTENTS TO BE DETERMINED BY FIELD ENGINEER/HYDROLOGIST.
6. WELDED WIRED MSE RETAINING WALLS INSTALLED AS NEEDED TO CONTAIN ROAD EMBANKMENT FILL, AS MANUFACTURED BY VIST-A-WALL. SEE GENERAL SPECIFICATIONS ON SHEET 2.
7. TREE-BUSH LINE TYPICALLY AT OHW OR BSW.
8. TEMPORARY CONSTRUCTION ACCESS ROAD TO BE 16' WIDTH SINGLE LANE CLEAR SPAN TEMPORARY BRIDGE WITH TIMBER PAD ABUTMENTS, FIELD LOCATED BY THE ENGINEER. NO CONSTRUCTION BELOW OHW.
9. BRIDGE DESIGN FROM AMEC DRAWING AAI-105684-10-13-301, DATED 9/10/08. WELDED WIRED MSE RETAINING WALLS HAVE REPLACED THE ROCK BASKET GABIONS USED IN THE ORIGINAL AMEC DESIGN.
10. HIGH HIGH WATER (HHW) BASED ON FIELD OBSERVATION. FLOOD ELEVATIONS TO BE DETERMINED DURING FINAL HYDRAULICS ANALYSIS.

NOTE: ALL GRADING IS PRELIMINARY AND SUBJECT TO CHANGE PRIOR TO FINAL DESIGN.
PRELIMINARY PLAN NOT FOR CONSTRUCTION
NOTES:

1. CLEARING LIMITS ARE TOE OF FILL.

2. SUBBASE GRADING B: TO CONSIST OF 3" MINUS, WELL GRADED, GRANULAR MATERIAL WITH 6 TO 10% PASSING THE 200 SIEVE. MATERIAL TO BE DURABLE.

3. SELECT MATERIAL TYPE B: TO CONSIST OF COARSE ROCK OR GRAVEL. NON-FROST-SUSCEPTIBLE.

4. DEPTH OF FILL WILL VARY DEPENDING ON SOIL TYPE AND CONDITION. 6' TOTAL EMBANKMENT DEPTH WILL TYPICALLY BE THE MINIMUM.

5. TO THE EXTENT POSSIBLE, NATIVE VEGETATION AND GROUND SURFACE TO BE LEFT INPLACE.

NOTES:

1. CLEARING LIMITS MIN. 3.3' BEYOND TOP OF CUT OR TOE OF FILL.

2. SUBBASE GRADING B; TO CONSIST OF 3" MINUS, WELL GRADED, GRANULAR MATERIAL WITH 6 TO 10% PASSING THE 200 SIEVE. MATERIAL TO BE DURABLE.

3. SELECT MATERIAL TYPE B; TO CONSIST OF COARSE ROCK OR GRAVEL. NON-FROST-SUSCEPTIBLE.

4. DEPTH OF FILL WILL VARY DEPENDING ON SOIL TYPE AND CONDITION. 3.3' TOTAL EMBANKMENT DEPTH WILL TYPICALLY BE THE MINIMUM.

5. BACKSLOPES WILL VARY DEPENDING UPON SOIL TYPES OR ROCK CHARACTERISTICS. TYPICAL:
   1.5:1 FOR WELL DRAINED SILT AND SILTY GRAVEL
   1.0:1 FOR ROCK

6. ACCOMMODATE EXCESS EXCAVATION AND WASTE DISPOSAL BY FLATTENING AND/OR EXTENDING IN-SLOPE. EXTENT TO BE DETERMINED BY FIELD ENGINEER.
NOTES:
1. CLEARING LIMITS TO BE MIN. 10' EACH SIDE OF POWER POLE.
2. MULCH AND ORGANIC DEBRIS FROM CLEARING TO REMAIN ON GROUND SURFACE.
3. SOIL NOT TO BE DISTURBED EXCEPT AT SPECIFIC LOCATIONS AS PERMITTED.
4. DIMENSIONS ARE APPROXIMATE.
WEST END - ROADWAY

PLAN VIEW

TYPICAL TEMPORARY CONSTRUCTION BRIDGE

1. ABUTMENT PADS AND STRUCTURES TO BE PLACED ABOVE OHW.
2. BRIDGE ABUTMENT CONSTRUCTION DETAILS FOR BRIDGES AT CROOKED CREEK, NORTH FORK GETMUNA CREEK, SOUTH FORK GETMUNA CREEK, GETMUNA TRIBUTARY, AND THE UPPER & LOWER CROSSINGS OF JUNGJUK CREEK. ALL BRIDGES TO BE INSTALLED PER PERMIT REQUIREMENTS AND AT LOCATIONS FIELD STAKED BY PROJECT ENGINEER.
CULVERT DIA. VARIES
MINIMUM COVER
EXISTING GROUND
JUNGJUK ROAD SURFACE
CULVERT BEDDING
NOTE: MINIMUM COVER AND CULVERT BEDDING TO BE DETERMINED WITH SITE SPECIFIC DESIGN.

STREAM
JUNGJUK ROAD
GRADING LIMITS
316T

TYPICAL CULVERT PLAN
SCALE 1" = 20'

TYPICAL CULVERT SECTION A-A'
SCALE 1" = 1'

NOTE: MINIMUM COVER AND CULVERT BEDDING TO BE DETERMINED WITH SITE SPECIFIC DESIGN.

0 10 20
Ft

0 6 12
In
PRELIMINARY PLAN NOT FOR CONSTRUCTION

Gas Pipeline Milepost
Proposed Natural Gas Pipeline
Proposed HDD Natural Gas Pipeline
Cut/Fill Limit
Stream Flow Direction
Work Area/Vegetation
100' Contour
Wetland Status
Upland
Wetland
River/Stream
Unnamed River/Stream
Acronyms
MS-Material Site
PSY-Pipe Storage Yard
WES-Water Extraction Site

Associated Engineering Figures
DONLIN GOLD PROJECT
APPLI-CAT Civil Group, LLC
4710 Business Park Dr., Suite 250
Anchorage, Alaska 99503

PLAN VIEW
PIPELINE AREA

PRELIMINARY PLAN NOT FOR CONSTRUCTION
TYPICAL PIPE STORAGE YARD PLAN

14" DIA PIPE (STACKED 5 HIGH)

BERMS

PIPE YARD
LOADING AREA

SEE DRAWING 101Tx
FOR PIPE STOCKPILE DETAIL

SEE DRAWING 101Tx
FOR PIPE STOCKPILE DETAIL

100'

CONSTRUCTION R.O.W.

60'

100'

WATER SIDE & TRAVEL

100'

BERMS

PIPE STORAGE YARD

400' TO 1000'

PO-4W-TYPT-01.DWG (BAKER) OCT 2013
ROPE INSTALLATION

1. ROPE SPACING SHOULD BE A MAXIMUM OF 6.0 FEET FROM THE PIPE ENDS.
2. THE INTERVALS BETWEEN RINGS SHOULD BE BETWEEN 10.0 FEET AND 20.0 FEET WITH A MINIMUM OF 36 LOOPS SPACED OVER A STANDARD TRIPLE RANDOM LENGTH (60 FEET).
3. THE INTERVALS MUST BE ADJUSTED TO INSURE THERE IS NO PIPE TO PIPE CONTACT. ROPE ENDS SHALL BE FUSED WITH A BLOW TORCH PRIOR TO SLIPPING THE LOOP OVER THE PIPE.

NOTES:

1. THE USE OF ALTERNATE METHODS FOR STOCKPILING PIPE AND/OR THE USE OF ALTERNATE MATERIALS FOR PREVENTING PIPE TO PIPE CONTACT SHALL REQUIRE WRITTEN APPROVAL OF THE COMPANY.
2. PIPE SHALL BE STOCKPILED AND SECURED (AS NECESSARY) TO PRECLUDE MOVEMENT OF PIPE.
3. ALL MATERIALS SHALL BE FURNISHED BY THE CONTRACTOR.

PIPE SIZE A' (NO. OF ROWS)

<table>
<thead>
<tr>
<th>Size</th>
<th>A'</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot;</td>
<td>10</td>
</tr>
<tr>
<td>6&quot;</td>
<td>8</td>
</tr>
<tr>
<td>8&quot;</td>
<td>6</td>
</tr>
<tr>
<td>10&quot;</td>
<td>6</td>
</tr>
<tr>
<td>12&quot;</td>
<td>5</td>
</tr>
<tr>
<td>16&quot;</td>
<td>4</td>
</tr>
</tbody>
</table>
NOTES:
1. REFER TO CROSS SECTION DETAILS (A) & (B).
2. ICE SURFACE TO BE CLEARED OF SNOW 30-50' EACH SIDE OF ROAD CENTERLINE TO AUGMENT ICE THICKENING.
3. CLEAN SNOW FOR FILL MAY BE ACCUMULATED FROM NATURAL OPEN AREAS NEAR CROSSING SITE AND ICE SURFACE.
4. TO THE EXTENT POSSIBLE, CROSSING TO BE ORIENTED PERPENDICULAR TO ACTIVE CHANNEL.
5. WATER FOR BUILDING ICE TO BE TAKEN FROM STREAM AT CROSSING LOCATION.
6. SNOW BERMS TO BE SHAPED FOR PASSAGE OF SNOWMACHINES AND SIGNAGE PLACED WARNING OF CROSSING.
7. SNOW BERMS TO DEFINE CROSSING SITE AND AID IN CONTAINING WATER DURING FLOODING TO BUILD ICE.
8. CROSSINGS SHALL BE DEVELOPED IN ACCORDANCE WITH STATE OF ALASKA FOREST RESOURCES AND PRACTICES REGULATIONS AS THEY ADDRESS WINTER ROADS/TRAILS AND STREAM CROSSINGS.
WINTER ROAD TYPICAL STREAM CROSSING SECTION A-A'

NOTES:
1. BEFORE DEVELOPMENT, ALL CROSSING LOCATIONS SHALL BE TESTED FOR ICE THICKNESS, WATER DEPTH AND EXTENT OF GROUNDED ICE. CLEAN SNOW FOR RAMP CONSTRUCTION MAY BE GATHERED FROM OPEN AREAS ADJACENT TO THE CROSSING SITE AND TRAIL. CROSSINGS SHALL BE DEVELOPED IN ACCORDANCE WITH STATE OF ALASKA FOREST RESOURCES AND PRACTICES REGULATIONS AS THEY ADDRESS WINTER ROADS/TRAILS AND STREAM CROSSINGS. ALL CROSSINGS SHALL BE ASSESSED BY A QUALIFIED ENGINEER AND APPROVED FOR USE.

WINTER ROAD TYPICAL SECTION B-B'

NOTES:
1. CLEARING LIMITS TO BE MIN. 15' EACH SIDE OF CENTERLINE OR MAX. 30' TOTAL WIDTH.
2. MULCH AND ORGANIC DEBRIS FROM CLEARING TO REMAIN ON GROUND SURFACE.
3. DEPTH OF PACKED SNOW AND ICE FOR RUNNING SURFACE WILL VARY.
4. SOIL NOT TO BE DISTURBED EXCEPT AT SPECIFIC LOCATIONS AS PERMITTED.
5. ADD TURNOUT LANE AT LOCATIONS DETERMINED BY ENGINEER. SURFACE WIDTH INCREASED TO 28' FOR TURNOUT. (APPROX. ONE PER 1/4 MILE).
TURNOUT & TURNAROUND TO BE CONSTRUCTED AT AN AVERAGE INTERVAL OF 1/4 MILE. CONSTRUCTION WILL OCCUR IN OPEN TREELESS AREAS UNLESS NO SUCH AREAS AVAILABLE.

NOTES:
1. TURNOUTS TO BE FIELD LOCATED BY ENGINEER TO BEST FIT TERRAIN CONDITIONS AND MAXIMIZE OPERATIONAL SAFETY.
2. TURNOUTS TO BE CONSTRUCTED SIMILAR TO ROAD RUNNING SURFACE.
3. OPEN AREA TURNOUTS MAY BE SHAPED AND SIZED TO BEST FIT TERRAIN AND NATURAL CLEARINGS. RADIUS IS REPRESENTATIVE ONLY.
NOTE:
- THIS IS A TYPICAL SITE SET-UP. THERE ARE VARIOUS CONFIGURATIONS USED DEPENDING UPON SITE RESTRICTIONS. FIELD MODIFICATIONS TO SUIT SITE.
- CUT/FILL SLOPES ARE 2:1 (HORIZ:VERT), TYPICAL.

TYPICAL HDD ENTRY SITE EQUIPMENT LAYOUT
N.F.S.
NOTES:

1. PULLOUTS WILL BE INSTALLED AS TERRAIN ALLOWS AT APPROXIMATELY 1/4 MILE INTERVALS. ADDITIONAL PULLOUTS WILL BE CONSTRUCTED WHERE HILLY TERRAIN AND LIMITED SITE DISTANCE ARE PREVALENT.
2. TEMPORARY CONSTRUCTION TURNAROUNDS WILL BE BUILT AT EACH PULLOUT AND FIELD FIT TO MINIMIZE CLEARING.
3. ROCK FILL SHALL BE PLACED IN NO GREATER THAN 12" LIFTS AND COMPACTED.
4. ROCK FILL SHALL BE UNDERLAIN WITH GEOTEXTILE WHEN DIRECTED BY PROJECT ENGINEER.
5. PULLOUTS TO MAY BE WIDENED OR LENGTHENED WHERE NATURAL CONDITION PERMIT AND AS DIRECTED BY PROJECT ENGINEER.
6. TEMP TURNAROUND GRUB ONLY LARGE STUMPS AND PLACE FILL SUFFICIENT TO SUPPORT VEHICLES, CLEAR TO TOE OF FILL OR TOP OF CUT.

NOTES:

1. FIELD FIT AT 400-500' INTERVALS TO MINIMIZE CLEARING AND EXCAVATION.
2. PLACE FILL SUFFICIENT TO SUPPORT VEHICLES, CLEAR TO TOE OF FILL OR TOPE OF CUT.
3. TEMPORARY CONSTRUCTION TURNAROUNDS WILL BE BUILT AT EACH PULLOUT AND FIELD FIT TO MINIMIZE CLEARING.
4. ROCK FILL SHALL BE PLACED IN NO GREATER THAN 12" LIFTS AND COMPACTED.
5. ROCK FILL SHALL BE UNDERLAIN WITH GEOTEXTILE WHEN DIRECTED BY PROJECT ENGINEER.
6. TEMP TURNAROUND GRUB ONLY LARGE STUMPS AND PLACE FILL SUFFICIENT TO SUPPORT VEHICLES, CLEAR TO TOE OF FILL OR TOPE OF CUT.
NOTES:
1. "SELECT MATERIAL" TO BE APPROVED GRANULAR SOIL
2. QUARRY ROCK FILL SHALL BE UNDERLAIN WITH NON-WOVEN GEOTEXTILE, GEOTEX NW 601 OR EQUAL.
3. IN WETLAND AREAS, CONTRACTOR MAY NOT PLACE FILL, REMOVE NATIVE MATERIAL, OR RUN EQUIPMENT OUTSIDE DESIGNATED CONSTRUCTION ZONE AS MARKED IN FIELD BY THE ENGINEER.
4. CROSS DRAINS SHALL BE ARMORED WATER BARS OR CULVERTS INSTALLED AT LOCATIONS DETERMINED BY FIELD ENGINEER.
5. CROSS CULVERTS IN UPLANDS SHALL BE INSTALLED WITH AN ENLARGED (BELL HOLE) DITCH SECTION ON THE INLET END. FILL TO 6" DEPTH WITH DITCH LINER MATERIAL.
6. CULVERT DIA. AND LOCATION PER SUMMARY PROVIDED BY PROJECT ENGINEER.

SHOOFLY OR ACCESS ROAD TYPICAL SECTION
VARIABLE TERRAIN (CUT/FILL)

NOTES:
1. MAX ROAD CLEARING WIDTH IS TOP OF CUT OR TOE OF FILL. IN NEARLY LEVEL TERRAIN, REDUCE CLEARING WIDTH TO 30 FT.
2. CUT SLOPES WILL VARY DEPENDING ON SOIL OR ROCK TYPE AND CHARACT., MIN 0.25:1.
3. FILL SHALL BE UNDERLAIN WITH GEOTEXTILE WHERE SOFT UNDERLYING SOILS ARE ENCOUNTERED.
4. RESERVE TOPSOIL AND ORGANIC MATERIAL FOR STABILIZATION AND SEEDING ON CUT SLOPES.
5. CROSS DRAINS SHALL BE ARMORED WATER BARS OR CULVERTS INSTALLED AT LOCATIONS DETERMINED BY FIELD ENGINEER.

SHOOFLY OR ACCESS ROAD TYPICAL SECTION
LEVEL TERRAIN (FILL)
**Bridge Design Notes:**

1. Design and maintain bridge to withstand and pass the highest anticipated flow that may occur while the bridge is in place. Culverts must be aligned to prevent bank erosion or stream bed scour.
2. Inspect bridge elevation so bridge remains supported above high bank, and does not sink into bank. Add additional support must be added on top of bank and under span if initial support starts to settle. All bridges must be anchored for stability.
3. Erosion and sedimentation control measures shall be inspected and maintained. Construct sediment barriers across the entire construction R.O.W. to prevent silt-laden water and spoil from flowing back into waterbody. Silt fence or sandbags may be used interchangeably.
4. Bridge decks will be kept free of soil.
5. Equipment bridges will consist of one of the following: clean rock placed over flume pipes; prefabricated construction mats or flex float; or other temporary bridging such as Bailey bridges.
6. Remove equipment bridges and associated material as soon as possible. Restore and stabilize bed and banks to approximate pre-construction conditions.

**Remarks:**

- Disposal of any rock as directed.
1. Design and maintain bridge to withstand and pass the highest anticipated flow that may occur while the bridge is in place. Culverts must be aligned to prevent bank erosion or stream bed scour.

2. Inspect bridge elevation so bridge remains supported above high bank, and does not sink into bank. Additional support must be added on top of bank and under span if initial support starts to settle. All bridges must be anchored for stability.

3. Erosion and sedimentation control measures shall be inspected and maintained. Construct sediment barriers across the construction site. To prevent silt laden water and spoil from flowing back into waterbody, silt fences or sandbags may be used interchangeably.

4. Bridge decks will be kept free of soil.

5. Equipment bridges will consist of one of the following: clean rock placed over flume pipes; prefabricated construction mats; or flood float or other temporary bridging, such as Bailey bridges.

6. Remove equipment bridges and associated material as soon as possible. Restore and stabilize bed and banks to approximate pre-construction conditions.

7. Dispose of any rock as directed.

Note: The above notes are typical for the Donlin Gold Project.
NOTES:

1. METHOD APPLIES TO CROSSING WHERE NO FLOWING WATER IS PRESENT AT THE TIME OF CROSSING.

2. CONTRACTOR MAY "MAINLINE THROUGH" THE CROSSING OR UP TO BOTH SIDES OF THE CROSSING; STRING, WELD, COAT, AND WEIGHT (IF NECESSARY), USING THE MAINLINE CREW WITH THE PIPE SKIDDED OVER THE CROSSING.

3. CONSTRUCT SEDIMENT BARRIERS ACROSS THE ENTIRE CONSTRUCTION R.O.W. FOLLOWING CLEARING AND GRADING AND MAINTAIN UNTIL CONSTRUCTION OF THE CROSSING. EROSION CONTROL MEASURES SHALL BE REINSTALLED IMMEDIATELY FOLLOWING BACKFILLING OF TRENCH AND STABILIZATION OF BANKS.

4. TOPSOIL AND SPOIL WILL NOT BE STOCKPILED IN THE CROSSING CHANNEL.

5. MAINTAIN STREAM FLOW THROUGHOUT CROSSING CONSTRUCTION.

6. BACKFILL WITH NATIVE MATERIAL.

7. RESTORE CROSSING CHANNEL TO APPROXIMATE PRE-CONSTRUCTION PROFILE AND SUBSTRATE.

8. RESTORE CROSSING BANKS TO APPROXIMATE ORIGINAL CONDITION AND STABILIZED, AS REQUIRED.

NOTES:

1. SCHEDULE CROSSING DURING LOW FLOW PERIOD IF POSSIBLE.

2. COMPLETE ALL IN-STREAM ACTIVITIES WITHIN 24 HOURS IF FEASIBLE.

3. NO REFUELING OF MOBILE EQUIPMENT WITHIN 200 FEET OF WATERBODY. REFUEL STATIONARY EQUIPMENT AS PER THE HAZARDOUS MATERIALS MANAGEMENT AND SPCC PLAN.

4. CONSTRUCT SEDIMENT BARRIERS ALONG THE SIDES OF STOCKPILES AND ACROSS THE ENTIRE CONSTRUCTION R.O.W. TO PREVENT SILT-laden WATER AND SPOIL FROM FLOWING BACK INTO WATERBODY. BARRIERS MAY BE TEMPORARILY REMOVED TO ALLOW CONSTRUCTION ACTIVITIES BUT MUST BE REPLACED BY THE END OF EACH WORK DAY.

5. IN-STREAM SPOIL TO BE STORED OUT OF THE STREAM CHANNEL AND WITHIN THE CONSTRUCTION R.O.W.

6. INSTALL SOFT PLUGS AT THE EDGE OF STREAM BANKS UNTIL JUST PRIOR TO PIPE INSTALLATION TO CONTROL WATER FLOW & TRENCH SLOUGHING, IF NEEDED.

7. MAINTAIN STREAM FLOW THROUGHOUT CROSSING CONSTRUCTION.

8. BACKFILL WITH NATIVE MATERIAL.

9. RESTORE CROSSING CHANNEL TO APPROXIMATE PRE-CONSTRUCTION PROFILE AND SUBSTRATE.

10. RESTORE CROSSING BANKS TO APPROXIMATE ORIGINAL CONDITION AND STABILIZED, AS REQUIRED.

11. ALL DIMENSIONS INDICATED SHALL BE DETERMINED BY ACTUAL CONSTRUCTION CONDITIONS.

12. FOLLOW REQUIREMENTS FROM THE ARMY CORPS OF ENGINEERS.

13. DRAWING DEPICTED IS SUPERSEDED BY WRITTEN STANDARD, SCOPE OF WORK OR LINE LIST.
1. Method applies to waterbodies that are not state designated fisheries where flume crossings are not required. If topography permits temporary equipment bridge installation, the contractor shall trench, string, weld, coat, and weight (if necessary) lower in and backfill utilizing the mainline crew traveling over the bridge. If topography prohibits installation of a temporary equipment bridge, contractor shall trench up to both sides of crossing; string, weld, coat and weight (if necessary) using the mainline crew; in stream excavation, lower in, and backfill will utilize a clam or dozes working from the banks.

2. Schedule crossing during low flow period if possible.

3. Construct sediment barriers along the sides of stockpiles and across the entire construction ROW to prevent silt laden water and spoil from flowing back into waterbody.

4. In-stream spoil to be stored out of the stream channel.

5. Install temporary (soft) plugs at the edge of stream banks until just prior to pipe installation to control water flow and trench sloughing.

6. Trench through waterbody using mainline excavation equipment where practical.

7. Maintain streamflow throughout crossing construction.

8. Restore waterbody channel to approximate pre-construction profile and substrate.

9. Restore stream banks to appropriate original condition and stabilize, as required.
NOTES:

1. THIS METHOD APPLIES TO SWALES, DRAINS, SMALL STREAMS OR CREEKS WITH LIMITED FLOW AT TIME OF CONSTRUCTION WHERE DOWNSTREAM SEDIMENTATION MUST BE AVOIDED AND THE CROSSING WIDTH IS NOT PROHIBITIVE.

2. SCHEDULE CROSSING DURING LOW FLOW PERIOD IF POSSIBLE.

3. COMPLETE ALL IN-STREAM ACTIVITIES AS EXPEDIENTLY AS POSSIBLE.

4. INSTALL TEMPORARY VEHICLE CROSSING, IF REQUIRED.

5. IN-STREAM SPOIL TO BE STORED OUT OF THE STREAM CHANNEL AND WITHIN THE CONSTRUCTION R.O.W. UNLESS DEPICTED OTHERWISE IN THE SITE SPECIFIC CROSSING PLANS.

6. CONSTRUCT SEDIMENT BARRIERS TO PREVENT SILT LADEN WATER AND SPOIL FROM FLOWING INTO WATERBODY. CONSTRUCTED SEDIMENT BARRIERS SHALL EXTEND ALONG THE SIDES OF THE SPOIL AND TOPSOIL STOCKPILES AND ACROSS THE ENTIRE CONSTRUCTION R.O.W. BARRIERS MAY BE TEMPORARILY REMOVED TO ALLOW CONSTRUCTION ACTIVITIES BUT MUST BE REPLACED BY THE END OF EACH WORK DAY.

7. CONSTRUCT UPSTREAM STRUCTURE (DAM) FOLLOWED BY DOWNSTREAM STRUCTURE (DAM). WATER STRUCTURES’ (AQUA DAM, JERSEY BARRIERS, SAND BAGS, STEEL PLATE, POLYETHYLENE LINER, ETC.) FINAL LOCATION WILL BE APPROVED BY THE COMPANY INSPECTOR.

8. SIZE PUMPS FOR DIVERSION OF ENTIRE STREAM FLOW. CONTRACTOR SHALL MAINTAIN 100% SPARE PUMPING CAPACITY ON SITE. PUMPS SHALL BE INSTALLED ON POLYETHYLENE BARRIERS OR OTHER APPROPRIATE CONTAINMENT. PUMP INTOXICANT WILL BE MONITORED AND REPORTED. MONITORING DURATION: TWO (2) DAYS. CONTRACTOR SHALL INSURE PUMPS AND WATER STRUCTURES SPILLAGE PROTECTION (DAM AQUA DAM, JERSEY BARRIERS, SAND BAGS, STEEL PLATE, POLYETHYLENE LINER, ETC.) IS COMPLETE. ALL LEAKAGE AT THE DAM STRUCTURES OCCURS, CONTRACTOR SHALL REPORT TO COMPANY INSPECTOR AND COMPANY INSPECTOR IS REQUIRED TO PROVIDE IN-STREAM DEPLOYMENT OF A WATER STRUCTURE (DAM) TYPICAL.

9. LEAVE HARD PLUGS AT STREAM BANK EDGE UNTIL JUST PRIOR TO PIPE INSTALLATION.

10. COMPLETE CONSTRUCTION OF IN-STREAM PIPE TOPSOIL R.O.W. TO APPROXIMATE ORIGINAL CONDITION. STABILIZE WATERBODY BANKS AND INSTALL TEMPORARY BARRIERS.

11. TRENCH THROUGH WATERBODY AS EXPEDIENTLY AS PRACTICAL. INSTALL TEMPORARY (SOFT) PLUGS, IF NECESSARY, TO CONTROL WATER FLOW AND TRENCH SLUDDLING.

12. LOWER-IN PIPE, INSTALL TRENCH PLUG AND BACKFILL IMMEDIATELY.

13. RESTORE WATERBODY CHANNEL TO APPROXIMATE PRE-CONSTRUCTION PROFILE AND SUBSTRATE.

14. RESTORE WATERBODY CHANNEL TO APPROXIMATE PRE-CONSTRUCTION PROFILE AND SUBSTRATE.

15. DISMANTLE DOWNSTREAM WATER STRUCTURE (DAM) AND UPSTREAM WATER STRUCTURE (DAM) AFTER TRENCH BACKFILL.

16. RESTORE STREAM BANKS TO APPROXIMATE ORIGINAL CONDITION. STABILIZE WATERBODY BANKS AND INSTALL TEMPORARY BARRIERS.
NOTES:
1. NORMAL FLOW OF DRAINAGE NOT TO BE CHANGED FOLLOWING PIPELINE CONSTRUCTION OPERATIONS.
2. CONSTRUCT ALL CROSSINGS IN ACCORDANCE WITH ENVIRONMENTAL PERMIT REQUIREMENTS AND CONDITIONS.
3. PIPELINE TO BE INSTALLED BY OPEN-CUT METHOD.

TYPICAL WATERBODY CROSSING HORIZONTAL BORE PLAN AND SECTION

TYPICAL SMALL CREEK CROSSING SECTION

NOTES:
1. NORMAL FLOW OF DRAINAGE NOT TO BE CHANGED FOLLOWING PIPELINE CONSTRUCTION OPERATIONS.
2. CONSTRUCT ALL CROSSINGS IN ACCORDANCE WITH ENVIRONMENTAL PERMIT REQUIREMENTS AND CONDITIONS.
3. PIPELINE TO BE INSTALLED BY OPEN-CUT METHOD.
SLOPE BREAKER NOTES:
1. SLOPE BREAKERS SHALL BE CONSTRUCTED OF NATIVE SOIL AND INSTALLED AT LOCATIONS AS SHOWN ON THE CONSTRUCTION DRAWINGS, OR AS REQUIRED.
2. SLOPE BREAKER SHALL BE ORIENTED AS SHOWN OR OTHER PATTERN AS REQUIRED.
3. SLOPE BREAKERS SHALL BE CONSTRUCTED AT A 2-8% GRADIENT ACROSS THE SLOPE.
5. THE OUTLET OF THE SLOPE BREAKER MUST FREELY DISCHARGE ALL RUNOFF OFF THE DISTURBED R.O.W. INTO A STABLE, WELL VEGETATED AREA OR INTO AN ENERGY DISSIPATOR.
6. WHERE SLOPE BREAKERS EXTEND BEYOND THE EDGE OF THE CONSTRUCTION R.O.W. TO DIRECT RUNOFF INTO STABLE, WELL VEGETATED AREAS, THESE LOCATIONS MUST BE APPROVED.

SILT FENCING, STAKED HAY BALES, ROCK, OR STABLE VEGETATED AREA AS AN ENERGY DISSIPATOR

FLOW ENERGY DISSIPATOR NOTES:
1. THE OUTLET SHALL CONTAIN AN ENERGY DISSIPATOR IF THE COMPANY DETERMINES EXISTING VEGETATION IS NOT SUFFICIENTLY STABLE TO PREVENT EROSION. THE ENERGY DISSIPATOR SHALL BE CONSTRUCTED AS FOLLOWS:
   - OUTFALL END OF DISSIPATOR SHOULD BE LOWER THAN SLOPE BREAKER END.
   - SILT FENCE, STRAW Bale OR ROCK DISSIPATORS SHOULD BE KEYED INTO THE END OF THE SLOPE BREAKER. PROVIDE ENOUGH AREA INSIDE "L" TO CAPTURE AND HOLD SEDIMENT.

PRELIMINARY PLAN NOT FOR CONSTRUCTION
20% SLOPE
1:1

RIGHT OF WAY

±68'
5'
25'
150'

"MODERATE" DISTURBANCE

"HEAVY" DISTURBANCE

APPROX. 1.5:1 SLOPE OR AS PER FIELD CONDITIONS

APPROX. 1:1 SLOPE OR AS PER FIELD CONDITIONS

±15'

TOPSOIL

FILL

APPROX. 1:1 SLOPE OR AS PER FIELD CONDITIONS

ACTIVE CONSTRUCTION RIGHT OF WAY

N.T.S.

RECLAIMED RIGHT OF WAY

N.T.S.

TOP OF CROWN

BURIED PIPELINE

20% SLOPE

DITCH SPOIL

1'

TOP OF CROWN

1'

TOPSOIL

150'

"MODERATE" DISTURBANCE

"MODERATE" DISTURBANCE

"HEAVY" DISTURBANCE
NOTES:

1. TRENCH BREAKERS SHALL BE INSTALLED:
   - ON SLOPES ALONG THE TRENCH LINE WHERE THE NATURAL DRAINAGE PATTERN, PROFILE, AND TYPE OF BACKFILL MATERIAL MAY RESULT IN LOSS OF BACKFILL MATERIAL OR ALTERATION OF THE NATURAL PATTERN
   - AT THE BASE OF SLOPES ADJACENT TO WATERBODIES AND WETLANDS
   - WHERE NEEDED TO AVOID DRAINING A WETLAND

2. OPEN WEAVE HEMP OR JUTE SACKS SHALL BE FILLED WITH A MINIMUM OF 55lbs IN A MIXTURE OF SAND & SUBSOIL.

3. BREAKER SPACING AND CONFIGURATION, INCLUDING THE NEED TO KEY THE BREAKER INTO THE UNDISTURBED SOIL AT THE SIDES AND BOTTOM OF THE TRENCH, MAY CHANGE AS DETERMINED BY COMPANY ENGINEER.

NOTES:

1. MINI-TRENCH BREAKERS SHALL BE INSTALLED AT EDGE OF EACH WETLAND.
2. OPEN WEAVE HEMP OR JUTE SACKS SHALL BE FILLED WITH A MINIMUM OF 55lbs. OF SAND OR SUBSOIL.
3. BREAKER CONFIGURATION MAY BE CHANGED TO INCLUDE KEYING AS DETERMINED BY COMPANY ENGINEER.
NOTES:
1. MARKERS SHALL BE PLACED DIRECTLY OVER THE PIPELINE WHEN THERE IS AT LEAST 1'-0" OF CLEARANCE BETWEEN THE TOP OF THE PIPE AND THE BOTTOM OF THE MARKER. MARKERS SHALL BE SLIGHTLY OFFSET IF THE CLEARANCE IS LESS THAN 1'-0". MARKERS WILL BE OFFSET IF THE PIPELINE IS IN A ROADWAY.

2. CONTRACTOR TO ASSEMBLE SIGN AND MOUNT ON POST.

3. REFLECTIVE STRIPING SHOULD BE ADDED ON ALL SIDES OF POST.

TYPICAL PIPELINE MARKER

- 3" GALV. PIPE
- DOT REFLECTIVE TAPE
- 1/2" GALV. BOLT & NUT
- 1"x1" ANGLE TO PIPE POST FOR ANCHOR

TYPICAL PIPELINE WARNING MARKER

- REFLECTIVE DECAL (BOTH SIDES)
- INSTALL 3" STD. WT. PIPE POST 9' LONG
- WELD 1"x1" ANGLE TO PIPE POST FOR ANCHOR

TYPICAL PIPELINE AERIAL MARKER

- MEDIUM YELLOW REFLECTIVE TAPE
- MEDIUM YELLOW REFLECTIVE TAPE
- MEDIUM YELLOW REFLECTIVE TAPE
- MEDIUM YELLOW REFLECTIVE TAPE

NOTES:
1. MARKERS SHALL BE PLACED DIRECTLY OVER THE PIPELINE WHEN THERE IS AT LEAST 1'-0" OF CLEARANCE BETWEEN THE TOP OF THE PIPE.
2. PIPE AND THE BOTTOM OF THE MARKER. MARKERS SHALL BE SLIGHTLY OFFSET IF THE CLEARANCE IS LESS THAN 1'-0". MARKERS WILL BE OFFSET IF THE PIPELINE IS IN A ROADWAY.

2. CONTRACTOR TO ASSEMBLE SIGN AND MOUNT ON POST.

3. REFLECTIVE STRIPING SHOULD BE ADDED ON ALL SIDES OF POST.
NOTES:
1. ALL WIRE SHALL BE INSULATED STRANDED COPPER #12 THHN AS SHOWN ABOVE.
2. TERMINAL BLOCK SHALL BE WIRED BY CONTRACTOR AS SHOWN IN TERMINAL DETAIL ABOVE.
3. ALL WIRE CONNECTIONS TO CARRIER PIPE SHALL BE MADE AS SHOWN IN DETAIL ABOVE. WIRE SHALL BE CONNECTED TO PIPE BY CADWELD PROCESS WITH COPPER HEAT SLEEVE.
4. CADWELD WIRE CONNECTIONS SHALL BE PRIMED WITH ROYSTON SPRAY PRIMER OR EQUAL AND ALLOWED TO DRY 3 TO 4 MINUTES OR UNTIL TACKY, AND COVERED WITH ROYSTON HANDY CAP OR EQUAL.
5. WIRE INSULATION SHALL BE PROTECTED FROM DAMAGE.
6. LAY WIRES ALONGSIDE PIPE. NOT OVER OR UNDER PIPE.
7. CATHODIC PROTECTION TEST STATION AND ALL OTHER MATERIALS SHALL BE FURNISHED BY CONTRACTOR.
8. INSTALL AT ALL LOCATIONS INDICATED ON ALIGNMENT SHEETS.

NOTE:
ALL WIRES TO MAKE A COMPLETE LOOP AROUND PIPE.

TYPICAL CATHODIC PROTECTION COUPON TEST STATION

NOTES:
1. ALL WIRE SHALL BE INSULATED STRANDED COPPER #12 THHN AS SHOWN ABOVE.
2. TERMINAL BLOCK SHALL BE WIRED BY CONTRACTOR AS SHOWN IN TERMINAL DETAIL ABOVE.
3. ALL WIRE CONNECTIONS TO CARRIER PIPE SHALL BE MADE AS SHOWN IN DETAIL ABOVE. WIRE SHALL BE CONNECTED TO PIPE BY CADWELD PROCESS WITH COPPER HEAT SLEEVE.
4. CADWELD WIRE CONNECTIONS SHALL BE PRIMED WITH ROYSTON SPRAY PRIMER OR EQUAL AND ALLOWED TO DRY 3 TO 4 MINUTES OR UNTIL TACKY, AND COVERED WITH ROYSTON HANDY CAP OR EQUAL.
5. WIRE INSULATION SHALL BE PROTECTED FROM DAMAGE.
6. LAY WIRES ALONGSIDE PIPE. NOT OVER OR UNDER PIPE.
7. CATHODIC PROTECTION TEST STATION AND ALL OTHER MATERIALS SHALL BE FURNISHED BY CONTRACTOR.
8. INSTALL AT ALL LOCATIONS INDICATED ON ALIGNMENT SHEETS.

NOTE:
ALL WIRES TO MAKE A COMPLETE LOOP AROUND PIPE.
NOTES:

1. REFERENCE DRAWING (DONLIN PIPELINE MLV DWG) AND CONSTRUCTION SPECIFICATIONS FOR DETAILED CONSTRUCTION GUIDELINES.

2. LOCATION OF GATE TO BE FIELD DETERMINED.
NOTES:
1. EQUIPMENT QUANTITY AND TYPE MAY VARY.

CONSTRUCTION RIGHT OF WAY BOUNDARY

LEGEND

Pioneer Access
(Approx. 25' Wide)

Snow Clearing Stored Between Trees

Associated Engineering Drawings

Donlin Gold Project

Applicant: Donlin Gold, LLC

4720 Business Park Blvd., Suite G-25
Anchorage, Alaska 99503

12/22/2017

PRELIMINARY PLAN NOT FOR CONSTRUCTION
PRELIMINARY PLAN NOT FOR CONSTRUCTION
NOTES:

1. MINIMUM DEPTH OF COVER: 36". ADDITIONAL COVER MAY BE REQUIRED FOR BUOYANCY CONTROL, RIVER AND STREAM SCOUR, AND BENDS.

2. EXCAVATION:
   - LOG THE TRENCH MATERIAL AS IT IS DUG. SEGREGATE ICE RICH MATERIAL IN A SPOIL PILE SEPARATE FROM DITCH SPOIL WHICH IS ACCEPTABLE FOR BACKFILL. IN EXTREME CASES OF ICE CONTENT, IT MAY BE NECESSARY TO HAUL ADDITIONAL SELECT MATERIAL AND/OR TO HAUL THE ICE RICH SPOIL TO AN APPROVED DISPOSAL SITE, SUCH AS AN ABANDONED MATERIAL SITE.

3. PRIOR TO FINAL DESIGN:
   - GEOFENICAL LOGGING OF BORE HOLES TO DETERMINE ICE CONTENT IN THE DITCH PROFILE AND BELOW THE DITCH BOTTOM FOR AN ADDITIONAL 10' OR WHATEVER DEPTH WAS DETERMINED TO AFFECT PIPELINE SETTLEMENT IN THE EVENT OF THAWING BELOW THE PIPELINE.

4. PLACE AND ROACH THE REMAINING DITCH SPOIL. INCLUDING THE ICE RICH SPOIL, OVER-TOP OF THE PADDING AND ALLOW IT TO THAW DURING THE SUMMER SEASON.

5. PLACE APPROPRIATE EROSION CONTROL DEVICES (ECDs) ALONG THE ROACHED DITCH LINE WHERE ICE RICH SPOIL MIGHT FLOW INTO AN EXISTING DRAINAGE WHEN IT MELTS. SEED THE ROACHED SPOIL PILE AND ANY DISTURBED RIGHTS OF WAY. INSPECT THE DITCH LINE IN THE SUMMER/FALL FOLLOWING WINTER CONSTRUCTION AND USE LOW GROUND PRESSURE EQUIPMENT TO DRESS UP OR RE-SHAPE THE ROACHED SPOIL OVER THE DITCH AS NEEDED. RE-SEED AND RE-PLACE ECDs IF NECESSARY. REPEAT INSPECTION ANNUALLY FOR THE FIRST THREE SEASONS OR AS NEEDED TO MAINTAIN SOIL STABILITY.

6. OVER-EXCAVATION 3 FEET BELOW TARGET DITCH DEPTH WHERE VISIBLE SEGREGATED ICE (FROZEN GROUND CLASSIFICATION Vx) IS DISCOVERED IN THE DITCH BOTTOM. BACKFILL OVER-EXCAVATION WITH THAW-STABLE BEDDING. PLACE GEOGRID, IF SO DIRECTED BY THE ENGINEER, TO SPAN AREAS OF OVER-EXCAVATION.
ASSOCIATED ENGINEERING DRAWINGS

ROW MODE 0
LIGHT GRADE, NON-PERMAFROST, ≤3% SIDE SLOPE, WINTER OR SUMMER
SCALE 1" = 20'-0"

ROW MODE 1
GRADED, NON-PERMAFROST, 3% TO 20% SIDE SLOPE, WINTER OR SUMMER
SCALE 1" = 20'-0"

ROW MODE 2
TWO TONE, NON-PERMAFROST, BENCH GRADE ON STEEP SIDE SLOPE, 20% TO 50% SIDE SLOPE
SCALE 1" = 20'-0"

ROW MODE 3
GRANULAR WORKPAD PERMAFROST, 0% TO 15% SIDE SLOPE, WINTER OR SUMMER
SCALE 1" = 20'-0"
ROW MODE 4
ICE OR SNOW WORKPAD, PERMAFROST OR NON-PERMAFROST, ≤ 3% SIDE SLOPE
SCALE 1" = 20'

ROW MODE 5
FROST PACK, FLAT WETLANDS, SLOPE ≤ 2%, ICE ROAD TRAVEL LANE
SCALE 1" = 20'

ROW MODE R7B-S
LARGE STREAM CROSSING, SUMMER, OPEN CUT
SCALE 1" = 20'

ROW MODE R7B-W
LARGE STREAM CROSSING, WINTER, OPEN CUT
SCALE 1" = 20'
ATTACHMENT A2  NHPA SECTION 106 PROGRAMMATIC AGREEMENT
This page intentionally left blank.
PROGRAMMATIC AGREEMENT

By and Among

The U.S. Army Corps of Engineers,

U. S. Bureau of Land Management,

Advisory Council on Historic Preservation,

Alaska State Historic Preservation Officer,

Alaska Department of Natural Resources,

and

Donlin Gold, LLC

Regarding the

Donlin Gold Project

WHEREAS, the Alaska District, U.S. Army Corps of Engineers (USACE) receives and considers applications for permits under Section 10 of the Rivers and Harbors Act of 1899 (Section 10) (33 U.S.C. § 403) and Section 404 of the Clean Water Act (Section 404) (33 U.S.C. § 1251 et. seq.); and

WHEREAS, the USACE received a permit application pursuant to Section 10 and Section 404 from Donlin Gold, LLC (Donlin Gold) to develop and operate an open pit, hardrock gold mine located 10 miles north of the village of Crooked Creek, Alaska with related facilities located near Bethel, Jungjuk Creek on the Kuskokwim River, and extending to the Cook Inlet; and

WHEREAS, the Donlin Gold Project (Project) includes construction, operation, maintenance, and reclamation activities proposed to occur over approximately 34.5 years (if authorized), and would consist of the open pit mine, tailings storage, waste rock facility, mill, 315-mile pipeline, power plant, and transportation facilities that include an airstrip, roads, barge landing, and barge terminal; and

WHEREAS, the USACE has determined that evaluation and/or issuance of Clean Water Act Section 404 and Rivers and Harbors Act Section 10 permits for the proposed Project make it an undertaking subject to review pursuant to Section 106 of the National Historic Preservation Act (NHPA) (54 U.S.C. § 306108) and its implementing regulations, “Protection of Historic Properties” (36 C.F.R. part 800), and under USACE’s regulations at 33 C.F.R. Part 325, Appendix C; and

WHEREAS, the U.S. Bureau of Land Management (BLM) has determined that approving the Project’s pipeline and fiber optic cable to cross federal lands administered by the BLM would require authorization under Section 28 of the Mineral Leasing Act of 1920, 30 U.S.C. § 185, as amended; and

WHEREAS, the BLM approvals of these project crossings in areas under its jurisdiction is a federal action associated with the undertaking that require the BLM to comply with Section 106 of the NHPA (Section 106) and 36 C.F.R. Part 800; and

WHEREAS, the State of Alaska Department of Natural Resources (State) is a landowner for a majority of the pipeline alignment. To address its obligations to protect State-owned historic, prehistoric, or archaeological resources as provided under Alaska Statute (AS) 41.35.200(a) and 11 Alaska Administrative Code (AAC); the State has been invited to participate in this PA as an Invited Signatory; and
WHEREAS, the State has determined that approving the Project on State lands administered by the State would require a variety of land use authorizations from the department; and

WHEREAS, the State has determined that Donlin Gold’s pipeline and its related facilities on State lands would require authorization under AS 38.35; and

WHEREAS, Section 106 of the NHPA requires each federal agency, prior to any federal or federally assisted or funded undertaking, to take into account the effect of its proposed undertaking on any property included in or eligible for inclusion in the National Register of Historic Places (NRHP) (hereafter called historic properties); and

WHEREAS, the USACE, as the lead federal agency and in consultation with the BLM, Alaska State Historic Preservation Officer (SHPO), State, and Donlin Gold, LLC, has established the undertaking’s Area of Potential Effects (APE), as defined in 36 C.F.R. § 800.16(d), which encompasses direct and indirect effects on historic properties for agency-permitted alternatives carried forward for detailed analysis in the Environmental Impact Statement (EIS) prepared pursuant to the National Environmental Policy Act (NEPA) (42 U.S.C § 4321 et. seq.). The APE description and figures are contained in Appendix A of this Programmatic Agreement (PA); and

WHEREAS, cultural resources identification, evaluation, and effects assessment efforts to date are summarized in Section 3.20 of the EIS and Appendix D of this PA (Cultural Resources Management Plan); and

WHEREAS, the USACE has determined that construction, operation, maintenance, and reclamation of the Project will cause adverse effects on historic properties included in or eligible for inclusion in the NRHP, or which the USACE, BLM, and SHPO agree to treat as eligible for inclusion in the NRHP; and

WHEREAS, the USACE, BLM, SHPO, and Advisory Council on Historic Preservation (ACHP) have determined that a PA for the Project is appropriate because the effects on historic properties cannot be fully determined prior to agency permit decisions and historic properties may be discovered during project implementation; and to record the terms and conditions agreed upon to resolve known and potential adverse effects of the Project on historic properties pursuant to 36 C.F.R. § 800.14(b); and

WHEREAS, the USACE and the BLM recognize the government-to-government obligation to consult with Native American tribes that may attach religious and cultural significance to historic properties that may be affected by the proposed undertaking and will continue to consult with such potentially affected tribes regarding their concerns under Section 106; in addition, the BLM and USACE will comply with the American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act (NAGPRA) as it applies to lands under federal control, and Executive Orders 13007 and 13175; and

WHEREAS, the USACE has invited potentially affected federally recognized Indian tribes as defined in 36 C.F.R. § 800.16(m) and listed in Appendix C1 of this PA to participate in consultation; and

WHEREAS, the USACE has invited Alaska native villages, regional corporations, and village corporations as defined in Section 3 of the Alaska Native Claims Settlement Act (43 U.S.C. § 1602) and listed in Appendix C2 of this PA to participate in consultation consistent with 36 C.F.R. § 800.16(m); and
WHEREAS, the USACE has provided Indian tribes, as well as Alaska native villages, regional corporations, and village corporations the opportunity to provide information about historic properties of concern to Indian tribes within the Project APE; and

WHEREAS, the USACE invited Indian tribes as well as Alaska native villages, regional corporations, and village corporations that participated in consultation to sign as Concurring Parties to this PA, consistent with 36 C.F.R. §§ 800.2(c)(2) and 800.6(c)(3); and

WHEREAS, the USACE, in consultation with the BLM and SHPO, has identified representatives of local governments and other entities with jurisdiction over the area in which effects of the undertaking may occur, Tribes, landowners, and individuals and organizations with a demonstrated interest in the Project and its potential effects on historic properties, and has invited identified agencies and interested groups to participate in the development of this PA. A list of these parties is included in Appendices C2 and C3; and

WHEREAS, the Project will cause adverse effects on a minimum of seven historic properties included in or eligible for inclusion in the NRHP, or which the USACE, BLM, and SHPO agree to treat as eligible for inclusion in the NRHP, including two historic cabins (IDT-00260 and TYO-00215), the Iditarod National Historic Trail (INHT), and four prehistoric occupation sites or lithic scatters (SLT-00094, IDT-00288, MCG-00071, and TYO-00277), and

WHEREAS, the Project will adversely affect the nationally significant INHT, which was designated by the U.S. Congress under the National Trails System Act (Public Law 90-543 as amended) on non-federal lands, and the BLM is the designated federal trail administrator for the INHT; and

WHEREAS, the INHT comprises a trail system, roughly 2400 miles long, that encompasses the INHT primary route and connecting trails as represented in the adopted Interagency Iditarod National Historic Trail Comprehensive Management Plan of 1986; and

WHEREAS, the Project will adversely affect the INHT on State lands, and the State has management responsibility of those segments of the trail; and

WHEREAS, the State manages the INHT on State lands, and the BLM, as the trail administrator for the INHT, has cooperated with the State to operate, develop, and maintain portions of the INHT located outside the boundaries of federally administered areas in accordance with the INHT Comprehensive Management Plan (1986) and as agreed to in the “Memorandum of Agreement Between the State of Alaska and Bureau of Land Management, U.S. Department of Interior Concerning the Iditarod National Historic Trail” (1987), and pursuant to the requirements of Public Law 90-543 (as amended); and

WHEREAS, the USACE has invited the Iditarod Historic Trail Alliance to consult on the potential for Project effects to the INHT; and

WHEREAS, in accordance with 36 C.F.R. § 800.6(a)(1), the USACE has notified the ACHP of its adverse effect determination with specified documentation, and the ACHP has chosen to participate in the consultation pursuant to 36 C.F.R. § 800.6(a)(1)(iii); and

WHEREAS, Donlin Gold, LLC has participated in consultation per 36 C.F.R. § 800.2(c)(4), and through signature to this PA, Donlin Gold, LLC, and/or its assignees agrees to carry
out the stipulations herein under the oversight of the USACE and is an Invited Signatory to this PA; and

WHEREAS, the USACE has provided the public with information about the undertaking and its potential effects on historic properties and sought public comment and input consistent with the requirements of Section 106 of the NHPA and 33 C.F.R. Part 325; and

NOW THEREFORE, the USACE, BLM, SHPO, ACHP, State and Donlin Gold agree that the Project shall be implemented in accordance with the following stipulations in order to take into account the potential effects of the Project on historic properties listed in or eligible for listing in the NRHP thus satisfying the requirements of Section 106 of the NHPA and the AHPA.

STIPULATIONS

The USACE and the BLM, as appropriate, shall ensure that the following measures are carried out:

I. THE PROJECT

A. The proposed Project is the development of an open pit, hardrock gold mine located 10 miles north of the village of Crooked Creek in western Alaska. Major project components include excavation of an open pit mine that ultimately would be approximately 2.2 miles long by 1 mile wide by 1,850 feet deep; a tailings storage facility approximately 1 mile long, and ultimately covering approximately 2,350 acres; a waste rock facility covering approximately 2,300 acres; a mill facility processing approximately 59,000 short tons of ore per day; a natural gas-fired power plant with a total connected load of 227 megawatts, supplied by an approximately 315-mile, small-diameter (14-inch) pipeline from the west side of Cook Inlet to the mine site; and transportation infrastructure including a 5,000-foot airstrip, a 30-mile-long road from the mine site to a new barge landing near Jungjuk Creek on the Kuskokwim River, and barge terminal facilities in Bethel (Appendix A of this PA).

II. ADMINISTRATIVE CONSIDERATIONS

A. The USACE, the BLM, and the State shall attach this PA or the stipulations listed in this legally enforceable PA to agency-specific permits, so that appropriate provisions of this PA and its requirements become binding on the permittee, so long as the underlying PA remains in effect for the area covered by the relevant permit. The permittee shall comply with this PA as implemented through these measures and failure to do so could result in suspension, modification, or revocation of the applicable agency’s permit.

B. If the proposed Project is permitted, this PA and all of its requirements shall be binding on Donlin Gold as permittee, its successors, and assigns. Donlin Gold shall include a provision requiring compliance with the PA in any contract of sale or transfer of ownership or management of the Project or components thereof.

C. Because of both singular and overlapping legal authorities and responsibilities among the USACE and the BLM (agencies) regarding individual components or activities, one or more of these agencies may be responsible for ensuring that the
terms of this PA are carried out for a given component or activity. For certain larger components and activities, all involved agencies may carry out the terms of this PA, so long as doing so is within the scope of their legal authorities under Section 106 of the NHPA. Nothing in this PA is intended to expand the jurisdiction of the USACE or the BLM beyond that afforded by Section 106 and its respective regulations.

D. The USACE, the BLM, and the State shall enforce the terms of this PA as is appropriate within each agency’s scope with regard to permits, and other conditions that incorporate this PA and its terms. Each shall notify the others if any of them becomes aware of an instance of possible non-compliance with the terms and conditions of this PA or permit or conditions as they relate to this PA. In such case, the responsible agency shall ensure compliance consistent with its legal authorities and consult with the other Signatories, as needed. USACE, as lead federal agency, is responsible for the stipulations to be carried out, regardless of the participation and/or actions of other permitting agencies.

E. Historic properties, APEs, and the applicability of this PA:

1. This PA shall apply to the Donlin Gold Project and all of its components, including those not known at this time or not specified in the permits, permit applications, or other project documents so long as they are within the jurisdiction of the USACE, the BLM, and/or the State.

2. In Stipulation IV and Appendix A of the PA, the USACE and BLM, in consultation with SHPO, have determined the APE for the Project and its components, as defined at 36 C.F.R. § 800.16(d), and pursuant to USACE jurisdictional authority for the “Permit Area” as defined at 33 C.F.R. Part 325, Appendix C(1)(g).

III. ROLES AND RESPONSIBILITIES

A. The USACE will make determinations of eligibility (DOEs) and findings of effect in coordination with the BLM, and will seek SHPO concurrence consistent with the requirements of 36 C.F.R. § 800.4 and 36 C.F.R. § 800.5. In addition, the USACE and BLM will ensure that copies of their DOEs and findings of effect are sent to Consulting Parties with interests within the ANCSA regional corporation boundaries within which the affected site is located (as listed in Appendix C of this PA). The USACE and the BLM, at their discretion, may expand this list to include adjacent interested parties not within the ANCSA boundaries. They will allow a 30-day comment period at the time DOEs and findings of effect are submitted to SHPO for review and concurrence. Any timely comments received will be taken into account in the final decision. The USACE and BLM are responsible for consultation with Tribes, including a) identifying Tribes that attach religious and/or cultural significance to historic properties potentially affected by the Project; and b) through consultation, providing Tribes a full opportunity to express any concerns about the Project, their views on identification efforts, and NRHP eligibility of any properties to which such Tribes attach religious and cultural significance; and c) allowing Tribe(s) to express their views on the assessment of effects and resolution of adverse effects to historic properties.
B. The USACE and BLM are responsible for identifying individuals and organizations with a demonstrated or known interest and expertise in historic properties and preservation issues in the Project Area, and have notified them about the Section 106 review of the Project and the opportunity to be a Consulting Party to this PA. The USACE and BLM have invited such persons or organizations to participate in the Section 106 review (see Appendix C of this PA).

C. The USACE, the BLM, and the State shall ensure that requirements of this PA have been met for that part of the undertaking under their respective jurisdictions. The agencies shall coordinate consultation to ensure that each agency independently satisfies its respective regulatory requirements under 36 C.F.R. Part 800, 33 C.F.R. Part 325 Appendix C, and AS 41.35.200(a). The USACE shall ensure that all work conducted as a result of this PA will be performed in accordance with the Secretary of the Interior’s Standards for Archeology and Historic Preservation (Standards and Guidelines) (48 Fed. Reg. 44716-44742).

D. Following consultation amongst the Signatories, as described below, Donlin Gold will be responsible for funding and overseeing, either directly or through qualified consultants or contractors, work that is determined necessary to ensure compliance with Section 106 and the terms of the PA.

E. The USACE, in consultation with the Signatories and Consulting Parties, shall oversee compliance with the terms of the PA and related work completed by Donlin Gold, including identification and evaluation of historic properties, records research, inventory, archaeological and above-ground surveys, assessments of effects, mitigation, pre- and post-construction data recovery, report preparation, required monitoring of construction, and curation of artifacts.

F. Donlin Gold, with oversight by the USACE, and BLM and the State as applicable, will ensure that all such activities undertaken under this PA are conducted in a professional manner and consistent with the stipulations of this PA. The consultation process for the work noted above is described in Stipulations III-XVII of this agreement document.

G. Donlin Gold, as project proponent, will ensure that persons supervising cultural resources work on their behalf hold any appropriate BLM, USACE, or State permits and/or authorizations as appropriate for archaeological inventory, monitoring, and other archaeological investigations, and meet the Standards and Guidelines, as well as the Secretary of the Interior’s Professional Qualification Standards (36 C.F.R. Part 61) for the applicable discipline.

H. Donlin Gold, as project proponent, may apply for permits, authorizations or approvals for individual project segments, facilities, or groups or portions of segments or facilities, on a phased or segmented basis, so long as all such activities are conducted in accordance with this PA and no other law, rule or regulation precludes such phasing in the applicable permit application process.
I. The USACE, the BLM, and the State shall ensure that no ground disturbance or other activities that may affect historic properties may take place in that project segment and/or component until identification, evaluation, and resolution of adverse effects have been completed for the area, taking into account project phasing.

IV. AREA OF POTENTIAL EFFECTS

A. The USACE, in consultation with the BLM, SHPO, and other Consulting Parties, has determined and documented the APE for the Project (see Appendix A of this PA). The USACE will also, as it deems appropriate, seek information from Consulting Parties and other individuals and organizations likely to have knowledge of, or concerns with, historic properties in the APE, as provided in Stipulation III.B, above.

B. The USACE will seek to gather information from Tribes to assist in identifying historic properties, including those to which each such Tribe attaches religious and cultural significance, recognizing that such Tribes may be reluctant to divulge specific information regarding the location, nature, or activities associated with such sites or properties.

C. Consistent with the confidentiality requirements in 36 C.F.R. § 800.11(c) and Section 304 of the NHPA, the USACE shall withhold from public disclosure information about the location, character, or ownership of a historic property when disclosure may cause a significant invasion of privacy, risk harm to the historic property, or impede the use of a traditional religious site by practitioners.

D. This PA addresses the following three types of effects that may be deemed to be adverse to historic properties: 1) direct effects; 2) indirect effects (e.g., visual, atmospheric, noise, vibratory); and 3) reasonably foreseeable effects that may occur later in time, be farther removed in distance, or be cumulative. The APE for the Project covers all areas where these project effects may occur.

E. For purposes of any required Section 106 review, previously unsurveyed areas added to the Project in the future, whether or not subject to additional or supplemental NEPA review, will be identified in project plans and subject to the terms of this PA. Project facilities added in the future and located on previously surveyed lands will be reviewed under the terms of this PA. The USACE, in consultation with the Signatories, will determine whether these additional facilities would require re-survey.

F. USACE may propose to enlarge or diminish the APE for a given project facility or segment as the USACE determines is reasonable and appropriate under the terms of this PA. This change shall require consultation with the Signatories to this PA, and documentation of their agreement with the change, in writing. The USACE will provide 30 calendar days prior notification of such action to the Signatories, Consulting Parties, and Tribes that attach religious and cultural significance to known historic properties in the area encompassed by or excluded by the alteration of the APE.
V. CULTURAL RESOURCES MANAGEMENT PLAN

A. Donlin Gold has prepared a Cultural Resources Management Plan (CRMP) to guide compliance with the stipulations in this PA. At time of Execution, a draft version of the CRMP is attached to Appendix D of this PA. The CRMP will be finalized and approved by the USACE, in consultation with the Signatories within six months of the Effective Date of this PA.

B. The CRMP contains:

1. Methods for identification and evaluation of historic properties,
2. Mitigation plans,
3. Standard mitigation options,
4. An inadvertent discovery plan,
5. A plan for the treatment of human remains,
6. Curation protocol, and
7. A monitoring plan.

C. The Signatories will review the CRMP every year at the annual meeting.

D. The CRMP may be updated without amendment in accordance with Stipulation VII.A to include mitigation plans for newly identified historic properties over the period of this agreement.

E. Any changes to processes or protocols of the CRMP would require following the amendment process outlined in Stipulation XV.

VI. IDENTIFICATION AND EVALUATION OF HISTORIC PROPERTIES AND ASSESSMENT OF EFFECTS

A. Previously Completed Identification, Evaluation, and Assessment of Effect

1. Donlin Gold has conducted 10 Phase I identification survey and Phase II site evaluation studies focusing on project areas that have the potential to be directly affected by project activities. Reports for all previous investigations have been submitted to the USACE, BLM, and SHPO, as referenced in the CRMP (Appendix D of this PA). Investigations conducted to date identified a total of 72 cultural resources; 49 of those are located within the APE.

2. Of the 49 resources identified in the APE, USACE and SHPO concurred that 14 sites are eligible to the NRHP and an additional 7 will be treated-as-eligible for the purposes of Section 106, for a total of 21 historic properties. SHPO concurrence for DOEs for known resources was received on 5/25/2016 and 10/25/2016. Cultural resources identified after this date will need to be evaluated for NRHP eligibility.

3. As currently proposed, construction, operation, maintenance, and reclamation of the Project will cause adverse effects on a minimum of seven historic properties included in or eligible for inclusion in the NRHP, or which the USACE, BLM, and SHPO agree to treat-as-eligible for inclusion in the NRHP, including two historic cabins (IDT-
00260 and TYO-00215), the INHT, and four prehistoric occupation sites or lithic scatters (SLT-00094, IDT-00288, MCG-00071, and TYO-00277).

B. Future Identification, Evaluation, and Assessment of Effects

1. Additional archaeological survey will be conducted in accordance with this PA prior to the initiation of construction or other ground disturbing activities that have the potential to affect as yet unidentified sites within any project areas not yet inventoried.

2. Identification efforts need to be conducted for proposed pipeline ancillary facilities for locations outside the previously surveyed 300-foot-wide corridor, and the North Route pipeline corridor.

3. Prior to the conclusion of identification and evaluation efforts for any particular activity zone or area not previously inventoried, Donlin Gold shall implement guidance received from the USACE, BLM, and SHPO regarding the level and scope of efforts. The level and scope of additional identification efforts shall be consistent and commensurate with the predictive models previously prepared for the Project and outlined in CRMP Section 3.0 - Previous Research and Cultural Resources Identified in the Project Area.

4. If Donlin Gold and the agencies disagree as to what constitutes adequate identification and evaluation efforts, the federal agencies, in consultation with SHPO, shall arrive at a determination.

5. Where construction modifications consist of corridors or large land areas, Donlin Gold will use a phased process, as per 36 C.F.R. § 800.4(b)(2) to conduct further identification and evaluation. This will facilitate project modifications, and may eliminate the need to prepare determinations of eligibility for sites that will not be affected. Such identification efforts shall be conducted in accordance with the principles, standards, and guidelines contained in Standards and Guidelines and follow the procedures set forth in 36 C.F.R. § 800.4.

6. Donlin Gold shall provide the agencies with documentation of these identification and evaluation efforts in a cultural resource report and shall provide recommendations for determinations of eligibility of those properties that will be reviewed by the BLM or USACE, as appropriate, and sent to the SHPO for concurrence. BLM will be responsible for coordination under this part for BLM lands. USACE will remain the responsible federal agency for all other land owners. In addition, the USACE or BLM, as appropriate, will ensure that copies of their DOEs and findings of effect are sent to all Consulting Parties with interests within the ANCSA regional corporation boundaries within which the affected site is located (as listed in Appendix C of the PA). The USACE and the BLM at their discretion, may expand this list to include adjacent interested parties not within the ANCSA boundaries. They will allow a 30-day comment period at the time DOEs and findings of effect are submitted to SHPO for
review and concurrence. Any timely comments received will be taken into account in the final decision. This information will be summarized in the annual PA report described in Stipulation XIII.

7. Any disagreements regarding NRHP eligibility will be resolved by requesting a determination of eligibility from the Keeper of the National Register, the National Park Service, in accordance with 36 C.F.R. Part 63, whose determination shall be final. The USACE, in consultation with SHPO and in accordance with 36 C.F.R. § 800.5, shall make an assessment of whether a component or activity may have an adverse effect on historic properties. The USACE will coordinate with BLM and the State on properties under BLM or State jurisdiction respectively.

VII. TREATMENT OF HISTORIC PROPERTIES

A. General Considerations

1. Donlin Gold shall ensure, to the extent practicable, the avoidance of all known historic properties, including archaeological and historical sites, districts, historic buildings, structures, traditional cultural properties, and landscapes.

2. Mitigation plans will be created for every adversely affected historic property, as outlined in CRMP Section 4. Mitigation plans will be created through consultation with the USACE, BLM, State, SHPO, Tribes, and other affected parties. The Signatories shall also determine if additional public involvement is warranted during the preparation of mitigation plans.

3. Methods of recording and documentation described in the mitigation plan shall use the Standards and Guidelines (48 Fed. Reg. 44730-44734) or other standards in consultation amongst BLM, USACE, and SHPO. The mitigation plan will provide a schedule for when activities will occur, when deliverables will be finalized, and the dissemination of those deliverables.

4. Donlin Gold will submit draft mitigation plans to the USACE for distribution to the Signatories and Consulting Parties for 30-day review for comments, unless a reduced review period is agreed upon by all Signatories. The USACE will take into account any timely comments before approving the final mitigation plan.

5. Donlin Gold will submit mitigation deliverables to Signatories for review and approval, unless otherwise stated in the mitigation plan.

B. Known Adverse Effects

1. Mitigation of adverse effects will be required for a minimum of seven historic properties, including two historic cabins (IDT-00260 and TYO-00215), the INHT, and four prehistoric occupation sites or lithic scatters (SLT-00094, IDT-00288, MCG-00071, and TYO-00277). Additional historic properties may be located during additional inventory efforts or construction activities.
2. Should USACE identify additional adverse impacts for the historic properties discussed in this stipulation, USACE, in coordination with the Signatories, and Consulting Parties, shall determine whether additional treatment is necessary.

3. Phase III Excavation and Data Recovery shall be conducted at two prehistoric sites with the highest data-recovery potential (MCG-00071, TYO-00277), and two historic cabin sites (TYO-00215 and IDT-00260). Recovered materials will receive analysis and the results will be documented in a cultural resource report consistent with Stipulation XIII.B.2 and Section 6.4 of the CRMP.

4. Lithic materials previously collected from one lithic scatter (IDT-00288) will receive additional analysis and the results will be documented in a cultural resource report.

5. USACE, SHPO, and the Crooked Creek Traditional Council will coordinate on one prehistoric site (SLT-00094), located in close proximity to the planned Jungjuk Port site, to determine if additional Phase II testing is needed to better ascertain and delineate the extent of site deposits and to determine potential additional data recovery and/or mitigation needs. This coordination will occur within one year of execution of this PA.

6. The results of archaeological survey, testing, data recovery, and analysis will be used to create a product for the general public. The Signatories will determine the final format and content at the annual meeting after the mitigation plans for the sites discussed in Stipulation VII.B.1 are finalized.

7. INHT

   i. As a layered historic property, the INHT has evolved over time beginning with surviving segments of the 1910 Iditarod (Goodwin) Trail, and then later trails (e.g., Iditarod National Historic Trail and Iditarod Race Trail) in the Project APE. The cultural and recreational uses of the trail, and the impacts to them, are intertwined to the extent that the Signatories agree that the impacts to the trail and trail corridors are best addressed in a holistic fashion.

   ii. Photographic Documentation – Donlin Gold will document viewshed(s) photographically in winter conditions before construction, collect and curate current and historic photographs, and produce a professional report presenting this information in a historic context.
iii. Video Documentation - Donlin Gold will collect video documentation of the INHT scenic area during winter conditions from the Skwentna Crossing to Three-mile Creek, and at Egypt Mountain. The documentation effort will be recorded in a cultural resources report (Stipulation XIII.B.2. and Section 6.5.1 of the CRMP. The video will be georeferenced, edited, and made available to the public for a minimum of 10 years, such as posting to the internet. In addition, the edited video and raw data will be stored at an archival repository, such as ARLIS, the Alaska State Library, or the UA Museum of the North.

iv. Safety Cabins – Donlin Gold will provide for the construction of four, non-exclusive, safety cabins in the general vicinity of the impacted sections of the INHT. This process will be initiated no later than the start of pipeline construction. These cabins will be owned and maintained by another party to be identified.

1. Donlin Gold will propose specific locations of the cabins and cabin design to be reviewed and approved by the State, SHPO, and other appropriate and/or affected parties as necessary. Prior to placement of the cabins, the selected locations must be authorized by the State. The BLM Iditarod National Historic Trail Administrator will be available for technical assistance, as requested.

2. Donlin Gold will provide the materials needed, arrange for labor to construct the cabins, and provide transportation and installation.

3. Donlin Gold will generate a quit-claim deed to the State, relinquishing ownership of the safety cabins upon receipt of a copy of the State authorization, such as a management agreement or easement, that may involve a local government or non-profit to hold the authorization transferring management to allow the operation of the safety cabins on State land.

4. Donlin Gold shall incorporate cabin inspections into their annual pipeline maintenance schedule.

v. Visual Impacts Minimization – Donlin Gold, as practicable with constraints for pipeline construction, operation, and safety, will minimize adverse impacts to the INHT by using landscaping where the pipeline ROW will cross the trail and placing surface infrastructure at inconspicuous locations to avoid or minimize their view from the INHT. Landscaping may include narrowing and/or feathering the pipeline ROW upon approval by the State, in consultation with the SHPO.
vi. Creative Mitigation – Donlin Gold shall complete one of the following types of creative mitigation projects every year while the pipeline is in Operation, beginning with the first full calendar year of pipeline operations. These options will be rotated annually in sequence unless modified by mutual agreement by the USACE, SHPO, Donlin Gold, and the State at the annual meeting. The selected option will be subject to mitigation plans to include a schedule of activities, a timeline for finalization of deliverables, and dissemination of those deliverables. The BLM Iditarod National Historic Trail Administrator will be available for technical assistance on any of the options listed below, if requested.

1. Brush Clearing: Prior to conducting its pipeline ROW maintenance brushing, Donlin Gold will coordinate with trail management groups to identify if any of the INHT trail from Skwentna to Nicolai are in need of brushing. Under this measure, Donlin Gold shall provide or support local efforts for brush clearing along the INHT for 10 to 20 miles of trail. Donlin Gold can provide trail brushing and support in-kind as part of their pipeline ROW brushing operations.

2. iTREC Teacher Sponsorship: Donlin Gold will sponsor a rural community teacher to attend the year-long Iditarod Trail in Every Classroom (iTREC) training program. Sponsorship will include all travel costs and necessary expenses to attend workshops, which may include tuition and/or supplies. Teacher recruitment will be done in consultation with the iTREC program coordinator.

3. Interpretive Kiosk with Community Engagement: In a rural community along the INHT, Donlin Gold, SHPO, and, upon request, the BLM INHT Administrator shall work with the community to develop and install an interpretive kiosk associated with that community’s connection to the trail. The priority communities are Skwentna, Nicolai, McGrath and Takotna (the communities closest to the pipeline); however any community along the trail shall be eligible to participate. Donlin Gold will incur all costs related to kiosk development, including fabrication and installation. The kiosk will include no less than 2 panels. Kiosk content will be developed in consultation with the community, the State, and SHPO.

4. Cabin Maintenance: Donlin Gold shall provide or support the routine maintenance on the shelter cabins constructed under Stipulation VII.B.7.iv.
5. Alternative Mitigation Option: Any of the Signatory Parties may propose an alternative creative mitigation idea at the annual meeting to be approved by USACE in consultation with the SHPO, Donlin Gold, and the State at the annual meeting.

C. Standard Mitigation

1. If the property is solely archaeological in nature, mitigation or treatment may include, but not be limited to:

   i. Developing community archaeology and/or cultural resource recordation programs;
   
   ii. Assisting with tribal artifacts or human remains repatriation efforts;
   
   iii. Preparation of a research design with provisions for data recovery and recordation;
   
   iv. Analysis, reporting, and curation of resulting collection and records in an institution as outlined in Stipulation XII (Collection and Curation); and
   
   v. Data recovery (See CRMP, Section 6.4.2 Methods for Historic Sites with High Data-Recovery Potential; Section 6.4.3 Methods for Sites with High Data-Recovery Potential; Section 6.4.5 Lithic Scatters – Methods for Spatial and Laboratory Analysis; and Section 6.4.4 Sites Requiring Further Phase II Testing). Archaeological recovery, analysis, and reporting shall use the Secretary of Interior’s Standards and Guidelines for Archaeological Documentation (Archaeological Documentation Guidelines) (48 Fed. Reg. 44734-44737).

2. If the historic property is a building, structure, traditional cultural property, or landscape, the mitigation plan shall specify approaches for the mitigation or treatment of the property in accordance with the principles, standards, and guidelines contained in Standards and Guidelines (48 Fed. Reg. 44716-44742), the Secretary of the Interior Standards for the Treatment of Historic Properties as codified in 36 C.F.R. Part 68, and the Secretary of the Interior’s Standards and Guidelines for Architectural and Engineering Documentation for acceptance into the Historic American Building Survey/Historic American Engineering Record, or Historic American Landscapes Survey. Other mitigation measures could include, but not be limited to:

   i. Relocating a historic property;
   
   ii. Re-landscaping to reduce effects;
   
   iii. Public interpretation;
   
   iv. Ethnographic documentation; and
v. Prescribing use of a project component or activity in such a way as to minimize effects to historic properties, or to those concerned about the effects of that component or activity.

VIII. PROCEDURES FOR INADVERTENT DISCOVERIES AND UNANTICIPATED EFFECTS (NOT INCLUDING HUMAN BURIALS, REMAINS, OR FUNERARY GOODS)

A. If an inadvertent discovery of potential cultural materials is made, Donlin Gold shall stop work in the immediate vicinity of the discovery and the USACE shall implement the Inadvertent Discovery Plan as contained in the CRMP (Appendix D of this PA). Donlin Gold shall proceed consistent with this plan:

1. Ensure construction activities that may affect the resource will cease without delay; work that does not affect the resource may continue.
2. Protect the discovery site against further disturbance pending the following actions.
3. Donlin Gold’s field coordinator will immediately notify the Donlin Gold environmental/regulatory manager and cultural resources specialist of the discovery.
4. The Donlin Gold cultural resources specialist will notify the USACE, the SHPO, local tribal entities, and appropriate landowner(s) (parties) of the discovery within one business day.
5. The Donlin Gold cultural resource specialist will evaluate the find, assess its potential significance (eligibility for the NRHP), and notify the parties as to the nature and potential significance of the discovery within three business days of the discovery.
6. The parties shall consult, by telephone or other means, on the nature and potential significance of the discovery and whether any additional investigation is warranted. A decision shall be provided to Donlin Gold no later than two business days following notification of the determination as outlined in Stipulation VIII.A.5.
   i. If the USACE determines, in consultation with the SHPO and the landowner, that the discovery is not significant (not eligible for the NRHP) and the SHPO concurs, verbal authorization to proceed may be given by the USACE. USACE shall provide written authorization to Donlin Gold within 2 business days following notification.
   ii. If the USACE determines that additional investigation is warranted, the Signatories, and Consulting Parties will continue to consult to determine an appropriate level of effort to determine the NRHP eligibility of the discovery.

B. If the discovery is determined to be eligible, Signatories will determine whether effects to it may be avoided or minimized sufficiently to not adversely affect the historic property. If the property will be adversely affected, the USACE, in consultation with the Signatories and Consulting
Parties, will determine acceptable mitigation to offset the adverse effects anticipated, considering the nature and extent of the historic property. Signatories may choose to utilize the standard mitigation as outlined in Stipulation VII.C, with additional details in Section 6.4 of the CRMP. A decision on significance and use of standard mitigation shall be provided to Donlin Gold by USACE no later than within two working days following receipt of appropriate documentation as noted in Stipulation VIII.A.5 pursuant 36 C.F.R. § 800.11(e).

C. The USACE will treat the newly discovered property as eligible for the NRHP for the purposes of Section 106 pursuant to 36 C.F.R. § 800.13(c) until the appropriate cultural resource assessment is completed. The USACE shall make a final decision in regard to NRHP eligibility and project effects. If there is a dispute between the USACE and SHPO concerning the NRHP eligibility of a resource, it would be resolved consistent with the requirements in Stipulation VI.B.7 of this agreement.

D. If Standard Mitigation is not chosen, USACE will initiate expedited consultation with BLM and Consulting Parties, that retain interests within the ANCSA regional corporation boundaries where the affected site is located (as listed in Appendix C of the PA). The Signatory Parties and Consulting Parties will provide input to the USACE on appropriate mitigation. The USACE and the BLM at their discretion, may expand the Consulting Parties list to include adjacent interested parties not within the ANCSA boundaries. The USACE will provide the final mitigation decision no later than 30 days after initiating consultation. Construction may not resume in the site protection/avoidance buffer (no less than 100 feet from the site limits) until onsite mitigation work, if required, has been completed.

E. Following consultation amongst the Signatories, the USACE may revoke or modify stop work orders, as determined appropriate and consistent with the stipulations of this PA and its originating laws and regulations. The USACE and the BLM, as applicable, shall have the right to issue, modify, and revoke stop work orders with respect to their respective permits, right-of-way grants, or other actions under their jurisdiction to ensure that requirements of this PA have been met for that part of the undertaking under their jurisdiction. USACE, or BLM as applicable, will document stop work decisions to demonstrate how requirements of the PA have been met.

IX. TREATMENT OF HUMAN REMAINS

If human remains are discovered on federal lands, the USACE or the BLM will follow the provisions of applicable state and local laws and NAGPRA (25 U.S.C. § 3001). If human remains are discovered on state or private lands, provisions of the Human Remains Plan of Action shall be followed. These procedures are included in Section 7.1 of the CRMP (Appendix D); as appropriate, a NAGPRA Plan of Action will be prepared in accordance with this PA. Table 7.3 of the CRMP provides all necessary contact information.

A. Prior to project ground-disturbing activities, all project personnel will receive appropriate training that includes guidance on proper reporting of inadvertent discovery of human remains.
B. If human remains are found during any phase of project-related work, as soon as safe to do so, work will cease in their immediate vicinity and a 100-foot buffer zone will be flagged or fenced off to protect the remains. Donlin Gold’s Cultural Resource Specialist (CRS), agencies, landowners, and tribal entities will be immediately notified as per the provisions of the CRMP.

C. The CRS will notify a peace officer (Alaska State Trooper) and the Alaska SME immediately after the discovery, as stipulated in AS 12.65.005. If the remains appear to be recent (less than 50 years old) in the judgment of the CRS, a State Trooper and medical examiner will determine whether the remains are of a forensic nature and/or subject to criminal investigation. The local Village Public Safety Officer (VPSO) may also be notified.

D. The Alaska SHPO will also be notified of any discovery unless circumstances indicate that the death or burial is less than 50 years old and that there is a need for a criminal investigation or legal inquiry by the coroner.

E. If the human remains are found to be historic in nature, a qualified professional physical anthropologist with experience in the analysis of human remains will examine them to determine racial identity. The physical anthropologist shall document, analyze, and photograph the remains so that an independent assessment of racial identity can be made. The physical anthropologist shall be afforded no more than 30 days to conduct his or her analysis.

F. For human remains and/or associated Native American cultural items on federal or tribal lands, this plan of action will include consultation with the appropriate tribe as mandated by 43 C.F.R. §10.5. Consultation will facilitate proposed treatment of the human remains and determine who is entitled to custody of the human remains and other cultural items under NAGPRA so that the disposition process can be completed.

G. If the unanticipated discovery consists of Native Alaskan human remains, Donlin Gold will consult with the Alaska SHPO, USACE, BLM, and appropriate Alaska Native organizations regarding measures to respectfully handle such a discovery. If it can be adequately determined that the identified human remains have affinity to any federally recognized Tribe(s), a reasonable effort will be made to identify, locate, and notify the Tribe. The appropriate Alaska Native regional corporations also will be contacted.

H. If the human remains are not Native Alaskan, and a determination has been made by the Trooper and Medical Examiner that a death investigation is not warranted, Donlin Gold, in consultation with the medical examiner, will attempt to identify, locate and inform descendants of the deceased.

X. EMPLOYEE AND CONTRACTOR CULTURAL RESOURCES TRAINING

A. As discussed in the CRMP (Appendix D), Donlin Gold shall provide cultural training to project personnel, contractors, and subcontractors. As practicable, the training will be conducted in concert with existing
environmental, health and safety training, on the project during
construction and operations. The cultural resource training component will
inform project personnel of their responsibilities under the law, and clearly
list procedures to follow in the event they encounter previously
undiscovered cultural resources.

XI. MONITORING AND STOP WORK ORDERS

A. Donlin Gold shall ensure that an archaeologist meeting the qualifications of
the Standards and Guidelines (48 Fed. Reg. 44738-44739) is present in
areas of ground disturbing activity designated as high potential and
indicated on Exhibit C of the CRMP, consistent with the CRMP and
Stipulation V. Work in areas requiring archaeological monitoring will not
proceed without an archaeological monitor. The archaeologist will have
authority to halt ground-disturbing and construction activities as soon as is
practicable considering worker safety in the immediate vicinity of the
discovery in a manner consistent with Stipulations VIII and IX. The
archaeologist will be responsible for reporting the results of monitoring and
any recommendation that work be stopped at any point to protect historic
properties.

B. The results of monitoring shall be included in a report to the USACE, BLM,
and SHPO. This report shall be developed annually and can be included as
an appendix to the annual PA report.

XII. COLLECTION AND CURATION

A. Materials collected under this PA are the property of the appropriate state
or federal land managing agency, or landowner if collected from privately
owned property.

B. Donlin Gold shall incur all standard costs necessary to ensure curation of
materials collected in conjunction with actions taken under this PA, unless
other arrangements have been made, as per Exhibit A of the CRMP.
Curation costs may include, but are not limited to, curation fees charged by
approved institutions, acquisition of archival materials, shipping, and
conservation actions.

C. Donlin Gold, and associated contractors, will safeguard collections from
theft and damage by providing adequate interim storage facilities and
conservation actions, as necessary and in consultation with approved
repository and landowners or land managing agency.

D. All collections will be returned to their owners or deposited in the approved
repository 6 months after approval of the final report or within 1 year of
completion of the fieldwork that generated the collection. All collections will
be curation-ready, as determined by the approved repository, unless
otherwise stipulated per Exhibit A of the CRMP.

E. Federal agencies will curate any artifacts, materials, or records resulting
from archaeological identification and mitigation conducted on federal
lands under their jurisdiction in accordance with 36 C.F.R. Part 79,
“Curation of Federally-Owned and Administered Archaeological
Collections.” Federal agencies with jurisdiction over the federal lands will consult with Indian tribes consistent with 36 C.F.R. Part 79.

F. On federally controlled or owned properties, the federal agency will determine the disposition of human burials, human remains, and funerary objects in accordance with applicable federal law, inclusive of NAGPRA.

G. Artifacts, faunal materials, and/or samples collected on State lands during activities covered by this PA shall be deposited in the University of Alaska Museum of the North, along with records, field notes, and related materials in accordance with their curation procedures and requirements in force at the time of submission of materials. A provisional curation agreement for collections will be established during the State Archaeological Permitting process and finalized prior to submission of collections to the University of Alaska Museum of the North.

H. Donlin Gold will encourage and assist private landowners in donating any returned artifacts to University of Alaska Museum of the North (Fairbanks) in accordance with an agreement negotiated between landowners and the Museum.

XIII. ANNUAL REVIEW AND REPORTS

A. Meetings

1. Annual Meeting: Donlin Gold will hold a meeting among all Signatories annually, no later than April 15, to discuss each previous year’s activities and activities scheduled for the upcoming year. The parties may be linked by telephone or other means of electronic communication by which each participant can communicate to and receive communications from all other participants (e.g., web-based multi-party conference services).

2. The draft annual report for the previous calendar year (see Stipulation XIII.B shall be submitted by Donlin Gold to the other Signatories by February 1 or at least 30 days prior to the annual meeting.

3. Additional Meetings: If any Signatory deems a meeting necessary in addition to the annual meeting described above, that party shall inform the other Signatories, who shall consider the request in consultation with the other parties. USACE will make the final decision as to whether an additional meeting will be called.

4. Meeting Minutes: Donlin Gold shall provide the other Signatories a draft of the meeting minutes within 15 calendar days of the date of the meeting(s). The other Signatories can provide comments on the minutes within 15 calendar days following the meeting. Donlin Gold will revise the minutes and make available to the other Signatories and Consulting Parties (upon request) the minutes of the meetings described above within 15 calendar days following the end of the comment period. If no comments are received then the draft comments will be considered final.
5. The Signatories shall consult no later than on the five-year anniversary from the Effective Date of this PA to review the effectiveness of the PA and its implementation, and evaluate whether the scope should be amended. The Signatories will conduct follow-up consultation every five years thereafter to monitor the effectiveness of the PA and identify any amendments necessary for continued effectiveness.

B. Reports

1. Annual Report: Each year, prior to the annual meeting, Donlin Gold will prepare and provide to the other Signatories a written report of previous and upcoming activities as they relate to compliance with the stipulations of this agreement. Consistent with 36 C.F.R. § 800.11(c) and Section 304 of the NHPA, sensitive cultural resources information shall be confidential. The report will include the following:

   a. A description of the past year’s activities, including presentation of and revisions to training materials;
   b. A projection of the upcoming year’s activities, including information about possible permit modifications;
   c. A summary of the past year’s and anticipated upcoming efforts to identify, evaluate, and protect historic properties, including references for cultural resource reports;
   d. A summary of any historic properties affected, as well as any testing, remediation, or mitigation efforts;
   e. A summary of artifacts or other archaeological or historic materials encountered, including representative photographs or drawings, a description of analyses, and other recordation documents as appropriate;
   f. A summary of artifacts sent to an approved facility for curation, or returned to the landowner, as appropriate;
   g. Clear maps of areas surveyed or monitored, cultural resources identified, and alternative routes to be followed to avoid any identified historic properties; and
   h. An evaluation of this PA and recommendations for any amendments or changes.
   i. An updated list of Signatories, Concurring Parties, and Consulting Parties.

2. Cultural resource activities, such as archaeological surveys, site evaluations, excavations, data recovery for mitigation, and monitoring, will be documented in technical reports subject to review by all Signatories. The scope and time parameters for these reports shall be determined on a case-by-case basis through consultation among the Signatories, but will be submitted for review no later than 1 year after completion of fieldwork or analysis.
3. Donlin Gold shall submit report drafts for annual and cultural resource technical reports to the other Signatories for review and the other Signatories will provide comments within 30 days of receipt by other Signatories. Donlin Gold will revise reports based on comments provided by the other Signatories and will submit final reports to all Signatories within 30 days after the close of the comment period. Subject to the confidentiality requirements of 36 C.F.R. § 800.11(c), the BLM or USACE may provide Consulting Parties with copies of reports upon request.

XIV. DISPUTE RESOLUTION

A. Should any of the Signatories to this PA object at any time to any actions proposed or the manner in which the terms of this PA are implemented, the USACE will consult with such party to resolve the objection. If it is determined that such objection cannot be resolved, the USACE will:

1. Forward all documentation relevant to the dispute, including the USACE’s proposed resolution, to the other Signatories. The Signatories will consult to resolve the dispute within 30 calendar days of receiving adequate documentation.

2. If the dispute cannot be resolved through consultation among the Signatories, then USACE will forward all documentation relevant to the dispute to the ACHP. The ACHP will provide the appropriate federal agency with its advice on the resolution of the objection within 30 calendar days of receiving adequate documentation. Prior to reaching a final decision on the dispute, the appropriate federal agency will prepare a written response that takes into account any timely advice or comments regarding the dispute from the Signatories, and provide them with a copy of this written response. The USACE will then proceed according to its final decision.

3. If the ACHP does not provide its advice regarding the dispute within the 30 calendar-day time period, the USACE may make a final decision on the dispute and proceed accordingly. Prior to reaching such a final decision, the appropriate federal agency will prepare a written response that takes into account any timely comments regarding the dispute from the Signatories, and provide them and the ACHP with a copy of such written response.

B. Concurring Parties and Consulting Parties (which includes members of the public) may bring objections or concerns to any of the Signatories who may then utilize the objections process outlined in Stipulation XIV.A.

C. All other actions subject to the stipulations of this PA, and that are not the subject of the dispute, will continue to be carried out as provided for by this PA.

XV. AMENDMENTS

A. Any of the Signatories may request that the other Signatories consider amending it, whereupon the Signatories shall consult to consider the amendment(s). Amendments will be executed in the same manner as the
original PA. Concurring Parties may suggest proposed amendments to the
Signatories. The Signatories shall consult to consider them.

B. Appendix E of the PA has been reserved to log amendments, which will be
provided to the Signatories following each amendment.

C. Agreement Appendices: The Signatories may agree to amend the
appendices to this Agreement through consultation without requiring
amendment to the body of the Agreement, unless the Signatories, through
such consultation, decide otherwise.

1. Amendments to the PA appendices are allowed with written approval
of the Signatories. Amendments to the CRMP shall follow the
process outlined in Stipulation V.D. and V.E.

2. If the Signatories agree to amend an Agreement appendix, Donlin
Gold will obtain the written concurrences on the amendment from the
other Signatories, and the USACE will append the written
concurrences to the Agreement. USACE shall notify the Signatories
of the amendment within thirty (30) calendar days of the amendment
approval date.

XVI. TERMINATION

A. If any of the Signatories to this PA determines that its terms will not or
cannot be carried out, that Signatory shall immediately consult with the
other Signatories to attempt to develop an amendment or agreement on
other actions that would avoid termination. If within 30 calendar days after
the initiation of such consultation an amendment or agreement on other
actions that would avoid termination cannot be reached, any of the
Signatories may terminate the PA upon written notification to the other
Signatories.

B. If the PA is terminated, and prior to work continuing on the undertaking, the
USACE must either (a) execute an MOA pursuant to 36 CFR § 800.6 or
(b) request, take into account, and respond to the comments of the ACHP
in accordance with 36 C.F.R. § 800.7. The USACE will notify the
Signatories, Concurring Parties, and Consulting Parties as to the
determined course of action.

XVII. CLOSING OUT THE AGREEMENT

A. If prior to any physical work associated with the undertaking actually
beginning, the USACE decides not to permit the proposed undertaking, it
may no longer have any Section 106 responsibilities. If so, the USACE
may elect to vacate the agreement by sending written notice to all
Signatories, Concurring Parties, and Consulting Parties of the change in
circumstances and its decision to vacate the agreement.

B. If work related to the undertaking has already begun, the Signatories
cannot vacate the PA as provided in Stipulation XVII.A. and instead must
seek to amend its terms as provided in Stipulation XVI.A. to provide for the
changed circumstances. In this event, the Signatories will determine the
extent and duration of additional data collection activities and post-fieldwork activities prior to closure of this PA.

C. When all of the terms of the PA have been carried out and the PA has expired in accordance with its duration clause (Stipulation XXI), the USACE will send written notice to the Signatories, Concurring Parties, and Consulting Parties informing them to that effect.

D. If the terms of the PA have been met but the PA remains in effect due to a longer duration clause, USACE should consider amending the agreement to alter its duration clause, recognize the work completed, and provide for the completion of its Section 106 responsibilities, following the amendment process outlined in Stipulation XV.

XVIII. COORDINATION WITH OTHER FEDERAL REVIEWS

A. In the event that another federal agency not initially a party to or subject to this PA receives an application for funding/license/permit for the undertaking as described in this agreement, that agency may fulfill its Section 106 responsibilities by stating in writing it concurs with the terms of this PA and notifying the USACE, SHPO, and the ACHP that it intends to do so.

XIX. COMMUNICATIONS

A. Electronic mail (email) will serve as the official correspondence method for all communications regarding this Agreement and its provisions, unless otherwise requested.

B. Donlin Gold will maintain the contact information list of Signatories, Concurring Parties, and Consulting Parties as best practicable. Donlin Gold will provide an updated list at each annual meeting.

C. It is the responsibility of each Signatory Party, Concurring Party, or Consulting Party to immediately inform Donlin Gold of any change in name, address, email address, or phone number of any point-of-contact. Donlin Gold will forward this information to the Signatories by email.

XX. DURATION OF THIS PA

A. Unless otherwise amended, terminated, or closed in accordance with Stipulations XV, XVI, or XVII, respectively, this PA will expire 30 years from the Effective Date. Prior to expiration, the Signatories will consult to determine whether a new PA should be developed or if the PA should be extended.

XXI. EFFECTIVE DATE

This PA shall be effective as of the date (the Effective Date) when it has been signed (Executed) by the date of the last Signatory.

EXECUTION of this PA by the USACE, BLM, SHPO, and ACHP, and implementation of its terms, evidences that the USACE and the BLM have taken into consideration the effects of the Project on historic properties and afforded the ACHP an opportunity to comment. By fulfilling the terms of this PA, these entities have satisfied their Section 106
responsibilities for all activities associated with the Donlin Gold Project, and the State has satisfied its responsibilities under the Alaska Historic Preservation Act pursuant to AS 41.35.
SIGNATORY SIGNATURE PAGE

PROGRAMMATIC AGREEMENT

PURSUANT TO SECTION 106 OF THE
NATIONAL HISTORIC PRESERVATION ACT

REGARDING THE
DONLIN GOLD PROJECT

U.S. Army Corps of Engineers

By: [Signature] Date: 6-12-16

David S. Hobbie, Chief Regulatory Program
U.S. Army Corps of Engineers
SIGNATORY SIGNATURE PAGE

PROGRAMMATIC AGREEMENT

PURSUANT TO SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT REGARDING THE DONLIN GOLD PROJECT

United States Department of the Interior, Bureau of Land Management

By: [Signature]

Karen Mouritsen, Acting State Director, BLM Alaska
Bureau of Land Management

Date: 6-19-18
SIGNATORY SIGNATURE PAGE

PROGRAMMATIC AGREEMENT

PURSUANT TO SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT

REGARDING THE DONLIN GOLD PROJECT

Alaska State Historic Preservation Officer

By: Richard VanderHoek, Deputy State Historic Preservation Officer

Alaska State Historic Preservation Office

Date: 6/13/2013
SIGNATORY SIGNATURE PAGE

PROGRAMMATIC AGREEMENT

PURSUANT TO SECTION 106 OF THE
NATIONAL HISTORIC PRESERVATION ACT

REGARDING THE
DONLIN GOLD PROJECT

Advisory Council on Historic Preservation

By: [Signature]

John M. Fowler, Executive Director
Advisory Council on Historic Preservation

Date: 6/20/18
INVITED SIGNATORY SIGNATURE PAGE

PROGRAMMATIC AGREEMENT

PURSUANT TO SECTION 106 OF THE
NATIONAL HISTORIC PRESERVATION ACT

REGARDING THE
DONLIN GOLD PROJECT

Alaska Department of Natural Resources

By: ___________________________  Date: 6/19/18
Andrew T. Mack, Commissioner
Alaska Department of Natural Resources
PROGRAMMATIC AGREEMENT
PURSUANT TO SECTION 106 OF THE
NATIONAL HISTORIC PRESERVATION ACT
REGARDING THE
DONLIN GOLD PROJECT

Donlin Gold, LLC
By: [Signature]
Andy Cole, General Manager
Donlin Gold, LLC

Date: June 15, 2018
CONCURRING PARTY SIGNATURE PAGE

PROGRAMMATIC AGREEMENT

PURSUANT TO SECTION 106 OF THE
NATIONAL HISTORIC PRESERVATION ACT

REGARDING THE
DONLIN GOLD PROJECT

Calista Corporation

By: [Signature]  Date: 6-18-18

Rosie Barr, VP Lands and Natural Resources
Calista Corporation
APPENDIX A: PROJECT AREA OF POTENTIAL EFFECTS
Section 106 of the National Historic Preservation Act (NHPA) requires Federal agencies to take into account the effects of their undertakings on historic properties. The act allows for consultation between Federal officials and interested parties, enabling parties the opportunity to comment. The goal of the consultation is to identify potentially affected National Register-eligible historic properties, assess the project’s effects, and seek ways to avoid, minimize or mitigate adverse effects on historic properties (Section 106 Regulations). Identification of historic properties and documentation of the Area of Potential Effects (APE) is defined in 36 CFR Part 800 Protection of Historic Properties §800.16(d):

*Area of potential effects means the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.*

The attached maps illustrate the proposed APE as it applies to the applicant preferred alternative. However, we have described the APE in such a way that it will be easy to adapt it to other alternatives if they become the US Army Corps of Engineers’ (USACE) preferred alternative.

The description of the APE is divided into direct and indirect effects. Adverse effects are defined in the regulations quoted below.

*An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property’s location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property’s eligibility for the National Register. Adverse effects may include reasonably foreseeable future effects caused by the undertaking that may occur later in time, be farther removed in the distance or be cumulative. (36 CFR 800.5(a)(1))*

**Examples of adverse effects.**

Adverse effects on historic properties include, but are not limited to:

(i) Physical destruction of or damage to all or part of the property;

(ii) Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation and provision of handicapped access, that is not consistent with the Secretary’s Standards for the Treatment of Historic Properties (36 CFR part 68) and applicable guidelines;

(iii) Removal of the property from its historic location;

(iv) Change of the character of the property’s use or of physical features within the property’s setting that contribute to its historic significance;
(v) Introduction of visual, atmospheric or audible elements that diminish the integrity of the property’s significant historic features;

(vi) Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and

(vii) Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property’s historic significance. (36 CFR 800.5(a)(2))

I. Area of Potential Effects (APE)

A. The USACE, in consultation with the BLM and other parties to this agreement, has defined and documented the proposed APE for the Donlin Gold Project based on potential direct, indirect and cumulative effects. The APE will apply to all lands regardless of management status that may be affected by the mine site, pipeline corridor, transportation system, staging areas, access roads, borrow areas, or other related infrastructure for this Undertaking. The APE, as defined and documented, is a baseline for survey and inventory.

1. Direct Effects—The following discussion of direct effects APE takes into account ground-disturbing activities associated with the Undertaking:

a. The direct effects APE for the Mine site will consist of Donlin’s mine lease area (approximately 64,238 acres). This is substantially larger than the proposed mine footprint, and allows for flexibility in Donlin’s operations. The airstrip and road between the mine site and the airstrip would also be contained within this mine lease area.

b. The direct effects APE for the Donlin-Jungjuk road, and the airstrip spur road will be a 500 foot wide corridor, 250 feet on either side of the road centerline, matching the area that would be leased from the State of Alaska and TKC.

c. The direct effects APE for materials sites along the Donlin Mine-Jungjuk port road will be the materials site footprints, plus a 100 foot buffer around them.

d. The direct effects APE for the Jungjuk port facility will be a 0.25-mile buffer surrounding the facility footprint (approximately 32 acres).

e. The direct effects APE for the pipeline corridor will be a 300 foot wide corridor, 150 feet either side of centerline for an approximate distance of 315 miles (approximately 11,385 acres).

f. The direct effects APE for the pipeline corridor access roads will be a 200 foot wide corridor, 100 feet either side of the road centerline.

g. The direct effects APE for the ancillary facility areas outside of the 300-foot pipeline corridor (such as material borrow sites, airstrips, temporary camps, HDD sites, etc.) will generally include the footprint of the facility and a buffer of
100 feet around the footprint of the proposed activity (approximately 3,678 acres), unless otherwise specified.

- The direct effects APE for specified spur roads will be a 100 foot buffer on either side of the road centerline.
- The direct effects APE for the Beluga barge landing site will consist of the landing footprint and a 50-foot buffer.
- The winter access routes for construction on State lands will consist of a 100 foot wide corridor, 50 feet on either side of the existing road centerline. This includes existing winter roads that may need to be hardened, widened, improved, etc., as well as turnouts along those routes.

h. For all other miscellaneous items not covered above, the direct effects APE will be the ground disturbance footprint plus a 100 foot construction buffer.

2. Indirect Effects

a. Refer to 36 CFR 800.5(a)(2)(iv) and 36 CFR 800.5(a)(2)(v) as cited above for the definition of indirect adverse effects.

b. The indirect effects APE for the mine site will extend generally for 2 miles surrounding the Mine site footprint, or to the lease boundary, whichever is larger. Because the direct effect APE is the lease boundary, the indirect APE will be at least as large as the direct APE, and never smaller. This is the same for the whole mine site area, including the mine area, airport, Donlin-Jungjuk Road, Donlin-Jungjuk materials sites, and the Jungjuk port.

c. The indirect effects APE for the pipeline ROW, including ancillary facilities and access roads, will extend for 1 mile on each side of the pipeline ROW centerline. This reflects viewshed analyses that have been conducted, as well as variations in topography and vegetation.

d. The indirect effects APE for the Bethel port facility will be the 19.5 acre facility footprint, plus a 100 foot buffer around the facility footprint. This APE may be revised if a permit is submitted to the USACE for reasonably foreseeable facility modifications.

e. Given the nature of the Kuskokwim River – with its constantly shifting route and ongoing seasonal erosion – mapping an indirect APE buffer will result in inaccuracies and will be of little use to the consulting parties. Rather, the agencies and the applicant will work to seek consulting party input to identify and consider significant sites along the Kuskokwim that may be affected by the proposed project-related activity along the river.

f. For the Cook Inlet barge landing, winter access routes, there will be no APE for indirect effects, unless the USACE identifies historic properties in the area that may be affected.
g. Where the indirect APE includes Traditional Cultural Properties (TCPs) that are identified during consultation, or other classes of visually-sensitive historic properties, additional analyses may be required and the indirect APE may need to be modified accordingly. These areas will require more specific analysis on a case by case basis, but could include particular views of TCPs, or vistas from particular viewpoints.

3. Cumulative Effects

a. The identification of the APEs will consider cumulative effects to historic properties as referenced in 36 CFR 800.5. Cumulative effects may be direct, indirect or both, or reasonable foreseeable effects caused by the Undertaking that may occur later in time, be farther removed in distance or be cumulative. The potential to increase access, and therefore, effect, to historic properties, is an example of this.

B. Modifications to the APE

1. The APE may be modified where tribal consideration, additional field research or literature review, consultation with parties to this agreement, or other factors indicate that the qualities and values of historic properties that lie outside the boundaries of the APE may be affected directly, indirectly or cumulatively.

2. Any party to this agreement may propose that the APE be modified by submitting a written request providing a description of the area to be included, justification for expanding the APE, and map of the area to be included to the USACE. USACE will notify the parties to this agreement of the proposal with a written description of the modification requested within 15 days of receipt of such a request. From the date of notification, USACE will consult with the parties to this agreement for no more than 30 days to reach consensus on the proposal.

3. If the parties to this agreement cannot agree to a proposal for the modification of the APE, then the USACE will consider their concerns and will render a final decision within 30 days after the consultation period closes.

4. For all modifications to the APE, USACE will provide a written record of the decision to the parties to this agreement.

5. Modification of the APE will not require an amendment to the PA.
APPENDIX B: DEFINITIONS

Area of Potential Effects: The geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking [as noted in 36 C.F.R. § 800.16(d)].

Concurring Parties: The signatory parties may agree to invite others (concurring parties) to concur in the PA. The refusal of any party invited to concur in the PA does not invalidate the PA, (as noted in 36 C.F.R. § 800.6(c)(3)).

Consultation: The process of seeking, discussing, and considering the views of other participants, and, where feasible, seeking agreement with them regarding matters arising in the section 106 process. The Secretary of the Interior’s “Standards and Guidelines for Federal Agency Preservation Programs pursuant to the National Historic Preservation Act” provide further guidance on consultation (36 C.F.R. § 800.16(f)).

Consulting Parties: Parties that have consultative roles in the Section 106 process, as defined in 36 C.F.R. § 800.2(c). These include the SHPO, Indian Tribes (which include native village, regional corporation, or village corporation, as those terms are defined in section 3 of the Alaska Native Claims Settlement Act (43 U.S.C. § 1602)), representatives of local governments, Donlin Gold, individuals and organizations with a demonstrated interest in the undertaking, and the public.

Cultural Resource: Locations of human activity, occupation, or usage that contain materials, structures, or landscapes that were used, built, or modified by people.

Effect: Alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the NRHP (see 36 C.F.R. § 800.16(i)).

Eligible for inclusion in the National Register: This term includes both properties formally determined as such in accordance with regulations of the Secretary of the Interior and all other properties that meet the National Register criteria.

Environmental Impact Statement: An analysis of a major federal action’s environmental impacts conducted under the auspices of NEPA.

Historic Property: Any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP maintained by the Secretary of the Interior pursuant to the criteria for evaluation set forth in 36 C.F.R. § 60.4.

Indian Tribe: An Indian tribe, band, nation, or other organized group or community, including a native village, regional corporation or village corporation, as those terms are defined in section 3 of the Alaska Native Claims Settlement Act (43 U.S.C. § 1602), which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians.

Invited Signatory: The agency official may invite additional parties to be signatories to a PA; any such party that signs the PA shall have the same rights with regard to seeking amendment or termination of the agreement as other Signatories. The USACE has invited Donlin Gold and the State to be a Signatory to this PA pursuant to 36 C.F.R. § 800.6(c)(2). The refusal of any party invited to become a Signatory pursuant to paragraph (c)(2) does not invalidate the PA.
National Register: The National Register of Historic Places maintained by the Secretary of the Interior.

Qualified Archaeologist: An archaeologist that meets the Secretary of the Interior’s Standards and Guidelines for archeology (36 C.F.R. Part 61), which consist of, at a minimum, a graduate degree in archeology, anthropology, or closely related field plus, at least one year of full-time professional experience or equivalent specialized training in archeological research, administration or management; at least four months of supervised field and analytic experience in general North American archeology, demonstrated ability to carry research to completion, and at least one year of full-time professional experience at a supervisory level in the study of prehistoric or historic period archeology.

Signatories: In accordance with 36 C.F.R. § 800.6(c)(1), signatories have the sole authority to execute, amend, or terminate the agreement.

State: In this document the term is used to specifically identify the Alaska Department of Natural Resources.

Traditional Cultural Property: A property that is eligible for inclusion in the NRHP based on its associations with the cultural practices, traditions, beliefs, lifeways, arts, crafts, or social institutions of a living community. Traditional Cultural Properties (TCPs) are rooted in a traditional community’s history and are important in maintaining the continuing cultural identity of the community. See https://www.nps.gov/history/tribes/Documents/TCP.pdf.

Undertaking: A project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including those carried out by or on behalf of a federal agency; those carried out with federal financial assistance; and those requiring a federal permit, license or approval.
### APPENDIX C1: LIST OF FEDERALLY RECOGNIZED TRIBES INVITED TO PARTICIPATE IN CONSULTATION (* indicates a response that they will participate)

<table>
<thead>
<tr>
<th>Region</th>
<th>Tribe Name</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Calista Region</strong></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Akiachak Native Community</td>
</tr>
<tr>
<td>8</td>
<td>Akiak Native Community</td>
</tr>
<tr>
<td>9</td>
<td>Village of Alakanuk*</td>
</tr>
<tr>
<td>10</td>
<td>Yupiit of Andreafski</td>
</tr>
<tr>
<td>11</td>
<td>Village of Aniak</td>
</tr>
<tr>
<td>12</td>
<td>Village of Atmautluak</td>
</tr>
<tr>
<td>13</td>
<td>Orutsaramuit Native Village (aka Bethel)*</td>
</tr>
<tr>
<td>14</td>
<td>Village of Bill Moore’s Slough</td>
</tr>
<tr>
<td>15</td>
<td>Village of Chefornak</td>
</tr>
<tr>
<td>16</td>
<td>Chevak Native Village*</td>
</tr>
<tr>
<td>17</td>
<td>Native Village of Chuathbaluk*</td>
</tr>
<tr>
<td>18</td>
<td>Chuloonawick Native Village</td>
</tr>
<tr>
<td>19</td>
<td>Village of Crooked Creek*</td>
</tr>
<tr>
<td>20</td>
<td>Native Village of Eek</td>
</tr>
<tr>
<td>21</td>
<td>Emmonak Village</td>
</tr>
<tr>
<td>22</td>
<td>Native Village of Georgetown*</td>
</tr>
<tr>
<td>23</td>
<td>Native Village of Goodnews Bay</td>
</tr>
<tr>
<td>24</td>
<td>Native Village of Hamilton</td>
</tr>
<tr>
<td>25</td>
<td>Native Village of Hooper Bay*</td>
</tr>
<tr>
<td>26</td>
<td>Village of Kalskag*</td>
</tr>
<tr>
<td>27</td>
<td>Village of Lower Kalskag*</td>
</tr>
<tr>
<td>28</td>
<td>Kasiigluk Traditional Elders Council</td>
</tr>
<tr>
<td>29</td>
<td>Native Village of Kipnuk</td>
</tr>
<tr>
<td>30</td>
<td>Native Village of Kongiganak</td>
</tr>
<tr>
<td>31</td>
<td>Village of Kotlik</td>
</tr>
<tr>
<td>32</td>
<td>Organized Village of Kwethluk*</td>
</tr>
<tr>
<td>33</td>
<td>Native Village of Kwigillingok</td>
</tr>
<tr>
<td>34</td>
<td>Lime Village</td>
</tr>
<tr>
<td>35</td>
<td>Native Village of Marshall (aka Fortuna Ledge)*</td>
</tr>
<tr>
<td>36</td>
<td>Native Village of Mekoryuk</td>
</tr>
<tr>
<td>37</td>
<td>Asa’carsarmiut Tribe</td>
</tr>
<tr>
<td>38</td>
<td>Native Village of Napaimute</td>
</tr>
<tr>
<td>39</td>
<td>Native Village of Napakiak</td>
</tr>
<tr>
<td>40</td>
<td>Native Village of Napaskiak</td>
</tr>
<tr>
<td>41</td>
<td>Newtok Village</td>
</tr>
<tr>
<td>42</td>
<td>Native Village of Nightmute</td>
</tr>
<tr>
<td>43</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>Native Village of Nunam Iqua</td>
</tr>
<tr>
<td>46</td>
<td>Native Village of Nunapitchuk*</td>
</tr>
<tr>
<td>47</td>
<td>Village of Ohogamiut*</td>
</tr>
<tr>
<td>48</td>
<td>Oscarville Traditional Village*</td>
</tr>
<tr>
<td>49</td>
<td>Native Village of Paimiut</td>
</tr>
<tr>
<td>50</td>
<td>Pilot Station Traditional Village</td>
</tr>
<tr>
<td>51</td>
<td>Native Village of Pitka’s Point</td>
</tr>
<tr>
<td>52</td>
<td>Platinum Traditional Village</td>
</tr>
<tr>
<td>53</td>
<td>Native Village of Kwinhagak (aka Quinhagak)</td>
</tr>
<tr>
<td>54</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>Village of Red Devil</td>
</tr>
<tr>
<td>56</td>
<td>Iqurrmuit Traditional Council</td>
</tr>
<tr>
<td>57</td>
<td>Algaaciq Native Village (St. Mary’s)</td>
</tr>
<tr>
<td>58</td>
<td>Native Village of Scammon Bay</td>
</tr>
<tr>
<td>59</td>
<td>Village of Sleetmute</td>
</tr>
<tr>
<td>60</td>
<td>Village of Stony River</td>
</tr>
<tr>
<td>61</td>
<td>Nunakauyarmiut Tribe</td>
</tr>
<tr>
<td>62</td>
<td>Tuluksak Native Community</td>
</tr>
<tr>
<td>63</td>
<td>Native Village of Tuntutuliak</td>
</tr>
<tr>
<td>64</td>
<td>Native Village of Tununak</td>
</tr>
<tr>
<td>65</td>
<td>Umkumiut Native Village</td>
</tr>
<tr>
<td>66</td>
<td></td>
</tr>
<tr>
<td>67</td>
<td><strong>Doyon Region</strong></td>
</tr>
<tr>
<td>68</td>
<td>Anvik Village</td>
</tr>
<tr>
<td>69</td>
<td>Organized Village of Grayling</td>
</tr>
<tr>
<td>70</td>
<td>Holy Cross Village</td>
</tr>
<tr>
<td>71</td>
<td>McGrath Native Village</td>
</tr>
<tr>
<td>72</td>
<td>Nikolai Village</td>
</tr>
<tr>
<td>73</td>
<td>Shageluk Native Village</td>
</tr>
<tr>
<td>74</td>
<td>Takotna Village</td>
</tr>
<tr>
<td>75</td>
<td>Telida Village</td>
</tr>
<tr>
<td>76</td>
<td></td>
</tr>
<tr>
<td>77</td>
<td><strong>Cook Inlet Region</strong></td>
</tr>
<tr>
<td>78</td>
<td>Knik Tribe*</td>
</tr>
<tr>
<td>79</td>
<td>Native Village of Tyonek*</td>
</tr>
<tr>
<td>80</td>
<td></td>
</tr>
<tr>
<td>81</td>
<td><strong>Ahtna Region</strong></td>
</tr>
<tr>
<td>82</td>
<td>Tazlina Native Village*</td>
</tr>
</tbody>
</table>
APPENDIX C2: LIST OF ALASKA NATIVE CORPORATIONS INVITED TO PARTICIPATE IN CONSULTATION (* indicates a response that they will participate)

<table>
<thead>
<tr>
<th>Calista Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Akiakchak Limited Corporation</td>
</tr>
<tr>
<td>Alakanuk Native Corporation*</td>
</tr>
<tr>
<td>Arviq Incorporated (Platinum)</td>
</tr>
<tr>
<td>Askink Corporation (Scammon Bay)</td>
</tr>
<tr>
<td>Atmautluak Limited Corporation</td>
</tr>
<tr>
<td>Azachorok Incorporated (Mountain Village)</td>
</tr>
<tr>
<td>Bethel Native Corporation*</td>
</tr>
<tr>
<td>Calista Corporation*</td>
</tr>
<tr>
<td>Chefarnmute Incorporated (Chefornak)</td>
</tr>
<tr>
<td>Chevak Company</td>
</tr>
<tr>
<td>Chinuruk Incorporated (Nightmute)</td>
</tr>
<tr>
<td>Chuloonawick CorporationDeloycheet, Incorporated</td>
</tr>
<tr>
<td>Emmonak Corporation*</td>
</tr>
<tr>
<td>Iqfijouaq Company (Eek)</td>
</tr>
<tr>
<td>Kasiglukm Incorporated</td>
</tr>
<tr>
<td>Kokarmuit Corporation*</td>
</tr>
<tr>
<td>Kongnikilnomuit Yuita Corporation (Kotlik)</td>
</tr>
<tr>
<td>Kotlik Yupik Corporation</td>
</tr>
<tr>
<td>Kugkaktlik, Limited (Kipnuk)</td>
</tr>
<tr>
<td>Kuitsarak, Incorporated (Goodnews Bay)</td>
</tr>
<tr>
<td>Kwethluk Incorporated*</td>
</tr>
<tr>
<td>Kwik Incorporated (Kwigillingok)</td>
</tr>
<tr>
<td>Lime Village Company</td>
</tr>
<tr>
<td>Maserculiq, Incorporated (Marshall)*</td>
</tr>
<tr>
<td>Napakiak Corporation</td>
</tr>
<tr>
<td>Nerklklimute Native Corporation*</td>
</tr>
<tr>
<td>Newtok Native Corporation</td>
</tr>
<tr>
<td>Nima Corporation (Mekoryuk)</td>
</tr>
<tr>
<td>Nunakauiak Yupik Corporation (Toksook Bay)</td>
</tr>
<tr>
<td>Nunapigllurtaq Corporation (Kotlik)</td>
</tr>
<tr>
<td>Nunapitchuk Limited</td>
</tr>
<tr>
<td>Ohog Incorporated (Lower Kalskag)</td>
</tr>
<tr>
<td>Oscarville Native Corporation (Napaskiak)</td>
</tr>
<tr>
<td>Paimiut Corporation (Hooper Bay)</td>
</tr>
<tr>
<td>Pilot Station, Incorporated</td>
</tr>
<tr>
<td>Pitka’s Point Native Corporation (St. Mary’s)</td>
</tr>
<tr>
<td>Qanirtuuq, Incorporated (Quinhagak)</td>
</tr>
<tr>
<td>Qemirtalek Coast Corporation (Kongiganak)</td>
</tr>
<tr>
<td>Russian Mission Native Corporation*</td>
</tr>
<tr>
<td>Sea Lion Corporation (Hooper Bay)*</td>
</tr>
<tr>
<td>St. Mary’s Native Corporation</td>
</tr>
<tr>
<td>Swan Lake Corporation (Nunam Iqua)</td>
</tr>
<tr>
<td>The Kuskokwim Corporation*</td>
</tr>
<tr>
<td>Tulkisamute Incorporated (Tuluksak)</td>
</tr>
</tbody>
</table>
Tuntutuliak Land Limited Corporation
Tununrmiut Rinit Corporation (Tununak)*

Doyon Region
Deloy Ges Incorporated (Anvik)
Doyon, Limited*
Hee-Yea-Lingde Corporation (Grayling)
MTNT, Limited (McGrath)*
Zho-Tse, Incorporated (Shageluk)

Cook Inlet Region
Alexander Creek Native Corporation*
Cook Inlet Regional Incorporated*
Knikatnu Incorporated (Knik)*
Tyonek Native Corporation*
APPENDIX C3: OTHER INVITED CONSULTING PARTIES (* indicates a response that they will participate)

Calista Region
Association of Village Council Presidents*
City of Akiak
City of Alakanuk
City of Bethel*
City of Chefornak
City of Chevak
City of Chuathbaluk*
City of Eek
City of Emmonak
City of Goodnews Bay
City of Hooper Bay
City of Lower Kalskag
City of Upper Kalskag
City of Kotlik*
City of Kwethluk
City of Marshall
City of Mekoryuk
City of Mountain Village
City of Napakiak
City of Nightmute
City of Nunam Iqua
City of Nunapitchuk
City of Pilot Station
City of Platinum
City of Quinhagak
City of Russian Mission
City of Scammon Bay
City of St. Mary’s
City of Toksook Bay
Yupiit Piciryarait Cultural Center

Doyon Region
Alaska Native Language Center
Anvik Historical Society
City of Grayling
City of Holy Cross
City of McGrath
City of Nikolai
City of Shageluk
Tochak Historical Society

Cook Inlet Region
<table>
<thead>
<tr>
<th></th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alaska Historical Society</td>
</tr>
<tr>
<td>2</td>
<td>Matanuska-Susitna Borough</td>
</tr>
<tr>
<td>3</td>
<td>Cook Inlet Historical Society</td>
</tr>
<tr>
<td>4</td>
<td>Iditarod Historic Trail Alliance*</td>
</tr>
<tr>
<td>5</td>
<td>Kenai Peninsula Borough</td>
</tr>
<tr>
<td>6</td>
<td>National Park Service, Alaska Regional Office</td>
</tr>
</tbody>
</table>
APPENDIX D: CULTURAL RESOURCES MANAGEMENT PLAN
RESTRICTION STATEMENT

The locations of cultural resources noted in this plan are provided to facilitate permit review and compliance. Under the provisions of the Archaeological Resources Protection Act and the National Historic Preservation Act, site location information is restricted. Disclosure of such information is exempt from requests under federal and state freedom of information laws. This is not a public document. It is intended to facilitate Section 106 consultation by the U.S. Army Corps of Engineers, Bureau of Land Management, Alaska Office of History and Archaeology (OHA), and the Alaska State Historic Preservation Office (SHPO) (housed within OHA) and referred to as the combined OHA/SHPO. It is only intended for release to Donlin Gold LLC, Calista Corporation, The Kuskokwim Corporation, Cook Inlet Region, Inc., the Joint Pipeline Office, the BLM, the OHA/SHPO Alaska Tribes, and other appropriate consulting parties.
# TABLE OF CONTENTS

## 1.0 INTRODUCTION ................................................................. 1-1

1.1 Project Description .................................................................. 1-1
1.2 Area of Potential Effects (APE) .............................................. 1-1
1.3 Purpose and Objective of CRMP .............................................. 1-2
1.4 Cultural and Paleontological Resources ............................... 1-2

## 2.0 REGULATORY FRAMEWORK ........................................... 2-1

2.1 Federal .................................................................................... 2-1
2.2 State of Alaska ......................................................................... 2-3

## 3.0 PREVIOUS RESEARCH AND CULTURAL RESOURCES IDENTIFIED WITHIN THE PROJECT AREA ........................................................................ 3-1

3.1 Iditarod National Historic Trail ............................................... 3-1

## 4.0 PROJECT IMPLEMENTATION SEQUENCE AND SCHEDULE ............ 4-1

4.1 Pre-Construction Phase .......................................................... 4-1
4.2 Construction Phase ............................................................... 4-1
4.3 Operations Phase ..................................................................... 4-2
4.4 Reclamation Phase ................................................................ 4-3
4.5 Management Structure (Authority and Responsibility) ......... 4-4

## 5.0 EMPLOYEE AND CONTRACTOR CULTURAL TRAINING .................. 5-1

## 6.0 AVOIDANCE, MINIMIZATION, AND MITIGATION ...................... 6-1

6.1 Avoidance ............................................................................. 6-1
6.2 Minimization .......................................................................... 6-1
6.3 Monitoring ............................................................................ 6-2
6.4 Standard Mitigation ............................................................... 6-3

6.4.1 Methods for Stratified Prehistoric Sites with High Data-Recovery Potential ......................................................... 6-3
6.4.2 Methods for Historic Sites with High Data-Recovery Potential ................................................................. 6-5
6.4.3 Lithic Scatters - Methods for Spatial and Laboratory Analysis .......... 6-5
6.4.4 Sites Requiring Further Phase II Testing .................................. 6-6

6.5 Alternative Mitigation ........................................................... 6-6

6.5.1 Iditarod National Historic Trail .............................................. 6-7
6.5.2 Angyaruaq SLT-00094 ............................................................ 6-7

6.6 Alternative Mitigative Activities Conducted to Date ............. 6-8

6.6.1 Crooked Creek Repatriation .................................................. 6-8
6.6.2 Angyaruaq Community Archaeology .................................... 6-8
6.6.3 James L. McPherson 1914 Kuskokwim Reconnaissance Historic Iditarod Trail Photo Mapping and Digitization ......................................................... 6-9
6.7 Final Disposition of Recovered Archaeological Materials................................. 6-9
   6.7.1 Curation.......................................................................................... 6-10
   6.7.2 Alternative Disposition Methods.......................................................... 6-10

7.0 UNANTICIPATED DISCOVERIES .................................................................. 7-1
    7.1 Human Remains Plan of Action................................................................. 7-4
    7.2 Plan for Unanticipated Discovery of Paleontological Resources................. 7-6

8.0 REFERENCES ................................................................................................. 8-1

EXHIBITS

Exhibit A – Curation Agreement(s)
Exhibit B – Potential Fossil Localities on Federal Lands
Exhibit C – Potential Monitoring Areas
Exhibit D – Monitoring Plan
Exhibit E – September 25, 2017 Meeting Summary

TABLES

Table 3-1: Number of Cultural Resources Identified in Previous Studies.................. 3-1
Table 3-2: Summary of Eligible Sites within APE and Recommended Mitigation........ 3-2
Table 7-1: Contacts to Notify in Event of Confirmed Find......................................... 7-2
Table 7-2: Contact Information.................................................................................. 7-3
Table 7-3: Contact to Notify in Event of Human Remains Discovery............................. 7-5
Table 7-4: Contact List for Immediate Notification of Paleontological Resources Find...... 7-7
## ACRONYMS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHRS</td>
<td>Alaska Heritage Resources Survey</td>
</tr>
<tr>
<td>AHPA</td>
<td>Archaeological and Historic Preservation Act</td>
</tr>
<tr>
<td>AIRFA</td>
<td>American Indian Religious Freedom Act</td>
</tr>
<tr>
<td>APE</td>
<td>Area of Potential Effects</td>
</tr>
<tr>
<td>ARPA</td>
<td>Archaeological Resources Protection Act</td>
</tr>
<tr>
<td>AST</td>
<td>Alaska State Troopers</td>
</tr>
<tr>
<td>BLM</td>
<td>Bureau of Land Management</td>
</tr>
<tr>
<td>BTC</td>
<td>Birch Tree Crossing</td>
</tr>
<tr>
<td>Calista</td>
<td>Calista Corporation</td>
</tr>
<tr>
<td>Chumis</td>
<td>Chumis Cultural Resources Services</td>
</tr>
<tr>
<td>CIRI</td>
<td>Cook Inlet Region, Inc.</td>
</tr>
<tr>
<td>CRMP</td>
<td>Cultural Resources Management Plan (or plan)</td>
</tr>
<tr>
<td>CRR</td>
<td>Cultural Resources Report</td>
</tr>
<tr>
<td>CRS</td>
<td>Cultural Resources Specialist</td>
</tr>
<tr>
<td>Donlin Gold</td>
<td>Donlin Gold LLC</td>
</tr>
<tr>
<td>EIS</td>
<td>Environmental Impact Statement</td>
</tr>
<tr>
<td>ESRI</td>
<td>Environmental Systems Research Institute</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information Systems</td>
</tr>
<tr>
<td>INHT</td>
<td>Iditarod National Historic Trail</td>
</tr>
<tr>
<td>IRT</td>
<td>Iditarod Race Trail</td>
</tr>
<tr>
<td>MP</td>
<td>Mile Post</td>
</tr>
<tr>
<td>NAGPRA</td>
<td>Native American Graves Protection and Repatriation Act</td>
</tr>
<tr>
<td>NEPA</td>
<td>National Environmental Policy Act</td>
</tr>
<tr>
<td>NHPA</td>
<td>National Historic Preservation Act</td>
</tr>
<tr>
<td>NLURA</td>
<td>Northern Land Use Research Alaska, LLC</td>
</tr>
<tr>
<td>NRHP</td>
<td>National Register of Historic Places</td>
</tr>
<tr>
<td>NTSA</td>
<td>National Trails System Act</td>
</tr>
<tr>
<td>OHA</td>
<td>Office of History and Archaeology</td>
</tr>
<tr>
<td>PA</td>
<td>Programmatic Agreement</td>
</tr>
<tr>
<td>PFYC</td>
<td>Probable Fossil Yield Classification</td>
</tr>
<tr>
<td>PRPA</td>
<td>Paleontological Resource Preservation Act</td>
</tr>
<tr>
<td>SHPO</td>
<td>State Historic Preservation Office</td>
</tr>
<tr>
<td>SME</td>
<td>State Medical Examiner</td>
</tr>
<tr>
<td>TBD</td>
<td>To Be Determined</td>
</tr>
<tr>
<td>TCP</td>
<td>Traditional Cultural Property</td>
</tr>
<tr>
<td>TKC</td>
<td>The Kuskokwim Corporation</td>
</tr>
<tr>
<td>USACE</td>
<td>U.S. Army Corps of Engineers, Alaska District</td>
</tr>
</tbody>
</table>
UNITS OF MEASURE

km         kilometer(s)
cm         centimeter(s)
ft         foot/feet
m          meter(s)
1.0 INTRODUCTION

This Cultural Resources Management Plan (CRMP or plan) was developed by Donlin Gold LLC (Donlin Gold) as part of project plans for the Donlin Gold Project (project), a proposed open pit hardrock mining project in southwestern Alaska. The intent of this plan is to describe and implement Donlin Gold’s program for consideration, management, and protection of cultural resources during project construction, operations, and reclamation phases in compliance with applicable laws and consistent with sound principles of cultural resources management.

1.1 Project Description

Donlin Gold is proposing to develop an open pit, hardrock gold mine 277 miles (446 kilometers [km]) west of Anchorage, 145 miles (233 km) northeast of Bethel, and 10 miles (16 km) north of the village of Crooked Creek, Alaska. The project includes the principal mine components listed below. Additional details regarding the proposed project are in the Project Description (SRK 2012a), and Natural Gas Pipeline Plan of Development (SRK 2012b).

- Mine Site – Open pit, waste rock facility, mill, tailings storage facility, freshwater dams, contact water dams, a natural gas power generation facility, and personnel camps.
- Transportation Infrastructure – A 5,000-foot (ft) (1,524-meter [m]) gravel airstrip, a port on the Kuskokwim River at the location known as Jungjuk (Jungjuk Port site), and a 30-mile (48-km) gravel road to connect the port and the mine site.
- Natural Gas Pipeline – A 14-inch (35.6 centimeters [cm]), 315-mile (507-km) buried steel pipeline to supply natural gas to the mine power plant originating (tie-in) at an existing natural gas pipeline near Beluga, Alaska.

1.2 Area of Potential Effects (APE)¹

The direct effects APE consists of the mine lease area (including the proposed airstrip and road between the mine and airstrip), the proposed Jungjuk port and road, the natural gas pipeline corridor, and all associated material source sites and ancillary facilities. The indirect effects APE for the mine site (including the airstrip, Jungjuk port, and roads) will extend generally for 2 miles surrounding the mine site footprint, or the lease boundary, whichever is larger. The indirect APE for the pipeline (including ancillary facilities) may extend for up to 1 mile on each side of the pipeline centerline depending on topography and/or vegetation. The indirect effects APE for the Bethel port facility will be the facility footprint plus a 100-ft buffer around the facility footprint. Given the nature of the Kuskokwim River – with its constantly shifting route and ongoing seasonal erosion – mapping an indirect APE will result in inaccuracies and will be of little use. Rather, the agencies and Donlin will seek consulting party input to identify and consider significant sites along the Kuskokwim that may be affected by the proposed project-related activity along the river.

A map of the APE is included in Appendix A of the Programmatic Agreement (PA).

¹ 36 CFR 800.16(d) defines APE as: “the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.”
Lands directly affected by the project include public lands managed by the Bureau of Land Management (BLM) and State of Alaska (State), and private lands owned by Calista Corporation (Calista), the Kuskokwim Corporation (TKC), and Cook Inlet Region, Inc. (CIRI).

1.3 Purpose and Objective of CRMP

Purpose: This CRMP was developed by Donlin Gold to describe project tasks and procedures to facilitate compliance with federal and state laws and regulations, as well as with pertinent cultural resource stipulations in project land use agreements with private landowners. This plan has been developed in cooperation with the signatories and consulting parties of the Donlin Gold Project PA. The PA was developed in compliance with the National Historic Preservation Act (NHPA) to describe procedures to mitigate potential adverse effects to eligible/listed historic properties. The PA is a legally binding agreement that records the signatories’ commitments to resolve adverse effects to historic properties, including procedures for identifying, recording, and managing any newly discovered cultural resource sites. Under NHPA Section 106, only “historic properties” eligible for the National Register of Historic Places (NRHP) are considered, not all cultural resources. However, the National Environmental Policy Act (NEPA), the National Trails System Act (NTSA), and other acts may address protection of cultural resources that are not necessarily NRHP-eligible. In addition, this plan also addresses compliance requirements with the Paleontological Resources Preservation Act (PRPA).

Objective: The main objective of this plan is to provide procedures and guidance for Donlin Gold to conduct the project while considering, managing, and, where feasible, preserving the area’s historic properties and other cultural resources that may warrant consideration and protection from adverse project effects. This CRMP will be in effect during the construction, operation, and reclamation phases of the project.

This CRMP describes procedures including:

- Training of workers regarding cultural resource issues and responsibilities;
- Measures to avoid or minimize impacts to cultural resources (e.g., flagging, monitoring);
- Standard protocols for any cultural resources that may be exposed during project construction, operations, and reclamation;
- Prescribed actions to be taken in the event that unanticipated cultural resources are discovered, or known resources are impacted in an unanticipated manner; and
- Protocols for treatment of any discovered human remains.

1.4 Cultural and Paleontological Resources

Based on requirements of the regulatory framework (Section 2.0) and consultation with participants developing the PA, the term "Cultural Resources" for purposes of this plan may include:

- Listed (or eligible for listing) historic properties (e.g., prehistoric/historic sites, districts, buildings, structures, traditional cultural properties [TCPs]) on the NRHP.
- Prehistoric Resources: Isolated occurrences or clusters of artifacts, features, and human burials, which are evidence of the activities of Native Alaskan peoples in the past. Indicators of prehistoric and protohistoric occupation by Native Alaskans include,
Cultural Resources Management Plan
Donlin Gold Project

but are not limited to: artifacts of various natural materials, areas of soil discoloration, shell, animal bone, manuports, heat-altered stone, and human bone. Occurrences of prehistoric materials may include, but are not limited to:

- artifacts (e.g., projectile points, shell beads);
- habitations (e.g., house pit depressions, shell and/or midden deposits, fire-affected rock, heat-treated rock, manuports);
- features (e.g., hearths, stone features, artifact caches); and
- human remains (burials or isolated bone fragments).

- Historic Cultural Resources: Defined as isolated occurrences or clusters of artifacts, features, and structures (or their remains), at least 50 years of age (or exceptional, or having Native Alaskan religious significance) that are evidence of the activities of peoples of all ethnicities of the American historic period. Historic materials may include, but are not limited to:
  - Buildings and structures, or the remains thereof;
  - Trash pits, privies, wells, and associated artifacts, surface dumps, and artifact scatters;
  - Isolated artifacts or isolated clusters of artifacts (e.g., metal cans, glass bottles, ceramic vessels); and
  - Human remains (burials or isolated bone fragments).

- Native Alaskan sacred site or significant ethnic sites (of any age)

Paleontological resources (e.g., fossils), although not included under Section 106, are also addressed in this CRMP to protect these resources during the project construction (Section 7.2 and Exhibit B, Potential Fossil Localities on Federal Lands in the Proposed Donlin Gold Project Area and Natural Gas Pipeline Corridor (Figure B-1)).
2.0 REGULATORY FRAMEWORK

This section is a summary of the key federal, state laws or regulations, and landowner stipulations that form the regulatory framework for development of this project in general, and specifically this CRMP.

2.1 Federal

The project area includes wetlands and waters of the United States; therefore, for certain project-related activities, Donlin Gold must obtain a permit issued by the U.S. Army Corps of Engineers, Alaska District (USACE), under provisions of Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899. Donlin Gold must also obtain right-of-way authorization for placement of portions of the pipeline on BLM-managed lands. Before making these federal decisions, the federal agencies must comply with NEPA. The USACE is the lead NEPA agency developing an Environmental Impact Statement (EIS) for the project. The BLM is a cooperating agency in developing the EIS. The project is subject to applicable federal laws and regulations pertaining to protection and consideration of possible adverse effects on cultural resources (defined for this CRMP in Section 1.4). The key federal acts, and Executive Order pertaining to cultural resources in Alaska are summarized below.


The NEPA process is intended to help federal agencies make decisions that are based on an understanding of all potential environmental consequences and to encourage actions that protect, restore, and/or enhance all aspects of the affected environment, including cultural resources. NEPA also provides opportunities for input from agencies, Tribes, and the public during development and review of the EIS. Regulations at 40 CFR 1500–1508 establish the policy requirements that are binding on all federal agencies for implementing NEPA.

• National Historic Preservation Act (NHPA 1966: 16 U.S.C. 470, as amended)

Section 106 of the NHPA requires federal agencies to take into account the effect of their undertakings on historic properties and afford the Advisory Council on Historic Preservation an opportunity to comment. Federal undertakings are defined as federally funded, licensed or permitted projects, or projects on federal land which may affect either a property listed on the NRHP, or an eligible property. "Historic Properties" are defined as those listed in, or eligible for, the NRHP (36 CFR 800.16(I)(1)). PAs are executed pursuant to NHPA Section 106 (specifically at CFR 800.14) and are compliance agreements setting forth how the federal agencies and project proponents will avoid, minimize, or mitigate adverse effects to historic properties. A PA is one of a variety of methods available to federal agencies to meet their Section 106 obligations.

• Archaeological and Historic Preservation Act (AHPA 1974, a.k.a. the Moss-Bennett Act)

The AHPA addresses the requirements of archaeological site data preservation for sites on federal land.
• **Archaeological Resource Protection Act of 1979 (ARPA)**

ARPA was enacted to protect archaeological sites, artifacts and human remains on federal lands from looting by providing effective law enforcement and penalties for convicted violators. ARPA makes it illegal to excavate or damage archaeological resources located on public or Native lands without a permit, and to sell, purchase, exchange, transport, or receive archaeological resources that were excavated illegally under federal, state, or local law.

• **Native American Graves Protection and Repatriation Act of 1990 (NAGPRA)**

NAGPRA provides for consultation with Native groups when Native burials may be, or are accidentally, disturbed by an action, and for inventorying and repatriating collections already held by federal museums and institutions. Alaska Native human remains, funerary objects, sacred objects, and objects of cultural patrimony as defined in NAGPRA (25 U.S.C. § 3001), encountered on BLM or other federal land in connection with the undertaking shall not be intentionally excavated or removed without a permit under ARPA, 16 U.S.C. § 470cc, and consultation with the appropriate Tribes. NAGPRA regulations apply only to federally-owned lands.

• **National Trails System Act (NTSA)**

The Iditarod National Historic Trail (INHT) was designated by Congress to recognize the trail’s significance as a historic transportation route. The NTSA establishes trails to “promote outdoor recreation and the preservation of, public access to, travel within, and enjoyment and appreciation of the open-air, outdoor areas and historic resources.” The INHT extends from Seward, Alaska, to Nome, Alaska, following the routes as depicted on maps identified as “Seward-Nome Trail,” in the Department of the Interior study report entitled: *The Iditarod Trail (Seward-Nome Route) and other Alaskan Gold Rush Trails*. The BLM, as Trail Administrator, coordinates cooperative management of the INHT among a variety of land owners including the State of Alaska, federal agencies, Native corporations, and private land owners.

• **American Indian Religious Freedom Act (AIRFA 1978)**

The AIRFA promotes federal agency consultation with Tribes regarding activities that may affect their traditional religious rights and cultural practices. These include, but are not limited to, access to sacred sites, freedom to worship through ceremonial and traditional rights, and use and possession of objects considered sacred. These rights and practices may be associated with, and lend significance to, a property.

• **Executive Order 11593 – Protection and Enhancement of the Cultural Environment**

Executive Order 11593 directs the federal government to provide leadership in preserving, restoring, and maintaining the historic and cultural environment of the nation by initiating measures necessary to preserve, restore, and maintain (for the inspiration and benefit of the people) federally owned sites, structures, and objects of historical, architectural, or archaeological significance.

• **Paleontological Resource Preservation Act (PRPA 2009, Preservation Law 111-011)**

The PRPA only applies to federal lands and does not affect private lands. It provides authority for the protection of paleontological resources on federal lands such as issuing permits for collecting paleontological resources, curation of paleontological resources, and confidentiality of locality.
data. It also includes criminal and civil penalties for fossil theft and vandalism. BLM Instruction Memo 2016-124-11 provides guidance for BLM implementation of PRPA 2009.

### 2.2 State of Alaska

The project area includes land owned by the State of Alaska; therefore, development plans are subject to provisions of state laws regarding historic, prehistoric, and archaeological resources threatened by public construction.

- **Alaska Historic Preservation Act (AHPA) (AS 41.35)**

The AHPA is central to the management of cultural resources on state-owned land. AS 41.35.070 stipulates:

(b) “Before public construction or public improvement of any nature is undertaken by the state, or by a governmental agency of the state or by a private person under contract with or licensed by the state or governmental agency of the state, the department may survey the affected area to determine if the area contains historic, prehistoric, or archeological values.

(c) If the department determines that historic, prehistoric, or archeological sites, locations, or remains will be adversely affected by the public construction or improvement, the proposed public construction or improvement may not be commenced until the department has performed the necessary investigation, recording, and salvage of the site, location, or remains. All investigation, recording, and salvage work shall be performed as expeditiously as possible so that no state construction project will be unduly impaired, impeded, or delayed.

(d) If in the course of performing public construction or improvements, historic, prehistoric, or archeological sites, locations, remains, or objects are discovered, the department shall be notified and its concurrence shall be requested in continuing the construction or improvement. Upon receipt of this notice, the department shall survey the area to determine whether the area contains historic, prehistoric, or archeological data which should be preserved in the public interest. The survey shall be conducted as expeditiously as possible. If, as a result of the survey, it is determined that (1) this data exists in the area, (2) the data has exceptional historic, prehistoric, or archeological significance, and should be collected and preserved in the public interest, and (3) it is feasible to collect and preserve the data, the department shall perform the necessary work to collect and preserve the data. This work shall be performed as expeditiously as possible.

(e) If the concurrence of the department required under (b) and (c) of this section is not obtained after 90 days from the filing of a request for its concurrence to proceed with the project, the agency or person performing the construction or improvement may apply to the governor for permission to proceed without that concurrence, and the governor may take the action the governor considers best in overruling or sustaining the department.”
Additionally, AS 41.35.80 requires permits for archaeological and historic property investigations as follows:

“The commissioner may issue a permit for the investigation, excavation, gathering, or removal from the natural state, of any historic, prehistoric, or archeological resources of the state. A permit may be issued only to persons or organizations qualified to make the investigations, excavations, gatherings, or removals and only if the results of these authorized activities will be made available to the general public through institutions and museums interested in disseminating knowledge on the subjects involved. If the historic, prehistoric, or archeological resource involved is one which is, or is located on a site which is, sacred, holy, or of religious significance to a cultural group, the consent of that cultural group must be obtained before a permit may be issued under this section.”

Several laws are applicable to the discovery of human remains in Alaska. The State Medical Examiner (SME) has jurisdiction over all human remains in the state (with rare exceptions, such as military aircraft deaths), regardless of age.

AS 12.65.5 requires immediate notification of a peace officer of the state (police, Village Public Safety Officer, or Alaska State Troopers [AST]) and the SME when death has “been caused by unknown or criminal means, during the commission of a crime, or by suicide, accident, or poisoning.” In this regard, contact the AST/Missing Persons Bureau first. (Table 7-3) The AST has interpreted notification procedures as applicable to all remains, including ancient remains.

AS 11.46.482(a)(3), which applies to all lands in Alaska, makes the “intentional and unauthorized destruction or removal of any human remains or the intentional disturbance of a grave” a class C felony.

AS 41.35.200, which applies only to State lands, makes the disturbance of "historic, prehistoric and archeological resources" (including graves, per definition) a Class A misdemeanor.

AS 18.50.250, which applies to all lands in Alaska, requires permits for the disinterment, transport, and re-interment of human remains. Guidance and permits are available from the Bureau of Vital Statistics (now Health Analytics & Vital Records).
3.0 PREVIOUS RESEARCH AND CULTURAL RESOURCES IDENTIFIED WITHIN THE PROJECT AREA

Phase I (surveys) and Phase II (evaluation reports and eligibility recommendations) have been completed for most areas that have the potential to be directly affected by project activities. The formal APE will remain somewhat flexible as project planning proceeds, but a large area along the pipeline corridor, project alternatives, and mine lease boundary have been assessed. Mitigation efforts may be required for sites where adverse effects cannot be avoided/minimized. This section addresses known resources.

Previous work has identified 72 cultural resources (Table 3-1). Fifty-five (55) of the identified resources are classified as prehistoric and 17 are historic. Forty-nine (49) of the 72 cultural resources are within the APE. Twenty-one (21) sites were deemed eligible or treated-as-eligible (13 sites are historic and 8 are prehistoric). Eligibility determination was made for 14 sites and 7 were treated-as-eligible, because additional investigation is needed to determine NRHP eligibility or the determination is pending (Table 3-1). The sites within the APE, along with recommended mitigation are listed in Table 3-2.

Table 3-1: Number of Cultural Resources Identified in Previous Studies

<table>
<thead>
<tr>
<th>Classification</th>
<th>Cultural Resources Identified</th>
<th>NRHP Eligible Historic Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prehistoric</td>
<td>55</td>
<td>13</td>
</tr>
<tr>
<td>Historic</td>
<td>17</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>72</td>
<td>21</td>
</tr>
</tbody>
</table>


Ten Phase I identification surveys and Phase II site evaluation reports have been submitted by Donlin Gold to: USACE, BLM, OHA/SHPO, TKC, Calista, and CIRI. EOE (Evaluation of Eligibility) forms were included in the following reports: Site Evaluations of Known Cultural Resources within the Proposed Donlin Creek Mine Area Lease Boundary (Hays et al, 2011); Phase I and II Cultural Resources Survey of the Proposed Donlin Gold Natural Gas Pipeline (Reuther et al. 2012); Results of the 2013 Phase I and Phase II Cultural Resources Survey of the Jones and Pretty Creek Realignment Routes of the Proposed Donlin Gold Natural Gas Pipeline Study (Rogers et al. 2013), and other project reports.

3.1 Iditarod National Historic Trail

Approximately 62 miles of the Iditarod Trail would be present within the APE within the Rainy Pass area (from approximately the “Skwentna Crossing” to Three Mile Creek) and the South Fork of the Kuskokwim area. Construction of the proposed pipeline would result in both direct temporary construction-related impacts and longer term indirect impacts to the setting through visual effects. The buried pipeline would cross the Iditarod National Historic Trail (INHT) 4 times, and would be collocated within the INHT for 2.5 miles and in proximity (within 1,000 feet [ft]) for approximately 14.3 miles (PFEIS USACE, 2017). However, after the project’s adoption of the “North Route” variant, approximately 47 miles of the Iditarod Trail would be present within the
APE, and the ROW would cross the INHT 4 times. Potential effects to the Iditarod Trail include alteration of character-defining features and integrity (e.g., location, design, setting, feeling, and association); and changes in scenic quality.

Table 3-2 lists the 14 eligible sites within the APE considering the current project plans (i.e., use of “North Route”).

**Table 3-2: Summary of Eligible Sites within APE and Recommended Mitigation**

<table>
<thead>
<tr>
<th>AHRS No.</th>
<th>Nature of Resource</th>
<th>Recommended Mitigation</th>
<th>Land Owner</th>
<th>Anticipated Adverse Effect</th>
<th>Project Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDT-00292</td>
<td>Lithic scatter</td>
<td></td>
<td>Calista</td>
<td>No Adverse Effect</td>
<td>Mine Area</td>
</tr>
<tr>
<td>IDT-00275</td>
<td>Lithic scatter</td>
<td></td>
<td>Federal</td>
<td>No Adverse Effect</td>
<td>Pipeline corridor</td>
</tr>
<tr>
<td>IDT-00288</td>
<td>Surface lithic artifacts</td>
<td>Spatial analysis</td>
<td>Federal</td>
<td>Physical destruction or damage</td>
<td>Pipeline corridor</td>
</tr>
<tr>
<td>MCG-00071</td>
<td>Stratified subsurface features</td>
<td>Phase III Excavation and Data recovery</td>
<td>State</td>
<td>Physical destruction or damage</td>
<td>Pipeline corridor</td>
</tr>
<tr>
<td>MCG-00072</td>
<td>Subsurface lithic artifacts</td>
<td>-</td>
<td>State</td>
<td>No Adverse Effect</td>
<td>Pipeline corridor</td>
</tr>
<tr>
<td>MCG-00075</td>
<td>Subsurface lithic artifacts</td>
<td>-</td>
<td>State</td>
<td>No Adverse Effect</td>
<td>Pipeline corridor</td>
</tr>
<tr>
<td>MCG-00076</td>
<td>Subsurface lithic artifacts</td>
<td>-</td>
<td>State</td>
<td>No Adverse Effect</td>
<td>Pipeline corridor</td>
</tr>
<tr>
<td>TYO-00022</td>
<td>Mountain Climber roadhouse</td>
<td>-</td>
<td>State</td>
<td>No Adverse Effect</td>
<td>Pipeline corridor</td>
</tr>
<tr>
<td>TYO-00277</td>
<td>Depression features</td>
<td>Phase III Excavation and Data recovery</td>
<td>State</td>
<td>Physical destruction or damage</td>
<td>Pipeline corridor</td>
</tr>
</tbody>
</table>

Assessments of effect were determined by the U.S. Army Corps of Engineers, and received concurrence from the Alaska SHPO.
### Cultural Resources Management Plan
#### Donlin Gold Project

<table>
<thead>
<tr>
<th>AHRS No.</th>
<th>Nature of Resource</th>
<th>Recommended Mitigation</th>
<th>Land Owner</th>
<th>Anticipated Adverse Effect</th>
<th>Project Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLT-00094</td>
<td>Multi-locus surface/subsurface features</td>
<td>Additional Phase II Survey and Delineation</td>
<td>Calista/TKC</td>
<td>Close proximity to construction activities</td>
<td>Jungjuk Port site</td>
</tr>
<tr>
<td>TYO-00215</td>
<td>Historic cabin</td>
<td>Documentation and report</td>
<td>State</td>
<td>Temporary visual effect</td>
<td>Pipeline corridor</td>
</tr>
<tr>
<td>TYO-00363</td>
<td>Historic campsite</td>
<td>-</td>
<td>State</td>
<td>No Adverse Effect</td>
<td>Pipeline corridor</td>
</tr>
<tr>
<td>IDT-00260</td>
<td>Historic cabin</td>
<td>Data recovery</td>
<td>State</td>
<td>Close proximity to construction activities</td>
<td>Mine area</td>
</tr>
<tr>
<td>IDT-00261</td>
<td>Historic cabin</td>
<td>-</td>
<td>TKC</td>
<td>No Adverse Effect</td>
<td>Mine area</td>
</tr>
<tr>
<td>Iditarod Trail (Good Iditarod Trail, Iditarod National Historic Trail, Iditarod Race Trail) TAL-00055, TYO-00085, MCG-00125</td>
<td>Linear trail segments</td>
<td>Creative Mitigation (See Section 6.5.1)</td>
<td>State</td>
<td>Alteration of character-defining features and integrity, changes in scenic quality</td>
<td>Pipeline corridor</td>
</tr>
</tbody>
</table>

---

Donlin Gold 3-3  
March 2018 – DRAFT 4.3
4.0 PROJECT IMPLEMENTATION SEQUENCE AND SCHEDULE

This section presents an overview of the tasks to be performed to consider, manage, and, if feasible, protect cultural resources. It is important to note that this plan covers all phases of the project including: pre-construction, construction, operations, and reclamation. Generally, ground-disturbing activities associated with construction present the largest risk of impact to cultural resources. The bulk of construction activities for the project will occur during the project construction phase. However, construction activities related to the growth of the mine will also occur during the operations and reclamation phases.

4.1 Pre-Construction Phase

Pre-construction phase tasks (prior to ground-disturbing activities) related to cultural resources include:

- Submit annual Cultural Resources Report (CRR) report (as outlined in PA Section XIII (B)) by February 1 or at least 30 days prior to the annual meeting.
- Submit draft Construction Monitoring Plan for review by signatories at least 30 days prior to the annual meeting.
- Annual meeting with PA signatories to discuss each year’s activities, review and approve monitoring plan (Exhibit D) and any other activities scheduled for the upcoming year during construction.
  - Prepare meeting minutes and share with all signatories of the PA.
  - Provide copies of meeting minutes to concurring signatories within 15 days, upon request.
- Conclude surveys to identify and evaluate other potential cultural resources in areas, not yet surveyed:
  - Pipeline “North Route” alignment.
  - Pipeline ancillary facilities (all areas outside of the surveyed 300-ft wide corridor).
- Evaluate potential TCPs in the APE.
- Address Tribal and local concerns regarding cultural resources.
- Address curation options in consultation with landowners.
- Complete Visual Documentation of the INHT (Section 6.5.1)
- Fabricate stone artifact replicas (Section 6.5.2)
- Review PA effectiveness with PA signatories and invited signatories every 5 years (if applicable).

4.2 Construction Phase

Construction phase tasks (initiation of ground breaking activities leading up to mill processing) for which Donlin will be responsible for related to cultural resources include:
• Submit annual CRR report, including draft treatment plans, by February 1 or at least 30 days prior to the annual meeting.

• Annual meeting with PA signatories to discuss each year’s activities, and activities scheduled for the upcoming year during construction.
  – Prepare meeting minutes and share with all signatories of the PA.
  – Provide copies of meeting minutes to concurring signatories within 15 days upon request.

• Designate a Cultural Resource Specialist(s) (CRS) (qualified archaeologist contractor(s) per 48 FR 44738-4473936) and provide the contractor list to OHA/SHPO, BLM, USACE, and other PA invited signatories parties.

• Train new employees for on-site cultural resources awareness (during first week of employment).

• Track progress of construction and project schedule.

• Monitor for cultural resources when and where necessary (Section 6.3).

• Identify and evaluate cultural resources that may be discovered during construction activities.

• Mitigate effects to eligible historic properties per consultation if avoidance/minimization is not possible.

• Conduct test investigations or data recovery analysis and reports per consultation (if buried cultural resources are discovered during construction activities).

• Prepare artifacts and other cultural materials to be curated.

• Transfer artifacts and cultural materials to the approved curating facility.

• Initiate INHT minimization and supplemental mitigation measures (Section 6.5.1): Pipeline construction at INHT Crossings; Placement of surface structures; Material Site MS-25; Initiate Donlin Gold INHT Annual Endowment.

• Review PA effectiveness review with PA signatories and invited signatories every 5 years (if applicable).

Additional construction phase tasks include notifying the Authorized Officer within 24 hours of any discoveries not subject to prescriptive treatment; maintaining daily logs and weekly summaries; and preparing compliance reports of all cultural resources monitoring and mitigation activities.

4.3 Operations Phase

Operations phase tasks related to cultural resources include:

• Submit annual CRR report by February 1 or at least 30 days prior to the annual meeting.

• Annual meeting with PA signatories to discuss each year’s activities, and activities scheduled for the upcoming year during construction.
  – Prepare meeting minutes and share with all signatories of the PA.
- Provide copies of meeting minutes to concurring signatories within 15 days upon request.
- Train new employees for on-site cultural resources awareness (during first week of employment).
- Track progress of operation activities and project schedule.
- Monitor for cultural resources when and where necessary (Section 6.3).
- Evaluate cultural resources that may be discovered during construction activities.
- Mitigate effects on eligible historic properties per consultation, if avoidance/minimization is not possible.
- Conduct test investigation or data recovery analysis and reports, per consultation (if buried cultural resources are discovered during construction activities).
- Prepare artifacts and other cultural materials to be curated.
- Transfer artifacts and cultural materials to the approved curating facility.
- Conduct test investigation or data recovery analysis and reports, per consultation (if buried cultural resources are discovered during construction activities).
- Review PA effectiveness review with PA signatories and invited signatories every 5 years (if applicable).

Additional operations phase tasks include notifying the Authorized Officer within 24 hours of any discoveries not subject to prescriptive treatment; maintaining daily logs and weekly summaries; and preparing compliance reports of all cultural resources monitoring and mitigation activities.

### 4.4 Reclamation Phase

Reclamation phase tasks related to cultural resources include:

- Submit annual CRR report by February 1 or at least 30 days prior to the annual meeting.
- Annual meeting with PA signatories to discuss each year’s activities, and activities scheduled for the upcoming year during construction.
  - Prepare meeting minutes and share with all signatories of the PA.
  - Provide copies of meeting minutes to concurring signatories within 15 days upon request.
- Train new employees for on-site cultural resources awareness (during first week of employment).
- Track progress of reclamation activities and project schedule.
- Monitor for cultural resources when and where necessary (Section 6.3).
- Evaluate cultural resources that may be discovered during reclamation activities.
- Mitigate effects on eligible historic properties, per consultation if avoidance/minimization is not possible.
• Conduct test investigation or data recovery analysis and reports, per consultation (if buried cultural resources are discovered during project activities).
• Prepare artifacts and other cultural materials to be curated.
• Transfer artifacts and cultural materials to the approved curating facility.
• Review PA effectiveness review with PA signatories and invited signatories every 5 years (if applicable).

Additional reclamation phase tasks include notifying the Authorized Officer within 24 hours of any discoveries not subject to prescriptive treatment; maintaining daily logs and weekly summaries; and preparing compliance reports of all cultural resources monitoring and mitigation activities.

4.5 Management Structure (Authority and Responsibility)

Donlin Gold has granted all employees, contractors, and the CRS the authority to stop work in the event of an unanticipated discovery of a cultural resource material, consistent with the procedures outlined in Section 7.0 Unanticipated Discoveries.

Cultural Resource Specialist(s) (CRS) – A qualified archaeologist as defined in 48 FR 44738-4473936. The CRS acts as the responsible party for cultural resources issues.

A formal management structure, including roles and responsibilities of cultural resource specialists and their qualifications, will be identified and submitted for review to USACE, BLM, and SHPO, at least 60 days prior to start of construction.
5.0 EMPLOYEE AND CONTRACTOR CULTURAL TRAINING

Donlin Gold will provide cultural training to Donlin Gold project personnel, contractors, and subcontractors within their first week of employment. The training materials will be prepared or approved by a qualified archaeologist meeting the qualifications of 48 FR 44738-4473936. As practicable, the training will be conducted in concert with existing environmental, health and safety training, on the project during construction and operations. The cultural training will focus on the following issues:

- Regulatory policies and laws protecting resources, and penalties for violations.
- Basic identification of cultural resources.
- The rationale for cultural resources monitoring.
- The procedures to follow in case of discovery of such resources.
6.0 AVOIDANCE, MINIMIZATION, AND MITIGATION

As agreed upon in the PA, Donlin Gold will, to the extent practicable, avoid all known eligible historic properties and paleontological resources. Avoidance is the preferred resolution of potential adverse effects. If adverse effects cannot be resolved through avoidance, then Donlin Gold will look for ways to minimize adverse effects, and develop mitigation or treatment plan(s) in consultation with the USACE, SHPO, other appropriate agencies, and consulting parties as agreed upon in the PA.

6.1 Avoidance

Eligible properties within the APE, for which the project has designed to avoid (Table 3-2: Summary of Eligible Sites within APE and Recommended Mitigation), will be typically given a protective buffer of 500 ft (152 m) but no less than 100 ft from the site limits. This will not be practicable for some sites, like SLT-00094, where the site limits are less than 100 ft to the proposed project limits. The following sites will be flagged by the CRS in a conspicuous manner and avoided:

- IDT-00260 Lewis Gulch Main Cabin
- IDT-00261 Grouse Creek Cabin
- SLT-00094 Angyaruaq
- IDT-00275 Surface Lithic Artifacts
- MCG-00072 Subsurface Lithic Artifacts
- MCG-00076 Subsurface Lithic Artifacts
- TYO-00215 Historic Cabin

Donlin Gold will enforce avoidance of the flagged areas during construction and reclamation activities (identified as the periods when inadvertent disturbance of a site would be most likely) and remove flagging once construction activity in the area is completed to detract attention and prevent potential vandalism.

6.2 Minimization

Revision and re-routing of the natural gas pipeline route away from portions of the INHT and IRT completed during project planning will avoid effects on some portions of these resources. During consultation, other methods have been discussed (e.g., vegetation buffers, operations protocols) that may minimize indirect effects on these and other resources. The results of these discussions included a commitment to the following:

- Pipeline Construction at INHT Crossings – As practicable, pipeline ROW construction at INHT crossings will be in a manner that minimizes the observer’s view of the pipeline ROW. This may include narrowing and/or feathering of the pipeline construction ROW and placement of visual barriers such as vegetation, brush piles, and/or berms (refer to September 25, 2017 meeting summary, Exhibit E).
• Placement of Surface Infrastructure – As practicable, mile markers, main blocks valves, and cathodic protectors will be placed at inconspicuous locations to avoid or minimize their view from the INHT.

6.3 Monitoring

For the purposes of this plan, archaeological monitoring during construction is defined as on-the-ground, close-up observation by a CRS. The objectives of monitoring are:

• Protect existing cultural resources from construction effects.

• Identify, at the time of discovery, any archaeological materials exposed during ground disturbance.

• Notify and apprise SHPO, applicable land owner(s) and Tribe(s) of all discoveries of cultural resources.

A monitoring plan will be developed and revised as needed based on consultation with PA signatories (Exhibit D).

Consultation among the USACE, BLM, ACHP, SHPO, and other consulting parties has determined that archaeological monitoring shall be conducted in areas specified in Exhibit C, identified as a result of previous fieldwork, examination of local geomorphology, predictive modeling, and best professional judgment. Predictive model development, implementation, and re-iteration based on field results are described in Reuther et al. 2010 and subsequent field survey reports.

Archaeological monitoring may also be initiated, per consultation, if project personnel believe that potential archaeological material has been found in the project area. The CRS will attempt to define and identify any discovered archaeological finds, halt construction in the vicinity of a find (if necessary, in order to evaluate it), and keep a daily log of construction activities observed and any archaeological finds. The CRS will set out flagging or fencing to create a buffer zone around known or discovered cultural resources signifying that ground-disturbing activities are not allowed at those locations. The CRS will check that the flagging and fencing remains a visible and effective barrier until project activities have been completed in the vicinity (adjacent to the flagged buffer area) of the cultural resource.

The CRS will provide recommendations of eligibility for the NRHP to the authorized individual (per Article III of the PA) for review and approval. Full-time monitoring will be conducted at sites where NRHP-eligible cultural resources have been discovered. This is defined as careful observation of the ground-disturbing activities of all machines on a construction site for as long as the machines are being operated. This type of monitoring requires one monitor per active earthmoving machine working in the archaeological-sensitive site. Full-time archaeological monitoring, if necessary, may require more than one monitor working at a time, depending on number of machines and distance between machines. If one monitor cannot observe all ground disturbances at the same time, additional monitors will be assigned so that all ground-disturbing activities can be observed.

The CRS will coordinate with Tribal participants, as appropriate, during Tribal monitoring of ground disturbance areas where archaeological resources or human remains have been discovered or are anticipated to be encountered. Wherever possible, these areas will be identified prior to the initiation of construction, in consultation with consulting parties. Tribal participation will be initiated at the time archaeological resources are found by construction personnel or the project owner and
assessed as Native Alaskan cultural resources by the CRS. If a Tribal monitor becomes necessary during project construction, the Tribal monitor(s) shall be chosen from the current list of Tribal representatives in the PA. If artifacts are recovered in these efforts, they will be handled (Section 6.4) and curated (Section 6.7) as outlined in this plan. If human remains are identified on federal lands within the APE, then the regulations contained in the NAGPRA would apply.

6.4 Standard Mitigation

*Mitigation* is a way to remedy or offset an adverse effect or a change in a historic property's qualifying characteristics. *Treatment* is the act of mitigating those effects, agreed upon in consultation. Consultation among the consulting parties will precede and inform all mitigation actions.

Standard mitigation treatment for archaeological sites typically consists of site excavation and archaeological “data recovery” and dissemination of information as appropriate. Guided by a formal Research Design, a portion of sites that will be affected by the project will be excavated and the resultant data recorded. This process ensures that the archaeological site or material will be thoroughly documented, analyzed, and curated so that project activities can proceed as planned.

For standard mitigation planning purposes, sites in the project area recommended as eligible for the NRHP and with an anticipated adverse effect from the project (Table 3-1), were categorized on the basis of criteria such as period, size, stratification, artifact type, and data-recovery potential. Recommended mitigation methods for each site type are described below.

Donlin Gold’s CRS will draft treatment plans and submit them to the signatories 30 days prior to the annual construction phase meeting (Section 4.2). The treatment plans will specify how effects to eligible historic properties will be mitigated if avoidance/minimization is not possible. Review and approval of final treatment plans, in consultation with and with input from consulting parties, will occur during the annual meeting.

6.4.1 Methods for Stratified Prehistoric Sites with High Data-Recovery Potential

Phase III Excavation and Data Recovery is the recommended mitigation approach for two prehistoric sites with the highest data-recovery potential (MCG-00071, TYO-00277). The level of mitigation effort will be commensurate with the potential project effects on these sites. All data recovery mitigation will be accompanied by a formal research design to be submitted for review by the signatories and approval (along with applicable permits) by the OHA/SHPO prior to planned construction in the respective zones where these sites are located.

High-resolution topographic mapping using surveying instruments (type Leica TS-06 total station) will be used to generate a pre-disturbance map of the site. Semi-permanent primary site datum points will be established with rebar and capped and labeled with the site number and date. All subsequent intermediate datum points will be established in the same grid and coordinate system, and measured relative to the main site datum points. All features, tests, excavation units and *in situ* artifact point proveniences will be recorded with total station as well. Positional data collected at each site will be used to determine contextual relationships among artifacts and features. Distribution maps can potentially be used to ascertain possible uses of space within the excavated areas. Mapping and spatial distribution files will be compatible with Environmental Systems Research Institute (ESRI) Geographic Information Systems (GIS) systems (ArcGIS).
A 3-inch core sampler and bucket auger and/or test pits will be used to test subsurface extents of the buried components outside the test excavations. Excavation units will be placed based on visible surface features and knowledge of the site gained through previous testing. All units will be hand excavated using trowels and dustpans. Excavated sediments will be screened through a \( \frac{1}{4} \)-inch mesh screen, as possible. Texture and dampness of the soils could make selecting a sample of sediments necessary. Bulk soil samples will be collected for flotation from around any hearths or evident floor structures encountered. Stratigraphic profiles and descriptions will be provided for all units and tests. Stratigraphic, sediment, and soil descriptions will follow national conventions established by the US Department of Agriculture Soil Survey (Soil Survey Division Staff 1993).

Recovered artifacts will be bagged in the field and each bag will be labeled with the following information: unit, level, depth below unit datum, date, excavator, contents, site number, field specimen and/or total station shot number (when applicable). Artifacts will be examined and described in the CRS’s or selected consultant’s labs and comparative analysis will be made to other collections at facilities such as University of Alaska Museum and the University of Alaska, Anchorage, Anthropology Laboratory. Metal, obsidian, and sediments will be analyzed using a portable X-ray florescence unit, as appropriate. All artifacts will be measured, described, and photographed using high-resolution digital cameras. Organic artifacts will be conserved using appropriate techniques prescribed following consultation with curatorial personnel. All artifacts and non-artifact samples collected will be accessioned to the appropriate curation facility. Cataloguing, processing and collections transfer will occur after the analysis and final reporting are complete (Curation Agreement, Exhibit A). Donlin will target completion of this work within one year to 18 months from the recovery of the artifacts.

Sampling methods for artifacts, charcoal and wood, plant macrofossils, fauna, and sediment will follow standard best practices in archaeology (Wooler et al. 2012). Samples will be collected separately and assigned specific field specimen numbers and proveniences. Sample locations will be plotted on excavation unit maps, and their 3-point position recorded using a total station to increase mapping accuracy. Samples recovered from excavation and test unit walls will be recorded on stratigraphic profiles. Bulk sediment samples may be collected for sieving through finer mesh and flotation in the laboratory to recover smaller artifact and non-artifact remains.

Radiocarbon dating and tephrochronology will be used to assess the age of occupations and potential contemporaneity of cultural features at the sites. Organic samples from features, and in tight associative context with cultural materials and deposits, will be collected for radiocarbon dating. Accelerator mass spectrometry radiocarbon is the preferred technique to date organic materials. Because much of the project area lies in a historically volcanic region, volcanic ash (tephras) falls can potentially be used as chronological markers to understand the general timing of occupations based on stratigraphic positioning to the tephras.

Digital photography will be used to record all phases of the project, from mapping and excavation through artifact analysis and documentation. All photographs taken in the field will be recorded in photograph logs that are later digitized.
6.4.2 Methods for Historic Sites with High Data-Recovery Potential

Two historic cabin sites were recommended as eligible for the NRHP (TYO-00215, and IDT-00260). Recommended mitigation methods for these historic sites are: data recovery (including testing and limited shallow excavation) following an approved research design; detailed site mapping; and artifact analysis. Excavation(s) for data recovery would in dimensions of either 3.3 ft x 3.3 ft or 3.3 ft x 6.6 ft (1 m x 1 m or 1 m x 2 m).

High-resolution topographic mapping using surveying instruments (type Leica TS-06 total station) will be used to generate a pre-disturbance map of each site. Semi-permanent primary site datum points will be established with rebar and capped and labeled with the site number and date. All subsequent intermediate datum points will be established in the same grid and coordinate system, and measured relative to the main site datum points. All features, tests, excavation units and in situ artifact point proveniences will be recorded with total station as well. Positional data collected at each site will be used to determine contextual relationships among artifacts and features. Distribution maps can potentially be used to ascertain possible uses of space within the excavated areas. Mapping and spatial distribution files will be compatible with ESRI GIS (Type ArcGIS).

Excavation units measuring either 3.3 ft x 3.3 ft (1 m x 1 m) or 3.3 ft x 6.6 ft (1 m x 2 m) will be placed based on visible surface features and knowledge of the site gained through previous testing. All units will be hand excavated using trowels and dustpans. Excavated sediments will be screened through a ¼-inch mesh screen, as possible. Bulk soil samples will be collected for flotation from within features and under cabin floors. Stratigraphic profiles and descriptions will be provided for all units and tests. Stratigraphic, sediment, and soil descriptions will follow national conventions established by the US Department of Agriculture Soil Survey (Soil Survey Division Staff 1993).

Recovered artifacts will be bagged in the field and all bags labeled with the following information: unit, level, depth below unit datum, date, excavator, contents, site number, field specimen and/or total station shot number (when applicable). Artifacts will be examined and described in the CSR’s or selected consultant’s lab and comparisons to other collections will be possible at facilities such as the University of Alaska Museum and the University of Alaska, Anchorage, Anthropology Laboratory. All artifacts will be measured, described, and photographed. Organic artifacts will be conserved using appropriate techniques, which will be followed after consultation with curatorial personnel.

After thorough documentation, common function and type mass-produced twentieth century artifacts will be reduced to a sample collection in the lab for later comparative study or museum display. Artifacts and non-artifact samples curated will be accessioned to the appropriate curation facility. Cataloguing, processing, and collections transfer will occur after the analysis and final reporting are complete (see Curation Agreement, Exhibit A).

Digital photography will be used to record all phases of the project, from mapping and excavation through artifact analysis and documentation. All photographs taken in the field will be recorded in photograph logs that are later digitized.

6.4.3 Lithic Scatters - Methods for Spatial and Laboratory Analysis

One eligible (IDT-00288) site comprises an extensive surface scatter of lithic materials. While small amounts of material were found in a subsurface context, the majority of material was exposed on
the surface and collected. Suggested mitigation strategies at this site are focused on spatial analysis of recovered materials and laboratory analysis of the artifacts themselves.

Contextual data derived from spatial relationships is among the most important sources of evidence for interpretations of ancient human behavior, social organization, site-formation processes, and the meaning of the archaeological record. The retrieval of archaeological information from various types of spatial relationships is thus a central aspect of the discipline. The distribution of, and relationships between artifacts, features, and other observable data have meaning in terms of activity areas, the organization of households, camps and larger settlements, and human use of landscapes (Banning 2000; Clark 1977). Deetz (1967) defined an archaeological site as a “spatial concentration of material evidence of human activity.” At a large scale, the IDT-00288 site – largely consisting of a surface flake scatter and other ephemeral remains – can be best understood by applying inter-site comparative analyses examining landscape variables such as altitude, aspect, local environment, surficial geology, distance to seasonal or perennial water sources, and distance to similar sites. Within the site, intrasite spatial patterning will be considered: spatial clustering (density patterning) and compositional patterning (Ferring 1984).

Laboratory analyses of the recovered lithic materials will consist of both macroscopic and microscopic inspection and description, to gain an understanding of their procurement, manufacture and use (cf. Andrefsky 1998). Results of laboratory and spatial analyses will be collated to provide contextual interpretation of the IDT-00288 site.

### 6.4.4 Sites Requiring Further Phase II Testing

One prehistoric site (SLT-00094) is in close proximity to the planned Jungjuk Port site. Further Phase II testing is recommended for the site to better ascertain and delineate the extent of site deposits. This testing may in effect constitute data recovery mitigation if it is determined by USACE, through consultation with SHPO and the Crooked Creek Traditional Council, that further data recovery is not necessary. SLT-00094 has already been the subject of a multi-season community archaeology project involving participation of local residents (Hays et al. 2012b; Rogers et al. n.d.), and continuation of this approach is proposed under Alternative Mitigation (Section 6.5).

### 6.5 Alternative Mitigation

The Section 106 mitigation phase presents unique opportunities to integrate traditional and cultural knowledge with western science and technology. DuVall (2014) notes the trend in cultural resource management toward alternative or creative mitigation approaches.

Section 106 does not “prescribe” any specific formula or recipe for mitigating adverse effects. Mitigation can (and does) involve a variety of alternative forms in addition to mitigation through data recovery, involving traditional archaeological research designs and scientific methods. Alternative mitigation treatments may include active preservation in place for future study, recovery or partial recovery of archaeological data, public interpretive display, collections return/repatriation, virtual (Web-based) reports and museum displays, development of educational curriculum packages, community archaeology projects, public lectures, or any similar or combination of these and other measures. Alternative or creative mitigation plans may be developed through consultation with consulting parties actively providing input on culturally appropriate and locally valued options.
The terms alternative, or “creative mitigation” are terms used in this plan simply within the context of having the ability to spot problems and devise appropriate solutions.

6.5.1 Iditarod National Historic Trail

Donlin Gold has proposed the following mitigation measures to address adverse effects to the INHT. Review, consideration, and acceptance of these measures is pending.

The following are creative mitigation measures associated with the construction and operation of the proposed natural gas pipeline, to mitigate adverse effects to the INHT:

- **Visual Documentation** – Donlin Gold will collect photo and video documentation using modern technology in a user-friendly format of the INHT scenic area during winter conditions from the Skwentna Crossing to Three-mile Creek, and at Egypt Mountain. The documentation will be compiled in a report and copies provided to the signatories to the PA and to the Iditarod National Historic Trail Alliance (INHTA).

- **Material Site MS-25** – During detailed construction planning, the need to develop Material Site 25 (MS-25) will be reevaluated. MS-25 may not be required and thus, not developed. If required, Donlin Gold will investigate means to minimize adverse effects by reducing the area of disturbance of the material site. If developed, MS-25 will be reclaimed by re-contouring the area to blend with the surrounding environment and methods would meet State of Alaska reclamation requirements. Visual barriers may also be installed, depending on the final configuration of the development at MS-25.

- **Communication and Coordination** – Donlin Gold will communicate through meetings, phone, and email and coordinate with INHT trail users (including the Iditarod Trail Committee and the Iron Dog) about pipeline construction plans and progress to enable free and safe passage at INHT/construction ROW crossings. Through its Public Outreach work, Donlin Gold will also provide information regarding pipeline construction and maintenance activities via its newsletters, webpage, and other social media.

Additional alternative mitigation measures to address adverse effects to the INHT are currently being proposed by Donlin Gold for review and consideration.

6.5.2 Angyaruaq SLT-00094

A Community Archaeology project conducted with Crooked Creek residents at SLT-0094 (the Angyaruaq site, see Section 6.6.2) resulted in scientific collections including a number of stone tools dating from roughly 2000 years ago. The most visually appealing artifacts include inset blades/arrow points, bi-points and bifaces manufactured from obsidian, chert and basalt. Donlin Gold will coordinate and fund the fabrication of 3 sets of lithic casts of select items. These three-dimensional artifact replicas can be used as part of teaching collections for scientific studies and/or as art objects for cultural displays. The following artifacts may be replicated:

- SLT-094-06-061 biface/end scraper
- SLT-094-06-059 biface (obsidian)
- SLT-094-10-027a inset blade/arrowpoint (obsidian)
• SLT-094-09-0299 knife blade fragment (black chert)
• SLT-09-0308 bipoint (basalt)

One set of replicas will be provided to Johnny John School in Crooked Creek for use as cultural and scientific teaching tools, and the other two sets will be provided to the land owners (TKC and Calista Corporation) for use in cultural collection displays.

6.6 Alternative Mitigative Activities Conducted to Date

Donlin Gold has been pro-active and accomplished certain activities to address potential project effects through three specific projects: Crooked Creek Repatriation, Angyaruaq Community Archaeology, and the James L. McPherson 1914 Kuskokwim Reconnaissance Historic Iditarod Trail Photo Mapping and Digitization Project. This work was conducted prior to the initiation of formal Section 106 consultation. Nevertheless, it was done in cooperation with several of the most directly affected communities and in collaboration with private landowners and the Crooked Creek Traditional Council. Although the projects were not codified in any specific 106 agreement (due to being completed early in project planning), they were done with the full knowledge and involvement of the SHPO, the relevant local community members and authorities, as well as the applicant. The information generated by these activities is available to use by consulting parties and agencies as more formal mitigation efforts proceed. These efforts are described here.

6.6.1 Crooked Creek Repatriation

During initial discussions regarding human remains protocols and other issues, Donlin Gold's contract archaeologist, Mr. Chris Wooley, asked if the Traditional Council had been contacted by any museums that may have collected any artifacts or human remains from their village. Smithsonian Physical Anthropologist Ales Hrdlicka's book, *Alaska Diary* (Hrdlicka 1943), referenced him taking remains of a single adult female from the Parent's Trading Post property at Crooked Creek (the family home site of Mrs. Thomas, a Crooked Creek resident). Repatriating the remains was an important community objective. In July 2007, discussions with Mrs. Thomas and former Donlin Gold representatives Mr. Nick Enos and Mr. Stan Foo resulted in a proposal to assist the Traditional Council's work with the Smithsonian Repatriation Office to get the remains repatriated. In March 2009, Mr. and Mrs. Thomas, accompanied by Mr. Wooley, travelled to Washington D.C. and returned to Alaska with the remains which were re-interred at Crooked Creek later that month. This process is documented in: *Return with a Sharing: Coming Home to the Kuskokwim* published in the Alaska Journal of Anthropology (Wooley and Thomas 2010).

6.6.2 Angyaruaq Community Archaeology

The community archaeology project at Angyaruaq, conducted by NLUR and Chumis with support from Donlin Gold, provided valuable initial mitigation (Hays et al. 2012). The fact that obsidian found at the site had originated many hundreds of miles away was discussed and the site and the ancestors' ability to flourish in the distant past became a topic of local pride. It became apparent that the site location was significant to the community of Crooked Creek because of its position between two traditional cultural sites: Uguohaydok Ridge and Angyaruaq (Canoe Mountain). These two landforms and their accompanying oral accounts speak to the origins of the local cultural groups. Local residents and the project staff integrated science, technology, and traditional knowledge as they investigated how ancient people lived 2,000 years ago. Interest in, and excitement about, investigating these and other aspects of the past at Angyaruaq has provided many tangible and intangible benefits to the community, the project, and the individuals involved.
The entire process of working with the Crooked Creek Tribal Council and landowners, requesting input on project activities, and hearing feedback on local concerns about cultural resources, has fostered an understanding of the broader ancient and contemporary cultural contexts of the site. Because of the recent cooperative effort in soliciting and exchanging information, much more is known today about the cultural and environmental context of Middle Kuskokwim River cultural resources.

Hrdlicka’s insensitive collecting of human remains set the wrong precedent for archaeologists working locally (Wooley and Thomas 2011). However, the Crooked Creek Tribal Council and area residents have asked their own questions about the past and have actively addressed the cultural aspects of human history in the area. The process of addressing scientific and oral historical questions about the origins of the people living at Angyaruaq over 2,000 years ago has formed a unique bond among the researchers and the community and has resulted in a trust relationship that will help facilitate cooperative, creative, and effective mitigation of any potential adverse effects of the Donlin Gold project on the Angyaruaq site.

Community archaeology combined science (with modern technological applications) and tradition (with cultural training and instruction from key Tribal members). This combined approach supports the goals of professional archaeologists to understand and preserve the past. In addition, the combined science/tradition approach helps tribal hosts/neighbors to become familiar with environmental science, and increases cultural pride by knowing more about their cultural heritage.

6.6.3 James L. McPherson 1914 Kuskokwim Reconnaissance Historic Iditarod Trail Photo Mapping and Digitization

As a result of archival research supplemental to the gas pipeline corridor field surveys, Mr. Josh Reuther (Northern Land Use Research Alaska, LLC [NLURA]) identified an unpublished collection of Iditarod Trail-related historic photographs at the University of Washington Allen Library Special Collections. In collaboration with the University of Washington, NLURA, and Chumis Cultural Resource Services, Donlin Gold funded research and digitization of the collection associated with the 1914 Kuskokwim Reconnaissance conducted by James L. McPherson for the Alaska Engineering Commission. This material was presented to the Iditarod Historic Trail Alliance and BLM and is available online at:


This effort has resulted in the wider availability of this important historical data for use by the public and particularly by trail history enthusiasts.

6.7 Final Disposition of Recovered Archaeological Materials

Archaeological materials (artifacts, faunal materials, and/or samples) collected during any project phase are the property of the appropriate state or federal land managing agency, or private landowner. Federal and state agencies are bound by a requirement that the collection for which they are responsible only go to facilities that meet the curation guidelines of the Secretary of the Interior’s guidelines for Archaeological Curation in 36 CFR 79. Although Donlin Gold encourages the curation for all archaeological materials, private landowners are not bound by these requirements and are free to choose alternative methods of final disposition. As applicable, Donlin Gold will consult with private land owners with regards to the final disposition of recovered archaeological materials. Curation agreements are included in Appendix A and would be finalized at least six months prior to commencement of construction. Curation may also be used as an
interim repository of archeological materials prior to the selection of alternative disposition methods by the private landowner.

6.7.1 Curation

The University of Alaska Museum of the North meets the federal guidelines for archaeological curation, and is the chosen curation facility for both federal and state agencies. Long-term curation arrangements are being worked out in consultation with private landowners (Exhibit A, Curation Agreement).

6.7.2 Alternative Disposition Methods

Possible alternative disposition methods for archaeological materials may include:

- Re-interment – Archaeological materials may be reinterred at the location found. This option may not be practical for improved or construction sites.

- Return - Archaeological materials may be returned/handed to the landowner for their safekeeping, or other.

- Alternative Repository – Archaeological materials may be permanently deposited at a facility that does not meet the federal guidelines of Archaeological Curation. Examples include:
  - Yupiit Piciryarait Cultural Center and Museum, Bethel.
  - School or village display cases.
7.0 UNANTICIPATED DISCOVERIES

If an unanticipated discovery of potential cultural materials is made, Donlin Gold shall stop work in the immediate vicinity of the discovery and proceed in a manner consistent with this plan.

- **Stop Work**: Ensure construction activities that may affect the resource will cease without delay; work that does not affect the resource may continue. The CRS will be notified of the potential discovery of cultural materials.

- **Site Protection**: Protect the discovery site against further disturbance pending the following actions.

- **Initial Evaluation**: The CRS will complete an initial evaluation of the discovery and evaluate if the finding is indeed a cultural resource. If the finding is not a cultural resource, construction activities at the site will be allowed to resume.

- **Initial Communication**: The CRS will notify the USACE, the SHPO, and appropriate landowner(s) (parties) of the discovery within 24 hours, in accordance to Table 7-1 and Table 7-2. The initial notification of unanticipated discoveries should include available information regarding the nature and extent of the cultural materials and the site coordinates. The CRS will coordinate contact with local Tribal representatives, as available, when archaeological resources or human remains have been, or are anticipated to be, discovered (See also Section 6.3).

- **Site Evaluation and Follow up Communication**: The CRS will evaluate the find, assess its potential significance (eligibility for the National Register of Historic Places), and notify the parties as to the nature and potential significance of the discovery within 72 hours.

- **Consultation and USACE Determination**: The parties shall consult, by telephone or other means, on the nature and potential significance of the discovery and whether any additional investigation is warranted. A decision shall be provided to Donlin Gold no later than within two (2) working days following consultation.
  
  - If the USACE determines, in consultation with the SHPO and the landowner, that the discovery is not significant (not eligible for the NRHP) and the SHPO concurs, verbal authorization to proceed may be given by the USACE. USACE shall provide written authorization to Donlin within 48 hours.

  - If the USACE determines that additional investigation is warranted, the parties will continue to consult to determine an appropriate level of effort to determine the NRHP-eligibility (significance) of the discovery. If the discovery is determined to be significant, the parties will determine whether effects upon it may be avoided or minimized sufficiently to not adversely affect the historic property. If effects may not be avoided or minimized, the parties will determine acceptable mitigation to offset the adverse effects anticipated, considering the nature and extent of the discovery.

---

3 This section will be revised (expanded or contracted) according to treatment of the topic in the PA.
Cultural Resources Management Plan
Donlin Gold Project

historic property. A decision shall be provided to Donlin Gold no later than within two (2) working days following consultation.

Table 7-1: Contacts to Notify in Event of Confirmed Find

<table>
<thead>
<tr>
<th>Land Owner</th>
<th>USACE</th>
<th>BL M</th>
<th>OHA/SHP O</th>
<th>Calista</th>
<th>CIR</th>
<th>TKC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal</td>
<td>(I)</td>
<td>(I)</td>
<td>(I)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State of Alaska</td>
<td>(I)</td>
<td></td>
<td>(I)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calista</td>
<td>(I)</td>
<td>(I)</td>
<td>(I)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CIRI</td>
<td>(I)</td>
<td></td>
<td>(I)</td>
<td></td>
<td>(I)</td>
<td></td>
</tr>
<tr>
<td>TKC (surface)/Calista (subsurface)</td>
<td>(I)</td>
<td>(I)</td>
<td></td>
<td></td>
<td></td>
<td>(I)</td>
</tr>
</tbody>
</table>

(I) = Immediate report, as soon as knowledge of the potential discovery is made.
## Table 7-2: Contact Information

<table>
<thead>
<tr>
<th>Land Owner</th>
<th>Point of Contact</th>
<th>Mailing Address</th>
<th>Phone (Main)</th>
<th>Phone (Direct)</th>
<th>Phone (Mobile)</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>USACE</strong></td>
<td>Primary</td>
<td>Jamie Hyslop</td>
<td>Regulatory Division Alaska District</td>
<td>907-753-2768</td>
<td>907-753-2670</td>
<td><a href="mailto:Jamie.R.Hyslop@usace.army.mil">Jamie.R.Hyslop@usace.army.mil</a></td>
</tr>
<tr>
<td></td>
<td>Alternate</td>
<td>BLM Anchorage Field Office Archaeologist</td>
<td>4700 BLM Road Anchorage, AK 99507</td>
<td>907-267-1246</td>
<td>907-267-1341</td>
<td><a href="mailto:jblanchard@blm.gov">jblanchard@blm.gov</a></td>
</tr>
<tr>
<td><strong>BLM</strong></td>
<td>Primary</td>
<td>BLM Anchorage Field Office Archaeologist</td>
<td>4700 BLM Road Anchorage, AK 99507</td>
<td>907-267-1246</td>
<td>907-267-1341</td>
<td><a href="mailto:jblanchard@blm.gov">jblanchard@blm.gov</a></td>
</tr>
<tr>
<td></td>
<td>Alternate</td>
<td>BLM Anchorage Field Office Archaeologist</td>
<td>4700 BLM Road Anchorage, AK 99507</td>
<td>907-267-1246</td>
<td>907-267-1341</td>
<td><a href="mailto:jblanchard@blm.gov">jblanchard@blm.gov</a></td>
</tr>
<tr>
<td><strong>State of Alaska</strong></td>
<td>Primary</td>
<td>Judy Bittner</td>
<td>550 West 7th Avenue Suite 1310 Anchorage, AK 99501</td>
<td>907-269-8721</td>
<td>907-269-8715</td>
<td><a href="mailto:Judy.bittner@alaska.gov">Judy.bittner@alaska.gov</a></td>
</tr>
<tr>
<td></td>
<td>Alternate</td>
<td>Richard VanderHoek</td>
<td>550 West 7th Avenue Suite 1310 Anchorage, AK 99501</td>
<td>907-269-8721</td>
<td>907-269-8728</td>
<td><a href="mailto:Richard.vanderhoek@alaska.gov">Richard.vanderhoek@alaska.gov</a></td>
</tr>
<tr>
<td><strong>Calista</strong></td>
<td>Primary</td>
<td>Vice President of Lands</td>
<td>5015 Business Park Blvd Suite 3000 Anchorage, AK 99503</td>
<td>907-275-2800</td>
<td>907-275-2800</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alternate</td>
<td>Calista</td>
<td>5015 Business Park Blvd Suite 3000 Anchorage, AK 99503</td>
<td>907-275-2800</td>
<td>907-275-2800</td>
<td></td>
</tr>
<tr>
<td><strong>CIRI</strong></td>
<td>Primary</td>
<td>Vice President of Lands</td>
<td>725 E. Fireweed Lane Suite 800 Anchorage, AK 99503</td>
<td>907-274-8638</td>
<td>907-274-8638</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alternate</td>
<td>CIRI</td>
<td>725 E. Fireweed Lane Suite 800 Anchorage, AK 99503</td>
<td>907-274-8638</td>
<td>907-274-8638</td>
<td></td>
</tr>
<tr>
<td><strong>TKC</strong></td>
<td>Primary</td>
<td>Vice President of Corporate Affairs</td>
<td>4300 B Street Suite 207 Anchorage, AK 99503</td>
<td>907-243-2944</td>
<td>907-243-2944</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alternate</td>
<td>TKC</td>
<td>4300 B Street Suite 207 Anchorage, AK 99503</td>
<td>907-243-2944</td>
<td>907-243-2944</td>
<td></td>
</tr>
</tbody>
</table>
7.1 Human Remains Plan of Action

- Prior to project ground-disturbing activities, all project personnel will receive appropriate training that includes guidance on proper reporting of inadvertent discovery of human remains.

- If human remains are found during any phase of project-related work, as soon as safe to do so, work will cease in their immediate vicinity and a 100-ft buffer zone will be flagged or fenced off to protect the remains. Donlin Gold’s CRS, agencies, land owners, and tribal entities will be immediately notified as per Table 7-3 and as required in Article IX of the PA.

- The CRS will notify a peace officer (AST, Missing Persons Bureau) and the Alaska SME immediately after the discovery, as stipulated in AS 12.65.005. If the remains appear to be recent (less than 50 years old) in the judgment of the CRS, the Trooper and Medical Examiner will determine whether the remains are of a forensic nature and/or subject to criminal investigation. The local Village Public Safety Officer (VPSO) may also be notified.

- The Alaska SHPO will also be notified of any discovery unless circumstances indicate that the death or burial is less than 50 years old and that there is a need for a criminal investigation or legal inquiry by the coroner.

- If the human remains are found to be historic in nature, a qualified professional physical anthropologist with experience in the analysis of human remains will examine them to determine racial identity. The physical anthropologist shall document, analyze, and photograph the remains so that an independent assessment of racial identity can be made. The physical anthropologist shall be afforded no more than 30 days to conduct his or her analysis.

- For human remains and/or associated Native American cultural items on federal lands, this plan of action will include consultation with the appropriate tribe as mandated by 43 CFR 10.5. Consultation will facilitate proposed treatment of the human remains and determine who is entitled to custody of the human remains and other cultural items under NAGPRA so that the disposition process can be completed.

- If the unanticipated discovery consists of Native Alaskan human remains, Donlin Gold will consult with the Alaska SHPO, USACE, BLM, and appropriate Alaska Native organizations regarding measures to respectfully handle such a discovery. If it can be adequately determined that the identified human remains have affinity to any federally recognized Tribe(s), a reasonable effort will be made to identify, locate, and notify the Tribe. The appropriate Alaska Native regional corporations also will be contacted.

- If the human remains are not Native Alaskan, and a determination has been made by the Trooper and Medical Examiner that a death investigation is not warranted, Donlin Gold, in consultation with the medical examiner, will attempt to identify, locate and inform descendants of the deceased.

- Protocols on avoidance, minimization, or removal/recovery/relocation of remains will be determined in consultation with parties listed in Table 7-3 and relevant tribal entities.
• Written authorization in the form of a Burial Transit Permit from the Alaska Health Analytics & Vital Records (formerly the Bureau of Vital Statistics) shall be obtained prior to any excavation or re-interment of any human remains. In addition, clearance from the appropriate Native organization must be obtained prior to excavation or re-interment.

• After permission to resume project activities in the area has been issued by the USACE and SHPO, Donlin Gold will resume project activities

### Table 7-3: Contact to Notify in Event of Human Remains Discovery

<table>
<thead>
<tr>
<th>Land Owner</th>
<th>AST, Missing Persons Bureau/SME</th>
<th>USACE</th>
<th>BLM</th>
<th>OHA/SHPO</th>
<th>Calista</th>
<th>CIRI</th>
<th>TKC</th>
<th>VPSO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal</td>
<td>(I)</td>
<td>(I)</td>
<td>(I)</td>
<td>(II)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State of Alaska</td>
<td>(I)</td>
<td>(I)</td>
<td>(I)</td>
<td>(II)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calista</td>
<td>(I)</td>
<td>(I)</td>
<td>(I)</td>
<td>(II)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CIRI</td>
<td>(I)</td>
<td>(I)</td>
<td>(I)</td>
<td>(II)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TKC(surface)/Calista</td>
<td>(I)</td>
<td>(I)</td>
<td>(I)</td>
<td>(II)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(I) = Immediate report, as soon as knowledge of the discovery of potential discovery is made.

(II) = Contacting the VSPO is recommended if the human remains are suspected or known to be <50 yrs.

**CONTACT INFORMATION FOR STATE OFFICIALS INVOLVED WITH HUMAN REMAINS ISSUES IN ALASKA**

*Denotes suggested contact person in list below.

**Alaska State Troopers, Missing Persons Clearinghouse:**
Phone: (907) 269-5038
Fax: (907) 337-2059
Lt. Paul Fussey
Phone: (907) 269-5682
Email: paul.fussey@alaska.gov
*Malia Miller
Phone: (907) 269-5038
Email: malia.miller@alaska.gov

*After contact by phone, send email with relevant information and photos to Lt. Fussey and Malia Miller.

**Alaska State Medical Examiner’s Office:**
* Reporting Hotline ( Death Hotline) to speak with on-duty investigator.
Phone: (907) 334-2356
1-888-332-3273 (Outside Anchorage)
Stephen Hoage, Operations Administration
Phone: (907) 334-2202
Fax: (907) 334-2216
Email: stephen.hoage@alaska.gov
Dr. Gary Zientek, Chief Medical Examiner
Phone: (907) 334-2200
Fax: (907) 334-2216
Email: gary.zientek@alaska.gov

**Alaska Office of History and Archaeology (State Historic Preservation Office):**
Office Phone: (907) 269-8700
*State Archaeologist
7.2 Plan for Unanticipated Discovery of Paleontological Resources

Donlin Gold has developed this plan to establish procedures in the event that previously unreported and unanticipated paleontological resources are found by project personnel. Prior to ground-disturbing activities, project personnel will receive environmental training including guidance on identifying potential paleontological resources. Paleontological resources include (but are not limited to): fossils of terrestrial plants (macrofossils), brachiopods, gastropods, trilobites, corals, conodonts, graptolites, marine bivalves and other marine invertebrate fossils, terrestrial vertebrates, and tracks.

The proposed project includes various areas that are known or have the potential to contain paleontological resources. Paleontological resources could be expected in the form of fossils in bedrock as well as buried Pleistocene-age mammals such as mammoths and mastodons. Geologic formations containing vertebrate fossils are considered to be the most significant. Vertebrate fossils tend to be rare and fragmentary, and thus have greater scientific importance than the more common invertebrate and plant fossils. Both federal and state laws mandate the protection of significant paleontological resources on federally and state-owned lands. The following procedures will be followed if paleontological resources are encountered.

- Work will be immediately stopped if significant paleontological resources are discovered to protect the integrity of the find.
  - Significant Paleontological Resources are fossils and fossiliferous deposits, consisting of identifiable vertebrate fossils, large or small, uncommon invertebrate, plant, and trace fossils, and other data that provide taphonomic, taxonomic, phylogenetic, paleoecologic, stratigraphic, and/or biochronologic information. Paleontological resources are considered to be older than recorded human history and/or older than middle Holocene (i.e., older than about 5,000 radiocarbon years) (SVP 2010)

- Donlin Gold’s Environmental Department will be immediately notified. The notification should include a detailed description of the nature and extent of the paleontological resources and an accurate and precise location including GPS coordinates.

- A representative from Donlin Gold’s Environmental Department will confirm the presence of paleontological resources. The finding will be documented with the following information: photographs, brief written description, exact location information, depth and apparent thickness of the stratum, local topography, and other pertinent conditions.

- Donlin Gold’s Environmental Department will contact a qualified paleontologist (Paleontological Consultant) who will coordinate Donlin Gold’s response to the find with the appropriate agency, landowner, or tribal entity as listed in Table 7-4.
Table 7-4: Contact List for Immediate Notification of Paleontological Resources Find

<table>
<thead>
<tr>
<th>Land Owner</th>
<th>USACE</th>
<th>BLM</th>
<th>State of Alaska</th>
<th>Calista</th>
<th>CIRI</th>
<th>TKC(surface)/Calista (subsurface)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal</td>
<td>(I)</td>
<td>(I)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State of Alaska</td>
<td>(I)</td>
<td></td>
<td>(I)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calista</td>
<td>(I)</td>
<td></td>
<td></td>
<td>(I)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CIRI</td>
<td>(I)</td>
<td></td>
<td></td>
<td></td>
<td>(I)</td>
<td></td>
</tr>
<tr>
<td>TKC(surface)/Calista (subsurface)</td>
<td>(I)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(I)</td>
</tr>
</tbody>
</table>

(I) = Immediate report, as soon as knowledge of the discovery of potential discovery is made.

- The Paleontological Consultant will immediately notify Donlin Gold’s Environmental Department by telephone regarding the preliminary significance of the find.

- If the find has the potential to be significant, and continuing work may damage more of the find, then Donlin Gold’s Paleontological Consultant will request recommendations from the appropriate parties regarding appropriate measures for site treatment. These measures may include:
  - Visits to the site by the appropriate federal land managing agency, SHPO, and other parties
  - Assessment of the find by a paleontologist for extent and significance
  - Preparation of a mitigation plan by Donlin Gold for approval by the appropriate federal land managing agency or SHPO
  - Implementation of the mitigation plan
  - Approval to resume work following completion of the fieldwork component of the mitigation plan.

- Once proper documentation and clearance has been obtained from the appropriate managing agency, Donlin Gold will resume operations.
8.0 REFERENCES


DuVall, Shina, 2014. Creative mitigation outcomes when an undertaking results in effects to historic properties under Section 106 in community-based archaeological heritage management - exploring pathways for effective collaboration symposium. Presentation to the 41st Alaska Anthropological Association Meetings, Fairbanks.


Hays, Justin M., Kris Farmen, Joshua D. Reuther, 2011. Site evaluations of known cultural resources within the proposed Donlin Creek Mine Area. Report submitted to Donlin Creek
Cultural Resources Management Plan
Donlin Gold Project


Reuther, Joshua D., Chris Wooley, Carol Gelvin-Reymiller, Justin M. Hays, Kris Farmen, Patrick T. Hall and Gayle Neufeld, 2011. Results of the 2010 phase I cultural resources survey of the proposed Donlin Creek Natural Gas Pipeline Project. Report submitted to Donlin Creek
Cultural Resources Management Plan
Donlin Gold Project

LLC, Anchorage, by Northern Land Use Research, Inc., Fairbanks, and Chumis Cultural Resources Services, Anchorage.


Rogers, Jason S., Joshua D. Reuther, Christopher B. Wooley, Justin M. Hays, Carol Gelvin-Reymiller, Robert C. Bowman, and Jill Baxter-McIntosh, n.d. Cultural Mixing and Environmental Change in Mid- to Late Holocene Western Alaska: A Case Study from the Middle Kuskokwim River.


Society of Vertebrate Paleontology (SVP), 2010. Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources.


Exhibit A – Curation Agreement(s)
The Kuskokwim Corporation (TKC) and Calista Corporation (Calista) understand that with development on Donlin leased lands defined under the Surface Use Agreement (SUA 2006), archaeological materials may be discovered during the normal course of operations. As private landowners, TKC and Calista are not bound by the same regulations as Federal and State agencies under the Secretary of the Interior’s guidelines, and understand that Donlin Gold LLC (Donlin Gold) needs direction from TKC and Calista in the event of an archaeological discovery. The intent of this document is to outline a process if archaeological materials are found during the normal course of work on TKC or Calista lands, in a manner that maximizes cultural protections as well as minimizes disruption to operations during development of the Donlin Gold Mine Project (Project).

1. TKC and Calista request and will provide in a timely manner a local native shareholder resource trained in identifying native cultural archaeological materials assist with site evaluation and accompany Donlin Gold’s archaeologist when archaeological materials (Materials) are discovered. This resource will have Traditional Knowledge of the area as well as cultural training.

2. TKC and Calista require that all items which have cultural significance will be curated at Museum of the North in Fairbanks, AK, an accredited repository.

3. Calista and TKC will sign a Memorandum of Agreement (MOA) with the Museum of the North establishing a curational partnership. The MOA will outline the details of responsibility for:
   a. Accession
   b. Cataloging
   c. Numbering
   d. Packaging
   e. Documentation
   f. Delivery
   g. Letter of Review

4. After the Materials have been curated, TKC or Calista or both, may request Materials for display with an approved plan outlining procedures, location, timeline, and process of care for displaying the Materials. TKC and Calista will work cooperatively to establish such plan.

5. A Traditional Council or Tribe in the TKC or Calista region may request from TKC and/or Calista, Material(s) to display with a Traditional Council or Tribe approved plan outlining procedures, location, timeline, and process of care for displaying the Material(s). This request will be approved by a management team (Management Team) comprised of one member from TKC and one member from Calista. A policy for evaluation will be approved by the TKC and Calista Board of Directors, as necessary.

6. At the discretion of TKC and Calista, a digitally printed replica of the Materials may be more appropriate for display. These guidelines will also be incorporated into policy by the TKC and Calista Board of Directors, as necessary, and executed by management.

7. Exceptional circumstances for Reinternment or Return of Archeological materials can be considered by the TKC and Calista Board of Directors, as necessary, with a written request if ownership is identified other than TKC or Calista.
8. Donlin Gold will pay all reasonable fees associated with the curation, as well as any digital printing replication of any artifacts.

9. Human Remains- if human remains are discovered, TKC and Calista will be immediately notified by Donlin Gold and a stop work order will immediately commence. With written prior approval from TKC and Calista, Donlin Gold will continue and follow The Native American Graves Protection and Repatriation Act (NAGPRA) guidelines. TKC and Calista will be at all consultation meetings and planning and have final say for the appropriate action of treatment of any human remains and determination of custody. Final actions must be approved by the TKC Board of Directors after consultation with the appropriate Tribe or Traditional Council. Possible outcomes are reinternment, or return, or an alternative repository.

All actions must be done in a timely manner to minimize disturbance to Project operations.

Attachment A: MOA between TKC, Calista, and Museum of the North

MAVER CAREY ___________________________ Date
President/CEO
The Kuskokwim Corporation

ROSIE BARR ___________________________ Date
VP Lands and Natural Resources
Calista Corporation

ANDY COLE ___________________________ Date
General Manager
Donlin Gold LLC
MEMORANDUM OF AGREEMENT

THIS MEMORANDUM OF AGREEMENT (“MOA”) is hereby made effective as of the ______ day of ____________, 20___, and entered into by and between the University of Alaska Museum of the North (“AMN”); the “Collection Owners” which include The Kuskokwim Corporation (“TKC”) and Calista Corporation (“Calista”); and Donlin Gold, LLC (“Donlin Gold”).

I. PURPOSE
   a. This MOA provides procedures for effective museum curation and storage of Cultural Material collected or excavated by Donlin Gold’s cultural resource consultants on lands owned by TKC and/or Calista.

II. DEFINITIONS
   a. “Cultural Material:” Historic or prehistoric remains of human activity as reflected in ruins, structures, objects, and artifacts; other remains found in archaeological context; and object or samples of contemporary esoteric value. This definition does not include actual human remains (e.g., human bones or teeth).

   b. “Accession:” An accession is a collection acquired from one source (site) at one time and can be comprised of one or many specimens. To accession is the formal process of accepting a new acquisition into the collections. A collection is not accessioned until it is physically deposited in the museum. When a collection is accessioned, the museum assumes a commitment to ensure the safe storage and availability for study and exhibition of that collection, in perpetuity or to the extent allowed by an agreement.

   c. “Cataloging:” The preparation of Cultural Materials for record by means of assigning each specimen, or collective “lot” of specimens or samples (e.g. charcoal, soil, wood, etc.), a unique catalog number assigned by the museum, and recorded in a corresponding database, each catalog number followed by a record of the appropriate contextual data associated with each specimen, or collective “lot” of specimens or samples, as recorded by the collector. At a minimum, this will contain the site name, date of acquisition, collector’s name, excavation unit, United States Geological Survey (“USGS”) quadrangle map with site designation, Alaska Heritage Resources Survey (“AHRS”) number, and any other available provenience information.

   d. AMN is a permanent repository that meets federal guidelines as outlined in the Secretary of the Interior’s guidelines for Archaeological Curation in 36 CFR 79. Federal agencies are bound by a requirement that the collection for which they are responsible only go to facilities that meet these guidelines. AMN possesses all of the following qualifications:
i. Ability to undertake responsible management of archaeological materials.

ii. A professional staff trained in museology, museum studies, anthropology, archaeology, and collections management.

iii. Capacity and willingness to protect archaeological materials from environmental damage, fire damage, theft, or loss through incompetent management or neglect.

iv. Adequate funding sources available.

v. Safe, secure, environmentally controlled facility.

III. TERMS

The Collection Owners and AMN mutually agree to promote a unified approach to issues relating to preservation and protection of Cultural Materials and agree to the following procedures, terms, and conditions:

a. AMN agrees to act as repository for the Cultural Materials recovered on TKC and Calista lands and to provide proper space, facilities and personnel for curation, storage, and maintenance of the material until such time as the Collection Owners request in writing a transfer of the collection to another repository or location. The Cultural Materials will be known as the TKC/Calista Collection.

b. Approximately 10 ft³ of existing collections will be accessioned by the AMN (10 boxes measuring 1 cubic foot each). These collections are from different archaeological sites located on lands owned by TKC and Calista.

c. Donlin Gold assumes responsibility to pay for cataloging all recovered Cultural Materials in the TKC/Calista Collection in accordance with the Curation Guidelines of the Archaeology Department at AMN. All cataloging will be completed before depositing Cultural Materials in AMN.

d. Donlin Gold will retain all Cultural Materials collected until all necessary analyses and cataloging are complete.

e. Staff at AMN will promptly notify the Collection Owners if items in the TKC/Calista Collection show signs of deterioration. AMN staff will not alter, clean, consolidate, or treat with chemicals any TKC/Calista Collection objects without the prior written notification of the Collection Owners. It is understood that some items may have already been so treated or cleaned prior to being deposited at AMN.

f. Upon approval of the Collection Owners, AMN agrees to make the TKC/Calista Collection available for scientific study, teaching, and public observation. With final written approval from the Collection Owners, AMN will review and approve or deny requests from third parties for...
access to or short-term loan of the TKC/Calista Collection (or a part thereof) for scientific, exhibit, or educational purposes. If requests arise for artifacts from the TKC/Calista Collection to be placed on loan, or significant consumptive uses of the collections (or a part thereof), AMN will promptly refer these requests to the Collection Owners for approval or denial. Significant intentional destruction is the consumptive use of 10 or more specimens for research purposes such as radiocarbon dating, isotope, residue, or DNA analyses. This testing is typically restricted to pieces of burnt wood or animal bones. Significant intentional destruction can also refer to less than 10 specimens if it is a one-of-a-kind, unique, or rare specimen that is requested for destructive analysis. The Collection Owners agree that AMN has certain non-exclusive rights for non-commercial purposes (educational/scholarly) and that part of normal and necessary professional curation may include photography of items from the TKC/Calista Collection or for the purposes of insurance, catalogs, collections management and/or public events or brochures.

g. AMN assumes no responsibility for Cultural Materials collected on TKC or Calista lands that have not been physically deposited in AMN or have been removed from AMN by the Collection Owners or their authorized representative.

h. All human remains (e.g. human bones or teeth), should any exist in the TKC/Calista Collection, are the responsibility of the Collection Owners and will not be curated at AMN unless mutually agreed by both TKC and Calista.

i. All records related to the TKC/Calista Collection will be deposited at the AMN at the same time as the TKC/Calista Collection. These records will include (but not be limited to) catalog ledgers and copies of all reports, papers, field notes, profiles, photographic negatives or transparencies and digital files. Catalogs will be provided as hardcopy and as Microsoft Excel computer files.

j. The Collection Owners and the AMN recognize that storage facilities and personnel support will be required to house and organize the TKC/Calista Collection following deposit at AMN. Donlin Gold will provide the published deposit fee (currently $575 per box) in support of curation and other costs associated with housing and organizing the approximately 10 ft³ of collections.

k. The Curator of Archaeology and the Collection Owners will periodically review this MOA and make necessary adjustments. The procedures, terms, and conditions of this MOA may be modified at any time by joint consent of all parties.
1. The term of this MOA shall be from _____________, 2017 until ________________, 20__. Any party may terminate this MOA at any time by giving written notice to all other parties not less than 180 days in advance of the effective date of termination.

m. In the event that this MOA is terminated by any party, the cost of packing and shipping the TKC/Calista Collection that has been collected up to that date will be paid for and arranged by Donlin Gold.

n. TKC and Calista asserts that they are the legal owner/steward of the TKC/Calista Collection described in this MOA.

The Collection Owners agree to hold AMN harmless for any loss or damage to the TKC/Calista Collection.

/s/ JOSH REUTHER Date
Curator of Archaeology
University of Alaska Museum of the North

/s/ MAVER CAREY Date
President/CEO
The Kuskokwim Corporation

/s/ ALDONA JONAITIS Date
Interim Director
University of Alaska Museum of the North

/s/ ROSIE BARR Date
VP Lands and Natural Resources
Calista Corporation

/s/ ANDY COLE Date
General Manager
Donlin Gold LLC
Exhibit B – Potential Fossil Localities on Federal Lands
Figure B-1: View of the proposed Donlin Gold Mine Area and associated infrastructure and natural gas pipeline route, showing Probable Fossil Yield Classification (PFYC) values for fossil-bearing rocks in the area in the Iditarod and Sleetmute quadrangles. The star indicates the 1982 fossil collection site of marine bivalves (PFYC Class 2; Elder and Miller 1991).
Exhibit C – Potential Monitoring Areas
HIGH POTENTIAL AREA
FOR UNANTICIPATED
DISCOVERIES

DONLIN GOLD PROJECT
HIGH POTENTIAL AREA FOR UNANTICIPATED DISCOVERIES

DONLIN GOLD PROJECT

Milepost (MP-)
Donlin Archaeological Predictive Model
Project Footprint
High Potential Areas

SCALE:

0 1 2 4 mi
0 1.5 3 6 km

FIGURE: 4

DG: PER0574_D.mxd, 09/29/17, R00

Service Layer Credits: Copyright © 2013 National Geographic Society, i-cubed
HIGH POTENTIAL AREA
FOR UNANTICIPATED
DISCOVERIES

DONLIN GOLD PROJECT

SCALE:

0  1  2  3  4 mi
0  1.5  3  6 km

Legend:

- Milepost (MP-)
- Project Footprint
- Donlin Archaeological Predictive Model
- High Potential Areas

FIGURE: 5

DONLIN GOLD PROJECT

Service Layer Credits: Copyright © 2013 National Geographic Society, i-cubed

KDG: PER0574_E.mxd, 09/29/17, R00
HIGH POTENTIAL AREA FOR UNANTICIPATED DISCOVERIES

DONLIN GOLD PROJECT

SCALE:

0  1  2  4
0  1.5  3  6 km

FIGURE: 6
HIGH POTENTIAL AREA FOR UNANTICIPATED DISCOVERIES

DONLIN GOLD PROJECT

FIGURE: 7

SCALE:
0  1  2  3  4 mi
0  1.5  3  6 km

DONLIN ARCHAEOLOGICAL PREDICTIVE MODEL
Project Footprint
High Potential Areas

Milepost (MP-)

Kitna Layer Credits: Copyright © 2013 National Geographic Society, i-cubed
HIGH POTENTIAL AREA FOR UNANTICIPATED DISCOVERIES

DONLIN GOLD PROJECT
Exhibit D – Monitoring Plan
Exhibit E – September 25, 2017 Meeting Summary
MEETING SUMMARY

METHODS TO AVOID OR MINIMIZE EFFECTS TO IDITAROD NATIONAL HISTORIC TRAIL

Donlin Gold Project

September 25, 2017

4720 Business Park Blvd., Suite G-25
Anchorage, Alaska 99503
INTRODUCTION

Donlin Gold\(^1\) met on September 25, 2017 with board members of the Iditarod Historic Trail Alliance (IHTA)\(^2\), Alaska Department of Natural Resources – State Historic Preservation Office (ADNR-SHPO)\(^3\), and the Bureau of Land Management (BLM) Iditarod National Historic Trail (INHT) Administrator\(^4\) personnel. This document captures and reinforces the information presented and discussed at the meeting.

The purpose of the meeting was to review and discuss potential adverse effects to the INHT as a result of the proposed construction of the Donlin Gold Natural Gas Pipeline (pipeline). The objectives of the meeting were to inform participants of the details of Donlin Gold’s proposed pipeline facilities and location with respect to the INHT right-of-way (ROW), and to brainstorm ideas to further minimize or mitigate potential adverse effects. During the meeting, Donlin Gold personnel discussed measures proposed to date to avoid impacts to the INHT, with emphasis on the “North Route Option.”

Information presented included spatial data of the proposed pipeline construction infrastructure disturbance limits and the State-surveyed INHT ROW limits displayed on top of high-resolution aerial photography, using ESRI\(^5\) ArcGIS digital mapping software and a screen display.

The meeting provided a venue for new or enhanced understanding by participants about:

- the reduced number of pipeline ROW and INHT ROW crossings proposed with the North Route Option (reduced to four crossings)
- elimination of co-located trail and pipeline routing
- proximity of proposed facilities and markers to the INHT
- an understanding of the environmental setting at each crossing.

Participants had the opportunity to ask questions about pipeline construction, design, and maintenance and discuss potential and perceived adverse effects and potential avoidance or minimization through planning, design, construction practices, and communication.

CROSSINGS OF PROPOSED PIPELINE AND INHT ROW

The currently proposed pipeline route shares the landscape with the INHT through the Alaska Range passage in two general areas:

1) An area separated from, but parallel to, the trail roughly between the INHT Skwentna River crossing and the Threemile Creek valley (Crossings #1, #2, and #3) (Figure 1)

---

1 Dan Graham, Enric Fernandez, and Kurt Parkan
2 Mark Nordman and Erin McLarnon
3 Judy Bittner, Richard VanderHoek, and Mark Rollins
4 Kevin Keeler
2) An area perpendicular to the trail on the north side of the Alaska Range, where the South Fork Kuskokwim River leaves the Alaska Range, near Egypt Mountain (Crossing #4) (Figure 1). The Iditarod National Historic Trail Comprehensive Management Plan describes the importance of the visual and perceptual aspects of these INHT segments and assigned them a “Class A” scenic quality category, because these areas “combine the most outstanding characteristics of each rating factor.” In general, the Class A category includes landscape characteristics that result in the high quality of the natural views from the INHT.

ADVERSE EFFECTS TO THE INHT

The construction of the proposed pipeline will result in landform and vegetation modifications, and introduction of pipeline components and signage, that will cause adverse effects to the INHT. The majority of these effects will be visual. The key project elements causing these effects are: vegetation clearing along the pipeline ROW and introduction of required pipeline safety structures such as line markers, main line valves (MLVs), and cathodic protectors.

In forested areas, where the INHT and the pipeline ROW overlap, or where the cleared ROW is visible from the trail, impacts would occur as a result of a strong visual contrast against the existing landscape. These adverse effects would be reduced with the passage of time, as construction areas are recolonized by natural vegetation, but some would persist through the life of the project (e.g., regulations require brushing a portion of the 50-foot wide ROW to aid in pipeline location for safe operations). The INHT is passable only during the winter, when there is adequate snow cover on the ground and ice on streams and lakes for cross-country travel. The viewshed of the pipeline would generally blend with the surrounding landscape during winter due to snow cover, especially in areas with low shrubs, tundra, or unvegetated areas. However, line markers, MLVs, and cathodic protection devices may cause visual impact, because they would not likely be covered in snow.

In addition, construction activities have the potential to interfere with use of the INHT during scheduled events in the year of construction, such as the Iditarod Dog Sled Race, Iron Dog, and Iditasport.

AVOIDANCE AND MINIMIZATION OF EFFECTS

Adverse impacts to the INHT may be avoided or minimized through several means: route selection during design, construction methods, communication and coordination with INHT users.

Design of Route Selection

Donlin Gold has studied various pipeline corridors that would avoid and/or minimize adverse effects to the INHT. The most significant route modifications are described below and have been incorporated into the proposed pipeline route shown on Figure 1:

- Jones Route Alternative – Selection of the Jones Route Alternative removed all contact between the pipeline ROW and the INHT through Rainy Pass north of Threemile Creek, Dalzell Gorge, Rohn Cabin, and South Fork Kuskokwim areas.
North Route Option – Selection of the North Route Option relocated the proposed pipeline corridor from the south to the north side of the Happy River, from the junction of the Happy and Skwentna Rivers, to Threemile Creek. This alternative avoids adverse impacts to the Happy River Steps, eliminates a large number of crossings with the INHT, and eliminates several miles of INHT trail and pipeline ROW collocation.

With the project’s adoption of the Jones Route and North Route changes, the number of INHT and pipeline ROW crossings has been reduced to four (4) (Figure 1): two (2) east of the INHT Skwentna River Crossing (Figure 2 and Figure 3); one (1) as the INHT approaches the Happy River Steps from the east (Figure 4); and one (1) near Egypt Mountain as the INHT leaves the South Fork Kuskokwim River Valley in the Alaska Range (Figure 5). This also eliminated several miles of co-located pipeline and INHT sections.
Happy River

INHT XSING #4

South Fork Kuskokwim

INHT XSING #3

INHT XSING #2

INHT XSING #1

Egypt Mtn.

North Route Option

INHT XSING #1

INHT XSING #2

INHT XSING #3

Skwentna R.

Skwentna R.

South Fork Kuskokwim

Donlin Gold Project

Former Proposed Route

Proposed Natural Gas Pipeline

INHT

Pipeline ROW and INHT Crossing

SCALE:

0 2.5 5 10

Miles

0 2.5 5 10

Kilometers

DONLIN GOLD PROJECT

INHT and PIPELINE CROSSINGS

FIGURE: 1

Legend:

DONLIN GOLD MAP, 10/08/17, R01

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, InCREMENT, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

© 2018 Donlin Gold Limited
Proposed Natural Gas Pipeline Construction Footprint

INHT, Public Access Easement (400' Wide)

Approximate INHT Location

Contour interval = 1m

Visual Effects Minimization Site
Visual Effects Minimization Site

- Proposed Natural Gas Pipeline Construction Footprint
- INHT, Public Access Easement (400' Wide)

Approximate INHT Location
Contour interval = 1m

DONLIN GOLD PROJECT

INHT XSING #2

SCALE:  
0  50  100  200 Feet  
0  12.5  25  50 Meters

FIGURE: 3
DONLIN GOLD PROJECT

INHT XSING #3

Proposed Natural Gas Pipeline Construction Footprint
INHT, Public Access Easement (400' Wide)
Approximate INHT Location

Visual Effects Minimization Site

SCALE:
0 50 100 200 Feet
0 12.5 25 50 Meters
Contour interval = 1m

FIGURE: 4
Proposed Natural Gas Pipeline Construction Footprint
INHT, Public Access Easement (400’ Wide)
Approximate INHT Location
Contour interval = 2 m

Visual Effects Minimization Site

INHT XSING #4
DONLIN GOLD PROJECT

FIGURE: 5
Construction Methods

The following discussion presents proposed methods to minimize adverse visual effects to the INHT during construction of the pipeline.

*Narrowing and/or Feathering the Pipeline Construction ROW*

Adverse visual effects to the INHT and pipeline ROW intersections may be minimized by narrowing the width of the construction ROW for a short distance on one or both sides of the trail. In addition, variation in the edges of the vegetation clearing (feathering) may be introduced to minimize visual adverse effects. Both techniques, either jointly or separately, narrow the observer’s horizontal field of view, and provide a more natural look at the vegetation clearing limits (Figure 6).

![Diagram of construction ROW](image)

Figure 6 – Narrowing and feathering the construction ROW reduces the observer’s horizontal field of view, and provide a more natural look at the vegetation clearing limits.

*Visual Barriers*

Adverse visual effects to the INHT can be minimized by limiting the field of view of the observer by placing barriers perpendicular to the INHT ROW and within proximity to the INHT (Figure 7). Barriers would be built using native vegetation, brush piles, earthen berms, or a combination. In addition, barriers can help define the location of the INHT and avoid potential confusion of travelers along the trail. The barriers are described below.

Vegetation barriers – Locally sourced tall vegetation (nominally 5 ft in height) can be planted on the sides of the INHT to speed up natural vegetation recovery and reduce visual effects.

Brush piles – Downed trees or brush piles, can be placed on the sides of the INHT to define the INHT and reduce visibility of the pipeline ROW.

Berms – Where hydrological conditions allow it, earthen berms constructed with locally sourced material, and revegetated to provide a visual obstruction of the ROW to the observer.
Figure 7 – Berms constructed with locally sourced material, and revegetated, provide a visual obstruction of the ROW to the observer, by limiting the vertical field of view.

Placement of Line Markers, Main Line Valves, and Cathodic Protection Devices

Line markers, MLVs, and cathodic protection devices are required pipeline safety components. These features and possible methods for their placement to minimize visual effects to trail users are described below.

**Line Markers**

Line markers (Figure 8) must be placed and maintained as close as practical over the buried pipeline at each crossing of a public road and railroad; and whenever necessary to identify the location of the pipeline to reduce the possibility of damage or interface (49 CFR 192.707). Typical line markers include: carsonite-type posts labeled “Warning Buried Pipeline”; and aerial mile markers mounted on metal posts and visible from the air. The aerial mile markers have the highest potential to be visible from the trail. However, the visual effects of the aerial mile markers may be minimized because of the forested vegetation along most of the INHT through the Rainy Pass area. The amount of forested vegetation is reduced as the INHT and pipeline approach the Threemile River, but at this point the distance between the trail and the proposed pipeline corridor is approximately 1 mile. Where practicable, aerial mile markers in the proximity of the Threemile River may be placed at sites where the terrain or vegetation hide the marker from the trail, while remaining visible from the air.

Figure 8 – Typical line markers: Aerial mile markers (left) and “Warning Buried Pipeline” marker (right).
Mainline Block Valves

Approximately 20 mainline block valves (MLVs) would be installed at intervals of no more than 20 miles. All of these valves would be manually operated. The valves would be fitted with locks and a signpost similar to the line markers, showing the MLV number. Reflective tape would be positioned on the signpost and there may be other visual aids with reflective tape to alert travelers along the ROW of the presence of the valve stations. The 25 ft by 25 ft (7.6 m by 7.6 m) MLV sites would be fenced and would have sliding gates with locks. The only currently known locations for MLVs would be: the Beluga Pipeline (BPL) tie-in at MP 0 of the pipeline, compressor station, and the Farewell pig launcher/receiver site. All other MLV locations will be determined during detailed design. As most practicable, MLV locations between the Skwentna and Threemile Rivers will be sited at locations visually hidden from the INHT. If this is impracticable, visual barriers such as vegetation may be used to obstruct the view.

Cathodic Protection Test Stations

Cathodic protection test stations would be installed at accessible locations, and at intervals of one mile or less, to measure pipe-to-soil potential for the establishment and maintenance of an effective cathodic protection system. Accessibility would be based on the expected cathodic protection survey season. Test stations would be installed where the pipeline parallels, crosses, or passes near other cathodically protected pipelines or structures. The specific location of test stations would be determined during final design. Where practicable and necessary to minimize visual effects, cathodic protection devices can be installed near line markers.

Communication and Coordination

Donlin Gold will communicate and coordinate with INHT trail users about pipeline construction plans and progress to enable free and safe passage at INHT/construction ROW crossings. Through its Public Outreach Plan, Donlin Gold would provide information regarding pipeline construction and maintenance activities. Pipeline construction work that has the potential to affect the free and safe passage of annually organized INHT events such as the Iditarod Sled Dog Race, Iron Dog, or Iditasport will be scheduled and coordinated in consultation with each interested party. This can minimize or eliminate conflicts of construction activities with trail users and especially the trail events hosted by these groups.

OTHER PLANS TO MINIMIZE ADVERSE EFFECTS

Pre-Construction Surveys of INHT Crossings 1, 2, 3, and 4

The INHT crossing locations will be surveyed and photographs will be taken to document the trail conditions and viewshed before construction.

A preliminary site assessment will be completed prior to construction at each INHT crossing to identify construction methods, or options to narrow and/or feather the construction ROW (see Figure 6).

After construction, each crossing will be assessed for the need to install visual barriers. If necessary, visual barriers will be installed perpendicular to the ROW based on site-specific conditions at the time.
Evaluation of Need and Location of Material Site 25

During detailed construction planning, the need to develop Material Site 25 (MS-25) will be re-evaluated. MS-25 may not be required and thus, not developed. If required, Donlin Gold will investigate means to minimize adverse effects by reducing the area of disturbance of the material site. If developed, MS-25 will be reclaimed by re-contouring the area to blend with the surrounding environment and methods would meet State of Alaska reclamation requirements. Visual barriers may also be installed, depending on the final configuration of the development at MS-25.
1 Appendix E (Reserved – Amendments)
This page intentionally left blank.
ATTACHMENT B  CORPS’ SUPPORTING ANALYSIS AND DOCUMENTATION

Attachment B includes the following sections:

- Attachment B1 – Response to Comments on Special Public Notice (SPN-1995-120)
- Attachment B3 – General Policies for Evaluating Section 10 RHA and 404 CWA Permit Decisions [33 CFR 320.4]
- Attachment B4 – Compliance with Environmental Requirements (33 CFR 320.3 Related Laws)
- Attachment B5 – Applicant’s Compensatory Mitigation Plan
- Attachment B6 – State of Alaska Certificate of Reasonable Assurance for the Donlin Gold Project
This page intentionally left blank.
ATTACHMENT B1    RESPONSE TO COMMENTS ON SPECIAL PUBLIC NOTICE (SPN-1995-120)

New substantive comments on the Final Environmental Impact Statement (Final EIS) were grouped into like Statements of Concern (SOCs) and summarized below. The Corps has added a response to the comment statements.

B1-1: A preferred alternative was not identified in the Final EIS, as required under National Environmental Policy Act (NEPA).
  
  • Response: The Corps is neither a proponent for nor an opponent of the proposed Project and does not have an agency preferred alternative. Under the regulatory process, the decision to issue or deny the permit is made after the 30 day review period for the Final EIS and documented in the Record of Decision (ROD).

B1-2: Because ANCSA calls for maximum participation by Alaska Natives in decisions affecting their rights and property, input from relevant Alaska Native corporations should be central to the public interest economic analysis.

  • Response: Economic impacts to Alaska Native corporations was considered and addressed in the public interest review.

B1-3: A freshwater pipeline from the Kuskokwim River to the Mine Site could support plant operations and potentially be used to augment flows to Crooked Creek.

  • Response: Use of a pipeline to transport Kuskokwim River water to the Crooked Creek watershed to supplement flows was considered in the Final EIS, Chapter 5. Constructing a pipeline at Project startup based on modeled flow losses from Crooked Creek is not considered a practicable measure; however, if unexpected flow losses were to occur, constructing a pipeline is one action that would be considered. Kuskokwim River water is not needed for plant operations.

B1-4: Construction of a cutoff wall and water pipeline from the Kuskokwim River should not be deferred as future adaptive management, but instead evaluated as part of the Section 404(b)(1) Guidelines analysis and disclosed in the Record of Decision.

  • Response: Donlin Gold has developed an Aquatic Resources Monitoring Plan (ARMP) Draft Framework in anticipation of producing a final ARMP under the provisions of its Title 16 fish habitat permits administered by the Alaska Department of Fish and Game (ADF&G). The ARMP will include aquatic resource monitoring throughout Crooked Creek and its tributaries upstream and downstream from the Mine Site, to include fish surveys, habitat, sediment, fish tissue, and flow monitoring. Flow monitoring will address both summer and winter flow conditions. The ARMP will provide for reporting to ADF&G and will require specific action by Donlin Gold if the data show variability from the predicted results on aquatic resources (to include flow). The actions that could be taken to reduce unexpected flow loss include but would not be limited to lining or relocating portions of the stream channel, augmenting flows from the Snow Gulch Reservoir or the Kuskokwim River, or a cutoff wall/grouting areas of bedrock demonstrating high flow rates (Final EIS, Chapter 5).
B1-5: Projects of this size deserve more effort in engagement. Public meetings and poster displays are a good step forward. But many of the residents of the area still did not understand the scope, nor did the Corps do a very good job of speaking clearly about the balance of development and risks. An Environmental Impact Statement (EIS) is intended to disclose what impacts are anticipated, not necessarily prevent them. So, it is possible that people’s expectations may not have been met. Many folks incorrectly believed that the EIS would “ensure” that there would be no impacts to the environment.

- Response: The Corps held 14 public scoping meetings and 17 public meetings for the Draft Environmental Impact Statement (Draft EIS). The Draft EIS public meetings had an open house component to allow the public to talk with members of the EIS team and ask questions. Additionally, as described in the Final EIS Section 6.3.5, the Corps provided:
  - 20 EIS overview and update presentations to stakeholder groups,
  - Monthly visits between August 2014 and October 2015 to the Yukon-Kuskokwim (Y-K) region to provide updates of the EIS process and discuss specific concerns and answer questions about the Project and EIS process,
  - Seven newsletters to inform the public and let them know of opportunities for public participation,
  - Translation of a Draft EIS summary into Yup’ik, and
  - Scoping, Draft EIS, and Final EIS notifications in local newspapers and on KYUK.

B1-6: Agency and resident comments that were not in line with mine development were only incorporated if it did not require much change to Donlin Gold’s general plan.

- Response: All comments on the Draft EIS were weighed equally and responded to in Appendix X, the Comment Analysis Report (CAR), of the Final EIS. Additionally, between the Draft and Final EIS documents, changes were made to the Proposed Action, alternatives considered, and recommended mitigation measures based on agency and public comments on the Draft EIS.

B1-7: The fact that the Akiak Native Community and The Kuskokwim River Watershed Council are mentioned as cooperating agencies in the Public Notice is something that I believe is indicative of a flawed public involvement process. Likewise, there are other villages listed as cooperating agencies. Listing six villages on the cover of the documents is somewhat misleading.

- Response: The six tribes on the cover formally agreed to be cooperating agencies in the EIS process. All Tribes and State and Federal agencies that agreed to join the process as cooperating agencies were invited to participate at each stage. Some entities were very active and others were not.

B1-8: When doing monitoring on smelt, attributing impacts to the project related activities would be difficult and contentious. Until a relatively accurate population estimate can be determined, it would be impossible to determine if, and when, the smelt are being affected by barge traffic before it was too late.

- Response: Donlin Gold would develop and implement a rainbow smelt monitoring program to establish additional baseline data for a better understanding of the species’
occurrence and the character, use, and distribution of spawning habitat along the Kuskokwim River. Survey methodology would likely include documenting sex ratio and age structure of the population and if possible, fecundity of females. Initially, surveys would be conducted annually to document the age structure of the rainbow smelt population and further document spawning patterns. Once an adequate baseline is established, regular sampling would be used to monitor for changes to existing patterns. The frequency of surveys over the long-term would depend on previous results and whether the data indicate a potential shift (Table 5.2-1 in the Final EIS, design feature T17). If rainbow smelt population changes are observed over a defined time period, additional work would need to be undertaken to investigate the reason for those changes. If observed changes were attributed to project-related activities, Donlin Gold would implement an assessment of measures available to address or mitigate those activities. Such activities would be coordinated with the Donlin Advisory and Technical Review and Oversight Committee (DATROC) Subsistence Subcommittee.

**B1-9:** No matter what technology is used, it’s not possible to ensure vessel passages are conducted through the deeper portions of the channel; if that were the case, there would be far fewer barge strandings than currently occur in the Kuskokwim River.

- **Response:** Donlin Gold has committed to employing professional barge captains using state of the art navigation and communication equipment. Donlin Gold’s barge plan includes an initial pre-barging survey of the active channel and periodic re-surveys to develop the route that would be followed. Additionally, Donlin Gold has committed to cease barging at a river flow below 39,000 cubic feet per second. The Final EIS concludes that these measures make barge stranding an unlikely event. The Final EIS Appendix W contains Donlin Gold’s Barge Communication and Grounding and Response Plans.

**B1-10:** There is no assessment of indirect emissions for different components. Therefore we have no idea if indirect emissions are important. Do Table 3.26-8 and Table 3.26-9 include indirect emissions? Or are they only direct emissions? While Ocean Barging emissions are quantified, air traffic emissions are not. It is not clear why Ocean Barging and Air Traffic are not considered “Direct” emissions (Final EIS page 3.26-29). They are regional, not local, in impact – but all greenhouse gas emissions are considered a global, not local, impact.

- **Response:** Assessment of indirect emissions is provided for each Project component and Project phase, as applicable. Sources of indirect emissions are also identified for each Project component and phases, as applicable. See Page 3.26-1: “Where possible, indirect emissions are assessed or qualitatively described.” See also page 3.26-27: “There are currently no defined methodologies for estimating indirect emissions from oil and gas production and refining, which is highly dependent on the design, operation, and product composition….” Both tables clearly only present direct emissions. See page 3.26-28 where the paragraph referring to Table 3.26-8 discusses only direct impacts; indirect impacts are in a separate following paragraph. For Table 3.26-9, see page 3.26-30; this table is clearly described as presenting only direct greenhouse gas (GHG) emissions in the paragraph preceding the table: “Direct GHG emissions at the Transportation Corridor would be within immediate Project Area (Table 3.26-9).” Direct versus indirect emissions are defined by the Clean Air Act (discussed in regulations sections, Page 3.26-6). Further discussion of emissions is discussed in and cross referenced to Section 3.8,
Air Quality. See CLIM 9 in the CAR, Appendix X, Page 123, for an explanation of what elements were analyzed in this EIS.

**B1-11:** The text not only fails to adequately compare alternatives, it downplays the impact by separating phases of the Project (emissions during construction would be less than 1 percent of annual GHG for the State of Alaska, during operations would be 3.7 percent of annual GHG for Alaska). A table of the emissions annually and over the life of mine should be provided. This would show in what sectors mitigation would have the most affect. It would also provide a framework for how to indicate the difference in GHG emissions between alternatives.

- Response: The intent of the percent of annual GHG for Alaska was not to downplay the impact of the Project, but to show context for the impact as required by Council on Environmental Quality (CEQ) guidelines, and temporal differences between Project phases. We concur with the usefulness of the example summary table and graphs provided in the comment and an expanded version of the table is provided below. (Note that the table in the comment appears to contain a conversion error in the Operations-Transport category, which inflated the annual million metric tons (MMT) amount and LOM (MMT) values for this phase/component.)

The numbers in Table B1 are consistent with the Final EIS, in that they show the largest contribution of GHG emissions occurring during Operations at the Mine Site component. Mitigations that target other Project components would have far less effect. The alternatives summary data are also consistent with the discussion in the Final EIS, and show that Alternative 3A would have slightly lower overall GHG emissions than Alternatives 2 and 6A; Alternatives 4 and 5A would have slightly more GHG emissions overall than Alternative 2; and Alternative 3B would have the largest total GHG emissions. We concur that Donlin Gold Mine would be a large source of GHGs: slightly more overall for the life of mine (48 MMT) than one year for all sources in Alaska combined (43 MMT). However, total GHGs over the life of mine would still be about 4 percent of total Alaska GHGs over the same time period.

<table>
<thead>
<tr>
<th>Table B7: GHG Summary for Life of Mine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Phase</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Construction a</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Operations</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Closure</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
### Table B7: GHG Summary for Life of Mine

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Project Component</th>
<th>GHG Emissions</th>
<th>Time Period</th>
<th>LOM Total for Alternative 2 or 6A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Annual (tpy)</td>
<td>Annual (MMT/yr)</td>
<td>LOM (MMT)&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>48</td>
</tr>
<tr>
<td><strong>Alternative 3A – LNG Haul Trucks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction a</td>
<td>Mine Site</td>
<td>58,100</td>
<td>0.0527</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>Transportation Corridor</td>
<td>208,200</td>
<td>0.189</td>
<td>0.28</td>
</tr>
<tr>
<td></td>
<td>Pipeline</td>
<td>86,600</td>
<td>0.0785</td>
<td>0.24</td>
</tr>
<tr>
<td>Operations</td>
<td>Mine Site</td>
<td>1,696,900</td>
<td>1.54</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>Transportation Corridor</td>
<td>73,000</td>
<td>0.0662</td>
<td>1.8</td>
</tr>
<tr>
<td></td>
<td>Pipeline</td>
<td>18,800</td>
<td>0.0171</td>
<td>0.47</td>
</tr>
<tr>
<td>Closure</td>
<td>Mine Site</td>
<td>194,300</td>
<td>0.176</td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td>Transportation Corridor</td>
<td>20</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Pipeline</td>
<td>20</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>LOM Total for Alternative 3A</td>
<td></td>
<td></td>
<td>46</td>
</tr>
<tr>
<td><strong>Alternative 3B – Diesel Pipeline</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction a</td>
<td>Mine Site</td>
<td>58,100</td>
<td>0.0527</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>Transportation Corridor</td>
<td>208,200</td>
<td>0.189</td>
<td>0.28</td>
</tr>
<tr>
<td></td>
<td>Pipeline</td>
<td>173,100</td>
<td>0.157</td>
<td>0.47</td>
</tr>
<tr>
<td>Operations</td>
<td>Mine Site</td>
<td>2,048,000</td>
<td>1.86</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>Transportation Corridor</td>
<td>73,000</td>
<td>0.0662</td>
<td>1.8</td>
</tr>
<tr>
<td></td>
<td>Pipeline</td>
<td>18,800</td>
<td>0.0171</td>
<td>0.47</td>
</tr>
<tr>
<td>Closure</td>
<td>Mine Site</td>
<td>194,300</td>
<td>0.176</td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td>Transportation Corridor</td>
<td>20</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Pipeline</td>
<td>20</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>LOM Total for Alternative 3B</td>
<td></td>
<td></td>
<td>55</td>
</tr>
<tr>
<td><strong>Alternative 4 – BTC Road/Port</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction a</td>
<td>Mine Site</td>
<td>58,100</td>
<td>0.0527</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>Transportation Corridor</td>
<td>500,100</td>
<td>0.454</td>
<td>0.68</td>
</tr>
<tr>
<td></td>
<td>Pipeline</td>
<td>86,600</td>
<td>0.0785</td>
<td>0.24</td>
</tr>
<tr>
<td>Operations</td>
<td>Mine Site</td>
<td>1,761,000</td>
<td>1.60</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>Transportation Corridor</td>
<td>122,800</td>
<td>0.111</td>
<td>3.1</td>
</tr>
<tr>
<td></td>
<td>Pipeline</td>
<td>18,800</td>
<td>0.0171</td>
<td>0.47</td>
</tr>
<tr>
<td>Closure</td>
<td>Mine Site</td>
<td>194,300</td>
<td>0.176</td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td>Transportation Corridor</td>
<td>40</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>
### Table B7: GHG Summary for Life of Mine

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Project Component</th>
<th>GHG Emissions</th>
<th>Time Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Annual (tpy)</td>
<td>Annual (MMT/yr)</td>
</tr>
<tr>
<td></td>
<td>Pipeline</td>
<td>20</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**LOM Total for Alternative 4**

<table>
<thead>
<tr>
<th>Alternative 5A – Dry Stack</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Mine Site</td>
</tr>
<tr>
<td>Transportation Corridor</td>
</tr>
<tr>
<td>Pipeline</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine Site&lt;sup&gt;f&lt;/sup&gt;</td>
</tr>
<tr>
<td>Transportation Corridor&lt;sup&gt;g&lt;/sup&gt;</td>
</tr>
<tr>
<td>Pipeline</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine Site&lt;sup&gt;f&lt;/sup&gt;</td>
</tr>
<tr>
<td>Transportation Corridor</td>
</tr>
<tr>
<td>Pipeline</td>
</tr>
</tbody>
</table>

**LOM Total for Alternative 5A**

**Total for state of Alaska<sup>h</sup>**

|                         | 43 | 1,200 | 27.5 |

**Notes:**

- a. Construction totals for whole phase (in Final EIS Sections 3.8 and 3.26) converted to tons per year (tpy) based on time period shown.
- b. Life of mine (LOM) values rounded to 2 significant digits.
- c. Reflects reduction in annual GHGs by 64,100 tpy to account for liquefied natural gas (LNG) haul trucks in lieu of diesel trucks, and reduction in river barging and fuel tanks (AECOM 2017a).
- d. Reflects increase in stationary emissions in Final EIS Table 3.8-19 of 28% for use of diesel instead of natural gas at power plant (Section 3.26.4.4.1).
- e. Reflects increase in land-based mobile transportation emissions, and reduction in river-based mobile emissions (Tables 3.8-27 through 3.8-31), by amounts proportionate to increase in BTC road length and decrease in river mile length, respectively.
- f. Reflects roughly 2% increase in mine mobile and stationary emissions over Alt 2.
- g. Reflects 6% increase in river mobile emissions over Alternative 2 North Option (Section 3.26.4.6.1).
- h. Total for 2010 (ADEC 2015).
B1-12: If the Dry Stack Tailings is rated as “low likelihood of implementation” in the Final EIS, why has it been followed through as a viable alternative? Why was it not eliminated from the Final EIS, if the high cost difference has been known for 2-3 years? If it were eliminated, would that have allowed room for other viable options (paste tails, cement tails, or other types of mining alternatives)?

- Response: The EIS considered other mining alternatives such as paste tails as part of the process of identifying potential alternatives and determining which ones would be carried forward for evaluation in the EIS (see Final EIS Appendix C). The dry stack tailings (DST) method was suggested as an alternative during scoping and evaluated in the EIS as a reasonable alternative to determine if the alternative could reduce impacts to waters of the U.S. (WOUS). The technology wasn’t proven at that time for operations with the throughput planned for Donlin Gold and remains unproven now at the conclusion of the NEPA process. Alternatives were not eliminated based on lack of “room” in the EIS and if other alternatives had been reasonable/feasible, they would have been evaluated.

B1-13: Removing captured liquid and solid mercury from the Mine Site by air was deemed to have a “low likelihood of implementation” because barging was safe (Final EIS Table 5.5-1B). Please provide a cost and safety analysis of the full transport route via barge (including truck and rail, if necessary) to the final intended repository with a cost and safety analysis of transport by plane. Include a potential option to build a Resource Conservation and Recovery Act facility for mercury storage in Alaska or other sites.

- Response: Donlin Gold is proposing to transport mercury recovered during the milling/refining process to long-term storage in the Continental U.S., using trucks to Angyaruaq (Jungjuk) Port site, river barges to Bethel, and ocean barges to certified handling and disposal facilities in the Pacific Northwest. Elemental mercury would be contained in 76 pound flasks or one metric tonne steel containers constructed and used specifically for this purpose. Additional shipments of mercury-loaded spent carbon in steel drums would also occur. All mercury containers would be further contained in steel shipping containers and secured to barges during transport. Crowley and Alaska Marine Lines, major shippers of containerized freight in Alaska and the Pacific Northwest, were queried and have not had any incidents in Alaska in at least the last decade with similar sized shipping containers being lost overboard (Walt Tague conversation, 2016, Mike Stuart conversation, 2016). In the meantime, there have been instances of cargo plane crashes in rural Alaska. The Corps finds that Donlin Gold’s proposed mercury shipments are lawful, meet standard industry transport practices, and are reasonable and we have no reason or authority to require air shipment. Additionally, there are no planned or existing facilities in Alaska permitted for mercury storage and the Corps has no reason or authority to require one.

B1-14: Under Alternative 4, how many locations with a potential for slides or rockfall are above fish-bearing water bodies?

- Response: The proposed sidehill cut and fill construction would reduce the risk of moderate to steep slopes experiencing slides or rockfall along most of the BTC road. However, as indicated in Final EIS Section 3.3.2.2.2, the one area of the road with increased potential for slope movement is along the northwest side of Juninggulra Mountain. This three mile long section lies at the headwaters of Montana Creek, which
is not known to be an anadromous fish stream (Final EIS Section 3.13.2.2.1). Most of this road segment is coincident with the Mine Access Road under Alternative 2 North Option. Although the anadromous Owhat River and lower reaches of its tributaries along the western portion of the BTC road are classified as Essential Fish Habitat (EFH) under the Magnuson–Stevens Fishery Conservation and Management Act (MSA), the risk of slides or rockfall is lower in this area of more moderate slopes.

B1-15: Would the piezometers and embankment settlement monuments continue to remain in place at the dam, and would they be part of the annual monitoring?

- Response: Alaska Dam Safety Program regulations and guidelines require that details necessary for dam closure be provided in an application for a Certificate of Approval to Modify or Abandon a Dam. Application requirements include hydraulic and stability evaluations of the final dam configuration; Operations and Maintenance (O&M) details; and financial assurance adequate to pay for post-closure O&M, monitoring, and inspections. The details requested in this comment would be included in this application. While it would be cost-effective to continue use of existing piezometers and embankment settlement monuments, new ones may be required as the downstream face would be flattened to a lower slope angle (Final EIS Section 3.3.3.2.2). The O&M details would specify when inspections would occur. Typically, extraordinary inspections would be conducted following heavy or extended precipitation, just as they would after earthquakes, in accordance with Alaska Dam Safety Program guidelines.

Though the Donlin Gold tailings storage facility (TSF) closure monitoring details are not available at this time, several points of comparison can be made between Bingham Canyon situation and the Donlin Gold TSF. The Bingham Canyon pit walls are steeper than the Donlin Gold TSF would be in post-closure: overall pit slope angles of 45 degrees are common in open pits, while the Donlin Gold TSF downstream face in post-closure would be 27 degrees (2H:1V). The Bingham Canyon pit walls are cut into bedrock, while the Donlin Gold TSF would be composed of rockfill. As such, the system used at Bingham Canyon to detect steep bedrock slope instabilities, such as extensometers, may or may not be applicable to the Donlin Gold TSF. The Bingham Canyon slide may have been caused by pre-existing bedrock weaknesses (such as a fault or sedimentary structure) that would not exist within the TSF rockfill dam, and current stability analyses of the TSF dam account for bedrock weaknesses in the dam buttresses (BGC 2011a).

B1-16: For the sentence “Impacts associated with climate change (for Alternative 3B) would be the same as discussed for Alternative 2” (Final EIS Section 3.18.2.4.4, page 3.8-63), are the increases during construction offset by decreases in operations? If so, that should be shown on a chart comparing GHG emissions between alternatives.

- Response: The sentence cited in the comment refers to socioeconomic impacts. As discussed in Section 3.26.4.4.1, lower GHG emissions under Alternative 3B due to reduced barging would be more than offset by higher GHGs from combustion of diesel at the Mine Site, as shown in Table B1.

B1-17: Why is the Tailings Storage Facility proposed to be designed to withstand a less severe event than the Waste Rock Facility? The tailings dam would be built to withstand a peak
ground acceleration (pga) of 0.36g (page 3.3-11), but the waste rock would be built to withstand a much higher pga of 0.4g.

- **Response:** The pga of 0.4g used in the numerical seismic deformation analysis of the WRF (BGC 2011b) was based on a recommendation in BGC (2011l) for a pga of 0.36g representing a maximum credible earthquake (MCE) of magnitude (M) 7.8. A smaller more frequent earthquake with a pga of 0.26g (for a 2,500-yr event) was also applied to the WRF in a pseudostatic analysis (BGC 2011b). The recommended MCE of M7.8 with a pga of 0.36g is the same as that used in the TSF analysis (BGC 2011a, 2011l). The higher MCE pga value used in the WRF analysis (0.4g vs 0.36g) appears to be due to rounding, or increased specificity and optimization applied to the analysis of the TSF dam. The TSF only considered the MCE in two types of seismic analyses; whereas the WRF analyses considered both a lower event (0.26g) and the MCE.

A less stable dam design was not chosen for the TSF as indicated in the comment. Rather, as described in Final EIS Section 3.3.3.2.1 (under “Seismic Deformation Analysis”), the same design was subjected to both the 5,000- and 10,000-year events, with the results showing minimal (up to 1.4 feet) settlement and displacement in both cases.

**B1-18:** Why do suggested Mitigation measures suggest further analysis of a higher level seismic event and revised seismic stability analysis for the pit and the WRF but not the TSF? (Final EIS, page 3.3-73).

- **Response:** As described in Section 3.3.3.2.1 (p. 3.3-42 under Waste Rock Facility (WRF), and p. 3.3-49 under Open Pit), these measures were based on specific concerns identified during review of feasibility level design reports (BGC 2011b, 2014j) regarding the presence of ice-rich soils at the WRF, and the use of a moderate level earthquake (250-year event) in the seismic analysis of pit slope stability. These specific concerns do not exist at the TSF, where all ice-rich overburden would be removed prior to construction, and where higher level earthquakes were used in the seismic analyses, as described above.

**B1-19:** It would be very helpful to have maps of the potential tailings flow after the draindown period (for the TSF), and for the Dry Stack Tailings Facility after the operating pond is reclaimed.

- **Response:** As described in Final EIS Section 3.24.3.5.2, tailings release scenarios selected for analysis in the EIS were based on a consensus of geotechnical expert opinion as to the most likely way a significant (low probability, high consequence) tailings spill could occur that is not considered “worst-case” (SRK 2015a, AECOM 2015c). In accordance with CEQ guidelines, not all variants of spill scenarios must be analyzed in detail. Many could fall within the probability and consequences of the selected scenario, and have smaller effects that are accounted for within the scope of the analyzed scenario (AECOM 2015c).

The tailings release scenarios selected for analysis in the EIS, from either a piping breach or sinkhole to the underdrain, would occur during late Operations when the TSF is at its ultimate size; and the fluid released could range from water only, to a slurry with 20 to 50 percent solids content (BGC 2015n). If the same scenarios were applied to the Closure situations described in the comment, the distance of travel would be the same or less...
than those shown on Figures 3.24-2 and 3.24-3 (Section 3.24.5.9). There would be no water-only release from either the TSF or Dry Stack Operating Pond, as the free water in both cases would be removed during Closure. The terminal density of the consolidated tails in the TSF after the draindown period would be the same as upper end of the slurry solids content (50 percent) considered in the inundation study for the selected scenarios (BGC 2015n) and could travel a similar distance. However, the likelihood of a TSF release occurring in post-closure may be less than that considered in the selected spill scenarios, due to flattening and covering of the TSF downstream face at Closure (BGC 2011a).

The dry stack material would be buttressed by the upper Operating Pond dam that would remain after Closure, and would have a lower moisture content than the TSF tails, due to filtering and compaction during placement (Section 3.3.3.6.1). As such, the material is unlikely to flow under the selected tailings spill scenarios. In the event that saturated dry stack material near the bottom of the pile is released under the selected spill scenarios, the distance it would travel would be less than that shown in Figures 3.24-2 and 3.24-3. Thus, a potential tailings flow from either of the situations described in the comment would be both less likely to occur, and have the same or less impact, than the scenarios analyzed in the EIS.

**B1-20:** Donlin Gold will emit seven times more than all the mines in Alaska combined. Another way to look at it would be that not building the Donlin Gold Mine would be the equivalent of Alaska producing no greenhouse gas emissions at all for 1.5 years. This type of information would provide us a good basis for comparing alternatives and also for discussion of climate mitigation, including carbon offsets.

- Response: The mining category in Final EIS Table 3.26-2 does not include mines which draw power from the grid, such as Fort Knox and Pogo, whose GHG emissions are attributed to the physical stationary source where the electricity is generated; i.e., GHG emissions for these mines are included in the power plant category. As such, the comparison between Donlin Gold mine and all mines in Alaska together in the comment is not an equivalent correlation.

As shown in Table B1 and noted above, the Project would emit slightly more GHG emissions for overall life of mine (48 MMT) as one year for all sources in Alaska combined (43 MMT). As such, we concur that not building the Donlin Gold Mine would be the equivalent of Alaska producing no greenhouse gas emissions at all for more than a year. On an average annual basis over the life of mine (48 MMT over LOM/27.5 years), Donlin Gold would emit roughly 1.75 MMT/yr GHGs, similar to other large single sources in Alaska such as on the North Slope, or several railbelt utilities combined (EPA 2014h). Average annual GHGs for other alternatives range from 1.67 to 2.00 MMT/yr. (Note that the 3 MMT/year figure for Donlin Gold cited in the comment adds up multi-year construction emissions, not annual emissions.)

**B1-21:** Was an assessment done to determine if pit walls would collapse under intensified precipitation conditions? A slope failure was predicted at Bingham Canyon and in preparation they set up nine layers of protection including slope stability radar, micro-seismic arrays, extensometers, GPS monitoring. Will similar layers of protection be placed in pit walls at Donlin? Describe what will be in place.
• Response: Assessment of pit wall stability in Project design documents (BGC 2007b, 2011k) was conducted based on both dewatered and fully saturated (unmitigated) conditions. The effect of intensified precipitation on pit walls, however, would primarily be to increase runoff to the in-pit surface water collection system, not necessarily increase groundwater levels and pit wall instability. As indicated in Final EIS, Appendix X (see GRD 17 in the CAR), most precipitation would quickly runoff the steeply sloping rock walls; any groundwater recharge into the pit walls/benches that did occur, even under intensified precipitation conditions, is anticipated to be inconsequential to the groundwater modeling and slope stability results. The dewatering pumping system was designed for a peak capacity (8,300 gallons per minute [gpm]) roughly three to five times higher than the range of average pumping rates expected (1,700 to 2,600 gpm). In addition, runoff from areas upslope from the pit would be diverted away from the pit by an interceptor ditch constructed around the perimeter (BGC 2011h), and is not expected to affect wall stability under intensified precipitation conditions.

Slope stability analyses conducted on the pit walls indicate that certain locations could have Factors of Safety (FOS) less than the target of 1.2 under saturated conditions (BGC 2007b, 2011k). At these slopes, the mine plan calls for more aggressive dewatering, which would entail increased pumping and/or closer spaced dewatering wells and horizontal drains. As noted in Final EIS Section 3.3.3.2.2, experience would be gained throughout Operations as to the performance and deformation behavior of the slopes, and the design and/or operations would be adjusted accordingly. For example, the number, length, and spacing of horizontal drains needed to generate adequate depressurization would largely be determined as mining progresses, through monitoring of pit wall pore pressures and seepage rates, and would target specific depressurization needs identified by the slope instrumentation and monitoring program (BGC 2011k, 2014c). Thus, it is unlikely that intensified precipitation would result in higher groundwater levels and increased slope instability that are not maintained through pumping.

The main difference between Bingham Canyon and Donlin Gold situations is that the slope failure was predicted at Bingham Canyon based on the instrumentation, and was not mitigated by changed design or operations; no such prediction has been made for the Donlin Gold pit under planned operating conditions. The “layers of protection” at Bingham Canyon were not intended protect the slope from failing, but to predict that it would, and to remove people and equipment in time. Similar protections such as slope instrumentation and monitoring are planned at Donlin, as well as optimization and adaptive management of slope design during both final design and operations, as described above.

B1-22: An Area of Critical Environmental Concern designation should be made in the Upper-Kuskokwim River region in the BSWI RMP [Bering Sea Western Interior Resource Management Plan] to conserve sheefish habitat and conservation of fish and game populations through monitoring in adaptive management models should be addressed.

• Response: The Corps does not have the authority to designate Areas of Critical Environmental Concern. The Applicant is proposing monitoring and adaptive management through the DATROC Barging and Subsistence Subcommittees and the proposed rainbow smelt monitoring program.
B1-23: Relocate the proposed pipeline corridor into the lower terrain of the north Alaska Range.

- Response: The Corps considered an alternative option that would relocate the pipeline into the lower terrain. It is addressed in Appendix C of the Final EIS as Option PL-30. The CAR also responded to requests to analyze this alternative in detail; see PAA 24 in Appendix X of the Final EIS.

B1-24: The Corps should require formation of an Upper Kuskokwim subcommittee under DATROC (commenter used the term "larger project citizens advisory group" which we interpret to be DATROC).

- Response: The Corps does not have authority to require the applicant to form and support an additional subcommittee under DATROC. The applicant has voluntarily committed to the Barging and Subsistence Subcommittees.

B1-25: A negotiated Controlled-Use Area designation should be made for the pipeline corridor to control/minimize use by non-local Alaska residents.

- Response: The Corps does not have authority to designate Controlled-Use Areas.

B1-26: The ROD should include a stipulation that local residents be included in an adaptive management scheme to participate in discussions, but also be involved in the fieldwork to assess inadvertent consequences and unforeseeable adverse effects to the upper resources of the Kuskokwim River.

- Response: The Corps does not have authority to require the applicant to develop an adaptive management program that designates local residents be involved in ecological monitoring.

B1-27: The Corps should consider a recommendation in the ROD for installation of thermosyphons to provide a thermal barrier in unstable soils with permafrost and in transition areas of the pipeline.

- Response: Thermosyphons are more typically used in areas of Alaska with ice-rich, discontinuous-to-continuous permafrost (such as the North Slope, Interior, and western Alaska coastal plains), than in areas crossed by the Donlin Gold pipeline, described as having sporadic-to-discontinuous permafrost (10-90%), localized thaw unstable areas, and no extensive areas of massive ground ice. As noted in FEIS Sections 3.2 (Soils) and 3.25 (Pipeline Reliability and Safety), mitigations such as strain demand monitoring, special wall thickness, and insulation may be employed to minimize differential settlement based on the results of additional geotechnical work in final design. In localized areas, thermosyphons could be considered as one such tool in final design or as a result of monitoring. It is the applicants’ responsibility to design, construct, and maintain the pipeline to prevent subsidence in ice rich soils.
ATTACHMENT B2 EVALUATION OF THE DISCHARGE OF DREDGE AND FILL MATERIAL IN ACCORDANCE WITH 404(B)(1) GUIDELINES (40 CFR SECTION 230, SUBPARTS B THROUGH H)

The Department of the Army (DA) permit application evaluation requires compliance with the U.S. Environmental Protection Agency’s (EPA) Section 404(b)(1) Guidelines (40 CFR 230; Guidelines). The Final EIS contains appropriate analysis of all factors within the Guidelines, except as supplemented here-in as specifically needed to comply with the Guidelines.

B2.1 SUBPART B – COMPLIANCE WITH THE GUIDELINES

B2.1.1 RESTRICTIONS ON DISCHARGE (SECTION 230.10)

The following sections summarize the evaluation of anticipated impacts from the proposed Donlin Gold Project (Project) with the specific regulatory criteria on restriction of discharge as listed in 40 CFR 230.10.

B2.1.1.1 FINDING OF PRACTICABLE ALTERNATIVES (SECTION 230.10[A])

Overall, the U.S. Army Corps of Engineers (Corps) finds that the basic purpose of the Project is not water dependent but that practicable alternatives that do not impact WOUS and/or special aquatic sites do not exist as a result of geographical and technological constraints of Project siting.

As described in Chapter 2 of the Final EIS, the Corps completed a rigorous and comprehensive process to identify and evaluate alternatives to the Project. After careful study, seven alternatives (including Alternative 1 – No Action) were evaluated and described in detail in Chapter 2 of the Final EIS (see Section 4.0 of this Joint Record of Decision [JROD]). The Corps determined that the six action alternatives meet the Project’s Purpose and Need; which is outlined in Section 3.0 of this JROD. Over 300 alternative options were evaluated and those eliminated from further analysis are presented in Chapter 2 of the Final EIS Section 2.4, Alternatives Considered but Eliminated from Detailed Analysis. Appendix C of the Final EIS includes tables that explain in detail why options were considered and provides rationale for the elimination of each option.

Of the six action alternatives analyzed in the Final EIS, Alternative 3A and Alternative 5A are determined to be not practicable due to existing technology. Alternative 3A was considered in detail in the EIS because equipment manufacturers had announced plans to produce liquefied natural gas (LNG) powered haul trucks; however, at the time of the JROD, trucks of the planned payload capacity are not proven or commercially available. Alternative 5A was considered in detail to examine potential for reducing impacts to WOUS but the technology is not proven for mining operations at the planned throughput rate.

Environmental Analysis of Practicable Alternatives

This environmental analysis focuses on the alternatives that the Corps determined to be practicable, and compares the relative extent and nature of impacts for the practicable alternatives to Alternative 2 North Option (described in Section 2.1 of the JROD). The alternatives are assessed in terms of impacts to the aquatic ecosystem to determine whether they would have less adverse impacts than the Proposed Action. If a practicable alternative is
determined to have greater adverse impacts to the aquatic ecosystem as compared to the Proposed Action, then that alternative is not considered to be the Least Environmentally Damaging Practicable Alternative (LEDPA).

**Alternative 3B – Diesel Pipeline**

Alternative 3B (includes Port MacKenzie and Collocated Natural Gas and Diesel Pipeline options) was developed as an alternative to reduce barging activity on the Kuskokwim River. Alternative 3B would provide an alternate method of transporting diesel to the Mine Site to power the large mining trucks and other equipment (the power plant would run on natural gas). The Proposed Action would require approximately 58 barge trips of diesel per year on the Kuskokwim River. Alternative 3B would construct an 18-inch, 334-mile diesel pipeline from Cook Inlet to the Mine Site, instead of the natural gas pipeline, to eliminate the 58 annual barge trips of diesel. The alternative was developed to respond to concern about barging impacts on the river such as spill risk, impacts to fish, propeller scour of the river bottom, barge wakes, wave induced erosion, and interference with subsistence fishing activities. The alternative increases direct impacts to WOUS by between approximately 150 to 240 acres depending on the option.

**How Alternative 3B Changes Spill Risk** – The Alternative 3B pipeline would originate at Tyonek, operate all year, and require improvements to the existing Tyonek barge facility. There are two options; the Port MacKenzie Option would originate at the existing Port MacKenzie and the Co-located Option would construct the 14-inch natural gas pipeline and a small diameter 8-inch diesel pipeline in the same corridor. The alternative and either option would require diesel deliveries and vessel transit in critical habitat for Cook Inlet beluga whales. It would also pose the risk of diesel pipeline leaks and the Final EIS Section 2.3.4.3 describes spill response equipment and construction infrastructure (roads and airstrips) that would need to be left in place for spill readiness. At least 25 additional surveillance flights per year would be required of the Pipeline corridor to look for diesel leaks.

Section 3.24.5.5 of the Final EIS describes two scenarios for diesel pipeline leaks associated with Alternative 3B; pinhole leaks and a complete rupture. The pinhole leak scenarios evaluated in the Final EIS range in probability from very high for low volume (less than 99.9 gallons) spills to medium to low probability for spills ranging up to 100,000 gallons. (Pinhole leaks can continue for some time because leak detection systems can have difficulty detecting the loss.) The pipeline rupture scenario evaluated in the Final EIS evaluated a very low probability (probability approaches zero) spill of 422,000 gallons or more. These spills could occur any time of the year and could travel downstream under ice in the winter complicating response and recovery efforts. Evaporation would be reduced in the winter allowing migration of the diesel over longer distances. Response efforts would be complicated by the remote location relative to response facilities.

In comparison, under the Proposed Action, Donlin Gold would transport diesel to the Mine Site during the ice-free season using specially constructed river barges. The diesel river barges would be double hulled and have ten separate water-tight compartments. These design features would reduce the potential for spills and also reduce the volume that could be released if there was an accident. Section 3.24.5.2 of the Final EIS describes a river barge spill scenario under Alternative 2 with a very low probability (probability approaches zero) that releases 37,817 gallons of diesel to the Kuskokwim River during the ice-free season. The tug crew would respond initially and other responders would be mobilized. The Final EIS describes that
between recovery from responders, evaporation, and dispersion, within three days there would be no or very little visible sheen remaining. Final EIS Section 3.24.6.7 – Water Quality notes that the impacts could extend downstream over distances of up to several miles beyond which natural processes would attenuate the impacts. The perception of water quality impacts for salmon fishers and other resources users could extend beyond the area of actual effects.

How Alternative 3B Changes Impacts to Aquatic Resources of the Kuskokwim River – Section 3.13.3.2.2 of the Final EIS finds that potential impacts from barge traffic on migrating adult salmon are expected to be unnoticeable. Also, the Final EIS concludes that the Proposed Action is unlikely to cause noticeable changes in fish behavior and that no noticeable incidents of injury or mortality to individual fish would likely occur. The Final EIS reports that impacts from prop wash scour on anadromous or resident fish and aquatic life would be limited to mainstem channel areas (Section 3.13.3.2.2). Scouring could displace, injure, or cause mortalities to eggs of rainbow smelt. As a result of reduced barge traffic under Alternative 3B, the potential effects of prop wash scour from barge traffic on migrating and rearing fish in confined and shallow sections of the navigation channel would be reduced from the Proposed Action. The Final EIS concludes that under Alternative 3B, impacts would be similar to that described for Alternative 2, but less likely to occur due to the reduced number of barge trips.

Barge actions under Alternative 2 are not expected to have perceptible impacts on surface water quality (Final EIS Section 3.7.3.2.2). The Final EIS also concludes that potential barge wake induced erosion could occur but would not be distinguishable from natural bank erosion on the Kuskokwim River (Final EIS Section 3.11.4.2.2). The reduced barging under Alternative 3B would have little effect on surface water quality or bank erosion.

How Alternative 3B Changes Impacts to Subsistence – As noted earlier, Alternative 3B will require readiness to respond to spills from the diesel pipeline and will require maintenance of roads and airstrips that would have been reclaimed after construction and made unusable under Alternative 2. As a result, Alternative 3B is expected to result in increased access by out of region hunters and trappers using airplanes. This will result in increased competition for subsistence users along the Pipeline right of way. The 25 additional surveillance flights per year would also cause disturbance of subsistence resources and users.

In comparison, barging under Alternative 2 would potentially interfere with subsistence fishing, primarily in several narrow reaches of the river. In response to concerns by local residents and subsistence users of the river, Donlin Gold will implement a communication program to keep local communities informed of the barge schedules and current status of barge traffic as well as minimize displacement of subsistence fishing by barges (see Final EIS, Appendix W, for Donlin Gold's Barge Communication Plan). Donlin Gold has also committed to two subcommittees, the Barge Subcommittee and the Subsistence Subcommittee, managed under the purview of the DATROC.

The Barge Communication Plan and the subcommittees under DATROC would reduce impacts under Alternative 2. Alternative 3B would reduce Project related barging by eliminating the diesel barges, thereby reducing the impact from Alternative 2.

Summary of LEDPA Analysis for Alternative 3B – Alternative 3B increases direct impacts to WOUS by between approximately 150 to 240 acres. Other environmental impacts represent tradeoffs:
• Alternative 3B eliminates the risk of barge related diesel spills on the Kuskokwim River during operations but adds the risk of larger pipeline spills to 334 miles of land and streams along the route;

• Alternative 3B increases the amount of ship traffic and diesel transfer in critical habitat for Cook Inlet beluga whales;

• Alternative 3B reduces barge related impacts to resources of the Kuskokwim River such as fish, water quality, bank erosion, and propeller scour;

• Alternative 3B reduces impacts to subsistence fishing on the Kuskokwim River but introduces new competition for subsistence resources along the Pipeline route through the roads and airstrips that would need to be maintained for spill response readiness; and

• Alternative 3B requires 25 additional surveillance flights per year that would disturb wildlife and subsistence users.

The Corps finds that Alternative 3B increases impacts to WOUS. While other environmental impacts such as potential impacts to rainbow smelt may be reduced by Alternative 3B, it represents an increased risk from oil spills, increased competition for subsistence resources, and increased vessel activity in critical habitat for Cook Inlet beluga whales. The Corps has determined Alternative 3B is not the LEDPA.

Alternative 4 – Birch Tree Crossing Port

Alternative 4 was a concept the Applicant considered prior to initiation of permitting and would have a longer road but a shorter barring distance. Alternative 4 would construct the upriver port at Birch Tree Crossing. Under Alternative 4, river barges would not ply the 75 river miles between Birch Tree Crossing and Jungjuk and not pass the communities of Aniak, Chuathbaluk, and Napaimute. A 76-mile road to the Mine Site would be required and would be about 46 miles longer than the road for Alternative 2. The alternative increases direct impacts to WOUS by approximately 345 acres and increases indirect impacts by approximately 1,380 acres.

There would be 11 fewer water body crossings (2 more bridges, 13 fewer culverts).

How Alternative 4 Changes Impacts to Aquatic Resources of the Kuskokwim River – Section 3.13.3.2.2 of the Final EIS finds that potential impacts from barge traffic on migrating adult salmon are expected to be unnoticeable. Also, the Final EIS concludes that the Proposed Project is unlikely to cause noticeable changes in fish behavior and that no noticeable incidents of injury or mortality to individual fish would likely occur. The Final EIS reports that impacts from prop wash scour on anadromous or resident fish and aquatic life would be limited to mainstem channel areas (Section 3.13.3.2.2). Scouring could displace, injure, or cause mortalities to eggs of rainbow smelt. Alternative 4 would have the same impacts as Alternative 2 up to Birch Tree Crossing but would eliminate all barge related impacts upstream except for a small number of barges during construction.

Barge actions under Alternative 2 are not expected to have perceptible impacts on surface water quality (Final EIS Section 3.7.3.2.2). The Final EIS also concludes that potential barge wake induced erosion would not be distinguishable from natural bank erosion on the Kuskokwim River (Final EIS Section 3.11.4.2.2).
How Alternative 4 Changes Impacts to Subsistence – Alternative 4 would eliminate barge-related impacts upstream of Birch Tree Crossing except for a small number of barges during construction. However, the longer access road under Alternative 4 (additional 46 miles) would cross through moose, black bear, waterfowl, and berry picking subsistence areas for Aniak and Chuathbaluk residents.

Barging under Alternative 2 would potentially interfere with subsistence fishing in several narrow reaches of the river. As mentioned above, Donlin Gold’s Barge Communication Plan and the subcommittees under DATROC would reduce these impacts.

Summary of LEDPA Analysis for Alternative 4 – Alternative 4 increases direct impacts to WOUS by approximately 345 acres and increases indirect impacts by approximately 1,380 acres. Other environmental impacts represent tradeoffs:

- Alternative 4 nearly eliminates barge-related impacts between Birch Tree Crossing and Jungjuk to resources of the Kuskokwim River such as fish, water quality, bank erosion, and propeller scour;
- Alternative 4 nearly eliminates impacts to subsistence fishing between Birch Tree Crossing and Jungjuk but has no change downstream of Birch Tree Crossing;
- Alternative 4 would cross through moose, black bear, waterfowl, and berry picking subsistence areas for Aniak and Chuathbaluk residents.

The Corps finds that Alternative 4 increases impacts to WOUS. While other environmental impacts such as potential impacts to rainbow smelt and interference with subsistence fishing may be reduced by Alternative 4, the road would cross through important subsistence areas. The Corps has determined Alternative 4 is not the LEDPA.

**Alternative 6A – Dalzell Gorge Pipeline Route**

Alternative 6A was the Applicant’s original proposed pipeline alignment through the Alaska Range. In December 2013, Donlin Gold revised their Plan of Development in favor of the currently proposed alignment which avoids Dalzell Gorge. Alternative 6A increases direct and indirect impacts to WOUS by approximately 105 acres. It would also increase impacts to the Iditarod National Historic Trail to include 20 additional crossing, 15 more miles of pipeline in close proximity for a greater length, and 12 more miles of co-located sections. There would be 3 fewer total pipeline miles and 3 fewer new airstrips required but one more existing airstrip used. The route would also pose greater geotechnical hazard from unstable slopes than corresponding Alternative 2 segment.

Alternative 6A would increase impacts to WOUS, the Iditarod National Historic Trail, and not provide any substantial benefits. The Corps has determined Alternative 6A is not the LEDPA.

**LEDPA Determination**

Based on the evaluation above, the Corps concludes that Alternative 2 North Option is the LEDPA. This alternative meets the overall Project purpose, is practicable in consideration of costs, logistics, and exiting technology, and has the least total direct impacts (excavation, fill, vegetation clearing) and potential indirect impacts (dust, dewatering) to WOUS of the practicable alternatives (see Final EIS Section 3.11). Table B2 summarizes the analysis for determining the LEDPA.
Table B8: Summary of LEDPA Analysis

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Practicability Analysis</th>
<th>Comparison of Environmental Impacts to Alternative 2 North Option</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative 1 – No Action</td>
<td>Not practicable - does not meet the overall Project purpose</td>
<td>Not applicable – alternative does not meet overall Project purpose.</td>
<td>Not LEDPA</td>
</tr>
<tr>
<td>Alternative 2 – North Option</td>
<td>Practicable</td>
<td>5,545 acres of direct and indirect impacts to WOUS. Of these, 4,285 are direct impact acres, and 1,260 are indirect impact acres. 58 diesel barge trips and 58 cargo barge trips per year on the Kuskokwim River during operations during open water. Nine new airstrips for pipeline construction that would be reclaimed and made unusable. Limited shipping (only during pipeline construction) in Cook Inlet Beluga critical habitat.</td>
<td>LEDPA</td>
</tr>
<tr>
<td>Alternative 3A – Reduced Diesel Barging: Liquefied Natural Gas Powered Haul Trucks</td>
<td>Not practicable - as of the time of the Final EIS and this JROD, trucks of the planned payload capacity are not proven or commercially available.</td>
<td>Not applicable – alternative is not practicable due to existing technology.</td>
<td>Not LEPDA</td>
</tr>
<tr>
<td>Alternative 3B – Reduced Diesel Barging: Diesel Pipeline (includes Port MacKenzie Option and Collocated Diesel and Natural Gas Pipelines Option)</td>
<td>Practicable</td>
<td>Increases direct impacts to WOUS by 160 acres. Port MacKenzie Option increases direct impacts to WOUS by 150 acres. Collocated Option increases direct impacts to WOUS by 200 acres. The Collocated Option configured with Port MacKenzie increases direct impacts to WOUS by 240 acres. Eliminates Project-related diesel barging on the Kuskokwim River during operations. There would be less on-site diesel storage required. Requires maintenance of the nine new airstrips used for pipeline construction for oil spill response readiness. These airstrips would cause increased competition for subsistence resources. There would be at least 25 more surveillance overflights per year. Diesel spills from the pipeline could be difficult to detect and occur under ice and snow in the winter. There would be about 20 more pipeline miles. Shoofly roads would need to be left in place along the pipeline for oil spill response. Increased ship activity in Cook Inlet Beluga critical habitat (12 fuel barge round trips per year during operations).</td>
<td>Not LEPDA</td>
</tr>
</tbody>
</table>
### Table B8: Summary of LEDPA Analysis

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Practicability Analysis</th>
<th>Comparison of Environmental Impacts to Alternative 2 North Option</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative 4 – Birch Tree Crossing Port</td>
<td>Practicable</td>
<td>Increases direct and indirect impacts to WOUS by 1,725 acres (345 more direct impact acres, and 1380 more indirect impact acres). There would be 15 fewer water body crossings (2 more bridges, 17 fewer culverts). Port size would be about 45 acres greater. Barges would not ply the 75 river miles between Birch Tree Crossing and Jungjuk and not pass the communities of Aniak, Chuathbaluk, and Napaimute. The longer access road (additional 46 miles) would cross through moose, black bear, waterfowl, and berry picking subsistence areas for Aniak and Chuathbaluk residents. There would be an additional 47 material sites required.</td>
<td>Not LEPDA</td>
</tr>
<tr>
<td>Alternative 5A – Dry Stack Tailings</td>
<td>Not practicable - technology is not proven for mining operations at the planned throughput rate.</td>
<td>Not applicable – alternative is not practicable due to existing technology</td>
<td>Not LEPDA</td>
</tr>
<tr>
<td>Alternative 6A – Modified Natural Gas Pipeline Alignment: Dalzell Gorge Route</td>
<td>Practicable</td>
<td>Increases direct impacts to WOUS by about 105 acres (no change in indirect impact acres). Increases impacts to the Iditarod National Historic Trail to include 20 additional crossing, 15 more miles of pipeline in close proximity for a greater length, and 12 more miles of co-located sections. There would be 3 fewer total pipeline miles. There would be 3 fewer new airstrips required but one more existing airstrip used. Greater geotechnical hazard from unstable slopes than corresponding Alternative 2 segment.</td>
<td>Not LEPDA</td>
</tr>
</tbody>
</table>
B2.1.1.2 THE PROPOSED DISCHARGE OF DREDGED OR FILL MATERIAL WOULD NOT (SECTION 230.10[B])


(2) Violate toxic effluent standards or prohibitions under section 307 of the Clean Water Act (CWA). The fill material would come from local sources known to be free of human or natural contamination.

(3) Jeopardize the continued existence of any species listed as endangered or threatened species under the Endangered Species Act of 1973 (ESA) or their critical habitat. The Proposed Action, as well as the alternative actions, have been coordinated with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) through informal consultation resulting in a determination of “may affect, not likely to adversely affect” for all listed species in the Project Area.

(4) Violate any requirement imposed by the Department of Commerce to protect marine sanctuaries under Title III of the Marine Protection, Research, and Sanctuaries Act of 1972. This is not applicable as there are no marine sanctuaries in the Project area.

This determination is based on the conclusions of factual determinations and technical evaluation factors of this analysis and takes into account the detailed analysis of impacts on specific physical, chemical, biological and human characteristics of the aquatic ecosystem conducted as part of the Final EIS. Additionally, Subpart H of the Guidelines (see Section B2.7 of this attachment) summarizes key measures that relate to the discharge of fill material into WOUS to minimize adverse effects.

B2.1.1.3 EXCEPT AS PROVIDED UNDER SECTION 404(B)(2), NO DISCHARGE OF DREDGED OR FILL MATERIAL SHALL BE PERMITTED WHICH WILL CAUSE OR CONTRIBUTE TO SIGNIFICANT DEGRADATION OF WATERS OF THE U.S. [SECTION 230.10(C)]

Findings of significant degradation related to the proposed discharge shall be based upon appropriate factual determinations, evaluations, and tests required by subparts B and C, after consideration of subparts C through F. The discharge shall not be permitted if it:

(1) Causes significant adverse effects through pollutants on human health or welfare, municipal water supplies, plankton, fish, shellfish, wildlife, and special aquatic sites. These factors for the Proposed Action, as well as the alternative actions have been thoroughly evaluated. See Sections B2.5.1 – B2.5.4 below.

(2) Causes significant adverse effects through pollutants on life stages of aquatic life and other wildlife dependent on aquatic ecosystems. These factors for the Proposed Action, as well as the alternative actions have been thoroughly evaluated. See Sections B2.1.2.5, B2.1.2.8, and B2.3.1 – B2.3.3 below.

(3) Causes significant adverse effects through pollutants on aquatic ecosystem diversity, productivity, and stability to the loss of fish and wildlife habitat or loss of the capacity of a wetland to assimilate nutrients, purify water, or reduce wave energy. These factors for the
Proposed Action, as well as the alternative actions have been thoroughly evaluated. See Sections B2.2.1 – B2.2.5 below.

(4) Causes significant adverse effects through pollutants on recreational, aesthetic, and economic values. These factors for the Proposed Action, as well as the alternative actions have been thoroughly evaluated. See Sections B2.5.1 – B2.5.4 below.

In letters dated May 31, 2016 and June 27, 2016, the EPA provided information that significant degradation could occur to the Kuskokwim River from barging and to Crooked Creek because of permanent modifications in the watershed. The modifications to Crooked Creek include loss of flows from discharge of fill material into Snow Gulch for the reservoir, American Creek for the waste rock facility, and Anaconda Creek for the tailings storage facility. (Based on hydrologic models, there could also be loss of flows from the groundwater pumping that would occur to dewater the pit; however these flow losses would not be the result of the discharge of fill and are outside the scope of the Corps’ authority.) Tables B3 and B4 quantify the average losses of flow and Tables B5 and B6 quantify the winter losses of flow attributed to the discharge of dredged or fill material (direct impact) and from pit dewatering (indirect impact) into Crooked Creek from Snow Gulch, American Creek, and Anaconda Creek. The indirect impacts assume base-case conductivity (K) bedrock condition. Changes in this condition would only affect the indirect impacts. The effects of the discharge of dredged or fill material would be independent of the bedrock conditions. The direct effect of the discharge of dredged or fill material would cause no more than an approximate 10 percent loss of flow to Crooked Creek.
This page intentionally left blank.
### Table B9: Average Annual Flow Loss – Crooked Creek Tributaries

<table>
<thead>
<tr>
<th></th>
<th>Snow Gulch</th>
<th>American Creek</th>
<th>Anaconda Creek</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline (cfs)</td>
<td>Direct Impacts</td>
<td>Direct + Indirect Impacts</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>cfs</td>
<td>%</td>
</tr>
<tr>
<td>Baseline</td>
<td>4.3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Direct -14</td>
<td>-14</td>
<td>-0.6</td>
<td>6.9</td>
</tr>
<tr>
<td>Indirect 0</td>
<td>0</td>
<td>0</td>
<td>4.3</td>
</tr>
</tbody>
</table>

### Table B10: Average Annual Flow Loss – Crooked Creek

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Crooked Creek&lt;sup&gt;10&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline (cfs)</td>
<td>Direct + Indirect Impacts</td>
</tr>
<tr>
<td></td>
<td>Flow Loss</td>
</tr>
<tr>
<td></td>
<td>%</td>
</tr>
<tr>
<td>Existing</td>
<td>100.2</td>
</tr>
<tr>
<td>Operations</td>
<td>100.2</td>
</tr>
<tr>
<td>Closure&lt;sup&gt;8&lt;/sup&gt;</td>
<td>100.2</td>
</tr>
</tbody>
</table>

**Notes:**
1. Direct = flow loss as a result of blockage of runoff from fill placement for dams, diversion structures, stockpile berms, WRF, TSF impoundment, and seepage recovery system (SRS).
2. Indirect = flow loss as a result of groundwater pumping for pit dewatering in Operations, and maintenance of pit lake level and groundwater flow direction in Closure.
3. Based on median (50th percentile) flow condition and water balance model for average precipitation.
4. All flow loss is from dam and diversion to process plant; no indirect flow loss from pit dewatering.
5. Percent (%) reduction from baseline.
6. Based on base-case hydraulic conductivity (K) bedrock condition for pit dewatering.
7. All flow loss is from TSF blockage and reduced recharge; no indirect flow loss from pit dewatering.
8. Represents flow loss after pit lake fills to managed capacity (Closure Year 52 on).
9. Represents contribution to pit lake pumping and treating from WRF fill seepage and runoff.
10. Below Crevice Creek: represents impacts downstream of all mine structures and fill.
11. Based on average of Mining Years 10 and 20.

cfs = cubic feet per second  
WRF = Waste Rock facility  
TSF = Tailings Storage Facility  
Source: Final EIS Section 3.5 and Appendix G; BGC (2015h); SRK (2017e)
### Table B11: Winter Flow Loss – Crooked Creek Tributaries

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Snow Gulch</th>
<th>American Creek</th>
<th>Anaconda Creek</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline (cfs)&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Direct&lt;sup&gt;1&lt;/sup&gt; Impacts</td>
<td>Baseline (cfs)</td>
</tr>
<tr>
<td></td>
<td>Flow Loss&lt;sup&gt;4&lt;/sup&gt;</td>
<td>Resulting Flow (cfs)</td>
<td>%&lt;sup&gt;5&lt;/sup&gt;</td>
</tr>
<tr>
<td>Existing</td>
<td>0.9&lt;sup&gt;9&lt;/sup&gt;</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Operations</td>
<td>0.9</td>
<td>-66</td>
<td>-0.6&lt;sup&gt;10&lt;/sup&gt;</td>
</tr>
<tr>
<td>Closure&lt;sup&gt;8&lt;/sup&gt;</td>
<td>0.9</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### Table B6: Winter Flow Loss – Crooked Creek

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Baseline (cfs)</th>
<th>Direct + Indirect Impacts</th>
<th>Direct Only</th>
<th>Indirect Only</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Flow Loss&lt;sup&gt;9&lt;/sup&gt;</td>
<td>Resulting Flow (cfs)</td>
<td>%&lt;sup&gt;5&lt;/sup&gt;</td>
<td>cfs</td>
</tr>
<tr>
<td>Existing</td>
<td>45.4</td>
<td>0</td>
<td>0</td>
<td>45.4</td>
</tr>
<tr>
<td>Operations</td>
<td>45.4</td>
<td>-16&lt;sup&gt;15&lt;/sup&gt;</td>
<td>-7.3</td>
<td>38.1</td>
</tr>
<tr>
<td>Closure&lt;sup&gt;8&lt;/sup&gt;</td>
<td>45.4</td>
<td>-14&lt;sup&gt;3&lt;/sup&gt;</td>
<td>-6.4</td>
<td>39.0</td>
</tr>
</tbody>
</table>

**Notes:**
1. Direct = Flow loss as a result of blockage of runoff from fill placement for dams, diversion structures, WRF, stockpile berms, TSF impoundment, and SRS.
2. Indirect = Flow loss as a result of groundwater pumping for pit dewatering in Operations, and maintenance of pit lake level and groundwater flow direction in Closure.
3. Based on average of monthly flow rates from November to March under median (50th percentile) flow conditions (Final EIS Appendix G).
4. All flow loss is from dam and diversion to process plant; no flow loss from pit dewatering.
5. Percent (%) reduction from baseline.
6. Based on base-case hydraulic conductivity (K) bedrock condition for pit dewatering.
7. All flow loss is from TSF blockage and reduced recharge; no indirect flow loss from pit dewatering.
8. Average of 25 periodic winter (November to March) measurements (BGC 2012a; Donlin Gold 2017c).
9. Represents flow loss after pit lake fills to managed capacity (Closure Year 52 on).
10. Assumes all demand for process water from Snow Gulch Reservoir would occur in January through March (SRK 2017e).
11. Assumes all water extraction from American creek watershed in winter is from year-round pit dewatering; i.e., there would be no runoff in winter to be blocked by fill.
12. Based on proportion of flow to pit lake that comes from WRF fill seepage and runoff.
13. While no pit lake pumping would occur in winter (SRK 2017e), groundwater would continue to flow towards pit lake in winter due to lowered lake levels, drawing flow from 14.
14. Below Crevice Creek: represents impacts downstream of all mine structures and fill.
15. Based on average of Mining Years 10 and 20.

**Units:**
cfs = cubic feet per second
WRF = Waste Rock facility
TSF = Tailings Storage Facility

**Sources:** Final EIS Section 3.5 and Appendix G; BGC (2012a, 2015h); Donlin Gold (2017c); SRK (2017e)
The District’s authority is limited to regulating the discharge of dredged or fill material into WOUS. The Alaska Department of Natural Resources Division of Water (ADNR-Water) is responsible for managing water in the State and has the authority to render a decision on whether establishment of a minimum instream flow is necessary to comply with the Anadromous Fish Act (AS 16.05.871-.901) and the Fish Passage Act (AS 16.05.841). Donlin Gold has stated they recognize the concerns regarding predicted flow losses in Crooked Creek and they have engaged the appropriate State agencies to work within the State permit process to address this issue. Since stream flow changes will occur slowly over an extended period of time and unknowns exist, the ADF&G has recommended Donlin Gold incorporate the establishment of a field monitoring program into their ADF&G application with provisions for making adaptive changes as needed to ensure the proper protection of aquatic resources in Crooked Creek (See Final EIS Section 5.2, Table 5.2-1, Design Feature A33, Crooked Creek Substrate Freezing Monitoring and Subsequent Mitigation Plan).

The primary measures to be implemented to avoid significant degradation of the Kuskokwim River and Crooked Creek include:

- Donlin Gold would develop and implement a rainbow smelt monitoring program to establish additional baseline data for a better understanding of the species’ occurrence and the character, use, and distribution of spawning habitat along the Kuskokwim River. Additionally, Donlin Gold will implement a communication program to keep local communities informed of the barge schedules and current status of barge traffic as well as minimize displacement of subsistence fishing by barges (see Final EIS, Appendix W, for Donlin Gold’s Barge Communication Plan). Donlin Gold has also committed to two subcommittees, the Barge Subcommittee and the Subsistence Subcommittee, managed under the purview of the DATROC. The Corps has concluded that while there would be impacts to the Kuskokwim River, with implementation of the rainbow smelt monitoring program, the communication program, and the subcommittees under DATROC, there would be no significant degradation of Kuskokwim River WOUS.

- Donlin Gold states they have applied for water rights authorization from the State and will comply with the monitoring requirements under that certificate as well, which is typically based on consultation with ADF&G. Donlin Gold has developed an Aquatic Resources Monitoring Plan Draft Framework in anticipation of producing a final ARMP for Crooked Creek under the provisions of its Title 16 fish habitat permits administered by the ADF&G. The ARMP will include aquatic resource monitoring throughout Crooked Creek and its tributaries upstream and downstream from the Mine Site, to include fish surveys, habitat, sediment, fish tissue, and flow monitoring. Flow monitoring will address both summer and winter flow conditions. The ARMP will provide for reporting to ADF&G and will require specific action by Donlin Gold if the data show variability from the predicted results on aquatic resources (to include flow). The actions that could be taken to reduce unexpected flow loss include but would not be limited to lining or relocating portions of the stream channel, augmenting flows from the Snow Gulch Reservoir or the Kuskokwim River, or grouting areas of bedrock demonstrating high flow rates (Final EIS Chapter 5). The Corps has concluded that while there would be impacts to Crooked Creek, with stipulation of permit conditions established by the State of Alaska, implementation of the ARMP, and the availability of actions than can be taken reduce unexpected flow loss, there would be no significant degradation of Crooked Creek WOUS.
The Corps finds that with the inclusion of the mitigation measures identified by the Applicant as part of the proposed Project, compensatory mitigation for unavoidable losses of WOUS, and additional mitigation measures in the form of special conditions, applied by the Corps (Section 6.0 of this JROD), the proposed Project would not cause or contribute to significant degradation of the WOUS. This determination is based on the conclusions of factual determinations and technical evaluation factors of this analysis and takes into account the detailed analysis of impacts on specific physical, chemical, biological and human characteristics of the aquatic ecosystem conducted as part of the Final EIS. Additionally, Subpart H of the Guidelines (see Section B2.7 of this attachment) summarizes key measures that relate to the discharge of fill material into WOUS to minimize adverse effects.

B2.1.1.4 MINIMIZATION OF POTENTIAL ADVERSE IMPACTS (SECTION 230.10[D])

Except as provided under Section 404(b)(2), no discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem. B2.7 Subpart H (below) identifies such possible steps.

B2.1.2 FACTUAL DETERMINATIONS (SECTION 230.11)

The determinations of potential short or long-term effects of proposed discharges of dredged or fill material on the physical, chemical and biological components of the aquatic environment are discussed below. These “factual determinations” are used to evaluate compliance with the second Guidelines compliance test (Restrictions on Discharges – see Section B2.1.1 above). The analysis of these determinations is based on findings of technical evaluation factors (Guidelines Subparts C through F – see Sections B2.2 through B2.5).

Measures identified to minimize impacts to each of the determinations outlined below can be found in the 2017 Plan of Operations Reclamation and Closure Plan: Volume 4; Final EIS, Chapter 5, Section 5.2, Design Features Proposed by Donlin Gold, and Standard Permit Conditions and BMPs discussed in Section 5.3; and Block 23 of the June 2018 updated Compensatory Mitigation Plan.

B2.1.2.1 PHYSICAL SUBSTRATE DETERMINATIONS (SECTION 230.11[A], 230.20)

References: Final EIS in Sections 3.1 (Geology), 3.2 (Soils), 3.5 (Surface Water Hydrology), and 3.11; Preliminary Jurisdictional Determination reports (Michael Baker 2016, 2017a, 2017 as cited in the Final EIS)

Ultimately the Project would result in a permanent loss of 2,877 acres of wetland substrates and 172,844 linear feet of stream substrates and the temporary loss (primarily those occurring along the Pipeline corridor) of 538 acres of wetland substrates and 53.346 linear feet of stream substrates. Indirect impacts would disturb a total of about 1,260 acres of wetlands substrates from dust and dewatering, of which 635 acres are dust impacts in the Mine Site; about 430 acres are overlapping dewatering impacts in the Mine Site, and about 630 acres are dust impacts in the Transportation Corridor. Indirect impacts would disturb of total of about 65,470 linear feet of streams due to dust and dewatering (including an overlapping 34,850 linear feet due to dewatering in the Mine Site).

The Applicant has incorporated measures to avoid and minimize impacts of the proposed Project to the physical substrate. The intensity of Project effects to physical substrate would be
reduced through effective design, reclamation, and use of BMPs. Additionally, Subpart H of the Guidelines (see Section B2.7 of this attachment) summarizes key measures that relate to the discharge of fill material into WOUS to minimize adverse effects.

Key measures applicable to physical substrate include:

- **A Fugitive Dust Control Plan and air quality permit requirements** will be followed that describe Best Available Control Technologies and source testing for particulate matter emissions, best management practices (BMPs) for controlling dust from site activities (including roads) and wind erosion, and training and performance assessment procedures (ADEC 2017i). These actions are required for an Applicant to meet ADEC, Division of Air Quality, requirements per 18 Alaska Administrative Code (AAC) 50.010, Ambient Air Quality Standards. Construction practices would meet requirements for air quality protection permits outlined in 18 AAC 50.502 (b). Donlin Gold LLC was issued an ADEC Air Quality Control Construction Permit on June 30, 2017 ( Permit AQ0934CPT01).

- **Erosion control and construction methods** will be described in the Donlin Gold Stormwater Pollution Prevention Plan (SWPPP). The SWPPP is required by ADEC Division of Water for an Applicant to acquire a Construction General Permit (CGP) for Storm Water Discharges for Large and Small Construction Activities (2016 CGP, AKR100000). The goal of the 2016 CGP is to minimize erosion and reduce or eliminate the discharge of pollutants, such as sediment carried in storm water runoff from construction sites, through implementation of appropriate control measures for embankment stabilization, including contouring and seeding will be employed Project-wide to reduce embankment erosion and potential sediment runoff into WOUS.

- **Most areas underlain by permafrost** will be crossed during winter to minimize disturbance from trenching for the Pipeline (CMP, Block 23, July 2018). A seasonal construction timeline minimizes impacts to WOUS, by timing construction activities in lowlands in the winter and in uplands during the summer. Approximately 60-percent of the total Pipeline length would be constructed during frozen winter conditions to minimize wetland and soil disturbances from equipment (delineated in the Pipeline Construction Execution Plan of December 2016). Snow and ice roads with frost packing will provide a stable surface for equipment to operate.

- **Monitoring of bank erosion** immediately upstream and downstream of Angyaruaq (Jungjuk) port will continue, with measures applied, as warranted, for streambank protection as part of adaptive management (as a Standard Operating Procedure). If warranted, this may include installation of geotextile matting, riprap armor or methods from the ADF&G Streambank Revegetation and Protection Manual (Walter et al. 2005), such as willow staking, to reduce the effects of eddy formation, scour, and bank erosion during flood events (BGC 2014e).

With Applicant design features and inclusion of special conditions, the proposed Project would comply with this factor of the Guidelines.

**B2.1.2.2 WATER CIRCULATION, FLUCTUATION AND SALINITY DETERMINATIONS**

*(SECTION 230.11[B], 230.22 – 230.25)*
The proposed Project will adversely impact water quality and chemistry as a result of geochemical alteration of mined rock and its interaction with air and water, mercury deposition from stacks and fugitive dust, and potentially sedimentation and turbidity from construction of Project component facilities and barging in shallow areas along the Kuskokwim River. Discharges at the Mine Site to Crooked Creek and its tributaries would be subject to Alaska Pollutant Discharge Elimination System (APDES) permit conditions which include effluent quality limitations that are protective of existing uses. Impacts from barging and during Pipeline construction would be temporary and intermittent.

Most effects from the Project on water circulation, patterns, and fluctuations would occur within the Mine Site. Surface water resources would be affected in a local area of approximately 20 square miles encompassing the pit, WRF, and TSF. Watershed disturbances from construction of Mine Site facilities combined with indirect impacts from dewatering of the pit area would affect streamflow by altering the amount of runoff that reaches streams and the amount of water that percolates to the groundwater that may contribute to streamflow in Crooked Creek. Development of Mine Site facilities would result in permanent changes to flow patterns of Crooked Creek, a complete loss of flows in American Creek, and the loss of substantial flows from Anaconda Creek. Surface flows would be rerouted around some of the constructed facilities and reintroduced downstream where the flow patterns in undisturbed areas below the fills would be reestablished. The highest intensity surface water impacts (dewatering losses and tributary diversions) would occur throughout Operations and the early closure period. After the pit lake achieves its maximum managed stage the magnitude of the effects would be reduced so that changes in water quantity are likely to be within the limits of historic seasonal variation.

Construction of the Pipeline and access road could result in localized short-term impacts to streamflows. Construction of the Angyaruaq (Jungjuk) Port would have minimal effects on circulation and fluctuation.

Impacts to salinity gradients, where salt water from the ocean meets and mixes with freshwater from land are not expected to result from Project activities.

The Applicant has incorporated measures to avoid and minimize impacts of the proposed Project to water quality, circulation, and water fluctuation. The intensity of Project effects to water quality, circulation, and fluctuation would be reduced through effective design, water management, use of BMPs, and compliance with State-issued APDES and waste management permits. Additionally, Subpart H of the Guidelines (see Section B2.7 of this attachment) summarizes key measures that relate to the discharge of fill material into WOUS to minimize adverse effects.

Key measures applicable to water quality, circulation, and fluctuation include:

- Donlin Gold has developed an Aquatic Resources Monitoring Plan Draft Framework in anticipation of producing a final ARMP under the provisions of its Title 16 fish habitat permits administered by the ADF&G. The ARMP will include aquatic resource monitoring throughout Crooked Creek and its tributaries upstream and downstream from the Mine Site, to include fish surveys, habitat, sediment, fish tissue, and flow
monitoring. Flow monitoring will address both summer and winter flow conditions. The ARMP will provide for reporting to ADF&G and will require specific action by Donlin Gold if the data show variability from the predicted results on aquatic resources (to include flow). The actions that could be taken to reduce unexpected flow loss include but would not be limited to lining or relocating portions of the stream channel, augmenting flows from the Snow Gulch Reservoir or the Kuskokwim River, or grouting areas of bedrock demonstrating high flow rates (Final EIS Chapter 5).

- The APDES 5-year permit would be reevaluated, as required, including water flow models and/or pit lake modeling as appropriate. The adequacy of post-Closure Water Treatment Plant technology would also be reevaluated as pit lake water monitoring is conducted; and treatment technologies would be adjusted, as necessary, as a result of this evaluation;

- Post-closure sediment controls would include site grading and capping of erodible material, revegetation, and re-routing of surface runoff to reestablish natural conditions;

- The Project design at the Mine Site includes water management strategies that would maintain flow and storage within the design capacity of structures, provide flexibility for extra storage in high precipitation years, and sufficient water supplies for processing in low precipitation years, and minimize storage if not needed through water treatment and discharge;

- The Project design includes streamflow monitoring and dam inspections (SRK 2016h) to continually provide data for water management and dam safety purposes;

- Donlin Gold would implement barge guidelines for operating at certain river flow rates, and conduct ongoing surveys of the Kuskokwim River navigation channel to identify locations that should be avoided to minimize effects on bed scour and the potential for barge groundings. As part of the proposed operation, equipment will be available to free or unload/lighter barges in the event of groundings. The equipment will be available as part of ongoing operations, it will not all be dedicated standby equipment.

With Applicant design features, the proposed Project would comply with this factor of the Guidelines.

B2.1.2.3 SUSPENDED PARTICULATE/TURBIDITY DETERMINATIONS (SECTION 230.11[C], 230.21)

References: Final EIS Sections 3.5 (Surface Water Hydrology), 3.7 (Water Quality), and Section 3.13 (Fish and Aquatic Resources); Final EIS Appendix F (Supplemental Soil Information); Water Resources Management Plan (SRK 2017a); Aquatic Resources Monitoring Plan.

Increases in suspended particulates and turbidity are expected at the Mine Site during in-stream construction. Erosion of cleared stream banks in the American Creek and Anaconda Creek watersheds are also expected during construction. Placement of fill during construction of the Angyaruaq (Jungiuk) Port would have the potential to cause localized erosion and resuspension of fine-grained sediments in the Kuskokwim River. Additionally, increases in suspended particulates and turbidity may occur at various stream crossings during Pipeline construction.

In order to minimize impacts to water quality from erosion, runoff and sedimentation, an important part of Donlin Gold’s water management strategy for construction involves diversion
structures that would direct surface water and runoff from precipitation around and away from the exposed areas (see Final EIS Section 3.2, Soils). By minimizing the rates of flow over the cleared areas, impacts from erosion and sedimentation would be controlled so that surface water quality would be expected to comply with all AWQC during the construction phase. Energy dissipating and erosion control features would be installed or modified as required to meet APDES discharge requirements.

Stormwater runoff would be managed for all construction-related activities and during operation of the mine through BMPs and erosion and sediment control (ESC measures), which will be detailed in Donlin Gold’s SWPPPs. Donlin Gold’s Draft Transportation and Mine Facility Erosion and Sediment Control Plan (Donlin Gold 2018) discusses the applicability of stormwater management (e.g., construction general permit or multi-sector general permit) across the various Project components and phases. ESC measures will be implemented prior to any ground-disturbing activities. Additionally, Subpart H of the Guidelines (see Section B2.7 of this attachment) summarizes key measures that relate to the discharge of fill material into WOUS to minimize adverse effects.

With Applicant design features and inclusion of special conditions, the proposed Project would comply with this factor of the Guidelines.

B2.1.2.4 CONTAMINANT DETERMINATIONS (SECTION 230.11[DJ])

References: Final EIS Sections 3.5 (Surface Water Hydrology), 3.6 (Groundwater Hydrology), and 3.7 (Water Quality), and Section 3.13 (Fish and Aquatic Resources); Final EIS Appendix F Supplemental Soil Information.

The following information has been considered in evaluating the biological availability of possible contaminants in dredged or fill material for all alternatives:

- Results from previous testing of the material or similar material in the vicinity of the Project. (See Final EIS Section 3.2.3.2.4 and Appendix F)
- Spill records for petroleum products or designated (Section 311 of CWA) hazardous substances. (See Final EIS Section 3.2.3.2.4 and Appendix F)
- Other public records of significant introduction of contaminants from industry, municipalities or other sources. (See Final EIS Section 3.2.3.2.4 and Appendix F)
- Known existence of substantial material deposits of substances which could be released in harmful quantities to the aquatic environment by man-induced discharge activities (See Final EIS Section 3.2.3.2.4 and Appendix F)

Dredge or fill material associated with the Mine Site, Transportation Corridor, and Pipeline will consist of native soils and parent material of native soils from borrow areas and other excavations in the Project area. Some of these materials will be stockpiled and reused for reclamation, and this would not be expected to introduce, relocate, or increase contaminants with implementation of erosion and sediment control measures. Non-acid generating rock, including waste rock and material from borrow sites, would be used for construction at the Mine Site. Material sites at the Mine Site, mine access road, and Pipeline would be evaluated prior to use for metals leaching and acid rock drainage (ARD) potential in final design using bulk geochemistry analysis, meteoric water mobility procedure (MWMP), and acid-base
accounting (ABA) methods. Alternative sites would be selected if results indicate the potential for impacts to downgradient water resources.

As discussed in the Final EIS Section 3.2.3.2.4, Soil Quality/Contaminated Sites, a review of public-record documents available from local, state, and federal agencies was conducted to identify possible impacts to the Project and from Project activities due to the presence of contaminated sites. No contaminated sites are present within the Mine Site Project boundaries. Contaminated sites were identified within the Project vicinity for the Transportation Corridor and Pipeline components. However, most of these sites are unlikely to have an effect on Project activities because they are outside areas that would be disturbed by construction activities. As stated in Section 5.2 of the Final EIS (Design Feature A11 in Table 5.2-1), Donlin Gold’s Project design includes evaluating material sites at the Mine Site, mine access road, and Pipeline (prior to use) for metals leaching and ARD potential in final design using bulk geochemistry analysis, MWMP, and ABA methods. Alternative sites would be selected if results indicate the potential for impacts to downgradient water resources. Because of the remote undeveloped nature the material sources, these sites are not expected to contain contaminants such as pesticides or petrochemicals from previous activities which would trigger additional testing.

Based on an evaluation of the information above, there is no reason to believe the material to be discharged in the WOUS would contain contaminants. With the inclusion of special conditions, the proposed Project would comply with this factor of the Guidelines.

B2.1.2.5 AQUATIC ECOSYSTEM AND ORGANISM DETERMINATIONS (SECTION 230.11[E])

References: Final EIS Sections 3.11 (Wetlands) and 3.13 (Fish and Aquatic Resources); Final EIS Appendix Q (Essential Fish Habitat Assessment); Water Resources Management Plan (SRK 2017a); Aquatic Resources Monitoring Plan.

Impacts to the aquatic ecosystem and organisms are discussed in more detail under Subpart D (Section B2.3.2). The Project would result in direct habitat removal, wetland removal, streamflow and temperature changes, and sedimentation. These effects would impact migration, spawning, or rearing life stages of Pacific salmon and other anadromous or resident fish species and aquatic habitat in the Crooked Creek drainage near the Mine Site. Just less than 8 miles of streambed (in American and Anaconda creeks and portions of Snow and Lewis gulches) would be eliminated to construct various Mine Site facilities. Of this, less than one mile is classified as anadromous waters and regulated as Essential Fish Habitat (EFH). Along the Transportation Corridor, depending on water conditions, Project-related barge/tug propeller forces along the Kuskokwim River travel route may create riverbed scour, particularly in narrow and shallow segments of the river. In combination with existing boat traffic, this could degrade habitat and disturb or destroy fish eggs, larvae, or juveniles. Impacts to aquatic ecosystems from construction of the transportation and Pipeline facilities would generally be limited to the construction period primarily at stream crossings.

The Applicant has incorporated measures to avoid and minimize impacts of the proposed Project to the aquatic ecosystem. Subpart H of the Guidelines (see Section B2.7 of this attachment) summarizes key measures that relate to the discharge of fill material into WOUS to minimize adverse effects.

Key measures specifically applicable to the aquatic ecosystem and organisms include:
• Donlin Gold has developed an Aquatic Resources Monitoring Plan Draft Framework in anticipation of producing a final ARMP. The ARMP would be developed in conjunction with ADF&G and ADNR through habitat and water rights permitting processes. The objectives of the plan are to: 1) monitor for major changes to aquatic communities, 2) monitor for smaller scale and incremental changes to aquatic communities, and 3) guide results-based refinement to the monitoring program. The plan would build on the existing baseline dataset and include both biological and flow components, including: fish presence/abundance, invertebrate and periphyton sampling, and fish metals analysis; flow monitoring and winter surface water sampling to characterize fish habitat/passage and freezedown patterns; sediment sampling; and collection of additional geology and hydrology data to refine understanding of dewatering and groundwater/surface water flow dynamics (Donlin Gold 2018a,b; Owl Ridge 2017c). The ongoing data collection would be used in an adaptive management approach to refine the understanding of the dynamics surrounding Crooked Creek flow in winter as well as the open water seasons and to identify the most effective measures that can be used to ensure that minimum flows in Crooked Creek are maintained. If the Project results in minimal losses to Crooked Creek flows, adaptive management measures may be unnecessary. If flow losses warrant a response, a range of measures could be considered that include but would not limited to: lining or relocating portions of the stream channel; augmenting flows from the Snow Gulch Reservoir; pumping water from the Kuskokwim River, or grouting areas of bedrock demonstrating high flow rates. (Donlin Gold 2018a);

• Donlin Gold would develop and implement a rainbow smelt monitoring program to establish additional baseline data for a better understanding of the species’ occurrence and the character, use, and distribution of spawning habitat along the Kuskokwim River. Survey methodology would likely include documenting sex ratio and age structure of the population and if possible, fecundity of females. Initially, surveys would be conducted annually to document the age structure of the rainbow smelt population and further document spawning patterns. Once an adequate baseline is established, regular sampling would be used to monitor for changes to existing patterns. The frequency of surveys over the long-term would depend on previous results and whether the data indicate a potential shift. If rainbow smelt population changes are observed over a defined time period, additional work would need to be undertaken to investigate the reason for those changes. If observed changes were attributed to Project-related activities, Donlin Gold would implement an assessment of measures available to address or mitigate those activities. Such activities would be coordinated with the DATROC Subsistence Subcommittee (Donlin Gold 2018a);

• Donlin Gold would implement barge guidelines for operating at certain river flow rates, and conduct ongoing surveys of the Kuskokwim River navigation channel to identify locations that should be avoided to minimize effects on bed scour and the potential for barge groundings. As part of the proposed operation, equipment will be available to free or unload/lighter barges in the event of groundings. The equipment will be available as part of ongoing operations, it will not all be dedicated standby equipment; and

• Culverts and bridges on transportation routes would be designed for fish passage.
With Applicant design features, the proposed Project would comply with this factor of the Guidelines.

**B2.1.2.6 PROPOSED DISPOSAL SITE DETERMINATION (SECTION 230.11[F])**

The Project does not involve open water disposal of material; therefore, this factual determination does not apply.

**B2.1.2.7 DETERMINATION OF CUMULATIVE EFFECTS OF THE AQUATIC ECOSYSTEM (40 CFR 230.11[G])**

**References:** Final EIS Chapter 4 (Cumulative Effects)

An assessment of cumulative effects takes into consideration the consequences of past, present and reasonably foreseeable future projects had, have, or will have on an ecosystem. Its impacts on the environment must be assessed in light of historical permitting activity, along with anticipated future activities in the area. Although a particular project may constitute a minor impact in itself, the cumulative impacts that result from a large number of such projects could cause a significant impairment of water resources and interfere with the productivity and water quality of existing aquatic ecosystems. We have reviewed the cumulative effects discussion in the Final EIS and find it to be a sufficient and accurate assessment.

The cumulative impacts expected from the proposed Project are permanent impacts to 2,877 acres of WOUS. Reasonably foreseeable future actions include mineral exploration activities at the Donlin Gold Mine development that the Applicant has been conducting in recent years.

The intensity of cumulative impacts attributable to the Project would vary in the Mine Site vicinity. The addition of mercury deposition from Project sources to global sources could result in water and sediment quality that is likely to be within regulatory limits or natural variation on average, but could exceed water quality criteria for total mercury in some areas. Impacts at the Mine Site would result in neither increases nor decreases to the cumulative effects on sediment quality associated with rates of mercury methylation in the Project Area. There would be additive incremental cumulative impacts to surface water and sediment quality along the Transportation Corridor and Pipeline components.

Cumulative effects on surface water hydrology would include Project-related localized noticeable changes in resource character during the life of the Project, and relatively small geographical area of effects on surface water. Cumulative effects on groundwater hydrology would include Project-related acute or obvious changes in the vicinity of the pit during the life of the Project because they are limited to a relatively small area and would be reduced in post-Closure.

The effects of predicted climate change on wetlands may increase in later years of the Project due to warming temperatures and altered precipitation patterns, resulting in permafrost loss, vegetation type changes, a general drying trend, and changed fire regime. The cumulative effects on wetlands, vegetation and fish and aquatic resources are expected to be measurable, but geographically limited.

The placement of fill material due to the reasonably foreseeable future action listed above would directly impact the physical substrate, water, and vegetation, and also cause indirect impacts to the aquatic ecosystem. These other potential impacts would be similar to those identified for the proposed Project. Overall, the Project when combined with past, present, and
reasonably foreseeable future projects, would not result in significant adverse cumulative impacts to aquatic resources with the area of cumulative effect.

Overall, the Project when combined with past, present, and reasonably foreseeable future projects, with the appropriate avoidance, minimization, and compensatory mitigation measures, would not result in significant adverse cumulative impacts to aquatic resources.

Any proposed future projects requiring DA authorization would be evaluated as separate permit actions and the appropriate environmental analysis would be required, including a cumulative effect analysis. Permitting of these projects would be subject to Section 404 of the CWA, including the Guidelines, and/or other appropriate laws and regulations. If the appropriate avoidance, minimization, and compensatory mitigation measures do not result in a Project in compliance with the above regulations, authorization under Section 404 of the CWA could not be authorized.

With Applicant design features and inclusion of special conditions, the proposed Project would comply with this factor of the Guidelines.

**B2.1.2.8 DETERMINATION OF SECONDARY EFFECTS ON THE AQUATIC ECOSYSTEM (40 CFR 230.11[H])**

**References:** Final EIS Chapter 2 (Table 2.3-55) and Chapter 3

Potential secondary effects on the aquatic ecosystem would be avoided and minimized to the maximum extent practicable by requiring special conditions for construction as described in Section B2.7 Subpart H below.

Secondary effects are effects on an aquatic ecosystem associated with a discharge of fill materials, but that do not result from the actual placement of the dredged or fill material. Secondary effects to the aquatic environment include impacts to physical substrate, water quality, vegetation, and aquatic ecosystems and organisms.

Impacts may include effects on wetlands, vegetation, and water bodies as a result of dust, impoundments; disturbance of wildlife populations as a result of noise or human activity; and a change in wildlife survival or productivity. Secondary effects may also include potential increases in resource competition among aquatic species due to habitat loss resulting from water withdrawals, increases in turbidity associated with erosion or discharge, or barriers to movement. These impacts are also discussed in Sections B2.2, B2.3, and B2.4, below.

Surface water hydrology would have secondary impacts from a decreased runoff contribution from American Creek and Anaconda Creek to Crooked Creek and would result in substantial flow diversions and changes in flow systems that are likely to affect nearby uses or environments. There is the potential for drainage changes and increased sedimentation associated with construction of access roads, the Angyaruaq (Jungjuk) Port, and the Pipeline; changes to surface water resources would be within the limits of historic seasonal variation.

Secondary impacts to water quality could result from erosion, runoff and sedimentation to surface water during construction of the Transportation Corridor and the Pipeline. Erosion and sediment controls would mitigate effects so the receiving waters would comply with ADEC water quality criteria. Mining activities would result in additional inputs of mercury to surface water from both atmospheric and aqueous sources. These inputs are likely to be within
regulatory limits on average, but could be sufficient to exceed AWQC and baseline ranges in some cases, depending on season, watershed location, and existing baseline concentrations.

Wetlands would experience secondary effects to about 1,260 acres of wetlands from fugitive dust deposition and dewatering at the Mine Site, and 630 acres of wetlands from fugitive dust deposition generated by traffic on gravel roads. There could also be impacts from potential thermal effects from the Pipeline in portions of the permanent ROW.

Unless effectively controlled, sediment generated from several sources at the Mine Site could be released to tributaries and the mainstem channel of Crooked Creek in the vicinity of the Mine Site. Habitat alterations from streamflow changes and sedimentation could cause secondary local effects to fish populations and aquatic habitat in Crooked Creek and its tributaries. Impacts would result from flow diversions and other water management activities at the Mine Site, pit dewatering, and clearing, earth movement, and grading along certain Crooked Creek tributaries. Habitat alterations from wetland and riparian removal would result in noticeable changes in the character and quantity of aquatic habitat. Habitat alterations from the Transportation Corridor resulting in changes in the character or quantity of aquatic habitat from erosion, turbidity, and water temperature may not be measurable or noticeable. Along the Pipeline, potential secondary impacts related to habitat degradation could result from stormwater runoff, suspended solids, and altered flows caused by disturbed soils; water withdrawals for ice-road construction and Pipeline hydrotesting; construction of stream crossings using open-trench methods; and water releases from Pipeline hydrotecting.

Secondary impacts are discussed in more detail in the technical evaluation discussions under Subparts C through F of this analysis.

With Applicant design features and inclusion of special conditions, the proposed Project would comply with this factor of the Guidelines.

**B2.1.3 FINDINGS OF COMPLIANCE OR NON-COMPLIANCE WITH THE RESTRICTIONS ON DISCHARGE (40 CFR 230.12)**

On the basis of these Guidelines (Subparts C through G after consideration of Subparts B through H ), the proposed disposal site for the discharge of dredged or fill material complies with the Section 404(b)(1) Guidelines with the inclusion of the appropriate and practicable discharge conditions to minimize pollution or adverse effects to the affected aquatic ecosystem. See Section 6.2.7 of the JROD for a list of special conditions.

**B2.2 SUBPART C – POTENTIAL IMPACTS ON PHYSICAL AND CHEMICAL CHARACTERISTICS OF THE AQUATIC ECOSYSTEM (40 CFR SECTION 230 SUBPART C)**

The effects described in this subpart were considered in making the factual determinations and the findings of compliance or non-compliance in Subpart B (see Section B2.1).

**B2.2.1 SUBSTRATE (SECTION 230.20, REQUIRED UNDER SECTION 230.11[A])**

**References:** Final EIS in Sections 3.1 (Geology), 3.2 (Soils), 3.5 (Surface Water Hydrology), and 3.11 (Wetlands)

The proposed Project would adversely impact the physical substrate through activities such as stream diversion, removal of wetland vegetation and substrates, gravel fill placement for roads,
work pads, airstrips, laydown areas; resource extraction for development of the Mine Site and material sites; trenching and HDD for Pipeline installation, etc. Fills associated the Project would consist of native soils stockpiled for use in reclamation and material from material borrow sites identified in the Final EIS. Estimated direct impacts to WOUS (and underlying substrate) due to cut and fills to construct the Project as well as the duration of fill (temporary vs. permanent) are outlined in Section 3.1 of this JROD. Ultimately the Project would result in a permanent loss of 2,877 acres of wetland substrates and 172,844 linear feet of stream substrates and the temporary loss (primarily those occurring along the Pipeline corridor) of 538 acres of wetland substrates and 53,346 linear feet of stream substrates.

The process for developing the Mine Site, Transportation Corridor, and Pipeline are discussed in the Final EIS, Chapter 2, Section 2.3.2. The process of developing facilities at the Mine Site involves capturing surface flows, diversion of streams, and removal of wetland vegetation and substrates underlying facilities to be located in the American Creek and Anaconda Creek watersheds. Substrates would be stockpiled for use in closure and reclamation or placed in the WRF, following construction. Substrates underlying the port and access road would also be stripped and stockpiled for the life of the facilities. Pipeline construction would involve conventional open cut methods with substrates used for backfilling and reclaiming the Pipeline trench following placement of the Pipeline.

Direct impacts on the substrate of the aquatic ecosystem from construction activities, ground disturbance, and placement of fill would include altered topography, compaction of soil, and potential exposure of unconsolidated materials to erosion. Soil types are described in the Final EIS, Chapter 3, Section 3.2 Soils. Discontinuous permafrost exists in areas of the Mine Site and along portions of the Pipeline corridor. Permafrost removal is a requirement for the Project, given that existing permafrost could potentially result in adverse impacts on the stability of important structures if not mitigated. For the Pipeline component, most areas underlain by permafrost will be crossed during winter to minimize disturbance from trenching. Permafrost degradation could cause drainage and drying wetlands and subsidence that converts wetlands to waters.

Indirect effects to physical substrate could result from fugitive dust deposition, changes in water circulation, depth, pattern, and fluctuation from discharges which alter substrate elevation or contours, and from pit dewatering. Pit dewatering would lower the groundwater table, resulting in adverse impacts to wetland soils that presently rely on un-perched shallow groundwater processes. Wetland substrates most susceptible to dewatering activities are primarily located at low elevations in Mine Site drainages, as discussed in the Final EIS Section 3.11, Wetlands. Soil disturbances and permafrost degradation would also result in the release of greenhouse gas (GHG) emissions. Estimates of GHG emissions from soils and other sources influenced by Project activities are presented in Final EIS Section 3.8, Air Quality.

With Applicant design features and inclusion of special conditions, the proposed Project would comply with this factor of the Guidelines.

**B2.2 SUSPENDED PARTICULATES/TURBIDITY (SECTION 230.21, REQUIRED UNDER SECTION 230.11[C])**

**References:** Final EIS Sections 3.5 (Surface Water Hydrology), 3.7 (Water Quality), and Section 3.13 (Fish and Aquatic Resources); Final EIS Appendix F (Supplemental Soil Information)
Potential Project impacts include increased turbidity at the Mine Site during construction resulting from suspension of sediment due to in-stream construction and erosion of cleared stream banks in the American Creek and Anaconda Creek watersheds. In-stream construction could cause dislodging and transport of channel bed sediment and the alteration of stream bottom contours, resulting in increased suspended sediment concentrations in surface water. Changes in the bottom contours could alter stream dynamics and increase downstream erosion or deposition. Surface discharges to the local drainages during construction would potentially result in increased erosion and sedimentation, which could adversely affect surface water quality by increasing suspended particulates and turbidity.

Other construction activities across all Project components would consist of vegetation clearing, grading, and excavation work, which would expose areas to erosion, potentially increasing sediment concentrations in adjacent streams and water bodies. Use of heavy construction equipment would cause disturbance of near-surface soils that could locally result in increased runoff and subsequent increased sedimentation at downstream locations. Surface water quality could be temporarily and locally affected during Pipeline construction at stream crossings, but would be mitigated by HDD crossings of selected waterways and winter trenching at other crossings.

During operation of the Mine Site, non-contact freshwater (water that is never touched by the mining process), including surface water flows and stormwater runoff, would be intercepted to control erosion, avoid contact with stockpiles and other mining infrastructure, and minimize potential water quality impacts to aquatic biota (see detailed figures in the Final EIS, Chapter 2, Alternatives). Collected non-contact freshwater would be conveyed to stormwater/sedimentation control and storage facilities before being returned directly to other tributaries downstream or Crooked Creek.

With Applicant design features and inclusion of special conditions, the proposed Project would comply with this factor of the Guidelines.

B2.2.3 WATER (SECTION 230.22, REQUIRED UNDER SECTION 230.11[B])

References: Final EIS in Sections 3.5 (Surface Water Hydrology), 3.6 (Groundwater Hydrology), 3.7 (Water Quality), and 3.13 (Fish and Aquatic Resources)

Prior to discharge to Crooked Creek, all mine contact water would be treated and would meet water quality standards (WQS); Mine Site waters outside the immediate mine area would also meet WQS. In the event of seepage recovery system (SRS) pump failure and overflow after Closure, the possibility exists that waters discharged to Anaconda and Crooked Creeks (WOUS) could exceed regulatory limits in WQS. There is also a possibility of contaminated groundwater migration from the South Overburden Stockpile towards Crooked Creek. Mitigation measures are described that would help reduce this potential impact. The Applicant has incorporated measures to avoid and minimize impacts of the proposed Project to water quality, circulation, and water fluctuation, as discussed in Section B2.1.2.2 and Subpart H.

Impacts to surface water quality resulting from atmospheric deposition of mercury would vary in intensity. Effects are likely to be within regulatory limits on average, but could vary above baseline conditions and EPA chronic criteria in certain tributary watersheds along Crooked Creek. Impacts to sediment quality in Crooked Creek, and increases in mercury and methylmercury concentrations in sediments, would be within the range of natural variation, and would be expected to decline in post-Closure. A Human Health Risk Assessment was
conducted to evaluate the risk from Project related concentrations of mercury, arsenic, and antimony and the findings are summarized in Section 3.22 of the Final EIS. The human health risk assessment (HHRA) concluded that the small increases in constituent concentrations are unlikely to result in unacceptable risks to human populations who would have the highest exposure (e.g., subsistence populations). Impacts to sediment quality from surface disturbances would be limited to discrete portions of the Project area by containment from BMPs.

Surface water quality could be temporarily and locally affected during Pipeline Construction at stream crossings, but would be mitigated by BMPs, HDD crossings of selected waterways, and winter trenching at other crossings.

Overall, impacts to water quality and chemistry are not expected to exceed regulatory limits. Discharges at the Mine Site to Crooked Creek and its tributaries would be subject to the APDES permit which was issued on May 24, 2018 and it contains effluent quality limitations that are protective of existing uses. Impacts during Pipeline construction would be temporary. The ADEC issued a conditioned 401 Water Quality Certification for the placement of the fill material for the Applicant's proposed Project described in our Public Notice (see Attachment B6 - State of Alaska Certificate of Reasonable Assurance for the Donlin Gold Project).

With Applicant design features and inclusion of special conditions, the proposed Project would comply with this factor of the Guidelines.

**B2.2.4 CURRENT PATTERNS AND WATER CIRCULATION (SECTION 230.23, REQUIRED UNDER SECTION 230.11[B]) AND NORMAL WATER FLUCTUATION (SECTION 230.24, REQUIRED UNDER SECTION 230.11[B])**

**References:** Final EIS in Sections 3.5 (Surface Water Hydrology), 3.6 (Groundwater Hydrology), 3.7 (Water Quality), and 3.13 (Fish and Aquatic Resources)

Most effects from the Project on water circulation, patterns, and fluctuations would occur within the Mine Site. Development of Mine Site facilities involves construction of freshwater reservoirs and diversion structures to manage the surface water flows in Anaconda and American Creek drainages as mine facilities are developed and operated. Placement of fill material to construct these facilities would result in changes in topography, soil permeability, vegetative cover, runoff and infiltration, and routing and storage of water in the Project area that would affect streamflow.

Surface water amount and flow would be altered during every Project phase in Snow Gulch, Lewis Gulch, American Creek, Omega Creek, Unnamed Creek SE1, and Anaconda Creek (see Final EIS Figure 3.51) through damming, pit dewatering, and other diversions. Additionally, water will be discharged into the Crevice Creek tributary of Crooked Creek after the post-reclamation phase. Affected drainages account for about 8 percent of the Crooked Creek watershed.

Surface water resources would be affected in a local area of approximately 20 square miles encompassing the pit, WRF, and TSF. Crooked Creek would have a decrease in streamflow that could extend for several miles downstream of the mine, but would have an imperceptible impact on the Kuskokwim River. As such, the extent or scope of impacts would range from discrete portions of the Project Area (Crooked Creek) to imperceptible impacts extending beyond the Project Area (Kuskokwim River). While surface water is an abundant resource in
the area, it is a shared resource and its use, diversion, and discharge are governed by State laws and regulations.

Effects on water circulation, patterns, and fluctuations from Transportation Corridor facilities would be primarily associated with potential drainage changes from construction of access roads and associated drainage structures. Bridges and culverts would be installed using standard construction practices and sized to pass design flows. Potential impacts to surface water from clearing and grading within the Pipeline construction ROW at stream crossings includes increased runoff, erosion, and sedimentation due to removal of vegetation and soil compaction from equipment. Pipeline construction would not result in long-term alterations to streamflow, stream profile, or structural components of streams and other water bodies crossed by the Pipeline (see Section 3.11, Wetlands, for description of wetlands crossing). For most stream crossings to water bodies would be limited to the Construction Phase. Stream beds, banks, and riparian areas would be restored to pre-project contours and configurations to the maximum extent possible. Channel banks and riparian areas would be revegetated to prevent erosion and to maintain bank stability. Design and implementation of erosion control procedures and BMPs at each water body crossing, for both the Transportation Corridor and Pipeline, would minimize potential impacts to surface water flow. Additionally, potential impacts to surface water are reduced by installing the Pipeline across most water bodies during winter months and low streamflow conditions. Therefore, the intensity of the impact of construction of Transportation Corridor and Pipeline facilities on surface water flow at stream crossings is such that changes are likely to be within the limits of historical seasonal variation.

With Applicant design features, the proposed Project would comply with this factor of the Guidelines.

B2.2.5 SALINITY GRADIENTS (SECTION 230.25, REQUIRED UNDER SECTION 230.11[B])

References: Final EIS in Sections 3.5 (Surface Water Hydrology), 3.6 (Groundwater Hydrology), 3.7 (Water Quality), and 3.13 (Fish and Aquatic Resources)

Discussion of impacts: The Kuskokwim River experiences tidal influence from the mouth upstream to approximately Akiachak located approximately 150 river miles downstream of the Jungiuk (Angyaruaq) port site. Therefore, the mine and transportation components of the Project are located well upstream of tidal influence on the Kuskokwim River. Impacts from construction and operation of transportation and mine facilities to surface flow and quality in the Crooked Creek drainage and the Kuskokwim River downstream would not affect salinity gradients.

Pipeline construction would involve dredging and the placement of fill materials for the Pipeline itself and the use of a winter trail to transport materials across the Susitna River watershed, which drains to Cook Inlet. These activities are well inland and would not affect salinity gradients downstream.

With Applicant design features and inclusion of special conditions, the proposed Project would comply with this factor of the Guidelines.
SUBPART D – POTENTIAL IMPACTS ON BIOLOGICAL CHARACTERISTICS OF THE AQUATIC ECOSYSTEM (40 CFR SECTION 230 SUBPART D)

The technical evaluation factors discussed in this section address potential impacts on the biological characteristics of the aquatic ecosystem (Guidelines Subpart D). The effects described in this subpart were considered in making the factual determinations and the findings of compliance or non-compliance in Subpart B (see Section B2.1).

THREATENED AND ENDANGERED SPECIES (SECTION 230.30)

References: Final EIS, Section 3.14 (Threatened and Endangered Species); Final EIS Appendix O (USFWS Biological Assessment, NOAA-NMFS Biological Assessment USFWS Letter of Concurrence; NOAA-NMFS Letter of Concurrence)

An endangered species is a plant or animal in danger of extinction throughout all or a significant portion of its range. A threatened species is one in danger of becoming an endangered species in the foreseeable future throughout all or a significant portion of its range.

A candidate species is one under consideration for listing under the ESA. The Proposed Action area for evaluation under Section 7 of the ESA includes all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action. Coordination with the USFWS and NMFS, completion of the process and analyses contained in the Final EIS and this JROD, and signature by the authorizing official, completes the Corps ESA responsibilities.

Biological Assessments

There are no threatened or endangered plant species in the action area. Threatened, endangered, or candidate species in the action area are listed below in Table B7.

USFWS Consultation: The Corps delivered a BA and requested initiation of informal consultation to the USFWS on August 18, 2017 to discuss impacts to northern sea otter, Pacific walrus, short-tailed albatross, spectacled eider, and Steller’s eider (see Table B7 below). Consultation also included consideration of critical habitat for northern sea otter. A final BA was submitted dated September 2017. The USFWS concurred with the Corps’ overall ESA effects determination of "may affect, not likely to adversely affect" listed species or their critical habitat. On November 2, 2017, the USFWS gave a Letter of Concurrence (LOC) to the Corps, agreeing to the Corps’ determination that the action may affect, but is not likely to adversely affect listed species or their critical habitat. The Applicant is obligated to incorporate the mitigation measures described in the LOC. The BA and LOC are available in the Final EIS, Appendix O. ESA Section 7 Consultation conclusions are described fully in the BAs (Final EIS Appendix O).

NFMS Consultation: The Corps initially met with NMFS in September 2016 to discuss the proposed Project and possible mitigation measures. NMFS then sent the Corps standard mitigation measures and research papers. The Corps requested consultation on August 23, 2017. NMFS requested information about the proposed Project in October, 2017, and in November, 2017, the Corps provided NMFS with a BA. NMFS requested additional information regarding mitigation measures proposed, and then met with the Corps on January 24, 2018 to discuss the proposed Project. ESA Section 7 consultation was initiated on February 26, 2018 to discuss impacts to North Pacific right whales, fin whales, humpback whales, gray whales (western North Pacific stock), beluga whales (Cook Inlet stock), Steller sea lion (western distinct
population segment), ringed seal, and bearded seal (see Table B7 below). Consultation also included consideration of critical habitat for Steller sea lion, North Pacific right whale, and beluga whale Cook Inlet stock. On March 29, 2018, the NMFS gave an LOC to the Corps, agreeing to the Corps’ determination that the action may affect, but is not likely to adversely affect listed species or their critical habitat. The Applicant is obligated to incorporate the mitigation measures described in the LOCs. The BA and LOC are available in the Final EIS, Appendix O. ESA Section 7 Consultation conclusions are described fully in the BAs (Final EIS Appendix O).

**Impacts and Mitigation:** The potential effects of the Proposed Action on listed species and critical habitat are listed below, along with mitigation as specified in the LOCs.

**Auditory or visual disturbance:** Underwater noise from barges may temporarily disturb or mask communication of marine mammals and alter behavior. An animal is disturbed when human activities alter an animal’s natural behavior. A listed species could react to Project activities by either investigating or being startled by barges or tugs. Disturbance from vessels could temporarily increase stress levels or displace an animal from its habitat. The primary underwater noise associated with the proposed barging operations is the continuous noise produced from propellers and other on-board equipment. Underwater noise from barges may temporarily disturb or mask communication of marine mammals.

- **Mitigation:** The implementation of mitigation measures related to barge operations are expected to further reduce the number of times marine mammals react to transiting vessels. Consequently, barge traffic is not expected to significantly disrupt normal marine mammal behavioral patterns (breeding, feeding, sheltering, resting, migrating, etc.), making acoustic harassment of listed marine mammals very unlikely. Barge plans are included in the Final EIS, Appendix W.

**Vessel strike or collision:** Aircraft, barges and tugs transiting the marine environment have the potential to collide with, or strike, birds or marine mammals. Collisions could cause injury or mortality. Effects may occur, but other than direct collision, they may not be detectable. Mitigation measures include:

- **Mitigation:** Shipping is proposed to be conducted in existing shipping corridors and at existing harbors.
- **Mitigation:** All aircraft will transit at an altitude of 1,500 feet or higher, to the extent practicable and excluding takeoffs and landing, while transiting over Cook Inlet and while maintaining Federal Aviation Administration flight rules (e.g., avoidance of cloud ceiling, etc.). If flights must occur at altitudes less than 1,500 feet due to environmental conditions, aircraft will make course adjustments, as needed, to maintain at least 1,500 foot separation from all observed marine mammals. Helicopters will not hover or circle above marine mammals.
- **Mitigation:** Specific to the North Pacific right whale: Barges will either: a) avoid transiting through designated North Pacific right whale critical habitat (73 FR 19000) or b) implement mitigation measures while traveling within North Pacific right whale critical habitat. Operators will maintain a ship log indicating the time and geographic coordinates at which vessels enter and exit North Pacific right whale critical habitat. Vessels will travel at speeds of 10 knots (or less while traveling within the boundaries of designated North Pacific right whale critical habitat. A minimum of two Protected Species Observers
(PSOs) or trained crew members will alternate shifts during travel through North Pacific right whale critical habitat. PSOs or trained crew members will maintain a constant watch for all marine mammals from the bridge or other similar vantage points. At least one dedicated observer will vigilantly scan for whales at all times. Scanning will involve the use of 10-power binoculars or greater. PSOs or trained crew members will maintain direct contact with the vessel pilot, advising the pilot/operator of the position of all observed marine mammals as soon as they are observed.

- If a North Pacific right whale is observed at a distance greater than 800 meters from the vessel’s intended course line, or other marine mammal is observed within 91 meters of the vessel’s intended course line, monitoring of the marine mammal(s) location will continue, and for whales, the direction of the vessel will be altered to maintain these minimum distances from the observed whale(s). Course alterations made to avoid cetacean disturbance will be made in a manner that avoids sudden changes in revolutions per minute (RPM) and cutting in front of their direction of travel.

- If a North Pacific right whale is observed within 800 meters of the vessel’s intended course line, or other whale species is observed within 274 meters of the vessel’s intended course line, vessel speeds will be reduced to no greater than 5 knots, sea conditions permitting, to minimize the risk of injurious collision. While avoiding collisions with marine mammals may necessitate sudden changes in vessel RPM and heading, course alterations made to avoid marine mammal disturbance will be made in a manner that avoids sudden changes in RPM and cutting in front of their direction of travel. Vessel speed may resume to normal operating speed when North Pacific right whales are greater than 800 meters and other whale species are greater than 274 meters from the vessel and its intended course.

- The vessel operator will avoid: i) direct approach of whales; ii) separating members of any group of whales from other members of that group; iii) causing a whale of any species to make multiple changes in direction.

- If the vessel is taken out of gear, vessel crew will ensure that no whales are within 50 meters of the vessel when propellers are re-engaged, thus minimizing risk of marine mammal injury.

- Marine mammal monitors (MMOs) will either be PSOs or crew members who have received standard PSO training from experienced trainers. MMOs must be able to accurately identify and distinguish between species of cetaceans under field conditions.

- MMOs will work in shifts lasting no longer than 4 hours with at least a 1-hour break from marine mammal monitoring duties between shifts. MMOs will not perform MMO duties for more than 12 hours in a 24-hour period (to reduce fatigue).

- While functioning as an MMO, that individual will have no other duty which could distract them from keeping careful watch for marine mammals near the vessel and along its intended course. At least one MMO will be actively engaged in scanning the surrounding waters at all times while transiting through North Pacific right whale critical habitat.
Prior to each transportation season, MMOs will attend a 1-day PSO training course (taught by an experienced trainer following a course syllabus approved by NMFS). Training may be delivered by video using the same syllabus. This course will: a) provide ecological information on Bering Sea marine mammals and specifics on the ecology and management concerns of North Pacific right whales; b) teach proper equipment use and methodologies in marine mammal observation and recording; and c) provide clarification of obligations including log keeping and seasonal reporting.

MMOs will record all marine mammals observed within North Pacific right whale critical habitat using NMFS-approved observation forms. Sightings of North Pacific right whales will be transmitted to NMFS within 24 hours. These sighting reports will include the following information:

- Date, time, and geographic coordinates of the sighting(s).
- Species observed, number of animals observed per sighting event; and number of adults/juveniles/calves per sighting event (if determinable).
- Because sightings of North Pacific right whales are uncommon, and photographs that allow for identification of individual whales from markings are extremely valuable, photographs will be taken if feasible, but in a way that does not involve disturbing the animal (e.g., if vessel speed and course changes are not otherwise warranted, they will not take place for the purpose of positioning a photographer to take better photos. Any photographs taken of North Pacific right whales will be submitted to NMFS.

Donlin Gold LLC will designate an individual who is familiar with NMFS reporting procedures to collect, organize, and report on vessel travel within North Pacific right whale critical habitat and marine mammal observations that occur within that critical habitat. These reports will be submitted to NMFS by the end of each calendar year. The end-of-year report will outline the following information:

- Ship logs (time and location for when a vessel entered and exited North Pacific right whale critical habitat).
- Species, date, and time for each sighting event.
- Number of animals per sighting event; and number of adults/juveniles/calves per sighting event (if determinable).
- Geographic coordinates for the observed animals, with the position recorded by using the most precise coordinates practicable (coordinates must be recorded in decimal degrees, or similar standard (and defined) coordinate system).
- Environmental conditions as they existed during each sighting event, including sea conditions, weather conditions, visibility (km/mi), lighting conditions, and percent ice cover.
- Any photographs taken.

NMFS Contact Info: Reports, observation forms, ship logs, and North Pacific right whale sightings will be transmitted to: National Marine Fisheries Service, Protected Resources Division at greg.balogh@noaa.gov, verena.gill@noaa.gov, and alicia.bishop@noaa.gov (individual North Pacific Right Whale sightings may also be called in to (907) 271-3023) or 907-271-1937. In the event that this contact information becomes obsolete, call 907-271-5006 for updated contact information.
• Though take is not authorized, if a listed marine mammal is struck by a vessel, it must be reported to NMFS within 24 hours. The following will be included when reporting take of a listed species:
  
  o a. All the information that would otherwise be listed in the PSO report. 
  b. Number of listed animals taken. 
  c. The date, time, and location of the take. 
  d. The cause of the take (e.g., vessel strike). 
  e. The time the animal(s) was first observed and last seen. 
  f. Mitigation measures implemented prior to and after the animal was taken. 
  g. Contact information for MMO on duty at the time of the collision, ship’s Pilot at the time of the collision, or ship’s captain.

Exposure to harmful materials: Some species could be exposed to harmful materials, fuel, oil, or chemicals through incidental and accidental spills during barging activities. Harmful materials may also cause habitat degradation. Fuel spills and associated response actions could increase risk to listed species, prey, and habitat. ESA listed species could be exposed to harmful materials, fuel, oil, or chemicals through incidental and accidental spills during barging activities. Incidental spills associated with Donlin Gold’s barging program are most likely to occur in port (Dutch Harbor, Bethel, Anchorage, Nikiski, or Beluga) during fuel and supply transfer, with the greatest risk during fuel barge filling operations at Dutch Harbor and offloading at Bethel. Accidental spills are large spills involving the rupture of a vessel or transported fuel tank, usually as a result of a collision, sinking, fire, or running aground. The Corps conducted spill risk and spill fate analyses and determined the probability of a spill was so low that effects on listed species would be discountable because a spill would be extremely unlikely to occur. Mitigation measures include:

  • Avoiding operation of watercraft in fall and winter in the presence of sea ice to the extent practicable.
  
  • Using double-hull tanks for fuel transport (from Dutch Harbor to Bethel) to reduce tank rupture risk.
  
  • Using fully operational vessel navigation systems composed of radar, chart plotter, sonar, marine communication systems, and satellite navigation receivers, as well as Automatic Identification System (AIS) for vessel tracking.
  
  • All Project barges operating in Cook Inlet will maintain a distance of 1.5 miles from the mean lower low water (MLLW) line of the Susitna Delta (MLLW line between the Little Susitna River and Beluga River).

Table B12: ESA Threatened, Listed, or Candidate Species Assessed for the Project

<table>
<thead>
<tr>
<th>Species</th>
<th>ESA Status1</th>
<th>Locations2</th>
<th>Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>northern sea otter</td>
<td>Threatened</td>
<td>Bering Sea bargeing route; occurs within the Action Area near Dutch Harbor.</td>
<td>USFWS</td>
</tr>
<tr>
<td>Pacific walrus</td>
<td>Candidate</td>
<td>Bering Sea bargeing route; haulout sites and foraging areas have been identified in Kuskokwim Bay within the Transportation Corridor of the Project Area.</td>
<td>USFWS</td>
</tr>
<tr>
<td>short-tailed albatross</td>
<td>Endangered</td>
<td>Bering Sea bargeing route; possibility of occurrence within the Action Area near</td>
<td>USFWS</td>
</tr>
</tbody>
</table>
Table B12: ESA Threatened, Listed, or Candidate Species Assessed for the Project

<table>
<thead>
<tr>
<th>Species</th>
<th>ESA Status</th>
<th>Locations</th>
<th>Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>spectacled eider</td>
<td>Threatened</td>
<td>Bering Sea barging route; the South Yukon-Kuskokwim Delta critical habitat breeding area is north of Kuskokwim Bay in the Transportation Corridor of the Project Area.</td>
<td>USFWS</td>
</tr>
<tr>
<td>Steller’s eider</td>
<td>Threatened</td>
<td>Bering Sea barging route; Kuskokwim Bay, the Kuskokwim River, and in upper Cook Inlet within the Transportation Corridor of the Project Area. Some overwinter in the Action Area near Dutch Harbor. Spring staging and fall molting occur in Kuskokwim Shoals critical habitat, near the Transportation Corridor of the Project Area.</td>
<td>USFWS</td>
</tr>
<tr>
<td>North Pacific right whale</td>
<td>Endangered</td>
<td>Bering Sea baring route; intersects Bering Sea right whale critical habitat area.</td>
<td>NMFS</td>
</tr>
<tr>
<td>fin whale</td>
<td>Endangered</td>
<td>Bering Sea baring route; the area around Dutch Harbor is used.</td>
<td>NMFS</td>
</tr>
<tr>
<td>humpback whale</td>
<td>Endangered</td>
<td>Bering Sea baring route; the area around Dutch Harbor is used.</td>
<td>NMFS</td>
</tr>
<tr>
<td>gray whale Western North Pacific stock</td>
<td>Endangered</td>
<td>Bering Sea baring route; occasional use of Alaskan waters near Dutch Harbor is presumed.</td>
<td>NMFS</td>
</tr>
<tr>
<td>beluga whale Cook Inlet stock</td>
<td>Endangered</td>
<td>Cook Inlet baring route; the Cook Inlet construction baring route would designate critical habitat area 1.</td>
<td>NMFS</td>
</tr>
<tr>
<td>Steller sea lion western distinct population segment (DPS)</td>
<td>Endangered</td>
<td>Bering Sea baring route; Kuskokwim Bay, the Kuskokwim River, and in upper Cook Inlet within the Transportation Corridor and Pipeline components of the Project Area.</td>
<td>NMFS</td>
</tr>
<tr>
<td>ringed seal bearded seal (referred to collectively as ice seals)3</td>
<td>Threatened</td>
<td>Bering Sea baring route; winter distribution overlaps with a portion of the proposed baring route, so there is no temporal overlap in use.</td>
<td>NMFS</td>
</tr>
</tbody>
</table>

Notes:
1. At the time of publication of the Final EIS, April 2018
2. Action Area is defined in the BAs per ESA Section 7 and is larger than the Project Area; not all species occur with the areas listed in the Action Area or Project Area at all times of the year.
3. Both species are assessed collectively in the BA, but are not included in the LOC.

With inclusion of special conditions, the proposed Project would comply with this factor of the Guidelines.
B2.3.2 FISH, CRUSTACEANS, MOLLUSKS, AND OTHER AQUATIC ORGANISMS IN THE FOOD WEB (SECTION 230.31)

**References:** Final EIS, Section 3.13 (Fish and Aquatic Resources)

The Project features and facilities presenting potential risks to aquatic ecosystems and biota primarily involve those that ultimately could directly or indirectly alter or degrade surface or groundwater and aquatic habitats. This includes construction of mine infrastructure, access roads, and related facilities; mining and earth moving activities; pumping/dewatering and other management practices involving groundwater, surface water, and stormwater; wastewater or contact water conveyance, treatment, and disposal; storage and handling of fuel, process chemicals/byproducts, and hazardous waste; and other site management practices near and upslope, or otherwise hydraulically connected to surface waters that might be a source of contamination.

**Mine Site** – Effects at the Mine Site component on aquatic resources and organisms include direct habitat removal, wetland removal, streamflow and temperature changes, and sedimentation, impacting migration, spawning, or rearing life stages of Pacific salmon and other anadromous or resident fish species and aquatic habitat.

Streams in the Crooked Creek drainage near the mine support Chinook, Coho, chum, pink, and sockeye salmon. Just less than 8 miles of streambed, (in American and Anaconda creeks and portions of Snow and Lewis gulches) would be eliminated to construct various Mine Site facilities. These, and smaller tributary drainages that would be affected, represent about 8 percent of the Crooked Creek watershed. Most of the segments that would be filled in these tributaries do not support salmon, but in some years, habitat in American Creek supports up to 200 age 0 and age 1 juvenile Coho salmon, which would be lost.

Streamflow changes would be seasonal, with greatest reductions during winter months, affecting resident fish and overwintering Coho salmon. The greatest effects of flow reductions and temperature increase in Crooked Creek would occur upstream of Crevice Creek. Below this, tributary inflows/runoff from unaffected watersheds (e.g., Bell and Getmuna creeks) would restore flow reductions during construction and operations phases. Water management practices permitted by the State of Alaska for the Mine Site component would help avoid and mitigate effects on downstream aquatic resources, including EFH.

**Transportation Corridor and Pipeline** – There would be no direct fill impacts to these resources in these two components.

In summary, noticeable impacts that may cause acute or obvious changes could result from streamflow reduction and sedimentation that cause local effects to fish populations and aquatic habitat in Crooked Creek and its tributaries in the vicinity of the Mine Site area.

With Applicant design features, the proposed Project would comply with this factor of the Guidelines.

B2.3.3 OTHER WILDLIFE (SECTION 230.32)

**References:** Final EIS, Section 3.12 (Wildlife)

The discharge of dredged or fill material can result in the loss or change of breeding and nesting areas, escape cover, travel corridors, and preferred food sources of resident and transient wildlife species associated with the aquatic ecosystem.
Wildlife associated with aquatic ecosystem includes resident and migratory mammals and birds.

For terrestrial wildlife, during all three phases, expected effects include habitat alteration or fragmentation from vegetation removal and modification (in some places permanent) or from potential accidental fire; behavioral disturbance from noise, vehicles and human presence including organic waste attraction; barriers to movement from Project activities; potential NNIS introduction; behavioral disturbance from increased barge, vessel, and vehicle traffic; and spread; and potential injury and mortality from vehicle collisions or environmental contamination. During closure, areas of permanent habitat alteration could remain and potential increased hunter and trapper access and pressure could exist.

For birds, effects during construction and operations phases include habitat alteration or fragmentation from vegetation removal and modification (in some places permanent) including nest site loss (loss of habitat suitable for birds to nest) or disturbance, or from potential accidental fire; behavioral disturbance from noise, vehicles and human presence including organic waste attraction; barriers to movement from Project activities; potential NNIS introduction and spread; potential injury and mortality from vehicle collisions or powerline collisions, or environmental contamination including pit lake attraction. During closure, areas of permanent habitat alteration could remain.

For marine mammals (non-ESA listed), effects during construction and operations phases of the Transportation Corridor include behavioral disturbance or displacement from in-water port site construction, fuel and cargo barge traffic; and potential injury and mortality from vessel collisions or environmental contamination. During closure, there would be reduced impacts as there would be less ocean barge traffic.

In some locations, changes in behavior due to Project activity may not be noticeable; animals would be expected to remain in the vicinity, although specific movement patterns may change in response to passing barges or construction noise. In other locations within the Project footprint or adjacent to Project activity, there may be noticeable changes in behavior that may affect reproduction or survival of individuals. Behavior would be expected to be altered for several years during construction and operations phases and would be expected to return to pre-Project activity levels after actions causing impacts were to cease. Some impacts would be seasonal or intermittent (noise, barge traffic). Impacts would occur within the Project Area, mainly around areas of Project activity within the Project footprint, but behavior patterns could cause changes in movement within the Project Area. Behavior patterns could cause changes in movement within the EIS Analysis Area for marine mammals. Impacted species are expected to be those common to the region, with some species such as moose being important game species, and some species such as small mammals being important furbearing species for trapping. Any impacted marine mammal species are protected under the MMPA. For birds, impacted species would be common to the region, except for species considered to be species of special concern or conservation need. Bald and golden eagles have protections under the Bald and Gold Eagle Protection Act. Migratory birds have protections under the Migratory Birds Treaty Act.

While injury or mortality may occur, population level effects are not expected to be detectable. There is unlikely to be a noticeable change in animal population character or quantity. In some locations, injury or mortality risk would be expected to be higher for several years and would return to pre-activity levels in the long-term after actions causing impacts were to cease. Some impacts would be seasonal or intermittent (vehicle use of roads, barge traffic). In some
locations, risk would be permanent such as the pit lake and would need to be addressed by
tappropriate mitigation and design. Impacts are expected to be limited to vicinity of the Project
footprint, but it is possible that individuals may be impacted throughout the Project Area due in
the case of environmental contamination to a species that is mobile.

With Applicant design features, the proposed Project would comply with this factor of the
Guidelines.

**B2.3.4 ESSENTIAL FISH HABITAT**

**References:** Final EIS, Section 3.13 (Fish and Aquatic Resources); Final EIS Appendix Q (NMFS
conservation recommendation letter, November 2017; NOAA-NMFS Essential Fish Habitat
Assessment)

Section 305(b)(2) of the MSA requires federal agencies to consult with NMFS on any action
authorized, funded, or undertaken which may adversely affect EFH. The EFH consultation
process begins with a determination of adverse effect by the action agency. If an action may
adversely affect EFH, an EFH Assessment is required per 50 CFR 600.920(e).

An EFH Assessment was submitted to NMFS dated September 26, 2017, from the Corps (see
Appendix Q of the Final EIS). The submission of this EFH Assessment asserts that the Corps
permitted actions may have adverse effects on EFH. The Corps determined that the overall
Project will have short term and long term effects; overall activities are unlikely to have adverse
effects on EFH, and any adverse effects on EFH will be minimal. Further, mine facilities and the
port at Jungjuk Point will not have any adverse effects on EFH. NMFS provided a conservation
recommendation letter to the Corps on November 2, 2017.

The EFH Assessment reports that the proposed Project would affect aquatic habitats that
support different species and life stages of salmon, summarized per component:

**Mine Site** – Streams near the proposed Mine Site support spawning by Chinook, Coho, and
chum salmon and rearing by juvenile Chinook and Coho salmon. Adult pink salmon and
sockeye salmon can be present in low numbers. Site-specific Project effects to EFH and EFH
species from mine facilities are judged to range from low to moderate, with an overall low level
of effect to EFH and EFH species in the drainage. Impacts are expected to range from negligible
to low in Crooked Creek mainstem habitats. EFH upstream from the proposed Mine Site
(primarily in Donlin Creek) and downstream from the proposed Mine Site (in two major
salmon tributaries downstream), would be unaffected. Crooked Creek mainstem habitats
adjacent to the Mine Site and downstream would be adversely affected, primarily by reduced
flow and associated increased sedimentation. A low level overall effect to EFH is anticipated in
this reach of Crooked Creek, with most reductions in habitat occurring adjacent to the Mine
Site. Localized moderate impacts are associated with loss of Chinook and Coho rearing habitat
through direct loss of two creeks and the effects of reduced flow in Crooked Creek. Rearing
stages of these two species are present in low densities in streams that will be affected by Project
activities. Coho spawning habitat will likely be reduced in Crooked Creek adjacent to the mine
area because of the estimated stream flow reductions; however, spawning in this reach is low.

**Transportation Corridor** – Transportation infrastructure will include a port on the Kuskokwim
River and a road connecting the port to the mine facilities. Transportation operations will
include increased barge activity along the Kuskokwim River, barge-handling activities at the
Port, and truck traffic from the Port to the mine facilities. The mine access road will cross six
streams used by Chinook, Coho and/or chum salmon, although crossings of Jungjuk Creek occur at least 1.6 miles (2.6 kilometers) upstream from documented EFH. Five streams will be crossed with full span steel arch bridge structures while Crooked Creek will be crossed with a clear span bridge, resulting in low effect. Activities associated with port construction, port operation, and barge navigation between the port and Bethel, are judged to result in a low effect to EFH and EFH species. Potential impacts at the port would primarily result from pile driving and propeller strikes. Barging between approximately May and September, may result in an increased potential for stranding juvenile salmon during the end of the smolt outmigration, primarily for chum salmon. However, such impacts should be low based on results of analysis of the temporal and spatial distribution and habitat use by outmigrating salmon and predicted barge-induced wave heights.

Pipeline – The Pipeline route will cross numerous streams containing habitat used by the five species of Pacific salmon (Chinook, chum, Coho, pink, and sockeye). Potential effects of the natural gas pipeline on EFH species are judged to be low, because most construction will be conducted during winter when salmon are not present. The few streams requiring summer construction will employ BMPs that reduce and mitigate disturbance to streambeds; or will be crossed using horizontal directional drilling (HDD) under the stream channel.

The NMFS reviewed the EFH Assessment and provided EFH conservation recommendations (CRs) for the Project, pursuant to Section 305(b)(4)(A) of the MSA (see the NMFS CR letter dated November 2, 2017, included in Appendix Q of the Final EIS). The NMFS’s CRs have been fully considered by the Corps during evaluation of the permit application for the Project. In accordance with 50 CFR 600.920(k), the Corps transmitted a response to the NMFS’s CRs on July 13, 2018. The following are the Corps’ responses to the NMFS’ CRs:

CR #1: The Corps and project proponents should address inadequacies and deficiencies identified by the cooperating agencies in the current ground water (hydrological) models (2015 Public Comments).

Response: The District concurs with this recommendation. Groundwater and hydrological model inadequacies and deficiencies identified by the cooperating agencies in the 2015 Draft Environmental Impact Statement (Draft EIS) have been addressed in the 2018 Final EIS.

CR #2: Implement measures to predict, regulate, and provide adequate instream flows of Crooked Creek to allow adequate water conditions to support migratory corridors, maintain fish passage, and provide salmon survival at all freshwater life stages in the upper reaches of Crooked Creek and Donlin Creek. The Corps should continue to work with the State of Alaska, U.S. Fish and Wildlife Service, and Donlin Gold to establish these flow levels.

CR #3: Design and install structures to supplement or reduce the loss of water flow underneath the reaches of Crooked Creek that are susceptible to dewatering, such as to employ technologies to limit loss of instream flows and surface waters to the influence of groundwater draw down.

Response: CRs 2 and 3 both relate to instream flows of Crooked Creek and can be addressed simultaneously. They are only partially consistent with the District’s authority to regulate the discharge of dredged or fill material into WOUS. Neither the pit dewatering nor the groundwater drawdown requires a DA permit. Therefore, it is beyond the District’s scope of authority to require Donlin Gold to take actions to avoid or mitigate for the loss of flows to Crooked Creek due to groundwater drawdown. The District concurs with this recommendation as it relates to the impacts, as a result of the discharge of dredged or fill material.
Tables are provided in the Corps response letter that quantify the losses of flow attributed to the discharge of dredged or fill material (direct impact) and from pit dewatering (indirect impact) into Crooked Creek from Snow Gulch, American Creek, and Anaconda Creek (see Tables B3 – B6 in Section B2.1.1.3 above). The indirect impacts assume base-case conductivity (K) bedrock condition. Changes in this condition would only affect the indirect impacts. The effects of the discharge of dredged or fill material would be independent of the bedrock conditions. The direct effect of the discharge of dredged or fill material is not expected to cause more than 10 percent loss of flow to Crooked Creek, as compared to baseline.

The State of Alaska has the authority to render a decision on whether establishment of a minimum instream flow is necessary to comply with the Anadromous Fish Act (AS 16.05.871-.901), and the Fish Passage Act (AS 16.05.841). Donlin Gold has stated they recognize the concerns regarding predicted flow losses in Crooked Creek, and they have engaged the appropriate State agencies to work within the State permit process to address this issue. Because stream flow changes will occur slowly over an extended period of time and unknowns exist, the ADF&G has recommended Donlin Gold incorporate the establishment of a field monitoring program into their ADF&G application, with provisions for making adaptive changes as needed to ensure the proper protection of aquatic resources in Crooked Creek (see Final EIS Section 5.2, Table 5.2-1, Design Feature A33, Crooked Creek Substrate Freezing Monitoring and Subsequent Mitigation Plan).

Donlin Gold has committed to developing and implementing a comprehensive Aquatic Resources Monitoring Plan (ARMP) for Crooked Creek under the provisions of its Title 16 fish habitat permits administered by the ADF&G. The ARMP will include aquatic resource monitoring throughout Crooked Creek and its tributaries upstream and downstream from the Mine Site; to include fish surveys, habitat, sediment, fish tissue, and flow monitoring. Flow monitoring will address both summer and winter flow conditions. Monitoring data collected during the initial years of mine development and operations will establish baseline data to determine the need for potential mitigation and mechanisms that may be most effective in minimizing any actual flow loss. The ARMP will require reporting to ADF&G, and will require specific action by Donlin Gold if the data show variability from the predicted results on aquatic resources (to include flow). The actions that could be taken to reduce unexpected flow loss include, but would not be limited to, lining or relocating portions of the stream channel, augmenting flows from the Snow Gulch Reservoir or the Kuskokwim River, or grouting areas of bedrock demonstrating high flow rates (Final EIS Chapter 5).

Additionally, the ADNR-Water is responsible for managing water in the State. Donlin Gold states they have applied for water rights authorization from the State and will comply with the monitoring requirements under that certificate. Any water rights authorized by ADNR-Water would be developed in coordination with ADF&G.

The District agrees there would be impacts to Crooked Creek. The permits that would be required by the State of Alaska; specifically, the implementation of the ARMP, addresses this CR.

CR #4: Monitor the project, post-closure mine pit, tailings impoundments, waste rock facilities, and associated ground and surface waters in perpetuity.

Response: This CR is outside of the District’s authority. This CR is addressed by the State of Alaska mining reclamation requirements. Therefore, the District would not incorporate this CR
into a DA permit, if issued. However, Donlin Gold mine facilities (e.g., tailings impoundment, waste rock facility, post-closure mine pit) and associated surface water and groundwater, water in Crooked Creek, and discharge water from water treatment plants, will be monitored during mine operations, closure, reclamation, and post-closure; as outlined in the Reclamation Plan.

The Corps finds that the Project would have moderate adverse effects on EFH which are not contrary to the public interest. With Applicant design features, the proposed Project would comply with this factor of the Guidelines.

**B2.4 SUBPART E – POTENTIAL IMPACTS ON SPECIAL AQUATIC SITES (40 CFR SECTION 230 SUBPART E)**

The technical evaluation factors discussed in this section address potential impacts on the special aquatic sites (Guidelines Subpart E). The effects described in this subpart were considered in making the factual determinations and the findings of compliance or non-compliance in Subpart B (see Section B2.1).

**B2.4.1 SANCTUARIES AND REFUGES (40 CFR SECTION 230.40)**

**References**: Final EIS, Section 3.15 (Land Ownership, Management, and Use)

There would be no direct or indirect effects from construction, operations, and closure of the proposed Transportation Corridor and Mine Site on the management of any legislatively designated area. However, a portion of the Applicant’s proposed Pipeline would cross the Susitna Flats State Game Refuge, designated by the Alaska State government for special management. The ADF&G manages the Susitna Flats State Game Refuge, in accordance with the purposes for which it was established, and under the guidance of the Susitna Flats State Game Refuge Management Plan; to ensure the protection of fish and wildlife populations and habitat, and to provide for public opportunities for wildlife viewing, photography, recreation, and the use of fish and wildlife and their habitats (ADF&G 1988 as cited in the Final EIS Section 3.15.3.2.2). The management plan states that new utilities may be allowed to cross the refuge where no feasible off-refuge alternative exists, consistent with the plan’s goals and objectives. The first 5 miles of the Pipeline, including the compressor station, would be located in the Susitna Flats State Game Refuge.

The Pipeline would be in the Pretty Creek public road easement through most of its route through the refuge, and the electric transmission line would follow the Chugach Electric Association high-voltage transmission line corridor to the connection with the Beluga pipeline and then would be within the ROW to the compressor station at MP 5. Therefore, the project would be consistent with the goals of the plan, and no direct or indirect effects would occur to the State’s land use management within the Susitna Flats State Game Refuge.

Construction activities would be timed to avoid disruption of breeding, spawning, or migratory movements of fish and wildlife. Under the terms of the management plan, any use, lease, or disposal of resources of State land in the Susitna Flats State Game Refuge, such as location of proposed facilities within the refuge, would require authorization from ADF&G and ADNR.

With Applicant design features, the proposed Project would comply with this factor of the Guidelines.
WETLANDS (40 CFR SECTION 230.41)

References: Final EIS Section 3.11 (Wetlands), Final EIS Appendix K, and Preliminary Jurisdictional Determination reports (Michael Baker 2016, 2017a, 2017 as cited in the Final EIS)

Wetlands occur throughout the Project Area. Detailed information on wetlands types and percentages can be found in the Final EIS Section 3.11, Wetlands.

Direct wetlands impacts, as assessed in this JROD, would include placement of fill in wetlands. Indirect wetlands impacts include dust emissions and dewatering areas. Permanent impacts would occur in those areas where fill is placed for the duration of mine life (estimated to be between 27 and 30 years), and permanent fill to WOUS that would remain after Project Closure. Temporary impacts would occur in those areas where fill is placed in wetlands for a brief period to facilitate construction activities, then removed concurrent with construction activities, or as soon as construction is complete. Indirect impacts, as assessed in this JROD, would include acres impacted by dust emissions or water drawdown (see also Table B2 for a Project summary of direct and indirect impacts to WOUS by direct and indirect acres, for the LEDPA analysis).

Indirect impacts in the Final EIS were also assessed for clearing and removal of wetland vegetation (quantified by vegetation cut acres), compaction, rutting, and mixing of wetland soils (qualitatively discussed using available quantified information), permafrost degradation creating subsidence that converts wetlands to waters (quantified by acres of vegetation cut/fill or vegetation cut on permafrost acres), and disruption of wetland hydrology through events such blocking surface water flow or diverting water flow that may dry wetlands (qualitatively discussed using available quantified information).

Mine Site – Construction of Mine Site facilities would cause direct impacts to wetlands. Excavation of the open pit and filling within the WRF and TSF would occur throughout the active life of the mine. Some wetland reclamation would begin shortly after the start of the Construction Phase and would continue throughout Operations and Closure. Impacts would be considered permanent, however, as they would occur through the life of the mine.

Permanent, direct fill impacts to wetlands include 2,877 acres. See also Table 2 in this document for details of proposed fill by facility for wetlands.

Indirect impacts (as assessed in the Final EIS, and included in calculations to inform Table B2) include 630 acres from dust emissions and 430 acres from potential dewatering (drawdown areas).

In the Final EIS, other wetland disturbance activities were assessed as direct impacts but are not considered direct fill impacts for the purposes of this JROD. An additional 815 acres are affected by vegetation clearing only, and an additional 98 acres are impacted by vegetation clearing in permafrost areas. This type of impact was assessed as being temporary rather than permanent; these areas may be suitable for reclamation to wetland conditions at or before the Closure Phase. Note that the totals shown in the LEDPA analysis (Table B2) include direct impact acres as defined in the Final EIS.

Transportation Corridor – Construction of the port site, mine access road, and ancillary facilities would cause direct impacts to wetlands. Transportation Corridor impacts would be permanent because the mine access road and other features would not be reclaimed.
Permanent, direct fill impacts include 105 acres of wetlands. See also Table 2 in this document for details of proposed fill for WOUS.

Direct impacts as defined in the Final EIS also include 119 acres of vegetation clearing or permafrost removal. Note that the totals shown in the LEDPA analysis (Table B2) include direct impact acres as defined in the Final EIS.

Indirect impacts (as assessed in the Final EIS, and included in calculations to inform Table B2) include 630 acres from dust emissions.

**Pipeline** – Construction of the pipeline would require trenching activities. Winter construction techniques, temporary rerouting of surface flows, and sediment control BMPs are measures that would be used to limit the extent of wetland habitat impacted. Construction of airstrips, ancillary facilities, and various other workspaces would be considered temporary impacts. Some sections of the pipeline and related ancillary facilities would be considered permanent as defined for this JROD, as they will not be reclaimed until after Closure. Indirect effects (as defined in the Final EIS) specific to the Pipeline component would generally occur within the permanent right-of-way (ROW) and would include changes in soil temperature, blockage of subsurface shallow groundwater flow, and potential aufeis formation.

Temporary, direct impacts include 538 acres of temporary impacts to wetlands. Permanent, direct impacts include 200 acres. Total direct impacts are therefore 738 acres.

Direct impacts as defined in the Final EIS also include 1,089 acres of vegetation clearing and permafrost clearing. Note that the totals shown in the LEDPA analysis (Table B2) include direct impact acres as defined in the Final EIS.

There would be no indirect impacts (as defined in the Final EIS) in this component.

**Total Project** – The total direct, temporary impacts to wetlands are 538 acres. The total direct, permanent impacts to wetlands are 2,877 acres. The total direct impact acres are 3,416. See also Table 2 in this document for a summary for all facilities. The total indirect acres (dust emissions and water drawdown is 1,260. Note that the calculated indirect impact as reported here and in Table B2 is not additive as many of the Mine Site drawdown indirect impact areas overlap with areas affected by dust.

Minimization and avoidance activities as described in the CMP (Block 23, June 2018) are described in Section 6.3.5. Compensatory mitigation would be required for the unavoidable impacts to wetlands as described in Attachment B5.

With Applicant design features and inclusion of special conditions, the proposed Project would comply with this factor of the Guidelines.

**B2.4.3 Mud Flats (40 CFR Section 230.42)**

Mudflats are not located in the Project area.

**B2.4.4 Vegetated Shallows (40 CFR Section 230.43)**

Vegetated shallows are not located within the Project area.

**B2.4.5 Coral Reefs (40 CFR Section 230.44)**

Coral reefs are not present in the Project area.
**B2.4.6 RIFFLE AND POOL COMPLEXES (40 CFR SECTION 230.45)**

**References:** Final EIS, Section 3.13 (Fish and Aquatic Resources)

**Discussion of impacts:**

A series of Title 16 fish habitat permits, issued by ADF&G would be required to protect in-water habitat, minimize impacts during construction, and assure long-term fish passage throughout post-closure phase monitoring. Compliance with the BMPs and stipulations identified in the Title 16 fish habitat permits for the various project phases would be intended to minimize impacts to aquatic habitat and fish passage, including potential impacts to riffle and pool complexes located in the streams adjacent to the Mine Site, and along the mine access road and pipeline.

**Mine Site** – Just under 8 miles of streambed (in American and Anaconda creeks and portions of Snow and Lewis gulches) would be filled to construct various Mine Site facilities. Fill would occur in the Crooked Creek watershed including Snow Gulch, American Creek, and Anaconda Creek. The details of these activities and potential impacts are discussed in detail in Sections B2.1.2.2 and B2.1.2.5. These activities would alter flow patterns and eliminate segments of riffle and pool complexes in those drainages. Riffle, pool, and run habitat types occur throughout the Crooked Creek watershed. A total of 33 linear miles of Crooked Creek and its tributaries were surveyed as reported in the 2012 Aquatic Biomonitoring Report by Ottertail Environmental Inc. Riffle habitat made up 12 percent of the wetted habitat within the Crooked Creek drainage (112.7 square miles). 71 percent of this riffle habitat was classified as poor quality, with 27 percent classified as fair quality. Pool habitat accounted for 8 percent of the habitat area (70.6 square miles) with 70 percent of that habitat classified as good quality and 25 percent as fair quality. Gravel and cobble substrates dominate the riffle areas and freezing in winter months can reach the stream bottom resulting in variable flows.

Riffle and pool complexes would be permanently lost in the American Creek and Anaconda Creek drainages. The American Creek drainage is the proposed location of the mine pit and WRF. American Creek drains an area of 6.9 square miles, comprising 2 percent of the entire Crooked Creek drainage. Beaver activity is prevalent throughout the drainage; but in reaches unaffected by beavers the stream is a narrow, incised channel with gravel substrates dominating riffle areas. Flowing water is present year-round in upstream portions of American Creek, while the lower reaches may freeze to the bottom in winter resulting in discontinuous surface flow. The small watersheds of Lewis Gulch (0.8 square miles) and Omega Gulch (1.0 square miles) have limited aquatic habitat, lack overwintering habitat, and are unlikely to support fish. Anaconda Creek is the proposed location of the TSF. Silt and sand are the dominant substrates in this creek, which drains an area of 7.9 square miles. Aquatic habitat is classified as poor quality due to the lack of gravel and cobble substrate, a highly incised channel, and highly variable water quality caused by flooding, major stream erosion, turbidity, and silt deposits.

Scouring/deposition patterns downstream in Crooked Creek would be managed using energy dissipaters at all discharge points to the extent possible.

**Transportation Corridor** – There would be no impacts to riffle or pool habitats as a result of fill in the Transportation Corridor.
Pipeline – Construction of the Pipeline could affect riffle and pool complexes during trenching activities. Winter construction techniques, temporary rerouting of surface flows, and sediment control BMPs are measures that would be used to limit the extent of wetted habitat directly affected and would reduce the volume of sediment potentially released downstream. The relatively narrow width of the trench where it crossed the stream would limit the disturbance footprint and the extent of subsequent effects within riffle and pool habitats.

For the Mine Site and Transportation Corridor, habitat loss would be avoided or minimized to the extent possible or practicable, as addressed in the CMP (Attachment B5). Other potential effects would be minimized through compliance with the Title 16 fish habitat permit from ADF&G.

With Applicant design features, the proposed Project would comply with this factor of the Guidelines.

B2.5 SUBPART F – POTENTIAL EFFECTS ON HUMAN USE CHARACTERISTICS (40 CFR SECTION 230, SUBPART F)

The technical evaluation factors discussed in this section address potential impacts on human use characteristics of the aquatic ecosystem (Guidelines Subpart F. The effects described in this subpart were considered in making the factual determinations and the findings of compliance or non-compliance in Subpart B (see Section B2.1).

B2.5.1 MUNICIPAL AND PRIVATE WATER SUPPLIES (40 CFR SECTION 230.50)

References: Final EIS, Section 3.6 (Groundwater Hydrology), Section 3.7 (Water Quality), Section 3.24 (Spill Risk)

Mine Site – Section 3.6.1.5 of the Final EIS discusses groundwater use for each Project component. Two wells are reported to serve the existing Donlin Gold Camp as a domestic water supply; a main well; and a backup well, located at the southeastern end of the current airstrip (see Figure 3.6-2 in Section 3.6, Groundwater Hydrology, of the Final EIS). A community water supply well is located in the village of Crooked Creek about 10 miles downstream of the Mine Site and ½ mile southwest of the confluence with the Kuskokwim River. Subsurface water rights are held here by Crooked Creek Traditional Council. The well and associated treatment, storage, and distribution system is listed as active as of 1993 by ADEC. The drinking water source protection area identified by ADEC for the well extends northwest and upslope of the hill west of the airstrip (see Figure 3.6-6 in Section 3.6, Groundwater Hydrology, of the Final EIS) and is 10 miles away from any potential source of contamination from the mine. A flood in Crooked Creek from the partial dam release considered in the Final EIS (predicted 1 foot increase near the village) would not impact the aquifer used by village drinking water supply well, as it is sited about 60 feet above Crooked Creek and Kuskokwim River.” Donlin Gold’s existing exploration camp wells would be decommissioned in early construction in accordance with State requirements and replaced with eight water wells that would be drilled between Omega Creek and an unnamed creek to the south (see Figure 2.3-7 in Chapter 2 of the Final EIS). These new wells would supply freshwater for the construction camp and ancillary water uses such as dust control, truck washing, and fire protection. The wells would lie outside of the pit/TSF cone of depression (See Final EIS Figure 3.6-8), and would be upgradient or cross-gradient from any shallow groundwater contamination that may develop in drainages beneath the WRF and TSF.”
Transportation Corridor – Nine villages (Kwethluk, Akiachak, Akiak, Tuluksak, Lower Kalskag, Upper Kalskag, Aniak, Chuathbaluk, and Napaimute) are located between Bethel and Crooked Creek along the Kuskokwim River and adjacent sloughs. Each village except Napaimute has records of one or more wells drilled for water supply. While most well records are for public water systems, there are also some records of privately owned wells. Bethel has the most numerous wells, with approximately 17 known public water systems served by wells, although a few are inactive. Wells have been in use in Bethel for several decades, so there is also the possibility that there are some formerly-used wells that are not part of current public water systems. There are records of a few other wells in Bethel that may be privately owned and used for residential or other purposes.

All other existing municipal and private water wells in the vicinity of the Project are outside the influence of the groundwater that may be affected by the Project and no water extraction sites would be developed in the vicinity of an existing public or private water supply. Thus the discharge of dredged or fill material related to the Mine Site, Transportation Corridor, or Pipeline would not adversely affect the quality or quality of municipal or private water supplies.

With Applicant design features, the proposed Project would comply with this factor of the Guidelines.

B2.5.2 RECREATIONAL AND COMMERCIAL FISHERIES (SECTION 230.51)

References: Final EIS, Sections 3.16 (Recreation), Section 3.18 (Socioeconomics), Section 3.21 (Subsistence)

Mine Site – Dredge and fill activities for mine development and transportation facilities would generally occur well away from subsistence fishing grounds. The discharge of treated water to Crooked Creek would also occur well away from recreational and commercial fishing activities; the discharge would meet all applicable Alaska Water Quality Standards (AWQS) and is not expected to result in adverse effects to aquatic resources. Potential impacts to aquatic habitat and fish resources in the Crooked Creek drainage are primarily in the middle reaches of the drainage, from Anaconda Creek to Snow Gulch, alongside the Mine Site, while the lower portion of the drainage, below Crevice Creek, would see limited effects.

Subsistence fishing use area maps for Crooked Creek residents show salmon and non-salmon fishing extending to Bell Creek in the lower reaches of the drainage. As a result, effects on salmon and non-salmon species subsistence fishing are unlikely.

Increased competition due to employment at the Mine Site would be reduced by policies prohibiting employees from hunting and fishing while at the Mine Site and by the enclave development strategy with housing at the Mine Site and transportation provided for employees commuting between their communities and the Mine Site.

Transportation Corridor – Dredge and fill activities for mine development and transportation facilities would generally occur well away from subsistence fishing grounds. The primary form of recreational and commercial fishing in the Project area is subsistence fishing, which is practiced by the local residents living along the Kuskokwim River. Construction of the facilities at the Angyaruaq (Jungjuk) Port could produce suspended sediments but any effects would be local and short-lived; impacts to habitats of key subsistence species would be minor. Spawning of key subsistence species typically occurs in tributaries that would be unaffected. The majority
of stream crossings required by Pipeline construction would be conducted during the winter and outside of typical timeframe for recreational or commercial fishing. No Project activities are expected to contribute sediments or other pollutants that would be disruptive to migration or adversely affect spawning areas for species important for subsistence or commercial fishing or the prey species upon which they depend.

**Pipeline** - Recreational and commercial fisheries also occur in Cook Inlet and rivers crossed by the natural gas pipeline route east of the Alaska Range, including the Susitna River. There would be no impact to recreational and commercial fisheries as a result of the Project.

With Applicant design features and inclusion of special conditions, the proposed Project would comply with this factor of the Guidelines.

**B2.5.3 WATER-RELATED RECREATION (SECTION 230.52)**

**References:** Final EIS, Section 3.16 (Recreation)

**Mine Site** – Construction and operation of mine-related facilities would not affect water-related recreation as they are located away from areas where such activities would occur.

**Transportation Corridor and Pipeline** – Recreational activities in the Kuskokwim River basin occur at moderate to low levels. Water-related recreation includes sport fishing and hunting and recreational boating; these activities would be minimal to non-existent in the Project Area during winter due to freezing conditions and ice.

The use of winter construction techniques and HDD to build the Pipeline would minimize the addition of sediments or other water quality constituents that could adversely affect water-related recreation along the Pipeline corridor; non consumptive water-related recreation on the east side of the Alaska Range would not be expected in the winter.

Similar to Mine Site construction, summer Pipeline construction activities would not occur in areas regularly used for consumptive or non-consumptive water-related recreation. The construction of the Angyaruaq (Jungjuk) Port would require the placement of clean rock fill and sheet pilings. At this location, the extent of fill placement is not expected to be of a level that would create a measurable loss of consumptive or non-consumptive recreational values although there could be some displacement of recreational users from the immediate vicinity during construction.

With Applicant design features and inclusion of special conditions, the proposed Project would comply with this factor of the Guidelines.

**B2.5.4 AESTHETICS (SECTION 230.53)**

**References:** Final EIS, Section 3.17 (Visual Resources), Section 3.9 (Noise and Vibration)

Dredge and fill activities associated with all three components would alter the visual aesthetics of aquatic ecosystems within their respective areas. Due to the remote location of the majority of proposed construction and operations activities, the effects of the proposed Project on the aesthetics of the potentially affected aquatic ecosystems are expected to very limited.

**Mine Site** – Mining activities would produce a strong visual contrast with the natural appearance of the surrounding landscape as the pit is excavated and the TSF, WRF, and stockpiles are built and enlarged. As the Mine Site is remote and not readily accessible and because public access would be restricted during construction and operations for safety reasons,
the general public would not have terrestrial access to the area. The only members of the
general public that may experience the aesthetic changes caused by the Project would be
passengers overflying the Project site in aircraft.

Viewer exposure would be restricted by the rugged topography and transient in nature when
viewed from the air. Due to topography, the visibility of changes in the Mine Site area from
ground-based viewer locations would generally be limited to a three to five mile range due to
the area’s rugged terrain. Following closure, the WRF and TSF would be regraded and
revegetated resulting in an area that blends with the surrounding topography. The pit lake
would remain and could create a visual attraction due to its contrast with the surrounding
landscape. Mining activities including blasting and heavy equipment operation could adversely
affect noise related aesthetics but the remote location would limit the number of human noise
receptors who might experience the anthropogenic sounds.

Some alterations to landforms would persist beyond the estimated life of the Project and after
closure. In terms of context, no sensitive viewers (such as a community for whom a particular
view is culturally or spiritually important) were identified in the viewshed of the proposed
Mine Site.

Transportation Corridor – Construction and operation of the Angyaruq (Jungjuk) Port would
result in new facilities that would affect the aesthetics in the area. The industrial activity would
present a strong visual contrast compared to the adjacent natural settings. The area around
Jungjuk burned in 2015 which also adversely affects the aesthetic appearance when compared
to adjacent, unburned forest.

Construction and operations would cause changes in landscape character along the Kuskokwim
River, from barge traffic and from the Angyaruaq (Jungjuk) Port site that would extend through
the life of the Project. The Port would be demobilized at closure, but a basic barge landing
facility and access road would remain at this site in perpetuity. Views of the proposed airstrip,
which would also remain in perpetuity, would be mostly limited to ridgetops west of the Mine
Site. Villages located along the Kuskokwim River and the river channel would potentially have
potentially high visual impact.

Pipeline – Visual effects from the Pipeline would be greatest in the following instances and
locations: during intensive but temporary construction activities, especially in high activity
areas such as locations where HDD would be used for river under-crossings; in forested areas
due to strong visual contrast of the cleared ROW against the existing forest; and, where the
ROW parallels, or crosses the Iditarod National Historic Trail (INHT). Apart from the INHT, the
affected area is not recognized in an existing land management plan for its scenic value.

The dredge and fill aspects of Pipeline construction are unlikely to present any long-term effect
on aesthetics since the trench and ROW would be returned to original grade following
installation of the Pipeline. Maintenance of the ROW would result in changes to the appearance
of vegetation in shrubby or forested areas, due to period and regular brushing. The width of the
ROW would be small compared to the surrounding landscape and would be most apparent to a
viewer in an aircraft following in a direction that paralleled the Pipeline.

With Applicant design features, the proposed Project would comply with this factor of the
Guidelines.
B2.5.5 PARKS, NATIONAL AND HISTORICAL MONUMENTS, NATIONAL SEASHORES, WILDERNESS AREAS, RESEARCH SITES, AND SIMILAR PRESERVES (SECTION 230.54)

References: Final EIS, Section 3.15 (Lands), Section 3.17 (Visual Resources), Programmatic Agreement (Final EIS, Appendix Y), Cultural Resource Management Plan (Final EIS, Appendix A of Appendix Y).

Mine Site and Transportation Corridor – The Mine Site and Transportation Corridor are not located proximate to any parks, national or historic monuments, national seashores, wilderness areas, research sites, or similar preserves. As a result, the placement of fill associated with these Project components would not affect areas designated under federal or state laws or local ordinances for special management.

Pipeline – As discussed in Appendix D, Cultural Resources Management Plan, of the Section 106 of the National Historic Preservation Act Programmatic Agreement for the Project, 47 miles of the INHT would be present within the Area of Potential Effects, and the Pipeline ROW would cross the INHT 4 times. Potential effects to the INHT include alteration of character-defining features and integrity (e.g., location, design, setting, feeling, and association); and changes in scenic quality.

The Corps, in consultation with the Alaska State Historic Preservation Officer, BLM, Advisory Council on Historic Preservation, ADNR, Donlin Gold and other consulting parties, including local villages and tribal organizations, the Corps developed a Programmatic Agreement under Section 106 of the National Historic Preservation Act. The Programmatic Agreement requires specific mitigation actions to offset adverse impacts to the INHT. In addition, in response to comments on the Draft EIS, Donlin Gold modified the route of the Pipeline that crossed or paralleled the INHT to a location that reduces the number of INHT crossings to four and eliminates the co-location with the INHT. The North Route is now part of Donlin Gold’s Proposed Project, and is discussed in the Final EIS as the North Option. The aesthetic values of the trail would be affected by the construction and maintenance of the Pipeline ROW, which would require control of woody vegetation by brushing on a regular basis resulting in a linear feature that would visually contrast with the adjacent landscape.

With Applicant design features, the proposed Project would comply with this factor of the Guidelines.

B2.6 SUBPART G – EVALUATION AND TESTING (40 CFR SECTION 230, SUBPART G)

References: Final EIS Sections 3.1 (Geology) and 3.2 (Soils)

The dredged and fill material to be placed in wetlands and WOUS would primarily consist of shotrock, sand, and gravel. As described in Section 3.1.2 of the Final EIS, two sources of borrow material would be used, bedrock and gravels. As stated in Section 5.2 of the Final EIS (Design Feature A11 in Table 5.2-1), Donlin Gold’s Project design includes evaluating material sites at the Mine Site, mine access road, and Pipeline (prior to use) for metals leaching and ARD potential in final design using bulk geochemistry analysis, MWMP, and ABA methods. Alternative sites would be selected if results indicate the potential for impacts to downgradient water resources. Because of the remote undeveloped nature the material sources, these sites are not expected to contain contaminants such as pesticides or petrochemicals from previous
activities which would trigger additional testing. This is discussed in more detail in Section B2.1.2 Contaminant determinations above.

With Applicant design features and inclusion of special conditions, the proposed Project would comply with this factor of the Guidelines.

**B2.7 SUBPART H – ACTIONS TO MINIMIZE ADVERSE EFFECTS (40 CFR SECTION 230, SUBPART H)**

The Applicant has identified numerous measures to minimize adverse impacts. These measures are outlined in the Chapter 5 of the Final EIS (Section 5.2) as well as in Block 23 of the DA permit application, which was updated in June 2018. Additionally, Donlin Gold has developed a Compensatory Mitigation Plan (Attachment B5) that identifies proposed compensatory mitigation for unavoidable wetland and stream impacts.

Minimization measures described below are the key measures that relate to the discharge of fill material. Additional minimization and mitigation measures are described in the Donlin Gold Project Plan of Operations and Chapter 5 of the Final EIS. These measures are incorporated into Factual Determinations and Technical Evaluation Factors of the Corps' analysis (see Sections B2.1.2 and B2.2) on which the finding of no significant degradation is based.

The Corps has reviewed the minimization measures proposed by the Applicant and considers them to be a reasonable starting point for developing the list of all appropriate and practicable steps which can be taken to minimize the potential adverse impacts of the proposed Project. In addition to the Applicant’s proposed mitigation measures, and BMPs, the Corps would require additional conditions and stipulations to further minimize impacts. These conditions are described in Section 6.2.7 of the JROD.

**B2.7.1 ACTIONS CONCERNING THE LOCATION OF THE DISCHARGE (SECTION 230.70)**

The Project includes the following avoidance and minimization actions related to the location of the discharge:

- Facilities (camps, roads, material sites, Pipeline layout, and mine components) have been designed and located to avoid WOUS to the maximum extent practicable. Donlin Gold evaluated multiple alternatives for the location and design of Project components with the intent to avoid and minimize impacts, while allowing development of a feasible Project.

- Facilities have been sited in previously disturbed areas where possible to minimize impacts. For example, the Mine Site components would be built in existing disturbed areas associated with exploration activities and the camp; the Pipeline would be located along an existing corridor in the Susitna Flats State Game Refuge; existing airstrips, roads, and camps would be used during Pipeline construction to the extent practicable.

- Donlin Gold has minimized the Mine Site footprint and concentrated land disturbances to create a compact footprint. The location of the ore reserves and therefore the open pit mine is fixed. Other Mine Site components (overburden storage areas, WRF, TSF, water management features, processing facilities) were located as close together as possible to
concentrate land disturbance and to limit effects to the American Creek and Anaconda Creek drainages, and, more broadly, the Crooked Creek watershed.

- The mine access road was designed to avoid wetlands and minimize stream crossings to the extent practicable, while maintaining grade, safe sight distance at stream crossings, and allowing for streamflow.
- The transmission line to the camp would be routed in proximity to the mine access road, where possible, to minimize impacts.
- The Mine Site airstrip location was selected to avoid wetlands to the extent possible and designed to minimize the amount of cut and fill required for runway construction.
- The Angyaruaq (Jungjuk) Port location was selected to reduce the length of mine access road while still allowing safe barge access. The port is sited on uplands to the extent practicable.
- The barge route and the Angyaruaq (Jungjuk) Port location and port design were developed to avoid the need for dredging.
- The Pipeline route was selected to minimize its length, minimize wetland and stream crossings, avoid geotechnical and hydrologic hazards, and minimize visual and recreational impacts. The Pipeline route follows uplands where available and avoids wetlands and waterbodies where practicable.
- Material sites for all Project components were designed to avoid wetlands to the extent practicable.
- Wetland mapping was used to guide placement of culverts to maintain natural drainage to the extent possible to maintain existing wetland hydrology.

With the inclusion of special conditions, the proposed Project would comply with this factor of the Guidelines.

**B2.7.2 ACTIONS CONCERNING THE MATERIAL TO BE DISCHARGED (SECTION 230.71)**

The Project includes the following avoidance and minimization actions related to the material that would be discharged.

- Waste rock and overburden has been characterized for the potential to be acid generating and metal leaching. Most of the waste rock is non-acid generating (NAG). NAG waste rock would be used for construction of the TSF as fill, filter media, riprap, and underdrain material. Use of NAG waste rock minimizes the amount of fill needed from material sites.
- The open pit mine has been engineered to optimize recovery of the ore reserve and minimize the amount of overburden and waste rock removed so as to minimize associated land disturbance for storage of these materials.
- Waste rock would be backfilled into the ACMA pit after it is mined to reduce the need for surface storage of waste rock and resulting land disturbance.
• Material sites at the Mine Site, mine access road, and Pipeline would be pre-sampled for metals leaching and ARD potential in final design, and alternative sites would be selected if results indicate the potential for impacts to downgradient water resources.

With the inclusion of special conditions, the proposed Project would comply with this factor of the Guidelines.

**B2.7.3 ACTIONS CONTROLLING THE MATERIAL AFTER DISCHARGE (SECTION 230.72)**

The Project includes the following minimization actions related to control of the material after it is placed.

• The design of the TSF impoundment dam complies with industry standards and State of Alaska Dam Safety Program requirements for stability and safety.

• Diversion channels would be constructed around all Mine Site stockpiles and facilities to minimize runoff and erosion.

• Facility slopes would be designed to minimize erosion to the extent practicable.

• The WRF would be designed to maximize concurrent reclamation, minimize the effects of PAG materials, minimize infiltration and erosion, and promote controlled surface runoff and revegetation.

• Concurrent reclamation would occur during mine operations where possible in areas no longer required for active mining (e.g., Pipeline ROW revegetation, reclamation of areas within the WRF and overburden stockpiles).

• BMPs would be used to minimize erosion and sedimentation to wetlands and WOUS for all Project components from construction through closure. BMPs are actions that both control the material after discharge and relate to the method of dispersion. Typical BMPs would include silt fences, sediment retention basins, cross bars and ditches, runoff interception and diversion, mulching and revegetating surfaces and stockpiles. Additional BMPs are listed below. The Final EIS describes how these BMPs would be required under various Project permits and approvals, including:
  - A SWPPP that describes BMPs related to storm water management would be required by ADEC.
  - A sediment and erosion control plan would be required by the State of Alaska Pipeline Office for the Pipeline.
  - Fish habitat permits issued by ADF&G would require implementation of BMPs.

• Road cuts would be stabilized and seeded as soon as possible as necessary to reduce sediment runoff.

• BMPs would be installed at all stream crossings to minimize impacts to fish, other aquatic biota, and their related habitats. Monitoring of BMPs would ensure their effectiveness.

• Temporary roads and water crossings are needed for Pipeline construction. These roads and water crossings would be removed as soon as practicable following construction of a Pipeline section.
• Select material sites would be evaluated for the potential to be reclaimed as ponds or wetlands.

• The Mine Site access road and airstrip would be maintained as permanent structures. The Mine Site facilities would be reclaimed following the Reclamation and Closure Plan (SRK 2017b). The Reclamation and Closure Plan would be approved by ADNR and ADEC to meet State reclamation and closure objectives that result in biological, chemical, and physical stability of the site. Post-mining drainage design would account for pre-mining channel characteristics and provide erosional stability, geotechnical stability, and compliance with AWQS.

• Financial assurance would be established and approved by the State of Alaska prior to construction and operations to cover the costs of reclamation and closure.

• Pipeline support infrastructure (temporary airstrips, camps, and construction roads) would be reclaimed. Fill would be removed as practicable and the ground scarified to reduce compaction. The surface would be re-contoured and the on-site growth media would be re-spread. Surface drainage would provide for storm flow capacity, erosional stability, Pipeline stability, and long-term surface permanence. All culverts and temporary bridges would be removed from channels and active floodplains. The Natural Gas Pipeline Plan of Development (SRK 2013b) describes Pipeline reclamation and requirements for a stabilization, rehabilitation and reclamation plan and detailed Pipeline abandonment plan. Final reclamation and abandonment of the Pipeline is under the jurisdiction of the BLM and Sate of Alaska Pipeline Coordinators Office who will review these plans.

• The Project design includes restoring flat-to-gently sloping wetlands by removal of fill at Project closure where feasible.

• Post-closure sediment controls would include site grading and capping of erodible material, revegetation, and re-routing of surface runoff to re-establish natural conditions.

With the inclusion of special conditions, the proposed Project would comply with this factor of the Guidelines.

B2.7.4 ACTIONS AFFECTING THE METHOD OF DISPERSION (SECTION 230.72)

In addition to the actions listed above, the Project includes the following minimization actions related to the methods of fill placement.

• The Project design includes installation of Project components (roads and pipelines) at most water bodies and wetlands primarily in the winter months when frozen ground and snow are present, flows are lowest, and disturbance of the river, stream banks, and local groundwater would be minimized, or by using HDD technology to avoid flow impacts at major Pipeline river crossings.

• The Project design includes (when possible) crossing drainages at right angles to reduce riparian impacts, and use of bridges.

• Construction effects on fish and fish habitat areas would be minimized by selecting stream crossing techniques that provide the appropriate level of protection for the specific habitat sensitivity. In-water work windows would be used to minimize effects
on fishery resources during sensitive life-cycle stages. Appropriate stream bank rehabilitation and reclamation techniques and BMPs would be used.

- For summer construction in wetlands without permafrost, workpads could be temporary. They would be made from imported fill and/or trench spoil (if suitable) or timber mats. A layer of geotextile or mats would be used to separate fill from vegetation.

- Permitted disturbance boundaries would be clearly delineated prior to construction work to confine activities to the construction zone or permitted footprint to prevent disturbance of surrounding vegetation.

- The roads would be constructed via the use of pioneer segments in the winter to minimize disturbance to wetlands and the vegetation mat underlying the road. As necessary a geosynthetic fabric would be installed over permafrost or wetland areas to minimize thawing and degradation of the gravel road bed. As soon as possible after construction is completed, road cuts would be stabilized and seeded.

- Winter construction is planned for a majority of the Pipeline route. In winter, wetlands that are underlain by permafrost would be crossed using an ice or snow pad. Wetlands without permafrost would be frost packed to freeze them down to more competent soils or deep enough to support the pipe and construction equipment.

- The Pipeline construction plan avoids the need for permanent gravel access roads. This reduces the need for permanent culverts, bridges, and structures in numerous streams.

- Buffers were established around streams to minimize impacts.

With the inclusion of special conditions, the proposed Project would comply with this factor of the Guidelines.

**B2.7.5 ACTIONS RELATED TO TECHNOLOGY (SECTION 230.74)**

The following technology-related actions would be taken to minimize impacts.

- HDD would be used to avoid direct impacts at six major stream crossings along the Pipeline route.

- The TSF and water dams were designed using rockfill, bedrock foundations, multiple filter zones, impermeable liners, and downstream construction methods to resist seismic hazards, static stability, and seepage concerns. The dams would be designed, constructed, and operated to meet or exceed State of Alaska Dam Safety Program engineering standards and requirements for environmental protection, stability, and safety. Certificates of approval to construct, operate, maintain, and abandoned the dams would be obtained by the ADNR Dam Safety Program.

- The Project design at the Mine Site includes water management strategies that would maintain flow and storage within the design capacity of structures, provide flexibility for extra storage in high precipitation years, and sufficient water supplies for processing in low precipitation years.

- The natural gas pipeline would be strain-based design to minimize impacts to permafrost.
• The Project would use bridges rather than culverts to cross fish-bearing streams along the mine access road to avoid impacts to streamflow, water circulation patterns, aquatic habitat, and fish migration.

• Runoff and seepage from Mine Site facilities would be generally collected and reused or treated to meet AWQS. The proposed treatment includes the use of high-rate classifiers, green sand filters, and reverse osmosis technology. Treated water would discharge to Crooked Creek as authorized by an APDES permit issued by ADEC.

With the inclusion of special conditions, the proposed Project would comply with this factor of the Guidelines.

**B2.7.6 ACTIONS AFFECTING PLANT AND ANIMAL POPULATIONS (SECTION 230.75)**

Many of the measures discussed above will minimize adverse effects on plant and animal populations. Following are additional actions that would be taken.

• Pre-construction surveys of vegetation to be disturbed would be conducted to determine the presence or absence of any rare and sensitive plant species. If any individuals or populations are found, the appropriate agencies would be consulted to determine potential mitigation such as avoidance or transplant.

• Raptor nest surveys would be conducted during the spring prior to start of construction. If occupied nests are found close to areas of proposed activity, the activity would be scheduled to occur outside the nesting season if feasible.

• Donlin Gold would develop a wildlife avoidance and human encounter/interaction plan to minimize the risk of adverse wildlife interactions with workers and avoid impact to subsistence species.

• Surface water quality sampling and aquatic life monitoring will regularly be conducted.

• ADEC’s Draft Waste Management Permit includes a provision to minimize the potential that any area containing contaminated water becomes attractive to birds and wildlife.

• Pursuant to the Reclamation and Closure Plan, disturbed areas will be reclaimed to a stable condition that can support wildlife habitat.

With Applicant design features, the proposed Project would comply with this factor of the Guidelines.

**B2.7.7 ACTIONS AFFECTING HUMAN USE (SECTION 230.76)**

Many of the measures discussed above will minimize adverse effects on human use. Following are additional actions that would be taken.

• Whenever reasonably possible, construction and maintenance schedules would recognize peak periods and locations of subsistence hunting and fishing, with the understanding that some construction activities must also take advantage of seasonal and environmental conditions.

• The Pipeline construction schedule would try to avoid peak periods of recreation and tourism activities.
• Donlin Gold would regularly communicate with local tourism and recreation businesses to avoid impacts during construction and operations.

With Applicant design features, the proposed Project would comply with this factor of the Guidelines.

**OTHER ACTIONS (SECTION 230.77)**

No impact reducing measures that would be classified as Other Actions are proposed.
ATTACHMENT B3  GENERAL POLICIES FOR EVALUATING SECTION 10 RHA AND 404 CWA PERMIT DECISIONS (33 CFR 320.4)

B3.1  PUBLIC INTEREST REVIEW (33 CFR 320.4[A])

The decision whether to issue a permit will be based on an evaluation of the probable impacts, including cumulative impacts, of the proposed activity and its intended use on the public interest.

The Corps has determined, after evaluation of the following general criteria (i – iii below) and the factors listed in Section B3.2 through B3.18, that the proposed Donlin Gold Project will not be contrary to the public interest, as long as all measures identified in Section 6.0 of the JROD, including permit special conditions listed in Section 6.2.7, are implemented.

i. The relative extent of the public and private need for the proposed work:

Donlin Gold’s stated need for the proposed Project is to enable Calista and The Kuskokwim Corporation (TKC) to maximize economic benefits for their shareholders, from lands with mineral potential selected and conveyed to them under ANCSA, by producing gold to meet worldwide demand. Gold is an established commodity with international markets. Donlin Gold’s need for the Pipeline is driven by the remote location of the Mine Site. There are no existing or readily useable resources that can provide sufficient energy needed for development and operation of the mine within Donlin Gold’s timeframe. The remote location does not have sufficient, naturally occurring gas resources, or other energy sources of the magnitude necessary to support mine development and operations. No existing transportation or utility infrastructure services are available to the proposed Mine Site or surrounding area. Access to the Mine Site is seasonal via the Kuskokwim River or by aircraft, as weather conditions allow.

Gold is an important precious metal used worldwide. The Project represents a needed exploitation and use of these metals, with stable prices allowing for profitable operations. The Corps has found that a demonstrable demand for gold exists and that the Applicant’s stated need is not unduly speculative. The Project will develop gold resources, representing an expanded source of gold in the United States and a contribution to worldwide gold supplies.

The Proposed Action would generate positive economic benefits to communities in the Y-K region, ANCSA corporations (Calista, TKC, and Cook Inlet Region Incorporated [CIRI]) and their shareholders, and the State and local governments.

The Donlin Gold Project would generate positive economic benefits from employment, income, sales (i.e., purchases of equipment and supplies) and tax revenues. Given the high unemployment in the Y-K region, beneficial employment effects would be particularly important within that region. The villages of the Y-K region are small, remote communities with subsistence-based economies and few opportunities for year-round employment. Commercial fishing, which is seasonal and subject to fluctuating stocks, is the mainstay of the private economy but has faced recent conservation and economic challenges. These communities have among the lowest rates in the State for per capita income, and among the highest for unemployment. Many people are leaving these small communities for economic opportunities in urban areas.
Under agreements with the landowners, Calista and TKC, Donlin Gold has a hiring preference for shareholders and descendants and residents of local communities. Many workers with the skills needed for Project construction are available within the region, and an estimated 1,600 to 1,900 from Y-K communities would be employed during this phase (14 to 17 percent of 2015 Y-K region employment). During Operations, an estimated 500 to 600 regional residents would be employed (4 to 5 percent of 2015 Y-K employment). Employment income could help to offset the current trend of decreasing income from fishing. Additionally, for each year the Project is operational, an estimated 650 jobs and $40 million in wages would be generated statewide through multiplier effects, while sales within the State would increase by $150 million per year. As landowners at the Mine Site, Calista and TKC would receive substantial income through lease, surface use agreement, and royalty payments. For the Pipeline, landowners will receive right-of-way (ROW) lease payments, while State and local governments would receive tax revenue. ANCSA corporations (Calista, TKC, and CIRI) would directly benefit from lease payments and ROW payments and all ANCSA corporations would benefit due to revenue sharing.

The duration of beneficial socioeconomic impacts would extend through the life of the mine. During Mine Site closure, seasonal workers would be employed only for monitoring and operations of the water treatment plant, which is planned to take function in perpetuity from the time when the pit lake fills (estimated at 50 years after Closure). While employment opportunities would significantly decrease at the Donlin Gold site after Closure, the ability to use the skills developed at the Donlin Gold site would persist and could result in continued employment at another location.

The Corps concludes that gold mined from the Project would help meet the public and private need for gold in both the short and long term and provide short and long term beneficial socioeconomic effects to a region of the State that is economically depressed.

   ii. The practicability of using reasonable alternative locations and/or methods to accomplish the objective of the proposed structure or work:

Overall, the Corps finds that practicable alternatives that do not impact WOUS and/or special aquatic sites do not exist as a result of geographical and technological constraints of Project siting. An analysis of practicable alternatives and the Corps’ LEDPA determination is presented in Subpart B of this analysis (Attachment B2.1, Section B2.1.1.1).

   iii. The extent and permanence of the beneficial and/or detrimental effects that the proposed structures or work may have on the public and private uses which the area is suited:

The Final EIS addresses the range of potential adverse and beneficial impacts related to the current and potential future public and private uses for which the area is suited. The Project would affect lands from the west side of Cook Inlet, through the Alaska Range, onto the Mine Site 10 miles north of Crooked Creek, and through the Kuskokwim River valley to the Bering Sea. These are generally very remote lands, used primarily by local communities for dispersed subsistence activities, with low levels of use by others. Additional important land uses include: ongoing metals exploration and small mining operations in the vicinity of the Mine Site and the Transportation Corridor; and dispersed recreation (sport hunting, fishing, rafting, and hiking) along with the seasonally intensive use of the INHT for the winter races in the vicinity of a portion of the Project Pipeline.
The proposed Mine Site area is privately owned by Calista for the subsurface and TKC for the surface. The proposed Transportation Corridor would affect land owned or managed by Calista, TKC, the State of Alaska, the City of Bethel, and private landowners. Lands affected by the proposed Pipeline are owned or managed by the State of Alaska, the BLM, Calista, and CIRI.

The Mine Site would primarily occupy private land, owned and managed by Calista and TKC, consistent with their land policies. The Transportation Corridor would occupy private lands managed by Calista and TKC, and public lands managed by the State of Alaska. The proposed transportation facilities would be consistent with the authorities and policies of the respective landowners. The Pipeline would occupy State lands for approximately 207 miles or 66 percent of the length, under the provisions of the Susitna Matanuska Area Plan, the Susitna Flats State Game Refuge Management Plan and the Kuskokwim Area Plan. Supply routes for Pipeline construction would also cross lands within the Southeast Susitna Area Plan boundaries. The INHT passes through State-owned lands near and within the Pipeline corridor, and is jointly managed under the Iditarod National Historic Trail Comprehensive Management Plan. Approximately 97 miles, or 31 percent, of the Pipeline ROW would occupy federal lands, which is currently managed under the Southwest Management Framework Plan of the Bureau of Land Management (BLM).

The proposed Project would require 3 to 4 years to construct. Active mining would occur for approximately 27 years, with concurrent restoration as the mine progresses. Many areas will not be reclaimed until 1 to 27 years after mining starts and some areas will require up to 33 years or longer before they will be fully reclaimed and closed. However, many effects that occur during active mining would be considerably reduced or reversed with time, and many habitat values and potential uses would improve, although not entirely to pre-mining conditions.

Detrimental impacts include the loss of WOUS, impacts on fish and aquatic resources, disturbance to subsistence resources, and effects on surface water and water quality. These impacts range in intensity. Many of these effects will be temporary and will be alleviated after the mine is closed and reclaimed. A number of these impacts will be minimized through measures to be implemented by the Permittee, through compliance with required state and federal regulations, and by specific permit conditions imposed by the respective permits.

In terms of beneficial effects, the area is economically depressed and the Project would create a considerable number of jobs in the area. This will benefit the community. The fiscal benefits of the Project may increase access and affordability of healthcare and would support subsistence activities.

The Corps has determined that the CMP proposed by Donlin Gold adequately compensates for the aquatic resources functions that would be lost as a result of the proposed Project. Furthermore, the Corps concludes the Project would not have detrimental effects on the public and private uses which the area is suited.

B3.2 FOOD AND FIBER PRODUCTION (33 CFR 320.4[A])

References: Final EIS Sections 3.21 (Subsistence), 3.22 (Human Health), and Appendix AB (Focused Risk Assessment [FRA]); ERM 2017b – Human Health Risk Assessment

During the scoping meetings for the Donlin Gold Project, Alaska Native residents in the Project area emphasized their desire to protect their cultural traditions and subsistence way of life. The
proposed Project has the potential for creating adverse and beneficial effects on subsistence resources and practices in the Project area. Potential impacts to subsistence include reductions in subsistence resource abundance and availability, restrictions on access to traditional use areas, increased competition for subsistence resources (from within and outside the region), and sociocultural changes due to employment, out-migration, and shift work. In regard to sociocultural impacts, new employment and income would be beneficial, increasing the ability of households to meet the high costs of subsistence equipment and fuel. The nature, intensity and duration of potential impacts vary by Project component, Project phase and geographic subregion. Potential mitigation measures, including specific Project design and construction/operations/closure procedures proposed by the Applicant, standard state and federal permit conditions, and best management practices were taken into consideration in analyzing potential impacts.

Generally, the habitat areas adversely affected by the Project and the proportion of traditional uses affected are small, and subsistence users may redirect effort to alternative use areas at little cost and effort, with little overall reduction in subsistence harvest levels. The intensity of displacement would be greater for Crooked Creek residents in relation to the Mine Site (with a small displacement of Aniak resident uses), greater for subsistence fishing in narrow and shallow segments of the river, near Aniak and the Oskawalik River, and a small increase in competition for McGrath and Nikolai due to competition deriving from greater use of Farewell Airstrip. Employment and income generated by the Project may be used to support subsistence.

Additionally, comments on the Draft EIS expressed concerns about the potential risk to human health associated with potential exposures to Project-related hazardous chemicals. Most of the concerns expressed were associated with consumption of chemicals in food (fish, wildlife, vegetation) and inhalation of chemicals in air. These and other comments were discussed with cooperating agencies during a technical review workshop. As a result of the discussions, a FRA was conducted as part of finalizing the EIS to evaluate the potential risks and hazards of exposure to Project-related hazardous chemicals and is included in Appendix AB of the Final EIS. A quantitative human health risk assessment (HHRA) was conducted by Environmental Resources Management, Inc. (ERM 2017b) with input from the Corps and AECOM, and is cited in the FRA. The results of the FRA as they apply to potential impacts to subsistence and consumption of subsistence resources are included in the Final EIS Section 3.21.

The FRA and HHRA evaluated the potential exposure of residents in the vicinity of the mine operations to baseline and mining generated levels of mercury, arsenic, and antimony as the result of consumption of representative subsistence resources. Overall, the findings of the quantitative HHRA indicated that the small increases in constituent concentrations estimated to occur outside of the Mine Site due to Project-related activities are unlikely to result in unacceptable risks to human populations who would have the highest exposure (i.e., subsistence users). Based on these findings, other human populations, such as other residents in the region, would not be expected to be exposed to unacceptable risk due to exposure to Project-related concentrations of mercury, arsenic, or antimony.

The Corps has determined that the proposed Project would have negligible effects on food and fiber production and it is not contrary to the public interest.

**B3.3 EFFECTS ON WETLANDS (33 CFR 320.4[B])**

**Reference:** Final EIS, Sections 3.11 (Wetlands)
The Applicant’s proposed Project would result in permanent loss of wetlands and vegetation, including those wetlands that may be involved with shallow groundwater recharge (320.4(b)(2)(i)) and wetlands that may be involved with wave action, erosion, or storm damage (320.4(b)(2)(iv)), through development of the Mine Site, placement of fill for transportation component facilities, and discharges from installation of the natural gas Pipeline. Indirect effects would be incurred from dust deposition and potential dewatering. Impacts to wetlands, including a summary of direct and indirect impact acreages, are discussed in Subpart E (Attachment B2.4, Section B2.4.2). Cumulative effects are discussed in Subpart B (Attachment B2, Section B2.1.2.7). Overall, the Project when combined with past, present, and reasonably foreseeable future projects, with the appropriate avoidance, minimization, and compensatory mitigation measures, would not result in significant adverse cumulative impacts to aquatic resources.

Compensatory mitigation would be required for unavoidable impacts to wetlands, as described in Section 6.2 of the JROD and Attachment B5. With implementation of the CMP, the Corps finds that the adverse effects on wetlands and the aquatic resource functions that would be lost as a result of the proposed Project would be adequately compensated. The proposed CMP will preserve wetlands and riparian areas in the Chuitna watershed, restore and enhance floodplain habitat in the upper Crooked Creek watershed. The Crooked Creek Permittee-Responsible Mitigation Project is located in the same watershed (on-site) of the proposed impact. Off-site options were extensively evaluated by Donlin Gold and the Project in Chuitna was determined to yield the optimal ecological increase in functions and services, while meeting land owner, land use, practicability and economic considerations. Implementation of the CMP would yield substantive, near-term benefits to aquatic resources which perform functions important to the public interest.

The Corps has determined that the proposed Project would have moderate adverse effects on wetlands and it is not contrary to the public interest.

**B3.4 FISH AND WILDLIFE (33 CFR 320.4[C])**

**Reference:** Final EIS, Sections 3.12 (Wildlife) and 3.13 (Fish and Aquatic Resources)

The Applicant’s proposed Project would result in a permanent loss of fish and wildlife habitat, fragmentation, and degradation from development of the Mine Site, placement of fill for transportation component facilities, and installation of the natural gas pipeline. The discharge of dredged or fill material can result in the loss or change of breeding and nesting areas, escape cover, travel corridors, and preferred food sources of resident and transient wildlife. Indirect effects vary in type and intensity for the different Project components and for the various fish and wildlife potentially affected by the Project. Overall, the cumulative effects on wildlife are expected to be geographically or temporality limited within a large area. While the individual impact of the Project is measurable, the cumulative effect is still considered to be limited, given the limited area of disturbance over the region. The cumulative effects on fish and aquatic resources are expected to increase over the life of the Project. Impacts to Fish and Wildlife are further discussed in Subpart B (Attachment B2, Section B2.1.2.5) and Subpart D (Attachment B2.3, Sections B2.3.1 – B2.3.3)

The Corps finds that overall the proposed Project would have a minor adverse effect on wildlife. There is unlikely to be a noticeable change in animal population character or quantity as a result of the Project.
An EFH Assessment was submitted to NMFS dated September 26, 2017, from the Corps (see Appendix Q of the Final EIS). The submission of this EFH Assessment asserts that the Corps permitted actions may have adverse effects on EFH. The Corps determined that the overall Project will have short term and long term effects; overall activities are unlikely to have adverse effects on EFH, and any adverse effects on EFH will be minimal. Further, mine facilities and the port at Jungjuk Point will not have any adverse effects on EFH. EFH consultation is discussed in Section B2.3.4.

The Corps has determined that the proposed Project would have minor adverse effects on fish and wildlife and it is not contrary to the public interest.

B3.5 WATER QUALITY (33 CFR 320.4[D])

References: Final EIS in Sections 3.5 (Surface Water Hydrology), 3.6 (Groundwater Hydrology), 3.7 (Water Quality), and 3.13 (Fish and Aquatic Resources); Water Resources Management Plan (SRK 2017a); Aquatic Resources Monitoring Plan.

The proposed Project would result in adverse direct and indirect impacts to water quality and chemistry as a result of geochemical alteration of mined rock and its interaction with air and water, mercury deposition from stacks and fugitive dust, and potentially sedimentation and turbidity from construction of Project component facilities and barging in shallow areas along the Kuskokwim River. Impacts to water quality are further discussed in Subpart B (Section B2.1.2.2) and Subpart C (Sections B2.2.3 – B2.2.5). As discussed in Subpart F (Attachment B2.5, Section B2.5.1), the discharge of dredged or fill material related to the Mine Site, Transportation Corridor, or Pipeline would not adversely affect the quality or quantity of municipal or private water supplies.

Overall, impacts to water quality and chemistry are not expected to exceed regulatory limits. Discharges at the Mine Site to Crooked Creek and its tributaries would be subject to the APDES permit which was issued on May 24, 2018 which contains effluent quality limitations that are protective of existing uses. Impacts to water quality during construction of the Transportation Corridor and Pipeline components would be temporary. The ADEC issued a conditioned Section 401 Water Quality Certification for the placement of the fill material for the Applicant's proposed Project described in our Public Notice (see Attachment B6 - State of Alaska Certificate of Reasonable Assurance for the Donlin Gold Project).

Considering that the Project would be required to maintain effluent water quality limitations administered by the APDES permit and adhere to the Section 401 Water Quality Certification the Corps has determined that the proposed Project would have minor adverse effects on water quality and it is not contrary to the public interest.

B3.6 HISTORICAL, CULTURAL, SCENIC, AND RECREATIONAL VALUES (33 CFR 320.4[E])

References: Final EIS, Sections 3.16 (Recreation), 3.17 (Visual), 3.20 (Cultural Resources), 3.21 (Subsistence), and Appendix Y (Programmatic Agreement).

Known historic properties (i.e., cultural resources determined eligible for nomination to the NRHP) would be adversely affected by the Project and additional resources may be identified where impacts cannot be avoided and or effects minimized. Donlin Gold has prepared a
Cultural Resources Management Plan (attached as Appendix D of the Programmatic Agreement), to guide mitigation or treatment in consultation with the Corps, BLM, ADNR, SHPO, Tribes, and other affected parties. Unavoidable impacts would create a permanent loss of integrity with resources eligible for the NRHP. However, data recovery and other mitigation could be implemented through the Programmatic Agreement to adequately resolve adverse effects. As outlined in the Programmatic Agreement, mitigation of adverse effects will be required for a minimum of seven historic properties, including two historic cabins (IDT-00260 and TYO-25 00215), the INHT, and four prehistoric occupation sites or lithic scatters (SLT-00094, IDT-00288, MCG-00071, and TYO-00277). Additional historic properties may be located during additional inventory efforts or construction activities. Measures to be implemented for the purposes of mitigating adverse effects to historic properties are detailed in the Programmatic Agreement.

Recreational use of the proposed Mine Site and areas affected by the proposed Transportation Corridor is currently low. The opportunities for recreation in these areas, such as sport (general or non-subsistence) hunting or snowmachining, are widely available elsewhere in the region. Since current recreation use is low, impacts involving changes in recreation access, setting, activities, or use levels that may not be measurable or apparent. The Mine Site is not recognized for its scenic value. The Transportation Corridor affected area may be recognized for its scenic quality and landscape character, though scenic resources are not protected by existing legislation.

Over much of the proposed natural gas pipeline route, recreational use of the corridor is low, and the resources would affect recreation in settings designated by legislation but not designated Wilderness. Guided hunting occurs in two Game Management Units, which are crossed by the Pipeline. As a principal recreational resource of the area, and one of historic significance to Alaska and the nation, the INHT is of special note with regard to the proposed Pipeline. Recreational effects of the Pipeline component would come from disturbance during construction and clearing of shrubs from the Pipeline ROW during construction and maintenance of the Pipeline. The duration of effects vary seasonally and geographically along the Pipeline due to differing levels and contexts of recreation use. The Pipeline corridor would overlap with the INHT for 2.5 miles, and would be within 1,000 feet of the route for 14.3 miles. Impacts to Recreation are further discussed under Subpart F (Attachment B2.5, Sections B2.5.2 and B2.5.3). Impacts to the INHT are further discussed under Subpart F (Attachment B2.5, Section B2.5.5 Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves).

Impacts to scenic values (visual resources) are discussed in Subpart F (Attachment B2.5, Sections B2.5.4 and B2.5.5).

The Applicant has incorporated design features to reduce impacts to cultural, recreational, and visual resources include. Design feature that minimize Project impacts are listed in Chapter 5 of the Final EIS.

Considering that the Applicant would be required, through the special conditions (see Section 6.2.7 of the JROD), to adhere to the National Historic Preservation Act Section 106 Programmatic Agreement, that includes mitigation to address adverse effects to historic properties, the Corps has determined that the proposed Project would have minor adverse effects on historic, cultural, scenic and recreational values and it is not contrary to the public interest.
B3.7 EFFECTS ON LIMITS OF THE TERRITORIAL SEA (33 CFR 320.4[F])

There are no limitations of the territorial sea anticipated from the construction of this Project.

B3.8 CONSIDERATION OF PROPERTY OWNERSHIP (33 CFR 320.4[G])

References: Final EIS Section 3.15 (Land Ownership, Management, and Use)

The proposed Mine Site area is privately owned by Calista for the subsurface and TKC for the surface. The proposed Transportation Corridor would affect land owned or managed by Calista, TKC, the State of Alaska, the City of Bethel, and private landowners. Lands affected by the proposed Pipeline are owned or managed by the State of Alaska, the BLM, Calista, and CIRI.

For all components under the proposed Project, land ownership would experience no impacts to no apparent impacts, and management would not be affected, because current managers would continue to hold authority and the Proposed Action is consistent with current management plans and policies. Lease agreements and ROWs from land owners would be obtained by Donlin Gold for the purposes of construction, operation and maintenance, and closure of the mine, Transportation Corridor, and Pipeline facilities.

Changes in land use at the Mine Site would be from partially disturbed land to intense industrial development. These changes, consistent with the goals of the landowners (Calista and TKC), would predominantly result in obvious changes in land use given the large shift in land use, which would be beneficial to the landowner. The duration of direct and indirect effects would vary. Changes in land use at the Mine Site would revert after closure to nearly pre-mining levels, except for the pit lake and residual transportation infrastructure, and easements. The adjustments to access easements would persist over the life of the Project and may persist after Project Closure even if the actions that caused the impacts were to cease. Access rights on easements crossing the Mine Site, including 17(b) easements, would be administratively adjusted through agreements between affected land managers, and comparable access would be provided.

Land ownership, management, and use changes for transportation facilities would persist after Project Closure and extend beyond a local area, and result in obvious changes and affect resources throughout the EIS Analysis Area for the proposed airstrip, port improvements and mine access road. Adverse effects that may not be measurable or apparent would occur to easements at the port site, and to intermittent users of the State lands affected by the Transportation Corridor footprint.

For the proposed Pipeline, the period of intense disturbance would persist only during the 3 to 4 years of construction. Disturbance from brushing each decade may not be measurable or apparent. During the period of operations and maintenance, changes in ownership, management, or land use may reasonably be expected to convert (or revert) to another use frequently, over the life of the Project. The INHT is considered as having special or rare characteristics with regard to the Pipeline component. Impacts to the INHT are discussed under Subpart F (Attachment B2.5, Section B2.5.5 Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves).
There are no unresolved issues with respect to property ownership. Therefore, the Corps has determined that the proposed Project would have negligible effects on property ownership and it is not contrary to the public interest.

B3.9 ACTIVITIES AFFECTING COASTAL ZONES (33 CFR 320.4[H])


B3.10 ACTIVITIES IN MARINE SANCTUARIES (33 CFR 320.4)

There are no marine sanctuaries in the Project area.

B3.11 OTHER FEDERAL, STATE, AND LOCAL REQUIREMENTS (33 CFR 320.4[J])

See Attachment B4 (Section B4.18) for State and Local authorizations obtained.

B3.12 SAFETY OF IMPOUNDMENT STRUCTURES (33 CFR 320.4[K])

References: Final EIS Sections 3.3 (Geohazards), 3.5 (Surface Water Hydrology), 3.2 (Soils), and 3.24 (Spill Risk); Final EIS Chapter 5 (Mitigation); Final EIS Appendix A (Financial Assurance) and AA (Additional Regulatory Information); ADNR (2005, 2017); BGC (2011a, c, f, l); SRK (2015a)

Dam safety in the State of Alaska is regulated by the ADNR primarily under Alaska Statute (AS) 46.17 “Supervision of Safety of Dams and Reservoirs” and 11 AAC 93 “Dam Safety.” Enforcement powers granted to ADNR under Dam Safety regulations include requirements for approval to construct, enlarge, repair, alter, remove, maintain, operate, or abandon a dam or reservoir; requirements governing different phases of the Project life, such as construction plans, quality assurance/quality control, operations, maintenance, repairs, monitoring and inspections, emergency action planning, and closure; authority for ADNR dam inspection, ordering the owner to take action to protect life and property, and supervisory control of the dam in emergency situations; and financial assurance requirements associated with dam safety (11 AAC 93.171 and 172) to pay for costs of reclamation and post-Closure monitoring and maintenance, or for breaching a dam and restoring the stream channel and land to natural conditions (see Final EIS Appendix A, Financial Assurance, and Appendix AA, Additional Regulatory Framework Information).

ADNR (2005, 2017) has published Guidelines for Cooperation with the Alaska Dam Safety Program, which is administered by ADNR in accordance with dam safety regulations. ADNR uses three classifications for dams based on the potential impacts of failure or improper operation of a dam. Those pertinent to dams at the Donlin Gold Mine Site include:

- Class I (high). Probable loss of one or more lives if failure were to occur.
- Class II (significant). No loss of life expected, although a significant danger to public health may exist; probable loss of or significant damage to structures or property; or
probable loss of or significant damage to waters identified under 11 AAC 195.010(a) as important for anadromous fish.

The planned dams at the Donlin Gold Mine Site consist of the following:

- The Tailings Storage Facility Dam (TSF) – Class I;
- Fresh Water Dam (FWD) (Snow Gulch FWD) – Class I;
- The Fresh Water Diversion Dams (FWDD) (American FWDD and North and South FWDDs) – Class II; and
- Upper and Lower Contact Water Dams (CWDs) – Class II.

The ADNR (2005, 2017) guidelines contain design requirements for hydrology (inflow flood, precipitation, snowpack); hydraulics (flood routing, spillway, freeboard); stability under a variety of loading conditions; design earthquake levels; seepage analysis; and cold regions factors such as permafrost foundation issues, ice loading, and other cold temperature effects on construction materials and operations. The input parameters and design elements of the proposed dams at the Donlin Gold Mine that meet these criteria are presented in BGC (2011a, c, f, and l) and are discussed in Final EIS Sections 3.3.3.2.1 (Earthquakes), 3.3.3.2.2 (Slope Stability), 3.3.3.2.3 (Other Geohazards [Dam Seepage]), 3.2.3.2.2 (Permafrost), 3.5.2.1.3 (Meteorological Inputs to Water Balance Modeling), and 3.5.3.2.1 (Surface Water Hydrology-Mine Site).

The results of static and seismic stability analyses of the TSF dam indicate that it is a robust design. Its downstream construction is inherently the most stable type of tailings dam, and proposed slopes and rock zones are considered safe and meet industry standard factors of safety. Valley siting, dam foundation preparation, water control structures, rockfill body, filter zones, liner materials, and downstream raises all contribute to dam stability in the event of an earthquake. Seismic parameters incorporated into the design, as well as performance examples for similar dams worldwide, indicate that the TSF dam would be extremely unlikely to fail during the largest earthquake that is considered probable in the area, and would very likely remain functional and easily repairable. The intensity of geohazards effects on the dam are expected to range from immeasurable to noticeable changes (e.g., up to 1.4-foot crest settlement and 0.5-foot horizontal displacement in the case of the maximum earthquake). These analyses and results apply to both operations and closure/post-closure phases of the TSF dam (the other Donlin Gold Project dams would be removed at closure).

The impacts of various geohazards on the two Class I dams at the Donlin Gold mine area were subject to review by a panel of geotechnical experts in an Early Stage Failure Modes and Effects Analysis (FMEA) workshop, during which various potential dam failure scenarios were evaluated for probability and consequences (SRK 2015a). Based on further screening analysis of the Early Stage FMEA results (AECOM 2015c), two failure scenarios that represent unlikely but not worst-case situations were selected for analysis of environmental impacts from a partial dam breach for the purposes of the EIS. The parameters for this analysis (failure mode selection, size of the release) and inundation maps from this modeled spill scenario are provided in the Final EIS Section 3.24, Spill Risk (Sections 3.24.3.5.2 and 3.24.5.9).

The ADNR (2005, 2017) dam safety guidelines also contain specific requirements under 11 AAC 93.164(b) for dam failure analysis and detailed inundation maps to be provided in emergency action plans, which estimate the extent of downstream flooding in the event of a complete dam breach regardless of failure mode. These analyses would be completed during final design and
State permitting which are ongoing. Donlin Gold has committed to meeting or exceeding State of Alaska engineering standards and requirements under the ADNR Dam Safety Program (Donlin Gold 2018). Other commitments related to dam safety included in Final EIS Chapter 5, Mitigation include the various construction elements described above, dam inspections and monitoring, excavation of permafrost to bedrock beneath abutments, and water management strategies to maintain flow and storage within the design capacity of all dams and minimize water storage in the TSF in particular.

The impoundment structures at the Donlin Gold mine would serve the public interest identified under B3.1 Public Interest Review (economic benefits) by functioning as necessary and integral parts of mine construction and operations. Based on review of feasibility level designs in the Final EIS that were prepared by qualified persons (e.g., BGC 2011a, c; SRK 2015a), commitments by Donlin Gold for meeting or exceeding State dam safety requirements in final design, and independent reviews of final design and emergency action plans by ADNR qualified persons, impoundment structures are expected to have negligible adverse effects on public safety and are not contrary to the public interest.

**B3.13 FLOODPLAIN MANAGEMENT** (33 CFR 320.4[L]; EXECUTIVE ORDER [EO] 11988)

**References:** Final EIS Section 3.5 (Surface Water Hydrology)

As stated in the referenced regulations, floodplains possess significant natural values and carry out numerous functions in the public interest including: flood attenuation, water quality maintenance, groundwater recharge, living resource values, and cultural resource values. A particular alteration of the floodplain may constitute a minor change; however, the cumulative impact of such changes may result in a significant degradation of floodplain values and functions and in increased potential for harm to upstream and downstream activities.

At the Mine Site, overall direct and indirect impacts to floodplains would result from surface water diversion and storage in the American and Anaconda Creeks, and interception of surface water and groundwater by the mine pit and dewatering wells in the American Creek watershed. These impacts would range in intensity; effects may or may not be within historic seasonal variation depending on season, watershed, and mine phase. The highest intensity of surface water impacts that would affect floodplains (dewatering losses and tributary diversions) would occur throughout Operations and the early closure period. Impacts to floodplains would also result from placement of fill that would eliminate wetlands where flood waters may be stored.

Surface water crossings associated with the Transportation Corridor have the potential to affect floodplain values if drainage structures are missing, undersized, or improperly constructed. Culverts would be installed using construction practices designed to prevent damage from heavy loads, pass the design discharge, and to prevent erosion at the outlets. Bridge and steel arch structures would be constructed to prevent impacts to streams during normal and flood conditions.

The Angyaruaq (Jungjuk) Port design includes a sheet pile wall that extends an average of 150 feet into the Kuskokwim River (BGC 2014e). The sheet pile wall and fill are necessary to provide a level dock adjacent to the moored barges for the lift-trucks loading and unloading shipping containers. A flood-peak frequency analysis (BGC 2014e), a hydraulic model of the 100-year
flood, and ice jam surveys (RECON 2014b) were used to design the fixed structure to be above the 100-year flood and known ice jam elevations. Hydraulic analysis conducted at the Angyaruaq (Jungjuk) Port location concluded that as designed, the sheet pile wall would not majorly impact Kuskokwim River channel morphology during average annual peak flow and 100-year flood conditions.

The majority of rivers and streams along the Pipeline route would be crossed by an open-cut method during winter months when flows are lowest and disturbance of the channel and streambank can be minimized. Final Pipeline design for burial depths and lengths at open-cut stream crossings will include surveying the stream reach to determine the main channel thalweg elevation and floodplain or fan width. These crossings would be designed in cooperation with the ADF&G for protection of habitat and fish, as well as with state and federal regulatory agencies to ensure compliance with applicable water quality regulations. Six Pipeline river crossings are proposed as HDD crossings. The HDD technique minimizes disturbance to the ground surface between the entry and exit points at a given crossing. Additionally, HDD eliminates the need to excavate and backfill within the stream channel.

Impacts to the physical characteristics of the aquatic ecosystem are also disused under Subpart B (Attachment B2.1, Section B2.1.2.1) and Subpart C (Attachment B2.2, Sections B2.2.3 and B2.2.4).

Overall, the Corps finds that the Project would have minor adverse effects on floodplains and it is not be contrary to the public interest.

**B3.14 WATER SUPPLY AND CONSERVATION (33 CFR 320.4[M])**

During construction, freshwater would be required for construction camps, extraction sites for construction of the Pipeline, and ancillary water uses such as dust control, truck washing, and fire protection.

At the Mine Site, the existing exploration camp wells would be decommissioned in early construction in accordance with ADEC (2017e) guidance, and replaced with eight water wells that would be drilled between Omega Creek and an unnamed creek to the south (See Final EIS Figure 2.3-7). Water rights for this proposed use of water have been applied for in the amount of 201 acre-feet per year (125 gpm on a continuous basis). The potable water wells remaining in use at the plant site during Operations would be decommissioned at Closure in accordance with ADEC (2017e guidance). The permanent camp and associated potable water wells would remain during Closure to support continuing reclamation and water treatment activities, although flow rates would be reduced in proportion to staffing reductions.

Construction of a potable water well would be required at the Angyaruaq (Jungjuk) Port. Water rights have been applied for from a well in the amount of 0.55 acre-feet/year (0.34 gpm on a continuous basis) and all conditions would be complied with. The potable supply well would be operated at the Angyaruaq (Jungjuk) Port for the duration of Project operations. The quantity of water used would make up a small portion of the capacity of local or regional aquifers. At Project closure, the potable water well at the Angyaruaq (Jungjuk) Port would be abandoned according to ADEC regulations. Any impacts on local and regional aquifers would be restored to pre-development conditions.

Water extraction sites from surface water sources would be necessary for Pipeline construction and water supply wells would be used to support remote construction camps. Peak numbers of
construction personnel is estimated to be 650 people. At 55 gallons per day (gpd)/person, this is 35,750 gpd or 25 gallons per minute, spread across several camp locations. The quantity of water use would likely be small compared to the quantity of groundwater resource readily available.

Water withdrawals are regulated by the State of Alaska, ADF&G and ADNR and they limit the amount of water removed from each withdrawal location to not adversely impact the resource. Overall, conservation of ground water is not of concern for the Project and the Corps finds that the Project would have no adverse effects on water supply and conservation and it is not contrary to the public interest.

Municipal and private water supply related impacts are discussed under Subpart F (Attachment B2.5, Section B2.5.1).

B3.15 ENERGY CONSERVATION AND DEVELOPMENT (33 CFR 320.4[N])

References: Final EIS, Section 3.18.2.2.3 Local Public Infrastructure and Services; Donlin Gold 2011

The Project is not an energy production facility. Rather, the Project would create new base load electric demand for ore extraction and processing. Electrical power for the Project would be generated on site from a dual-fueled reciprocating engine power plant with a steam turbine using waste heat recovery from the engines. Natural gas would be the primary fuel, with ultra-low sulfur diesel as backup. The power plant would have a total installed capacity of 227 megawatts (MW), an average running load of 153 MW, and a peak load of 184 MW. Natural gas would be transported to the Donlin Gold Mine Site via a 316-mile, 14-inch-diameter buried steel pipeline originating from an existing 20-inch natural gas pipeline near Beluga, Alaska.

Alaska’s electrical energy infrastructure differs from that in the rest of the U.S. in that there is no extensive infrastructure of transmission interties that span the state. The electrical needs of some communities in the EIS Analysis Area are currently served by public utilities connected to a regional transmission line owned by the Alaska Energy Authority. However, in the smaller, more isolated communities, such as those in the Yukon-Kuskokwim (Y-K) region, electricity is generated by isolated diesel generators that are not tied into regional grids. Residents of the Y-K region have the highest energy costs in the nation, at $7 to $12 per gallon for diesel heating fuel; diesel-generated electricity is delivered at a cost ranging from $0.58 to $1.05 per kilowatt hour.

The operation of the Project would have a potential indirect effect on local public utility costs in some Y-K region communities. Although the Project would not be a natural gas distributor, other entities could use any excess capacity that may become available in the natural gas pipeline to help Y-K region communities meet their energy needs (Donlin Gold 2011; as cited in the Final EIS). As stated in the natural gas pipeline plan of development (SRK 2013b; as cited in the Final EIS), providing a means for a reliable natural gas fuel source to the Project may create opportunities for further development of natural gas use beyond that of the Project. For example, the construction of off-take points from the natural gas pipeline would make it possible to provide natural gas to communities that are not currently served by natural gas utilities. This gas could be used for commercial and residential heating needs, as well as for electricity generation capacity.

It is difficult to determine the likelihood that the Project would result in the provision of an alternative energy source for communities in the Y-K region. The biggest challenge lies in the
lack of economies of scale. The fixed costs associated with constructing a regional natural gas pipeline distribution system are large, and the customer base is small. It is unlikely that development of a distribution system would be economically viable unless it was subsidized by an outside entity. However, if this were to happen, the Project would result in a beneficial impact to Y-K region communities.

The Corps has determined that the proposed Project would have beneficial effects over the long term on energy conservation and development, and it is not contrary to the public interest.

B3.16 MINERAL NEEDS (33 CFR 320.4[A][1])

References: Final EIS Section 3.1 (Geology), Final EIS Section 3.23 (Transportation)

For the proposed action, about 50 million tons of overburden would be moved and reused for reclamation across about 9,000 acres at the Mine Site; 4.6 million cubic yards of gravel resources would be extracted from material sites; alteration of surficial deposits would occur along 340 miles of roads and Pipeline ROW; and there would be about 2,800 acres of material sites and Pipeline infrastructure areas. Quantities of sand and gravel mineral resources would be needed to construct access roads, road pads, building facility pads, and other mine- and Pipeline-related infrastructure. The proposed action would not provide for the mineral needs of others; only consume them for the fill area construction. Most rock and gravel aggregate resources impacted are usual or ordinary resources that are not considered depleted, although the ore-containing bedrock at the mine is a rare economic resource.

The Corps has determined that the proposed Project would have no adverse effects on mineral needs and is not contrary to the Public Interest.

B3.17 NAVIGATION (33 CFR 320.4[O])

References: Final EIS Section 3.23 (Transportation)

Water transportation is important throughout the Project area during the open-water period of the summer. The Port of Anchorage is a year-round major cargo hub for the state, especially the rail belt; while the Port of Bethel operates only during the ice-free season and is the principal cargo hub for the Y-K Delta. Existing barge traffic on the Kuskokwim River supplies communities with fuel and goods, while small boat river travel supports the critical subsistence activities of fishing, hunting, gathering, and sharing, as well as inter-community family and social travel.

During the winter, the frozen Kuskokwim River serves as a Transportation Corridor for snowmachines, off-highway vehicles, dogsleds, and light-duty passenger vehicles (cars and pickup trucks). There are approximately 28 miles of ice road on and along the Kuskokwim River in winter that support heavy equipment and large trucks (up to 25,000 pounds [not including cargo]) for an average of 1 month each winter when ice thickness is sufficient. During the shoulder seasons of freeze-up and breakup, there typically are no motorized vehicles or boats on the river. Using the Kuskokwim River for winter travel by snowmachines (or less frequently, dog teams) between Aniak and Crooked Creek is common. An extensive system of marked winter trails runs between villages, which allows for local travel by snowmachine (or less frequently, dogsleds).
On the lower river, closer to the city of Bethel, hovercrafts provide summer and winter postal, freight, and passenger service to eight nearby communities, operating over open water, marshy land, and river ice. Hovercrafts are used year-round in the area between Napaskiak and Akiak on the lower Kuskokwim River, with the exception of short times during freeze-up and breakup periods.

The greatest effects to navigation from the Project would be associated with barging on the Kuskokwim River. The Project would increase commercial vessel traffic on the Kuskokwim River during all phases of the Project as cargo and fuel are transported to the Angyaruaq (Jungjuk) Port (estimates of river barge round trips per season are proved in Table 3.23-11 of the Final EIS). Existing transportation systems would remain intact; however, the volume of additional barge traffic on the Kuskokwim River over the life of the Project would have a noticeable disturbance or displacement of transportation access, mode, or traffic levels. This would cause potential for disturbance and limited displacement of the commercial and non-commercial vessel traffic, approximately 395 average annual commercial vessel trips, and 1,600 average annual non-commercial vessel trips on the Kuskokwim River. The contribution of the Donlin Gold Project barges carrying Pipeline support material in Cook Inlet would be minimal.

Navigation impacts would be minimized by implementation of design features detailed in Table 5.2-1 of the Final EIS. The Corps has determined that the proposed Project would have minor adverse effects on navigation, and it is not contrary to the public interest.

**B3.18 ENVIRONMENTAL BENEFITS (33 CFR 320.4[P])**

The Proposed Action would not provide any identifiable environmental benefits.

**B3.19 ECONOMICS (33 CFR 320.4[Q])**

**References:** Final EIS Section 3.18 (Socioeconomics)

The Proposed Action would generate positive economic benefits to communities in the Y-K region, ANCSA corporations (Calista, TKC, and Cook Inlet Region Incorporated [CIRI]) and their shareholders, and the State and local governments.

Project impacts would include beneficial effects from employment, income, sales (i.e., purchases of equipment and supplies) and tax revenues. Given the high unemployment in the Y-K region, beneficial employment effects would be particularly important within that region. Under agreements with the landowners, Calista and TKC, Donlin Gold has a hiring preference for shareholders and descendants and residents of local communities. Many workers with the skills needed for Project construction are available within the region, and an estimated 1,600 to 1,900 from Y-K communities would be employed during this phase (14 to 17 percent of 2015 Y-K region employment). During Operations, an estimated 500 to 600 regional residents would be employed (4 to 5 percent of 2015 Y-K employment). Employment income could help to offset the current trend of decreasing income from fishing. Additionally, for each year the Project is operational, an estimated 650 jobs and $40 million in wages would be generated statewide through multiplier effects, while sales within the State would increase by $150 million per year. As landowners at the Mine Site, Calista and TKC would receive substantial income through lease, surface use agreement, and royalty payments. For the Pipeline, landowners will receive ROW lease payments, while State and local governments would receive tax revenue. ANCSA corporations (Calista, TKC, and CIRI) would directly benefit from lease payments and ROW
payments, and all ANCSA corporations would benefit due to revenue sharing. Commercial fishing is also important to the economy of several local communities. If the project had impacts to fish, commercial fishing would also be impacted, but determining the extent of those impacts is difficult and would depend on potential impacts to the fisheries (see also Section B3.4).

Overall, the duration of socioeconomic impacts during the Construction Phase would be temporary, lasting the 4 years in which Project construction occurs. For impacts due to mine operations, the duration would extend through the 27-year estimated life of the mine. Impacts during the Closure Phase would return to pre-activity levels when actions causing impacts cease, because seasonal workers would be employed only for monitoring and operations of the water treatment plant, which is planned to function in perpetuity from the time when the pit lake fills (estimated at 50 years after Closure). However, while employment opportunities would significantly decrease at the Donlin Gold site after Closure, the ability to use the skills developed at the Donlin Gold site would persist, and could result in continued employment at another location.

It is assumed that appropriate economic evaluations have been completed by the Applicant, the proposal is economically viable, and is needed in the market place (33 CFR 320.4(q)).

The Corps has determined that the proposed Project would have moderate, long-term beneficial effects on economics in the Yukon Kuskokwim Region, and it is not contrary to the public interest.

**B3.20 CONSERVATION (33 CFR 320.4[M])**

**References:** Final EIS Chapter 1, Final EIS Chapter 3

Federal laws, executive orders, and agency regulations and policy guidance frequently address the need for conservation of natural resources. The Corps Regulatory Program, by authority, is focused on conservation of WOUS, including wetlands. The proposed action would include impacts to waters and wetlands, fish and wildlife, vegetation, soils, air, land, minerals, and subsistence plants and animals. As described throughout the other subsections in Section B3, this evaluation discloses that conservation of natural resources would be accomplished by the proposed action, aside from extracted gold ore.

The Corps has determined that the proposed Project would have no adverse effects on Conservation and would not be contrary to the Public Interest.

**B3.21 GENERAL ENVIRONMENTAL CONCERNS (33 CFR 320.4[A])**

**References:** Final EIS Section 3.9 (Noise), Final EIS Section 3.24 (Spills), Final EIS Section 3.26 (Climate Change).

General environmental concerns include noise, spill risk, and climate change, which were identified in the Final EIS as matters of general environmental concern, and which are not included in the standard public interest topics.

Equipment operation for drilling, construction, and production, as well as vessels and aircraft used for transportation, would contribute to increased levels of noise in the Project area. Noise levels are expected to be consistent with other mine production facilities once production and development operations commence. Noise emissions from fixed-place facilities attenuate rapidly with distance from the facility. Cumulative noise effects associated with the proposed
Project are unlikely to impact local communities. Overall impacts to noise are anticipated to be minor.

Risks are associated with potential spills of five substances proposed for use in the Donlin Gold Project: ultra-low sulfur diesel fuel (diesel) transported in barges, trucks, and pipelines, and stored in tanks; liquefied natural gas (LNG) releases; mercury or cyanide release to the environment during transport; and tailings behind the tailings dam. The substances would be regulated by a variety of federal, state, and international standards. The impacts described are not part of the Project design, but represent upset or system failure.

The relatively small amount of greenhouse gases (GHGs) exhausted from construction, drilling, and operation of the proposed action would not have a measurable effect to climate change. At this time, the long-term effects of climate change in the Project area are unknown. The adverse impacts caused by the Project construction and operation due to GHGs are expected to be negligible.

Overall, the Corps finds that the Project would have moderate adverse effects on environmental concerns and it is not be contrary to the public interest.

**B3.22 MITIGATION (33 CFR 320.4 [R])**

Mitigation is discussed in Subpart H (Attachment B2.7) and in Section 6.0 of the JROD.
ATTACHMENT B4  COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS (33 CFR 330.3 RELATED LAWS)

B4.1 CLEAN WATER ACT (33 USC SECTION 1341) SECTION 401 CERTIFICATE OF REASONABLE ASSURANCE (33 CFR 320.4[D])

The ADEC issued a conditioned 401 Water Quality Certification for the placement of the fill material for the Applicant's proposed Project described in our Public Notice (see Attachment B6 - State of Alaska Certificate of Reasonable Assurance for the Donlin Gold Project).

B4.2 COASTAL ZONE MANAGEMENT CONSISTENCY DETERMINATION (33 CFR 320.4[H])


B4.3 ENDANGERED SPECIES ACT OF 1973 (16 USC 1531)

References: Final EIS, Section 3.14 (Threatened and Endangered Species)

Impacts to endangered species and the outcome of consultation with the USFWS and NMFS are discussed under Subpart D (Attachment B2.1, Section B2.3.1).

Coordination under Endangered Species Act (ESA) with the USFWS and NMFS has been completed. Letters of Concurrence (LOCs) agreeing with the Corps’ determination that the action “may affect, but is not likely to adversely affect listed species or their critical habitat” were provided by the USFWS and NMFS. The Applicant would be obligated to incorporate the mitigation measures described in the LOCs into the Project operations. The Corps would incorporate the NMFS and USFWS LOCs as a special condition of any permit we may authorize (see Section 6.2.7 of the JROD). ESA compliance has been met.

B4.4 FISH AND WILDLIFE COORDINATION ACT (16 USC 661)

Coordination with the USFWS, NMFS, and ADF&G, and completion of the process and analyses contained within the JROD and signature by the authorizing official completes the Corps’ Fish and Wildlife Coordination Act responsibilities.

B4.5 MAGNUSON-STEvens FISHERY CONSERVATION AND MANAGEMENT ACT

Consultation under the Magnuson-Stevens Fishery Conservation and Management Act with the NMFS has been completed and is summarized in Section B2.3.4. Signature of this JROD by the authorizing official completes the Corps’ responsibilities under this act.
B4.6 NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 (42 USC 4321 – 4347)
Signature of this JROD by the authorizing official completes the Corps NEPA requirements and responsibilities.

B4.7 NATIONAL HISTORIC PRESERVATION ACT OF 1966 (16 USC 470 ET SEQ.)
Completion of consultation with the Alaska Office of History and Archaeology and signature of the Programmatic Agreement completes the Corps’ NHPA requirements.

B4.8 CLEAN WATER ACT (33 USC 1251 ET SEQ. 404[B][1] GUIDELINES 40 CFR 230 SUBPART B)
Completion of the process and analysis contained within the JROD (Attachment B2) completes the Corps 404(b)(1) requirements.

B4.9 CLEAN WATER ACT (33 USC 1251 ET SEQ.) SECTION 404 (33 USC 1344)
Completion of the process and analysis contained within the JROD and signature by the authorizing official completes the Corps CWA 404 requirements.

B4.10 RIVERS AND HARBORS APPROPRIATION ACT OF 1899 (33 USC 401, 403, 407)
Completion of the process and analysis contained within the JROD and signature by the authorizing official completes the Corps RHA requirements.

B4.11 MARINE MAMMAL PROTECTION ACT OF 1972 (16 USC 1361 ET SEQ., 1401-1407, 1538, 4107)
The Proposed Action does not involve the transport of dredged material for disposal or any construction in marine waters. Under ESA coordination, the Corps, USFWS, and NMFS evaluated impacts from barging on listed marine mammals and their critical habitat. See Section B4.3 above. This consultation also satisfies the requirements of the Marine Mammal Protection Act of 1972.

B4.12 EXECUTIVE ORDER 13175 CONSULTATION AND COORDINATION WITH INDIAN TRIBAL GOVERNMENTS
This EO was designed to establish regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications and to strengthen the U.S. government-to-government relationships with Indian tribes.

The Corps identified 66 federally recognized tribes potentially affected by the Project (see Final EIS Section 6.2 and Appendix P). On September 24, 2012 the Corps sent a letter of notification and inquiry to the 66 tribes offering the opportunity to participate in formal government-to-government consultation, to participate as a cooperating agency, or to simply receive information about the Project. The letters also included a Tribal Coordination Plan for the development of the EIS. The Corps requested information from the tribes on the following
topics: subsistence, archaeological sites, and traditional cultural properties as well as special expertise regarding any environmental, social and/or economic impacts. Six tribes elected to serve as cooperating agencies during development of the EIS (see Section 1.1 of the JROD for a complete list of cooperating agencies). Discussions with potentially affected tribal governments continued throughout the course of the Project. A summary of consultation efforts by the Corps is included in the Final EIS Section 6.2 (Tribal Coordination and Government-to-Government Consultation).

Consultation with federally recognized Tribes and completion of the process and analysis contained within this document and signature by the authorizing official completes the Corps’ Executive Order 13175 requirements.

B4.13 CLEAN AIR ACT (42 USC 7401 – 7671 SECTION 176[C])

The ADEC has issued an air quality control permit that serve as a framework for the operation of the Mine Site. The Corps of Engineers finds the issuance of the permit by ADEC is conclusive with regards to air quality issues. Completion of the process and analysis contained within this JROD and signature by the authorizing official completes the Corps Clean Air Act requirements.

B4.14 EXECUTIVE ORDER 12898 (ENVIRONMENTAL JUSTICE)

Executive Order 12898 requires federal agencies identify and address "as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations."

Most communities in the Project area are low-income and minority communities, as defined under the Council on Environmental Quality (CEQ) guidelines (see Final EIS Figure 3.18-1). This includes the Yukon-Kuskokwim (Y-K) region and the Native Village of Tyonek. Communication and outreach with these communities occurred throughout the scoping process, the public meetings on the Draft EIS, and in government-to-government consultation with Tribes. Final EIS Sections 6.2 and 6.3 of Chapter 6, Consultation and Coordination, discuss these outreach and consultation efforts. This outreach effort identified many concerns, which are catalogued in the Scoping Report and the Comment Analysis Report. Many of the issues selected for further analysis in Chapter 6, Consultation and Coordination, reflect concerns raised by communities included in the environmental justice analysis.

As discussed in the Final EIS Section 3.19 (Environmental Justice), the proposed Project would result in a variety of direct and indirect impacts to socioeconomics, subsistence, and human health as they relate to environmental justice. Table 3.19-7 in the Final EIS provides a summary of impacts. These impacts are also addressed Attachment B3 (Sections B3.19 [economics] and B3.2 [food and fiber production]) above.

The proposed Project would provide employment and income to the Y-K region, an area with notably low per capita incomes, high unemployment, and high poverty rates. In terms of intensity, employment impacts in the Y-K region during Construction would be beneficial and result in changes to socioeconomic indicators that are well outside normal variation and trends or greater than a 10 percent increase. During Operations, the beneficial increase in employment would be from 4 to 5 percent. Payments to ANCSA landowners would be outside of normal
variation and trends, exceeding a 10 percent increase, while tax revenues would represent large sums of income to borough and state governments.

Adverse impacts to subsistence would include disruption to subsistence resources and displacement of access to subsistence use areas of different communities depending on the project component. The duration of socioeconomic impacts would be for the Construction and Operations Phase. However, while employment opportunities would significantly decrease at the Donlin Gold Mine after Closure, the ability to use the skills developed at Donlin Gold would persist and could result in continued employment at another location. For subsistence effects, most impacts would occur for the duration of the Construction and Operations phases. However, for the pipeline component, the disturbance to subsistence resources and displacement of subsistence access would be greater during the Construction phase, and would decrease considerably during Operations when the pipeline would be buried in nearly all of its length, with limited monitoring activity and brushing of the corridor every ten years.

An increase in employment and incomes could support subsistence activities, improve food security, and contribute to improving health. Adverse human health impacts could include increases in substance abuse, potential accidents and injuries, exposure to hazardous constituents, and infectious diseases. Balancing the beneficial and potential adverse impacts of the proposed Project on minority and low-income populations, it is not expected to raise an environmental justice concern. Donlin Gold will implement a communication program to keep local communities informed of the barge schedules and current status of barge traffic as well as minimize displacement of subsistence fishing by barges (see Final EIS Section 3.19.3.2.6 and Appendix W, for Donlin Gold’s Barge Communication Plan). Donlin Gold has also committed to two subcommittees, the Barge Subcommittee and the Subsistence Subcommittee, managed under the purview of the DATROC.

In accordance with Title 111 of the Civil Right Act of 1964 and Executive Order 12898, it has been determined that the Project would not directly or through contractual or other arrangements, use criteria, methods, or practices that discriminate on the basis of race, color, or national origin nor would it have a disproportionate effect on minority or low-income communities.

Completion of the process and analysis contained within this JROD and signature by the authorizing official completes the Corps Executive Order 12898 requirements.

**B4.15 EXECUTIVE ORDER 11988 (FLOOD PLAIN MANAGEMENT)**

See Attachment B3, Section B3.13. The Proposed Action would not be constructed in designated floodplains and would not create flood hazards in floodplains. Completion of the process and analysis contained within this JROD and signature by the authorizing official completes the Corps Executive Order 11988 requirements.

**B4.16 EXECUTIVE ORDER 13112, INVASIVE SPECIES**

Through the Applicant’s compensatory mitigation plan, required as a special condition (see 6.3.7 in the JROD), the Permittee will be required to control the introduction and spread of exotic species.
B4.17 EXECUTIVE ORDERS 13212 AND 13302, ENERGY SUPPLY AND AVAILABILITY

The Project was not one that will increase the production, transmission, or conservation of energy, or strengthen Pipeline safety.

B4.18 OTHER FEDERAL, STATE AND/OR LOCAL AUTHORIZATIONS (IF ISSUED)

ADEC – Alaska Pollutant Discharge Elimination System Permits (AK0055867)
  Date Issued: 5/24/2018
  Conditions for issuance: ☒ Yes ☐ No

ADEC – Air Quality Control Construction Permit (AQ0934CPT01)
  Date Issued: 6/30/2017
  Conditions for issuance: ☒ Yes ☐ No

ADEC – Certificate of Reasonable Assurance (POA-1995-120)
  Date Issued: 8/10/2018
  Conditions for issuance: ☒ Yes ☐ No

U.S. Department of Transportation – Special Permit (PHMSA-2016-0149)
  Date Issued: 6/5/2018
  Conditions for issuance: ☒ Yes ☐ No

B4.19 SIGNIFICANT NATIONAL ISSUES (33 CFR 325.2[A][6])

The regulations state that if a district engineer makes a decision on a permit application that is contrary to State or local decisions, the district engineer will include in the decision document the significant national issues, and explain how they are overriding in importance.

This decision document and final decision are not contrary to State or local decisions, and there are no significant issues of overriding national importance.
This page intentionally left blank.
Block 23. Avoidance, Minimization, and Compensation

Donlin Gold Project
Department of the Army Permit POA-1995-120
July 2018
Block 23. Avoidance, Minimization, and Compensation

Contents

Avoidance and Minimization (A&M)

Compensatory Mitigation Plan (CMP)

Attachment A Pipeline Area Wetlands Impacts by HUC-10 (Acres) Before and After Construction

Attachment B Hydrogeomorphic (HGM) Classification

Attachment C Mine Area Restoration Plan

Attachment D Upper Crooked Creek Permittee Responsible Mitigation Plan

Attachment E Chuitna Permittee Responsible Mitigation Plan

Attachment F Transportation Area Restoration Plan
Avoidance and Minimization

Contents
Avoidance and Minimization ........................................................................................................................ 2
Avoidance and Minimization ........................................................................................................................ 3
Mine Area (MA) ......................................................................................................................................... 3
Avoidance and Minimization during Design .......................................................................................... 3
Minimization During Construction ........................................................................................................... 10
Transportation Area (TA) ........................................................................................................................ 12
Avoidance and Minimization During Design ......................................................................................... 12
Minimization During Construction ...................................................................................................... 18
Pipeline Area (PA) ................................................................................................................................... 20
Avoidance and Minimization During Design ........................................................................................ 20
Minimization During Construction ...................................................................................................... 28
References .............................................................................................................................................. 31

Figures
Figure 1  Watersheds within the Proposed Mine Area............................................................................ 4
Figure 2  Anadromous and Resident Fish Habitat Extent ........................................................................ 5
Figure 3  Mine Facilities Footprint ........................................................................................................... 8
Figure 4  Transportation Corridor – Avoidance Measures ...................................................................... 15
Figure 5  Camp Facilities Location .......................................................................................................... 16
Figure 6  Airstrip Location .......................................................................................................................... 17
Figure 7  Alaska Range Alternative Locations ....................................................................................... 23
Figure 8  Pig Launcher/Receiver Site ....................................................................................................... 25
Figure 9  Compressor Station Location .................................................................................................. 26
Figure 10  Kuskokwim River HDD Crossing Location ............................................................................. 27

Tables
Table 1  Alaska Range Alternative Locations .......................................................................................... 21
Avoidance and Minimization

Donlin Gold, LLC (Donlin Gold) has planned the proposed project to avoid and minimize impacts to Waters of the United States (WOUS) to the extent practicable during the construction, operation, reclamation, and closure phases of the project. The following is a description of avoidance and minimization efforts for the proposed project. For ease of explanation the narrative has been grouped by the three distinct project areas: Mine Area (MA), Transportation Area (TA), and Pipeline Area (PA). A description of compensatory mitigation follows the avoidance and minimization discussions.

Mine Area (MA)

The proposed facilities in the MA include the open pit, waste rock facility (WRF), tailings storage facility (TSF), mill facilities, shop, power plant, stockpiles, fuel storage, water management facilities, laydown areas, material sites, connecting roads, and other associated facilities. Figure 1 depicts the watersheds in the proposed MA. The proposed mine footprint encompasses approximately 9,000 acres. There are approximately 6,430 acres of uplands within the proposed mine footprint, and 2,570 acres of wetlands. The following measures to avoid and minimize impacts to WOUS were included in the project design and construction plans.

Avoidance and Minimization during Design

- Placement of Facilities to Avoid and Minimize WOUS Impacts – Due to the abundance of wetlands within the project area, avoiding all fill discharges into WOUS is not practicable. The 2007 Preliminary Jurisdictional Determination (PJD) (Michael Baker International 2017a, 2017b) delineation for the project shows that ridgetops and hillsides at higher elevations in watersheds are upland, while WOUS are more prevalent in valley bottoms and hillsides at lower elevations in watersheds. The proposed project infrastructure layout maximizes the use of uplands, while minimizing WOUS encroachment to the extent practicable. Potential mine impacts were reduced by placing facilities in fewer watersheds and WOUS. Facility placement and design are typically more efficient on flatter ground. However, to avoid WOUS, the facilities were placed on upland ridges as feasible; where additional site preparation work will be needed to provide level and stable pads.

- Anadromous and Resident Fish Habitat – The proposed locations of the WRF, TSF, mine facilities, Snow Gulch freshwater reservoir and material sites, and north and south overburden and material sites avoid anadromous fish habitat. Resident Dolly Varden are the only species of fish observed at higher creek elevations in the American and Anaconda Creek watersheds. See Figure 2 for the extent of Anadromous and Resident Fish within the proposed MA.

- Open Pit – The open pit is immovable and irreplaceable in nature. Design criteria included: access to the mineral resources; minimizing waste rock volumes; maintaining pit wall stability; and minimizing disturbance footprint. Studies were completed to determine the steepest practicable wall slopes to maintain stability, and consequently minimize the surface disturbance of the pit. The impacts to WOUS by the open pit are unavoidable, and have been minimized to the extent practicable.
Figure 1  Watersheds within the Proposed Mine Area
Figure 2  Anadromous and Resident Fish Habitat Extent
- **Waste Rock Facility** – General design criteria for the WRF location included: capacity to store approximately 2,449 million short tons (Mst) of waste rock and 46 Mst of overburden fill; ability to manage runoff water; proximity to the open pit to minimize transportation costs; wetlands avoidance and minimization; and geotechnical factors such as hydrology, slope stability, and seismic stability. Potential locations for storage of waste rock considered placement of all waste rock in the American Creek valley, or splitting the waste rock storage between American Creek and Anaconda Creek or Snow Gulch. Siting the WRF within American Creek watershed provided the most practical option because of the proximity to the open pit to minimize transportation cost, and the ability to use the open pit to control runoff post mine closure. The WRF minimizes WOUS impacts with a compact footprint located in the upper watershed of American Creek. The WRF was designed to an overall slope of 3(H):1(V). This design allowed for placement of all waste rock within the American Creek valley, to an elevation of 1,705 feet above sea level, avoiding potential impacts from waste rock management in Snow Gulch or Anaconda Creek valley.

- **Tailings Storage Facility** – General design criteria for the TSF location included: capacity to store 334,298 acre-feet of tailings; proximity to the MA facilities to minimize tailings transportation costs; wetlands avoidance and minimization; and geotechnical factors such as hydrology, slope stability, and seismic stability. Potential locations for storage of tailings considered placement of all tailings in the Anaconda Creek, Crevice Creek, and Snow Gulch valleys, or dividing the tailings between the Anaconda Creek and American Creek valleys. Siting the TSF within the Anaconda Creek valley provided the most practical option because of the proximity to the MA facilities, availability of construction material sources, and capacity to manage tailings within a single area. The TSF minimizes WOUS impacts with a compact footprint. The TSF dam was designed with a maximum height of approximately 462 feet to maximize the storage capacity within the east half, or upper reaches of the Anaconda Creek valley, thus limiting the TSF footprint and avoiding additional wetland impacts in the lower valley, closer to Crooked Creek; avoiding potential impacts from TSF management in Snow Gulch or American Creek valley. It is not feasible to collocate the WRF and TSF in one valley.

- **Mine Area Facilities** – General design criteria for the MA facilities included: sufficient space to accommodate mine facilities (e.g., crusher, processing facility, power plant, fuel storage, and laydown pads); proximity to the open pit, ore stockpile, and TSF to minimize ore and tailings transportation costs; geometrically designing pads with the lowest volumes of cut and fill; wetlands avoidance through strategic location of facilities; and factors such as hydrology, and soil stability. Potential locations for the MA facilities considered included the lower (near Crooked Creek) or middle portion of the American Creek ridge because of proximity to the open pit and TSF. The lower American Creek ridge location would have resulted in longer roads to the ore stockpile and TSF and greater impacts to WOUS. Locating the facilities in the middle portion of the American ridge avoided all impacts to WOUS. See Figure 3.

- **Material Sites** – Material sites are necessary for the construction of mine facilities and roads. River floodplains are typically valuable sources of aggregate material. Donlin Gold recognized early in the MA development that using material near Crooked Creek would likely have impacts
to anadromous fish reaches. All material sites chosen were sited outside the floodplain of Crooked Creek. The material sites identified are immovable and irreplaceable in nature. The sites identified provide high volume, high-quality material, while minimizing access road distances. The amount of aggregate estimated to be required was minimized by designing facilities and roads that would need the least material to construct and maintain. The material site required for the Snow Gulch freshwater dam has been sited on a ridgetop where suitable material is present to avoid WOUS. In summary, although some material sites are in WOUS, they were sited outside of the Crooked Creek floodplain and away from headwater streams.
Figure 3  Mine Facilities Footprint
- **Mine Roads** – Mine roads are used to transport personnel, goods, and materials between mine facilities. These roads have been designed to meet traffic and safety requirements for the mine truck fleet. General design criteria for locating mine roads included: development of a two-lane transportation route that is suitable for mine trucks, safe transport of mine supplies with a grade of less than eight percent; minimizing construction and maintenance costs; geometrically designing roads with the lowest volumes of fill; minimizing drainage crossings and locating necessary crossings at hydrologically prudent locations; locating suitable material sites within proximity of the proposed project to minimize road construction cost and associated impacts of material site access roads; and avoidance and minimization of impacts to WOUS. The length of road access required was minimized by the compact design of the mine facilities, which shortened the distance between areas and minimized impacts to WOUS. Where practicable, mine roads were designed to reach multiple locations via the same access, and avoid the need for secondary roads and additional WOUS impacts.

- **Laydown Pads** – Laydown pads are areas to store equipment and mine supplies. General design criteria for locating laydown pads included: proximity to mine facilities; geometrically designing pads with the lowest volumes of cut and fill; wetlands avoidance and minimization; and factors such as hydrology and soil stability. Where practicable, laydown areas were located in uplands and adjacent to other pads to minimize mine road construction needs and additional impacts to WOUS, including stream crossings. Development of laydown areas at the MA adjacent to long-term disturbance areas reduces the need for additional equipment and material storage at the proposed Jungjuk (Angyaruaq) Port.

- **Facilities Co-located with Other Facilities** – Where practicable, facilities were designed to share space and accommodate multiple uses to minimize the project ground disturbance footprint. Two proposed material sites within the Omega and Anaconda drainages will be used as overburden storage areas after the required material volume has been extracted. The ore stockpile and contact water dams have been located within the footprint of the WRF.

- **Road Stream and Drainage Crossings** – The mine roads were designed to minimize the number of stream and drainage crossings. Where these were unavoidable, the road was designed to approach each WOUS perpendicular to the flow to minimize WOUS impacts. Bridge structures or culverts will be installed at each stream and drainage crossing to facilitate vehicle passage and minimize impacts. Bridge structures will be installed at major crossings. Minor stream crossings and drainages will have culverts installed to ensure cross-flow and hydrologic connectivity. Crooked Creek is only crossed once at the MA. A full-span bridge, with no in-channel supports, will be used to avoid impacts to Crooked Creek. Retaining walls would be installed as needed to contain road embankment fill. See Engineering Drawings TA-310D1a through TA-310D1b of the Crooked Creek Bridge.

- **Mine Area Restoration** – The TSF Material Site-06/ TSF Stockpile 2 and TSF Material Site-07/TSF Stockpile 3 within the Anaconda drainage will be used as growth media storage areas after the material has been extracted. Post mine, the growth media fills will be removed and used for reclamation purposes, and the sites will be returned to WOUS. See Block 23 CMP Attachment C for a detailed description of proposed MA restoration plan related to these facilities.
- **Condemnation Drilling** – Condemnation drilling tests were conducted under the mine facilities to verify that no recoverable minerals occur, so that facilities could be sited without the risk of future relocation impacting additional WOUS.

- **Reclamation and Closure** – A reclamation and closure plan has been prepared for the mine. To summarize: stockpiled overburden and organic materials will be used to reclaim the WRF, TSF, pads, material sites, and the majority of mine roads. While some of the reclaimed areas will no longer meet WOUS criteria, these areas will provide habitat for wildlife species and native plants.

**Minimization During Construction**

- **Vegetation Clearing Activities** – Vegetation clearing for the proposed MA facilities will be scheduled to occur outside the migratory bird nesting season as best possible consistent with the United States Fish and Wildlife Service (USFWS) guidance. If avoiding the suggested window is not possible, the area will be surveyed for the presence of nests immediately prior to clearing activities during the restricted clearing periods, and identified nests can be provided appropriate protection; or if otherwise authorized by permit from the USFWS. The Migratory Bird Treaty Act (MBTA) prohibits the killing or harassment of migratory birds, and migratory bird nests, eggs, or nestlings if work were to be conducted in nesting habitat during the spring and summer breeding season. Clearing will not be conducted outside established vegetation clearing boundary limits. Cut vegetation will be piled within the project disturbance limits, so as not to block surface water flows or adversely affect nearby WOUS except when used to provide Best Management Practices (BMPs) for stormwater management under the Multi-Sector General Permit (MSGP).

- **Erosion Control Measures** – Erosion control and construction methods will be described in the Donlin Gold Stormwater Pollution Prevention Plan (SWPPP) required by the State of Alaska 2015 MSGP for Stormwater Discharges Associated with Industrial Activity. BMPs for embankment stabilization, including contouring and seeding will be employed project-wide to reduce embankment erosion and potential sediment runoff into WOUS. The State of Alaska will provide a Certification under Section 401 of the Clean Water Act. The Donling Gold Project will comply with the State’s Water Quality Standards.

- **Construction in Drainages** – To minimize potential sediment suspension and transport, stream crossing structures will be constructed during periods of low flow or normal flow regimes. Water diversion structures will be implemented where required.

- **Temporary Construction Work Areas** – Temporary construction work areas (buffers) are located adjacent to all proposed MA facilities to provide a transition between proposed cut and fill locations and adjacent land use. Buffer widths vary, but are typically 25 feet. Trees and tall shrubs will be cut, but organic soil and root mass will be left intact as practicable. Stumps will only be removed if it is determined that intact stumps would pose a risk to the installation of structures, the movement of equipment, or the safety of personnel. Stockpiled materials will not be placed in WOUS. Existing disturbed areas for temporary construction activities will be used to the maximum extent possible to avoid new disturbance.
• Development of Material Sites – Material sites within Omega Gulch and Anaconda Creek watersheds would have unavoidable impacts to WOUS. The following construction guidelines are provided to limit the disturbance footprint, prevent impacts to nearby WOUS, and minimize the overall footprint to WOUS. Construction considerations for material sites include:

  o Source material testing for metal leaching and acid rock drainage potential will be completed on hard rock material sites prior to mining. Material that does not meet environmental standards will not be used as fill. By not using acid generating and metal leaching material, water quality standards will be met.

  o Material site and work area boundaries will be surveyed and monumented with a Global Positioning System (GPS) device as well as physically marked, using rebar stakes and flagging prior to breaking ground to avoid impacting WOUS outside of the permitted area.

  o Vegetation and organic soils will be stockpiled separately from overburden in uplands as practicable for future use in reclamation.

  o Appropriate offsets will be provided between overburden berms and the active pit areas.

  o Material work pads will be used in summer construction over thaw-unstable permafrost and any overlaying wetlands and soft soils; the organic layer will be left intact to slow thermal degradation and to aid in final reclamation.

  o Mining will proceed in a benched manner. Individual benches will be no more than 40 feet apart vertically, and will be no narrower than 20 feet wide. Multiple benches can be in production at one time, with slope angles of approximately 2 Horizontal (H):1 Vertical (V).

• Material Sites Reclamation – Material sites will be reclaimed following these guidelines:

  o Grade overburden or unusable material piles after use to slopes of 3(H):1(V), or flatter.

  o Except where the steepness of the wall makes it impractical or impossible, pits and quarry walls will be reclaimed as follows:

    ▪ The pit and quarry walls will be reclaimed when future development is not required.

    ▪ Pit and quarry walls will be graded to 2(H):1(V) or flatter. Stockpiled overburden or unusable material can be used for grading.

    ▪ Available organic soils will be spread over re-graded slopes. Spread available vegetative material over the organic soils to aid re-establishment of native species, and seed as necessary.

    ▪ At the end of use, un-reclaimed faces will be scaled of loose and dangerous rock so that the faces are left in a condition such that they will not collapse or allow loose rock to present a safety hazard.

    ▪ The pit floor or pad will be graded to a flat or gently sloping shape, and all equipment and non-native debris and waste will be removed.
- The active work area will be reclaimed with access roads and culverts removed and reclaimed when access is no longer needed.

- **Invasive Plant Species** – Construction activities requiring re-seeding of vegetation cover will utilize certified seed materials meeting requirements of the State of Alaska Seed Regulations (11 Alaska Administrative Code [AAC] 34 Articles 1 & 4) regarding purity, germination, and weed restrictions. Construction BMPs will be employed to keep equipment clean and prevent the spread of invasive species. BMPs can include establishing an equipment cleaning practice, invasive species education for staff and contractors, scheduling work at times when plants do not have viable seeds, using certified weed-free erosion control products, controlling invasive species at material sites, disposing of spoil and vegetation contaminated with invasive species appropriately, re-vegetating with local native plant species, and developing a monitoring and treatment plan. Stream corridors are pathways for the spread of invasive species. Crooked Creek has only one bridged crossing, and the project includes only one facility (treated water discharge facility) near the floodplain, thus minimizing the potential for invasive species to spread through the downstream Crooked Creek floodplain.

- **Spill Prevention** – Procedures to avoid or minimize the potential for spills into WOUS will be implemented. Refueling activities and fuel storage will take place in uplands and 100 feet from WOUS, except under the following circumstances: equipment that is not mobile or must remain on site for prolonged periods to safely complete a construction task (e.g., drill rigs, cranes for structure installation, water pumps) may be refueled in wetlands, providing that proper temporary spill prevention, control, and containment procedures are employed. In addition, there is only one crossing of Crooked Creek and one facility in the floodplain, minimizing the risk of spills reaching Crooked Creek.

- **Fugitive Dust Control** – The Donlin Gold Project (Project) incorporates design features that minimize dust emissions that have the potential to adversely affect local air quality from ore processing activities (e.g., ore crushing, ore conveying, and stockpiling of crushed ore) through a combination of emissions capture and control, and enclosures. A Fugitive Dust Control Plan (FDCP) has been developed, which includes BMPs to minimize fugitive dust emissions.

**Transportation Area (TA)**

The proposed facilities in the TA include the Jungjuk (Angyaruaq) Port, a 30-mile mine access road, a 5,000-foot airstrip and connecting road, a camp with associated utility corridors, and material sites with associated access roads. The following measures were included in the Project to avoid and minimize impacts to WOUS.

**Avoidance and Minimization During Design**

- **Transportation Area Alternatives** – Project development considered two practical port location alternatives: Birch Tree Crossing (BTC) and Jungjuk (Angyaruaq) Port, each with a road connecting the port to the proposed MA. In evaluating each port/road alternative, the following engineering design criteria were utilized: development of a two-lane transportation road that is safe for transporting mine supplies with a grade of less than eight percent; minimizing construction and maintenance costs; geometrically designing a facility with the lowest volumes of fill; minimizing drainage crossings and placing crossings perpendicular to flow, locating
suitable material sites close to the proposed road to reduce impacts of material site access roads. The BTC route is 76 miles long and would require 32 material sites (1,012 acres total), with potential to impact 285 acres of WOUS. The Jungjuk (Angyaruaq) Port is 30 miles long, and requires 13 material sites (431 acres total), impacting 36 acres of WOUS. The BTC road itself would impact approximately 260 acres; while the Jungjuk (Angyaruaq) Port road would impact 55 acres of WOUS. The selection of the Jungjuk (Angyaruaq) Port site over the BTC port site and associated roads and material sites, results in reduced wetland impacts.

- **Placement of Facilities to Avoid and Minimize Impacts to WOUS** – TA facilities were located on upland ridgetops instead of wetter hillsides and valleys, as practicable, or sited away from WOUS. Examples of this are: the Donlin-Jungjuk Road (Figure 4), camp (Figure 5), and airstrip (Figure 6). The TA project facilities require the development of 13 material sites, five of which would impact WOUS. Material site boundaries were adjusted to avoid and minimize impacts to WOUS, as practicable. The transportation facilities are designed to limit the number of watersheds disturbed. The road leaving the port first climbs up out of the Jungjuk Creek watershed, then enters the Crooked Creek watershed, where it remains for the remainder of the route. After crossing the Getmuna tributary to Crooked Creek, the road straddles the ridge line/drainage divide between Crooked Creek and the Iditarod River watershed to the west, but does not impact wetlands in that watershed. The airstrip is the only other facility located outside the Crooked Creek watershed, but is located on a ridge line, avoiding wetlands (see Figure 6). The airstrip was placed on a ridgetop to minimize the amount of cut and fill in WOUS.

- **Jungjuk (Angyaruaq) Port Design** – The port location selection criteria included: distance to the mine to minimize road footprint and transportation costs; avoidance of private land; adequate depth to dock and maneuver barges throughout the summer season without the need to dredge; avoidance of cultural resources; avoidance of WOUS; minimization of the amount of onshore grading; minimization of the probability of water or ice jams overtopping the wharf during the freshet; and sizing to fit 1,000 Twenty-foot Equivalent Units (TEU); stackable containers. The proposed Jungjuk (Angyaruaq) Port is 30.5 acres and includes 16.2 acres of unavoidable impacts to WOUS. The Jungjuk (Angyaruaq) Port footprint was reduced by: planning to store cargo temporarily rather than permanently for transport to and from the mine; transporting cargo in stackable TEU containers; and stacking loaded containers up to three TEUs high, and empty containers up to six TEUs high. Following mine closure, the port will be reclaimed by removing the wharf fills, including sheet pile, and the area will be re-contoured leaving the access road and a “beach-type” landing in place.

- **Co-located Facilities** – Where practicable, facilities will share space or accommodate multiple uses to minimize the Project ground disturbance footprint: the proposed camp facilities will be constructed within the disturbance footprint of Material Site-01; non-wetland material sites will be used for the temporary storage of construction equipment, refueling, and overburden storage during construction; the airport will be placed in the closest practicable location to the Donlin-Jungjuk Road. The Donlin-Jungjuk Road will be used to gain access to the airport with a short spur road. Transmission lines were designed parallel to roads to reduce access route footprints and the number of drainages disturbed.
• **Road Stream and Drainage Crossings** – The Donlin-Jungjuk Road was designed to minimize the number of stream and drainage crossings by following upland ridgelines to the extent practicable (Figure 4). Where stream crossings were unavoidable, the road approaches are designed to be perpendicular to the flow to minimize WOUS impacts. Bridge structures and/or culverts will be installed at each stream and drainage crossing to facilitate vehicle passage and minimize impacts. Bridge structures will be installed at six major stream crossings where fish presence has been identified. Each bridge was designed to span the width of the creek, either as a steel span or steel span arch, and designed to account for high-water flow conditions. Riprap will be placed along the length of the arch or wall bases on both the upstream and downstream ends of the structure to protect the arch bases from erosion. Minor stream crossings and drainages will have appropriately sized culverts installed to ensure cross flow and maintain hydrologic connectivity. The State of Alaska will provide a Certification under Section 401 of the Clean Water Act. The Project will comply with the State’s Water Quality Standards.

• **Material Site Restoration** – Material sites that impact WOUS were evaluated to determine viable opportunities to offset impacts through restoration. Material Sites-01, 05, 10, 12, and 16 have unavoidable impacts to WOUS. Material Sites-10, 12, and 16 were identified as most likely to provide wetland restoration and creation opportunities based on proximity to groundwater hydrology and final grading elevations. Block 23 CMP Attachment F describes Donlin Gold’s plans to restore wetlands in these areas.
Figure 4  Transportation Corridor – Avoidance Measures
Figure 5  Camp Facilities Location
Figure 6  Airstrip Location
Minimization During Construction

- **Vegetation Clearing Activities** – Vegetation clearing for the proposed TA facilities will be scheduled to occur outside the migratory bird nesting season as best possible, consistent with USFWS guidance. If avoiding the suggested window is not possible, the area will be surveyed for the presence of nests immediately prior to clearing activities during the restricted clearing periods, and identified nest can be provided appropriate protection; or if otherwise authorized by permit from the USFWS. The MBTA prohibits the killing or harassment of migratory birds, and migratory bird nests, eggs, or nestlings if work were to be conducted in nesting habitat during the spring and summer breeding season. Clearing will not be conducted outside established vegetation clearing boundary limits. Cut vegetation will be piled within the Project disturbance limits, so as not to block surface water flows or adversely affect nearby WOUS except when used to provide BMPs for stormwater management under the MSGP.

- **Erosion Control Measures** – Erosion control and construction methods will be described in the SWPPP required by the State of Alaska 2016 Construction General Permit for Stormwater Discharges for Large and Small Construction Activities. BMPs for embankment stabilization, including contouring and seeding, will be required Project-wide to reduce embankment erosion and potential sediment runoff into WOUS. Stockpiling of material, equipment staging, and mobilization will avoid WOUS, as practicable. When filling in wetlands, temporary straw waddles, silt fencing, or other BMPs will be employed to reduce sediment runoff into temporary short-term fill areas. Embankments will be tracked and stabilized in accordance with BMPs to prevent embankment erosion and sediment runoff. The State of Alaska will provide a Certification under Section 401 of the Clean Water Act. The Project will comply with the State’s Water Quality Standards.

- **Construction in Drainages** – To minimize potential sediment suspension and transport, culverts and bridges will be constructed during periods of low flow or normal flow.

- **Temporary Construction Work Areas** – Temporary construction work areas (buffers) are provided adjacent to all proposed TA facilities. Buffers vary in width, but are typically 25 feet. Trees and tall shrubs will be cut, but organic soil and vegetative mat will be left intact and stockpiled materials will not be placed in WOUS, as practicable. Stumps will only be removed if it is determined intact stumps pose a risk to the installation of structures, the movement of equipment, or the safety of personnel.

- **Development of Material Sites** – Material Sites-01, 05, 10, 12, and 16 have unavoidable impacts to WOUS. The following construction guidelines limit the disturbance footprint, prevent impacts to nearby WOUS, and minimize the overall impacts to WOUS. Construction considerations for material sites included:
  
  o Source material testing for metal leaching and acid rock drainage potential will be completed on hard rock material sites prior to mining. Material that does not meet environmental standards will not be used as fill. By not using acid generating and metal leaching material, water quality standards will be met.
Block 23. Avoidance and Minimization

Donlin Gold, LLC
Application for DA Permit POA-1995-120
July 2018

- Material site and work area boundaries will be surveyed and marked with high visibility stakes and flagging prior to breaking ground to avoid impacting WOUS outside of the permitted area.

- Vegetation and organic soils will be stockpiled separately from overburden in uplands as practicable for future use in reclamation.

- Appropriate offsets (10 feet typical) will be provided between overburden berms and the active pits.

- Mining will proceed in a benched manner. Individual benches will be no more than 40 feet apart vertically, and will be no narrower than 20 feet wide. Multiple benches can be in production at one time, with slope angles of approximately 2(H):1(V).

- **Material Sites Reclamation** – When no longer needed, material sites will be reclaimed following these guidelines:

  - Overburden or unusable material piles will be graded after use to slopes of 3(H):1(V), or flatter.

  - Except where the steepness of the wall makes it impractical or impossible, pits and quarry walls will be reclaimed as follows:

    - Pit or quarry walls will be reclaimed when future development is not required.

    - Pit or quarry walls will be graded to 2(H):1(V) or flatter. Stockpiled overburden or unusable material can be used for grading.

    - Available organic soils will be spread over re-graded slopes. Available vegetative material will be spread over the organic soils to aid re-establishment of native species, and seeded as necessary.

    - At the end of use, un-reclaimed faces will be scaled of loose and dangerous rock so that the faces are left in a condition such that they will not collapse or allow loose rock to present a safety hazard.

    - The pit floor or pad will be graded to a flat or gently sloping shape, and all equipment and non-native debris and waste will be removed.

    - The active work area will be reclaimed and access roads will be removed or reclaimed.

- **Invasive Plant Species** – Construction activities requiring re-seeding of vegetation cover will utilize certified seed materials meeting requirements of the State of Alaska Seed Regulations (11 AAC 34 Articles 1 & 4) regarding purity, germination, and weed restrictions. Construction BMPs will be employed to keep equipment clean and prevent the spread of invasive species. BMPs can include establishing an equipment cleaning practice, invasive species education for staff and contractors, scheduling work at times when plants do not have viable seeds, using certified weed-free erosion control products, controlling invasive species at material sites, disposing of
spoil and vegetation contaminated with invasive species appropriately, re-vegetating with local native plant species, and developing a monitoring and treatment plan.

- **Spill Prevention** – Procedures to avoid or minimize the potential for spills into WOUS will be implemented. Refueling activities and fuel storage will take place in uplands and 100 feet from WOUS, except under the following circumstances: equipment that is not mobile or must remain on-site for prolonged periods to safely complete a construction task (e.g., drill rigs, cranes for structure installation, water pumps) may be refueled in wetlands, providing that proper temporary spill prevention, control, and containment procedures are employed.

- **Fugitive Dust Control** – The Project incorporates design features that minimize dust emissions that have the potential to adversely affect local air quality, from ore processing activities (e.g., ore crushing, ore conveying, and stockpiling of crushed ore) through a combination of emissions capture and control, and enclosures. A FDCP has been developed, which includes BMPs to minimize fugitive dust emissions.

### Pipeline Area (PA)

The proposed PA facilities include a natural gas pipeline and fiber optic cable, compressor station, metering station, pig launcher/receiver site, check valves, and associated construction related facilities such as: camps and temporary airstrips, construction access roads, material sites, Pipe Storage Yard, shoofly and site access roads, HDD workspaces, water extraction site and access roads, work pads and the pipeline construction Right-of-Way (ROW). The following measures are included in the Project to avoid and minimize impacts to WOUS:

#### Avoidance and Minimization During Design

- **Pipeline Area ROW Alternatives** – Design considerations for the proposed pipeline route included selection of the shortest pipeline length possible to minimize Project footprint, while avoiding the following to the extent practicable: geotechnical hazards; hydrological hazards; known environmental and cultural sites, the Iditarod National Historic Trail (INHT); and potential land use conflict areas. The pipeline route and ROW design also considered seasonal construction schedules; constructability; and avoidance and minimization of impacts to WOUS. Several route alternatives were evaluated to traverse the Alaska Range, which is the largest geographical obstacle between the origin and terminus of the pipeline. The Jones River and Rainy Pass (Dalzell Gorge) routes were deemed practical, but the Jones River route was determined to be the preferred alternative to avoid geohazards in the Dalzell Gorge and potential land use conflicts with the INHT. The North Route avoids crossing the Happy and Skwentna Rivers, contains less WOUS impact acres and linear feet, and moves the PA ROW away from the INHT. Routing alternatives developed leading up to and through the Alaska Range are shown in Table 1 and Figure 7. Other re-routes avoided geohazards at the Castle Mountain and Denali Fault locations and the Susitna Flats State Game Refuge near the mouth of the Susitna River. Routes were moved higher on mountain sides and along ridgetops to avoid wetlands and streams along valley bottoms, as practicable.
### Table 1  Alaska Range Alternative Locations

<table>
<thead>
<tr>
<th>Pipeline Route Alternative</th>
<th>General Description</th>
<th>Estimated WOUS Acres Impacted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dalzell Gorge</td>
<td>Route alternative from MP 106.1 to 153.1. Traverses Rainy Pass and parallels the South Fork Kuskokwim River.</td>
<td>257</td>
</tr>
<tr>
<td>Jones Route</td>
<td>Route alternative from MP 106.1 to 153.1. Diverges at Threemile Creek, crosses the Tatina River, and parallels the Jones River.</td>
<td>89</td>
</tr>
<tr>
<td>North Route (Proposed)</td>
<td>Route alternative from MP 85 to 112. Parallels the Happy River on the north side from its confluence with the Skwentna River to Threemile Creek.</td>
<td>44</td>
</tr>
<tr>
<td>Round Mountain Route</td>
<td>Route alternative from MP 85 to 112. Crosses the Happy River near its confluence with the Skwentna River and parallels the Happy River on the south side.</td>
<td>65</td>
</tr>
</tbody>
</table>

- **Compressor Station** – During design, the compressor station was converted from electric power to natural gas power. This eliminated the need for a transmission line. The transmission lines would have needed adjacent corridors with cleared vegetation. Transmission lines can lead to increased all-terrain vehicle use in accessible areas. One compressor station is adequate to meet the pipeline design capacity.

- **Pipeline Diameter** – The pipeline diameter was increased during design from 12-inch to 14-inch to ensure adequate capacity of natural gas for mine operations. This reduced the need for future upgrades to the pipeline.

- **Roadless Design** – The pipeline has been designed to be installed primarily underground, eliminating the need for road access which would have created permanent roads and long-term impacts along the pipeline route.

- **Horizontal Directional Drilling (HDD)** – All pipeline stream crossings were analyzed for flow, width, and characterization to determine crossing modes to avoid major diversions in rivers and major re-routes. HDD methods will be used to install the pipeline underneath the Skwentna, Happy, Kuskokwim, George, East Fork George, and the North Fork George Rivers. Excavated cuttings from HDD sites will not be placed in waterbodies or in drainages. Without HDD crossings, there would be a larger disturbance footprint for gravel pads necessary for crossing and work areas, and likely aerial crossings of these rivers. Criteria for HDD stream crossing locations included 100-year flood recurrence interval, depth of cover, setbacks for pipe exposure, bank mitigation/restoration to prevent erosion, bank protection, fish habitat and recreation value, and adverse impacts to WOUS. The State of Alaska will provide a Certification.
under Section 401 of the Clean Water Act. The Project will comply with the State’s Water Quality Standards.
**Figure 7**  
**Alaska Range Alternative Locations**
• **Use of Existing Facilities and Infrastructure** – The barge landing in Cook Inlet would utilize an existing landing area and access road. Existing winter roads would be used to access the eastern portions of the pipeline. The Farewell airstrip will be used to access portions of the pipeline and transport equipment and personnel.

• **Use of Barge, and Winter Access Routes** – Barge traffic and winter access routes included in the design reduce the need for additional permanent roads. Construction of barge landings on the Kuskokwim River will not require placement of fill below ordinary high water. The barge landing on Cook Inlet is an existing developed facility. The Cook Inlet barges will use their attached loading ramps to help offload pipe and supplies. No dredging will be conducted and no fill will be placed below mean high tide.

• **Reduced Footprint Design of Ancillary Facilities** – Where practicable, material sites, airstrips, and camps are within the pipeline ROW or adjacent to each other to enhance collocation, decrease the need for ancillary roads, and thus reduce footprint size.

• **Placement of Material Sites to Avoid and Minimize WOUS** – The PA includes 69 material sites totaling 1,008 acres. Six of the PA material sites impact wetlands and waters, totaling 10.4 acres of impact. Of the six material sites, three (Material Sites-01, 38, and 41), were identified as most likely to provide wetland restoration and creation opportunities based on proximity to groundwater hydrology and final grading elevations.

• **Placement of Other Facilities to Avoid and Minimize WOUS** – Work pads will be the minimum size necessary for equipment and construction activities and were sited in uplands along the pipeline ROW. Temporary construction camps and airstrips were sited in uplands. Existing winter trails will be integrated into the winter ice routes for transportation of pipeline construction infrastructure. The timing of the construction and use of ice roads eliminates the need for permanent gravel access roads and construction pads. The pig launcher/receiver site (Figure 8) was sited in uplands.

• **Co-located Facilities** – Several facilities along the pipeline will be multi-purpose. These include: material sites, laydown areas, equipment storage, staging areas, fueling areas, material and pipeline stockpiling, camp units, and airstrips.
  
  o The compressor station (Figure 9) is sited at an existing previously disturbed area. The Kuskokwim River HDD crossing includes a pipe laydown area collocated with a material site (Figure 10). Figure 9 and Figure 10 illustrate the siting of these facilities in uplands to avoid wetlands and WOUS.

  o The Skwentna River HDD Exit will be located on a material site pad.

  o The currently operating Cook Inlet Barge Landing will be used for supplies transport in addition to stockpiling pipe and materials.
Figure 8  Pig Launcher/Receiver Site
Figure 9  Compressor Station Location
Figure 10  Kuskokwim River HDD Crossing Location
• **Stream and Drainage Crossings** – The pipeline was designed to minimize the number of stream and drainage crossings, and the total pipeline length and ROW width. The pipeline ROW was designed to the minimum width necessary to complete construction activities: approximately 100 to 150 feet for construction in wetlands depending on site-specific conditions.

**Minimization During Construction**

• **Vegetation Clearing Activities** – Vegetation clearing for the proposed PA facilities will be scheduled to occur outside the migratory bird nesting season as best possible, consistent with USFWS guidance. If avoiding the suggested window is not possible, the area will be surveyed for the presence of nests immediately prior to clearing activities during the restricted clearing periods, and identified nest can be provided appropriate protection; or if otherwise authorized by permit from the USFWS. The MBTA prohibits the killing or harassment of migratory birds, and migratory bird nests, eggs, or nestlings if work were to be conducted in nesting habitat during the spring and summer breeding season. Clearing will not be conducted outside established vegetation clearing boundary limits. Cut vegetation will be piled within the Project disturbance limits, so as not to block surface water flows or adversely affect nearby WOUS except when used to provide BMPs for stormwater management under the MSGP.

• **Erosion Control Measures** – Erosion control and construction methods will be described in the SWPPP, and will comply with the State of Alaska 2016 Construction General Permit for Stormwater Discharges for Large and Small Construction Activities. BMPs for embankment stabilization, including contouring and seeding will be required Project-wide to reduce embankment erosion and potential sediment runoff into WOUS. Construction methods in wetlands will minimize construction-related effects on wetlands, including marking wetland boundaries and clearing limits, using winter construction to the maximum extent practicable, confining activities to the construction zone to prevent disturbance of surrounding vegetation, maintaining slope stability, controlling erosion, using mats or other ground protection during non-winter months, maintaining existing wetland hydrology, minimizing disturbance in wetlands, and constraining permanent facilities to uplands. Mats will be utilized in a leap frog construction technique. All mats will be removed from wetlands. The State of Alaska will provide a Certification under Section 401 of the Clean Water Act. The Project will comply with the State’s Water Quality Standards.
  
  o While working in wetlands, crews will use mats, where practical to protect vegetation and soils from equipment; low ground-pressure tires will be used on equipment operating on or near wetlands. Ditch plugs will be installed in the pipe trench at stream crossings and at wetland-upland interfaces as needed.

• **Stream and River Crossings** – Open-cut stream crossings will be used during normal to low flow and low-habitat sensitivity periods. Disturbed areas will be stabilized using geotextile matting, gravel blankets, riprap, gabions, or other geosynthetics. All stream banks will be stabilized and re-vegetated as soon as practicable following the methods described in the Project restoration plan. Where practicable, mobile modular bridges will be used. The East Fork of the George River will be crossed with a temporary floating bridge during construction. For descriptions of reclamation at stream crossings, see Engineering Drawings PA-142T through PA-147T.
• **Temporary Construction Activities** – Grading will only occur where necessary for equipment to access construction locations. The organic layer will remain intact except at the trench cut or where side hill cuts occur along the alignment. On steep side slopes, double benching will be employed to reduce the cut and fill volume and associated impacts. If sufficient organic soils are present, these materials will be segregated and stockpiled for use during reclamation. Where necessary, material work pads will be used over thaw-unstable permafrost. Unless specifically required, the organic layer will be left intact to slow thermal degradation and to aid in final reclamation.

• **Construction Seasons** – Most areas underlain by permafrost will be crossed during winter to minimize disturbance from trenching. A seasonal construction timeline minimizes impacts to WOUS, by timing construction activities in lowlands in the winter and in uplands during the summer. Approximately 60 percent of the total pipeline length would be constructed during frozen winter conditions to minimize wetland and soil disturbances from equipment (Pipeline Construction Execution Plan December 2016). Snow and ice roads with frost packing will provide a stable surface for equipment to operate.

• **Development of Material Sites** – The following construction guidelines limit the disturbance footprint, prevent impacts to nearby WOUS, and minimize the overall impacts to WOUS:

  o Source material testing for metal leaching and acid rock drainage potential will be completed on hard rock material sites prior to mining. Material that does not meet environmental standards will not be used as fill. By not using acid generating and metal leaching material, water quality standards are met.

  o Material site and work area boundaries will be surveyed and monumented with a GPS device as well as physically, using rebar stakes and flagging to avoid impacting WOUS outside of the permitted area.

  o Vegetation and organic soils will be stockpiled separately from overburden in uplands as practicable for future use in reclamation.

  o Appropriate offsets will be provided between overburden berms and the active pits.

  o Material work pads will be used in summer construction over thaw-unstable permafrost and any overlaying wetlands and soft soils; the organic layer will be left intact to slow thermal degradation and to aid in final reclamation.

  o Mining will proceed in a benched manner. Individual benches will be no more than 40 feet apart vertically, and will be no narrower than 20 feet wide. Multiple benches can be in production at one time, with slope angles of approximately 2.0(H):1(V).

• **Material Site Reclamation** – When no longer needed, material sites will be reclaimed following these guidelines:

  o Overburden or unusable material piles will be graded after use to slopes of 3(H):1(V), or flatter.
Except where the steepness of the wall makes it impractical or impossible, pits and quarry walls will be reclaimed as follows:

- Pit or quarry walls will be reclaimed when future development is not required.
- Pit or quarry walls will be graded to 2(H):1(V) or flatter. Stockpiled overburden or unusable material can be used for grading.
- Available organic soils will be spread over re-graded slopes. Available vegetative material will be spread over the organic soils to aid in re-establishment of native species, and seeded as necessary.
- At the end of use, un-reclaimed faces will be scaled of loose and dangerous rock so that the faces are left in a condition such that they will not collapse or allow loose rock that presents a safety hazard.
- The pit floor or pad will be graded to a flat or gently sloping shape, and all equipment and non-native debris and waste will be removed.
- The active work area will be reclaimed and access roads will be removed or reclaimed.

**Invasive Plant Species** – Construction activities requiring re-seeding of vegetation cover will utilize certified seed materials meeting requirements of the State of Alaska Seed Regulations (11 AAC 34 Articles 1 & 4) regarding purity, germination, and weed restrictions. Construction BMPs will be employed to keep equipment clean and prevent the spread of invasive species. BMPs can include establishing an equipment cleaning practice, invasive species education for staff and contractors, scheduling work at times when plants do not have viable seeds, using certified weed-free erosion control products, controlling invasive species at material sites, disposing of spoil and vegetation contaminated with invasive species appropriately, re-vegetating with local native plant species, and developing a monitoring and treatment plan.

**Spill Prevention** – Procedures to avoid or minimize the potential for spills into WOUS will be implemented. Refueling activities and fuel storage will take place in uplands and 100 feet from WOUS, except under the following circumstances: equipment that is not mobile or must remain on-site for prolonged periods to safely complete a construction task (e.g., drill rigs, cranes for structure installation, water pumps) may be refueled in wetlands, providing that proper temporary spill prevention, control, and containment procedures are employed.
References


Compensatory Mitigation Plan
Executive Summary

Donlin Gold, LLC (Donlin Gold) is proposing the development of an open pit, hard rock gold mine in Alaska. The mine is located 277 miles west of Anchorage, 145 miles northeast of Bethel, and 10 miles north of the village of Crooked Creek on the Kuskokwim River. Bethel, the largest community in western Alaska, is the administrative and transportation center of the Yukon-Kuskokwim (Y-K) Delta. The proposed Jungjuk (Angyaruaq) Port site is approximately 178 river miles upstream of Bethel, and about 57 river miles upstream of Aniak, the regional transportation center for the middle Kuskokwim Valley.

The minerals at the Project are owned and were selected by Calista Corporation (Calista), an Alaska Native regional corporation, under the authority of the Alaska Native Claims Settlement Act (ANCSA) in partial compensation for the extinguishment of Alaska Native title claims. Most of the surface lands at the site are owned by The Kuskokwim Corporation (TKC), an Alaska Native village corporation comprising the ten Alaska Native villages closest to the site. Donlin Gold operates the Project pursuant to a Mining Lease with Calista and a Surface Use Agreement (SUA) with TKC.

Donlin Gold submitted a Preliminary Application for the Department of the Army Permit (DA Permit) to the United States Army Corps of Engineer (USACE) in July 2012, pursuant to Clean Water Act (CWA) Section 404 and Rivers and Harbors Act of 1899 (RHA) Section 10. In December 2012, USACE published a Notice of Intent to prepare an Environmental Impact Statement (EIS) for the Donlin Gold Project (Project). Donlin Gold updated its DA Permit application in December 2014 and August 2015. The Draft EIS and the DA Permit application were released for public comment in November 2015. Donlin made a final update to its DA application in December 2017. Donlin Gold’s Conceptual Compensatory Mitigation Plan (CMP) was submitted in November 2015 and a CMP was included with the December 2017 DA application. The Final EIS was released in April 2018 along with a Special Public Notice (SPN) soliciting public comments on the 2017 CMP. This Final CMP responds to agency and public comments on the SPN.

In 2008, the USACE and the United States Environmental Protection Agency (EPA) published regulations (33 Code of Federal Regulations [CFR] 332; 40 CFR 230) entitled, “Compensatory Mitigation for Losses of Aquatic Resources” (Mitigation Rule, or Rule). The Rule emphasized the selection of compensatory mitigation sites on a watershed basis and established operating standards for mitigation providers and mechanisms: mitigation banks, in-lieu fee (ILF) programs, and permittee responsible mitigation (PRM) Plans. Where the Project’s permanent impacts primarily occur in the Crooked Creek watershed (Hydrologic Unit Code [HUC]-10 definition), no approved mitigation banks can provide credits currently, or in the timeframe of the Project permitting process. There are also no statewide ILF providers. Hence, the Project is proposing all compensatory mitigation for permanent fill impacts in the Crooked Creek watershed through PRM Plans.

Donlin Gold has evaluated all available and practicable options to assure compliance with the provisions of the Rule and the 1994 Alaska Wetland Initiative (EPA et al. 1994) through PRM alternatives, focusing first on the immediate (HUC-10) watershed and then systematically assessing larger hydrologic units (e.g., HUC-08, HUC-06, HUC-04) for compensatory mitigation opportunities. This assessment specifically included a detailed examination of the current land conditions in the Crooked Creek drainage to determine restoration opportunities.
The Project design avoids and minimizes fill impacts to wetlands and streams to the maximum extent practicable. Some Project activities in wetland areas include vegetation clearing, winter roads, and work areas where no fill placement will occur. For these activities, no compensatory mitigation credit is being proposed.

Permanent fill impacts from the proposed Project total 2,876 acres of wetlands and 173,953 linear feet (32.9 miles) of streams. The Mine Area (MA) and Transportation Area (TA) will permanently fill 2,676 wetland acres and 173,953 (32.9 miles) linear feet of streams, and the Pipeline Area (PA) includes 200 acres of permanent wetland fill with no permanent fill impacts to streams.

Donlin Gold proposes two PRM Plans, and a limited purchase of mitigation bank credits to offset the Project permanent fill impacts. They are:

- The Upper Crooked Creek PRM Plan (Attachment D) will yield substantive, near-term benefits to aquatic resources. The Upper Crooked Creek PRM Plan includes the enhancement, reestablishment, restoration, rehabilitation and preservation of wetlands, riparian areas, stream channels, and uplands within 221.5 acres. The PRM Plan will restore degraded acreage in Quartz, Snow, Ruby and Queen gulches, and at the Wash Plant Tailings Area. The PRM Plan will restore 95.7 acres of degraded floodplains into 93.0 acres of wetlands and 2.75 acres of riverine channel. A total of 8,892 liner feet of stream will be enhanced and reestablished by the restoration work in the floodplain. Within the wetland floodplain 15.2 acres of off channel ponds will be enhanced for aquatic resources. In addition, there will be 16.8 acres of adjacent upland terrestrial habitat enhanced in upper Crooked Creek. A total of 109 acres of riparian uplands, and wetland buffers will be protected around the restored and enhanced floodplain wetlands. This PRM will be initiated concurrent with the start of MA construction.

- The Chuitna PRM Plan (Attachment E) will preserve 5,870 acres, including 3,269 acres of wetlands and ponds, and 418 acres of streams and rivers, totaling 3,687 acres of Waters of the United States (WOUS). It also protects 2,183 acres of upland riparian area and buffers, and 258,056 linear feet (48.8 miles) of streams in the Chuitna watershed. Donlin Gold will execute preservation of the parcel concurrently with work authorized in the DA application for the Project.

- Prior to initiating Project construction, Donlin Gold has secured and will purchase 9.80 wetland mitigation credits from the Great Land Trust (GLT). GLT received USACE approval in June 2018 for 229 mitigation bank credits within the Matanuska-Susitna Borough (MSB) boundaries. A portion of the permanent impacts from the PA are located within the GLT’s service area.
Figures
Figure 1  Mine Area and Transportation Area ......................................................................................... 11
Figure 2  Pipeline Area ............................................................................................................................ 12
Figure 3  Land Ownership in the Kuskokwim River Watershed (Hults and Geist 2017)...................... 21
Figure 4  Ecological and Conservation Values Scores (Hults and Geist 2017)........................................ 22
Figure 5  Platinum Mining Claims ........................................................................................................... 25
Figure 6  Hydrogeologic Alterations at Platinum ..................................................................................... 26
Figure 7  Crooked Creek Watershed (HUC-10)....................................................................................... 49
Figure 8  Crooked Creek Watershed (HUC-10) Vegetation Map .......................................................... 50
Figure 9  Crooked Creek Watershed (HUC-10) Land Status Map ....................................................... 52
Figure 10 Crooked Creek Watershed (HUC-10) Fisheries Data .............................................................. 54
Figure 11 Crooked Creek Watershed (HUC-10) Stream Habitat Model Results .................................... 58
Figure 12 Credit Purchase Receipt ......................................................................................................... 72

Tables
Table 1  Donlin Gold DA Permit Application Submissions and Supporting Documentation to USACE ...... 10
Table 2  Project Mine Area, Transportation Area, and Pipeline Area Stream Fills in Linear Feet (Miles) .. 15
Table 3  Project Mine Area, Transportation Area, and Pipeline Area Wetlands Fill: HGM Class and Cowardin Group (Acres) ................................................................................................................ 16
Table 4  Compensatory Mitigation Options Evaluated by Donlin Gold................................................. 35
Table 5  Upper Crooked Creek PRM Plan Areas Protected under the Site Protection Instrument (Acres) 41
Table 6  Acreage and Linear Feet of Resources Re-established, Enhanced, and Protected by the Upper Crooked Creek PRM ......................................................................................................................... 42
Table 7  Compensatory Mitigation Proposed for Upper Crooked Creek by HGM Class and Cowardin Group (Acres) ......................................................................................................................... 43
Table 8  Preservation Area Resource Types (Acres) .................................................................................. 43
Table 9  HGM Class Wetlands Comparison: Preservation Area and MA/TA (Acres) ............................... 44
Table 10 Riverine HGM Class Wetlands Comparison: Preservation Area and MA/TA (Acres) ............... 45
Table 11 Summary of Anadromous Stream Habitat: Chuitna River Drainage Preserved and Crooked Creek Drainage Permanent Fill (Linear Feet) .................................................................................. 45
Table 12 Permanent Fill in Streams Compared to Restored and Preserved Stream Lengths, by Linear Feet (Miles) ........................................................................................................................................ 46
Table 13 Compensatory Mitigation Proposed by PRM Plan for Wetlands by HGM Class and Cowardin Group (Acres) ......................................................................................................................... 47
Table 14 Vegetation Type within Crooked Creek (HUC-10) Watershed (Percentage) ............................ 51
Table 15 Land Ownership Status within the Crooked Creek (HUC-10) Watershed ............................... 51
Table 16 Summary of Wetland Types within the Crooked Creek (HUC-10) Watershed......................... 53
Table 17 Fish Species Identified within the Crooked Creek Watershed (2004-2014) ............................ 55
Table 18 Adult Salmon Stream Reaches ................................................................................................. 55
Table 19 Crooked Creek Watershed Stream Fish Habitat Suitability Determination ............................. 57
Table 20 Crooked Creek Watershed Channel Habitats ............................................................................ 59
Table 21  Crooked Creek Watershed Habitat Mapping Summary, Wetted Surface Area (m²) ................. 59
Table 22  Summary of Wetland Impacts in the Crooked Creek Watershed .................................................. 61
Table 23  Summary of Wetland Credits for Purchase from the Great Land Trust........................................... 69
Table 24  Compensatory Mitigation Proposed for Wetlands by HGM Class and Cowardin Group (Acres) . 71
Table 25  Compensatory Mitigation Proposed for Streams in Linear Feet (Miles)........................................... 71
Table 26  Wetland Credits to be Purchased from the Great Land Trust.......................................................... 71

Photos
Photo 1  Panorama of Spoil Piles at Platinum .................................................................................................. 26
Photo 2  Tuluksak/Nyac Site .......................................................................................................................... 28

Attachments
Attachment A Pipeline Area Wetlands Impacts by HUC-10 (Acres) Before and After Construction
Attachment B Hydrogeomorphic (HGM) Classification
Attachment C Mine Area Restoration Plan
Attachment D Upper Crooked Creek Permittee Responsible Mitigation Plan
Attachment E Chuitna Permittee Responsible Mitigation Plan
Attachment F Transportation Area Restoration Plan
# Acronyms and Abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADF&amp;G</td>
<td>Alaska Department of Fish and Game</td>
</tr>
<tr>
<td>ADNR</td>
<td>Alaska Department of Natural Resources</td>
</tr>
<tr>
<td>AMHT</td>
<td>Alaska Mental Health Trust Authority</td>
</tr>
<tr>
<td>amsl</td>
<td>above mean sea level</td>
</tr>
<tr>
<td>ANCSA</td>
<td>Alaska Native Claims Settlement Act</td>
</tr>
<tr>
<td>Angler</td>
<td>Angler Mining Pty, Ltd.</td>
</tr>
<tr>
<td>ARMP</td>
<td>Aquatic Resources Monitoring Plan</td>
</tr>
<tr>
<td>ATV</td>
<td>All-Terrain Vehicle</td>
</tr>
<tr>
<td>AWC</td>
<td>Anadromous Waters Catalog</td>
</tr>
<tr>
<td>AWI</td>
<td>Alaska Wetlands Initiative</td>
</tr>
<tr>
<td>BLM</td>
<td>Bureau of Land Management</td>
</tr>
<tr>
<td>BMP</td>
<td>Best Management Practice</td>
</tr>
<tr>
<td>BSW</td>
<td>Black Spruce Woodland</td>
</tr>
<tr>
<td>Calista</td>
<td>Calista Corporation</td>
</tr>
<tr>
<td>CAS</td>
<td>Closed Alder Shrub</td>
</tr>
<tr>
<td>CBM</td>
<td>Coal Bed Methane</td>
</tr>
<tr>
<td>Cells</td>
<td>Material Site Excavation Area</td>
</tr>
<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
</tr>
<tr>
<td>cfs</td>
<td>cubic feet per second</td>
</tr>
<tr>
<td>CIRI</td>
<td>Cook Inlet Regional Incorporated</td>
</tr>
<tr>
<td>CMP</td>
<td>Compensatory Mitigation Plan</td>
</tr>
<tr>
<td>CWA</td>
<td>Clean Water Act</td>
</tr>
<tr>
<td>DA</td>
<td>Department of the Army</td>
</tr>
<tr>
<td>Donlin Gold</td>
<td>Donlin Gold, LLC</td>
</tr>
<tr>
<td>DSSR</td>
<td>Disturbance-related shrub and sapling re-growth</td>
</tr>
<tr>
<td>EIS</td>
<td>Environmental Impact Statement</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
</tr>
<tr>
<td>ERDC</td>
<td>U.S. Army Engineer Research and Development Center</td>
</tr>
<tr>
<td>ESA</td>
<td>Endangered Species Act of 1973</td>
</tr>
<tr>
<td>FR</td>
<td>Federal Register</td>
</tr>
<tr>
<td>FVP</td>
<td>Field Verification Points</td>
</tr>
<tr>
<td>GPS</td>
<td>Global Positioning System</td>
</tr>
<tr>
<td>GLT</td>
<td>Great Land Trust</td>
</tr>
<tr>
<td>Hansen</td>
<td>Hansen Industries, Inc.</td>
</tr>
<tr>
<td>HDD</td>
<td>Horizontal Directional Drilling</td>
</tr>
<tr>
<td>HGM</td>
<td>Hydrogeomorphic</td>
</tr>
<tr>
<td>HMU</td>
<td>Habitat Mapping Unit</td>
</tr>
<tr>
<td>HUC</td>
<td>Hydrologic Unit Code</td>
</tr>
<tr>
<td>ILF</td>
<td>In-Lieu Fee</td>
</tr>
<tr>
<td>IR</td>
<td>Invasiveness Rank</td>
</tr>
<tr>
<td>LGL</td>
<td>LGL Alaska Research Associates, Inc.</td>
</tr>
</tbody>
</table>
LMP Long-term Management Plan
LST Low Shrub Tundra
m² meter-squared
MA Mine Area
MH Mesic Herbaceous
Michael Baker Michael Baker International
MLRA Major Land Resources Areas
MSC Material Site Closure
MSB Matanuska-Susitna Borough
NMFS National Marine Fisheries Service
NOAA National Oceanic and Atmospheric Administration
NPS National Park Service
NRCS Natural Resources Conservation Service
NWI National Wetlands Inventory
OAS Open Alder Shrub
OAWS Open Alder Willow Shrub
OBSF Open Black Spruce Forest
OWS Open Willow Shrub
OWSF Open White Spruce Forest
PA Pipeline Area
PAF Preservation Adjustment Factor
PJ D Preliminary Jurisdictional Determination
PRC PacRim Coal
Preservation Area Chuitna Preservation Area
PRM Permittee Responsible Mitigation
Project Donlin Gold Project
Refuge Togiak National Wildlife Refuge
RHA Rivers and Harbors Act of 1899
RPW Relatively Permanent Waters
Rule Mitigation Rule (33 CFR 325 and 33 CFR 332; 40 CFR 230)
SC Stream Crossing (Points)
sq. mi. square mile
SUA Surface Use Agreement
TA Transportation Area
TKC The Kuskokwim Corporation
TNC Tyonek Native Corporation
TNW Traditional Navigable Waters
TSF Tailings Storage Facility
UCG Underground Coal Gasification
USACE United States Army Corps of Engineers
USFWS United States Fish and Wildlife Service
USGS United States Geological Survey
WB Waterbody (Points)
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBM</td>
<td>Water Balance Model</td>
</tr>
<tr>
<td>WD</td>
<td>Wetland Determination</td>
</tr>
<tr>
<td>WH</td>
<td>Wet Herbaceous</td>
</tr>
<tr>
<td>WMF</td>
<td>Woodland Mixed Forest</td>
</tr>
<tr>
<td>WOUS</td>
<td>Waters of the United States</td>
</tr>
<tr>
<td>WQS</td>
<td>Water Quality Standards</td>
</tr>
<tr>
<td>WRF</td>
<td>Waste Rock Facility</td>
</tr>
<tr>
<td>Y-K</td>
<td>Yukon-Kuskokwim</td>
</tr>
</tbody>
</table>
Compensatory Mitigation Plan

1.0 Introduction

Purpose
Donlin Gold, LLC (Donlin Gold) is proposing to mine and process gold ore at a site in the Crooked Creek watershed, which is part of the Kuskokwim River drainage in Alaska. Calista Corporation (Calista), an Alaska Native regional corporation, selected the mineral rights at the Donlin Gold site under the Alaska Native Claims Settlement Act (ANCSA) because of the site's known gold potential. The Kuskokwim Corporation (TKC), an Alaska Native village corporation, owns the majority of the surface estate at the Donlin Gold site. ANCSA mandates that Calista develop the mineral resources at Donlin Gold for the benefit of Calista's shareholders and the shareholders of other Alaska Native corporations which benefit from natural resource development through ANCSA 7(i) and (j) revenue distribution requirements. Donlin Gold operates the Donlin Gold Project (Project) under a mineral lease with Calista and a surface use agreement with TKC. This Compensatory Mitigation Plan (CMP) explains how Donlin Gold will compensate for the unavoidable losses of Waters of the United States (WOUS) including wetlands, streams, ponds, and creeks in the Project area.

On April 10, 2008, the United States Army Corps of Engineers (USACE) and the United States Environmental Protection Agency (EPA) published regulations (33 Code of Federal Regulations [CFR] 332; 40 CFR 230) entitled, “Compensatory Mitigation for Losses of Aquatic Resources” (Mitigation Plan, or Rule). The Rule emphasized the selection of compensatory mitigation sites on a watershed basis and established operating standards for mitigation providers and mechanisms: mitigation banks, ILF programs, and permittee responsible mitigation (PRM) plans. Prior to the Rule, EPA, USACE, United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) issued the Alaska Wetland Initiative (AWI) (EPA et al. 1994). This initiative clarified that “no net loss of wetlands” was not realistic or practicable in Alaska and there was minimal justification for comprehensively implementing a mitigation program designed for the Contiguous United States and not Alaska. The Rule recognizes the provisions of the AWI as valid and still applicable for mitigation planning in Alaska. This CMP follows the AWI guidance, and the recently released June 15, Memorandum of Understanding (2018 MOU) between USACE and EPA regarding Mitigation Sequence for Wetlands in Alaska under Section 404 of the Clean Water Act (CWA).

This CMP discusses the proposed Project and compensatory mitigation plans for permitting under the CWA Section 404 and the Rivers and Harbors Act of 1899 Section 10.

2.0 Proposed Project
The open pit, hard rock gold mine site is located 277 miles west of Anchorage, 145 miles northeast of Bethel, and 10 miles north of the village of Crooked Creek. The village of Crooked Creek is located on the banks of the Kuskokwim River. The proposed mining Project includes the following principal mine components:

- Mine Area (MA) – Includes an open pit mine, waste rock facility (WRF), processing facility, tailings storage facility (TSF), fresh water dams, contact water dams, a natural gas power generation facility, and personnel camps.
• Transportation Area (TA) – Includes a 5,000-foot gravel airstrip, Jungjuk (Angyaruaq) Port on the Kuskokwim River, and a 30-mile gravel road connecting the port and MA.

• Pipeline Area (PA) – Includes a 14-inch, 315-mile buried steel pipeline to supply natural gas to the mine power plant. The pipeline ties into Enstar’s gas distribution line near Beluga and traverses 315 miles through the Alaska Mountain Range to the power plant and processing facility as shown in Figure 1.

Project components are shown in Figure 1 and Figure 2. Additional details about the proposed Project can be found in the Project Description, Natural Gas Pipeline Plan of Development (SRK 2016) and the Department of the Army (DA) Permit and revisions (Donlin Gold 2012, 2014, 2015, and 2017).

3.0 Donlin Gold Section 404 and Section 10 Permitting

Donlin Gold initiated the permitting process by submitting a Preliminary DA Permit application package under Section 404 of the CWA and Section 10 of the Rivers and Harbors Act of 1899 (RHA) to USACE on July 26, 2012. The package included an initial Preliminary Jurisdictional Determination (PJD) and the DA Permit application. Donlin Gold subsequently submitted a revised DA Permit application to USACE in December 2014. Another update to the application was submitted to USACE in August 2015, which was public noticed with the Draft Environmental Impact Statement (EIS). A revised PJD incorporating additional field work was submitted to USACE in January 2017. On February 27, 2017, USACE accepted the revised PJD, which refined the boundaries of the WOUS subject to USACE jurisdiction for the Project. In July 2017, Donlin Gold completed the North Route pipeline re-alignment and wetland mapping. Updated data reflecting the North Route were provided to USACE in August 2017, and accepted in October 2017. A further revision to the DA Permit application, including the North Route data and a CMP, was submitted to USACE in December 2017. The Final EIS was released in April 2018 along with a Special Public Notice (SPN) soliciting public comments on the 2017 CMP. This Final CMP responds to agency and public comments on the SPN. Table 1 summarizes the relevant Donlin Gold permit submittals

| Table 1 | Donlin Gold DA Permit Application Submissions and Supporting Documentation to USACE |
|———|———|———|
| Document Name | Submitted to USACE |
| Preliminary DA Permit Application (Engineer Form 4345) and Initial PJD | July 2012 |
| DA Permit Application (Engineer Form 4345) | Updated December 2014 and August 2015 |
| PJD Donlin Gold Project - December 2016 | January 2017 |
| North Route Addendum to the PJD Donlin Gold Project - August 2017 | September 2017 |
| DA Permit Application (Engineer Form 4345) including CMP | December 2017 |
| Final CMP addressing agency and public comments | July 2018 |
| PJD Chuitna Preservation Area | Scheduled Late July 2018 |
Figure 2  Pipeline Area

Donlin Gold

Communities

Proposed Natural Gas Pipeline Milepost (MP-)

Streams

Proposed Natural Gas Pipeline Alignment

SCALE:

0 10 20 30 40 mi

Seward Meridian, UTM Zone 5, NAD83
World Topographic Map Etrs
Note: Updated to include North Route

Pipeline Area

FIGURE: 2
4.0 Wetland Fill Impacts from Proposed Project

The development of the Project will discharge fill that will result in permanent fill in wetlands and WOUS. The calculated Project wetlands disturbance and fill activities are in Blocks 21 and 22 of the December 2017 DA Permit.

The Project fill impacts are summarized into three areas: the MA, which includes all mine-related facilities east of Crooked Creek; the TA, which includes all transportation-related facilities west of Crooked Creek; and the PA, which includes the natural gas pipeline and ancillary facilities (see Figure 1 and Figure 2).

Wetland fills were calculated using geospatial data and geographic information systems data analysis tools. The data used included the Project PJD wetlands map, as accepted by USACE and the Project footprint. These datasets were overlain to calculate the Project fill impacts to WOUS. The results are described in the following sections.

Wetlands Fill Impact Types

Wetland fill impacts for the Project are grouped into two main categories: non-regulated and jurisdictional.

- **Non-regulated Impacts** – This impact category includes vegetation clearing, winter roads, and work areas where no fill placement is planned in wetlands or WOUS. These impact types are not addressed by this CMP.

- **Jurisdictional Impacts** – These impacts include the placement of fill into wetlands or WOUS that require approval by USACE through its permitting authorities. These fill impacts are addressed in the CMP.

The impact types are further divided in the DA permit application based on the duration of the fill:

- **Temporary Short-term Fill** – These are areas where fill is placed into wetlands or WOUS for a limited period during construction to facilitate activities, then removed concurrent with construction activities or as soon as construction is complete. This fill may be in place for a matter of days or up to three years. Donlin Gold has not proposed compensatory mitigation for temporary short-term fill impacts.

- **Temporary Long-term Fill** – This category represents cut and fill activities where the fill will be removed more than three years after initial placement. At the request of USACE, temporary long-term fill has been combined with permanent fill in calculating fill impacts for the Project.

- **Permanent Fill** – This category represents cut and fill activities at facility locations where the fill will not be removed from WOUS. This includes the open pit, TSF, and WRF. The fill cannot practicably be removed from the TSF and WRF because of the large volumes of fill in each facility. The open pit will be partially backfilled at mine closure, but cannot practicably be fully backfilled.
Wetlands and Aquatic Resource Fill Impacts

Wetlands and waters have been characterized by Hydrogeomorphic (HGM) classification (Brinson 1993); vegetation type based on a modified Viereck classification system (Viereck et al. 1992); and Cowardin classification (Cowardin et al. 1979).

Mine Area and Transportation Area

Stream fill impacts are presented in Table 2. Stream fills have been subdivided by stream channels filled that are anadromous or non-anadromous. The MA and TA permanent stream fills are 173,953 linear feet (32.9 miles). The MA and TA include a total of 2,676 acres of permanent wetland fill. Table 3 provides a summary of the MA, TA, and PA temporary and permanent wetland fill by area.

Pipeline Area

PA fill impacts account for pipeline crossings (open cut with stream diversions) and for temporary access across streams. All fill in streams is temporary because it is removed during reclamation and restoration. Wetland fill to streams is presented in Table 2. All the PA stream fills are short-term temporary and total 53,346 linear feet (10.1 miles). The PA includes 538 acres of temporary fill and 200 acres of permanent fill in wetlands. Table 3 provides a summary of the PA wetland fill by duration.

The PA traverses 28 Hydrologic Unit Code (HUC)-10 watersheds. The 200 acres of permanent wetland fill impacts from the pipeline are in 14 of those HUC-10 watersheds. These watersheds have very limited existing disturbance. The maximum permanent wetland fill impact from PA construction in any single HUC-10 watershed is 64 acres (Headwaters Tatlawiksuk River). For the PA construction, the maximum total wetland disturbance in a watershed is 0.03 percent of the total watershed area. Additional details on the PA fill impacts by HUC-10 watershed are provided in Attachment A.

---

1. The stream impacts are measured along the channel centerline within the MA, TA, or PA and categorized by the duration. Stream length is measured in linear feet (miles) within the jurisdictional streams listed in Donlin Gold's 2016 PJ D prepared by Michael Baker International.
### Table 2  
**Project Mine Area, Transportation Area, and Pipeline Area Stream Fills in Linear Feet (Miles)**

<table>
<thead>
<tr>
<th></th>
<th>HGM</th>
<th>Cowardin Group</th>
<th>Temporary</th>
<th>Permanent</th>
<th>Temporary</th>
<th>Permanent</th>
<th>HGM</th>
<th>Temporary</th>
<th>Permanent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anadromous Stream</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channel</td>
<td></td>
<td>Intermittent</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perennial</td>
<td>0</td>
<td>2,218 (0.4)</td>
<td>0</td>
<td>0</td>
<td>10,992 (2.1)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Non-Anadromous</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stream Channel</td>
<td></td>
<td>Intermittent</td>
<td>0</td>
<td>37,901 (7.2)</td>
<td>0</td>
<td>774 (0.1)</td>
<td>42,353 (8.0)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perennial</td>
<td>0</td>
<td>130,882 (24.8)</td>
<td>0</td>
<td>2,178 (0.4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>0</td>
<td>171,001 (32.4)</td>
<td>0</td>
<td>2,952 (0.5)</td>
<td>53,346 (10.1)</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

*Inconsistencies are due to rounding.*
### Table 3  Project Mine Area, Transportation Area, and Pipeline Area Wetlands Fill: HGM Class and Cowardin Group (Acres)

<table>
<thead>
<tr>
<th>HGM</th>
<th>Cowardin Group</th>
<th>MA</th>
<th>TA</th>
<th>PA</th>
<th>Temporary</th>
<th>Permanent</th>
<th>Temporary</th>
<th>Permanent</th>
<th>Temporary</th>
<th>Permanent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Depressional</strong></td>
<td>Palustrine Aquatic Bed (Pond)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Palustrine Emergent</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Palustrine Forested</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Palustrine Scrub Shrub</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Palustrine Unconsolidated Bottom (Pond)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Depressional Total</strong></td>
<td><strong>0</strong></td>
<td><strong>3</strong></td>
<td><strong>0</strong></td>
<td><strong>0</strong></td>
<td><strong>20</strong></td>
<td><strong>0</strong></td>
<td><strong>25</strong></td>
<td><strong>0</strong></td>
<td><strong>0</strong></td>
</tr>
<tr>
<td><strong>Flat</strong></td>
<td>Palustrine Emergent</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>20</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Palustrine Forested</td>
<td>0</td>
<td>508</td>
<td>0</td>
<td>9</td>
<td>53</td>
<td>220</td>
<td>109</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Palustrine Scrub Shrub</td>
<td>0</td>
<td>1,052</td>
<td>0</td>
<td>3</td>
<td>15</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Flat Total</strong></td>
<td><strong>0</strong></td>
<td><strong>1,562</strong></td>
<td><strong>0</strong></td>
<td><strong>62</strong></td>
<td><strong>298</strong></td>
<td><strong>151</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Riverine Non-Anadromous</strong></td>
<td>Palustrine Emergent</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Palustrine Forested</td>
<td>0</td>
<td>35</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Palustrine Scrub Shrub</td>
<td>0</td>
<td>113</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Palustrine Unconsolidated Bottom (Pond)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Riverine Non-Anadromous Total</strong></td>
<td><strong>0</strong></td>
<td><strong>152</strong></td>
<td><strong>0</strong></td>
<td><strong>3</strong></td>
<td><strong>17</strong></td>
<td><strong>1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Riverine Anadromous</strong></td>
<td>Palustrine Emergent</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Palustrine Forested</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Palustrine Scrub Shrub</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>11</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Palustrine Unconsolidated Bottom (Pond)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Riverine Anadromous Total</strong></td>
<td><strong>0</strong></td>
<td><strong>4</strong></td>
<td><strong>0</strong></td>
<td><strong>1</strong></td>
<td><strong>15</strong></td>
<td><strong>2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Slope</strong></td>
<td>Palustrine Emergent</td>
<td>0</td>
<td>31</td>
<td>0</td>
<td>1</td>
<td>15</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Palustrine Forested</td>
<td>0</td>
<td>322</td>
<td>0</td>
<td>18</td>
<td>52</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Palustrine Scrub Shrub</td>
<td>0</td>
<td>496</td>
<td>0</td>
<td>21</td>
<td>133</td>
<td>38</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Slope Total</strong></td>
<td><strong>0</strong></td>
<td><strong>849</strong></td>
<td><strong>0</strong></td>
<td><strong>40</strong></td>
<td><strong>200</strong></td>
<td><strong>46</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>0</strong></td>
<td><strong>2,570</strong></td>
<td><strong>0</strong></td>
<td><strong>106</strong></td>
<td><strong>538</strong></td>
<td><strong>200</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Inconsistencies are due to rounding.

1. Temporary long-term fill has been combined with permanent fill for purposes of determining compensatory mitigation requirements.
5.0 Evaluation of Compensatory Mitigation Options

The Rule specifically establishes a watershed-based framework for determining appropriate types of compensatory mitigation. Under the Rule, compensatory mitigation can be carried out through four methods:

1. Restoration of a previously existing aquatic site
2. Enhancement of an aquatic site’s function
3. Establishment of a new aquatic site
4. Preservation of an existing aquatic site

In the Rule, the concepts of aquatic sites and resources are considered together. The key element is that proposed compensatory mitigation must relate directly to unavoidable fill impacts to aquatic resources. On a watershed level, Donlin Gold’s unavoidable fill impacts are largely concentrated on aquatic resources (anadromous and resident fish) in the Crooked Creek watershed. Therefore, in determining what compensatory mitigation to propose, each option was evaluated in terms of how it could be directly compared to these watershed fill impacts to aquatic habitat for fish species. In addition, 33 CFR 332.3(a) recommends that larger contiguous tracts are preferred to help comply with the watershed approach for mitigation. Hence, Donlin Gold’s search prioritized larger singular options rather than numerous small ventures spread over broad areas and numerous watersheds.

The Rule also establishes several distinct types of mitigation, including mitigation bank credits, ILF credits, and numerous forms of PRM. Throughout the U.S., compensatory mitigation is often provided through mitigation bank and ILF programs. In remote areas of Alaska, however, the availability of these programs is very limited. Donlin Gold evaluated the feasibility of purchasing credits from the existing organizations. The Conservation Fund’s ILF program has been the only program that provided credits for the entire state. Advance credit transactions were suspended on May 19, 2017, and as of October 2017, The Conservation Fund could no longer offer any mitigation credits in Alaska.

Mitigation banks are assigned service areas and can generally only be used for developments with fill impacts within those established service areas. The only mitigation bank that is established and has a service area that overlaps any identified Project fill impacts for which Donlin Gold is seeking CWA Section 404 permit coverage is the Su-Knik Bank in the Matanuska-Susitna Borough (MSB). The Great Land Trust recently (June 2018) received approval of wetland mitigation program credits for wetland impacts within a service area that generally comprise the MSB boundaries. Donlin Gold has committed to acquire 9.8 wetland credits from the Great Land Trust for the permanent wetland fill impacts associated with the PA within the MSB. See Table 23 for the mitigation credits proposed for purchase.

As discussed above, the existing ILF programs and mitigation banks do not have service areas that cover most of the Project impact areas and cannot meet the mitigation needs for the permanent fill impacts associated with the MA and TA, and portions of the PA not within the MSB. This left Donlin Gold with only the PRM option under the Rule for achieving compensatory mitigation requirements via one or more of the four methods above: considering on-site and in-kind projects first, then expanding to out-of-kind and, if needed, off-site mitigation. Another key aspect involved determination of the amount of
mitigation. There is no accepted functional assessment for the wetlands impacted. Under 33 CFR 332.3(f)(1), when no functional assessment is available, “a minimum one-to-one [1:1] acreage or linear foot compensation ratio must be used.” Under 33 CFR 332.3(f)(2), consideration on the amount of mitigation also needs to consider the method, likelihood of success, differences in functions (or type) of wetlands, temporal losses and the distance between the impact and mitigation site. Donlin Gold proceeded with these goals and guidance in mind (see Section 8.0).

On-Site Options
Donlin Gold evaluated numerous compensatory mitigation opportunities for the permanent fill impacts associated with the MA, TA, and PA. The most concentrated permanent, unavoidable Project fill impacts occur in the Crooked Creek HUC-10 watershed. In other watersheds associated with the PA, the permanent wetland and stream fill impacts comprise only very small percentages of HUC-10 watersheds (0.03 percent or less of the total watershed areas within each HUC crossed). Therefore, in evaluating mitigation options, and in keeping with 33 CFR 332.3(b)(4) (PRM) and 33 CFR 332.3(c) (watershed approach) relating to compensatory mitigation, Donlin Gold first focused on opportunities within the HUC-10 watershed of the MA (i.e., generally the Crooked Creek drainage) and then extended to the HUC-10s associated with the TA. The only existing developed areas in these hydrologic units are the village of Crooked Creek, the existing Donlin Gold camp supporting exploration activities, and the placer mining activity around the upper Crooked Creek and Donlin Creek confluence. Among these, the sole opportunity to provide immediate on-site and in-kind compensatory mitigation for Project fill impacts to aquatic resources is to restore past placer mining disturbances in upper Crooked Creek and several of its tributaries (Quartz, Snow, Ruby, and Queen Gulches). These restoration and mitigation activities are directly applicable to the MA and TA fill impacts because they represent in-kind wetland and stream channel restoration, enhancement, and long-term preservation within the HUC-10 of the MA and some of the TA activities.

The proposed Upper Crooked Creek PRM Plan is provided in Attachment D and is designed to:

- Restore geomorphically stable channels and floodplains in the lower reaches of Quartz, Snow, Ruby, and Queen Gulches and enhance the aquatic habitat.
- Remove barriers to fish passage and improve anadromous and resident fish-rearing habitat in the reaches of Snow, Ruby, and Queen Gulches fill-impacted by placer mining.
- Preserve restored wetlands and aquatic habitat by creating riparian buffers around the restoration areas.

Donlin Gold will implement the Upper Crooked Creek PRM Plan concurrently with the start of MA and TA development. The Upper Crooked Creek PRM Plan includes the enhancement, reestablishment, restoration, rehabilitation and preservation of wetlands, riparian areas, stream channels, and upland

---

2 Donlin Gold generated a full functional assessment using the Hollands-Magee method in 2014, which was determined inappropriate by the U.S. Army Engineer Research and Development Center (ERDC). Donlin Gold proposed a second methodology in 2016 using Cowardin and a functional capacity index combined with an HGM method that was determined by USACE to be inappropriate for this situation.
buffers totaling 221.5 acres in Quartz, Snow, Ruby and Queen Gulches, and the Wash Plant Tailings Area. The PRM Plan will specifically restore 95.7 acres of degraded floodplains into 93.0 acres of wetlands and 2.7 acres of riverine channel. A total of 8,892 liner feet of stream will be enhanced and reestablished by the restoration work in the floodplains. A total of 109 acres of riparian uplands, and wetland buffers will be protected around the restored and enhanced floodplain wetlands.

Beyond the Upper Crooked Creek PRM Plan, Donlin Gold will restore areas within the MA and TA as wetlands to the maximum extent practicable when they are no longer needed for Project activities. This includes both material and stockpile areas as described in the MA Restoration Plan included as Attachment C, and the TA Restoration Plan included as Attachment F. The MA Restoration Plan provides for restoration of 556 acres of wetland and 6,363 linear feet of stream. The TA Restoration Plan provides for 34.7 acres of wetland restoration. Donlin Gold is not requesting compensatory mitigation credit for these Restoration Plans but is committing to those projects as part of the Project minimization efforts.

Donlin Gold broadly considered the current surface conditions/disturbances in the watersheds of the PA for potential mitigation opportunities for fill impacts from pipeline construction. Donlin Gold evaluated the viability of restoring locations in these watersheds previously impacted by development. An analysis by HUC of existing impervious cover was done to facilitate potential restoration areas. The pipeline crosses 28 HUC-10 watersheds over its 315-mile length. The analysis showed total impervious cover across all HUC-10s before pipeline construction comprises only 0.04 percent of the HUCs, and no HUC had any practicable, substantive restoration opportunities. Overall, there is little to no existing disturbance to restore in the proximity of the PA. See Attachment A for additional details on PA wetland impacts. Compensatory mitigation for the PA effects may not be required due to the very limited (<0.05 percent) effect within each HUC-10 watershed crossed. However, Donlin Gold has included this acreage in this plan to account for these impacts.

**Off-Site Options**

To further compensate for the Project fill impacts to achieve the minimum 1:1 ratio under the Rule, Donlin Gold considered additional off-site mitigation opportunities. Table 4 summarizes the specific off-site mitigation options Donlin Gold considered for the Project and describes the potential applicability of the mitigation option to this CMP. The following guidelines were applied to each off-site opportunity:

- Identify restoration and preservation opportunities that would yield watershed-level aquatic resource mitigation comparable to the MA and TA fill impacts; specifically, restoration and/or preservation of wetland acres and stream miles, with specific focus on anadromous and other important fish and wildlife populations.

- Identify any credits readily available from Mitigation Banks or ILF programs where Project impacts are within the service areas of the providers.

- For restoration opportunities, consider options that can be demonstrated to yield ecological “lift” (an increase in functions and services in the wetlands) in both a practicable and measurable manner.
• For preservation opportunities, show a clear threat of development and that the lands can be preserved over the long term.

• For all opportunities, determine whether the compensatory mitigation can be performed in a manner that generates benefits in an economically sound and reasonable manner, and can be maintained over the long term.

• Use the USACE definition (33 CFR 332.2) of “Practicable” in assessing options ("available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall project purposes").

Donlin Gold followed USACE guidelines in considering the proximity of specific off-site opportunities to the impacted watershed, by first considering those within the middle Kuskokwim River watershed (HUC-08) and then expanding out concentrically, eventually extending to the entire Yukon-Kuskokwim (Y-K) region (HUC-06) and then, if needed, to other watersheds in Alaska. The Rule describes the general approach that permittees must follow in defining appropriate compensatory mitigation. In addition, as recognized by the 1994 AWI (EPA et.al. 1994), Alaska is unique because of its remoteness, lack of development, high percentage of wetland areas compared to the Contiguous United States and limited opportunities for off-site mitigation. The AWI and 2018 MOU acknowledge Alaska’s unique nature by encouraging flexibility in the levels and types of appropriate compensatory mitigation proposed.

Land ownership is a key consideration when assessing potential mitigation ventures. The USFWS, in partnership with the Great Land Trust, Alaska Department of Fish and Game (ADF&G) Division of Subsistence, and the University of Alaska Anchorage (UAA) Alaska Center for Conservation and Science produced a report on the Kuskokwim River watershed dated November 30, 2017 (Hults and Geist 2017). The report provides information relevant to an evaluation of the entire Kuskokwim River watershed. The watershed contains approximately 43.5 million acres of land. Figure 3, from the USFWS report, shows the general land ownership. The watershed land base is 83 percent State and Federal lands. The Federal lands under National Park Service (NPS) and USFWS management encompass 25 percent of the HUC-06 watershed. These lands are already protected for conservation under land plans established and managed by those agencies and do not require further protection. Land managed by the Bureau of Land Management (BLM) and the State (53 percent of the watershed) are not available for restoration and preservation as neither agency/entity has a mechanism to encumber the lands with the required long-term protection instruments. This applies to both preservation and any restoration opportunities. Hence, the only lands generally available in the watershed are private lands, which encompass less than about 17 percent of the watershed. Most of these lands are lands granted through ANCSA with the intent of being developed for revenue generation. An exception to this classification involves Federal and State mining claims that are inholdings located within a refuge or park system boundary which may present viable mitigation options.
Another consideration for assessing mitigation options is to identify key areas of concern. This was a focus of the USFWS report, which identified significant habitat areas and threatened and endangered species areas within the watershed (see Figure 7 and Figure 8 in the report). None are located near the proposed Project wetland impact areas except for a single raptor nesting polygon near the Jungjuk (Angyaraq) Port site. The report’s primary focus was to use a compilation of ecological factors to rank areas on a 5-point scale from “Very High” to “Lowest” conservation value (see Figure 14 in the report, provided as Figure 4 below). The Project areas were scored “Lowest” in conservation value, except for the area immediately adjacent to Crooked Creek, which was scored as “Low.” Areas further away from the Project in the HUC-06 watershed, i.e., generally closer to the coast, were ranked as “High” to “Very High” values by USFWS; coinciding with the Yukon-Delta and Togiak National Wildlife Refuges.
**Watershed Level Mitigation Projects**

The most viable opportunities capable of generating off-site mitigation credits of the scale and impact types associated with the Project at a watershed level involve stream restoration and preservation in mineralized areas. Much of the watershed-level development in the Kuskokwim River region has been associated with historical and modern mining districts. To evaluate potential compensatory mitigation at the scale of the Project fill impacts, Donlin Gold considered options of restoring watersheds impacted by mining operations at the: (1) Platinum Mining District, (2) Tuluksak/Nyac Mining District, (3) Red Devil Mine Area, and (4) Kolmakof Mine Area. Donlin Gold also considered preserving the Fuller Creek watershed from future placer and hard rock mining activity.

In each of these areas, Donlin Gold considered the opportunity in terms of practicability for restoration/preservation, including availability, feasibility and cost, land ownership and long-term durability, and the potential for ecological enhancement/lift to wetland areas, streams, and riparian areas. Many other smaller, historical placer mining areas are located within the region, e.g., in the George and Holitna river drainages. However, these often involve small, single prospects where development is limited to small acreages and stream sections. Given their remote and scattered locations, any restoration work at these sites would be costly and complex, and unlikely to yield the watershed level of mitigation credits needed for the Project. Finally, there is virtually no threat of more extensive future development, and often no mechanism to impose a durable protective instrument (i.e.,
State or BLM lands). Smaller placer mines were, therefore, eliminated as viable compensatory mitigation options.

The Red Devil and Komerof mine areas are not practicable options for compensatory mitigation. The reasons are as follows:

- **Red Devil** is not practicable because it does not meet the overall purposes for compensatory mitigation through generation of wetland acres and stream miles. In addition, decisions on the final remedial action plan among BLM and the landowners\(^3\) is an ongoing process. BLM does not expect to finalize a work plan for site clean-up until 2019 or beyond. This also makes it unavailable for Donlin Gold.

- **Komerof restoration work** is largely complete. The Project, like Red Devil, does not meet the overall purposes for compensatory mitigation acres through generation of wetland acres and stream miles.

This left the Tuluksak/Nyac and Platinum districts, and Fuller Creek watershed for detailed consideration. Significant effort was expended in investigating each of these options and the results are described below.

**Platinum Mining District**

The Platinum site is located along the southwest coast of Alaska – south of the Kuskokwim River delta, approximately 240 miles from the Donlin Gold MA. Platinum is in the same HUC-06 watershed as the Project MA and TA. The site generally consists of the Salmon River watershed, which flows into Kuskokwim Bay. In July 2017, Donlin Gold staff observed an abundance of sockeye and coho salmon moving upstream in the Salmon River to spawn. Other salmon species have also been observed and the river and tributaries provide key areas for juvenile salmon rearing. The area further includes significant avian and Steller sea lion habitat in and around the Togiak National Wildlife Refuge (Refuge).

The Platinum site includes mined and unmined mineral claims on BLM lands. A portion of the unmined claims in the lower Salmon River watershed extend onto the Refuge. Placer mining for platinum in the Salmon River watershed began in the 1920s and has occurred at various times through 2011 when XS Platinum ceased the most recent operations. Approximately 645,000 ounces of platinum have been produced to date. The residuals from past placer mining (tailings and overburden) fill large areas of the Upper Salmon River watershed; rough estimates suggest millions of cubic yards of these residuals. The excavation, washing, and placement of these materials have significantly changed the hydrology of the drainages in and around the mined areas.

Donlin Gold investigated a combined preservation and restoration PRM plan in the Salmon River watershed within and below the areas where mining has taken place. Preservation would have included claims situated within and outside the Refuge. Restoration, located entirely outside the Refuge, would have primarily focused on re-establishing stream connectivity to improve access to salmon habitat.

---

\(^3\) BLM is in the process of developing several options on how to address the concerns related to possible future contamination of the Kuskokwim River from this site.
throughout the drainage. Figure 5 depicts the Platinum area with conceptual plans where restoration and preservation could potentially occur, it also shows where potential future placer mining might be conducted. The total wetland acreage of the combined plan would have been approximately 1,800 acres. Donlin Gold proceeded to further investigate this option to determine the remainder of the practicability components.

The majority of the mining claims are currently owned by a private family business, Hansen Industries, Inc. (Hansen). Hansen’s stated goal is to sell all its claims at Platinum. The recorder’s office shows an interest in some of these claims that were originally held by Harry Shippey and have been passed along to several heirs. Angler Mining Pty, Ltd. (Angler) has an option agreement in place and currently controls the entire claim block. Hence, the property is under the control of an active claim owner and not readily available. Initial offers to purchase an interest in the claims at market value were rejected.

The residual placer mining materials have been placed in very large piles with steep side slopes (angle of repose) along the Salmon River drainages. To remove these materials and restore the topography and hydrology associated with wetlands would involve re-locating several million cubic yards of materials into non-wetland areas. For example, the current stream width is approximately 20 to 30 feet wide with no riparian zone. With the geometry of the washed rock spoil piles (see Photo 1), it would necessitate the removal of between 3,630 and 7,300 cubic yards to create 20 feet of riparian zones/wetlands per 100 feet of stream length. This would provide 0.046 acres of restored wetlands. The estimated cost to generate 1 acre of wetlands through removal of material down to the water table, placement of at least 1 foot of soil (if available), and re-vegetation would be in the range of $640,000 to $1 million per acre.

A key physical challenge to restoring wetlands in the mined areas is the groundwater table lowered as a result of the past mining activity. The dredge used for mining had a reach of up to 60 feet below the water level in which the dredge was working. The sluicing process removed all the fines from the material being processed and they were washed downstream and out to the coastal waters. This resulted in changes to the water table hydrogeology that cannot be physically restored. The diagram below (Figure 6) is a graphical representation of the hydrogeologic changes. As such, these areas have been converted to uplands. Re-grading the surrounding spoils back to the original contours would only eliminate the existing stream and not restore wetlands (see bottom image in Figure 6).
Photo 1  Panorama of Spoil Piles at Platinum

Figure 6  Hydrogeologic Alterations at Platinum

- Pre-mining Grade

- Existing Grade

- If Restored to Pre-mining Contours
Logistically, two other issues affect practicability:

1. The excess material from the wetland creation discussed above would need to be stockpiled. Essentially all areas surrounding the previous mining activities are wetlands. If these materials are placed in the surrounding areas, then the creation of new wetlands would be offset by the filling of other wetlands. Alternatively, if the material is kept within the current disturbance footprint, then existing ponds in the surrounding valleys would be filled and the amount of wetland acres created would be substantially reduced.

2. To create wetlands, an estimated 1,600 cubic yards of soil would be needed for each acre of wetland to be established. In addition, BLM has stated that, if existing spoils are disturbed, the resulting reclamation would need to meet BLM’s reclamation standards, which include at least 70 percent vegetative cover. This also would necessitate placement of soils over all reclaimed areas. Hence, to reclaim 1,000 acres as either wetlands or uplands would require 1.6 million cubic yards of soils. These quantities of soil do not exist at the site.

Based on availability, cost, technological, and logistical criteria, the results of this review show that restoration of wetlands in the previously mined areas at Platinum is not practicable to obtain compensatory mitigation credit.

With elimination of restoration as an alternative, potential preservation at Platinum consists of two parts: claims inside and outside the Refuge. For claims situated within the Refuge land control would revert to the USFWS upon claim abandonment. The Refuge claims comprise about 650 wetland acres and 200 additional upland buffer acres with high, watershed-level aquatic and avian habitat value. There is the potential threat of mineral development based on the valid existing rights in the mining claims, although to date no detailed mineral evaluation and mine planning has occurred with respect to these claims. These numbers fall well short of the target watershed-level acres sought for off-site compensatory mitigation credit by the Project. These claims also fail the availability requirement for the same reasons cited above.

Outside of the Refuge, BLM has expressed a desire to see the claims mined. Further, if Hansen and Angler agreed to relinquish their mining claims situated outside of the Refuge, Calista has a right to assume ownership. Considering the ANCSA mandate that lands selected for their mineral potential be developed for the benefit of Alaska Native shareholders, Calista may not be able to allow these lands to be preserved from development over the long-term. The complexity of the claim ownership and availability make it impractical to establish a preservation agreement for the unmined claims situated outside of the Refuge.

Based on all the above factors, the Platinum Mining District was eliminated as an off-site compensatory mitigation option.

**Tuluksak/Nyac Mining District**

The Tuluksak River watershed was selected as a potential compensatory mitigation opportunity based on its contributions to the Kuskokwim River salmon stock and its presently low production of Chinook and chum salmon returns. The Tuluksak River watershed is located within the lower Kuskokwim River...
basin approximately 138 river miles upstream from the mouth of the Kuskokwim River. The Tuluksak River originates in the Kilbuck Mountains and flows approximately 86 miles through the Yukon Delta National Wildlife Refuge, entering the Kuskokwim River near the village of Tuluksak. The entire watershed is approximately 892 square miles and supports spawning populations of Chinook, chum, coho, and pink salmon. Resident species include Arctic grayling and Dolly Varden.

The Tuluksak/Nyac Mining District is known for its long history of mining activity dating back to 1907. Disturbance and stream alteration associated with more than a century of mining have resulted in decreased salmon production in the watershed, especially Chinook and chum salmon stocks. In September 2000, the Alaska Board of Fisheries identified Tuluksak River Chinook salmon within the “stocks of yield concern.” The designation was discontinued in 2007 after escapements returned to levels above the historical average. However, poor returns of Chinook salmon to the Tuluksak River since 2007 indicate it is still a stock of concern.

Existing dredge tailings and overburden are located throughout the historical Tuluksak River floodplain and form a circuitous maze of pools and low-flow waters. The high mounds of tailings and overburden left behind by dredge activity have forced the main Tuluksak River channel to the northern edge of the floodplain. Photo 2 shows the nature of the past mining activity and the current condition of the Tuluksak/Nyac site.

Photo 2  Tuluksak/Nyac Site

Donlin Gold investigated a restoration PRM plan in the Tuluksak River watershed within the areas where mining has occurred. Restoration would have primarily focused on increasing stream connectivity to the ponded areas to improve access to salmon habitat throughout the mined areas. The total wetland acreage of the combined projects would have been very small and primarily involved open water habitat. Despite this significant limitation, Donlin Gold further investigated the practicability of this option.
In the Tuluksak/Nyac District, the underlying claims are controlled by Calista. The placer mine operation is leased from Calista by Dr. J. Michael James/Nyac Gold, LLC, who assumed full management of the claims nearly 20 years ago after the death of his business partner. In recent years, Dr. James has continued mining activity in the district and has maintained the validity of his claims. Overall, Dr. James’s total claim area comprises tens of thousands of acres. Because of the site control and active ownership status, securing the land for mitigation is difficult.

Donlin Gold conducted an evaluation of potential opportunities to conduct restoration work in the Tuluksak River watershed. Full-scale restoration of the river, riparian areas, and associated wetlands is not practicable given the nature of the disturbance, the lack of space available for tailings and overburden management to create wetlands from uplands, and the lack of soil available to support reclamation of the re-located materials. A key difference between the Platinum site, which has high spoil peaks and widely spaced valleys, and the Tuluksak/Nyac site is the wider, closer spaced valleys filled with ponds at Tuluksak/Nyac (see Photo 2). Creating wetlands from this configuration is physically and logistically problematic. There is very little working room for equipment, which would have to work along the narrow spoil ridges. There is no space readily available to dispose of the material if the goal is to create wetlands from the ridge areas. Re-grading the spoil ridges downward would fill the adjacent ponds, creating turbidity and reducing the open water habitat. The geometry is such that the grading could eliminate the ponds to achieve a material balance. This would eliminate the existing anadromous habitat – a detriment, not an improvement. As with Platinum, there is a lack of soil available to complete wetland creation. In addition, the spoils at Tuluksak/Nyac have re-vegetated and provided stable habitat. Therefore, creation of wetlands from the current configuration is not practicable based on logistics and available technology.

From a fisheries perspective, it would be more effective to focus on individual projects to improve stream hydrology, connectivity, and aquatic habitat from and within the existing network of ponds. Therefore, Donlin Gold identified specific projects that could benefit aquatic resources including: (1) targeted alterations of the main channel to approach the variety of geomorphology that supports a greater diversity of fish habitat; (2) the removal of fish passage barriers between the historical dredge pond maze and the main channel, thus opening up new fish spawning and rearing areas presently inaccessible from the mainstem of the Tuluksak River; and (3) removal of the partial fish passage barrier (culvert replacement) within Slate Creek, thereby opening all of Slate Creek to upstream spawning migration during all flow stages and providing free and unrestricted movement for rearing juvenile salmonids. Like Platinum, these projects would yield significant lift in the aquatic habitat but few, if any, wetland acre credits that are needed to meet the target mitigation needs. Therefore, while these projects would provide some desired environmental benefits, they do not accomplish restoration at a watershed level.

Donlin Gold’s review determined this project is not practicable. The area is under active lease and not readily available. The Tuluksak/Nyac District mitigation option could result in tangible improvements in aquatic habitat and increased fish populations, but lacks potential to create significant wetland acre mitigation credits. Based on these factors, it was eliminated from further consideration as an off-site compensatory mitigation option.
Fuller Creek Parcel

Donlin Gold evaluated the permanent protection of a 10,873-acre parcel in the Fuller Creek watershed. The Fuller Creek parcel is in the middle Kuskokwim River watershed, approximately 0.5 miles south of the community of Red Devil, within the Vreeland Creek-Kuskokwim River HUC-10 watershed. The Vreeland Creek-Kuskokwim watershed is approximately 19 miles southeast from the Project MA, and is located within the same HUC-08 Aniak watershed as the MA and much of the TA.

The Fuller Creek parcel is large enough and contains sufficient wetlands (3,135 acres) and aquatic stream resources (50 stream miles) to offset the potential losses of aquatic resources associated with the Project. In addition, the parcel serves as a large buffer that further protects the Fuller Creek watershed and the physical, chemical, and biological functions of the parcel’s wetlands and streams. The Fuller Creek parcel specifically includes 8 miles of coho salmon spawning and rearing stream reaches, supported by the physical, chemical, and biological functions of the adjacent wetlands. The presence of other anadromous species has not been documented in the Fuller Creek watershed.

The Fuller Creek placer prospect is located along Fuller Creek, about 3.1 miles south-southeast of the mouth of the creek. Placer gold deposits reportedly occur for about one mile in Fuller Creek, west of Barometric Mountain. Other mining prospects within the Fuller Creek parcel include McCally, Fairview, and an unnamed prospect southeast of Barometric Mountain. The bedrock geology of the area comprises shale and sandstone of the Upper Cretaceous, Kuskokwim Group, intruded by small Late Cretaceous to Early Tertiary mafic to felsic intrusions (Bundtzen and Miller 1997). This geology is quite similar to the geology of the Donlin Gold Project.

While mineral prospects exist in the Fuller Creek drainage, there is no indication that they will be developed in the foreseeable future (no current or pending leases or claims to demonstrate a threat of development). In western Alaska, placer deposits have generally been the most available sources of minerals due to their ready access in drainages and simple mineral recovery by relatively low-cost methods. Recently, development of new watershed-wide placer mine operations has been rare; instead the common practice is to mine existing placer areas where facilities and equipment are already in place. Within the Y-K region, placer mining activity in general has been declining. Development of the Fuller Creek deposits by placer mining would pose greater challenges than exist at other nearby areas that have been previously mined. Therefore, the threat of placer mining in the Fuller Creek parcel is considered very low in the foreseeable future.

As for hard rock mining opportunities, remote areas of Alaska present extraordinary challenges in developing mining projects. Deposits must be of the size and scale to support the excessive costs of developing and sustaining the infrastructure required to access, construct, operate, and close the projects. This often involves defining millions of ounces of resources at depths that typically extend hundreds and even thousands of feet below the ground surface. For example, serious advancement of this Project has been ongoing since 1989 with more than $500 million already spent in exploration, design, and permitting costs. After six years of review under the National Environmental Policy Act, Donlin Gold has still not obtained the required permits that are necessary before it can make a construction decision. Moreover, Donlin Gold is recognized as one of the richest undeveloped, open pit gold deposits in the world. While having somewhat similar geology to Donlin Gold, there is no evidence
that Fuller Creek has comparable resources that could be mined. No detailed exploration work (e.g., drilling) has been conducted to characterize the hard rock mineral potential. As such, even if viable hard rock deposits are in the Fuller Creek parcel, they are realistically many decades away from potential development.

Because of the lack of existing placer mining activity in the Fuller Creek parcel and the fact that it is highly unlikely a large hard rock mine would be constructed in the foreseeable future, Donlin Gold considers the threat of development in the watershed to be very low.

As noted above, coho salmon are the only salmon species observed in the Fuller Creek drainage. While important, there is no evidence that there is a lack of coho salmon habitat within the Y-K Region. Specifically, preservation of the parcel would likely not yield any tangible benefits in terms of increased coho salmon populations in the Kuskokwim River. In addition, there is no evidence that subsistence use of coho salmon in any areas of the region is limited.

Finally, Donlin Gold entered into discussions with the interests that control the Fuller Creek parcel to ascertain its availability for preservation as compensatory mitigation. These interests had previously worked with the USACE to potentially establish a compensatory mitigation bank that would facilitate preservation of the Fuller Creek parcel specifically for the Project. Unfortunately, there were significant differences in the valuations placed on the Fuller Creek parcel by the various parties. The interests that control Fuller Creek asked for reimbursement several multiples in excess of the fair market value of lands and placer deposits in the region (generally $500 to $1,000 per acre). As a result, Donlin Gold determined it was impracticable to pursue preservation of the Fuller Creek parcel.

In summary, because of the low development threat in the reasonably foreseeable future, the documented presence of only coho salmon use, and the significantly above-fair-market-value requested for preservation, the Fuller Creek parcel was eliminated as an off-site mitigation option.

Other Mitigation Options Considered within the HUC-06
Many of the off-site options evaluated involve non-traditional mitigation opportunities, i.e., they do not directly include restoration or preservation of wetlands and streams. These included: (1) landfill and solid and hazardous waste management improvements, (2) community drinking water and sanitary system improvements, (3) erosion control along rivers and streams, (4) trail enhancements to minimize erosion, (5) reclamation of the Newtok Village site that is being re-located, and (6) invasive species control in the Crooked Creek watershed. These projects reflect specific environmental and human health needs in the Kuskokwim River watershed. While these projects can lead to indirect improvements in stream water quality and aquatic habitat, such results are not readily quantified into wetland acres or stream miles as required under the Rule. Therefore, they do not meet the overall Project need as it relates to compensatory mitigation. There generally is no quantitative method to describe how they would compensate for unavoidable Project impacts to aquatic habitat and fish in the watershed. Further, their long-term “performance” cannot be readily measured in terms of benefitting aquatic resources. Showing such measurable long-term performance is typically required to obtain compensatory mitigation credits for affected wetland acres and stream miles. Finally, there is essentially
no precedent for such non-traditional measures being accepted as compensatory mitigation in Alaska. The non-traditional compensatory mitigation options are therefore not included in the CMP.

**Broader State-Wide Potential Mitigation**

While it is typically not required, Donlin Gold continued to look beyond the HUC-06 watershed to determine if there were other areas or projects that may meet the general intent of the Rule, taking into consideration the flexibility provided by the 1994 AWI (EPA et.al. 1994). The following discussion addresses two projects Donlin Gold identified: (1) the Flat/Iditarod Mining District, a historical gold mining district in the Yukon River watershed, and (2) the Chuitna River watershed, which has a long history of coal, oil, gas, and timber activity, and is a highly productive salmon river in the populated Cook Inlet watershed.

**Flat/Iditarod Mining District**

The Flat/Iditarod Mining District is in the Flat Creek drainage. The area is approximately 40 miles north-northeast of the Donlin Gold MA, just over a ridge separating the drainage between the Yukon and Kuskokwim Rivers. Despite the proximity to the Project MA, Flat is outside the HUC-04 of the MA; it is located in the Lower Yukon River HUC-04. The Flat Creek area comprises thousands of acres of historically dredged/placer-mined streams and tributaries. The district is also of historical significance, and is part of the Iditarod Trail, although it is not included in the modern Iditarod Trail events and activities. The Flat area includes a functioning airstrip and some remnant roads which historically provided access to Iditarod and beyond.

The area is mostly situated in a parcel that was conveyed to Doyon Limited (Doyon) under ANCSA, although the mining rights remain under BLM control. BLM has expressed hope that restoration could be conducted on much of the area to facilitate full transfer to Doyon. It is not evident that the material needed, including topsoil, is available to complete reclamation. Much of the area is uplands. Several mining claims exist under private control, many held by the Miscovich family who were original residents and miners. Historical features are present throughout the landscape.

The Flat/Iditarod Mining District provides a large restoration area opportunity for compensatory mitigation. However, the complexity of the land issues makes it difficult to acquire all the claims and secure long-term durability. The comments related to reclamation of BLM lands at Platinum also apply to Flat. This includes the challenges associated with meeting current reclamation and revegetation standards and potential conflicts with ANCSA mandates. There are also significant and numerous historical features that would complicate efforts to perform large-scale reclamation of the area. Securing this area to conduct wetland restoration for wetland compensatory mitigation will require compliance with Section 106 of National Historic Preservation Act for potential impacts to cultural resources. Mitigation compliance costs are not typically determined until the end of the consultation process, which traditionally takes years to complete. This time constraint severely complicates logistics and planning. Therefore, the Flat/Iditarod Mining District was not considered further in this CMP.

**Chuitna River Watershed**

The Chuitna River watershed is a drainage located on the west side of Cook Inlet 45 air miles from Anchorage, the largest city in Alaska. This area has a unique mix of existing and potential future industrial activities that surround the Chuitna drainage. The area has two active ports – one at North
Foreland to the south, which includes a beach barge landing area and a pile supported trestle and dock; and a barge beach landing area to the north known as Grant’s Landing. The ports have been used for the import of oil field pipe, equipment, fuel, and supplies for Tyonek and Beluga, two local communities. A series of connecting service trails and roads connect Tyonek and Beluga for local uses. Resource development roads are interspersed in the region to facilitate the harvest of timber, and for the development of the regional oil and gas industry. Temporary roads have been constructed for coal exploration and development. The Beluga coal field and the Beluga oil and gas basin are centered here. Gas from the region is collected and shipped to the Beluga natural gas power plant or into the regional gas supply system for distribution to Anchorage, the Matanuska-Susitna Borough, and the Kenai Peninsula for heating and power generation.

The Chuitna River area is used by Alaskans and non-residents for recreational and guided fishing. Offshore fisheries in Cook Inlet include salmon and halibut. The Chuitna River contains very productive salmon runs including Chinook salmon (listed as a species of concern by the ADF&G), coho, sockeye (minor use), chum, and pink salmon. These salmon provide an important food source for endangered Cook Inlet Beluga whales. While State and Federal permit programs strive to balance development with land, habitat, and wildlife protection, the proximity of the area to Anchorage places development and use pressures on the Chuitna River that merit special consideration for additional protection through preservation of portions of the watershed.

Donlin Gold entered into discussions with two of the key land owners in the watershed: the Tyonek Native Corporation (TNC), and the Trust Land Office (TLO), which manages lands for the Alaska Mental Health Lands Trust (AMHT) Authority. Both entities expressed an interest in preserving key critical habitat areas within the 95,000-acre Chuitna watershed while preserving their ability to generate revenues from the remaining lands in the area. Donlin Gold reached an agreement with both entities to obtain the preservation rights to nearly 6,000 acres of wetlands, highly productive salmon streams, and associated upland buffer areas.

Off-Site Options Conclusion
After conducting extensive review of all off-site mitigation options to supplement the reclamation and restoration of placer-mined areas in upper Crooked Creek and the post-mining restoration of wetlands in the MA, Donlin Gold proposes to preserve lands within the Chuitna watershed as a PRM Plan for the Project. The PRM Plan for the Chuitna Preservation Area (Preservation Area) is provided in Attachment E. Selection of these lands for preservation is based on:

- The ability to preserve extensive wetland acres and stream miles providing compensatory mitigation for the permanent and long-term fill impacts in the MA, TA, and PA. This includes several tributaries including headwaters, and much of the mainstem of the Chuitna River to the estuarine water of Cook Inlet. The proposed Preservation Area will set aside 5,870 acres, including 3,269 acres of wetlands and ponds, and 418 acres of streams and rivers, totaling 3,687 acres of WOUS. It also protects 2,183 acres of upland riparian area and buffers, and 258,056 linear feet (48.8 miles) of streams in the Chuitna watershed. The 2,183 acres of upland riparian and buffers, and 418 acres of stream serve a critical role in maintaining the watershed-level functions and values of the preserved wetlands.
• The watershed provides important spawning and rearing habitat for all five Pacific salmon species as well as having large populations of resident fish species. While not in the same HUC-10 as the MA and TA, the linear length of important salmon habitat in the Preservation Area is 36 times more than the areas that would be filled in the Crooked Creek watershed. As discussed in the Chuitna PRM Plan (Attachment E), observed salmon populations are much higher in the Chuitna watershed compared to Project drainages. The Chuitna watershed also overlaps with the critical habitat for endangered Beluga whales and salmon provide an important food source for these whales.

• There is a recent threat of development associated with coal resources throughout the watershed. The extent and potential value of the coal deposits are well-established and detailed mine plans have been advanced, including significant work to permit these deposits. In addition to the threat of coal mining, oil and gas development activities, timber harvest, and gravel extraction operations exist throughout the watershed with a long history of development of these in the area (see Attachment E for an expanded discussion of the development threats).

• Donlin Gold has reached agreements to establish secure, durable deed restrictions for the proposed mitigation areas.
**Table 4  Compensatory Mitigation Options Evaluated by Donlin Gold**

<table>
<thead>
<tr>
<th>Mitigation Option</th>
<th>Description</th>
<th>Rationale for Elimination</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Banks and ILF Programs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conservation Fund</td>
<td>Instrument intended to provide mitigation credits for projects throughout Alaska.</td>
<td>No longer offering credits in Alaska per the USACE decision to terminate the program in October 2017.</td>
</tr>
<tr>
<td>State-wide ILF Program</td>
<td>Instrument intended to provide mitigation credits for projects throughout Alaska, although primarily focused on the Anchorage area. Credits are currently available only for wetland impacts in the Matanuska-Susitna service area.</td>
<td>The service area for available credits is currently limited to the Matanuska-Susitna Borough. Hence, the Program cannot provide compensatory mitigation for most of the permanent Project impacts. However, Donlin Gold has made a commitment to purchase credits for the 5.0 acres of permanent PA impacts within the GLT service area.</td>
</tr>
<tr>
<td><strong>Great Land Trust ILF Program</strong></td>
<td>Instrument intended to provide mitigation credits for projects throughout Alaska, although primarily focused on the Anchorage area. Credits are currently available only for wetland impacts in the Matanuska-Susitna service area.</td>
<td>The service area for available credits is currently limited to the Matanuska-Susitna Borough. Hence, the Program cannot provide compensatory mitigation for most of the permanent Project impacts. However, Donlin Gold has made a commitment to purchase credits for the 5.0 acres of permanent PA impacts within the GLT service area.</td>
</tr>
<tr>
<td>State of Alaska ILF Program</td>
<td>Planned to provide credits associated with State lands.</td>
<td>In early stages of development; no guarantee credits will be available to Donlin Gold.</td>
</tr>
<tr>
<td>Su-Knik Bank</td>
<td>Offers compensatory mitigation credits associated with high-value preservation areas in the Matanuska-Susitna Borough. As of May 2018, the Bank had 1,700 credits available for purchase.</td>
<td>All but 5 acres of the permanent Project impacts to wetlands are outside of the Bank’s primary and secondary service areas. Donlin Gold solicited a competitive bid offer from the Bank to provide credits for the PA impacts in their service areas. As a result of that process, Donlin Gold chose to secure the necessary credits from Great Land Trust, who has an overlapping service area with Su-Knik Bank.</td>
</tr>
</tbody>
</table>

**Village Site Restoration**

<table>
<thead>
<tr>
<th>Mitigation Option</th>
<th>Description</th>
<th>Rationale for Elimination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newtok Village Reclamation and Remediation</td>
<td>Donlin Gold reached out to USFWS to identify potential mitigation opportunities. USFWS expressed interest in the Newtok Village reclamation and restoration. The village is located 94 miles north of Bethel at the confluence of the Ninglick and Newtok Rivers. Severe erosion along the Ninglick River is threatening the village and it is being relocated. Continued erosion could destroy the village, with infrastructure potentially slumping into the river creating waterborne hazards. Beyond erosion are threats of contamination associated within an old armory, Bureau of Indian Affairs school, landfill and waste storage areas, tank farms, other tanks, a generator facility, and other community and commercial facilities. The school and armory are on the State’s Contaminated Sites List.</td>
<td>While many of the Newtok facilities with potential contamination risk have been inventoried, detailed investigations and clean-up plans have not been developed or approved by State and Federal agencies. Given the number and extent of the sources and expectation of compliance with stringent state clean-up standards, remediation could take many years and costs are currently impossible to quantify due to the many unknowns. There is also the potential for significant long-term liability. The USFWS Hazardous Materials Inventory for the village acknowledges the most significant data gap is the extent of contaminated soil, ground and surface water. In addition, remediation activities likely have limited potential for wetlands restoration and thereby would not generate substantive wetland and stream mitigation credit. As a result, Newtok Village reclamation and remediation is not a practicable compensatory mitigation alternative for Donlin Gold.</td>
</tr>
<tr>
<td>Mitigation Option</td>
<td>Description</td>
<td>Rationale for Elimination</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td><strong>Mining/Mineral Development Area Restoration and Preservation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flat/Iditarod Mining District Restoration</td>
<td>Gold was discovered in Flat in 1908, and the subsequent influx of miners and businesses created a town of about 6,000 by 1914. The area surrounding Flat Creek/Otter Creek in the Yukon River watershed has been thoroughly mined by placer activity, and miles of disturbed streams and un-reclaimed overburden/tailings dominate the landscape. The land is managed by BLM, which administers the various claims/leases in the area.</td>
<td>Multiple claim and lease holders made the likelihood of successfully negotiating required agreements low. Also, all restoration would likely have to meet current BLM reclamation standards, which is impracticable given the scale of the deposited material, availability of segregated soil to support re-vegetation, and changes to the baseline hydrology in the watershed. There would also be significant issues in protecting cultural resources in the District related to the historical mining activity and the Iditarod Trail.</td>
</tr>
<tr>
<td>Tuluksak/Nyac Mining District Restoration</td>
<td>The Nyac Mine is located on the Tuluksak River and its tributaries about 60 miles east/northeast of Bethel. The underlying claims and some of the land areas are controlled by Calista. The placer mine operation is leased from Calista by Dr. J. Michael James (Nyac Gold, LLC), who assumed full management of the claims nearly 20 years ago.</td>
<td>Because of its location in the Kuskokwim River watershed, Donlin Gold evaluated Nyac Mine restoration in detail. In the mined and other impacted areas, existing natural processes have resulted in restoration of stream and aquatic habitat. Salmon are present in the stream system and restoration activities may pose a risk to them. The volumes and arrangements of tailings and overburden left by the dredge activities make restoration of wetlands while protecting salmon impracticable. Opportunities for watershed-level ecological lift from restoration work are therefore limited.</td>
</tr>
<tr>
<td>Red Devil Mine Remediation</td>
<td>The Red Devil cinnabar/mercury mine is an abandoned historical mine on land managed by the BLM. The site is a very high-profile remediation/clean-up project; BLM has proposed a range of remedial actions to restore and protect Red Devil Creek and the Kuskokwim River.</td>
<td>Because of its location in the middle Kuskokwim River watershed, Donlin Gold evaluated Red Devil Mine remediation in detail. While the BLM has proposed specific remedial plans, there is disagreement on the scope among the EPA, the State of Alaska, and TKC, the landowner. These issues are likely to continue for years. Until a final resolution is agreed upon, it is unclear how Donlin Gold could contribute to restoration activities. In addition, the property does not lend itself to restoration and preservation of a significant amount of wetland acres as needed for the Project purpose. This makes Red Devil impracticable as a mitigation option.</td>
</tr>
<tr>
<td>Mitigation Option</td>
<td>Description</td>
<td>Rationale for Elimination</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Kolmakof Mine Site Remediation</strong></td>
<td>The Kolmakof Mine is a historical cinnabar/mercury mine east of Aniak on the north shore of the Kuskokwim River. The last known production was in 1970. The site has been substantially cleaned up and most contaminants removed in a coordinated effort between EPA and BLM. Some mercury/contaminated soils are still on-site and plans are in place to remove them.</td>
<td>The site is relevant because of its location in the middle Kuskokwim watershed. However, because clean-up has generally been completed at the site, there is little or no opportunity for additional restoration to create ecological lift and associated mitigation credit.</td>
</tr>
<tr>
<td><strong>Platinum Mining District Restoration and Preservation</strong></td>
<td>The Platinum Mine site is just south of Goodnews Bay, on Kuskokwim Bay, west of Bristol Bay on the Bering Sea. The mine site comprises nearly 200 BLM claims totaling just over 4,000 acres. Placer mining has occurred in the watershed since the 1930s, with the most recent mining in 2008. Extensive placer tailings and overburden are found in the watershed and the hydrology has been altered. Approximately 800 acres of largely undisturbed claims are situated within the Refuge. Angler has entered into an agreement with the current lease holder, Hansen, to access the claims and conduct additional placer mining.</td>
<td>Because of its potential for significant watershed-level restoration and preservation of important anadromous fish and avian habitat, Donlin Gold evaluated Platinum in detail. The restoration of the area has the potential to restore hydraulic connections and thereby enhance fish passage and habitat. However, with the large volumes of deposited tailings and overburden and the disturbance to the subsurface hydrology from large-scale dredge activity, restoration of wetlands is not generally practicable. It is unclear how mitigation credit would be acquired as it relates to acres of wetlands. Also, discussions with BLM suggest the mined material would have to meet current mine reclamation standards, such as 70 percent revegetation success. This is not practicable given the types of materials and how the bucket-line dredge materials were deposited. Restoration was judged to not be practicable. For undisturbed lands in the lower areas of the Salmon River drainage outside the Refuge, underlying, long-term land control issues (minimum three-party involvement) make preservation of these areas impracticable. Donlin Gold actively pursued preservation of the approximately 850 acres (650 wetland acres) in the Refuge. If the mining claims were relinquished, control would revert to the USFWS (for long-term preservation). Donlin Gold approached the owners to acquire this property, but these efforts were unsuccessful.</td>
</tr>
<tr>
<td>Mitigation Option</td>
<td>Description</td>
<td>Rationale for Elimination</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Fuller Creek Watershed Preservation</td>
<td>The Fuller Creek watershed is approximately 20 miles upriver from the Crooked Creek/Kuskokwim River confluence in the same HUC-08 as the Donlin Gold MA. The USACE previously recognized the mineral development threat in the Fuller Creek watershed; although only limited prospecting has occurred to date. Fuller Creek is listed in the state’s Anadromous Waters Catalog for coho salmon, including supporting juvenile rearing. The presence of other aquatic species has not been documented. The lands are owned by Calista.</td>
<td>Because of the potential for preservation of anadromous fish habitat, the potential for watershed-level development, and proximity to the MA and TA, Donlin Gold evaluated Fuller Creek preservation in detail. Wetlands encompass approximately 3,000 acres within the approximate 10,000-acre watershed. Donlin Gold approached the partners that hold the rights to the parcel (Calista and Earthbalance Corporation) but were unable to reach an agreement that would make this option practicable. In addition, the actual threat of placer or hard rock mining development in the foreseeable future is very low.</td>
</tr>
</tbody>
</table>

### Non-traditional Mitigation Projects

| Community Water and Wastewater System Improvements in the Y-K Region | Many communities in the Y-K Region, including the City of Bethel, have inadequate systems to provide safe drinking water and sanitary wastewater treatment. This presents both human health and environmental risks. In numerous cases, designs for improved systems are in place; however, they have not been implemented due to limited funding. Donlin Gold spoke to communities and the Yukon-Kuskokwim Health Corporation about opportunities to support such programs and gain compensatory mitigation credit. | Because these programs are non-traditional for compensatory mitigation, the benefits are not easy to quantify in terms of benefits to wetland acres or stream miles. Further, performance metrics are not readily quantified, and success cannot easily be demonstrated. There is essentially no precedent for acceptance of these measures for compensatory mitigation for large projects in Alaska. Therefore, they cannot reliably be shown to be able to provide the mitigation credits necessary for the Project. |

<p>| Solid and Hazardous Waste Management | Many communities in the Y-K Region have landfills that do not meet minimum design standards. In addition, communities often have no viable and affordable options for management of hazardous materials and wastes. Both conditions pose significant risks to human health and the environment, including impacts to wetlands and streams. | Donlin Gold contacted communities about potential support for landfill improvements. In addition, Donlin Gold investigated options to facilitate backhaul of used hazardous materials and wastes to appropriate disposal facilities. For the reasons cited for community water and wastewater system improvements, these non-traditional options cannot be reliably shown to provide the mitigation credits necessary for the Project. |</p>
<table>
<thead>
<tr>
<th>Mitigation Option</th>
<th>Description</th>
<th>Rationale for Elimination</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Erosion Control Projects in the Kuskokwim River Watershed</strong></td>
<td>Natural and man-made erosion is widespread throughout the Kuskokwim River watershed. Such erosion affects hydrology and water quality as well as aquatic resources. Erosion in some areas threatens villages. USACE completed a conceptual study of potential erosion control projects in the watershed. (This assessment was not done specific to the Project, but rather involved USACE’s mission related to navigable waterways).</td>
<td>Donlin Gold considered options to support erosion control projects. However, it is difficult to provide permanent erosion control in dynamic stream systems like the Kuskokwim River. Designs can be complicated, materials availability scarce, and the projects would require ongoing maintenance to be effective. As indicated, the USACE study was conceptual and did not include specific designs, costs, and expected performance. For the reasons cited for community water and wastewater system improvements, this non-traditional option cannot reliably be shown to provide the mitigation credits necessary for the Project.</td>
</tr>
<tr>
<td><strong>All-terrain Vehicle (ATV) Trail Hardening Projects in the Y-K Region</strong></td>
<td>Environmental impacts associated with the degradation of ATV trails have become a serious concern in many locations in Alaska, including in the Y-K Region. Where ATV trails cross wetlands, alpine areas, steep slopes, and other areas with sensitive soil conditions, trails can become mucky, rutted, and eroded. Environmental problems associated with ATV trail damage include removal of vegetation, disruption and compaction of the soil surface, and alterations to site hydrology.</td>
<td>While there is a broad need in the region to protect wetlands and riparian systems from degradation due to ATV traffic, likely benefits are difficult to predict and performance cannot be readily measured. For the reasons cited for community water and wastewater system improvements, this non-traditional option cannot reliably be shown to provide the specific mitigation credits necessary for the Project.</td>
</tr>
<tr>
<td><strong>Non-native Species Plant Removal in the Crooked Creek Watershed</strong></td>
<td>Non-native species have the potential to adversely impact watershed function. Donlin Gold conducted a reconnaissance survey and found a minimum of 123.6 acres of land in the Crooked Creek watershed near the MA colonized by non-native species.</td>
<td>While valuable ecologically, it is not possible to quantify how removal of invasive species would provide restoration or enhance wetland acres or streams. As a result, potential mitigation credits cannot be determined, and performance could not be readily measured. For the reasons cited for community water and wastewater system improvements, this non-traditional option cannot reliably be shown to provide the specific mitigation credits necessary for the Project.</td>
</tr>
</tbody>
</table>
6.0 Compensatory Mitigation

Donlin Gold proposes two PRM Plans and a limited purchase of mitigation bank credits to offset the Project permanent fill impacts. They are:

1. The Upper Crooked Creek PRM Plan (Attachment D) includes the enhancement, reestablishment, restoration, rehabilitation and preservation of wetlands, riparian areas, stream channels, and uplands within 221.5 acres. The PRM Plan will restore degraded acreage in Quartz, Snow, Ruby and Queen Gulches, and at the Wash Plant Tailings Area. The PRM Plan will restore 95.7 acres of degraded floodplains into 93.0 acres of wetlands and 2.7 acres of riverine channel. A total of 8,892 liner feet of stream will be enhanced and reestablished by the work in the floodplain. Within the wetland floodplains. This PRM will be initiated concurrent with the start of MA construction.

2. The Chuitna PRM Plan (Attachment E) will preserve 5,870 acres, including 3,269 acres of wetlands and ponds, and 418 acres of streams and rivers, totaling 3,687 acres of WOUS. It also protects 2,183 acres of upland riparian area and buffers, and 258,056 linear feet (48.8 miles) of streams in the Chuitna watershed. A deed restriction and Long-Term Management Plan will be in place prior to the start of Project construction.

3. Prior to initiating Project construction, Donlin Gold will complete the purchase 9.80 wetland mitigation credits from Great Land Trust’s mitigation bank for the permanent impacts from the PA in the Program’s service area.

HGM and Cowardin classification systems were specifically used to calculate the acres of wetlands and linear feet for PRM stream restoration and preservation areas.

Summary of the Upper Crooked Creek PRM Plan

The Upper Crooked Creek PRM Plan was selected to provide compensatory mitigation for the Project from a wide range of potential PRM options identified across the Lower Kuskokwim watershed and throughout western Alaska. The PRM Plan includes the enhancement, reestablishment, restoration, rehabilitation and preservation of wetlands, riparian areas and uplands within 221.5 acres. The PRM plan will restore degraded wetlands and floodplains in Quartz, Snow, Ruby and Queen Gulches, and at the Wash Plant Tailings Area, Table 5.

Table 5 Upper Crooked Creek PRM Plan Areas Protected under the Site Protection Instrument (Acres)

<table>
<thead>
<tr>
<th>Restoration Area</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quartz Gulch</td>
<td>45.2</td>
</tr>
<tr>
<td>Snow Gulch</td>
<td>36.7</td>
</tr>
<tr>
<td>Wash Plant Tailings Area</td>
<td>29.3</td>
</tr>
<tr>
<td>Ruby and Queen Gulches</td>
<td>110.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>221.5</strong></td>
</tr>
</tbody>
</table>

The PRM Plan will restore 95.7 acres of floodplains into 93 acres of wetlands and 2.75 acres of riverine channel. A total of 8,892 liner feet of stream will be enhanced and reestablished by the restoration work in the floodplains. Within the wetland floodplains, 15.2 acres of off-channel ponds will be improved as
aquatic resource habitat. In addition, there will be 16.8 acres of adjacent upland terrestrial habitat enhanced. A total of 109 acres of riparian upland and wetland buffers will be preserved around the restored and enhanced wetlands and stream channels. The riparian upland and wetland buffers are designed to maintain the long-term viability of the proposed restoration. This plan will be initiated concurrent with the start of MA construction. Table 6 summarizes the Upper Crooked Creek PRM Plan.

Table 6  Acreage and Linear Feet of Resources Re-established, Enhanced, and Protected by the Upper Crooked Creek PRM

<table>
<thead>
<tr>
<th></th>
<th>Quartz Gulch</th>
<th>Snow Gulch</th>
<th>Wash Plant Tailings Area</th>
<th>Ruby and Queen Gulches</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-establishment of Stream Channel to Pre-mining Conditions (Linear Feet)</td>
<td>1,630</td>
<td>4,421</td>
<td>N/A</td>
<td>2,931</td>
<td>8,982</td>
</tr>
<tr>
<td>Re-establishment of Floodplain Habitat (Acres)</td>
<td>13.1</td>
<td>21.9</td>
<td>11.4</td>
<td>49.3</td>
<td>95.7</td>
</tr>
<tr>
<td>Enhancement of Off-channel Pond Habitat (Acres)*</td>
<td>N/A</td>
<td>2.7*</td>
<td>0.5*</td>
<td>12.0*</td>
<td>15.2*</td>
</tr>
<tr>
<td>Enhancement of Terrestrial Habitat (Acres)</td>
<td>2.5</td>
<td>3.4</td>
<td>2.4</td>
<td>8.5</td>
<td>16.8</td>
</tr>
<tr>
<td>Protection of Buffer Areas (Acres)</td>
<td>29.5</td>
<td>11.4</td>
<td>15.6</td>
<td>52.5</td>
<td>109.0</td>
</tr>
<tr>
<td><strong>Total Protected under Site Protection Instrument (Acres)</strong></td>
<td><strong>45.2</strong></td>
<td><strong>36.7</strong></td>
<td><strong>29.3</strong></td>
<td><strong>110.3</strong></td>
<td><strong>221.5</strong></td>
</tr>
</tbody>
</table>

* Acreage of enhanced off-channel pond habitat is included within the re-established floodplain habitat.
N/A: Not Applicable.
Note: Inconsistencies in sums are due to rounding.

Mitigation credits can include both wetlands and buffers. “District engineers may require the restoration, establishment, enhancement, and preservation, as well as the maintenance, of riparian areas and/or buffers around aquatic resources where necessary to ensure the long-term viability of those resources. Buffers may also provide habitat or corridors necessary for the ecological functioning of aquatic resources. If buffers are required by the district engineer as part of the compensatory mitigation project, compensatory mitigation credit will be provided for those buffers.” [33 CFR 332.3(h)(2)(i)].

As shown in (Table 7), The Upper Crooked Creek PRM was divided by wetland HGM types using Cowardin Classifications for both the restoration and preservation areas. The wetlands restored will be riverine. The wetlands within the preservation buffer areas include depressional, flat, riverine anadromous, and slope wetlands.
Table 7 Compensatory Mitigation Proposed for Upper Crooked Creek by HGM Class and Cowardin Group (Acres)

<table>
<thead>
<tr>
<th>Classification</th>
<th>Upper Crooked Creek Restoration</th>
<th>Upper Crooked Creek Preservation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wetland HGM (Cowardin Classes)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depressional</td>
<td>0</td>
<td>1.6</td>
</tr>
<tr>
<td>Estuarine Fringe (E2EM, E2US)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Flat (PEM, PFO, PSS)</td>
<td>0</td>
<td>32.7</td>
</tr>
<tr>
<td>Riverine Non-Anadromous</td>
<td>93.0</td>
<td>0</td>
</tr>
<tr>
<td>Riverine Anadromous</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>Slope (PEM, PFO, PSS)</td>
<td>0</td>
<td>11.6</td>
</tr>
<tr>
<td>Totals</td>
<td>Wetlands and Ponds</td>
<td>93.0</td>
</tr>
<tr>
<td></td>
<td>Stream and River Area</td>
<td>2.75</td>
</tr>
<tr>
<td></td>
<td>Upland Riparian and Buffers</td>
<td>16.8</td>
</tr>
<tr>
<td></td>
<td>Sub-Totals</td>
<td>112.5</td>
</tr>
<tr>
<td></td>
<td>Total Area</td>
<td>221.5</td>
</tr>
</tbody>
</table>

Summary of the Chuitna PRM Plan

The Preservation Area in the Chuitna PRM Plan (Attachment E) will preserve 5,870 acres, including 3,269 acres of wetlands and ponds, and 418 acres of streams and rivers, totaling 3,687 acres of WOUS. It also protects 2,183 acres of upland riparian area and buffers, and 258,056 linear feet (48.8 miles) of streams in the Chuitna watershed. The wetland systems within the Preservation Area include large areas of slope HGM wetlands including ericaceous shrub bog-string bog wetlands, riverine HGM riparian wetlands adjacent to anadromous streams, estuarine fringe HGM wetlands, and a small number of depressional HGM wetlands. Ericaceous shrub bog-string bog wetlands, a type of slope HGM wetlands, are a unique wetland type to the area, and only occur in a few very specific places worldwide.

Table 8 Preservation Area Resource Types (Acres)

<table>
<thead>
<tr>
<th>Resource Type</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wetlands and Ponds</td>
<td>3,269</td>
</tr>
<tr>
<td>Stream and River Area</td>
<td>418</td>
</tr>
<tr>
<td>Upland Riparian and Buffers</td>
<td>2,183</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5,870</strong></td>
</tr>
</tbody>
</table>

Source: Field Verified Mapping, Michael Baker 2017

Uplands and wetlands in the Preservation Area surrounding the Chuitna River and its tributary, Lone Creek, were selected to maximize the protection of wetlands, floodplains, anadromous streams, and riparian areas using a watershed approach. The Chuitna River floodplain includes back water sloughs,
ponds, minor channels, riverine wetlands, and scrub and forested uplands in the bends of the river. The preservation boundaries on the mainstem of the Chuitna River were selected to maximize full protection of the floodplain flow channels, which support the anadromous stream system. This protection provides a diversity of habitat, vegetation types, and terrestrial and aquatic resources within uplands and wetlands while protecting anadromous waters.

The boundaries around Lone Creek were established to maximize the amount of unique ericaceous shrub bog string bog wetlands. This created a large contiguous undeveloped parcel of the stream and its tributaries and wetlands interspersed with uplands. This unfragmented parcel in the lower Lone Creek watershed protects the wetlands, baseflow, streams, and anadromous fisheries of both Lone Creek and the Chuitna River from development.

Table 9 shows a comparison of the Preservation Area HGM wetlands preserved and MA/TA wetlands permanently filled.

<table>
<thead>
<tr>
<th>HGM Class</th>
<th>Preservation Area Preserved Acres</th>
<th>MA/TA1 Permanent Fill Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depressional</td>
<td>79</td>
<td>3</td>
</tr>
<tr>
<td>Estuarine Fringe</td>
<td>29</td>
<td>0</td>
</tr>
<tr>
<td>Flat</td>
<td>0</td>
<td>1,623</td>
</tr>
<tr>
<td>Riverine</td>
<td>500</td>
<td>160</td>
</tr>
<tr>
<td>Slope</td>
<td>2,661</td>
<td>888</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,269</strong></td>
<td><strong>2,676</strong></td>
</tr>
</tbody>
</table>

*Inconsistencies are due to rounding.
Notes: 1DA (Donlin Gold 2017)

Compared to the MA/TA’s low-flow streams and small associated floodplains, the Preservation Area preserves over four times the riverine HGM floodplains; these floodplains help support the salmon fisheries of the Chuitna River. Also associated with the wetland floodplains are 2,183 acres of adjacent riparian uplands included in the Preservation Area.

The streams and rivers in the Preservation Area provide habitat for Chinook, coho, chum, and pink salmon, as well as limited habitat for sockeye salmon, Dolly Varden, and rainbow trout. The mainstem of the Chuitna River includes Chinook, coho, chum, and pink salmon spawning habitat, and rearing habitat for all five Pacific salmon species. Tributaries to the Chuitna River that fall within the Preservation Area also have documented use by all five Pacific salmon species. The Chuitna River and Lone Creek, both anadromous streams, have 424 acres of associated riverine HGM floodplains as shown in (Table 10) while the MA and TA have 7.8 acres. Only 76 acres of riverine HGM wetlands in the Preservation Area are not associated with anadromous streams compared to 152.2 acres in the MA and TA.
Table 10  
**Riverine HGM Class Wetlands Comparison: Preservation Area and MA/TA (Acres)**

<table>
<thead>
<tr>
<th>HGM Class</th>
<th>Preservation Area¹</th>
<th>MA/TA Permanent Fill Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riverine, Anadromous</td>
<td>424</td>
<td>7.8</td>
</tr>
<tr>
<td>Riverine, Non-Anadromous</td>
<td>76</td>
<td>152.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>500</strong></td>
<td><strong>160</strong></td>
</tr>
</tbody>
</table>

¹Inconsistencies are due to rounding.  
Source: See Attachment E

Table 11 summarizes the anadromous stream habitat preserved in the Chuitna River drainage and permanently filled in the Crooked Creek drainage.

Table 11  
**Summary of Anadromous Stream Habitat: Chuitna River Drainage Preserved and Crooked Creek Drainage Permanent Fill (Linear Feet)**

<table>
<thead>
<tr>
<th>Species</th>
<th>Spawning Habitat Preserved Linear Feet (miles)</th>
<th>Rearing Habitat Preserved Linear Feet (miles)</th>
<th>Total Anadromous Habitat Linear Feet (miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chuitna River Drainage</td>
<td>Crooked Creek Drainage</td>
<td></td>
</tr>
<tr>
<td>Chinook</td>
<td>77,616 (14.7)</td>
<td>133,214 (25.23)</td>
<td>133,214 (25.23)</td>
</tr>
<tr>
<td>Sockeye</td>
<td>0</td>
<td>101,006 (19.13)</td>
<td>133,214 (25.23)</td>
</tr>
<tr>
<td>Coho</td>
<td>70,541 (13.36)</td>
<td>148,632 (28.15)</td>
<td>148,632 (28.15)</td>
</tr>
<tr>
<td>Chum</td>
<td>44,088 (8.35)</td>
<td>12,514 (2.37)</td>
<td>131,789 (24.96)</td>
</tr>
<tr>
<td>Pink</td>
<td>106,128 (20.1)</td>
<td>13,253 (2.51)</td>
<td>133,214 (25.23)</td>
</tr>
<tr>
<td></td>
<td>Crooked Creek Drainage</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Inconsistencies are due to rounding.  
Source: See Attachment E

On October 22, 2008, the NMFS listed the Distinct Population Segment of Beluga whale found in Cook Inlet as endangered under the Endangered Species Act of 1973, as amended (ESA). On April 11, 2011, NMFS designated critical habitat for the Cook Inlet Beluga whale under the ESA. Two areas were designated as critical habitat; both comprising 3,016 square miles of marine and estuarine environments considered essential for the whales' survival and recovery. The Preservation Area includes approximately 29 acres of estuarine fringe HGM wetlands at the mouth of the Chuitna River that overlap with critical habitat for Cook Inlet Beluga whales.

**Summary of Proposed PRM Plans**
Table 12 provides a summary of the linear feet of permanent stream loss from the Project compared to linear feet restored and preserved by the PRM Plans. With these PRM Plans, the overall linear feet of stream restored and preserved exceeds Project losses; there is a net gain of 93,085 linear feet (17.6 miles) of streams. The Project impacts predominantly non-anadromous streams in the MA and replaces this loss with restoration and preservation of anadromous stream. There is specifically a net gain of 194,074 linear feet (36.8 miles) of anadromous stream gains. Polylines were used to calculate the stream lengths. During the digital mapping process, all visible wetland, waters, and vegetation boundaries are delineated as polygons (mapped as an area) and classified as uplands, wetlands, ponds,
or streams. All streams are delineated as polylines (mapped as a linear feature). Stream impacts and credits have been calculated from the polylines in linear feet.

**Table 12 Permanent Fill in Streams Compared to Restored and Preserved Stream Lengths, by Linear Feet (Miles)**

<table>
<thead>
<tr>
<th>HGM Class Stream Channel</th>
<th>MA and TA Permanent Fill in Streams</th>
<th>Upper Crooked Creek PRM Restored</th>
<th>Chuitna PRM Preserved</th>
<th>Total Restored and Preserved</th>
<th>Net</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anadromous Intermittent</td>
<td>0</td>
<td>0</td>
<td>161 (0.0)</td>
<td>161 (0.0)</td>
<td>gain</td>
</tr>
<tr>
<td>Perennial</td>
<td>-2,218 (0.4)</td>
<td>0</td>
<td>196,131 (37.1)</td>
<td>196,131 (37.1)</td>
<td>193,913 (36.7) gain</td>
</tr>
<tr>
<td>Total Anadromous</td>
<td>-2,218 (0.4)</td>
<td>0</td>
<td>196,292 (37.2)</td>
<td>196,292 (37.1)</td>
<td>194,074 (36.8) gain</td>
</tr>
<tr>
<td>Non-Anadromous Intermittent</td>
<td>-38,675 (7.3)</td>
<td>0</td>
<td>6,615 (1.3)</td>
<td>6,615</td>
<td>loss</td>
</tr>
<tr>
<td>Perennial</td>
<td>-133,060 (25.2)</td>
<td>8,982 (1.7)</td>
<td>55,149 (10.4)</td>
<td>64,131</td>
<td>68,929 (13.1) loss</td>
</tr>
<tr>
<td>Total Non-Anadromous</td>
<td>-171,735 (32.9)</td>
<td>8,982 (1.7)</td>
<td>61,764 (11.7)</td>
<td>70,746</td>
<td>100,989 (19.1) loss</td>
</tr>
<tr>
<td>Total</td>
<td>-173,953 (32.9)</td>
<td>8,982 (1.7)</td>
<td>258,056 (48.8)</td>
<td>267,038</td>
<td>93,085 (17.6) gain</td>
</tr>
</tbody>
</table>

*Inconsistencies are due to rounding.

1 In Upper Crook Creek: Anadromous fish use is expected in the restoration areas. However, the exact stream lengths that will provide for anadromous fish habitat cannot be accurately predicted. Post-restoration monitoring will verify presence or absence of anadromous and resident fish.

Table 13 shows wetland HGM classes and the Cowardin groups comparing permanent Project wetland losses to the gains from the two PRM Plans. Wetland and pond polygons from the mapping were used to calculate wetland and pond acres, while upland riparian buffers and stream polygons were mapped, and acres calculated separately. There are no upland riparian buffers or stream acreages included within Table 13. Table 13 is comparing wetlands and ponds. The major gains from the PRM Plans are in slope (1,737.6 acres) and riverine anadromous wetlands (434.9 acres). There is a loss of flat wetlands (1,742.3 acres). There is a net gain of 550 acres of all wetland classifications from the implementation of the PRM Plans.
### Table 13  Compensatory Mitigation Proposed by PRM Plan for Wetlands by HGM Class and Cowardin Group (Acres)

<table>
<thead>
<tr>
<th>Classification</th>
<th>Chuitna Preservation Area</th>
<th>Upper Crooked Creek Restoration</th>
<th>Upper Crooked Creek Preservation</th>
<th>MA/PA loss</th>
<th>Net Loss or Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wetland HGM (Cowardin Classes)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depressional (PAB, PEM, PFO, PSS, PUB)</td>
<td>79</td>
<td>0</td>
<td>1.6</td>
<td>3</td>
<td><strong>77.6 (gain)</strong></td>
</tr>
<tr>
<td>Estuarine Fringe (E2EM, E2US)</td>
<td>29</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td><strong>29 (gain)</strong></td>
</tr>
<tr>
<td>Flat (PEM, PFO, PSS)</td>
<td>0</td>
<td>0</td>
<td>32.7</td>
<td>1,775</td>
<td><strong>1,742.3 (loss)</strong></td>
</tr>
<tr>
<td>Riverine Non-Anadromous (PEM, PFO, PSS, PUB)</td>
<td>76</td>
<td>93.0</td>
<td>0</td>
<td>156</td>
<td><strong>13 (gain)</strong></td>
</tr>
<tr>
<td>Riverine Anadromous (PEM, PFO, PSS, PUB)</td>
<td>424</td>
<td>0</td>
<td>17.91</td>
<td>7</td>
<td><strong>434.9 (gain)</strong></td>
</tr>
<tr>
<td>Slope (PEM, PFO, PSS)</td>
<td>2,661</td>
<td>0</td>
<td>11.6</td>
<td>935</td>
<td><strong>1,737.6 (gain)</strong></td>
</tr>
<tr>
<td>Totals Wetlands and Ponds</td>
<td>3,269</td>
<td>93.0</td>
<td>63.8</td>
<td>2,876</td>
<td><strong>550.75 (gain)</strong></td>
</tr>
</tbody>
</table>

1 Riverine wetlands are adjacent to Crooked Creek.

* Inconsistencies are due to rounding.
7.0 Crooked Creek Watershed Analysis

Introduction

Regulations addressing wetland mitigation [33 CFR 332.3(c) and 40 CFR 230.93(c)] direct the district engineer to use a watershed approach to establish compensatory mitigation requirements. The goal of using a watershed approach is to maintain and improve the quality and quantity of aquatic resources within watersheds through strategic selection of compensatory mitigation sites. Most of the permanent fill to wetlands and streams from the Project will occur in the Crooked Creek watershed. Since a watershed plan has not been developed for Crooked Creek, Donlin Gold prepared this watershed analysis to provide additional information to the district engineer. The analysis includes descriptions of watershed characteristics, a summary of potential impacts to aquatic resources, and opportunities for mitigation.

Watershed Overview

The Crooked Creek HUC-10 watershed (Figure 7) is located within the Kuskokwim River basin in southwest Alaska and covers an area of 215,067 acres (approximately 0.67 percent of the Kuskokwim River watershed). The watershed is situated in a zone of discontinuous permafrost in the southwest portion of the Kuskokwim Mountains region (Pewe 1975). Crooked Creek, a tributary of the Kuskokwim River, is the largest stream in the watershed. As the name indicates, it is a sinuous stream, with a relatively low gradient, and channel widths ranging from approximately 50 feet in the upper reaches to 340 feet at its confluence with the Kuskokwim River.

The Crooked Creek watershed is predominantly undeveloped and includes large expanses of wetlands and streams that provide habitat for fish and wildlife. Historical placer mines, hard rock mining exploration areas, and the village of Crooked Creek are the only anthropogenic ground disturbing activities currently in the watershed. The village of Crooked Creek, located at the mouth of Crooked Creek along the north bank of the Kuskokwim River, is the only established community within the watershed.

Landcover

The Crooked Creek watershed landcover includes a mosaic of vegetated areas with a few barren locations, including disturbed areas. Landcover classification for the Crooked Creek watershed was derived from Landsat 7 ETM+ satellite imagery (2001-2002) and classified using the Alaska Vegetation Classification (Viereck et al. 1992) (Figure 8). The dominant vegetation is typical of Interior Alaska and includes needleleaf woodland and needleleaf forest, mixed wood forest, low shrub, and broadleaf forest/tall shrub. Table 14 provides a list and percentages of each landcover type found in the Crooked Creek watershed. At present, 3,579 acres (1.66 percent) of the Crooked Creek watershed are classified as barren. This includes approximately 164 acres (or 0.08 percent of the watershed) of anthropogenic ground disturbance that has resulted from historical placer mining, mine exploration activities, and the village of Crooked Creek.
Figure 7  Crooked Creek Watershed (HUC-10)
Figure 8  Crooked Creek Watershed (HUC-10) Vegetation Map
**Land Ownership**

The Crooked Creek land ownership in the watershed includes Federal and State public lands (58.8 percent), Alaska Native corporation lands (41.1 percent) (see Table 15 and Figure 9), and a small percentage of other private lands (0.1 percent). Alaska Native corporation lands are privately owned by TKC and Calista. TKC is the largest surface land owner in the watershed. Both Alaska Native corporations have the desire to realize economic benefits from their lands for their shareholders and other ANCSA corporations through responsible development. There are no established administrative boundaries within the watershed that would protect lands or wetlands from potential future development.

**Table 14**  
Vegetation Type within Crooked Creek (HUC-10) Watershed (Percentage)

<table>
<thead>
<tr>
<th>Vegetation Type</th>
<th>Watershed Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needleleaf Woodland</td>
<td>30.02</td>
</tr>
<tr>
<td>Needleleaf Forest</td>
<td>23.59</td>
</tr>
<tr>
<td>Mixedwood Forest</td>
<td>11.56</td>
</tr>
<tr>
<td>Low Shrub</td>
<td>6.64</td>
</tr>
<tr>
<td>Broadleaf Forest/Tall Shrub</td>
<td>5.27</td>
</tr>
<tr>
<td>Dwarf Shrub Lichen</td>
<td>4.63</td>
</tr>
<tr>
<td>Broadleaf Forest</td>
<td>4.33</td>
</tr>
<tr>
<td>Wetland – Woodland Complex</td>
<td>3.86</td>
</tr>
<tr>
<td>Shrub Mixed</td>
<td>1.76</td>
</tr>
<tr>
<td>Barren</td>
<td>1.66</td>
</tr>
<tr>
<td>Wetland</td>
<td>1.57</td>
</tr>
<tr>
<td>Tall Shrub</td>
<td>1.18</td>
</tr>
<tr>
<td>Wetland/Shadow</td>
<td>0.94</td>
</tr>
<tr>
<td>Sparse Vegetation</td>
<td>0.81</td>
</tr>
<tr>
<td>Burn</td>
<td>0.63</td>
</tr>
<tr>
<td>Dwarf Shrub Open</td>
<td>0.61</td>
</tr>
<tr>
<td>Snow</td>
<td>0.24</td>
</tr>
<tr>
<td>Cloud</td>
<td>0.20</td>
</tr>
<tr>
<td>Herbaceous</td>
<td>0.18</td>
</tr>
<tr>
<td>No Data</td>
<td>0.16</td>
</tr>
<tr>
<td>Water/Shadow</td>
<td>0.12</td>
</tr>
<tr>
<td>Shallow Water</td>
<td>0.03</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>99.99</strong></td>
</tr>
</tbody>
</table>

**Table 15**  
Land Ownership Status within the Crooked Creek (HUC-10) Watershed

<table>
<thead>
<tr>
<th>Ownership Status</th>
<th>Area (Acres)</th>
<th>Percent of Land</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal Land (BLM Managed)</td>
<td>68,421.9</td>
<td>31.8</td>
</tr>
<tr>
<td>State-owned.</td>
<td>58,071.9</td>
<td>27.0</td>
</tr>
<tr>
<td>Tentatively Approved or Patented Land</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Kuskokwim Corp Patented Lands (Surface)</td>
<td>70,511.2</td>
<td>32.8</td>
</tr>
<tr>
<td>and Calista Corp Patented Lands (Subsurface)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calista 14(h)(8) Patented (Surface and Subsurface)</td>
<td>17,814.0</td>
<td>8.3</td>
</tr>
<tr>
<td>Other Private Land</td>
<td>248.6</td>
<td>0.1</td>
</tr>
</tbody>
</table>
Figure 9  Crooked Creek Watershed (HUC-10) Land Status Map
Wetlands

Wetlands data for the entire Crooked Creek watershed are provided by the USFWS National Wetlands Inventory (NWI) (USFWS 2018). A comparison of the areas mapped in detail for Donlin Gold using the USACE delineation approach with the NWI assessment indicates that the NWI likely overstates the extent of wetland area, but the NWI still provides a useful estimation of total wetland acres in the watershed. The NWI data indicate that wetlands occupy 45.8 percent (98,508 acres) of the Crooked Creek watershed. The dominant wetland type is freshwater forested/shrub wetlands which accounts for 99.2 percent. Freshwater pond and lake habitat are the least abundant wetland types in the watershed (less than 1 percent). A breakdown of the NWI wetland types observed in the Crooked Creek watershed is provided in Table 16.

<table>
<thead>
<tr>
<th>NWI Wetland Type</th>
<th>Area (Acres)</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshwater Emergent Wetland</td>
<td>733</td>
<td>0.7</td>
</tr>
<tr>
<td>Freshwater Forested/Shrub Wetland</td>
<td>97,745</td>
<td>9.9</td>
</tr>
<tr>
<td>Freshwater Pond</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Lake</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>98,508</strong></td>
<td><strong>99.9</strong></td>
</tr>
</tbody>
</table>

Source: USFWS 2018

Fish

Fish studies were conducted across the Crooked Creek drainage between 1996 and 2014 (OtterTail 2014a). In 2004, a comprehensive aquatic biomonitoring program was initiated as part of the Project which included general fish sampling (electrofishers and minnow traps), aerial salmon spawning surveys, fish tissue metals sampling and analysis, periphyton sampling, and aquatic macroinvertebrate sampling. In 2008, a resistance-board fish weir was constructed and installed near the mouth of Crooked Creek to better estimate salmon escapement. An intensive stream habitat survey was conducted in 2009 to document the aquatic habitat throughout the Crooked Creek mainstem. Although these studies have focused on the Project, they provide relevant information to the overall watershed.

Fish species identified within the Crooked Creek watershed are presented in Table 17 by HUC-12 where data are available. A fish distribution map for the Crooked Creek watershed is provided as Figure 10. Fish population assessments within the Crooked Creek drainage show that the system supports spawning populations of Chinook, chum, and coho salmon. Since 2008, when the fish weir was constructed, limited numbers of sockeye salmon and pink salmon have also been documented. Neither Chinook salmon nor chum salmon have been documented in tributaries to Crooked Creek, except for the larger Donlin Creek and Getmuna Creek drainages. In contrast, limited numbers of coho salmon have been reported in a number of tributaries. Aerial adult salmon surveys determined that the watershed includes a total of 464,136 linear feet of salmon spawning reaches (Table 18). The longest salmon spawning stream reach in the watershed is Crooked Creek, but Getmuna Creek, Bell Creek, and Crooked Creek downstream from Getmuna Creek support the majority of overall documented salmon spawning.
Figure 10  Crooked Creek Watershed (HUC-10) Fisheries Data
Other resident fish species are Dolly Varden, Arctic grayling, round whitefish, slimy sculpin, burbot, humpback whitefish, longnose sucker, northern pike, Alaska blackfish, Alaskan brook lamprey, and nine-spine stickleback.

**Table 17**  **Fish Species Identified within the Crooked Creek Watershed (2004-2014)**

<table>
<thead>
<tr>
<th>Fish Species Family</th>
<th>Species</th>
<th>Common Name</th>
<th>Bell Creek</th>
<th>Donlin Creek</th>
<th>Flat Creek</th>
<th>Grouse Creek*</th>
<th>Getmuna Creek</th>
<th>Crooked Creek</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Salmonidae</strong></td>
<td>Oncorhynchus tsawytscha</td>
<td>Chinook salmon</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Oncorhynchus keta</td>
<td></td>
<td>Chum salmon</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Oncorhynchus kisutch</td>
<td></td>
<td>Coho salmon</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Oncorhynchus gorbuscha</td>
<td></td>
<td>Pink salmon</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Oncorhynchus nerka</td>
<td></td>
<td>Sockeye salmon</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Oncorhynchus mykiss</td>
<td></td>
<td>Rainbow trout</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Salvelinus malma</td>
<td></td>
<td>Dolly Varden char</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
| Thymallus arcticus |      | Arctic grayling | X | X | X | X | X | X | X 
| Prosopium cylindraceum |           | Round whitefish | X | X | X | X | X | X | X | X |
| Coregonus pidschian |      | Humpback whitefish | X | X | X | X | X | X | X | X |
| **Catostomidae**    | Catostomus catostomus  | Longnose sucker | X | X | X | X | X | X | X | X | X |
| **Cottidae**        | Cottus cognatus  | Slimy sculpin | X | X | X | X | X | X | X | X | X |
| **Esocidae**        | Esox Lucius | Northern pike | X | X | X | X | X | X | X | X | X |
| **Umbridae**        | Dallia pectoralis | Alaska blackfish | X | X | X | X | X | X | X | X | X |
| **Petromyzontidae** | Lampetra alaskensis | Alaskan brook lamprey | X | X | X | X | X | X | X | X | X |
| **Gadidae**         | Lota lota | Burbot | X | X | X | X | X | X | X | X | X |
| **Gasterosteidae**  | Pungitius pungitius | Nine-spine stickleback | X | X | X | X | X | X | X | X | X |

*The majority of MA facilities are located in the Grouse Creek HUC.

**Table 18**  **Adult Salmon Stream Reaches**

<table>
<thead>
<tr>
<th>Stream</th>
<th>Adult Salmon Reach (Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bell Creek</td>
<td>89,710</td>
</tr>
<tr>
<td>Crooked Creek</td>
<td>175,070</td>
</tr>
<tr>
<td>Donlin Creek</td>
<td>78,108</td>
</tr>
<tr>
<td>Flat Creek</td>
<td>449</td>
</tr>
<tr>
<td>Getmuna Creek</td>
<td>118,282</td>
</tr>
<tr>
<td>Grouse Creek*</td>
<td>2,380</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>464,136</strong></td>
</tr>
</tbody>
</table>

*The majority of MA facilities are located in the Grouse Creek HUC.
**Channel Habitat Classification**

A classification of in-stream habitat for the entire Crooked Creek watershed is necessary to quantify the amount of fish habitat in the watershed. Donlin Gold completed a detailed in-stream habitat field survey in 2009 to document aquatic habitat, but the study was limited to the Crooked Creek mainstem (OtterTail 2015). Extending this field survey to the remaining areas of the watershed is not practical. Instead a separate rapid channel habitat classification model was completed as a desktop study to establish channel habitats suitable for fish in the Crooked Creek watershed.

**Watershed Channel Habitat Classification Model**

A rapid channel habitat classification model for the entire watershed was created using available data sources, and best professional judgement. The model used streamflow data, elevation data, and existing fish presence data to classify channel habitat for 1:63360 scale streams. Average streamflow for the month of July generally represents the lowest summer water elevation and is a good indicator for availability of aquatic habitat; elevation data were used as a surrogate for gradient, which typically affects fish passage; and fish presence data were used to determine the streamflow and elevation parameters where fish presence was not detected.

The rapid channel habitat classification model employed the following data inputs:

- **Streamflow** – Streamflow conditions in the watershed were characterized by estimating average July discharge at 375 locations. Locations were selected by taking the stream network and defining nodes where stream segments intersect. For each location, the upstream watershed area was calculated using an iterative ArcGIS script. The nodes have an average watershed area of 27 square miles (sq. mi.), with a range between 0.4 and 331 sq. mi. An average July runoff depth was then applied to estimate average July streamflow for each of the nodes. The average July runoff depth was estimated using the deterministic water balance model (WBM) developed by BGC (2011) for the Project mine site. This model is calibrated to site conditions based on regional climate data for the period 1940-2010. For this 71-year period, the average July runoff is 1.50 inches in the American Creek watershed. Streamflow data are also available near the mouth of Crooked Creek at a gaging station maintained by the U.S. Geological Survey (USGS). This station, identified as Crooked Creek near Crooked Creek, Alaska (#15304010), has been in operation since July 1, 2007. For the available period of record, the average July discharge is 432 cubic feet per second (cfs). Based on a watershed area of 330 sq. mi., this equates to a runoff depth of 1.53 inches, which is essentially identical to the American Creek estimate from the WBM.

- **Elevation** – The USGS National Elevation Dataset was used to determine elevation ranges for each stream within the watershed.

- **Fish Presence Data** – Fish presence was obtained from the aquatic biomonitoring program 2004-2014 and included fish presence data at 29 aquatic monitoring sites; aerial adult salmon survey data for the entire watershed; and individual upper reach fish presence determinations for American and Anaconda creeks, and Snow Gulch.
Using geographic information system spatial analysis techniques, the streamflow, elevation, and fish presence datasets were intersected, to create a stream database containing data from all inputs. The resulting stream dataset was then segregated into fish habitat suitability categories, in accordance with the parameters presented in Table 19. These parameters were determined as follows: streamflow values were segregated based on the Jenks natural breaks clustering method, and elevation limits were defined using a correlation of fish presence and elevation. Finally, the stream habitat classification was then adjusted where necessary to match known fish presence or absence in streams. For example, the model predicted that the upper reaches of Getmuna Creek were non-fish bearing, due to the elevation being greater than 250 meters and low streamflow, however, Getmuna Creek headwaters include unique high altitude deep water ponds where Dolly Varden presence is known.

The fish habitat suitability categories are:

- None – No fish habitat is predicted.
- Possible – Fish presence may be possible.
- Known or likely – Fish presence is known based on field survey data, or it is likely to include fish.

### Table 19 Crooked Creek Watershed Stream Fish Habitat Suitability Determination

<table>
<thead>
<tr>
<th>Stream Flow (cfs)</th>
<th>0.48 — 5</th>
<th>5—100</th>
<th>&gt;100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevation Above Mean Sea Level (m)</td>
<td>&gt;41.6</td>
<td>41.6 - 200</td>
<td>200 - 250</td>
</tr>
<tr>
<td>Fish Habitat Suitability</td>
<td>None</td>
<td>Known or Likely</td>
<td>Possible</td>
</tr>
</tbody>
</table>

Source: Rapid Channel Habitat Classification Model

### Watershed Channel Habitat Classification

Results of the Crooked Creek watershed channel habitat modeling indicate 2,896,225 linear feet of streams. A total of 1,310,152 linear feet of streams are known to have fish or are expected to include fish, while 298,469 linear feet of streams could possibly have fish, and 1,358,327 linear feet of streams are not expected to have fish (Table 20). Primary fish species expected to use habitats within the known, likely, and possible categories can be predicted by stream reach relative location, either within the immediate historical floodplain of Crooked and Donlin Creeks, or those habitats upstream from the floodplain. Floodplain stream reaches are most likely to provide rearing habitat for juvenile coho salmon and some resident fish species such as slimy sculpin, Dolly Varden and Arctic grayling. Stream reaches upstream from the floodplain areas are most likely to provide habitat for Dolly Varden and slimy sculpin. The total length of streams identified in the analysis is less than those identified by the PJD (Michael Baker 2016) for similar areas. This is due to differences in the mapping scale. This would affect the smaller tributary streams in upper drainages that typically do not provide fish habitat. Thus, the total length of streams reported in the model should be considered underreported.

Figure 11 shows the results of the stream habitat model predictions.
Figure 11  
Crooked Creek Watershed (HUC-10) Stream Habitat Model Results
**Compensatory Mitigation Plan**

**Donlin Gold, LLC**

**Application for DA Permit POA-1995-120**

**July 2018**

### Table 20  
**Crooked Creek Watershed Channel Habitats**

<table>
<thead>
<tr>
<th>Fish Habitat</th>
<th>Linear Feet</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>1,307,605</td>
<td>45</td>
</tr>
<tr>
<td>Possible</td>
<td>278,469</td>
<td>10</td>
</tr>
<tr>
<td>Known or Likely</td>
<td>1,310,152</td>
<td>45</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,896,225</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Source: Rapid Channel Habitat Classification Model

### Aquatic Habitat Mapping

An aquatic habitat mapping study was conducted in 2009 along a 33-mile Crooked Creek mainstem reach from the confluence of Flat and Donlin creeks to the confluence with the Kuskokwim River (OtterTail 2012). The study mapped base flow habitat conditions and adult salmon spawning locations, and areas of fish rearing habitat were identified. A total of 840 habitat mapping units (HMUs) were mapped (Table 21).

### Table 21  
**Crooked Creek Watershed Habitat Mapping Summary, Wetted Surface Area (m²)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Run</th>
<th>Fast Run</th>
<th>Riffle</th>
<th>Pool</th>
<th>Glide</th>
<th>Backwater</th>
<th>Side Arm</th>
<th>Abandoned Channel</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of HMU</td>
<td>325</td>
<td>5</td>
<td>206</td>
<td>118</td>
<td>16</td>
<td>83</td>
<td>39</td>
<td>48</td>
<td>840</td>
</tr>
<tr>
<td>Percent of Total Wetted Surface Area</td>
<td>61.4</td>
<td>0.4</td>
<td>12.2</td>
<td>7.6</td>
<td>4.7</td>
<td>4.6</td>
<td>3</td>
<td>6.1</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>568,638</strong></td>
<td><strong>3,793</strong></td>
<td><strong>112,729</strong></td>
<td><strong>70,587</strong></td>
<td><strong>43,433</strong></td>
<td><strong>42,553</strong></td>
<td><strong>27,375</strong></td>
<td><strong>56,587</strong></td>
<td><strong>925,696</strong></td>
</tr>
</tbody>
</table>

Source: OtterTail 2012

Run habitat was the most abundant habitat type, riffle habitat was the second most numerous, and pool habitat was limited. Other documented habitat types were fast run, glide, backwater, side arm, and abandoned channels. Run habitat comprised 61.4 percent of the total wetted surface area and 325 of the 840 HMU types were mapped as runs.

Riffle habitat comprised 12.2 percent of the total wetted surface area and 206 of the 840 HMU types were mapped as riffles. Many of the riffle habitats were shorter than other HMU types and were often found to quickly transition into run or pool habitat. Abundant shallow margins with little flow made up 30.2 percent of all riffle habitat samples. While fish sampling was not part of this habitat mapping study, an abundance of juvenile fish was typically observed during the surveying of riffle margin areas. In addition, numerous juvenile salmonids from fish studies have been documented in these Crooked Creek riffle margin habitats.

Pool habitat made up 7.6 percent of the total wetted surface area and 118 of the 840 HMU types were mapped as pool habitat. Based on the habitat type criteria, much of what would also likely be considered run habitat at a higher flow rate was identified as pool habitat (OtterTail 2014). Substrates in the pool habitats were primarily sand and small cobble. Over 20 percent of all pools sampled contained abundant amounts of woody debris and/or shallow margins, which are considered prime habitat for juvenile salmon rearing. Juvenile coho salmon, in particular, almost entirely stay in pool habitat and avoid riffle areas (Morrow 1980) or areas with higher velocities.
Glide and fast run habitat were not very common due to the sinuous, meandering sections within the Crooked Creek mainstem, which are not suitable conditions for glide and fast run habitat. Observations of fast runs only occurred in the lower part of Crooked Creek where the stream is larger.

Backwaters, side arms, and abandoned channels were the most dynamic of the habitat types that were mapped during the survey. Backwater habitat made up 4.6 percent of the total wetted surface area and 83 of the 840 HMU types were mapped as backwater habitat. Much of the backwater habitat appeared nearly disconnected from the mainstem at the sampled low flows. Juvenile fish were captured in these backwater habitats during sampling, and well documented literature supports that rearing coho salmon prefer these areas of slower water that provide cover (Narver 1978, McMahon 1983, Raleigh et al. 1986, Morrow 1980, ADF&G 1986).

Side arm habitat was rare and made up approximately 3 percent of the total wetted surface area and 39 of the 840 HMU types were mapped as side arm habitat. Side arm habitat was observed to be surrounded by low elevation sediment bars next to the main channel, but not all sections of divided channel were classified as side arms based on the habitat type criteria. The majority of the side arm habitat contained abundant shallow margins, woody debris, and canopy cover, and was considered fair to good habitat for salmon.

Abandoned channels (disconnected habitat) made up 6.1 percent of the total wetted surface area and 48 of the 840 HMU types were mapped as abandoned channel habitat. Not all abandoned channels were mapped. Abandoned channels were considered excellent salmon habitat primarily due to observations of abundant fish (OtterTail 2015).

**Watershed Conditions and Opportunities**

Existing data indicate the Crooked Creek watershed is largely undeveloped and opportunities to restore wetlands and streams are limited due to the low total disturbance in the area. The following opportunities, however, do exist:

- Historical placer mining development in the Donlin Creek and Flat Creek areas created stream channel modifications, and exposed soils, that appear to be affecting water quality in the upper reaches of the Crooked Creek watershed. Fish passage to habitats upstream from the placer mining activity in both drainages has also been limited, or eliminated. The Snow Gulch and Ruby and Queen gulches historical placer mining areas present aquatic habitat creation and restoration opportunities in the watershed. Fish passage could also be restored to stream habitats upstream from the disturbed areas in each stream.

- The Crooked Creek watershed includes few freshwater pond and shallow lake habitats (less than 1 percent of the watershed area). However, analogous habitats do occur as backwaters to Crooked Creek (estimated to be only 4.6 percent of the HMU area) and have been documented to be productive for juvenile coho salmon (OtterTail 2014b). This indicates that these habitats are limited and the addition of ponds and/or backwater areas is a substantial opportunity for watershed enhancements.
Watershed Impacts and Mitigation

Wetlands
The long-term and permanent impacts caused by the Project include 2,876 acres of wetlands. The majority of these impacts are associated with the development of the MA and TA facilities (2,676 acres of wetland fill) most of which are in the Crooked Creek watershed.

These Project impacts are located in a watershed with large expanses of wetlands that have little risk of development. The wetland fill impacts would affect approximately 2.7 percent of the inventoried wetlands in the watershed. Currently, the Project is the only proposed development in the watershed, and it is extremely unlikely that other large developments will be proposed in the Crooked Creek watershed for the foreseeable future.

The dominant wetland types impacted by the Project are abundant in the watershed, and most impacts are confined to the American and Anaconda creek drainages. Palustrine forested/palustrine scrub-shrub wetlands impacted by the Project (2,632 acres) account for 99.2 percent of the wetlands in the entire watershed (the most common wetland type). The Project impacts would cause a reduction of 2.7 percent of this type of wetlands in the Crooked Creek watershed (Table 22). In contrast, palustrine pond wetlands are scarce in the watershed (less than 1 percent of the watershed wetlands). With the Upper Crooked Creek PRM, the net gain will be 15.2 acres of pond habitat; or an increase of 152 percent in the watershed. The other benefit is the restoration of 8,892 linear feet of stream which will connect pond habitats. The Project will case a reduction of a combined 2,676 acres of palustrine emergent forested and palustrine scrub shrub wetlands. The Upper Crooked Creek PRM will restore 93.0 acres of degraded wetland stream floodplain to HGM riverine wetlands as palustrine emergent, and palustrine scrub-shrub wetland.

Table 22 Summary of Wetland Impacts in the Crooked Creek Watershed

<table>
<thead>
<tr>
<th>Wetland Types</th>
<th>Crooked Creek Watershed (Acres)</th>
<th>MA/TA Permanent Fill (Acres)</th>
<th>Crooked Creek Watershed Wetlands Permanent Fill (Percent)</th>
<th>Proposed Upper Crooked Creek PRM Restored (Acres)</th>
<th>Crooked Creek Watershed Wetland Permanent Fill After Mitigation (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palustrine Emergent, Palustrine Forested/ Palustrine Scrub-Shrub</td>
<td>98,478</td>
<td>2,676</td>
<td>-2.7 (Loss)</td>
<td>93</td>
<td>-2.6 (Loss)</td>
</tr>
<tr>
<td>Palustrine Pond</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>15.2</td>
<td>152 (Gain)</td>
</tr>
<tr>
<td>Lake</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>98,508</td>
<td>2,676</td>
<td>108</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Channel Habitats
Construction of the Project would cause the permanent loss of 173,953 linear feet of streams. All these impacts are primarily associated with the development of the MA, and secondarily the TA facilities, in
the Crooked Creek watershed. This represents roughly 6 percent of all streams in the Crooked Creek watershed. It includes intermittent streams (only contain flowing water part of the year) “upper” watershed perennial streams. Generally, upper watershed perennial streams are defined as streams with low gradient and slow water velocity that carry some water flows throughout the year. Neither of these types of streams constitute significant losses in terms of aquatic habitat for fish other than their water and water quality contributions downstream to lower perennial streams where more suitable aquatic habitat exists. Adult spawning salmon reaches in the Crooked Creek watershed include mainstem Crooked Creek, and the largest upper perennial watershed streams like Getmuna, and Bell Creeks, or relatively small portions of upper perennial streams with sufficient flow and habitat like American, Anaconda, Flat, and Grouse Creeks. Intermittent streams, and most of the upper perennial streams are not currently used by adult spawning salmon.

Construction of MA facilities within the American Creek watershed would result in a loss of 21,648 linear feet of upper perennial aquatic fish habitat, of which approximately 2,640 linear feet are documented as anadromous habitat for coho salmon rearing. Additionally, construction and operation of the TSF within the Anaconda Creek watershed would result in a loss of 7,920 linear feet of aquatic habitat, including the potential to affect 865 linear feet of coho salmon rearing habitat. No spawning habitat will be directly impacted by these facilities (Owl Ridge 2017).

Although not a direct effect, and thus not the subject of this CMP, the loss of water contributions to Crooked Creek (because of the estimated permanent stream losses of intermittent and upper perennial streams, and the predicted water flow reductions in Crooked Creek because of mine dewatering activities) would result in the following habitat reductions from existing flow conditions below the MA at the maximum predicted drawdown period (year 20 of the mine life) (OtterTail 2015).

- **Summer**
  - 3 percent (3.17 acres) of overall aquatic habitat
  - 6 percent (0.87 acres) of riffle habitat
  - 3 percent (2.11 acres) of run habitat
  - 2 percent (0.19 acres) of pool habitat

- **Winter**
  - 6 percent (4.2 acres) of overall aquatic habitat
  - 11 percent (1.03 acres) of riffle habitat
  - 5 percent (2.91 acres) of run habitat
  - 3 percent (0.26 acres) of pool habitat

The direct losses as a result of the permanent fill to streams are 173,953 linear feet of streams, including 29,568 linear feet of fish bearing streams. The loss of 29,568 linear feet of fish bearing streams represents approximately a 1.9 to 2.3 percent loss of fish habitat in the entire watershed. While up to 2.3 percent of modeled fish-bearing stream habitat would be eliminated via the loss of the fish bearing portions of American and Anaconda creeks, the habitats being eliminated have low overall fish use, and low contributions to overall numbers of fish identified in baseline sampling. The aquatic baseline biomonitoring program sampling from 2004 through 2014, which did not include Donlin Creek tributaries upstream from Dome Creek, calculated the annual average fish captured by species among
all of the 300-foot reaches sampled: The average annual juvenile coho count was 400 fish, and American and Anaconda Creeks contributed on average 6 and 0.1 (only one juvenile coho was captured in Anaconda in 2011 over the nine years surveyed) juvenile coho respectively. Resident fish species contributions from American and Anaconda Creeks were similarly low: The average slimy sculpin captured for all reaches sampled was 2,185 fish, and the combined American and Anaconda Creeks annual average contribution was 53.4 slimy sculpin; and the average Dolly Varden captured for all reaches samples was 200 fish, while the combined American and Anaconda Creeks annual average contribution was 13 Dolly Varden. As noted above, the annual baseline program did not include resident fish sampling in tributaries upstream from Dome Creek, which according to the rapid channel modelling effort are predicted to contain additional fish habitat for these species. Overall, loss of the habitat used by fish in American and Anaconda Creeks is unlikely to affect overall fish populations in the drainage because similar habitat is available for fish that would be displaced.

Connected backwater habitats were investigated primarily in the middle reaches of Crooked Creek over a two-year period by sampling 100-foot reaches by electrofishing and sampling with minnow traps. The data suggest that for juvenile coho salmon, these habitats are probably some of the most productive in the drainage. Electrofishing produced 144.5 juvenile coho per 100 feet on average and minnow trap reaches, though variable in length and number of traps, produced an annual average of 132.5 juvenile coho per backwater tested (OtterTail 2014b). While baseline and backwater sampling methods are not directly comparable, connected backwater habitats considering electrofishing results are estimated to produce 433.5 juvenile coho per 300 feet of sampling. When factoring in minnow trapping results, this number increases. In total, this limited habitat type has the potential to function as highly productive fish habitat, particularly for juvenile coho salmon. In comparison to the coho salmon contributions from American and Anaconda Creeks, slow moving backwaters and ponds are likely to have considerably more fish production potential than those lost in the two creeks.

Data from other studies supports the findings related to the importance of backwater habitat. For example, voluntary restoration of disturbed stream habitats in the upper Fish Creek drainage at the Fort Knox Gold Mine in Interior Alaska created wetland, stream, and shallow pond habitats analogous to existing backwater habitats in the Crooked Creek drainage as well as those proposed in the Upper Crooked Creek PRM Plan. The mitigation successfully created spawning habitat and highly productive rearing habitat for Arctic grayling and burbot (Ott and Morris 2005). Age 0 Arctic grayling residing within the created wetlands habitats were nearly twice as large as age 0 fish from colder stream reaches in the drainage, illustrating increased productivity and likely increased probability of future survival provided by the created habitats (Ott and Morris 2005).

Because of the direct loss of known fish bearing habitat in American and Anaconda Creeks, Donlin Gold has proposed mitigation through restoration that will create the highest potential for fish habitat and aquatic productivity lift in the drainage. The low overall availability of backwater habitats in the drainage, and the near complete lack of pond habitats provide an opportunity for habitat enhancements. Review of coho salmon juvenile numbers encountered in the backwater habitats along Crooked Creek and the resident fish benefits observed in shallow constructed wetlands at the Fort Knox Mine indicate that addition of shallow ponds and backwaters in previously disturbed habitats in the drainage will be beneficial to overall drainage productivity.
Habitat enhancements proposed for the Ruby and Queen Gulches disturbed areas would create approximately 2,931 feet of relatively low gradient stream habitat primarily within the historical floodplain of Crooked Creek. Modelling and fish sampling data show these habitats are the most utilized within the small tributaries to Crooked Creek. The enhancements would also restore fish passage to approximately 7,048 feet of upstream stream habitat, which is currently unavailable to fish. Perhaps most significantly, the proposed Upper Crooked Creek PRM Plan will create about 15.2 acres pond and backwater habitats, those documented to be considerably more productive for juvenile coho salmon than habitats that would be eliminated in American and Anaconda Creeks.

Similarly, habitat enhancements proposed within the disturbed areas of Snow Gulch would create 4,421 feet of stream habitat within the historical floodplain of Crooked Creek and upstream within the Snow Gulch floodplain. Low gradient habitats would be created within the floodplain of Crooked Creek while higher gradient stream habitat would be created through enhancement of the Snow Gulch area to help restore access to the upper drainage and to stabilize the existing constricted channel configurations. While these habitats are upgradient from the Crooked Creek floodplain, they are within areas documented to have some periodic fish use during baseline sampling, and within the area of the stream that modelling suggests would be fish habitat. The new stream habitats would also create improved access to 12,672 linear feet of upstream habitat that would be restored. The proposed Upper Crooked Creek PRM Plan would further create backwater and pond habitat within the Crooked Creek and Snow Gulch floodplains. Depending on the winter flows, post construction and filling of the Snow Gulch Reservoir, there is additional potential that viable spawning habitat for coho salmon will result from the PRM proposed in Snow Gulch.

Restoration work proposed in Quartz Gulch would add potential backwater and stream habitats where none currently exists. Restoration would create 1,630 linear feet of stream habitat largely within the Crooked Creek historical floodplain that could be used by juvenile coho salmon and resident fish species. An additional 6,258 linear feet of possible fish bearing stream habitat would be made accessible to fish through the PRM Plan. Stream habitats upstream from the Crooked Creek floodplain would be possible habitat primarily for resident fish species such as Dolly Varden and slimy sculpin.

**Summary and Conclusion of Watershed Impacts to Wetland and Channel Habitats**

The Project will discharge fill that will result in the permanent loss of 2,676 acres and 173,953 linear feet of WOUS in the Crooked Creek watershed. This will result in adverse effects to the aquatic ecosystems within the American and Anaconda Creek drainages. However, because of the abundance of similar wetland types, and the limited fish habitat contribution of the impact areas to the overall watershed, this will not create significant adverse effects to the aquatic ecosystem and diversity of the overall Crooked Creek watershed.

Approximately 2.7 percent of the wetlands, and less than 6 percent of the streams in the Crooked Creek watershed, will be lost as a result of the Project. Impacts will be primarily confined to the American and Anaconda Creek drainages, and the type of palustrine forested/palustrine scrub-shrub wetlands and functions that will be permanently lost are abundant in the Crooked Creek watershed. After implementation of the Upper Crooked Creek PRM Plan, the percent of impacted wetlands will decrease to 2.6 percent and rarely occurring, yet highly productive, palustrine ponds will increase 152 percent.
Therefore, significant adverse effects to the aquatic ecosystem, including wetlands in the Crooked Creek watershed are not anticipated.

Losses of fish habitat because of elimination of American and a portion of Anaconda Creeks will have negligible effect on both resident fish and salmon species in the overall Crooked Creek drainage. While up to 2.3 percent of fish habitat will be lost, baseline fish data document these habitats are some of the lowest producing fish habitats in the Crooked Creek watershed. The most important salmon spawning habitats occur either upstream or downstream from the Project. Greater than 90 percent of Chinook and chum salmon spawning occurs downstream of the Project and greater than 80 percent of coho spawning occurs either upstream or downstream from the Project. Indirect effects of pit dewatering and the loss of perennial drainages on Crooked Creek flows will be primarily limited to the middle reaches of the creek between Snow Gulch and Crevice Creek where primary fish use is for juvenile rearing. Despite the potential reductions in stream flow, primary habitat loss during rearing periods will total approximately 3 percent within the potentially impacted area and will not reduce or degrade habitat in a manner that population level effects are anticipated. Significant adverse effects to important spawning habitats are thus not anticipated.

As described in Section 6.0 and Attachment D, high value aquatic habitat proposed for restoration as part of the Upper Crooked Creek PRM Plan, especially in Ruby/Queen and Snow Gulches, will reduce the percentage of overall linear stream fish habitat loss by 32 percent. The proposed palustrine wetlands would act as backwaters, which are important for juvenile coho, and would increase backwater habitats in Crooked Creek. Overall, the limited effects associated with the losses of American and Anaconda Creeks are expected to be more than offset by the net gains in available fish habitat and productivity from the PRM.

Finally, Donlin Gold is committed to ensuring no significant adverse effect of the aquatic ecosystem in the Crooked Creek watershed throughout Project construction, operation, and after closure. To accomplish this, Donlin Gold will implement a comprehensive Aquatic Resources Monitoring Plan (ARMP) under the provisions of its Title 16 fish habitat permits administered by the Alaska Department of Fish and Game (ADF&G). The ARMP will include aquatic resource monitoring throughout Crooked Creek and its tributaries upstream and downstream from the Project area. In addition to adult, juvenile, and spawning fish surveys, the program will also include habitat, sediment, fish tissue, and flow monitoring. Flow monitoring will specifically address both summer and winter flow conditions. Monitoring will be initiated before the start of construction to continue to provide baseline data, as needed. The ARMP will provide for detailed data analysis and reporting to ADF&G on monitoring results. It will also require specific action by Donlin Gold if the data show variability from the predicted effects on aquatic resources. The data can also be used to assess potential opportunities for creating additional ecological lift in the watershed.
8.0 **Rationale for Proposed Compensatory Mitigation Credit/Impact Ratio**

The Rule provides that mitigation/impact ratios greater than 1:1 should be required where preservation is proposed to satisfy compensatory mitigation requirements. In determining the appropriate higher ratio, the district engineer “must consider the relative importance of both the impacted and the preserved aquatic resources in sustaining watershed functions.” In addition, consideration is given to the likelihood of success, functional (or in this case, qualitative) differences between the impact and mitigation sites, and impacted versus preserved resource values. Donlin Gold is proposing mitigation ratios of approximately 2.2:1 for acres (including both wetlands and upland riparian buffers) and 1.6:1 for streams, considering the Upper Crooked Creek and Chuitna PRM Plans. This includes the Upper Crooked Creek and Chuitna PRM. Donlin Gold also purchased 9.8 mitigation credits to be secured from Great Land Trust. The credit calculation used a 2:1 ratio for preservation. These purchased credits are not considered or included in the ratios listed above for acres and stream length.

Within the Crooked Creek watershed, compensatory mitigation options are limited by the extent of past disturbance. While the acreages and linear feet of streams restored by the proposed Upper Crooked Creek PRM are relatively low on a quantitative basis compared to MA and TA impacts, they provide in-watershed restoration of high aquatic resource values and functions. Specifically, they provide important stream, pond, and backwater habitat for anadromous and resident fish species. In addition, the proposed stream restoration activities will be initiated immediately upon the start of construction, with streams and wetlands meeting performance standards within 3 to 5 years after construction has finished. Therefore, the restored streams and wetlands are expected to become fully functioning within the timeframe that MA and TA impacts are occurring. This is documented in the watershed assessment included in Section 7.0. Hence, they provide for local, in-watershed mitigation as well as timely mitigation to eliminate temporal losses.

After accounting for the in-watershed mitigation provided, along with the limited purchased mitigation credits that are applicable, the remaining mitigation is almost entirely provided by off-site PRM. Under Donlin Gold’s CMP, the preponderance of mitigation acres and linear feet of streams are provided by the Chuitna PRM Plan. The distance from the watersheds that will be primarily impacted by the Project could be considered in limiting the credit values. However, all other factors that USACE recognizes for credit generation support a high value for the proposed Preservation Area. Specifically:

- As summarized in Section 7.0, the Project will not significantly impact aquatic resources at the watershed level. The in-watershed restoration, when considered with the associated monitoring plans, protects the Crooked Creek watershed from significant degradation.

- The Preservation Area represents a large, contiguous interconnected area that protects important wetland and stream aquatic resources at the watershed level.

- The Preservation Area encompasses important aquatic habitat for all five Pacific salmon and additional resident fish species. The presence of the Pacific salmon species in the Preservation Area is much more diverse and abundant than that found in the Crooked Creek and tributary watersheds that will be affected by the Project.
• A portion of the Preservation Area overlaps with critical habitat for endangered Beluga whales. The salmon protected in the Preservation Area are an important food source for these whales.

• The Preservation Area represents an almost entirely pristine area that is under documented threat of near-term oil and gas, coal, and timber-related development.

To further support the high credit value of the Preservation Area, it is illustrative to consider the Debit-Credit Methodology (Methodology) adopted by USACE’s Alaska District in September 2016. Donlin Gold has not specifically used this Methodology primarily because its use is optional and no functional assessment approach was accepted for the Project. However, the Methodology concepts are appropriate to consider in generally determining credit values for the Preservation Area for both wetland acres and linear feet of streams.

The initial input to the Methodology is the result of a functional assessment or other metric of the “value” of the proposed mitigation. The impacts are typically assigned a score of 1.0 and the proposed mitigation a level less than 1.0 based on these values. Since there is no approved functional assessment approach for the Project, the assigned value is subjective for the Preservation Area. However, considering the above factors, Donlin Gold believes that a functional score approaching 1.0 is justified.

The second input into the Methodology is based on the difference or delta between the anticipated condition of the Preservation Area with and without preservation. As indicated above and documented in the Chuitna PRM Plan, the Preservation Area is almost entirely pristine. With the existing, near-term threat of watershed-level degradation, it is reasonable to assume full elimination of wetland and stream function. As a result, like the functional score, a difference or delta factor approaching one is justified for undisturbed, pristine wetlands within the Preservation Area.

The final input into the Methodology is the Preservation Adjustment Factor (PAF). The PAF is calculated based on two components: threat (0.3 or 30 percent of the calculation) and ecological significance (0.7 or 70 percent of the calculation). In terms of threat, the full score of 30 percent is appropriate for the Preservation Area since there are both:

• Demonstrated threat of mining activities through extensive prospecting, which indicates there are economically recoverable reserves and commodities; and

• Demonstrated threat of oil and gas activities through exploration activities, which indicate there are economically recoverable reserves.

The ecological significance score is divided into the following four components:

• Aquatic resources that are adjacent to or connect regionally important publicly held lands, such as: National Marine Sanctuaries, National Seashores, National and State Parks, Forests, Refuges and Wildlife Management Areas (0.10 of the overall PAF). The Preservation Area is adjacent to the Trading Bay State Game Refuge and Susitna Flats State Game Refuge. Therefore, the full score (0.10 of the PAF) is justified for the Preservation Area.
• **Site contains aquatic resources that have been identified as significant or productive within a specified Ecoregion.** Such as: Alaska's Wildlife Action Plan or Anadromous Waters Catalog (AWC), ADF&G; Aquatic Resource of National Importance. A major portion of the Preservation Area encompasses highly productive anadromous waters. Therefore, the full score (0.30 of the PAF) is justified for the Preservation Area.

• **Aquatic resources that provide habitat important to species that have some special (Federal, State, or local) designation or importance.** The Preservation Area supports the viability of endangered Cook Inlet Beluga whales. In addition, the five Pacific salmon species are abundant in the Chuitna watershed and have special status at the State and Federal levels. Therefore, the full score (0.20 of the PAF) is justified for the Preservation Area.

• **Scarcity of Aquatic Resource Type.** Such as: specific preservation to maintain diversity of habitat type within islands systems removing the threat of habitat fragmentation for fish and wildlife species (Alexander Archipelago Islands (Southeast Alaska) Kodiak and the Aleutian Chain). Donlin Gold assumes that, while high value, the Preservation Area does not provide scarce aquatic resources or habitat. Therefore, a score of zero is assumed for this factor.

In summary, a PAF of 0.9 is justified for the Preservation Area. There is no time lag or risk associated with the Preservation Area as the land is currently available for preservation and required preservation instruments would be put in place prior to construction. This value along with scores approaching 1.0 for both the value of the Preservation Area and the difference/delta between the preserved versus existing conditions, demonstrates that using USACE's Methodology would result in credits of approximately 0.9 for every acre of preservation.

In addition, Donlin Gold is also proposing immediate restoration of high value wetlands and stream channels through the Upper Crooked Creek PRM Plan that would create lift of wetland and stream functions in-watershed. As a result, the proposed wetland mitigation and impact ratios of approximately 2.2:1 for acres (including both wetlands and upland riparian buffers) and 1.6:1 for streams, considering the Upper Crooked Creek and Chuitna PRM Plans provide more than sufficient compensatory mitigation for the Project impacts.

### 9.0 Summary of Mitigation Program Credits

Wetland mitigation credits will be purchased from Great Land Trust. There are just under 5 acres of permanent wetland fill impacts associated with the PA in the Matanuska Susitna Borough (in Great Land Trust’s service area). Using methods approved by the Alaska USACE District the acres of wetland impact in the MSB have been converted to 9.8 credits needed from Great Land Trust. Donlin Gold has secured an option to purchase these. The 9.8 credits to be provided are summarized in Table 23. Donlin Gold will submit a receipt proving purchase of the wetland credits to USACE prior to the start of construction authorized by the DA Project permit. An example receipt is included in Figure 12. Donlin will provide a letter of credit availability to the USACE PM prior to rendering a permit decision (expected by the end of July 2018).
### 10.0 Conclusion

Donlin Gold proposes this CMP to compensate for unavoidable permanent fill impacts to wetlands and streams within the MA, TA, and PA. This CMP includes an in-kind, in-watershed PRM Plan in the Upper Crooked Creek watershed. The Upper Crooked Creek PRM Plan includes the enhancement, reestablishment, restoration, rehabilitation and preservation of 221.5 acres of wetlands, riparian areas, stream channel, and uplands. The PRM Plan will restore degraded wetland acreage in Quartz, Snow, Ruby and Queen Gulches, and at the Wash Plant Tailings Area. The PRM Plan will restore 95.7 acres of degraded floodplains into 92.3 acres of wetlands and 2.7 acres of riverine channel. A total of 8,892 liner feet of stream will be enhanced and reestablished by the restoration work in the floodplains. Within the wetland floodplains, 15.2 acres of off channel ponds will provide improved aquatic resource habitat. In addition, 16.8 acres of adjacent upland terrestrial habitat will be created. A total of 109 acres of riparian uplands and wetland buffers will be preserved around the restored and enhanced floodplain wetlands. This PRM Plan will be initiated concurrent with the start of MA construction. Through the Upper Crooked Creek PRM Plan, and more broadly Donlin Gold’s efforts to confine all MA activities to two drainages that support limited aquatic habitat and fish populations, there will be no significant impacts to aquatic resources at the watershed level. The Upper Crooked Creek Permittee Responsible Mitigation Plan is included in Attachment D.

A small portion of project impacts along the natural gas pipeline fall within the service area of at least 2 mitigation credit providers. Donlin Gold has committed to secure 9.8 credits from the GLT to offset the 5 acres of permanent impacts to wetlands identified in their service area.

Donlin Gold conducted an extensive process to identify and pursue off-site, in-kind compensatory mitigation options to provide additional wetland acres and stream feet mitigation credits. Each option was considered in terms of wetland and stream values, feasibility of land acquisition and long-term protection, and, for restoration, likelihood of success, and, for preservation, threat of development. The results of the evaluation led to the Chuitna Preservation Area. Under this PRM Plan, Donlin Gold will ensure protection of 5,870 acres, including 3,269 acres of wetlands and ponds, and 418 acres of streams and rivers, totaling 3,687 acres of WOUS. It also protects 2,183 acres of upland riparian area and buffers, and 258,056 linear feet (48.8 miles) of streams in the Chuitna watershed. The Chuitna Preservation Area includes: 29 acres of estuarine fringe HGM wetlands, 70 acres of depressional HGM wetlands, 500 acres of riverine HGM wetlands, and 2,661 acres of HGM Slope wetlands. Within the Slope HGM wetlands there are 802 acres of ericaceous shrub bog-string bog wetlands which are a unique wetland type to the area, and only occur in a few very specific locations worldwide. The Preservation Area includes protection of important anadromous and resident fish habitat protection at the watershed level from...
near-term threats of natural resource development. The PRM Plan will also help to protect critical habitat of the endangered Cook Inlet Beluga whale. The Chuitna PRM Plan is included in Attachment E.

For the PRM Plans, the proposed compensatory mitigation for wetlands by HGM class and Cowardin group is shown in Table 24. The compensatory mitigation proposed for streams is shown in Table 25. Overall, Donlin Gold’s has proposed a compensatory mitigation ratio for long-term and permanent fill impacts of 2.2:1 for acres (including both wetlands and upland riparian buffers) and 1.6:1 for streams. This does not include the 9.8 mitigation credits to be provided by Great Land Trust’s mitigation credit Program (see Table 26).

Based on the USACE regional and national guidance; current regulations; wetlands and streams proposed for restoration, enhancement, and preservation; the compensatory mitigation proposed by Donlin Gold is sufficient to support DA permit issuance.
### Table 24  Compensatory Mitigation Proposed for Wetlands by HGM Class and Cowardin Group (Acres)

<table>
<thead>
<tr>
<th>Wetland HGM (Cowardin Classes)</th>
<th>Classification</th>
<th>Chuitna Preservation Area</th>
<th>Upper Crooked Creek Restoration</th>
<th>Upper Crooked Creek Preservation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Depressional (PAB, PEM, PFO, PSS, PUB)</td>
<td>79</td>
<td>0</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td>Estuarine Fringe (E2EM, EZUS)</td>
<td>29</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Flat (PEM, PFO, PSS)</td>
<td>0</td>
<td>0</td>
<td>32.7</td>
</tr>
<tr>
<td></td>
<td>Riverine Non-Anadromous (PEM, PFO, PSS, PUB)</td>
<td>76</td>
<td>93.0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Riverine Anadromous (PEM, PFO, PSS, PUB)</td>
<td>424</td>
<td>0</td>
<td>17.9(^1)</td>
</tr>
<tr>
<td></td>
<td>Slope (PEM, PFO, PSS)</td>
<td>2,661</td>
<td>0</td>
<td>11.6</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>Wetlands and Ponds</td>
<td>3,269</td>
<td>93.0</td>
<td>63.8</td>
</tr>
<tr>
<td></td>
<td>Stream and River Area</td>
<td>418</td>
<td>2.7</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td>Upland Riparian and Buffers</td>
<td>2,183</td>
<td>16.8</td>
<td>44.1</td>
</tr>
<tr>
<td><strong>Total of Parcel</strong></td>
<td></td>
<td>5,870</td>
<td>112.5</td>
<td>109</td>
</tr>
</tbody>
</table>

1Riverine wetlands are adjacent to Crooked Creek.
*Inconsistencies are due to rounding.

### Table 25  Compensatory Mitigation Proposed for Streams in Linear Feet (Miles)

<table>
<thead>
<tr>
<th>HGM</th>
<th>Chuitna Preservation Area</th>
<th>Upper Crooked Creek Restoration</th>
<th>Upper Crooked Creek Preservation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anadromous Stream Channel</td>
<td>196,292 (37.2)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Non-Anadromous Stream Channel</td>
<td>61,746 (11.7)</td>
<td>8,982 (1.7)(^1)</td>
<td>4,036 (0.8)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>258,056 (48.9)</td>
<td>8,982 (1.7)</td>
<td>4,036 (0.8)</td>
</tr>
</tbody>
</table>

1The return of anadromous salmon to restored streams is expected but cannot be accurately predicted in terms of specific stream length. Post-restoration monitoring will verify presence or absence of anadromous and resident fish.
*Inconsistencies are due to rounding.

### Table 26  Wetland Credits to be Purchased from the Great Land Trust

<table>
<thead>
<tr>
<th>HGM Wetland Credit Type</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riverine</td>
<td>3.6</td>
</tr>
<tr>
<td>Slope</td>
<td>6.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>9.8</td>
</tr>
</tbody>
</table>
Figure 12  Credit Purchase Receipt.

<table>
<thead>
<tr>
<th>CREDIT PURCHASE RECEIPT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compensatory Mitigation Type: Mitigation Bank ( ) In-Lieu-Fee Program ( )</td>
</tr>
<tr>
<td>Mitigation Provider (Sponsor):</td>
</tr>
<tr>
<td>Service Area or Name of Mitigation Site:</td>
</tr>
<tr>
<td>Permit Number: POA-20 USACE Project Manager:</td>
</tr>
<tr>
<td>Waterway:</td>
</tr>
<tr>
<td>Project:</td>
</tr>
<tr>
<td>Impact Type:</td>
</tr>
<tr>
<td>Impact Site Location: Latitude , Longitude</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CREDITS PURCHASED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit Type</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TOTAL CREDITS PURCHASED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

Permittee's Name/Company & Signature Date

Mitigation Provider's Name/Signature Date

Upon completion of the fulfillment of the mitigation required by the permit, please email a copy of this signed Receipt to mitigationmanager@usace.army.mil (RIBITS Administrator) and to USACE Project Manager above.
11.0 References


Donlin Gold, LLC. 2017. DA Permit (compliance with Section 404 CWA and Section 10 of RHA). Engineer Form 4345.


Memorandum of Understanding (June 15, 2018 MOU) between USACE and EPA regarding Mitigation Sequence for Wetlands in Alaska under Section 404 of the Clean Water Act.


OtterTail Environmental, Inc. 2012. 2009. Instream Habitat Analysis of Crooked Creek for the Donlin Creek Project.


Attachment A
Pipeline Area Wetlands Impacts by HUC-10 (Acres)
Before and After Construction
## Pipeline Area Wetlands Impacts by HUC-10 (Acres) Before and After Construction

<table>
<thead>
<tr>
<th>HUC-10</th>
<th>Watershed Acres</th>
<th>Existing Disturbed Wetland Acres</th>
<th>Existing Percent Disturbed</th>
<th>PA Permanent Impact Acres</th>
<th>Percent Disturbed After Pipeline Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unnamed HUC 1903040510</td>
<td>127,053</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Alexander Creek</td>
<td>210,480</td>
<td>1</td>
<td>0.00</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Beluga River</td>
<td>211,588</td>
<td>134</td>
<td>0.06</td>
<td>0</td>
<td>0.06</td>
</tr>
<tr>
<td>Crooked Creek</td>
<td>215,234</td>
<td>1115</td>
<td>0.52</td>
<td>0</td>
<td>0.52</td>
</tr>
<tr>
<td>East Fork George River</td>
<td>262,717</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>George River</td>
<td>285,127</td>
<td>98</td>
<td>0.03</td>
<td>2</td>
<td>0.04</td>
</tr>
<tr>
<td>Happy River</td>
<td>224,527</td>
<td>2</td>
<td>0.00</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Headwaters Middle Fork Kuskokwim River</td>
<td>232,387</td>
<td>2</td>
<td>0.00</td>
<td>36</td>
<td>0.02</td>
</tr>
<tr>
<td>Headwaters Tatlawiksuk River</td>
<td>239,536</td>
<td>0</td>
<td>0.00</td>
<td>64</td>
<td>0.03</td>
</tr>
<tr>
<td>Johnson Creek</td>
<td>96,681</td>
<td>7</td>
<td>0.01</td>
<td>1</td>
<td>0.01</td>
</tr>
<tr>
<td>Jones River</td>
<td>81,749</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Khuchaynik Creek</td>
<td>94,198</td>
<td>0</td>
<td>0.00</td>
<td>22</td>
<td>0.02</td>
</tr>
<tr>
<td>Little South Fork</td>
<td>75,851</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Lower Skwentna River</td>
<td>241,346</td>
<td>100</td>
<td>0.04</td>
<td>2</td>
<td>0.04</td>
</tr>
<tr>
<td>Lower South Fork Kuskokwim River</td>
<td>214,958</td>
<td>186</td>
<td>0.09</td>
<td>5</td>
<td>0.09</td>
</tr>
<tr>
<td>Middle Big River</td>
<td>128,994</td>
<td>0</td>
<td>0.00</td>
<td>25</td>
<td>0.02</td>
</tr>
<tr>
<td>Middle Skwentna River</td>
<td>236,827</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Middle South Fork Kuskokwim River</td>
<td>177,205</td>
<td>23</td>
<td>0.01</td>
<td>0</td>
<td>0.01</td>
</tr>
<tr>
<td>Moose Creek</td>
<td>132,086</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>North Fork George River</td>
<td>93,624</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Nunivak Bar-Kuskokwim River</td>
<td>245,153</td>
<td>14</td>
<td>0.01</td>
<td>1</td>
<td>0.01</td>
</tr>
<tr>
<td>Nunsatuk River</td>
<td>154,841</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Pitka Fork Middle Fork Kuskokwim River</td>
<td>189,005</td>
<td>24</td>
<td>0.01</td>
<td>17</td>
<td>0.02</td>
</tr>
<tr>
<td>Sheep Creek</td>
<td>170,686</td>
<td>186</td>
<td>0.11</td>
<td>17</td>
<td>0.12</td>
</tr>
<tr>
<td>Susitna River-Frontal Cook Inlet</td>
<td>322,859</td>
<td>113</td>
<td>0.04</td>
<td>1</td>
<td>0.04</td>
</tr>
<tr>
<td>Tatina River</td>
<td>144,282</td>
<td>1</td>
<td>0.00</td>
<td>2</td>
<td>0.00</td>
</tr>
<tr>
<td>Theodore River</td>
<td>81,093</td>
<td>88</td>
<td>0.11</td>
<td>0</td>
<td>0.11</td>
</tr>
<tr>
<td>Windy Fork Middle-Fork Kuskokwim River</td>
<td>226,059</td>
<td>3</td>
<td>0.00</td>
<td>3</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5,116,147</strong></td>
<td><strong>2097</strong></td>
<td><strong>0.04</strong></td>
<td><strong>200</strong></td>
<td><strong>0.04</strong></td>
</tr>
</tbody>
</table>

*Column is rounded to the nearest whole number.*
Attachment B

Hydrogeomorphic (HGM) Classification
## Contents

HGM Descriptions ......................................................................................................................................... 3
  Flat (Organic Soil) Wetlands...................................................................................................................... 3
  Depressional Wetlands ............................................................................................................................. 5
  Estuarine (Coastal) Fringe Waters ............................................................................................................ 7
  Riverine Wetlands ..................................................................................................................................... 7
  Slope Wetlands ......................................................................................................................................... 9
References .................................................................................................................................................. 11

## Photos

Photo 1  Black Spruce Flat (Organic Soil) HGM Wetland on Hillside, Mine Site, Crooked Creek Watershed ........................................................................................................................................................ 4
Photo 2  Low Shrub Tundra Flat (Organic Soil) HGM Wetland, Lower South Fork Kuskokwim River Watershed .................................................................................................................................................. 5
Photo 3  Wet Herbaceous Depressional HGM Wetland, Headwaters Tatlawiksu River Watershed .......... 6
Photo 4  Open Water Depressional HGM Wetland, Middle Big River Watershed ........................................ 6
Photo 5  Open Water Coastal Fringe HGM Wetland, Old Tyonek Creek – Frontal Cook Inlet Watershed .. 7
Photo 6  Wet Herbaceous Riverine HGM Wetland, Johnson Creek Watershed ............................................. 8
Photo 7  Open Willow Shrub Riverine HGM Wetland, Middle South Fork Kuskokwim River Watershed ... 8
Photo 8  Open Willow Shrub Slope HGM Wetland, Happy River Watershed .............................................. 9
Photo 9  Ericaceous Bog – String Bog, Slope HGM Wetland, Beluga River Watershed ......................... 10
Attachment B Hydrogeomorphic (HGM) Classification

The hydrogeomorphic (HGM) classification of wetlands was developed by the United States Army Corps of Engineers (USACE) Waterways Experiment Station (Brinson 1993). It is based on a wetland’s (1) position in the landscape or geomorphic setting, (2) dominant source of water, and (3) hydrodynamics of the water in the wetland (Brinson 1993). The purpose of the HGM classification is to provide a mechanism to account for the inherent natural variation of wetlands, particularly when wetland functions are being assessed. For example, a riverine wetland will generally have a much higher ability to export organic carbon than a confined depressional wetland, based on the riverine wetland’s landscape position and hydrodynamics.

In Alaska, HGM regional guidebooks are developed for Interior Alaska precipitation-driven (flat) HGM wetlands [Alaska Department of Environmental Conservation (ADEC) and USACE 1999], slope/flat HGM wetland complexes in the Cook Inlet Basin ecoregion (Hall et. al 2003), and riverine and slope HGM river proximal wetlands in coastal Southeast and Southcentral Alaska (Powell et. al 2003).

The HGM classification of the Donlin Gold Project (Project) Area is presented in the 2016 Preliminary Jurisdictional Determination (PJD) (Michael Baker 2016), which reports on the wetland and waters of the United States (WOUS) acres within the Project Area. HGM wetland classes identified in the Project Area include:

- Flat
- Depressional
- Estuarine (Coastal) Fringe
- Riverine
- Slope

HGM Descriptions

Flat (Organic Soil) Wetlands
Flat wetlands are found in areas of high terrain located between valleys of adjacent waterways (interfluves), relic lake bottoms, and abandoned floodplain terraces above the zone of river flooding. The dominant water source is precipitation; flats are unique because they typically lack significant groundwater inputs. Flats can be further classified as mineral soil flat wetlands or organic soil flat wetlands based on the accumulation of organic matter. Organic soil flats differ from mineral soil flats, in part because their elevation and topography are controlled by vertical accretion of organic matter (Brinson et al. 1995). They occur commonly on flat interfluves, but also where depressions have become filled with peat to form a large level surface. Flats lose water by evapotranspiration, overland flow, and seepage to underlying groundwater. Flats are characterized by low lateral drainage, usually due to low hydraulic gradients (ADEC and USACE 1999).
In Alaska, flats cover vast areas where shallow permafrost tables hold precipitation at or near the surface. These flats can occur on sloping terrain, such as the millions of acres of tussock tundra dominated by tussock cotton-grass on the low, rolling hills of the North Slope region. Black spruce dominated hillside forests and woodlands in Interior Alaska are generally considered to be organic soil flat wetlands when permafrost occurs at a shallow depth. Large, flat wetlands also can be found on glacial outwash terraces and in parts of valley bottoms characterized by broad, shallow basins not exhibiting lateral water movement (ADEC and USACE 1999).

Flat HGM wetlands in the Project Area are almost exclusively organic soil flats. Vertical fluctuations are the dominant hydrodynamic in flat HGM wetlands. Photo 1 and Photo 2 are examples of flat HGM wetlands.

*Photo 1  Black Spruce Flat (Organic Soil) HGM Wetland on Hillside, Mine Site, Crooked Creek Watershed*
Depressional Wetlands

Depressional wetlands occur where water accumulates in depressions; they occur on geomorphic surfaces with closed elevation contours. Depressional wetlands can have a variety of inlets and/or outlets or can lack them completely. Water sources include precipitation, groundwater discharge, inlets and surface flow, and interflow from neighboring uplands. Typically, water flows toward the center of the depressional wetland from surrounding upland areas. Seasonal vertical fluctuation is the primary dominant hydrodynamic. Depressional wetlands lose water from an outlet (temporary and permanent), evapotranspiration, or vertical movement to deeper groundwater (ADEC and USACE 1999).

Depressional HGM wetlands occur as small bog or pond features embedded within large flat wetlands dominated by scrub black spruce. In the Project Area, they are evenly spaced, small shallow depressional features on terraces adjacent to Crooked Creek and other waters. Photo 3 and Photo 4 are examples of depressional wetlands.
Photo 3  Wet Herbaceous Depressional HGM Wetland, Headwaters Tatlawiksuk River Watershed

Photo 4  Open Water Depressional HGM Wetland, Middle Big River Watershed
Estuarine (Coastal) Fringe Waters

Estuarine fringe wetlands are found along ocean or sea coastlines and in estuaries. The dominant source of water is bi-directional flow from tides, either through flooding or groundwater. Additional inputs can come from groundwater and precipitation. Water loss in estuarine fringe wetlands comes from tidal exchange, overland flow, or evapotranspiration. Organic matter can accumulate in the absence of erosive forces (ADEC and USACE 1999). Photo 5 shows a coastal fringe HGM wetland.

Photo 5  Open Water Coastal Fringe HGM Wetland, Old Tyonek Creek – Frontal Cook Inlet Watershed

Riverine Wetlands

Riverine wetlands are found within active floodplains and along the banks of river and stream channels (riparian corridors). Dominant water sources are subsurface hydraulic connections or overbank flow from nearby river and stream channels and wetlands. Groundwater discharge from surficial aquifers, overland flow from neighboring uplands and small tributaries, and precipitation may contribute additional inputs. Riverine wetlands lose surface water by flow returning to the channel after flooding or precipitation events. Subsurface water loss generally occurs through discharge to nearby active channels, evapotranspiration, and vertical migration to deeper groundwater (ADEC and USACE 1999).

In Alaska, riverine wetlands range from broad floodplains along large meandering river channels, such as the Yukon, Tanana, and Kuskokwim Rivers, to narrow, temporarily flooded zones bordering higher gradient rivers and streams. Extremely large riverine wetland complexes are found on deltas, such as the Yukon-Kuskokwim Delta, the Copper River Delta, and the Stikine River Delta.

Photo 6 and Photo 7 are examples of riverine HGM wetlands.
Photo 6  
*Wet Herbaceous Riverine HGM Wetland, Johnson Creek Watershed*

![Photo 6](image1)

Photo 7  
*Open Willow Shrub Riverine HGM Wetland, Middle South Fork Kuskokwim River Watershed*

![Photo 7](image2)
Slope Wetlands

Slope wetlands are usually dominated by scrub black spruce with an understory of ericaceous shrubs and a dense mat of sphagnum moss. Black spruce forested wetlands are found at the base of slopes where hillsides become wetter. The Cowardin functional class includes both stunted scrub and full-size trees. Slope HGM wetlands include patterned fens, hillside seeps, spring-fed wetlands, and wetlands at the base of bluffs or hills where groundwater is discharged near the surface, and also includes flooded bottomland slope wetlands and string bogs in the Cook Inlet Basin. Slope HGM wetlands have downslope, unidirectional flow of water.

Slope wetlands are normally found where groundwater is discharged to the surface (ADEC and USACE 1999). They occur on sloping land; elevation gradients may range from steep hillsides to slight slopes. Slope wetlands are usually incapable of water storage because they lack closed contours. Principal water sources are usually groundwater return flow and interflow from surrounding uplands, as well as precipitation. Hydrodynamics are dominated by downslope unidirectional water flow. Slope wetlands can occur in nearly flat landscapes if groundwater discharge is present. Slope wetlands lose water through subsurface saturation and surface flows, and through evapotranspiration.

Photo 8 and Photo 9 are examples of slope HGM wetlands.

Photo 8  Open Willow Shrub Slope HGM Wetland, Happy River Watershed
Photo 9  Ericaceous Bog – String Bog, Slope HGM Wetland, Beluga River Watershed
References


Attachment C
Mine Area Restoration Plan
Contents

Objectives ..................................................................................................................................................... 4
Site Selection Criteria.................................................................................................................................... 4
  Vegetation............................................................................................................................................... 12
  Post Restoration Vegetation ................................................................................................................... 14
  Hydrology ................................................................................................................................................ 15
Sites After Restoration ............................................................................................................................ 16
  TSF Stockpile 1 .................................................................................................................................... 16
  South Overburden Stockpile ............................................................................................................... 17
  Material Sites (Material Site-06/TSF Stockpile 2 and Material Site-07/TSF Stockpile 3) ................. 19
Restored Wetlands ..................................................................................................................................... 27
Restoration Plan ........................................................................................................................................ 28
Reclamation Criteria ................................................................................................................................... 30
  Vegetation Criteria .................................................................................................................................. 30
  Wetland Hydrology Criteria .................................................................................................................... 31
Monitoring .................................................................................................................................................. 32
References .................................................................................................................................................. 33
Figures
Figure 1  Wetland Impact Restoration Areas Considered at the MA ......................................................... 5
Figure 2  Groundwater Drawdown and Wetlands in the MA ................................................................. 6
Figure 3  MA TSF Stockpile 1 Map and Site Photos ............................................................................. 7
Figure 4  MA South Overburden Stockpile Map and Site Photos .......................................................... 8
Figure 5  MA TSF Material Site-06/TSF Stockpile 2 Map and Site Photos ............................................. 9
Figure 6  MA TSF Material Site-07/TSF Stockpile 3 Map and Site Photos ............................................. 10
Figure 7  MA Snow Gulch Freshwater Reservoir Map and Site Photos ............................................... 11
Figure 8  TSF Stockpile 1 MA Restoration ............................................................................................ 20
Figure 9  South Overburden Stockpile MA Restoration ..................................................................... 21
Figure 10 TSF Material Site-06/TSF Stockpile 2 MA Restoration ......................................................... 22
Figure 11 TSF Material Site-07/TSF Stockpile 3 MA Restoration ......................................................... 23
Figure 12 MA Snow Gulch Freshwater Reservoir ............................................................................... 24
Figure 13 MA TSF Stockpile 1 Cross-Section ....................................................................................... 25
Figure 14 MA South Overburden Stockpile Cross-Section .................................................................. 25
Figure 15 MA TSF Material Site-06/TSF Stockpile 2 Cross-Section ....................................................... 25
Figure 16 MA TSF Material Site-07/TSF Stockpile 3 Cross-Section ...................................................... 26

Tables
Table 1 MA Wetland and Stream Restoration Sites, Acres and Linear Feet to be Restored ..................... 4
Table 2 MA Restoration Sites Field Data; HGM and Cowardin Classifications and Hydrology Notes ... 18
Table 3 Completed MA Restoration HGM Classifications and Cowardin Groups (Acres) ...................... 27
Table 4 MA Wetland Types: Comparison of Permanent Fill Acres and Restored Acres, by Site ......... 28
Table 5 MA Wetland Restoration Sites and Proposed Restoration Sequence ........................................... 29
Table 6 Wetland and Upland Seed Mixes ............................................................................................. 30
Table 7 MA Vegetation Performance Criteria, including Timing ........................................................... 31
Table 8 MA Wetland Hydrology Performance Indicators .................................................................... 31

Photos
Photo 1 Open Black Spruce Forest Vegetation Type ............................................................................ 13
Photo 2 Black Spruce Woodland Vegetation Type .............................................................................. 13
Photo 3 Wet Herbaceous Vegetation Type .......................................................................................... 14
Photo 4 Open Alder Willow Shrub Vegetation .................................................................................. 15
Photo 5 Open Willow Shrub Vegetation ............................................................................................ 15

C3
Objectives
Donlin Gold, LLC (Donlin Gold) has developed a Restoration Plan (Plan) to address wetlands lost by the Mine Area (MA) facility development from the Donlin Gold Project (Project). The Plan provides restoration and rehabilitation of wetlands in impacted watersheds with in-kind restoration. The Donlin Gold MA is in the Crooked Creek HUC-10 watershed. The actions are designed to exceed reclamation requirements required by the State of Alaska [Alaska Department of Natural Resources (ADNR) 2014] upon mine closure in this watershed. The Plan provides additional habitat diversity in this black spruce dominated area. Donlin Gold is not requesting compensatory mitigation credits for the mine area wetland restoration plan.

Site Selection Criteria
Each facility in the Donlin Gold MA was considered for wetland restoration potential at facility closure; they were reviewed based on the wetland mapping and the expected occurrence of wetlands-supporting hydrology at mine closure. All MA facility boundaries were examined in the context of the final facility boundary and the 2016 Preliminary Jurisdictional Determination (PJD) [Michael Baker International (Michael Baker) 2016]. Facilities, such as the open pit, waste rock facility (WRF), and tailings storage facility (TSF), are permanent features that cannot be restored to wetlands at mine closure. The fill cannot be practicably removed, the wetlands restored, or the area re-filled for rehabilitation. However, restoration opportunities were identified in the MA where hydrology will be available. Restoration of wetlands in the MA can be accomplished at growth media stockpiles, overburden stockpiles, material sites, and at the Snow Gulch freshwater reservoir. Five sites were chosen based on the potential for hydrology to remain or return to the site following mine closure.

Figure 1 depicts the sites considered for wetlands restoration within the MA. The North overburden stockpile, shown on Figure 1 was eliminated as a restoration site because of its proximity to the open pit and its location within the predicted post-closure drawdown area. Figure 2 illustrates the post-closure drawdown area and the restoration sites. Table 1 lists the sites targeted for restoration, acres of wetlands to be restored, and the re-establishment of the Snow Gulch stream within the MA. Figure 3 through Figure 7 are maps and photos of each restoration site.

Table 1  MA Wetland and Stream Restoration Sites, Acres and Linear Feet to be Restored

<table>
<thead>
<tr>
<th>MA Site</th>
<th>HUC-10</th>
<th>Wetland Acres</th>
<th>Linear Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSF Stockpile 1</td>
<td>Crooked Creek</td>
<td>113</td>
<td>0</td>
</tr>
<tr>
<td>South Overburden Stockpile</td>
<td>Crooked Creek</td>
<td>70</td>
<td>0</td>
</tr>
<tr>
<td>TSF Material Site-06/TSF Stockpile 2</td>
<td>Crooked Creek</td>
<td>114</td>
<td>0</td>
</tr>
<tr>
<td>TSF Material Site-07/TSF Stockpile 3</td>
<td>Crooked Creek</td>
<td>217</td>
<td>0</td>
</tr>
<tr>
<td>Snow Gulch Freshwater Reservoir</td>
<td>Crooked Creek</td>
<td>42</td>
<td>6,363</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>Crooked Creek</strong></td>
<td><strong>556</strong></td>
<td><strong>6,363</strong></td>
</tr>
</tbody>
</table>

*Totals were rounded to the nearest whole number.*
Figure 1  Wetland Impact Restoration Areas Considered at the MA

- Snow Gulch Freshwater Reservoir
- North Overburden Stockpile (Eliminated)
- South Overburden Stockpile
- TSF Material Site-06/TSF Stockpile 2
- TSF Material Site-07/TSF Stockpile 3

Map Location:
- Flow Direction
- MA Restoration Area
- Study Area

Wetlands HGM Class:
- Depressional
- Flat
- Riverine
- Riverine Channel
- Slope

Scale: 0 0.25 0.5 1 Miles

Seward Meridian, UTM 4, NAD83
APPLICANT: Donlin Gold
FILE NO.: POA-1995-120

DG: MA Overall Minimization Map revd: 04/05/2018, R00
Figure 2  Groundwater Drawdown and Wetlands in the MA
Figure 3  MA TSF Stockpile 1 Map and Site Photos
Figure 4  MA South Overburden Stockpile Map and Site Photos
Figure 5  MA TSF Material Site-06/TSF Stockpile 2 Map and Site Photos
Figure 6  MA TSF Material Site-07/TSF Stockpile 3 Map and Site Photos
Figure 7: MA Snow Gulch Freshwater Reservoir Map and Site Photos
Once mine construction in the MA begins, TSF Stockpile 1 and the South Overburden Stockpile will be established for long-term storage of overburden and growth media (native soil material) collected during construction of other mine facilities. In addition, two material sites, TSF Material Sites 06 and 07, will be developed to source gravel for the construction of MA facilities. Once the gravel extraction is complete, these material sites will be used for long-term storage of overburden and growth media (as TSF Stockpiles 2 and 3).

At mine closure, the overburden and growth media will be removed and used for mine closure per State standards in other locations of the facility footprint. After removal of the stockpiles, the four storage areas will be restored to wetlands. Two of the stockpile locations (the former material sites) will be re-contoured as concave, depressional features, which will hold water. The other two stockpiles are located on precipitation-driven wetlands [flat hydrogeomorphic (HGM)] wetlands; see the Donlin Gold Compensatory Mitigation Plan (CMP) Attachment B for HGM information. In flat HGM wetlands, water perches on shallow frozen soils, creating saturated conditions. Water drawdowns in the MA will not affect these sites; permafrost found at these sites will remain after removal of the stockpiles and wetland vegetation will re-establish [BGC Engineering, Inc. (BGC) 2018].

During mine operation, a freshwater reservoir is proposed for the upper reaches of Snow Gulch. Upon mine closure, the dam associated with the reservoir will be breached and removed. Snow Gulch, a perennial stream, will flow freely again. The wetland floodplains will be naturally restored as the water levels drop. Natural surface and groundwater flows will resume in Snow Gulch.

Vegetation
Wetlands in the MA are dominated by open black spruce forest (OBSF) and black spruce woodland (BSW) vegetation types that are classified as flat HGM wetlands. OBSF is characterized by the presence of an open canopy of trees and saplings dominated by black spruce (Picea mariana), with a predominantly ericaceous shrub understory. Understory species commonly found in both upland and wetland OBSF plots include alpine blueberry (Vaccinium uliginosum), marsh labrador-tea (Rhododendron tomentosum), black crowberry (Empetrum nigrum), swamp birch (Betula nana), northern mountain-cranberry (Vaccinium vitis-idaea), Bigelow’s sedge (Carex bigelowii), woodland horsetail (Equisetum sylvaticum), and cloudberry (Rubus chamaemorus).

Typical OBSF forested Cowardin classifications (COWARDIN et al. 1979) include PFO4/SS1B and PSS4/1B (Photo 1) (all photos and Cowardin classifications are from the 2016 PJD; Michael Baker 2016). The BSW vegetation type is characterized by a sparse canopy (cover, 10 to 25 percent) of trees and saplings dominated by black spruce. Dominant understory species are typically the same as for OBSF. Typical spruce woodland Cowardin classifications include PSS1/FO4B and PSS1/4B (Photo 2).
Photo 1  
*Open Black Spruce Forest Vegetation Type*

Photo 2  
*Black Spruce Woodland Vegetation Type*
Post Restoration Vegetation

The stockpile and material sites will be either depressional or flat HGM wetlands upon restoration, based on hydrological inputs.

After removal of the stockpiles, initial vegetation types will be the wet herbaceous (WH) vegetation type. This vegetation type is characterized by a sparse canopy of tree and saplings (cover, less than 10 percent), and an overall shrub cover of less than 25 percent (Photo 3). Dominant species for this vegetation type in the Crooked Creek watershed include leafy tussock sedge (*Carex aquatilis*), pumpkin-fruit sedge (*Carex rotundata*), purple marshlocks (*Comarum palustre*), water horsetail (*Equisetum fluviatile*), cottongrass (*Eriophorum spp.*), and bluejoint (*Calamagrostis canadensis*). These plots typically have a Cowardin classification of PEM1C. Restoration to the WH vegetation type will provide additional diversity within the black spruce forests of the area. WH vegetation types within the Crooked Creek watershed account for 0.7 percent of the 24,178 acres mapped (Michael Baker 2016).

Areas flooded by the Snow Gulch freshwater reservoir will restore as open alder willow shrub (OAWS) and open willow shrub (OWS) vegetation types, similar to the understory of the existing valley bottom. Species commonly found in wetland OAWS plots include speckled alder (*Alnus incana*), Sitka/green alder (*Alnus viridis*), diamond-leaf willow (*Salix pulchra*), Steven’s Meadowsweet (*Spiraea stevenii*), alpine blueberry, and bluejoint (Photo 4). Species commonly found in wetland OWS plots include several species of willow depending on landscape position, including diamond-leaf willow, felt-leaf willow (*Salix alaxensis*), and little-tree willow (*Salix arbusculoides*). Understory shrubs include swamp birch and alpine blueberry. Understory herbaceous species include bluejoint and purple marshlocks (Photo 5). Typical Cowardin classifications for OWS and OAWS are PSS1 and PSS1/EM1 with an A or C water regime.
Hydrology

Interior Alaska wetlands, including the MA, are dominated by flat HGM precipitation-driven (i.e., rain and snowmelt) wetlands, many on discontinuous permafrost. Precipitation-driven wetlands are the result of either loamy mantle layers or restricting permafrost that perches water at or near the surface during the growing season. Precipitation is the main hydrologic input to these wetlands, and evapotranspiration is the primary output. Flat HGM wetlands in the MA restoration area are almost
exclusively organic soil flat HGM wetlands as seen in Figure 1. Flat HGM wetlands systems are described in CMP Attachment B.

Establishing hydrology in the MA restoration area is the foundation for re-establishing wetlands at mine closure. When the hydrology is returned to baseline conditions, hydrophytic vegetation will establish quickly from wetland seed mixes and the native seed bank. Hydrology is also the basis for hydric soils of new wetlands.

The MA is located within an area of discontinuous permafrost, with isolated masses in coarse-grained soils, and moderately thick to thin permafrost in fine-grained soils (Ferrians 1965, 1994). Permafrost has a mean depth of approximately 19 feet in the MA, ranging from 7.5 to 105 feet near Anaconda Creek (BGC 2006).

Field data within the restoration areas were analyzed to determine baseline hydrology as presented in Table 2. BGC data (2018) show permafrost present in core samples excavated from the restoration areas in the MA.

Sites After Restoration
Based on field plot hydrology data (Table 2) and groundwater hydrology modeling from BGC (2018), mine dewatering drawdown will not have an effect on the hydrology of the MA restoration sites or the ability of wetlands to return through restoration. The areas outside of the mine dewatering drawdown, including the flat HGM precipitation-driven wetlands, will see successful restoration of hydrology [Figure 2; (BGC 2018)]. BGC (2018) documents that the restoration targets are not groundwater-dependent as indicated by modeling, field data, and flat HGM wetlands hydrologic inputs. Core sampling by BGC and wetland field plot data (Table 2) indicate permafrost is present in the MA.

Flat HGM wetlands are not affected by dewatering drawdown; hydrology inputs are precipitation from rain and snow. The wetlands stay saturated because the surface water entering the site remains perched on the underlying discontinuous permafrost. The permafrost barrier holds the water in the top 24 inches of the soil. Thick organic mats retain subsurface water in the wetlands. These sites are outside the drawdown area; but in any case, the removal of groundwater does not adversely affect this type of wetland.

TSF Stockpile 1
Groundwater modeling for the TSF Stockpile 1 site shows available water for this site will not be impacted by mine site dewatering; groundwater conditions and surface runoff at closure will be comparable to current conditions (BGC 2018). Many of the holes drilled in this site’s footprint encountered permafrost (BGC 2018). The wetlands within this site are flat HGM on the hillsides, and slope HGM in minor swales (Michael Baker 2016).

The TSF Stockpile 1 wetlands will undergo compression from the stockpiled materials. This will compact the existing wetland soils, but not affect the frozen layer below. The frozen material will remain as an aquitard, protected by the insulating vegetative mat and overlying overburden.
Permafrost is expected to remain after restoration, which will allow for precipitation-driven wetlands to re-form. In addition, when contours are re-established, the minor swales will re-form as minor drainages, with OWS and OAWS type wetland vegetation re-establishing. Swales and the concave areas at the bottom of the hillside adjacent to Anaconda Creek are expected to re-establish quickly, while the hillsides will take longer as precipitation collects, saturates, and reduces the soil horizons.

**South Overburden Stockpile**

Groundwater modeling for the South Overburden Stockpile shows available water for this site will not be impacted by mine site dewatering; groundwater conditions and surface runoff after restoration will be comparable to current conditions (BGC 2018). Many of the holes drilled in this footprint may have encountered permafrost (BGC 2018). The wetlands within this site are flat HGM on the hillsides, and slope and riverine HGM down the center swale (Michael Baker 2016).
### Table 2  MA Restoration Sites Field Data; HGM and Cowardin Classifications and Hydrology Notes

<table>
<thead>
<tr>
<th>Plot Number</th>
<th>HGM Classification</th>
<th>Cowardin Classification</th>
<th>Restoration Site</th>
<th>Hydrology Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>3PP14908</td>
<td>Slope</td>
<td>PFO4/SS1B</td>
<td>TSF Stockpile 1</td>
<td>Saturation at 4&quot;, surface water, water table 14&quot;</td>
</tr>
<tr>
<td>DC077</td>
<td>Flat</td>
<td>PFO4/SS1B</td>
<td>TSF Stockpile 1</td>
<td>Saturation at 5&quot;, Water table at 13&quot;</td>
</tr>
<tr>
<td>DC088</td>
<td>Flat</td>
<td>PSS4/1B</td>
<td>TSF Stockpile 1</td>
<td>Saturation at 5&quot;, Water table at 12&quot;</td>
</tr>
<tr>
<td>DC089</td>
<td>Flat</td>
<td>PSS1/FO4B</td>
<td>TSF Stockpile 1</td>
<td>Saturation at 10&quot;</td>
</tr>
<tr>
<td>3PP12855</td>
<td>Flat</td>
<td>PSS4B</td>
<td>TSF Material Site-07/TSF Stockpile 3</td>
<td>Saturation at 8&quot;</td>
</tr>
<tr>
<td>3PP12868</td>
<td>Flat</td>
<td>PSS4B</td>
<td>TSF Material Site-07/TSF Stockpile 3</td>
<td>Saturation at 4&quot;</td>
</tr>
<tr>
<td>3PP12869</td>
<td>Flat</td>
<td>PSS4B</td>
<td>TSF Material Site-07/TSF Stockpile 3</td>
<td>Saturation at 12&quot;</td>
</tr>
<tr>
<td>3PP12871</td>
<td>Flat</td>
<td>PSS4B</td>
<td>TSF Material Site-07/TSF Stockpile 3</td>
<td>Saturation at 11&quot;, Permafrost at 14&quot;</td>
</tr>
<tr>
<td>3PP2046</td>
<td>Flat</td>
<td>PSS4B</td>
<td>TSF Material Site-07/TSF Stockpile 3</td>
<td>Saturation at 0&quot;, Water table at 3&quot;</td>
</tr>
<tr>
<td>MB4346</td>
<td>Flat</td>
<td>PSS1/4B</td>
<td>TSF Material Site-07/TSF Stockpile 3</td>
<td>Saturation at 10&quot;, Water table at 17&quot;</td>
</tr>
<tr>
<td>3PP12862</td>
<td>Flat</td>
<td>PSS4/1B</td>
<td>TSF Material Site-06/TSF Stockpile 2</td>
<td>Saturation at 13&quot;</td>
</tr>
<tr>
<td>3PP1372</td>
<td>Flat</td>
<td>PSS1/4B</td>
<td>TSF Material Site-06/TSF Stockpile 2</td>
<td>Water table at 12&quot;, seasonal frost at 13&quot;, Saturation at 0&quot;</td>
</tr>
<tr>
<td>3PP1373</td>
<td>Flat</td>
<td>PSS1/4B</td>
<td>TSF Material Site-06/TSF Stockpile 2</td>
<td>Saturation at 0&quot;, Water table at 21&quot;</td>
</tr>
<tr>
<td>MB3304</td>
<td>Flat</td>
<td>PSS4B</td>
<td>TSF Material Site-06/TSF Stockpile 2</td>
<td>Saturation at 4&quot;</td>
</tr>
<tr>
<td>MB3308</td>
<td>Flat</td>
<td>PSS4B</td>
<td>TSF Material Site-06/TSF Stockpile 2</td>
<td>Saturation at 4&quot;, Water table at 13&quot;</td>
</tr>
<tr>
<td>3PP12857</td>
<td>Flat</td>
<td>PSS4B</td>
<td>South Overburden Stockpile</td>
<td>Saturation at 8&quot;</td>
</tr>
<tr>
<td>3PP12866</td>
<td>Riverine</td>
<td>PSS1/EM1A</td>
<td>South Overburden Stockpile</td>
<td>Water table 24&quot;, Saturation at 15&quot;</td>
</tr>
<tr>
<td>MB0283</td>
<td>Flat</td>
<td>PSS4/1B</td>
<td>South Overburden Stockpile</td>
<td>Saturation at 9&quot;, Water table at 14&quot;</td>
</tr>
<tr>
<td>MB0322</td>
<td>Flat</td>
<td>PFO4B</td>
<td>South Overburden Stockpile</td>
<td>Saturation at 14&quot;, Water table at 17&quot;</td>
</tr>
<tr>
<td>MB1401</td>
<td>Flat</td>
<td>PSS4B</td>
<td>South Overburden Stockpile</td>
<td>Saturation at 4&quot;, Restrictive layer at 4&quot;</td>
</tr>
<tr>
<td>3PP12837</td>
<td>Slope</td>
<td>PSS4B</td>
<td>Snow Gulch Freshwater Reservoir</td>
<td>Saturation at 4&quot;, Impeding layer at 3&quot;</td>
</tr>
<tr>
<td>3PP12840</td>
<td>Slope</td>
<td>PSS4/1B</td>
<td>Snow Gulch Freshwater Reservoir</td>
<td>Shallow Permafrost</td>
</tr>
<tr>
<td>3PP2124</td>
<td>Slope</td>
<td>PFO4/SS1B</td>
<td>Snow Gulch Freshwater Reservoir</td>
<td>Saturation at 0&quot;, Water table at 2&quot;</td>
</tr>
</tbody>
</table>
The South Overburden Stockpile wetlands will undergo compression from the stockpiled materials. This will compact the existing wetland soils, but not affect the frozen layer below. The frozen material will remain as an aquitard, protected by the insulating vegetative mat and overlying overburden.

Permafrost is expected to remain after restoration, which will allow for precipitation-driven wetlands to re-form. The main swale down the middle of the wetland will continue to funnel surface and groundwater. The small floodplain will re-establish as a slope HGM wetland at the top, and riverine HGM towards the bottom with OWS and/or OAWS vegetation types.

**Material Sites (Material Site-06/TSF Stockpile 2 and Material Site-07/TSF Stockpile 3)**

Material sites will be excavated 75 to 100 feet into the hillsides. The material sites are within discontinuous permafrost (BGC 2018) that would intersect subsurface water and possibly groundwater at the depth of excavation. Groundwater will enter the excavation through seepage faces (BGC 2018). Surface runoff is expected to be comparable to current conditions.

Berms have been incorporated into the design of TSF Material Sites 06 and 07. They have been placed around the outside edges of the downslope sides of the sites. These berms will be left in place following mining, during use of the sites as overburden stockpiles, and during restoration. During restoration, the material sites will be re-contoured as concave, depressional features. Following restoration, the berms will act as barriers to movement of water; increasing the amount of water supporting restored wetlands.

Hydrologic drainage will be restored upslope and will return as depressional HGM palustrine emergent wetlands. The material sites are not within the post-closure mine dewatering drawdown area (BGC 2018).

Figure 8 through Figure 12 are maps of the restoration sites post-mining. Cross-sections are provided for planning purposes (Figure 13 through Figure 16); the locations of the cross-sections are shown on the corresponding map figure.
Figure 8   TSF Stockpile 1 MA Restoration
Figure 9  South Overburden Stockpile MA Restoration

[Map Image]

- 2m Contours
- Wetlands HGM Class
- MA Restoration Area
- Depressional
- Flat
- Riverine
- Riverine Channel
- Slope

SCALE: 0 0.03 0.06 0.12 Miles

Seward Meridian, UTM 4, NAD83

APPLICANT: Donlin Gold

FILE NO.: POA-1995-120
Figure 10  TSF Material Site-06/TSF Stockpile 2 MA Restoration
Figure 11  TSF Material Site-07/TSF Stockpile 3 MA Restoration
Figure 12 MA Snow Gulch Freshwater Reservoir
Figure 13  MA TSF Stockpile 1 Cross-Section

Figure 14  MA South Overburden Stockpile Cross-Section

Figure 15  MA TSF Material Site-06/TSF Stockpile 2 Cross-Section
Figure 16  MA TSF Material Site-07/TSF Stockpile 3 Cross-Section

TSF MATERIAL SITE 7/TSF STOCKPILE 3

- Existing Ground
- BERM
- Restoration Surface
- 3:1 Slope
Restored Wetlands
The total wetland acres of HGM and Cowardin groups after the MA restoration are shown in Table 3.

Table 3  Completed MA Restoration HGM Classifications and Cowardin Groups (Acres)

<table>
<thead>
<tr>
<th>HGM Classification</th>
<th>Cowardin Group</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depressional</td>
<td>Palustrine Emergent</td>
<td>331</td>
</tr>
<tr>
<td>Flat</td>
<td>Palustrine Scrub Shrub</td>
<td>159</td>
</tr>
<tr>
<td>Riverine</td>
<td>Palustrine Scrub Shrub</td>
<td>19</td>
</tr>
<tr>
<td>Slope</td>
<td>Palustrine Scrub Shrub</td>
<td>47</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>556</strong></td>
</tr>
</tbody>
</table>

Table 4 is a comparison of the vegetation types and HGM classifications of the wetlands impacted and restored for the restoration sites. Flat HGM wetlands are the dominant class that will be impacted within the MA restoration sites. Post-mine restoration will return the TSF material sites to concave surfaces, creating depressional, emergent wetlands. Depressional, emergent wetlands will diversify wetland classes and increase wetland values and functions. Depressional emergent wetland acreage is increased by 329 acres after restoration.
Table 4  MA Wetland Types: Comparison of Permanent Fill Acres and Restored Acres, by Site

<table>
<thead>
<tr>
<th>Facility</th>
<th>HGM Class</th>
<th>Cowardin Group</th>
<th>Permanent Fill Acres</th>
<th>Restored Acres</th>
<th>Acres Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSF Stockpile 1</td>
<td>Flat</td>
<td>Scrub-Shrub</td>
<td>97</td>
<td>97</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Riverine</td>
<td>Scrub-Shrub</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Slope</td>
<td>Scrub-Shrub</td>
<td>16</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>114</strong></td>
<td><strong>114</strong></td>
<td><strong>0</strong></td>
</tr>
<tr>
<td>South Overburden Stockpile</td>
<td>Flat</td>
<td>Scrub-Shrub</td>
<td>62</td>
<td>62</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Riverine</td>
<td>Scrub-Shrub</td>
<td>3</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Slope</td>
<td>Scrub-Shrub</td>
<td>5</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>70</strong></td>
<td><strong>70</strong></td>
<td><strong>0</strong></td>
</tr>
<tr>
<td>TSF Material Site-06/TSF Stockpile 2</td>
<td>Depressional</td>
<td>Emergent</td>
<td>0</td>
<td>114</td>
<td><strong>114</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scrub-Shrub</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Flat</td>
<td>Forested</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scrub-Shrub</td>
<td>120</td>
<td>0</td>
<td>-120</td>
</tr>
<tr>
<td></td>
<td>Slope</td>
<td>Emergent</td>
<td>1</td>
<td>0</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>121</strong></td>
<td><strong>114</strong></td>
<td><strong>-7</strong></td>
</tr>
<tr>
<td>TSF Material Site-07/TSF Stockpile 3</td>
<td>Depressional</td>
<td>Emergent</td>
<td>2</td>
<td>217</td>
<td><strong>215</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Forested</td>
<td>32</td>
<td>0</td>
<td>-32</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scrub-Shrub</td>
<td>191</td>
<td>0</td>
<td>-191</td>
</tr>
<tr>
<td></td>
<td>Slope</td>
<td>Emergent</td>
<td>1</td>
<td>0</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Forested</td>
<td>1</td>
<td>0</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scrub-Shrub</td>
<td>3</td>
<td>0</td>
<td>-3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>229</strong></td>
<td><strong>217</strong></td>
<td><strong>-12</strong></td>
</tr>
<tr>
<td>Snow Gulch Freshwater Reservoir</td>
<td>Riverine</td>
<td>Scrub-Shrub</td>
<td>16</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Slope</td>
<td>Scrub-Shrub</td>
<td>26</td>
<td>26</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>42</strong></td>
<td><strong>42</strong></td>
<td><strong>0</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Grand Total</strong></td>
<td></td>
<td><strong>576</strong></td>
<td><strong>556</strong></td>
<td><strong>-20</strong></td>
</tr>
</tbody>
</table>

1Sums may differ due to rounding.
2 The 20 acre change is due to 50-foot upland berms included in TSF Material Sites 06 and 07.

Restoration Plan

Restoration activities will begin in the targeted sites after the closure of the mine. This is projected to be approximately 27 years after mining operations commence. The restoration activities will consist of planning and sequencing the loading, hauling, dumping, grading, and restoring of the excavated material sites. All overburden material will be removed from the stored locations and be used throughout the MA for restoration purposes. The proposed wetland restoration steps are summarized in Table 5. Throughout all phases of this Plan, water and erosion control structures will be maintained to protect water quality in adjacent wetlands, streams, and rivers.
<table>
<thead>
<tr>
<th>Site (Impact Type)</th>
<th>Planning and Design</th>
<th>Fill Removal</th>
<th>Return to Original Contours</th>
<th>Grade to Increase Water Retention</th>
<th>Site Preparation</th>
<th>Re-vegetation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSF Stockpile 1 (cut and fill)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>a</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>South Overburden Stockpile (fill)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>a</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>TSF Material Site-06/TSF Stockpile 2 (cut and fill)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>a</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>TSF Material Site-07/TSF Stockpile 3 (cut and fill)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>a</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Snow Gulch Freshwater Reservoir (fill/pond)</td>
<td>x</td>
<td>x</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
</tbody>
</table>

Notes: x – Planned restoration activity; a – If required

The following is a synopsis of wetland restoration activity at each targeted site.

- Planning and Design – Includes planning the activity and functions, surveying, data collection, analysis, and the final engineering design of roads, work fill pads, required site grades for overburden and growth media deposition, and mine facilities for materials storage necessary to meet the final overburden placement requirements.

- Fill Removal – Removal of fill with the use of mechanized equipment. Fill removed will be used for mine reclamation at other facilities. The overburden and growth media will be loaded into haul trucks and moved along mine roads to final deposition locations.

- Return to Original Contours – The area topography and elevations will be returned to pre-construction contour conditions. Ditches will be filled or blocked. Overland surface drainage connectors will be re-established. Roads will be scarified and removed.

- Cut Down Snow Gulch Reservoir Dam – The Snow Gulch reservoir dam will be cut down to allow natural drainage to return. The Snow Gulch stream bed and bank will return as the reservoir is drawn down and the dam breached.

- Grade Material Sites to Increase Water Retention – The former material site topography and elevations will be deeper than pre-construction conditions. In these cases, the terrain will be modified to store the overland and precipitation flow, and for water retention. Drainages will be restored if they were previously diverted away from these areas. New drainage connectors to existing swales or streams will be established. Material sites will be graded with a 50-foot berm on the downslope side for water retention.
• Site Preparation – The substrate will be prepared for re-vegetation. This will include layering the restoration site, or portions of the restoration site, with growth media and/or mulch. Mechanized equipment will be used to create micro-environments and conditions that provide favorable seed germination and seedling growth. Detailed site preparation techniques are included in the Interior Alaska Re-vegetation and Erosion Control Guide (Czapla and Wright 2012). Seed mixes will be cultivated from both the seedbank in stockpiled wetland topsoil (growth media) and from commercially available native wetland seed mixes. Species present in currently available wetland and upland seed mixes are listed in Table 6. Egan American Sloughgrass (*Beckmannia syzigachne*), a primary component of the seed mix, has been shown to be successful for revegetation in wetlands in Interior Alaska (Czapla and Wright 2012).

<table>
<thead>
<tr>
<th>Species Name</th>
<th>Latin Name</th>
<th>NWI Indicator Status</th>
<th>Upland Mix, Percent</th>
<th>Wetland Mix, Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arctic Red Fescue</td>
<td><em>Festuca rubra</em></td>
<td>Facultative</td>
<td>50</td>
<td>20</td>
</tr>
<tr>
<td>Tundra Glaucous Bluegrass</td>
<td><em>Poa glauca</em></td>
<td>Not Listed</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>Gruening Alpine Bluegrass</td>
<td><em>Poa alpina</em></td>
<td>Facultative Upland</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>Nortran Tufted Hairgrass</td>
<td><em>Deschampsia caespitosa</em></td>
<td>Facultative</td>
<td>10</td>
<td>40</td>
</tr>
<tr>
<td>Egan American Sloughgrass</td>
<td><em>Beckmannia syzigachne</em></td>
<td>Obligate</td>
<td>0</td>
<td>40</td>
</tr>
</tbody>
</table>

• Re-vegetation – Plant cover will be re-established by means of seeding, or natural re-colonization. If necessary, fertilizer will be added to promote re-vegetation. Uplands will be re-vegetated to control sediment and nutrient loading to wetlands. Detailed re-vegetation techniques are included in the Interior Alaska Re-vegetation and Erosion Control Guide (Czapla and Wright 2012). Depressional, palustrine emergent wetlands will be the primary established wetland type in the two former material sites. Over time, native seeds will germinate from the growth media seed bank or from natural colonization from adjacent vegetation. Black spruce and shrubs will return to the restoration areas over time as palustrine scrub shrub and forested wetlands.

**Reclamation Criteria**

Performance criteria are modified from General Permit (GP) POA-2014-55: Mechanical Placer Mining Activities within the State of Alaska [United States Army Corps of Engineers (USACE) 2014]. Vegetation and hydrology performance criteria are included. Soil performance criteria are not included in this Plan; development of hydric soils typically progresses behind the other two parameters following creation or restoration of wetlands.

**Vegetation Criteria**

Vegetation performance criteria ensure restored and revegetated wetland areas and upland berms are following a trajectory to be stable and functioning biologically. Table 7 contains the vegetation performance criteria and timing.
Table 7  MA Vegetation Performance Criteria, including Timing

<table>
<thead>
<tr>
<th>Restoration Area</th>
<th>Performance Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upland Berms</td>
<td>Achieve 30% live plant cover of the upland berm by the end of three (3) growing seasons. Achieve 70% live plant cover of the upland berm by the end of five (5) growing seasons. Cover of invasive species is no more than 10%.</td>
</tr>
<tr>
<td>Wetlands</td>
<td>Achieve 30% live plant cover of restored wetland areas by the end of three (3) growing seasons. Achieve 70% live plant cover of constructed wetland areas with the vegetation community meeting the Dominance Test or Prevalence Index for hydrophytic vegetation by the end of five (5) growing seasons. Cover of invasive species is no more than 10%.</td>
</tr>
</tbody>
</table>

Wetland Hydrology Criteria

Wetland hydrology indicators as described in the Alaska Regional Supplement (USACE 2007) will be used as evidence of sufficient hydrology to support wetland and pond formation and function. However, only three of the four groups of the available indicators as described in the Regional Supplement will be used during the monitoring period. The fourth group, Group D – Evidence from Other Site Conditions or Data, will not be used to monitor hydrologic conditions within the restored wetland areas because landscape variables for the group were derived for natural settings and are not applicable for use in recently restored wetlands. Additionally, the indicator Sparsely Vegetated Concave Surface will be excluded because it is counter to the vegetation performance criteria.

The wetland hydrology performance criteria are shown in Table 8. One primary indicator from any group is sufficient to conclude that wetland hydrology is present. Secondary indicators have been excluded. Monitoring for hydrologic indicators will occur within 10-meter-squared (m²) plots coinciding with the vegetation monitoring.

Table 8  MA Wetland Hydrology Performance Indicators

<table>
<thead>
<tr>
<th>Group A – Observations of Surface Water or Saturated Soils</th>
<th>Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 – Surface Water</td>
<td></td>
</tr>
<tr>
<td>A2 – High Water Table</td>
<td></td>
</tr>
<tr>
<td>A3 – Saturation</td>
<td></td>
</tr>
<tr>
<td>B1 – Water Marks</td>
<td></td>
</tr>
<tr>
<td>B2 – Sediment Deposits</td>
<td></td>
</tr>
<tr>
<td>B3 – Drift Deposits</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group B – Evidence of Recent Inundation</th>
<th>Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>B4 – Algal Mat or Crust</td>
<td></td>
</tr>
<tr>
<td>B5 – Iron Deposits</td>
<td></td>
</tr>
<tr>
<td>B6 – Surface Soil Cracks</td>
<td></td>
</tr>
<tr>
<td>B7 – Inundation Visible on Aerial Imagery</td>
<td></td>
</tr>
<tr>
<td>B15 – Marl Deposits</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group C – Evidence of Current or Recent Saturation</th>
<th>Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1 – Hydrogen Sulfide Odor</td>
<td></td>
</tr>
<tr>
<td>C2 – Dry-season Water Table</td>
<td></td>
</tr>
</tbody>
</table>
Monitoring

Wetland monitoring will include periodic inspections, once a year for five years following restoration. The inspections will occur during the growing season. The purpose of the monitoring will be to assess the success of the restored habitats using the performance criteria described above and to determine whether additional remedial actions are necessary to assure the criteria are met.

Monitoring of restored wetlands and ponds will consist of collecting and evaluating quantitative data on the hydrology and plant communities within the restored wetlands. Monitoring points will be established to monitor trends in plant communities. Transects at monitoring points will be established to determine vegetation cover across the restoration areas.

Monitoring point locations will be monumented with GPS and physically using rebar stakes and flagging to facilitate revisit. At shrub vegetation sampling points, the percent cover of shrub species, bare ground, and open water, as well as the number of species, will be recorded within a 10-m² plot. Herbaceous species and percent cover will be recorded within a 1-m² quadrat placed at random in the plot area. Hydrology will be characterized at wetland and pond sampling points. All non-native plant species and their relative cover will be recorded. Non-native plant recruitment data will be used to determine the need for active measures to remove non-native plants from restoration areas.

Monitoring reports will be produced annually and submitted USACE by December 31 of each year until the areas meet the performance criteria.
References


Attachment D  Upper Crooked Creek Permittee Responsible Mitigation Plan
Contents
Introduction .................................................................................................................................................. 4
Objectives .................................................................................................................................................. 5
Site Selection Criteria .................................................................................................................. 7
Site Protection Instrument ................................................................................................................ 9
Baseline Information .............................................................................................................................. 10
  Historical Placer Mining ..................................................................................................................... 10
  Hydrology ........................................................................................................................................... 11
  Fisheries ............................................................................................................................................. 13
  Soils .................................................................................................................................................... 15
  Vegetation Types ............................................................................................................................... 15
  Wetlands ........................................................................................................................................... 15
  Non-native Plant Species .................................................................................................................... 16
Determination of Credits ....................................................................................................................... 17
Mitigation Work Plan .............................................................................................................................. 19
Restoration Timing ................................................................................................................................. 20
  Quartz Gulch ...................................................................................................................................... 21
    Quartz Gulch Existing Conditions ........................................................................................................ 21
    Quartz Gulch Restoration .................................................................................................................... 22
  Snow Gulch ........................................................................................................................................ 24
    Snow Gulch Existing Conditions ......................................................................................................... 24
    Snow Gulch Restoration ..................................................................................................................... 25
Wash Plant Tailings Area ....................................................................................................................... 30
  Wash Plant Tailings Area Existing Conditions .................................................................................. 30
  Wash Plant Tailings Area Restoration ............................................................................................... 30
Ruby and Queen Gulches ....................................................................................................................... 31
  Ruby and Queen Gulches Existing Conditions .................................................................................... 31
  Ruby and Queen Gulches Restoration .................................................................................................. 32
Final Design, Monitoring, and Performance Standards ........................................................................ 36
  Final Design ...................................................................................................................................... 36
Monitoring Program ............................................................................................................................... 36
  Stream Channel Monitoring ............................................................................................................... 36
  Wetland Monitoring ............................................................................................................................ 38
  Terrestrial Habitat (Revegetation) Monitoring ..................................................................................... 38
  Additional Monitoring .......................................................................................................................... 38
  Monitoring Reports ............................................................................................................................... 38
Performance Standards .......................................................................................................................... 39
  Stream Channel Performance Standards ............................................................................................ 39
  Wetland Performance Standards ......................................................................................................... 41
  Terrestrial Habitat Performance Standards .......................................................................................... 43
Maintenance Plan ................................................................................................................................... 44
Long-term Management Plan (LMP) ...................................................................................................... 44
Adaptive Management Plan .................................................................................................................. 46
Financial Assurances ............................................................................................................................... 47
References ............................................................................................................................................... 53
Figures
Figure 1  Upper Crooked Creek Permittee Responsible Mitigation Plan Area Overview.......................... 6
Figure 2  Fish Species Present and Adult Salmon Densities in Upper Crooked Creek Drainages......... 14
Figure 3  Comparison of Recent and Historical Aerial Imagery for Snow Gulch Outlet to Donlin Creek......................................................................................................................................... 26
Figure 4  Adaptive Management Cycle.................................................................................................... 47

Tables
Table 1  Overview of Objectives for the Upper Crooked Creek PRM Plan Area .............................. 7
Table 2  Upper Crooked Creek PRM Plan Areas Protected Under the Site Protection Instrument (Acres)....................................................................................................................................... 10
Table 3  Watershed Characteristics of Crooked Creek Watershed Streams............................. 12
Table 4  Summary of Fish Presence 2004 — 2014 ........................................................................ 13
Table 5  Upper Crooked Creek PRM Plan Restoration Areas Current Resource Types, by Site (Acres)....................................................................................................................................... 16
Table 6  Non-native Plant Species in Snow Gulch.......................................................... 17
Table 7  Acreage and Linear Feet of Resources Re-established, Enhanced, and Protected by the Upper Crooked Creek PRM............................................................................................................. 18
Table 8  Upper Crooked Creek HGM Summary......................................................................... 19
Table 9  Typical Construction Schedule for a Restoration Area...................................................... 21
Table 10  Preliminary Design Parameters for Quartz Gulch.............................................................. 23
Table 11  Summary of Re-established, Enhanced, and Protected Areas within the Quartz Gulch Restoration Area............................................................................................................................................... 24
Table 12  Historical and Preliminary Design Parameters for Snow Gulch........................................... 27
Table 13  Summary of Re-established, Enhanced, and Protected Areas within the Snow Gulch Restoration Area............................................................................................................................................... 29
Table 14  Summary of Re-established, Enhanced, and Protected Areas within the Wash Plant Tailings Area Restoration Area .............................................................................................................. 31
Table 15  Historical and Preliminary Design Parameters for Ruby Gulch........................................... 34
Table 16  Summary of Re-established, Enhanced, and Protected Areas within the Queen and Ruby Gulches Restoration Area .............................................................................................................. 35
Table 17  Upper Crooked Creek PRM Plan Stream Performance Standards ............................. 40
Table 18  Wetland Vegetation Performance Standards................................................................. 41
Table 19  List of Wetland Hydrology Indicators for Alaska*............................................................. 43
Table 20  Terrestrial Habitat Vegetation Performance Standards................................................... 44

Photos
Photo 1  Placer Mining Wash Plant Tailings Area (View toward Northwest) ...................... 10
Photo 2  Lower Snow Gulch Placer Disturbance (View toward North)..................................... 11
Photo 3  Lower Ruby and Lower Queen Gulches Placer Disturbance (View toward Southwest) .... 11

Appendices
Appendix D-1, Figures 2 – 13
Appendix D-2
Attachment D Upper Crooked Creek Permittee Responsible Mitigation Plan

Introduction
The proposed Donlin Gold, LLC (Donlin Gold) Project (Project) mine site is located within the Crooked Creek watershed (United States Geological Survey [USGS] 10-digit Hydrologic Unit Code [HUC] watershed 1903050108). The Crooked Creek watershed is remote and predominately undisturbed, with minimal development occurring on its landscape. The majority of existing disturbances within the watershed are in two distinct locations: the village of Crooked Creek on the Kuskokwim River, and the upper reaches of the watershed near the proposed Project area.

The disturbed areas near the proposed Project in the upper Crooked Creek watershed are concentrated in the Grouse Creek-Crooked Creek (12-digit HUC 190305010803) and Donlin Creek (12-digit HUC 190305010801) watersheds. Disturbances in these areas are primarily the result of two activities: Donlin Gold’s ongoing exploration operations and historical placer mining. Placer mining has resulted in landscape-scale alterations to topography and impacts to aquatic resource functions. Placer mining impacts in the upper Crooked Creek watershed, specifically the Quartz, Snow, Ruby, and Queen Gulches, have rerouted streams from their historical channels into linear excavated ditches with no floodplains and excavated floodplains down to bedrock. Ponds, ditches, excavations, overburden fill, and side castings have all contributed to the impacts in these drainages, which include disrupted/ disconnected floodplains, lowered water tables, steep and unstable stream channels, poor water quality, steep eroding stream side slopes, loss of overlying soils, loss of vegetative cover, and narrowed hydraulic conveyances.

Based on Crooked Creek watershed fisheries habitat assessments and using the Function Based Framework for Stream Assessment and Restoration Projects (Harman et al. 2012), Donlin Gold has selected the restoration of these heavily impacted drainages as part of the Compensatory Mitigation Plan (CMP) for the Project. Using a Functional Pyramid approach from Harman et al, this Upper Crooked Creek Permittee Responsible Mitigation (PRM) Plan (Plan) defines how re-establishing the 15 functions critical to stream and riparian ecosystems will be achieved. The Functional Pyramid Approach builds on a hierarchy of processes starting with basic watershed hydrology, ascending through hydraulic processes dictated by channel, floodplain and stream sediment parameters which in turn drive geomorphic processes, sediment transport, large woody debris, and riparian vegetation to create bed form diversity and dynamic equilibrium. These building blocks are the focus of the restoration work and when accomplished correctly recreate the parameters for healthy physiochemical and biological habitats. Simply put, a correctly reconstructed stream with natural gradients, sinuosity, and properly sized and revegetated substrate, channel and floodplains will reproduce healthy aquatic and fisheries habitats.

Four distinct restoration projects are described within the 221.5 acre Upper Crooked Creek PRM Plan (Plan) boundary:

- Restoration of lower Quartz Gulch
• Restoration of lower Snow Gulch
• Restoration of the wash plant tailings area along Crooked Creek, between Snow and Ruby Gulches
• Restoration of lower Ruby and Queen Gulches

These areas are shown on Figure 1.

These restoration projects will increase the function and sustainability of the watershed and its fisheries because they:

• Re-establish and rehabilitate historical stream and wetland functions present prior to placer mining;
• Re-establish historical and establish new stream, pond, and off-channel anadromous and resident fish habitat; and
• Have a high likelihood of success to restore naturally occurring, self-sustaining systems within the Crooked Creek watershed because they are based on a stream functional framework.

All four restoration projects are located in the same 10-digit HUC watershed as the majority of the long-term and permanent aquatic resources impacts from the Project.

**Objectives**

The objective of this Plan is to return naturally occurring, self-sustaining wetland and stream functions to the upper Crooked Creek watershed. The Plan fulfills this objective by re-establishing floodplains and stream channels to pre-placer mining parameters using a stream functional framework and reference reaches upgradient of the impacted areas. The total benefits from this plan are presented in Table 1.
Figure 1  Upper Crooked Creek Permittee Responsible Mitigation Plan Area Overview
Table 1  Overview of Objectives for the Upper Crooked Creek PRM Plan Area

<table>
<thead>
<tr>
<th>Restoration Activity</th>
<th>Expected NWI Classes</th>
<th>Habitat Type</th>
<th>Activity Description</th>
<th>Linear Feet</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-establish</td>
<td>R3UBH, R3USC, R2UBH, R2USA</td>
<td>Stream Channel</td>
<td>Stream channels will be re-created within their natural alluvial setting to natural dimensions, patterns, and profiles.</td>
<td>8,982</td>
<td>-</td>
</tr>
<tr>
<td>Re-establish</td>
<td>PSS1A, PSS1C, PSS1/EM1C, PEM1C</td>
<td>Wetland Floodplain</td>
<td>Wetland floodplains will be reshaped and re-contoured into natural pre-mining configurations. These areas will be revegetated with native plant species.</td>
<td>-</td>
<td>95.7</td>
</tr>
<tr>
<td>Enhance</td>
<td>PUBH, PABH, PEM1H, PEM1F</td>
<td>Off-channel Pond</td>
<td>Existing mining ponds will be converted into productive habitat through the creation of littoral zones and deep overwintering habitat.</td>
<td>-</td>
<td>15.2*</td>
</tr>
<tr>
<td>Enhance</td>
<td>U</td>
<td>Terrestrial</td>
<td>Tailings and other areas outside of the floodplain that need to be re-graded and re-contoured to support the re-establishment of floodplains will be revegetated with native species.</td>
<td>-</td>
<td>16.8</td>
</tr>
<tr>
<td>Protect</td>
<td>U, PSS1C, PSS1/EM1C, PEM1C, PSS1/EM1B, PSS1/4B, PSS4B, PSS4/1B, PEM1B</td>
<td>Buffer</td>
<td>Areas within a restoration buffer, plus the habitats above, will be placed under a site protection instrument to ensure the long-term performance of the restoration projects.</td>
<td>-</td>
<td>109.0</td>
</tr>
</tbody>
</table>

Total for the PRM Plan Area 8,982 221.5

*Enhanced off-channel pond habitat is within the re-established wetland floodplain habitat and not included in the total acres.
“-” Not Applicable.

Historical placer mining in the Quartz, Snow, Ruby, and Queen Gulches represents a significant portion of the existing aquatic resource impacts within the Crooked Creek watershed. Restoration of these streams; floodplains; and associated wetland, upland, and buffer areas will provide a portion of the compensatory mitigation required by the United States Army Corps of Engineers (USACE) under a Department of the Army (DA) permit for the Project.

Site Selection Criteria
The Upper Crooked Creek PRM Plan were selected to provide compensatory mitigation for the Project from a wide range of potential PRM Plans identified across the Lower Kuskokwim watershed and throughout western Alaska (6-digit HUC 190305). Among all projects considered, the potential PRM Plans identified within the Crooked Creek watershed (10-digit HUC 1903050108), where the proposed Project is primarily located, were ranked highest during the site selection process. These projects were ranked highly because they restore aquatic functions and contribute to the ecological sustainability of the impacted watershed, have a high likelihood of feasibility and success, and will require limited long-
term maintenance to achieve sustainability. The Upper Crooked Creek PRM Plans and restoration of some disturbed mine areas as wetlands at mine closure (see Attachment C of the CMP), were the only opportunities for mitigation identified in the Crooked Creek 10-digit HUC watershed. See Section 7.0 of the CMP for a discussion of how this Plan specifically enhances aquatic resources in the watershed.

The suitability of the PRM sites in the upper Crooked Creek watershed to provide compensatory mitigation for the proposed Project was determined based on the following factors:

1. Hydrologic conditions, soil characteristics, and other physical and chemical characteristics (33 CFR 332.3 (d)(i))

Previous placer mining has drastically altered the physical, hydrologic, and soil characteristics of the Crooked Creek watershed. Placer mining activities have, over time, altered the location and character of multiple tributaries to Crooked Creek. Former natural stream channels have been relocated, ditched, and diverted, and associated riverine wetland and riparian corridors have been subsequently altered or removed. These PRM Plans will reshape the altered drainages to approximate historical natural conditions in existence prior to placer mining. The projects will be supported by the natural hydrologic conditions, physical characteristics, and soil characteristics of the surrounding areas. The projects have high likelihood of success because the depth of disturbance to the hydrologic system is shallow and limited and the designs are based on pristine reference reaches within the same stream systems within the Crooked Creek watershed.

2. Watershed-scale features, such as aquatic habitat diversity, habitat connectivity, and other landscape scale functions (33 CFR 332.3(d)(ii))

The Upper Crooked Creek PRM Plans were selected, in part, because of the opportunity they provide to restore aquatic functions to a large hydrologically connected area and are in very close proximity to the impacts that they are targeted to offset. The projects will re-establish and re-connect the floodplains of Crooked Creek, Donlin Creek, Quartz Gulch, Snow Gulch, Ruby Gulch, and Queen Gulch, as well as restore hydrologic and ecologic connectivity between undisturbed areas upgradient and downgradient of the sites. The sizes and locations of the sites relative to each other and the larger Crooked Creek watershed contribute to their likelihood of success and long-term sustainability.

3. The size and location of the compensatory mitigation site relative to hydrologic sources and other ecological features [33 CFR 332.3(d)(iii)]

The hydrologic sources of these sites are perennial streams and their associated drainage basins, relying on natural existing hydrology patterns. The projects do not require active engineering devices to provide the site hydrology, increasing the likelihood of success.

4. Compatibility with adjacent land use uses and watershed management plans [33 CFR 332.3(d)(iv)]
While there is no watershed management plan for the Plan area, the proposed sites are consistent with the Alaska Department of Natural Resources (ADNR) Kuskokwim Area Plan for State Lands (1988), a goal of which is to: “protect the hydrologic, habitat, and recreational values of important public wetlands.”

5. **Reasonably foreseeable effects the compensatory mitigation project will have on ecologically important aquatic or terrestrial resources, cultural sites, or habitat for federally- or state-listed threatened and endangered species** (33 CFR 332.3(d)(v))

The upper Crooked Creek watershed contains streams, wetlands, floodplains, and riparian resources that have been adversely impacted by historical placer mining. If these areas are not restored, they will continue to be sources of sediment and erosion, and a likely place for invasive plant species to establish. These PRM Plans will restore natural vegetation, increase aquatic habitat diversity and connectivity, establish floodplain habitat, provide habitat for ecologically important wildlife species (e.g., salmonids), and maintain water quality.

6. **Other relevant factors including, but not limited to, development trends, anticipated land use changes, habitat status and trends, the relative locations of the impact and mitigation sites in the stream network, local or regional goals for the restoration or protection of particular habitat types or functions (e.g., re-establishment of habitat corridors or habitat for species of concern), water quality goals, floodplain management goals, and the relative potential for chemical contamination of the aquatic resources** [33 CFR 332.3(d)(vi)]

The PRM Plans will re-establish floodplain habitat and reduce the current sedimentation impacts to downstream aquatic ecosystems. Connection of naturalized stream and floodplain habitats to natural conditions upgradient and downgradient of the projects will result in a higher functioning and more resilient watershed. These sites are within the Crooked Creek watershed, which is the same 10-digit HUC watershed as the primary long-term aquatic resource impacts from the Project.

**Site Protection Instrument**

Donlin Gold will supply a detailed site protection instrument through a deed restriction acceptable to the USACE in advance of restoration activities. Donlin Gold has the concurrence of the surface landowner (The Kuskokwim Corporation), the subsurface landowner (Calista Corporation), and the leaseholder (the Lyman Family) to establish a site protection instrument following restoration activities. The following activities will be strictly prohibited by the site protection instrument:

- Any excavation of soils, sediments, and other substrates with the exception of any that may be related to approved habitat enhancement projects (i.e., building additional wetland or fish habitat);
- Construction of durable structures, both permanent and temporary;
- Disturbance of soil, sediment, and other substrates by mechanical equipment and transportation vehicles, except on the existing access roads;
- Mining and mining-related activities;
- Vegetation removal, clearing, cutting, or other impacts, except for subsistence food uses; and
• Storage, abandonment, stockpiling, or disposal of any earthen materials, debris, refuse, supplies, durable materials, or other manmade objects.

The Plan area, which totals 221.5 acres, will be protected under the site protection instrument (Table 2). The site protection instrument will cover the areas directly impacted by the proposed re-establishment, establishment, and rehabilitation activities as well as buffer areas to help maintain the long-term viability of the proposed projects.

Table 2 Upper Crooked Creek PRM Plan Areas Protected Under the Site Protection Instrument (Acres)

<table>
<thead>
<tr>
<th>Restoration Area</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quartz Gulch</td>
<td>45.2</td>
</tr>
<tr>
<td>Snow Gulch</td>
<td>36.7</td>
</tr>
<tr>
<td>Wash Plant Tailings Area</td>
<td>29.3</td>
</tr>
<tr>
<td>Ruby and Queen Gulches</td>
<td>110.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>221.5</strong></td>
</tr>
</tbody>
</table>

Baseline Information

Historical Placer Mining

Historical gold placer mining has occurred in the proposed restoration areas since the early twentieth century. Placer tailings and overburden have been deposited in several locations within the various floodplains, causing adverse impacts to aquatic resources (Photo 1). Water diversion ditches were constructed, resulting in the channeling of surface and shallow groundwater flow from the original stream paths. An estimated 8,700 linear feet (1.64 miles) of stream channels have been mined and the abutting wetlands degraded. No placer mining is currently ongoing in any of the drainages. Photo 2 and Photo 3 show placer disturbance in lower Snow, Ruby, and Queen Gulches.

Photo 1 Placer Mining Wash Plant Tailings Area (View toward Northwest)
Hydrology

Hydrology at the proposed restoration sites is controlled by Crooked Creek, Donlin Creek, and the following tributaries: Quartz Gulch, Snow Gulch, Ruby Gulch, and Queen Gulch. Quartz and Snow Gulches flow into Donlin Creek. Donlin Creek, Ruby Gulch, and Queen Gulch flow into Crooked Creek. Quartz, Snow, Ruby, and Queen Gulches have been extensively degraded in their lower reaches from placer mining activity. Watershed characteristics of these streams are included in Table 3.
Table 3  Watershed Characteristics of Crooked Creek Watershed Streams

<table>
<thead>
<tr>
<th>Drainage Basin</th>
<th>Crooked Creek Watershed (Percent)</th>
<th>Drainage Area (Square Miles)</th>
<th>Channel Length (Miles)</th>
<th>Slope (Percent)</th>
<th>Sinuosity</th>
<th>Dominant Rosgen Type</th>
<th>Dominant Substrate in Riffles</th>
<th>Average Wetted Width (Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quartz Gulch</td>
<td>0.35</td>
<td>1.2</td>
<td>4</td>
<td>3.2</td>
<td>1.03</td>
<td>G3g</td>
<td>gravel/cobble</td>
<td>8</td>
</tr>
<tr>
<td>Snow Gulch</td>
<td>1.01</td>
<td>3.4</td>
<td>2.6</td>
<td>1.9</td>
<td>1.04</td>
<td>G6</td>
<td>sand</td>
<td>4.4</td>
</tr>
<tr>
<td>Ruby Gulch</td>
<td>0.15</td>
<td>0.34</td>
<td>1</td>
<td>4.2</td>
<td>1.16</td>
<td>G3g</td>
<td>gravel/cobble</td>
<td>6</td>
</tr>
<tr>
<td>Queen Gulch</td>
<td>0.21</td>
<td>0.7</td>
<td>1.6</td>
<td>2.6</td>
<td>1.01</td>
<td>G3g</td>
<td>sand/gravel</td>
<td>6.6</td>
</tr>
<tr>
<td>Donlin Creek</td>
<td>9.09</td>
<td>30.5</td>
<td>16.7</td>
<td>0.4</td>
<td>1.82</td>
<td>B5c</td>
<td>gravel</td>
<td>19.9</td>
</tr>
<tr>
<td>Crooked Creek</td>
<td>100</td>
<td>335.5</td>
<td>33.4</td>
<td>0.2</td>
<td>1.62</td>
<td>C4</td>
<td>gravel/cobble</td>
<td>~60</td>
</tr>
</tbody>
</table>

Sources: OtterTail 2012, Rosgen and Silvey 2006, USGS 2017

Quartz Gulch is a small, high-gradient drainage with an area of 1.2 square miles. This drainage has been extensively placer mined in its lower end, and silt from this area continues to be transported into Donlin Creek during high storm events.

Snow Gulch is a small tributary of Donlin Creek. The Snow Gulch drainage area is 3.4 square miles with a main channel length of 2.6 miles and mean basin elevation of 1,015 feet. The lower end of the Snow Gulch drainage has been extensively placer mined and rerouted, but above the existing mined area the stream is essentially undisturbed (OtterTail 2012). The upgradient undisturbed portion of Snow Gulch Creek varies from a deeply incised channel with silt substrates to meandering sections with gravel substrates and beaver activity.

Ruby Gulch is the smallest drainage in the Plan area, draining 0.34 square miles. The downstream end has been extensively placer mined. All the flow from Ruby Gulch flows into a series of ponds, which also receive flows from Queen Gulch, formed from previous mining.

Queen Gulch drains an area of 0.7 square miles. The lower end of Queen Gulch has been severely disturbed by placer mining. Above the mined area, the Queen Gulch stream channel is small and the gradient is relatively steep (OtterTail 2012). The lower end of the stream flows over tailings, dropping approximately 8 feet onto the Crooked Creek floodplain. All the flow from the series of ponds fed by Ruby and Queen Gulches is directed into a ditch that flows parallel to Crooked Creek for 2,400 feet before its confluence with Crooked Creek.

Donlin Creek and its tributaries drain an area of 30.5 square miles. Donlin Creek joins Flat Creek to become Crooked Creek between Snow and Ruby Gulches. Donlin Creek has a moderate gradient and relatively high sinuosity, resulting in classic riffle-run-pool habitat types. Although heavy icing during winter results in some sections of the stream freezing solid, pool depth is generally sufficient to provide fish overwintering habitat, or at a minimum egg incubation for coho salmon. Gravel and cobble are the dominant substrates in riffles throughout much of the Donlin Creek mainstem.
The upstream end of Crooked Creek is at the confluence of Donlin and Flat Creeks. The Crooked Creek watershed covers 336 square miles and ranges in elevation from 135 feet to 3,610 feet, with a total basin relief of approximately 3,475 feet and a mean basin elevation of 856 feet. The main channel length is approximately 49 miles. The morphology of Crooked Creek between Anaconda Creek and the Donlin Creek-Flat Creek confluence is typical of a low gradient sinuous stream, characterized by riffle-pool channel types. Channel bed material in the steeper riffle sections is predominately coarse gravel and sand, and in the lower gradient pool sections is predominately sand and silt. The upper Crooked Creek tributaries that have been impacted by placer mining include Quartz, Snow, Lewis, Ruby, and Queen Gulches (OtterTail 2012).

**Fisheries**

Populations of Chinook, chum, and coho salmon as well as limited numbers of sockeye and pink salmon have been recorded in Crooked Creek. Additionally, Dolly Varden, Arctic grayling, slimy sculpin, burbot, and round whitefish are present in Crooked and Donlin Creeks. Surveys in Snow Gulch have documented the presence of Dolly Varden and occasionally adult coho salmon in the lower reaches attempting to migrate upstream. Surveys in Crooked Creek have documented presence of Chinook, coho, and chum salmon above Queen Gulch, and coho and chum salmon above Snow Gulch. In aerial surveys of the mainstems of Crooked and Donlin Creeks, over 90 percent of chum and Chinook salmon adults documented were present in the lower drainage downstream from Eagle Creek (approximately 6 miles downstream from Queen Gulch), while 67 percent of coho salmon adults documented were identified in upstream areas in the drainage, in Donlin Creek. Table 4 lists fish species present by drainage.

<table>
<thead>
<tr>
<th>Table 4</th>
<th>Summary of Fish Presence 2004 — 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Salmon Species</strong></td>
<td><strong>Resident Fish Species</strong></td>
</tr>
<tr>
<td>Quartz Gulch</td>
<td></td>
</tr>
<tr>
<td>Snow Gulch</td>
<td></td>
</tr>
<tr>
<td>Ruby Gulch</td>
<td></td>
</tr>
<tr>
<td>Queen Gulch</td>
<td></td>
</tr>
<tr>
<td>Donlin Creek</td>
<td></td>
</tr>
<tr>
<td>Crooked Creek</td>
<td></td>
</tr>
</tbody>
</table>

Sources: ADF&G 2010; OtterTail 2012, 2014

Figure 2 shows the resident fish species present and the adult salmon densities in the Crooked Creek watershed, including in the upper Crooked Creek drainages. The section of Crooked Creek receiving input from placer mining-impacted tributaries has reduced salmon densities compared to upstream and downstream reaches. Fish surveys have also documented reduced fisheries use numbers at sampling locations downstream of Snow Gulch compared to upstream points.
Figure 2  Fish Species Present and Adult Salmon Densities in Upper Crooked Creek Drainages

Source: OtterTail Environmental, Inc 2014
OtterTail Environmental, Inc. (OtterTail) conducted habitat research and baseline fish and aquatic invertebrate sampling from 2004 through 2014 (OtterTail 2014). They found that Crooked Creek exhibited a similar composition but lower abundance of fish and invertebrate species compared to other similarly sized tributaries to the Kuskokwim River. They attributed this finding to the naturally high siltation rates and cobble embeddedness in Crooked Creek, which appeared to be higher on average than other similarly sized tributaries (OtterTail 2014). These results may be partial evidence that the long-term placer mining activity has influenced the fisheries habitat in the downstream reaches of Donlin and Crooked Creeks. Sedimentation and siltation may have degraded downstream fish habitat. Historical aerial photographs taken during active mining in the early 1950s clearly show high volumes of sediments entering the mainstem streams and suggest likely impacts to substrate gravels and siltation. Additionally, fish presence is limited in the lower reaches of the Plan area drainages due to obstacles created from previous placer mining. Alteration and degradation of floodplains have contributed to steep and unstable stream channels and narrowed hydraulic conveyances that are susceptible to beaver activity, resulting in loss of fish passage.

Soils
Crooked Creek is within the Western Interior Rivers Soil Survey Area based on Soil Survey Geographic Database mapping by the United States Department of Agriculture, Natural Resources Conservation Service (NRCS 2008). The restoration sites are underlain by two soil map units: 1) the Yukon-Kuskokwim Highlands, Boreal Floodplains, and Terraces (R30FPA); and 2) the Yukon-Kuskokwim Highlands, and Boreal and Subalpine Mountains (R30MTC). Unit R30FPA is located in the floodplain of Donlin and Crooked Creeks. Soil organic depths are typically 0 to 4 inches, composed of peat and other organic matter for boreal scrub, silty terraces. Unit R30MTC is located on the slopes east of Donlin and Crooked Creeks, including Quartz, Snow, Ruby, and Queen Gulches. Soil organic depths are typically 0 to 7 inches, composed of stratified peat to silt loam for boreal scrub, silty colluvial slopes. The dominant mineral soil texture is silt loam. Additional soils information is provided in the 2016 Preliminary Jurisdictional Determination (PJD) Report prepared for the restoration sites (Michael Baker 2016).

Vegetation Types
The disturbed areas within the Plan area are currently dominated by open willow shrub (OWS) and open alder willow shrub (OAWS) communities in wetland areas, and disturbance-related shrub and sapling re-growth (DSSR) in upland areas. OWS and OAWS communities contain limited to no tree cover and an open canopy of shrubs (25 to 74 percent cover) in which willow (Salix spp.) and/or alders (Alnus spp.) are dominant. DSSR communities contain young re-growth of tree species (e.g., birch [Betula neoalaskana], spruce [Picea spp.], aspen and balsam poplar [Populus spp.]) and ericaceous shrubs on previously disturbed areas. The vegetation types present in the restoration sites were described in the 2016 PJD (Michael Baker 2016).

Wetlands
Wetland mapping and descriptions of wetland types present in the Plan area were provided in the 2016 PJD (Michael Baker 2016). Table 5 shows acreages of each resource type within the four restoration areas.
### Table 5  Upper Crooked Creek PRM Plan Restoration Areas Current Resource Types, by Site (Acres)

<table>
<thead>
<tr>
<th>Resource Type</th>
<th>Area (Acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quartz Gulch Restoration Area</strong></td>
<td></td>
</tr>
<tr>
<td>Wetland</td>
<td>25.2</td>
</tr>
<tr>
<td>Disturbed Wetland</td>
<td>8.7</td>
</tr>
<tr>
<td>Disturbed Waterbody</td>
<td>0.4</td>
</tr>
<tr>
<td>Disturbed Upland</td>
<td>8.5</td>
</tr>
<tr>
<td>Upland</td>
<td>2.2</td>
</tr>
<tr>
<td><strong>Quartz Gulch Restoration Area Total</strong></td>
<td>45.2</td>
</tr>
<tr>
<td><strong>Snow Gulch Restoration Area</strong></td>
<td></td>
</tr>
<tr>
<td>Wetland</td>
<td>17.8</td>
</tr>
<tr>
<td>Waterbody</td>
<td>0.9</td>
</tr>
<tr>
<td>Disturbed Wetland</td>
<td>1.7</td>
</tr>
<tr>
<td>Disturbed Waterbody</td>
<td>1.7</td>
</tr>
<tr>
<td>Disturbed Upland</td>
<td>14.6</td>
</tr>
<tr>
<td><strong>Snow Gulch Restoration Area Total</strong></td>
<td>36.7</td>
</tr>
<tr>
<td><strong>Tailings Restoration Area</strong></td>
<td></td>
</tr>
<tr>
<td>Wetland</td>
<td>12.2</td>
</tr>
<tr>
<td>Disturbed Wetland</td>
<td>4.9</td>
</tr>
<tr>
<td>Disturbed Waterbody</td>
<td>0.7</td>
</tr>
<tr>
<td>Disturbed Upland</td>
<td>7.9</td>
</tr>
<tr>
<td>Upland</td>
<td>3.3</td>
</tr>
<tr>
<td><strong>Wash Plant Tailings Area Total</strong></td>
<td>29.3</td>
</tr>
<tr>
<td><strong>Ruby/Queen Gulch Restoration Area</strong></td>
<td></td>
</tr>
<tr>
<td>Wetland</td>
<td>56.6</td>
</tr>
<tr>
<td>Waterbody</td>
<td>1.2</td>
</tr>
<tr>
<td>Disturbed Wetland</td>
<td>4.7</td>
</tr>
<tr>
<td>Disturbed Waterbody</td>
<td>4.7</td>
</tr>
<tr>
<td>Disturbed Upland</td>
<td>31.4</td>
</tr>
<tr>
<td>Upland</td>
<td>11.7</td>
</tr>
<tr>
<td><strong>Ruby/Queen Gulch Restoration Area Total</strong></td>
<td>110.3</td>
</tr>
<tr>
<td><strong>Total Area</strong></td>
<td>221.5</td>
</tr>
</tbody>
</table>

Note: Inconsistencies in sums are due to rounding.

**Non-native Plant Species**

Not all non-native species are considered invasive and a risk to natural ecosystems. To prioritize species management tasks, Alaska Natural Heritage Program staff, in cooperation with other agencies, developed a system to summarize the risk a non-native species poses to natural habitats in Alaska as a numerical score with a corresponding invasiveness ranking (Carlson et al. 2008). A score greater than 70 is considered “Highly Invasive,” indicative of a species likely to pose a serious threat to natural ecosystems in Alaska. Species with scores of 60 to 69 and 50 to 59 are considered “Moderately Invasive.”
and “Modestly Invasive,” respectively, while those with scores between 40 and 49 are considered “Weakly Invasive,” and scores below 40 are considered “Very Weakly Invasive” (Carlson et al. 2008, Nawrocki et al. 2011).

Surveys of the Project area in 2014 found eight non-native plant species present in the vicinity of the Lyman yard and airstrip in Snow Gulch (Moody 2015, Table 6). No Highly Invasive species were found. A survey of non-native plant species presence and extent will be conducted within all of the Plan area prior to initiation of mitigation activities.

**Table 6 Non-native Plant Species in Snow Gulch**

<table>
<thead>
<tr>
<th>Species</th>
<th>Invasiveness Score</th>
<th>Invasiveness Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Matricaria discoidea</em> (pineapple-weed)</td>
<td>32</td>
<td>Very Weakly Invasive</td>
</tr>
<tr>
<td><em>Stellaria media</em> (common chickweed)</td>
<td>42</td>
<td>Weakly Invasive</td>
</tr>
<tr>
<td><em>Plantago major</em> (common plantain)</td>
<td>44</td>
<td>Weakly Invasive</td>
</tr>
<tr>
<td><em>Poa pratensis</em> ssp. <em>pratensis</em> (Kentucky bluegrass)</td>
<td>52</td>
<td>Modestly Invasive</td>
</tr>
<tr>
<td><em>Trifolium hybridum</em> (alsike clover)</td>
<td>57</td>
<td>Modestly Invasive</td>
</tr>
<tr>
<td><em>Taraxacum officinale</em> (common dandelion)</td>
<td>58</td>
<td>Modestly Invasive</td>
</tr>
<tr>
<td><em>Leucanthemum vulgare</em> (oxeye daisy)</td>
<td>61</td>
<td>Moderately Invasive</td>
</tr>
<tr>
<td><em>Hordeum jubatum</em> (foxtail barley)</td>
<td>63</td>
<td>Moderately Invasive</td>
</tr>
</tbody>
</table>

Sources: Moody 2015, Carlson et al. 2008, Nawrocki et al. 2011

**Determination of Credits**

For this Plan, watershed restoration mitigation credits are measured in acres of wetland floodplain habitat and off-channel stream habitat restored and enhanced, while mitigation credits for stream restoration are measured in linear feet of stream channel restored. The Plan will produce 95.7 wetland acre credits and 8,982 linear feet of stream credits. The reshaping of the watersheds and stream channels will allow for proper hydrologic functioning and re-establishment of natural wetland floodplain habitat. Placer mining ponds will be deepened to create overwintering habitat and littoral zones will be added. Littoral zones are productive areas of aquatic ecosystems, allowing for nutrient retention and cycling of elements, shoreline and sediment stabilization, aquatic vegetation growth, refuge for juvenile fish, and organic material inputs (Peters and Lodge 2009). Table 7 shows the acreage and linear feet of re-established and enhanced aquatic resources and associated habitats. Table 1 contains the expected mitigation credits by NWI classification associated with this Plan.

Buffers around the reestablished and enhanced habitats will also be protected under the site protection instrument to maintain the long-term viability of the aquatic resource. These buffers will provide protection of the restored aquatic habitats from future disturbance, including sedimentation, and will maintain permanent connections to Crooked Creek. Buffer areas function to maintain water quality, limit sediment loads, maintain thermal processes, maintain microclimatic conditions, filter particulates and metals from remaining placer stockpiles, filter nutrients, provide organic matter inputs, maintain habitat for wildlife, and serve as corridors for wildlife movement. Buffer areas process pollutants and
prevent the areas from serving as a source of pollution by slowing surface flow and allowing for infiltration before water reaches downslope wetlands and streams.

Table 7: Acreage and Linear Feet of Resources Re-established, Enhanced, and Protected by the Upper Crooked Creek PRM

<table>
<thead>
<tr>
<th>Resource Description</th>
<th>Quartz Gulch</th>
<th>Snow Gulch</th>
<th>Wash Plant Tailings Area</th>
<th>Ruby and Queen Gulches</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-establishment of Stream Channels to Pre-mining Conditions (Linear Feet)</td>
<td>1,630</td>
<td>4,421</td>
<td>-</td>
<td>2,931</td>
<td>8,982</td>
</tr>
<tr>
<td>Re-establishment of Wetland Floodplain Habitat (Acres)</td>
<td>13.1</td>
<td>21.9</td>
<td>11.4</td>
<td>49.3</td>
<td>95.7</td>
</tr>
<tr>
<td>Enhancement of Off-channel Pond Habitat (Acres)*</td>
<td>-</td>
<td>2.7*</td>
<td>0.5*</td>
<td>12.0*</td>
<td>15.2*</td>
</tr>
<tr>
<td>Enhancement of Terrestrial Habitat (Acres)</td>
<td>2.5</td>
<td>3.4</td>
<td>2.4</td>
<td>8.5</td>
<td>16.8</td>
</tr>
<tr>
<td>Protection of Buffer Areas (Acres)</td>
<td>29.5</td>
<td>11.4</td>
<td>15.6</td>
<td>52.5</td>
<td>109.0</td>
</tr>
<tr>
<td><strong>Total Protected under Site Protection Instrument (Acres)</strong></td>
<td><strong>45.2</strong></td>
<td><strong>36.7</strong></td>
<td><strong>29.3</strong></td>
<td><strong>110.3</strong></td>
<td><strong>221.5</strong></td>
</tr>
</tbody>
</table>

* Acreage of enhanced off-channel pond habitat is included within the re-established wetland floodplain habitat.

“-” Not Applicable.

Note: Inconsistencies in sums are due to rounding.

These acreages are further broken down, for application of mitigation credits, into aquatic resource types and HGM categories in Table 8.
### Table 8  Upper Crooked Creek HGM Summary

<table>
<thead>
<tr>
<th>Aquatic Resource Type</th>
<th>HGM</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wetland</td>
<td>Depressional</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td>Flat</td>
<td>32.7</td>
</tr>
<tr>
<td></td>
<td>Riverine (non-anadromous)</td>
<td>93.0</td>
</tr>
<tr>
<td></td>
<td>Riverine (anadromous)</td>
<td>18.0</td>
</tr>
<tr>
<td></td>
<td>Slope</td>
<td>11.6</td>
</tr>
<tr>
<td>Stream</td>
<td>Riverine Channel</td>
<td>3.6</td>
</tr>
<tr>
<td>Upland</td>
<td>N/A</td>
<td>61.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>221.5</strong></td>
</tr>
</tbody>
</table>

The 100-foot buffer size for this Plan was selected using guidance from the ADNR Kuskokwim Area Plan for State Lands (1988). ADNR’s plan states that a 100-foot buffer on wetlands with an outlet will minimize adverse impacts on the important functions of wetlands. ADNR’s information represents the best available information in this region of Alaska for protecting and maintaining the ecological functions associated with aquatic resources. Upstream of restoration areas, buffers are 100 feet, while downstream of restoration areas they are expanded to include all surface and subsurface hydrologic connections to Crooked and Donlin Creeks. The size of the buffers are reduced at Snow Gulch site due to land ownership restrictions associated with the homestead at the Lyman property. Overall, approximately 109 acres of upland and wetland buffer area (in addition to the re-established and enhanced areas) will be protected under the site protection instrument (Figure 1).

### Mitigation Work Plan

Site-specific preliminary work plans have been prepared for each of the four restoration areas. These work plans are provided in the following sections. Restoration design parameters will be finalized based on detailed field surveys of the sites, which will serve as a final refinement of the restoration plans that will include timing, grading plans, overburden removal, revegetation design plans, erosion control, and dewatering, as well as stream plan/profile form and function and stream diversion plans for stream work. This design effort will address and finalize the functional hydrologic and geomorphic parameters, and serve as a basis for restoration construction management, inspection, and quality control. Final design documents shall be subject to USACE approval.
At this time, there are limited reference reach studies for the restoration sites. Much of the data collected on reference reaches are, by default, the areas upstream and downstream of the disturbed portions of these gulches. The actual mined areas proposed for mitigation are associated with the transition zones where the steep side gulches flatten out as they meet the Donlin Creek and Crooked Creek floodplains. These are where the gold placers were deposited over time and where subsequent mining caused the most disturbances. The following preliminary hydraulic and habitat functional designs for each area are proposed. These designs are based on existing information as follows:

1. High resolution aerial photography of the area, and ground surveyed topography augmented with Light Detection and Ranging (LiDAR) digital elevation mapping.


3. Hydrologic analyses of stream flows, both of existing conditions and with potential impacts from the Project, performed by BGC Engineering. These analyses utilized surface and groundwater modeling to assess existing flows as well as USGS regression analysis of projected flood flows. The values used in these restoration designs are based on 2-year and 100-year flood flows without the potential drawdown in groundwater associated with mine development or potential attenuation effects of the planned water reservoir in the upper reaches of Snow Gulch.

4. Extensive fisheries work performed by OtterTail Environmental, Inc. from 2004 through 2014 (OtterTail 2004), and Owl Ridge Resource Consultants in 2016–2017. This work catalogued the current usage of streams in the upper Crooked Creek watershed by anadromous and resident fish populations and made site-specific recommendations for habitat restoration in the upper Crooked Creek placer mining areas. Recommendations included the reclamation habitats best suited to each drainage considering fish species most likely to benefit from the restoration.

Prior to final submittal of design documents, a more detailed stream and topographic survey of these and adjacent unmined gulches will be conducted to establish baseline reference reach parameters to guide the designs. Determination of a full suite of geomorphic measurement parameters will be made and incorporated into both the design and performance standards. These parameters will ensure the appropriateness of the design and measure the performance of the completed restoration over time.

Although reference reach information will help guide the design process, some of the proposed restoration work involves creation of significant ponded features that are not natural features of this watershed. As such, these features will rely more heavily on the experience of fisheries, wetland, and stream reconstruction specialists. Enhancement of fisheries habitat is the design goal of these non-stream enhancements.

**Restoration Timing**

Construction of the four restoration projects is planned to occur over four consecutive years, with the potential for some to occur simultaneously. Work at each restoration area will require one construction season. A general schedule for a restoration area is shown in Table 9.
The restoration areas will be revegetated promptly after completion of earth-disturbing activities to reduce the potential for erosion, sedimentation, and invasive species colonization. Revegetation will be conducted no later than the beginning of the first growing season after construction is completed. Revegetation activities will be performed in accordance with the final revegetation design plan, which will identify targeted vegetation communities for each revegetation area. The final revegetation design plan will be part of the final design package and will be provided to USACE prior to implementation.

Revegetation will be conducted using guidance from the Interior Alaska Revegetation and Erosion Control Guide (Czapla and Wright 2012) and the Streambank Revegetation and Protection Guide (ADF&G 2005). Methods and techniques will be determined by site conditions, including soils, hydrography, slope, and aspect, but may include seeding grasses, planting willow cuttings or other shrubs, spreading charged overburden, and allowing natural re-colonization. Mulches, topsoil, and fertilizer will be placed as conditions warrant. Certified weed-free seed mixes will be used.

**Table 9  Typical Construction Schedule for a Restoration Area**

<table>
<thead>
<tr>
<th>Season</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year 1</strong></td>
<td></td>
</tr>
<tr>
<td>Summer</td>
<td>Conduct stream channel work during this low-flow period. Reshaping of floodplains, regrading of tailings areas, filling of ditches, and pond construction activities may also occur in late summer.</td>
</tr>
<tr>
<td>Fall and Winter</td>
<td>Conduct continued reshaping of floodplains, regrading of tailings areas, filling of ditches, and pond construction activities, which may occur in wet or flooded areas.</td>
</tr>
<tr>
<td><strong>Year 2</strong></td>
<td></td>
</tr>
<tr>
<td>Spring</td>
<td>Conduct post-construction survey after break-up; plant willow cuttings to stabilize stream banks.</td>
</tr>
<tr>
<td>Early Summer</td>
<td>Perform revegetation activities.</td>
</tr>
<tr>
<td>Winter</td>
<td>Submit design criteria monitoring report.</td>
</tr>
<tr>
<td><strong>Years 3-6</strong></td>
<td></td>
</tr>
<tr>
<td>Summer</td>
<td>Conduct monitoring activities; perform any required management activities to ensure performance standards are met.</td>
</tr>
<tr>
<td>Winter</td>
<td>Submit monitoring report.</td>
</tr>
<tr>
<td><strong>Year 7</strong></td>
<td></td>
</tr>
<tr>
<td>Summer</td>
<td>Conduct monitoring activities.</td>
</tr>
<tr>
<td>Winter</td>
<td>Submit final monitoring report and monitoring closeout report (for entire Plan area assuming performance standards are met).</td>
</tr>
</tbody>
</table>

**Quartz Gulch**

**Quartz Gulch Existing Conditions**

Historical placer mining in Quartz Gulch has left a heavily impacted, but partially revegetated, stream valley (Appendix D-1, Figure 2). The gulch bottom was stripped of vegetation and mined, and spoil piles were pushed to the sides of the valley floor. Some of these disturbed areas have had significant time to...
revegetate. Much of the lower portion of the gulch has been re-contoured, leaving a series of ditches, spoils piles, and an impacted stream channel. At the upper end of the previously mined area, the gulch and stream channel have been cut with a cross ditch that collects groundwater and surface waters and re-directs flow along the west side of the gulch for approximately 1,100 linear feet. In the existing condition, this lateral ditch leaks water downslope, and fish passage can be blocked during low flow periods. In its present location, the stream is above the water table and loses flow to groundwater, a significant loss during low flow conditions.

Although the main course of the stream follows the mining ditch along the west side of the gulch, a secondary stream has re-established in the bottom of the valley, fed by surface water from the east side of the watershed as well as groundwater seepage from the perched mining ditch on the west side of the gulch. Historical aerial photographs show the original stream followed the path of the secondary stream fairly closely in the upper portion of the gulch. Lower in the gulch, the ditch discharges back to the valley floor and follows the original valley bottom in a less confined channel, through what appears to be an adequate and substantially revegetated floodplain. Where the stream enters the Donlin Creek floodplain, it has created a small back water stream along the mainstem. The stream eventually enters a second, long diversion ditch that bypasses a section of the Donlin Creek floodplain, including an abandoned oxbow, and discharges to Donlin Creek approximately 900 feet downstream. This ditch lowers the water table in the bypassed portion of the Donlin Creek floodplain and creates a potential bypass risk for the mainstem of Donlin Creek. A mainstem bypass of this type would result in substantial loss of natural aquatic habitat.

Existing conditions in Quartz Gulch are depicted in Appendix D-1, Figure 2.

**Quartz Gulch Restoration**

The proposed restoration activities include filling the diversion ditch features in Quartz Gulch and the Donlin Creek floodplain, directing the flows in the upper portion of Quartz Gulch to the secondary stream channel along the original stream path, and allowing the backwatered flows to return to Donlin Creek via the abandoned oxbow in the lower end of the system. Elimination of the mining ditch in the upper portion of the gulch will re-establish the historical channel along the valley floor. This movement of the main channel should return the stream to a more stable hydrologic regime and remove the hydraulically losing reach from the system. The removal of both ditch sections will result in expanded floodplain overbank flow function for the re-established stream sections in Quartz Gulch and Donlin Creek.

A preliminary estimate of the stream restoration parameters for Quartz Gulch is included in Table 10. As the engineering design progresses, further refinements will be made based on reference reach parameters where available, or Rosgen and regional functional parameters for drainages with similar watershed characteristics.
Table 10  Preliminary Design Parameters for Quartz Gulch

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Preliminary Design Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basin Area</td>
<td>1.18 square miles</td>
</tr>
<tr>
<td>Stream Type (Rosgen)</td>
<td>G3</td>
</tr>
<tr>
<td>Q2</td>
<td>22.8 cubic feet/second, 3.9 feet/second</td>
</tr>
<tr>
<td>Q100</td>
<td>125 cubic feet/second, 3.6 feet/second</td>
</tr>
<tr>
<td>Valley Slope (average)</td>
<td>Less than 5%</td>
</tr>
<tr>
<td>Channel Slopes</td>
<td>Upper Reach 4.7%, Mid Reach Step 16%, Lower Reach 2.8%</td>
</tr>
<tr>
<td>Bank Full Width</td>
<td>7–12 feet</td>
</tr>
<tr>
<td>Ordinary High Water Width</td>
<td>3–8 feet</td>
</tr>
<tr>
<td>Floodplain Width</td>
<td>35–70 feet (narrower in steeper sections)</td>
</tr>
<tr>
<td>Bank Height Ratio (BHR)</td>
<td>Less than 1.2</td>
</tr>
<tr>
<td>Entrenchment Ratio (ER)</td>
<td>Greater than 3</td>
</tr>
<tr>
<td>Width:Depth Ratio</td>
<td>Stable</td>
</tr>
<tr>
<td>Profile Form</td>
<td>Riffle-Pool or Riffle-Run-Pool</td>
</tr>
<tr>
<td></td>
<td>Step Pools (step section)</td>
</tr>
<tr>
<td>Sinuosity</td>
<td>1.35; straighter in steeper sections</td>
</tr>
<tr>
<td>Belt Width</td>
<td>20-25 feet</td>
</tr>
<tr>
<td>Channel Depth</td>
<td>1.0 foot in riffles</td>
</tr>
<tr>
<td></td>
<td>1.8 feet in pools</td>
</tr>
<tr>
<td>Ripple Spacing</td>
<td>+/- 20 feet</td>
</tr>
<tr>
<td>Grade Control</td>
<td>Large wood debris, roots of bank vegetation, larger rock</td>
</tr>
<tr>
<td></td>
<td>substrate</td>
</tr>
</tbody>
</table>

Subject to final design refinement, the following work plan sequence is proposed for Quartz Gulch. Appendix D-1, Figure 3 illustrates the components of this work plan. Appendix D-1, Figure 4 illustrates the proposed outcome of the restoration. The work plan includes:

1. Backfill diversion ditch in the Donlin Creek floodplain, utilizing the side cast spoils pile left from the original excavation. Return the ground contours to elevations consistent with the surrounding floodplain and revegetate this area with native species per the revegetation design plan. This work will increase surface and groundwater elevations in the surrounding floodplain, divert Quartz Gulch flows back to Donlin Creek via the abandoned oxbow upstream of the ditch, restore natural hydrology allowing for natural re-establishment of wetlands, and provide a settlement area for runoff from any subsequent restoration work further upstream in Quartz Gulch.

2. Survey the historical stream channel area in the upper gulch to determine if this channel contains the necessary hydraulic form and habitat functional components for re-watering. This channel will be assessed based on the finalized design parameters. Any augmentation of this existing channel will be carried out prior to re-watering. It is anticipated that work in this area will be minimally
invasive to preserve the revegetated portions of the mined areas as much as possible. Appendix D-2, Sheets 1 and 2 show the preliminary cross section and profile of the restored stream channel.

3. Refill the cross gulch and lateral slope ditch with existing onsite spoils, and return the full flow to the gulch floor channel. Filling the ditch will return pre-mining ground and surface flows to a sustainable and more habitat-diverse channel in the valley floor. This is also expected to increase flows in the rerouted section across a wide range of hydraulic conditions, especially during low and winter flow conditions.

Table 11 is a summary of the Quartz Gulch Restoration Area restoration activities.

<table>
<thead>
<tr>
<th>Restoration Activity</th>
<th>Habitat Type</th>
<th>Linear Feet</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-establish Stream channels</td>
<td>1,630</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Re-establish Floodplain habitat</td>
<td>-</td>
<td>9.7</td>
<td></td>
</tr>
<tr>
<td>Re-establish Floodplain habitat (includes revegetation)</td>
<td>-</td>
<td>3.4</td>
<td></td>
</tr>
<tr>
<td>Enhance Terrestrial habitat (includes revegetation)</td>
<td>-</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Protect Buffer</td>
<td>-</td>
<td>29.5</td>
<td></td>
</tr>
</tbody>
</table>

Total 1,630 45.2*

*Entire area will be covered under the site protection instrument. 
“-” Not Applicable.

The results of these proposed hydraulic and geomorphic functional restorations on the fisheries resources are as follows:

- An increase in rearing habitats for resident fish and coho salmon juveniles in the lower reaches of Quartz Gulch, and the adjacent Donlin Creek floodplain and oxbow.
- Improved low water and slightly improved winter flows within Quartz Gulch, improving summer rearing opportunities and year-round resident fish habitat.
- Better temperature regimes for resident and rearing fisheries populations resulting from the replacement of ditched flows with more natural and better shaded valley floor stream channels.
- Long-term reduction in substrate embeddedness and potential spawning habitat improvements in Crooked Creek through improved water quality and reductions of suspended solids in Quartz Gulch and downstream reaches of Donlin Creek, especially at higher flows.

Snow Gulch

Snow Gulch Existing Conditions
Lower Snow Gulch has been impacted by disturbance that began in 1910 and continued through 2016. Mining has resulted in several changes that have impacted the aquatic resources, both in Snow Gulch and the adjacent Donlin Creek floodplain. In addition to the release of large quantities of suspended sediments into the watershed, as evidenced by historical imagery, placer mining activities have left three areas of excavated ponds (upper, middle, and lower) connected by the stream, which has been diverted and channelized in several areas. The remnant stream, ponds, and valley bottom exhibit steep
unstable side slopes, filled wetland areas, unsustainable stream channel gradients, little or no floodplains, disconnected groundwater and surface waters, and denuded erosional features that occasionally contribute sediment during high flow events.

The primary obstacle to overcome at this site is that the excavated ponds have created flat sections in the post-placer mining valley stream profile, resulting in an unnaturally steep gradient for the remaining portions of the stream profile. The pre-mining valley slope is approximately 2 percent from above the upper pond to the outfall into the lowest excavation pond. Portions of the existing channelized stream slope approach 10 percent. A second challenge is the lack of any significant overbank floodplain along the current excavated stream channel. The resultant steepened and confined channel exhibits high velocity scour from flood flows, which results in unstable banks and suspended sediment, especially during high flow events.

Existing conditions in Snow Gulch are depicted in Appendix D-1, Figure 5.

**Snow Gulch Restoration**

Restoration of Snow Gulch will involve restoration of a sustainable stream channel as well as restoration and revegetation of the floodplain in the lower gulch, modification of the excavated ponds to create shallow and deep water (greater than 6 feet) aquatic habitats, and re-connection of groundwater and surface waters to the Donlin Creek floodplain.

To restore this stream system, a new channel will be constructed between the lower and middle ponds from the substrate materials that originally formed the historical channel. The new channel will exhibit scour and sediment transport properties consistent with the original sediments, geometry, gradients, and resultant flood flow velocities. The new channel will be designed to mimic the parameters of the pre-mining system based on calculations from undisturbed sections of Snow Gulch and from analysis of flood flow hydraulics. Portions of the regionally rare and productive habitat provided by the middle ponds will be retained.

In Snow Gulch, the upper and middle excavated ponds will be enhanced to create additional fish and quiescent water habitat. A portion of the northern end of the middle pond will be filled to gain additional length for the proposed re-constructed channel. Additional length is needed for the created channel to approach the gradient parameter of the original system in the sections that are now flat open water ponds. A sinuous channel routing will be chosen to minimize cut and fill requirements, following a detailed survey of the area prior to construction. Stream channel substrate will be locally available fill materials with sufficient fines (greater than 20 percent) to sustain surface flows, and may be augmented with larger rock and woody debris features as needed to provide aquatic invertebrate substrate, hydraulic cover, low flow channelization for fish, and grade control to maintain channel stability.

A fish passage conveyance may be required on at least one access route linking the Lyman airstrip, which runs along the east side of Snow Gulch, with the facilities on the southwest side of the middle pond. If the structure is located in the backwater between the middle ponds, a simple, large diameter, round culvert will be sufficient. If this structure is located along the stream channel, the final design will contain provisions for a stream simulation designed conveyance with width equal to 120 percent of the stream bank full width.
The historical connection from Snow Gulch to Donlin Creek is currently blocked by a berm on the west side of the lower pond. The historical channel feature, while difficult to see from current aerials, shows up prominently in black and white aerial photographs from 1953 (Figure 3). To re-establish the connection with the Donlin Creek floodplain, the berm surrounding the west and north ends of the lowest pond will be removed and the current connection from the pond to Donlin Creek will be filled. Removal of the berm will funnel stream flow back into the historical channel west of the pond, and re-water off-channel habitat. The lower pond will be excavated and provide additional settlement area to improve downstream water quality.

**Figure 3** Comparison of Recent and Historical Aerial Imagery for Snow Gulch Outlet to Donlin Creek

2016 Aerial Photography

1953 Aerial Photography
(USGS EarthExplorer)

Note: Post-construction stream channel and ponds shown on both images.

A portion of the historical connection between the lower pond and Donlin Creek will have to be re-excavated to remove placer tailings, but the remaining oxbow channel will be re-watered in its present condition. Reintroduced stream flows are expected to reform a small thalweg within the oversized and vegetated channel. These historical channels are typically incised less than 1.5 to 3 feet into the surrounding floodplain, which makes it difficult for beavers to completely block fish passage. Inclusion of historical channels in the completed channel design should protect the system from blockage by beavers, a problem that currently exists in the narrow, deeply incised ditch exiting the middle and lower ponds. The pond margins themselves will be returned to an elevation approximately equal to the surrounding floodplain, making blockage of fish passage by beaver dams difficult. It is assumed that the original floodplain vegetated mat will be encountered as the placer mining tailings are removed, which will both serve as a vertical indicator for excavation and provide substrate for the revegetation efforts.
A short section of the existing berm will be retained on the east side of the lower pond to prevent Donlin Creek from meandering through the pond at flood flows. Once established as a semi-natural feature, the pond will be allowed to return to the natural morphology of the surrounding floodplain and will not be artificially maintained.

A preliminary estimate of the stream restoration parameters for Snow Gulch is included in Table 12. As the engineering design progresses, further refinements will be made based on reference reach parameters where available, or Rosgen and regional functional parameters for drainages with similar watershed characteristics.

### Table 12 Historical and Preliminary Design Parameters for Snow Gulch

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Historical (Pre-Mining) Value</th>
<th>Preliminary Design Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basin Area (Square Miles)</td>
<td>3.41</td>
<td>3.41</td>
</tr>
<tr>
<td>Stream Type (Rosgen)</td>
<td>G3</td>
<td>G3</td>
</tr>
<tr>
<td>100-year Flood Flow Q100 (Cubic Feet/Second)</td>
<td>271</td>
<td>271</td>
</tr>
<tr>
<td>100-year Flood Velocity (Feet/Second), Floodplain</td>
<td>N/A</td>
<td>4.0</td>
</tr>
<tr>
<td>2-year Flood Flows Q2 (Cubic Feet/Second)</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>2-year Flood Velocity (Feet/Second), Bank Full</td>
<td>N/A</td>
<td>4.0</td>
</tr>
<tr>
<td>Valley Slope (Percent)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upstream of upper pond: 3.8*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower gulch: 1.7**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channel Slope</td>
<td>Less than 2%</td>
<td>Less than 2%</td>
</tr>
<tr>
<td>Bank Full Width (Feet)</td>
<td>Upper gulch: 7 feet**</td>
<td>16 feet</td>
</tr>
<tr>
<td>Below middle pond: 20 feet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ordinary High Water Width (Feet)</td>
<td>Upper gulch: 5 feet**</td>
<td>12 feet with low flow channel</td>
</tr>
<tr>
<td>Existing ditch below middle pond: 8 feet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floodplain Width (Feet)</td>
<td>100 feet**</td>
<td>86-foot minimum</td>
</tr>
<tr>
<td>Bank Height Ratio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greater than 1.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entrenchment Ratio</td>
<td>Stable</td>
<td>Stable</td>
</tr>
<tr>
<td>Width:Depth Ratio</td>
<td>Stable</td>
<td>Stable</td>
</tr>
<tr>
<td>Stream Substrate Sizing for 2-year In-channel and</td>
<td>D100 = 6 inches</td>
<td></td>
</tr>
<tr>
<td>100-year Floodplain Stability</td>
<td>D85 = 4 inches</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D50 = 2 inches</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D30 = ½ inch</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D15 = #10 sand</td>
<td></td>
</tr>
<tr>
<td>Profile Form</td>
<td>N/A</td>
<td>Riffle-Run-Pool</td>
</tr>
<tr>
<td>Sinuosity</td>
<td>1.19*</td>
<td>1.33</td>
</tr>
<tr>
<td></td>
<td>1.33**</td>
<td></td>
</tr>
<tr>
<td>Belt Width</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Channel Depth</td>
<td>N/A</td>
<td>1.0 foot in riffles</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.8 feet in pools</td>
</tr>
<tr>
<td>Riffle Spacing</td>
<td>N/A</td>
<td>+/- 20 feet</td>
</tr>
<tr>
<td>Grade Control</td>
<td>N/A</td>
<td>Large wood debris, roots of bank vegetation, larger rock substrate</td>
</tr>
</tbody>
</table>

*Historical values determined by 3PPI (Donlin Gold, LLC 2014).
**Historical values determined using LiDAR
N/A - Not Available.
Subject to final design refinement, the following work plan sequence is proposed for Snow Gulch. Appendix D-1, Figure 6 illustrates the components of this work plan. Appendix D-1, Figure 7 illustrates the proposed outcome of restoration. The work plan includes:

1. Remove overburden piles from Donlin Creek floodplain, reshape lower pond, and move pond outfall to historical channel west of the lower pond. The abandoned oxbow will be reutilized as the connection to Donlin Creek, mimicking the original hydraulic configuration of the floodplain prior to mining. It is anticipated that no disturbance will be required in the area of the old oxbow and that the historical floodplain vegetated mat will be uncovered by the removal of overburden. Excess overburden materials and side cast will be stockpiled or used to shape the new gulch stream channel, as required. All disturbed areas will be revegetated with native upland and wetland species.

2. The northern third of the middle ponds will be filled to create added stream channel length needed to overcome gradient constraints. A new stream channel at the proposed gradient and geometry will be constructed to join the middle ponds with the lower pond. Construction will be to the parameters of the final design. Materials will be selected from available overburden piles, with larger rock components imported from the wash plant tailings area or from Donlin Gold mining activities. Stream diversion and dewatering/re-watering of the existing and proposed channel will be per the stream diversion/dewatering plan prepared with the final design. Reshaping work within the ponds will be facilitated by cordonning off active work areas from stream flow with silt fence separators. Appendix D-2, Sheets 9 through 12 show the preliminary plan, profile and design details of the stream channel. Appendix D-1, Figure 7 shows the location of a selected cross-section. Appendix D-2, Sheet 11 shows a profile of the proposed stream alignment.

3. The outlet of the upper pond will be reinforced with larger rock to maintain the grade of this feature in perpetuity. This material will be a mixture of coarser rock components having a D50 of 6 inches, combined with finer materials to create an armored stream substrate. Areas of the middle and upper ponds will be reshaped and/or excavated to create open water diversity, with shallow and deeper water aquatic habitats. Disturbed areas will be revegetated.

Table 13 is a summary of the Snow Gulch Restoration Area restoration activities.
Table 13  Summary of Re-established, Enhanced, and Protected Areas within the Snow Gulch Restoration Area

<table>
<thead>
<tr>
<th>Restoration Activity</th>
<th>Habitat Type</th>
<th>Linear Feet</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-establish</td>
<td>Stream channels</td>
<td>4,421</td>
<td>-</td>
</tr>
<tr>
<td>Re-establish</td>
<td>Floodplain habitat</td>
<td>-</td>
<td>18.5</td>
</tr>
<tr>
<td>Re-establish</td>
<td>Floodplain habitat (includes revegetation)</td>
<td>-</td>
<td>3.4</td>
</tr>
<tr>
<td>Enhance</td>
<td>Off-channel pond habitat*</td>
<td>-</td>
<td>2.7*</td>
</tr>
<tr>
<td>Enhance</td>
<td>Terrestrial habitat (includes revegetation)</td>
<td>-</td>
<td>3.4</td>
</tr>
<tr>
<td>Protect</td>
<td>Buffer</td>
<td>-</td>
<td>1.4</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>36.7**</td>
</tr>
</tbody>
</table>

* Enhanced off-channel pond habitat is within the re-established floodplain habitat.
** Entire area will be covered under the site protection instrument. An additional 617 linear feet of stream channel, 6 acres of floodplain habitat, and 2.7 acres of off-channel pond habitat will be restored, but will not be covered under the site protection instrument because long-term protection cannot be fully ensured within the Lyman homestead area.
“-” Not Applicable.

The results of these proposed hydraulic and geomorphic functional restorations on the fisheries resources are as follows:

- Significant increase in productive pond habitats in the lower reaches of Snow Gulch, and in accessible habitat throughout Donlin Creek.
- Removal of opportunities for beaver dam blockages in channelized sections of streams, and at the narrow outfall from the lower pond to Donlin Creek.
- Increased fish passage to habitats upstream of the restoration area.
- Lowered gradient access to the middle ponds for enhanced rearing, and possibly coho spawning, habitat along this reach.
- An increase in off-channel rearing habitats for resident fish and coho salmon juveniles in the lower reaches of Snow Gulch and the adjacent Donlin Creek floodplain and oxbow.
- Raised water levels in the lower pond for improved deep water and potential overwintering habitats.
- Provision of littoral habitats in the lower pond and attendant increases in aquatic vegetation, aquatic invertebrates, water quality, and habitat diversity.
- Reduced side slopes and improved vegetative cover for improved water quality to provide additional shading and cover for fish along stream and pond margins.
- Better temperature regimes for resident and anadromous fish species resulting from the replacement of ditched flows with more natural and better shaded stream channels.
- Long-term reduction in substrate embeddedness and potential spawning habitat improvements in Crooked Creek through improved water quality via reductions of suspended solids in Snow Gulch and downstream reaches of Donlin Creek, especially at higher flows.
Compensatory Mitigation Plan
Donlin Gold, LLC
Attachment D Upper Crooked Creek Permittee Responsible Mitigation Plan
Application for DA Permit POA-1995-120
July 2018

Wash Plant Tailings Area

Wash Plant Tailings Area Existing Conditions
Placer gravels were historically processed at a wash plant in an area between Snow and Ruby Gulches. The outlet of the wash plant was allowed to discharge to the Crooked Creek floodplain just downstream of the confluence of Donlin and Flat Creeks, with separate stockpile areas for coarse- and fine-grained materials. Coarse-grained tailings were stockpiled mostly in uplands immediately adjacent to the Crooked Creek floodplain, while fine-grained tailings were discharged into wetlands adjacent to and within the Crooked Creek floodplain, forming an alluvial fan-type deposit. In historical wetland areas at the lowest elevations of the fan, hydrophytic vegetation has re-established in the fine-grained materials. An artificial berm designed to dike off the settlement area from the mainstem of Crooked Creek remains in place and raises backwater levels in this area.

Off-channel habitats appear to have been minimally impacted by the wash plant effluent. Historical aerials show little connected open water areas.

Existing conditions at the Wash Plant Tailings Area are depicted in Appendix D-1, Figure 8.

Wash Plant Tailings Area Restoration
The Crooked Creek floodplain under the effluent discharge fan will be reshaped and re-contoured into a condition to restore wetlands back to the area. Materials will be removed down to the underlying organic layers that mark the original vertical extent of the floodplain. The berm along the settlement area will be left to maintain water levels in the restored areas. The coarse-grained tailings pile and other areas will be regraded and re-contoured for stability (minimum 2:1 slopes), and augmented with finer materials to promote vegetation growth. Disturbed areas will be revegetated.

Subject to final design refinement, the following work plan sequence is proposed for the Wash Plant Tailings Area. Appendix D-1, Figure 9 illustrates the components of this work plan. Appendix D-1, Figure 10 illustrates the proposed outcome of restoration. The work plan includes:

1. The coarse-grained tailings pile will be re-contoured and topped with fine-grained materials to promote slope stability and vegetation establishment. The coarse-grained tailings pile can be re-contoured at any time as it is mostly an uplands feature. It may be most expedient to do this work prior to the removal of fine-grained material as this material will be needed to cover the coarse-grained material and provide a growth medium for revegetation.

2. Fine-grained material covering wetlands in the Crooked Creek floodplain will be excavated in winter, and the area will be revegetated with herbaceous hydrophytes. Removed material will be utilized at the coarse-grained tailings pile and at other places in the restoration to facilitate development of hydric soils and growth of hydrophytic vegetation.

Table 14 is a summary of the Wash Plant Tailings Area restoration activities.
**Table 14** Summary of Re-established, Enhanced, and Protected Areas within the Wash Plant Tailings Area Restoration Area

<table>
<thead>
<tr>
<th>Restoration Activity</th>
<th>Habitat Type</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-establish</td>
<td>Floodplain habitat (includes revegetation)</td>
<td>10.8</td>
</tr>
<tr>
<td>Enhance</td>
<td>Off-channel pond habitat*</td>
<td>0.5*</td>
</tr>
<tr>
<td>Enhance</td>
<td>Terrestrial habitat (includes revegetation)</td>
<td>2.4</td>
</tr>
<tr>
<td>Protect</td>
<td>Buffer</td>
<td>15.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>29.3</strong></td>
</tr>
</tbody>
</table>

* Enhanced off-channel pond habitat is within the re-established floodplain habitat.
** Entire area will be covered under the site protection instrument.

The results of these proposed hydraulic and geomorphic functional restorations on the fisheries resources are as follows:

- Fisheries improvements from these restorations are related to reductions in suspended solids entering the mainstem of Crooked Creek. This will positively impact spawning area and smolt production.
- Some pond habitats will be produced and/or maintained in the re-established floodplain.

**Ruby and Queen Gulches**

**Ruby and Queen Gulches Existing Conditions**

The most downstream disturbance in the Plan area is at Ruby and Queen Gulches, where significant areas of excavation, overburden deposition, and dewatering ditches have altered the landscape and impacted hydraulic function.

The lower 800 feet of Ruby and Queen Gulches have been mined extensively. Ruby Gulch has been mined more recently. There is a 3-foot head cut at the upper end of Ruby Gulch where the original stream channel spills out of a forested area into the placer mining scar. Removal of the floodplain, riparian habitat, and stream channel have left a wide, poorly contained channel running on a mostly bedrock substrate. Areas of steeper slopes and unconsolidated and unvegetated substrate result in ongoing erosion and siltation of the downstream during high flow events.

In Queen Gulch, the majority of the stream flow is routed from the historical channel into a mining ditch along the south side of the gulch for approximately 500 feet. Lower in the gulch the stream flows through two excavated ponds and under a mining access road before flowing into a long diversion ditch in the Crooked Creek floodplain. Considerable time has elapsed since Queen Gulch was mined and areas of the lower gulch have revegetated.

Once in the Crooked Creek floodplain, Ruby and Queen Gulch empty into a series of large excavated ponds and ditches. Ruby Gulch provides water at the north end of this system where it flows into the northern-most pond. A small unnamed drainage enters the system between Ruby and Queen Gulches, and at the south end of the system Queen Gulch enters from the east just below the “square pond.” Groundwater from the adjacent hill slope also feeds into the system throughout its length.
This system is below the elevation of the floodplain of Crooked Creek, lowering the water table, degrading aquatic habitat and restricting fish access. Steep sided back and subsurface pond slopes are unstable, contributing to sediment and erosion, especially during high flow conditions. Overburden stockpiles in the Crooked Creek floodplain block surface and groundwater flows into Crooked Creek and impact adjacent wetland areas. Narrow hydraulic conveyances between ponded areas contribute to fish passage blockage by beaver activities. South of the square pond, the system flows into a long ditch that parallels Crooked Creek for 2,400 feet. This ditch both lowers the elevations of the water in the ponds below the Crooked Creek floodplain and intercepts groundwater from the hillsides east of the creek. Steep sides along the ditch contribute to erosion and degraded water quality. The ditch lowers the water table and separates upslope groundwater and surface water flows from the Crooked Creek floodplain. Side cast overburden along the ditch degrades adjacent wetlands.

Existing conditions in Ruby and Queen Gulches are depicted in Appendix D-1, Figure 11.

**Ruby and Queen Gulches Restoration**

Restoration activities for Ruby and Queen Gulches will include restoring portions of the Ruby Gulch stream channel, removing overburden stockpiles in the Crooked Creek floodplain, filling the drainage ditch in upper Queen Gulch to reroute the stream to the valley floor, reshaping the ponds to provide increased shallow water and deep water habitats, removing constricted areas where beaver activity can easily block fish passage, restoring a floodplain elevation outlet from the ponded area through abandoned oxbows into Crooked Creek, and filling in the long drainage ditch currently connecting the ponded area to Crooked Creek. Disturbed areas will be re-contoured into shallow slopes running down to the ponds, allowing re-establishment of the floodplain and diverse aquatic habitats. Disturbed areas will be revegetated.

Restoration of Ruby Gulch will be similar to that of Snow Gulch except on a smaller scale. Re-establishing the historical floodplain gradient will involve refilling the area with appropriate substrate, shaping an appropriately sized channel, adding habitat features and grade control, and revegetating disturbed areas. Fish passage structures may be required where Ruby and Queen Gulches are crossed by the existing mining access road.

Reconnection of Ruby and Queen Gulches to the Crooked Creek floodplain is more complex than at Snow Gulch. The pond system fed by the gulches is separated from the Crooked Creek floodplain by a steep-sided berm constructed from the overburden materials removed from placer mining operations. North of the dogleg at the north end of the berm is a large deposit of overburden tailings that will be left substantially intact to prevent the main Crooked Creek channel from shortcutting through the ponds. At the dogleg, additional water is added to the system from a shallow, surface water basin and the tailings deposit is reduced to a simple berm separating the ponds from the floodplain. This berm would be substantially removed south of the dogleg so the pond features would be joined hydraulically with the existing natural oxbows along Crooked Creek. The average elevation of these oxbows (382 feet) appears consistent with the proposed water level in the ponds.
Restoration of Queen Gulch has been developed while considering the predicted drawdown effects from the proposed open pit. Rerouting of flow in Queen Gulch will be similar to Quartz Gulch with available side cast used to refill the ditch, rerouting the flows to the old stream channel location and revegetation of disturbed areas. Expansion of two small ponded areas in the lower reach will enhance resident fisheries habitats. The flows from Queen Gulch will be re-directed into the square pond. A fish passage conveyance or low water ford will be provided at the road crossing. Berms around the south and west sides of the square pond will be removed to re-connect this pond with the floodplain and the pond margins will be regraded similar to the more northern ponds. An outfall will be established to an existing oxbow in the northwest corner of the square pond.

Finally, the ditches connecting the northern ponds to the square pond and the diversion ditch, which connects the pond system to Crooked Creek, will be refilled with the side-cast materials and revegetated.

A preliminary estimate of the stream restoration parameters for Ruby Gulch is included in Table 15. As the engineering design progresses, further refinements will be made based on reference reach parameters where available, or Rosgen and regional functional parameters for drainages with similar watershed characteristics.
Table 15  Historical and Preliminary Design Parameters for Ruby Gulch

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Historical (Pre-Mining) Value</th>
<th>Preliminary Design Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basin Area (square miles)</td>
<td>0.34</td>
<td>0.34</td>
</tr>
<tr>
<td>Stream Type (Rosgen)</td>
<td>G3</td>
<td>G3</td>
</tr>
<tr>
<td>100-year Flood Flow (Cubic Feet/Second)</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>100-Year Flood Velocity (Feet/Second)</td>
<td>N/A</td>
<td>3.5</td>
</tr>
<tr>
<td>2-Year Flood Flows Q2 (Cubic Feet/Second)</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>2-Year Flood Velocity (Feet/Second), Bank Full</td>
<td>N/A</td>
<td>3.3</td>
</tr>
<tr>
<td>Valley Slope</td>
<td>Less than 5%</td>
<td>Less than 5%</td>
</tr>
<tr>
<td>Channel Slope (Percent)</td>
<td>4.17</td>
<td>4.19</td>
</tr>
<tr>
<td>Ordinary High Water Width (Feet)</td>
<td>2.4</td>
<td>6</td>
</tr>
<tr>
<td>Bank Full Width (Feet)</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Floodplain Width (Feet)</td>
<td>82</td>
<td>50</td>
</tr>
<tr>
<td>Stream Substrate Sizing for 2-year In-Channel and 100-year Floodplain Stability</td>
<td>Soil gradation needed</td>
<td>D100 = 4 inches D85 = 3 inches D50 = 1 inches D30 = 0.4 inches D15 = #10 sand</td>
</tr>
<tr>
<td>Bank Height Ratio (BHR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entrenchment ratio (ER)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width:depth Ratio</td>
<td>Stable</td>
<td>Stable</td>
</tr>
<tr>
<td>Profile Form</td>
<td>N/A</td>
<td>Step-Pool</td>
</tr>
<tr>
<td>Sinuosity</td>
<td>1.16*</td>
<td>1.16</td>
</tr>
<tr>
<td>Belt Width</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Channel Depth</td>
<td>N/A</td>
<td>1.0 foot in riffles 1.8 in pools</td>
</tr>
<tr>
<td>Riffle Spacing</td>
<td>N/A</td>
<td>+/- 20 feet</td>
</tr>
<tr>
<td>Grade Control</td>
<td>N/A</td>
<td>Large wood debris, roots of bank vegetation, larger rock substrate</td>
</tr>
</tbody>
</table>

*Historical values determined by 3PPI (Donlin Gold, LLC 2014).
N/A – Not Available.

Subject to final design refinement, the following work plan sequence is proposed for Ruby and Queen Gulches. Appendix D-1, Figure 12 illustrates the components of this work plan. Appendix D-1, Figure 13 illustrates the proposed outcome of restoration. The work plan includes:

1. Reshape the excavated ponds in the Crooked Creek floodplain to create shallow and deep water habitat areas. This would be done while the water table is still artificially depressed by the drainage ditch.

2. Remove the overburden berms around the south and west sides of the square pond and along the west sides of the northern ponds to the point where the berm transitions to a larger overburden deposit at the dogleg. Breach the square pond in the northwest corner and connect the other excavated areas to the abandoned oxbows to the west. Appendix D-2, Sheet 13 shows a typical section through this area.
3. Fill the mining ditch in upper Queen Gulch and re-establish the stream within the historical channel. Re-contour excavated ponds to provide enhanced off-channel habitat. Reroute the Queen Gulch stream channel in its lower section and install a fish passage structure under the existing road (or create a low water crossing) to connect Queen Gulch to the square pond.

4. Re-build the lower section of Ruby Gulch to hydraulic functional parameters as refined in final design. Add a fish passage conveyance at the mining access road as needed. Appendix D-2, Sheet 12 shows the preliminary design section of the stream channel.

5. Fill the drainage ditch extending south to Crooked Creek to restore floodplain water levels and groundwater continuity. Appendix D-2, Sheet 14 shows a typical section of this ditch fill.

6. Revegetate all disturbed areas per the revegetation design plan.

Table 16 is a summary of the Queen and Ruby Gulches Restoration Area restoration.

<table>
<thead>
<tr>
<th>Restoration Activity</th>
<th>Habitat Type</th>
<th>Linear Feet</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-establish Stream channels</td>
<td>2,931</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Re-establish Floodplain habitat</td>
<td>-</td>
<td>46.7</td>
<td></td>
</tr>
<tr>
<td>Re-establish Floodplain habitat (included revegetation)</td>
<td>-</td>
<td>2.6</td>
<td></td>
</tr>
<tr>
<td>Enhance Off-channel pond habitat*</td>
<td>-</td>
<td>12.0*</td>
<td></td>
</tr>
<tr>
<td>Enhance Terrestrial habitat (includes revegetation)</td>
<td>-</td>
<td>8.5</td>
<td></td>
</tr>
<tr>
<td>Protect Buffer</td>
<td>-</td>
<td>52.5</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,931</strong></td>
<td><strong>110.3</strong>*</td>
<td></td>
</tr>
</tbody>
</table>

* Enhanced off-channel pond habitat is within the re-established floodplain habitat.

**Entire area will be covered under the site protection instrument.

"." Not Applicable.

The results of these proposed hydraulic and geomorphic functional restorations on the fisheries resources are as follows:

- Significant increase in productive pond habitats in the lower reaches of Ruby and Queen Gulches and in accessible habitat throughout Crooked Creek.
- Removal of opportunities for beaver dam blockages in areas of narrow conveyance, including ditches and pond inlets and outlets, which create a blockage to fish passage.
- Lowered gradient access to the lower reaches of Ruby Gulch for enhanced resident fish and juvenile coho passage and habitats along this reach.
- An increase in off-channel rearing habitats for resident fish and coho salmon juveniles in the Crooked Creek floodplain and oxbow.
- Raised water levels in the ponds for improved deep water and potential overwintering habitats.
- Provision of littoral habitats in the ponds and attendant increases in aquatic vegetation, aquatic invertebrates, water quality, and habitat diversity.
- Reduced side slopes and improved vegetative cover to improve water quality and provide additional shading and cover for fish along stream and pond margins.
Better temperature regimes for resident and anadromous fish species resulting from the replacement of ditched flows with more natural and better shaded stream channels.

Long-term reduction in substrate embeddedness and potential spawning habitat improvements in Crooked Creek through improved water quality and reductions of suspended solids in Queen and Ruby Gulches, especially at higher flows.

Final Design, Monitoring, and Performance Standards

Final Design
Establishing and implementing the final design, which will provide the basis for the final performance standards for the PRM, is expected to be a multi-step process, as follows:

1. Donlin Gold will perform additional field work to assess and determine the final reference reach and design parameters. In using a reference reach, Donlin Gold will be able to compare to other streams being sampled, whereby “success” will be measured as the new stream reaches fall within the natural variability of other sample sites in the monitoring program.

2. At least 6 months prior to initiating Project construction, Donlin Gold will submit to USACE a final restoration design (modifying the plans contained herein as appropriate) based on specific hydrologic, hydraulic, geomorphic, revegetation, and construction sequencing parameters.

3. USACE will approve the final design, and the final performance standards, prior to the start of Project construction.

4. Donlin Gold will construct the proposed PRM as designed and provide as-built documentation to verify that the restorations meet the design specifications.

After the completion of the constructed restoration and acceptance of the as-builts by USACE, the PRM will enter the monitoring phase to demonstrate compliance with the performance standards.

Monitoring Program
Project monitoring will be conducted to demonstrate that the PRM is meeting its performance standards, provide a basis for USACE acceptance of the work, determine if adaptive management actions are necessary, and document the aquatic resource health of the area. Donlin Gold will monitor to gauge progress against the performance standards for stream channels, wetlands, terrestrial vegetation, and fish use. Additionally, Donlin Gold will also monitor stream flow. The types of monitoring to be performed are described below. A more detailed monitoring program with locations and protocols will be submitted to USACE for review and approval, along with the final performance standards, at least 6 months prior to the start of the Project construction.

Stream Channel Monitoring
Monitoring of physical stream channel (hydraulic and geomorphic) parameters will be conducted annually for at least 5 years after construction or longer if performance standards are not met. Monitoring will take place during the same time period each year in early June, timed to coincide after spring breakup flows and before the mid-summer low water period. Obvious failures of the channel design or excessive erosion will be addressed with USACE (in coordination with ADF&G), and corrective actions will be developed by Donlin Gold and approved by USACE prior to initiation of in-stream work. If site conditions fail to meet
performance standards during monitoring, the design and mitigation work plan will be reviewed and adjusted to implement solutions. After the fifth year, monitoring would only continue to be performed in those specific areas where the performance standards are not being met.

Biological monitoring of the stream channels and near pond outlets for macroinvertebrates and periphyton communities will also be conducted annually for at least five years after construction or longer if performance standards are not met. Monitoring will be conducted in mid- to late July to maintain consistency with baseline sampling and capture the period of peak abundance and species diversity.

Aquatic invertebrate sampling will be conducted using the methods Donlin Gold followed for baseline data collection. Five replicate samples will be collected to reduce sampling variability within a single site and to increase statistical power. Samples will be collected each year from the same riffle(s) using a Surber sampler (1 ft², 600 μm mesh). The Surber sampler will be placed on the stream bottom with its opening perpendicular to stream flow. Substrates within the 1 ft² (0.09 m²) Surber base will be scrubbed with a nylon brush to remove invertebrates and organic matter. Organic matter retained by the net will be drained onto a 600 μm sieve, placed in plastic bags, and preserved in 70 percent isopropyl alcohol. In the laboratory, samples will be lightly rinsed with water in a 600 μm (standard #30) sieve. Macroinvertebrates will be removed by hand under magnification, identified to the lowest possible taxonomic level (typically genus), and counted. Large samples (>300 individuals) will be sub-sampled using a white tray subdivided into four quadrants. Samples will be evenly distributed across the tray, and each quarter picked until a minimum of 300 individuals is reached (typically ¼ or ½ of the original sample). Large samples will also be viewed in their entirety before sub-sampling; large and/or rare taxa found in this search will be removed and added to the sample total.

The analysis will include identifying taxa present; estimating aquatic invertebrate density and taxa richness; and calculating ratios of mayflies, stoneflies, and caddis flies versus all other aquatic invertebrate taxa. Multiple sampling sites will be established in the restored drainages and ponds (excluding the Wash Plant Area).

Lower trophic level sampling for periphyton standing crop would be conducted in concert with aquatic invertebrate sampling. Periphyton sampling sites will be established within newly created stream reaches, 10 rocks per site will be sampled. Samples will be processed to measure chlorophyll a, b, and c concentrations to produce an estimate of periphyton standing crop and basic community structure determination. Chlorophyll analysis will show overall productivity of the community as well as potential shifts in community structure over time by examining the relative ratios of chlorophyll a, b, and c.

Fish monitoring will be conducted annually for at least five years after construction or longer if performance standards are not met. Monitoring will occur in both pond and stream habitats within the PRM areas (excluding the Wash Plant Area) beginning in the first open water season after construction. A combination of fyke nets in pond habitats and minnow traps in stream habitats will be employed to provide documentation of fish using the mitigation habitats. Sampling will be timed to document various important life history phases for fish anticipated to use the habitats. For example, some sampling will occur each spring to detect spawning grayling, and some sampling will occur each fall to document
spawning coho salmon. Generally, most fish sampling efforts will be during mid-summer to identify peak uses by all species. Monitoring timing will be consistent from year to year for comparability of results.

**Wetland Monitoring**
Monitoring of wetland hydrology and wetland revegetation will be conducted annually for at least 5 years after construction. The wetland monitoring will occur during the same period each year before July 1. Monitoring timing may be adjusted for yearly variations in the onset of the growing season. One monitoring point will be sited for every 5 acres that are revegetated to adequately monitor trends in establishing plant communities. Point locations will be monumented with a Global Positioning System (GPS) device as well as physically, using rebar stakes and flagging to facilitate revisit. At these locations, a pit will be dug (unless surface water is present) to observe hydrology, and the percent coverage of individual plant species (native and non-native), bare ground, and surface water will be recorded. Vegetation data will be compiled within a 10-square-meter (m²) plot for shrub communities and a 1-m² plot for herbaceous communities. Wetland monitoring data will be compared to the performance standards to determine if additional management actions are necessary. Non-native plant recruitment data may specifically lead to active measures to remove non-native plants from restoration areas.

**Terrestrial Habitat (Revegetation) Monitoring**
Monitoring of terrestrial revegetation will be conducted on the same schedule as the monitoring of wetlands. The inspections will occur during the growing season. One monitoring point will be sited for every 5 acres that are revegetated to adequately monitor trends in establishing plant communities. Point locations will be monumented with a GPS device as well as physically, using rebar stakes and flagging to facilitate revisit. At these locations, the percent coverage of individual plant species (native and non-native) and bare ground will be recorded. Vegetation data will be compiled within a 10- m² plot for shrub communities and a 1-m² plot for herbaceous communities. Monitoring data will be compared to performance standards to determine if additional management actions are necessary. Non-native plant recruitment data may specially lead to active measures to remove non-native plants from restoration areas.

**Additional Monitoring**
In addition to the monitoring necessary to verify compliance with the performance standards, Donlin Gold will also monitor stream flows. A stream flow gage with a documented stage-flow relationship will be established on one or more of the streams as a surrogate for stream flows in all restored streams. These gauges will be established upstream of the restoration work on the restored tributaries and will serve as a baseline for assessing the performance of the restoration channels across different flow regimes. The gauges will be established within the stable cross-sections of natural channels. They will be monitored via recording water level sensors (i.e. pressure transducers) during the open water season beginning in the first season after construction and continuing for the duration of the stream channel monitoring program.

**Monitoring Reports**
Monitoring reports will be produced for each year of post-construction monitoring and submitted to USACE by the end of January of the following year. The results of all stream channel, wetland, terrestrial habitat, stream flow, and fish monitoring will be summarized. Each monitoring report will specifically
include a description of each performance standard and identify if the standard has been achieved. If performance standards are not progressing as anticipated, adaptive management actions will be provided to USACE for approval as necessary.

At the end of all monitoring activities, a monitoring closeout report will be completed for the entire PRM area for review and acceptance by USACE. The monitoring closeout report will briefly summarize the findings of the monitoring activities and describe how the PRM has met the performance standards. In addition, the monitoring closeout report will formally request closure of the post-construction monitoring period.

Performance Standards
The following is a discussion of the performance standards that will be used to judge the functional performance of the Upper Crooked Creek PRM. These standards are broken out into three categories targeting restored stream channels, restored wetlands, and restored terrestrial habitats. In specifically using reference reaches, Donlin Gold will compare the PRM to other streams, whereby “success” will be measured as the new stream reaches fall within the targeted design parameters, considering the natural variability of other sample sites in the monitoring program.

Stream Channel Performance Standards
The primary basis of these performance standards is the United States Environmental Protection Agency (EPA) framework for stream function assessment (Harman et al. 2012) Appendix A-d Performance Standards Table. This table lists specific performance standards that can be used to assess stream restoration projects. Each parameter is measured and assigned a score of Functioning, Functioning-At-Risk, or Not Functioning. Functioning-At-Risk can be further classified as degrading toward Not Functioning or improving toward Functioning. Not all parameters in Harman et al. 2012 are appropriate for any specific reconstruction project, and a number are duplicative. Table 17 identifies the parameters and initial proposed performance standards for the Upper Crooked Creek PRM. The final performance standard parameters and values will be approved by USACE along with the final restoration design prior to construction. The EPA standards for stream function contain some parameters for riparian area revegetation that overlap with the wetland and terrestrial revegetation performance standards listed in other criteria.

For compliance, the monitoring of these parameters must show that the stream and floodplain values fall within the categories of Functioning or Functioning-At-Risk (improving) as specified by the EPA criteria. These values must be attained for 3 consecutive years. Additionally, a Functioning score must be achieved in the last of the 3 years for compliance to be attained.
### Table 17  Upper Crooked Creek PRM Plan Stream Performance Standards

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Measurement Method</th>
<th>Performance Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hydraulic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flood Plain Connectivity</td>
<td>Bank Height Ratio (BHR)</td>
<td>1.0 to 1.2 1.3 to 1.5 &gt;1.5</td>
</tr>
<tr>
<td></td>
<td>Entrenchment Ratio</td>
<td>&gt;2.2 2.0 to 2.2 &lt;2.0</td>
</tr>
<tr>
<td><strong>Geomorphic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large Woody Debris</td>
<td>Large Woody Debris Index (LWDI)</td>
<td>LWDI of project reach equals LWDI of reference reach, but is trending in that direction</td>
</tr>
<tr>
<td>Channel Evolution</td>
<td>Simon Channel Evolution Model Stages</td>
<td>Sinuous, pre-modified, quasi-equilibrium</td>
</tr>
<tr>
<td>Lateral Stability</td>
<td>Meander Width Ratio</td>
<td>&gt;3.5 based on reference reach survey 3.0 to 3.5 as long as sinuosity is &gt;1.2 &lt;3.0</td>
</tr>
<tr>
<td>Riparian Vegetation</td>
<td>Buffer Density (stems/acre)</td>
<td>Parameter is similar to reference reach condition, with no additional maintenance required</td>
</tr>
<tr>
<td></td>
<td>Buffer Age, Composition, Growth</td>
<td>Parameter deviates from reference reach condition, but the potential exists for full functionality over time or with moderate additional maintenance</td>
</tr>
<tr>
<td></td>
<td>Canopy Density</td>
<td>Significantly less functional than reference reach condition; little or no potential to improve without significant restoration effort</td>
</tr>
<tr>
<td></td>
<td>NRCS Rapid Visual Assessment Protocol</td>
<td>Natural vegetation extends at least one to two active channel widths on each side, or if less than one width, covers entire floodplain</td>
</tr>
<tr>
<td></td>
<td>Bed Material Composition</td>
<td>Natural vegetation extends at least one-half to one-third active channel width on each side, or filtering function moderately compromised</td>
</tr>
<tr>
<td></td>
<td>Project reach is not statistically</td>
<td>Natural vegetation less than one-third active channel width on each side, or lack of revegetation, or filter function severely compromised</td>
</tr>
<tr>
<td></td>
<td>different than reference reach</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Project Reach is statistically</td>
<td></td>
</tr>
<tr>
<td></td>
<td>different (finer) than reference</td>
<td></td>
</tr>
<tr>
<td></td>
<td>reach</td>
<td></td>
</tr>
</tbody>
</table>
**Bed Form Diversity**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Percent Riffle</th>
<th>40-60</th>
<th>70-80</th>
<th>&gt;80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pool-to-Pool Spacing Ratio</td>
<td>2-4</td>
<td>4 to 6</td>
<td></td>
<td>&gt;6</td>
</tr>
<tr>
<td>Depth Variability</td>
<td>&gt;1.5</td>
<td>1.2 to 1.5</td>
<td>&lt;1.2</td>
<td></td>
</tr>
</tbody>
</table>

**Biologic***

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Measurement Method</th>
<th>Performance Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fisheries</td>
<td>As listed in the paragraph above</td>
<td>Functioning</td>
</tr>
<tr>
<td></td>
<td>Fish presence</td>
<td>Fish not present</td>
</tr>
<tr>
<td>Macroinvertebrate and Periphyton Communities</td>
<td>As listed in the paragraph above</td>
<td>Exceptional to or similar to reference reach</td>
</tr>
</tbody>
</table>

*Not based on Harman et al.

**Wetland Performance Standards**

All floodplain habitat areas addressed by this Plan are expected to become wetlands and meet wetland vegetation and hydrology performance standards.

**Wetland Vegetation Performance Standards**

Vegetation performance standards have been developed to ensure that revegetated areas are on a trajectory to achieve stability and ecological functionality. Vegetation performance standards will be met at each restoration area. A restoration area will be considered to have achieved the vegetation performance standards when at least 85 percent of monitoring locations satisfy the standards.

The vegetation performance standards are outlined in Table 18. These vegetation performance standards are based on the Draft Oregon Department of State Lands Routine Monitoring Guidance for Vegetation (ODSL 2009). It may be necessary to modify the performance standards for vegetation response to match similarities with reference vegetation communities near the Project. Any proposed modifications will be detailed in the annual monitoring report and submitted to USACE for approval.

**Table 18  Wetland Vegetation Performance Standards**

- Cover of native and/or revegetation hydrophytic* plant species is at least 60 percent.
- Cover of invasive species is no more than 10 percent.
- Cover of bare substrate is no more than 20 percent.

*Plant species with indicator status of FAC, FACW, or OBL
Wetland Hydrology Performance Standards

Wetland floodplain habitat will additionally be required to meet wetland hydrology performance standards. The performance standard for hydrology is that the area must meet the wetland hydrology indicators as outlined in the 2008 Alaska Regional Supplement. Wetland hydrology indicators as described in the Alaska Regional Supplement (USACE 2007) will be used as evidence of sufficient hydrology to support wetland habitat formation and function. However, only a subset of the available indicators as described in the Regional Supplement will be used to gauge performance. This subset includes three of the four groups of indicators presented in the supplement (see Table 19). The fourth group, Group D – Evidence from Other Site Conditions or Data, will not be used to gauge hydrologic conditions within the PRM area because landscape variables for the group were derived for natural settings and are not applicable for use in recently constructed wetlands.

One primary indicator from any group is sufficient to conclude that wetland hydrology is present. In the absence of a primary indicator, two or more secondary indicators from any group are required to conclude that wetland hydrology is present. Monitoring for hydrologic indicators will occur within 10-m² plots coinciding with the vegetation monitoring. Table 19 lists wetland hydrology indicators to be used for the Upper Crooked Creek PRM.
Table 19  List of Wetland Hydrology Indicators for Alaska*

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group A – Observation of Surface Water or Saturated Soils</strong></td>
<td></td>
</tr>
<tr>
<td>A1 – Surface water</td>
<td>Primary</td>
</tr>
<tr>
<td>A2 – High water table</td>
<td>Primary</td>
</tr>
<tr>
<td>A3 – Saturation</td>
<td>Primary</td>
</tr>
<tr>
<td><strong>Group B – Evidence of Recent Inundation</strong></td>
<td></td>
</tr>
<tr>
<td>B1 – Water marks</td>
<td>Primary</td>
</tr>
<tr>
<td>B2 – Sediment deposits</td>
<td>Primary</td>
</tr>
<tr>
<td>B3 – Drift deposits</td>
<td>Primary</td>
</tr>
<tr>
<td>B4 – Algal mat or crust</td>
<td>Primary</td>
</tr>
<tr>
<td>B5 – Iron deposits</td>
<td>Primary</td>
</tr>
<tr>
<td>B6 – Surface soil cracks</td>
<td>Primary</td>
</tr>
<tr>
<td>B7 – Inundation visible on aerial imagery</td>
<td>Primary</td>
</tr>
<tr>
<td>B8 – Sparsely vegetated concave surface</td>
<td>Primary</td>
</tr>
<tr>
<td>B9 – Water-stained leaves</td>
<td>Secondary</td>
</tr>
<tr>
<td>B10 – Drainage patterns</td>
<td>Secondary</td>
</tr>
<tr>
<td>B15 – Marl deposits</td>
<td>Primary</td>
</tr>
<tr>
<td><strong>Group C – Evidence of Current or Recent Soil Saturation</strong></td>
<td></td>
</tr>
<tr>
<td>C1 – Hydrogen sulfide odor</td>
<td>Primary</td>
</tr>
<tr>
<td>C2 – Dry-season water table</td>
<td>Primary</td>
</tr>
<tr>
<td>C3 – Oxidized rhizospheres along living roots</td>
<td>Secondary</td>
</tr>
<tr>
<td>C4 – Presence of reduced iron</td>
<td>Secondary</td>
</tr>
<tr>
<td>C5 – Salt deposits</td>
<td>Secondary</td>
</tr>
</tbody>
</table>


Terrestrial Habitat Performance Standards
Revegetated and regraded terrestrial habitat areas are expected to meet only terrestrial revegetation performance standards for compliance.

Terrestrial Revegetation
Vegetation performance standards have been developed to ensure that revegetated areas are on a trajectory to achieve stability and ecological functionality. Vegetation performance standards will be met at each restoration area. Achievement of vegetation performance standards will be assessed at locations established after the first full growing season (year 1). An entire restoration area will be
considered to have achieved the performance standards when at least 85 percent of monitoring locations satisfy the standards.

The vegetation performance standards are outlined in Table 20. These vegetation performance standards are based on the draft Oregon Department of State Lands Routine Monitoring Guidance for Vegetation (ODSL 2009). It may be necessary to modify the performance standards for vegetation response to match similarities with reference vegetation communities near the Project. Any proposed modifications will be detailed in the annual monitoring report and submitted to USACE for approval.

<table>
<thead>
<tr>
<th>Table 20</th>
<th>Terrestrial Habitat Vegetation Performance Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover of native and/or revegetation plant species is at least 60 percent.</td>
<td></td>
</tr>
<tr>
<td>Cover of invasive species is no more than 10 percent.</td>
<td></td>
</tr>
<tr>
<td>Cover of bare substrate is no more than 20 percent.</td>
<td></td>
</tr>
</tbody>
</table>

**Maintenance Plan**

The mitigation restoration work plans are designed to eliminate the need for regular maintenance. No artificial structures will be used to regulate hydrology so change should follow the natural evolution and geomorphic process of the watershed. Any failures or deficiencies noted during the monitoring period or the review period associated with the long-term management plan (LMP) will be reported and addressed as part of the Adaptive Management Plan.

**Long-term Management Plan (LMP)**

As part of finalizing the site protection instrument (deed restriction) for this Plan, Donlin Gold will prepare a LMP for the upper Crooked Creek PRM site. The LMP will be implemented as soon as USACE concurs that performance standards have been achieved in each restoration area. The LMP will be applied by a third party to conduct inspections and provide reports to demonstrate long-term compliance with the deed restriction. Selection of the third party will be subject to USACE review and approval based on their qualifications to serve in this role.

Donlin Gold will submit the LMP to USACE at least 6 months prior to the start of Project construction. Project construction will not be initiated until the deed restriction is in place and the LMP is approved by USACE.

Specifically, the LMP will be designed to ensure that the upper Crooked Creek PRM site is monitored, managed, and maintained for the long-term sustainability and preservation of its restored conditions. The LMP will be intended to extend for the duration of the deed restriction. The LMP will also specifically describe the mechanism by which the proposed third party’s inspections and reporting will be funded over the term of the restriction.

To support preparation of the LMP (and finalize the deed restriction), Donlin Gold will complete a metes and bounds survey of the upper Crooked Creek restoration site according to methods acceptable to the USACE. The survey is expected to closely resemble the boundaries represented within this Plan and will
be used to establish the exact property boundaries for the deed restriction and LMP. Under the provisions of the LMP, the third party and the landowners will implement methods to limit access to, and restrict activities in, the upper Crooked Creek restoration site where appropriate.

Donlin Gold shall implement the approved LMP for the purposes stated above. The LMP will require annual monitoring site visits by the third party to qualitatively monitor the general conditions of the upper Crooked Creek restoration site and compliance with the terms of the deed restriction. The conditions of the upper Crooked Creek restoration site will be evaluated, documented, and mapped during the site visits. The third party will be responsible for preparing annual monitoring reports detailing the conditions of the upper Crooked Creek PRM site, and any recommended management actions. In the annual reports, the third party will specifically describe if there have been any anthropogenic changes to the status of the upper Crooked Creek PRM site functional values including: waters of the United States (wetlands and streams). The annual monitoring reports will be available to USACE upon request.

As described in the LMP, the landowners will not be responsible for changes to the site conditions attributable to natural catastrophes such as flood, fire, drought, disease, regional pest infestation, and others that are beyond their reasonable control. Active management will not be required for ecological changes that come about because of processes such as climate change, fluctuating river levels, and sedimentation due to overbank flood deposits that may affect the upper Crooked Creek PRM site’s streams and wetlands. Over time, natural successional and geomorphic processes could occur that may affect wetland and stream functions or total wetland acreages or linear feet of stream.

Finally, the LMP will describe how Donlin Gold and the third party will work with the landowners to ensure that any activities proposed to occur in the upper Crooked Creek PRM site comply with the requirements of the deed restriction. This will include preventing any activities that are specifically prohibited by the deed restriction, see the Site Protection Instrument Section.

In summary, Donlin Gold proposes that the LMP include the following specific sections:

1. Introduction and Purpose
2. Third party and Responsibilities
3. PRM Area Description
   a. Location and boundaries
   b. Ownership
   c. Land (to be updated after restoration completion)
   d. Baseline conservation values, including wetlands, streams, and WOUS (to be updated after restoration completion)
4. Management and Monitoring
   a. Annual Site visits, including Scope, Documentation, and Action Items
   b. Security, safety, and public access
   c. Limits of responsibility, including exclusions for natural events
5. Allowable Improvements and Activities
   a. Permitted and prohibited actions
b. Third party and landowner coordination

6. Adaptive Management
7. Reporting and Administration
9. Funding
10. USACE Rights, Responsibilities, and Authorities
11. Signatures

Adaptive Management Plan
There are two stages of adaptive management: (1) adaptive management of the restoration sites to meet performance standards and (2) adaptive management under the LMP to enforce the site protection instrument conditions.

During restoration activities, the adaptive management plan will work toward successful restoration by adjusting and adapting to issues with implementation and onsite conditions. The adaptive management process is designed to deal with the uncertainty of the PRM field program and allow for problem solving and adjustments during design, implementation, and long-term PRM management. To have a successful PRM Plan, Donlin Gold understands it will be necessary to follow six steps in an adaptive management process (Figure 4). Within each step, several essential elements will be completed. Adaptive management is a process of connecting and linking the information from the PRM design, implementation, construction, monitoring, and evaluation phases to ensure that the initial design functions and meets the intended standards and objectives. If monitoring demonstrates that a corrective action is needed, Donlin Gold will adjust the work plan to meet the performance standards of the Plan. Adaptive management continually evaluates the results and adjusts work elements to meet the overall objective (Ministries of Forests and Range 2008). Donlin Gold is fully committed to this framework for a successful PRM Plan.

After restoration is completed and the performance standards are met, adaptive management will be conducted as described in the LMP. As discussed above, annual monitoring reports will be completed documenting updated site conditions. The annual reports will identify any areas of concern (i.e., occurrence of prohibited activities) along with any necessary corrective or remedial actions.
Financial Assurances

Donlin Gold is committed to providing a full financial assurance estimate for the restoration work when the final design is submitted for USACE approval. Once a value is agreed upon, Donlin Gold will cover that amount with a bond instrument acceptable to USACE prior to commencing work authorized by the Department of Army Permit. Further details of the financial assurance estimate and instrument for the Upper Crooked Creek PRM are described below.

Donlin Gold is fully responsible for providing financial assurance for activities related to the restoration, construction, and monitoring work. The mitigation rule states that “In determining the assurance amount, the district engineer shall consider the cost of providing replacement mitigation, including costs for land acquisition, planning and engineering, legal fees, mobilization, construction and monitoring” [33 CFR 332.3(n)(2)]. However, the guidance provided to the district engineer explains that “Not all component costs listed above might be applicable in every case. Land cost, which is often the single largest project cost component in many areas of the country, may or may not be relevant for determining assurance amounts...If it is believed that the mitigation project remediation would be desirable and likely to be successful (e.g., the mitigation site is an excellent candidate for a successful restoration project), then there would be no need to include component costs for land purchase when

---

1 Donlin Gold requests that this be included as a special condition to the permit and that a final assurance amount along with an accepted financial instrument will be approved and in place prior to construction.
setting assurance amounts.” With this background, Donlin Gold provides the following information as the basis for the financial assurance estimate.

Donlin Gold does not propose that land costs be included in the financial assurance for the following reasons:

1. The project sites have all of the elements required to provide an excellent candidate for a successful restoration project;

2. Donlin Gold being a mining company, located adjacent to the proposed restoration site, will have the equipment, resources and expertise to not only maintain the sites during the monitoring period, but will have the capacity to revise designs and reconstruct should the need arise;

3. The land owners have concurred with preserving the areas being considered for wetlands and stream restoration and preservation, and have extensive additional land holdings in the HUC-10 if the need arises to relocate the project sites as contemplated by the Rule.

Based on the above reasons, Donlin Gold does not propose any amount for land acquisition in the financial assurance estimate. Donlin Gold has included engineering redesign fees as one of the indirect cost components to allow for re-engineering the sites, if the need arises, prior to meeting performance standards (discussed in further detail below).

For the construction costs of building the restoration sites, Donlin Gold will follow standard cost estimation procedures for reclamation-type activities. BLM has a publically available spreadsheet program \(^2\) that Donlin Gold used to provide the financial assurance estimate to the State of Alaska for the full mine site reclamation and closure activities; the spreadsheet program is known as SRCE (Standardized Reclamation Cost Estimator). This program has been widely used by industry and accepted by regulatory agencies for generating small and large reclamation project cost estimates. The approach used, in compliance with the requirements of the Rule, is to ensure that USACE, through a third party, has access to the funds to hire a contractor to complete the proposed restoration work, if necessary.

The construction component of the estimate will contain the elements described below. Donlin Gold proposes to apply the same inputs used for the existing reclamation cost estimate for the mine site that have been reviewed and approved by the Alaska Department of Natural Resources – Division of Mining, Land and Water’s Mining Section and the Alaska Department of Environmental Conservation – Division of Environmental Health’s Solid Waste Program. These agencies review and implement reclamation project cost estimates in all regions of the state for large and small mine projects and have extensive experience in this subject. Their preference for estimating project costs is to use SRCE.

---

\(^2\) Available for download at https://nvbond.org/srce_downloads/
Table of Inputs

- Labor rates – Alaska Davis Bacon wages (Pamphlet 600) latest update
- Equipment hourly rates – based on quotes and cost sheets from equipment suppliers in the region
- Fuel and material costs – based on local quotes delivered to site

Earthworks and Direct Costs

Material excavation: The current estimate of excavation requirements for the combined restoration sites is 430,000 cubic yards (CY). The majority of this work will be done via a track mounted excavator. Some excavation may be conducted by wheel loader. For the final cost estimate, each site will be examined to determine a more refined excavation rate (CY per hour) for that specific portion of the project. The final cost estimate then becomes a calculation of the volume of material divided by the excavation rate to determine the number of equipment hours needed. The hours will be multiplied by the hourly cost (equipment plus labor plus fuel) to determine the estimated excavation cost. The site details to generate final volumes and productivity rates are not currently available at this level of design. However, a preliminary estimate has been made by multiplying the volume times the typical bid tab rate for that activity managed by the State of Alaska’s Department of Transportation and Public Facilities (ADOTPF). Excavation rates are roughly $0.50 per CY, making the engineering estimate for this component $215,000.

Loading and hauling costs (for excess material): The current designs indicate that there will be 258,000 CY of excess material that will need to be loaded and hauled offsite for storage. There is ample capacity in the overburden stockpiles identified in the mine permit’s footprint for this material. Cost estimating for this component follows similar reasoning to the excavation calculation, but adds the costs of trucks and bulldozers. A detailed estimate requires an analysis of the haul route and distance to determine how many trucks will be required for a given production rate. A fully loaded cost for the fleet is multiplied by the number of fleet hours estimated to arrive at an overall cost for loading and hauling of excess material. For the preliminary engineering estimate, Donlin Gold applied a unit rate of $3.00 per CY to the 258,000 CY of excess material to calculate a cost of $774,000 for this cost component.

Processing and importing of select sized material (if needed): Construction of the stream channels will likely require the import and placement of appropriately sized gravel material for construction of the pool-riffle-run sequences. The amount of this material has not been defined at this level of design but would be included in the final designs to be provided to USACE for approval. The remnants from the past placer mining activity provide an ample source supply for gravel. This component would include screening of the material located near the site to generate the correct volume and size requirements of material for placement into the stream channel beds. No preliminary estimate of this amount is

---

3 A bid tab is short for bid tabulation; this is a historic tracker spreadsheet ADOT manages that shows the bid cost by contractors for different projects throughout the state, broken down by bid component. These bid tab costs are often used to generate an engineering estimate for projects before they go out for bid
available at this time. An estimate for 8,982 feet of channel, 1 foot thick and 6 feet wide would require roughly 2,000 CY of sized stream bed material.

**Stream construction activities (placement of bank protection):** The construction of the stream sections will entail special consideration to the stream banks. This may include temporary waddles with willow plantings, embedding woody debris roots into the stream bank, or sections with boulders or rip rap armoring. The details for this level of cost estimating are not available at this time but will be included in the final cost estimate. For the preliminary engineering estimate, Donlin Gold assumed $60 per lineal foot of stream multiplied by 8,982 feet of stream channel to calculate a component cost of $224,550.

**Other project elements (e.g., culverts):** The only other project elements (structure) identified at this time are two culvert crossings for the access road between the mine area and the restoration areas. A full fish passage culvert design will be provided for the final design approval and included in the final cost estimate. For the preliminary engineering estimate, Donlin Gold has assumed 60 feet of culvert at an installed rate of $100 per lineal foot, or $6,000 for this cost component.

**Topsoil placement:** Restoration of the area will require importation and placement of topsoil in the reclaimed areas. The current design identifies 59 acres of upland and wetland area that will require soil placement. This number will be refined in the final design as additional details are available. The cost of placement is estimated similar to the loading and hauling component above. The fleet would include a loader at the source, trucks to haul topsoil to placement sites, and a bull dozer to spread the material. Scrapers could be used in lieu of the loader and trucks. Assuming an average of 18 inches of soil placement, this would require 142,780 CY of soil. Applying a unit rate of $2.50 per CY placed, the preliminary estimate for this cost component is $356,950.

**Re-vegetation (both seed and seedlings as required):** The final step in the construction process is applying seed and transplanting seedlings in the restored areas. This includes the cost of labor, equipment (spreaders, planters) and materials (seed, seedlings). The current Donlin Gold SCRE model estimates this to be $340 per acre for similar sized areas. Based on the 59 acres identified for revegetation needs, the preliminary estimate for this component is $14,750.

Summing the components identified above, the subtotal for the preliminary engineering estimate for direct costs for the restoration area work is $1,596,560.

**Indirect Cost Items (generally a percentage of direct costs)**

**Mobilization/demobilization of equipment and crews to/from site:** While equipment will be on site to support mine activities, the cost estimate will assume that a contractor would need to mobilize and demobilize equipment to and from the project site. Current freight rates from Anchorage to the Jungjuk Port site are estimated at $265 per ton. Applying a 10 percent cost to the direct cost (on the high side of a typical range, accounting for the remote location), the preliminary estimate includes $159,656 for mobilization and demobilization. This would provide for 300 tons of equipment to be transported to and from the site. A more detailed breakdown will be provided with the final estimate when a full equipment list is available.
Contingency (typically 4 to 8 percent): The Donlin Gold SRCE model identifies a range of suggested contingency values that are a function of the overall project cost. They recommend 10 percent to be used for small projects (<$500,000) ranging down to 4 percent for large projects (>$$50 million). Donlin Gold used the recommended 8 percent for this estimate (<$5,000,000).

Construction management (2 to 4 percent): This covers the cost for the contractor site foreman and other administration staff to support the field efforts. The Donlin Gold SRCE modeling approved by the agencies has a 1.1 percent cost for this component, but it is for a much larger project. Donlin Gold increased this to 5 percent, allowing for $79,828 for site construction management.

Engineering redesign fee (typically 4 to 8 percent, depending on complexity): This cost component allows for engineering support in the event that the restoration project is not performing as planned and adjustments need to be made. Due to the small size of the project and the level of engineering design expected for the final design, Donlin Gold has included a 4 percent engineering contingency, which is $63,862.

Contractor profit (10 percent): This is a typical, standard cost component rate to allow for profit for the contractor. For this project, a $159,656 profit has been included.

Management fee for agency/third party (4 to 6 percent): This is money available to the third party administrator to cover their costs to oversee the contract on behalf of USACE for completing the scope of work. Donlin Gold has included 5 percent of the direct costs, which is $79,828.

Overall, the indirect costs are $670,555, or 42 percent of the direct costs. This is at the high end of what indirect costs typically add to a reclamation cost estimate and should be sufficient for accomplishing the construction phase of the project.

A detailed cost estimate will be provided based on the final design approved by USACE prior to construction. For planning purposes, a preliminary engineering cost estimate prepared using the current volumes from the design contained in this Plan totals $2,267,115, including $1,596,560 in direct costs and $670,555 in indirect costs.

Long-Term Monitoring and Reporting: Donlin Gold will provide a separate estimate for the ongoing maintenance, monitoring, and reporting as prescribed in the LMP. Donlin Gold has not provided a preliminary estimate for these at this time, since the LMP has yet to be prepared and approved.

Form of Financial Assurance: The form of financial assurance will comply with those mechanisms identified in the IWR March 2016 report, “Implementing Financial Assurance for Mitigation Project Success,” Section 2.5, Instruments. The most likely form will be a letter of credit, performance bond, or escrow agreement. Donlin Gold will also establish an agreement with a third party to be approved by USACE that will be the beneficiary of the financial assurance instruments to carry out any construction corrections and to assure the monitoring and reporting are conducted out as required. This can take the form of a trust agreement with the chosen third party. Donlin Gold requests that the details of that be
provided for in a special condition of the DA permit to allow time for those details to be worked out prior to construction.
References


Appendix D-1, Figures 2 – 13
Stream flow routed through mining ditch along west side of valley.

Lower ditch dewatering Donlin Creek floodplain and intercepts sub-surface flow.

Cross ditch intercepts original stream channel and routes flows to west side of valley.

Revegetated stream through mined areas to Donlin Creek floodplain.

Mining ditch discharges back to valley floor.

Secondary unconfined stream established in mined area.

Quartz Creek

Donlin Creek

Mainstream

Existing Site Features
- Ditch
- Overburden
- Existing Streams
- FlowPath

Compensatory Mitigation Plan
Attachment D, Upper Crooked Creek PRM Plan, Appendix D-1

Quartz Baseline Conditions

NAD 1983 UTM Zone 4N;
Imagery 0.5 m resolution, capture date 5/29/2016

Figure 2
Refill ditch with sidecast berm; revegetate to re-establish groundwater and surface water migration to valley floor.

Fill ditch with sidecast berm and revegetate.

Redirect stream to old oxbow

Minimally invasive excavation for viable aquatic habitat.

Re-establish main stream flow in existing channel along valley bottom. Reshape mine tailings to establish adequate floodplain where necessary.

Fill ditch - redirect flows to channel in valley bottom.

Fill ditch with sidecast berm; revegetate to re-establish groundwater and surface water migration to valley floor.

Use minimally invasive excavation and retain recovering vegetation to establish viable aquatic habitat and stable hydraulic regime.
Re-establish stream flow in existing channel along valley bottom. Improved low water and winter flows. Improved temperature regimes for fisheries habitats from improved vegetative cover.

Filled drainage ditches here and in the upper gulch will re-establish ground water flows to floodplains.

Re-establish stream flow in existing channel along valley bottom. Improved low water and winter flows. Improved temperature regimes for fisheries habitats from improved vegetative cover.

Rewatering of oxbow features will increased off channel rearing habitat.

Reductions in suspended solids loading will enhanced water quality and improved spawning gravels in Quartz and Donlin Creeks.

Quartz Post-Construction

Compensatory Mitigation Plan
Attachment D, Upper Crooked Creek PRM Plan, Appendix D-1

NAD 1983 UTM Zone 4N;
Imagery 0.5 m resolution, capture date 5/29/2016
Large ponds in the middle reaches of Snow Gulch have altered the natural stream gradient, creating unstable stream channels, eroding pond outlets, and fish passage blockages.

Mining ditch lacks floodplain and hydraulic function; this degrades water quality, channel diversity, and fish habitat.

Overburden filling oxbow features and Donlin Creek floodplain.

Overburden berms blocking connectivity to Donlin Creek floodplain.

Steep ditched stream channel.

Narrow channel easily blocked by beaver dams.

Donlin Creek.

Middle Ponds.

Upper Ponds.

Ditches: Steep side slopes contribute to erosion and degraded water quality. Drainage lowers water table and separates upland ground and surface water flows from Donlin Creek floodplain. Side cast overburden degrades wetlands.

Snow Baseline Conditions

Compensatory Mitigation Plan
Attachment D, Upper Crooked Creek PRM Plan, Appendix D-1

NAD 1983 UTM Zone 4N;
Imagery 0.5 m resolution, capture date 5/29/2016

Figure 5
Excavate/fill to create 1.7% gradient run/riffle/pool stream channel in widened floodplain. Create aquatic habitat with woody debris and larger rock structures.

Fill north end of pond to create stable outlet and stream channel.

Remove overburden piles to elevation of original floodplain. Reconnect pond outfall to abandoned oxbow habitats.

Fill pond outfall and leave existing channel as side channel habitat.

Ditch from Quartz Drainage Reinforce pond outfall with large wood debris and rock.

Enlarge pond area south of road crossing to offset loss at north end of middle pond.

Augment existing excavation area to create ponded area and direct stream through pond.

Reshape and revegetate embankment for stability

Reshape and revegetate overburden piles.

Fill existing mining ditch and revegetate.

Reshape pond to provide deep and shallow water habitats.

Enlarge pond area to create more diverse habitat

Reshape and revegetate embankment for stability

Construct fish passage conveyance at road crossing.
Increased pond area and diversity of habitats. Raise water table in adjacent floodplain areas.

Removed overburden from wetlands and reconnect floodplain to pond and upland water sources.

Provide fish passage to middle ponds via high function stream channel with rearing and spawning habitat.

Decrease side slopes and erosional areas in ditchlines and pond margins will improve water quality in Snow and Donlin Creeks.

Remove narrow conveyance channel at pond outfall to reduce beaver blockage of fish passage.

Increase pond habitats for resident fish in upper and middle pond areas.

Re-establish off channel habitats in oxbow features.

Site Protection Boundary clipped to edge of Lyman-owned parcel.

Figure 7
Coarse grained tailings, mostly upland impacts

Fine grained tailings, impacts to uplands and wetlands

Floodplain settlement area, impacts to wetlands

Containment berm

Crooked Creek

Wash Plant Site

Coarse grained tailings mostly upland impacts

Figure 8

0 237.5 475 Feet

Existing Site Features
- Ditch
- Overburden
- Pond
- Existing Streams
- FlowPath

Compensatory Mitigation Plan
Attachment D, Upper Crooked Creek PRM Plan, Appendix D-1

Wash Plant Tailings
Baseline Conditions

NAD 1983 UTM Zone 4N;
Imagery 0.5 m resolution, capture date 5/29/2016
Recontour coarse tailings pile to 2:1 slopes top with fines and revegetate.

Remove fine tailings from floodplain and wetland areas. Revegetate.

Retain containment berm to maintain ponding water levels in the short term.

Retain ponding and backwater area.

Recontour coarse tailings pile to 2:1 slopes top with fines and revegetate.

Compensatory Mitigation Plan
Attachment D, Upper Crooked Creek PRM Plan, Appendix D-1
Wash Plant Tailings Construction Plan

Grading Plan
- Red: Regrade Cut
- Blue: Proposed Flood Plain Boundary
- Blue: Pond

NAD 1983 UTM Zone 4N;
Imagery 0.5 m resolution, capture date 5/29/2016
Removal of fine tailings will extend floodplain, reduce suspended solids wash off to Crooked Creek and return function to wetlands.

Retention of berm and ponded area will improve water quality and spawning in adjacent areas of Crooked Creek.

Regrading, stabilization, and revegetation of tailings will reduce suspended solids runoff into Crooked Creek.

Compensatory Mitigation Plan, Attachment D, Upper Crooked Creek PRM Plan, Appendix D-1

Wash Plant Post-Construction

NAD 1983 UTM Zone 4N; Imagery 0.5 m resolution, capture date 5/29/2016
Ditches:
Steep side slopes contribute to erosion and degraded water quality. Drainage lowers water table and separates upland ground and surface water flows from Crooked Creek floodplain. Side cast overburden degrades wetlands.

Overburden Stockpiles blocking surface and ground water flows to Crooked Creek floodplain and impact wetland areas.

Existing ponds are below the floodplain of Crooked Creek, lowering water table and providing marginal aquatic habitat.

Narrow hydraulic conveyances with no floodplain areas contribute to fish passage blockage by beaver activities.

Off channel abandoned oxbows
Berms block connectivity to floodplain oxbow features

Revegetated reach of Queen Gulch
Mining ditch reroutes stream channel along south side of Queen Gulch

Compensatory Mitigation Plan
Attachment D, Upper Crooked Creek Plan, Appendix D-1

Ruby Queen Baseline Conditions
NAD 1983 UTM Zone 4N;
Imagery 0.5 m resolution, capture date 5/29/2016

Figure 11
Remove overburden pile on west and south sides of pond. Reshape pond to provide deep and shallow water habitats and stable side slopes.

Reshape ponds to provide deep and shallow water habitats and stable side slopes.

Remove overburden berm to original floodplain elevation.

Fill and revegetate overburden piles for stability.

Create pond outlet connection to historic oxbows.

Fill and revegetate ditch.

Fill and revegetate ditch.

Fill and revegetate ditch.

Fill and revegetate ditch.

Fill and revegetate ditch.

Fill and revegetate ditch.

Fill and revegetate ditch.

Fill long North to South ditch with overburden pile. Re-establish historic ground water table.

Fill North to South ditch with overburden pile. Re-establish historic ground water table.

Reshape ponds to provide deep and shallow water habitats and stable side slopes.

Fill and revegetate ditch.

Fill and revegetate ditch.

Fill and revegetate ditch.

Create pond outlet connection to historic oxbows.

Deepen and reshape small ponds.

Provide fish passage conveyance at road crossing or remove to create low water crossing.

Fill and revegetate ditch.

Compensatory Mitigation Plan Attachment D, Upper Crooked Creek PRM Plan, Appendix D-1

Ruby Queen Construction Plan

NAD 1983 UTM Zone 4N;
Imagery 0.5m resolution, capture date 5/29/16
Increasing pond area will improve habitat diversity for anadromous rearing habitat.

Removing restricted conveyance channels at pond outlet will alleviate beaver blockage of fish passage.

Reconstructing lower gradient stream channel will improve resident fish habitat and water quality.

Removing berm and raising of pond water levels will reconnect habitats with Crooked Creek floodplain.

Filling of ditch will stop interception of sub-surface flow, raise the water table, and re-establish the floodplain.

Rerouting flows to oxbow features will increase off-channel habitats and lower suspended solids in Crooked Creek.

Removing overburden from ponds and flattening of side slopes will improve water quality and temperature regime.

Compensatory Mitigation Plan Attachment D, Upper Crooked Creek PRM Plan, Appendix D-1

Ruby Queen Post-Construction

NAD 1983 UTM Zone 4N; Imagery 0.5m resolution, capture date 5/29/16

Figure 13
Appendix D-2
Notes: Not for construction. Plans are conceptual and require field verification prior to restoration activities.

Drawing is not to scale. Vertical exaggerated to show detail.

All section cuts taken facing in downstream direction.

Surface data in feet derived from ArcticDEM 2m.
EXISTING WATER SURFACE

PROPOSED WATER SURFACE

EXISTING MINING DITCH PROFILE

PROPOSED STREAM PROFILE

MINING DITCH

UPPER QUARTZ GULCH PROFILE B

Notes: Not for construction. Plans are conceptual and require field verification prior to restoration activities.

Drawing is not to scale. Vertical exaggerated to show detail.

All section cuts taken facing in downstream direction.

Surface data in feet derived from ArcticDEM 2m.

Compensatory Mitigation Plan

UPPER QUARTZ GULCH RESTORATION

Drawn By: SRB
Date: 6/6/18

APPENDIX D-2 SHEET 2
FLOOD PLAIN WIDTH VARIES
90 FT± RUBY
110 FT± SNOW

BANK WIDTH VARIES
6 FT RUBY
12 FT SNOW

NOTE: HARVEST WOODY DEBRIS FROM OVERBURDEN REMOVAL AREAS

EDGE OF FLOOD PLAIN

ROCK CLUSTERS

LAY WOODY DEBRIS ON STREAM BOTTOM; HOLD IN PLACE WITH ROCK CLUSTERS IN CENTER OF BRANCH TANGLE

APPROXIMATE GROUND PROFILE RUBY GULCH

APPROXIMATE GROUND PROFILE SNOW GULCH

EDGES OF FLOOD PLAIN

TYPICAL RESTORATION CHANNEL PLAN & SECTION

Notes: Not for construction. Plans are conceptual and require field verification prior to restoration activities.

Drawing is not to scale. Vertical exaggerated to show detail.

All section cuts taken facing in downstream direction.

Surface data in feet derived from ArcticDEM 2m.
18'±
12'±
ORDINARY HIGH WATER WIDTH = 12'±

FLOW VARY CREEK BANK TO ACHIEVE NATURAL HABITAT DIVERSITY (TYP)

FLOOD PLAIN WIDTH VARIES
WILLOW BRUSH LAYERING (TYP.)
BRUSH DEBRIS GRADE CONTROL STRUCTURE; STRUCTURES MAY OR MAY NOT BE INSTALLED IN EVERY SEQUENCE
RANDOM ROCK FEATURES (TYP.)

POOL SECTION
RUN SECTION
RIFFLE SECTION
VARY CREEK BANK TO ACHIEVE NATURAL HABITAT DIVERSITY (TYP)

TYPICAL STREAM CHANNEL PLAN, RIFFLE–RUN–POOL

Notes: Not for construction. Plans are conceptual and require field verification prior to restoration activities.
Drawing is not to scale.
TYPICAL STREAM CHANNEL PROFILE, RIFFLE–RUN–POOL

Notes: Not for construction. Plans are conceptual and require field verification prior to restoration activities.

Drawing is not to scale. Vertical exaggerated to show detail.

All section cuts taken facing in downstream direction.

Surface data in feet derived from ArcticDEM 2m.
TYPICAL STREAM CHANNEL PLAN, STEP–POOL

Notes: Not for construction. Plans are conceptual and require field verification prior to restoration activities.

Drawing is not to scale. Vertical exaggerated to show detail.

All section cuts taken facing in downstream direction.

Surface data in feet derived from ArcticDEM 2m.

Compensatory Mitigation Plan

RUBY GULCH RESTORATION

Drawn By: SRB
Date: 6/6/18

APPENDIX D–2 SHEET 6
1.5
1

IMPORTED STREAM SUBSTRATE

4-8:1
6.0'

WOODY DEBRIS
GRADE CONTROL
AND LARGE ROCK

VARIES 10-15'

ROCK CLUSTERS

IMPORTED STREAM SUBSTRATE

BRUSH LAYERING
(OPPOSITE BANK)

COIR LOG
(OPPOSITE BANK)

TYPICAL STREAM CHANNEL PROFILE, STEP–POOL

Notes: Not for construction. Plans are conceptual and require field verification prior to restoration activities.

Drawing is not to scale. Vertical exaggerated to show detail.

All section cuts taken facing in downstream direction.

Surface data in feet derived from ArcticDEM 2m.

Compensatory Mitigation Plan

RUBY GULCH
RESTORATION

Drawn By: SRB
Date: 6/6/18

APPENDIX D–2 SHEET 7
SNOW GULCH TYPICAL SECTION C

Notes: Not for construction. Plans are conceptual and require field verification prior to restoration activities.

Drawing is not to scale. Vertical exaggerated to show detail.
All section cuts taken facing in downstream direction.
Surface data in feet derived from ArcticDEM 2m.
### SNOW GULCH POND SECTION D

**Notes:** Not for construction. Plans are conceptual and require field verification prior to restoration activities.

- Drawing is not to scale. Vertical exaggerated to show detail.
- All section cuts taken facing in downstream direction.
- Surface data in feet derived from ArcticDEM 2m.

---

### Compensatory Mitigation Plan

- **SNOW GULCH POND SECTION**
- **Drawn By:** SRB
- **Date:** 6/6/18

---

**DONLIN GOLD**

**APPENDIX D—2 SHEET 9**
EXISTING GROUND PROFILE

PROPOSED GROUND PROFILE

PROPOSED STREAM CHANNEL IN EXISTING OXBOW FEATURE

EXISTING WATER SURFACE

DONLIN CREEK

SNOW GULCH & DONLIN CREEK SECTION E

Notes: Not for construction. Plans are conceptual and require field verification prior to restoration activities.

Drawing is not to scale. Vertical exaggerated to show detail.

All section cuts taken facing in downstream direction.

Surface data in feet derived from ArcticDEM 2m.

Compensatory Mitigation Plan

SNOW GULCH RESTORATION

Drawn By: SRB
Date: 6/6/18

APPENDIX D–2 SHEET 10
SNOW GULCH PROFILE F

Notes: Not for construction. Plans are conceptual and require field verification prior to restoration activities.

Drawing is not to scale. Vertical exaggerated to show detail.

All section cuts taken facing in downstream direction.

Surface data in feet derived from ArcticDEM 2m.

Compensatory Mitigation Plan

SNOW GULCH STREAM BED PROFILE

Drawn By: SRB
Date: 6/6/18
EXISTING MINED AREA SURFACE

EXISTING WATER SURFACE

EXISTING STREAM CHANNEL

EXISTING VALLEY SURFACE

PROPOSED WATER SURFACE

PROPOSED VALLEY SURFACE

PROPOSED FLOOD PLAIN

PROPOSED STREAM CHANNEL

RECONTOUR USING OVERBURDEN MATERIALS FROM FLOOD PLAIN AND POND AREAS

REVEGETATE ALL DISTURBED AREAS

RECONTOUR USING OVERBURDEN MATERIALS FROM FLOOD PLAIN AND POND AREAS

PROPOSED STREAM CHANNEL

RUBY GULCH TYPICAL SECTION G

Notes: Not for construction. Plans are conceptual and require field verification prior to restoration activities.

Drawing is not to scale. Vertical exaggerated to show detail.

All section cuts taken facing in downstream direction.

Surface data in feet derived from ArcticDEM 2m.

Compensatory Mitigation Plan

RUBY GULCH RESTORATION

Drawn By: SRB
Date: 6/6/18
APPENDIX D–2 SHEET 12
EXISTING GROUND PROFILE

EXISTING DONLIN CREEK FLOOD PLAIN

EXISTING WATER SURFACE

EXISTING CROOKED CREEK

EXISTING ABANDONED OXBOWS

MINING ACCESS ROAD

REMOVE OVERBUREN PILES

EXISTING CROOKED CREEK

EXISTING ABANDONED OXBOWS

PROPOSED POND AREA

POND DEPTH TO EXTEND TO BEDROCK OR 10'; WHICHER IS LESS

PROPOSED STREAM CHANNEL

PROPOSED LITTORAL ZONE; 3:1 SLOPE (TYP.)

4:1 SLOPE BELOW WATER SURFACES (TYP.)

EXISTING DONLIN CREEK FLOOD PLAIN

PROPOSED WATER SURFACE

EXISTING WATER SURFACE

RUBY–QUEEN TYPICAL SECTION H

Notes: Not for construction. Plans are conceptual and require field verification prior to restoration activities.

Drawing is not to scale. Vertical exaggerated to show detail.

All section cuts taken facing in downstream direction.

Surface data in feet derived from ArcticDEM 2m.
EXISTING GROUND PROFILE
EXISTING WATER SURFACE
EXISTING CROOKED CREEK
EXISTING DITCH; SEE DETAIL
EXISTING GROUND SURFACE
EXISTING CROOKED CREEK FLOOD PLAIN
EXISTING GROUND PROFILE
EXISTING OVERBURDEN
FILL DITCH WITH OVERBURDEN MATERIAL
REVEGETATE ALL DISTURBED AREAS
DEPRESSED AROUND WATER TABLE
RESTORED WATER TABLE
REMOVE EXISTING OVERBURDEN
EXISTING GROUND SURFACE

DITCH TYPICAL SECTION

DITCH DETAIL

RUBY—QUEEN DITCH SECTION I

Notes: Not for construction. Plans are conceptual and require field verification prior to restoration activities.

Drawing is not to scale. Vertical exaggerated to show detail.

All section cuts taken facing in downstream direction.

Surface data in feet derived from ArcticDEM 2m.

Compensatory Mitigation Plan

RUBY—QUEEN RESTORATION

Drawn By: SRB
Date: 6/6/18

APPENDIX D–2 SHEET 14
Attachment E

Chuitna Permittee Responsible Mitigation Plan
Contents

Objectives ..................................................................................................................................................... 4
Site Selection Criteria ..................................................................................................................................... 7
  Regulatory Considerations ........................................................................................................................ 7
  Preservation Area Location and Size ........................................................................................................ 8
  Preservation Area Wetland Ecology ......................................................................................................... 9
  Preservation Area Wetland Ecology Comparison to MA/TA ................................................................. 16
  Preservation Area Stream Ecology and Fisheries ................................................................................... 19
  Preservation Area Stream Ecology Comparison to MA/TA ................................................................. 24
  Preservation Area Endangered and Protected Species ........................................................................... 25
  Preservation Area Site Condition ............................................................................................................ 29
  Oil and Gas Development ....................................................................................................................... 30
  Coal Production ..................................................................................................................................... 30
  Coal Bed Methane and Underground Coal Gasification Development ................................................... 31
  Timber ..................................................................................................................................................... 31
  Gravel and Placer Mining ........................................................................................................................ 31
  Summary .................................................................................................................................................. 31
Site Protection Instrument .......................................................................................................................... 34
  Draft Language for TNC Lands .............................................................................................................. 34
  Draft Language for AMHT Lands ............................................................................................................ 38
Baseline Information .................................................................................................................................. 41
  Preservation Area Wetland Mapping ..................................................................................................... 41
  Preservation Area Site Condition Analysis .............................................................................................. 42
Determination of Credits ............................................................................................................................ 42
Mitigation Work Plan .................................................................................................................................. 42
Maintenance Plan ....................................................................................................................................... 42
Performance Standards ............................................................................................................................... 43
Monitoring Requirements ........................................................................................................................... 43
Long-term Management Plan (LMP) .......................................................................................................... 43
Adaptive Management Plan ....................................................................................................................... 45
Financial Assurances .................................................................................................................................. 45
References .................................................................................................................................................... 46
Figures

Figure 1  Chuitna PRM Preservation Area ................................................................. 6
Figure 2  Representative Chuitna River Cross-Section in the Preservation Area ........................................ 15
Figure 3  Representative String Bog/Tributary Stream Cross-Section in the Preservation Area .......... 16
Figure 4  Preservation Area ADF&G Anadromous Streams ......................................................... 22
Figure 5  Cook Inlet Beluga Whale Critical Habitat ............................................................... 28
Figure 6  Chuitna PRM Threat Map .................................................................................. 33
Figure 7  Chuitna Wetland and Stream Tyonek Native Corporation Preservation Area ................. 37
Figure 8  Chuitna Wetland and Stream Alaska Mental Health Trust Preservation Area ................. 40

Tables

Table 1  Chuitna River and Old Tyonek Creek-Frontal Cook Inlet Watershed Wetlands and Waters (Acres, Percent) ................................................................. 10
Table 2  Preservation Area Wetlands and Waters and Buffers (Acres, Percent) ..................................... 10
Table 3  Preservation Area HGM Classification (Acres, Percent) ..................................................... 11
Table 4  Preservation Area Vegetation Type Classification (Acres, Percent) ....................................... 12
Table 5  Preservation Area Cowardin Classifications (Acres, Percent) .............................................. 13
Table 6  Preservation Area HGM Classification Wetlands Comparison to MA/TA: Preserved and Permanently Filled (Acres) ................................................................. 16
Table 7  Preservation Area Riverine HGM Wetlands Comparison to MA/TA ....................................... 19
Table 8  Preservation Area Salmon Habitat Preserved in the Chuitna River Mainstem ...................... 20
Table 9  Preservation Area Salmon Habitat Preserved in Tributaries to the Chuitna River .................. 21
Table 10 MA/TA Crooked Creek Anadromous Fish Habitats Permanently Filled by Project Development ................................................................. 24
Table 11 Summary of Anadromous Stream Habitat Preserved (Chuitna Drainage) and Permanently Filled (Crooked Creek Drainage) ......................................................... 25
Table 12 Salmon, Rainbow Trout, and Dolly Varden Comparison: Crooked Creek and Chuitna River ... 25
Table 13 Preservation Area Condition Analysis (Acres) ................................................................ 29
Table 14 Areas Permanently Protected by the Preservation Area .................................................. 42

Photos

Photo 1  MA/TA Upper American Creek ................................................................................ 17
Photo 2  Preservation Area String Bog Systems Example .............................................................. 18
Photo 3  MA/TA American Creek Riverine HGM Floodplain ..................................................... 18
Photo 4  Preservation Area Riverine HGM Wetlands, Chuitna River ........................................... 19
Attachment E Chuitna Permittee Responsible Mitigation Plan

Objectives
The objective of the Chuitna Permittee Responsible Mitigation (PRM) Plan (Plan) is to provide compensatory mitigation for the wetland and aquatic resource impacts associated with the Donlin Gold, LLC (Donlin Gold) Project (Project). The Plan will protect a parcel of land totaling 5,870 acres, including 3,269 acres of wetlands and ponds, and 418 acres of streams and rivers, totaling 3,687 acres of Waters of the United States (WOUS). It also protects 2,183 acres of upland riparian and buffers, and 258,056 linear feet (48.87 miles) of streams. Fill and other ground disturbing activities in wetlands in the Chuitna Preservation Area (Preservation Area) would be detrimental to aquatic habitat and wetland-dependent wildlife species, including all five species of Pacific salmon and endangered Beluga whales at the mouth of the Chuitna River. The Preservation Area is on land owned by the Tyonek Native Corporation (TNC) and the Alaska Mental Health Trust Authority (AMHT) as shown on Figure 1. Michael Baker International (Michael Baker) completed field wetland delineation work in the Chuitna Preservation Area from June 5th through 11th 2018. The field verified results are presented in this Plan. Preservation is appropriate under the 2008 Mitigation Rule (Rule) under the criteria of 33 CFR 332.3(h) (United States Army Corps of Engineers [USACE] and United States Environmental Protection Agency [EPA] 2008) and supported by the 1994 Alaska Wetland Initiative (EPA et al. 1994). In 33 CFR 332.3(3)(b)(4) of the Rule, USACE and the EPA discuss the mitigation hierarchy of mitigation banks, in-lieu fee (ILF) programs, and PRM projects. The Code of Federal Regulation (CFR) states:

"Where permitted impacts are not in the service area of an approved mitigation bank or in-lieu fee program that has the appropriate number and resource type of credits available, permittee responsible mitigation is the only option. Where practicable and likely to be successful and sustainable, the resource type and locations for the permittee-responsible compensatory mitigation should be determined using the principles [added emphasis] of a watershed approach..."

A portion of the natural gas pipeline includes some very limited permanent wetland impacts within the Great Land Trust ILF program and Su-Knik Mitigation Bank service areas (see Compensatory Mitigation Plan [CMP], Section 5.0). However, no existing bank or ILF programs are available for the Mine Area (MA) impacts, the Transportation Area (TA) impacts or the majority of the Pipeline Area (PA) impacts. Hence, the Preservation Area is proposed as PRM.

One concern often raised regarding PRM projects is that the applicants cannot gain control of all the land necessary for watershed level benefits; i.e., PRM areas often are small isolated areas that represent small parts of a much larger watershed area. The Chuitna parcel, in keeping with the principles of a watershed approach, provides a large, contiguous, and ecologically valuable site, selected based on its location, size, connectivity, unique aquatic values, and the ongoing threat of near-term development in the watershed. In establishing the Preservation Area, Donlin Gold specifically focused on protecting important and productive wetlands and streams at the watershed level. The parcel boundaries were determined through a detailed planning process that is based on geographic features. The goal is to
protect the streams and associated floodplains as well as the valley slopes adjacent to the floodplain. In most areas, the boundary is defined by the crest at the top of the valley.
The unique and valuable ecological features of the Preservation Area are:

- The parcel is composed of productive wetlands, streams, and upland habitats. This diversity contributes to the ecological success and long-term sustainability of the watershed.
- The size and location of the parcel provide a connection between the hydrologic source waters in the Alaska Range, through shallow ground water that flows through the wetland string bogs, the tributaries, and finally to the Chuitna River and Cook Inlet.
- The ericaceous shrub bog-string bog wetlands, a specific type of slope Hydrogeomorphic (HGM) wetlands (also known as patterned fens) are a unique wetland type to the area, and only occur in a few very specific places worldwide.
- The parcel preserves important wetlands, riparian areas, and buffers adjacent to anadromous streams containing five Pacific salmon species.
- The riparian wetland areas provide ecological functions and services to maintain and protect water quality.
- The parcel contains estuarine habitat in Cook Inlet which supports Beluga whales and is part of the designated critical habitat area for this listed endangered species.

The method of legal conservation is land preservation via deed restrictions. The resources for preservation contribute to the ecological sustainability of the watershed, including Pacific salmon.

**Site Selection Criteria**

**Regulatory Considerations**

The Rule was consulted to determine the site selection criteria framework. Mitigation plans must address the following criteria if preservation is proposed [33 CFR 332.3(h)]:

1. “The resources preserved must provide important physical, chemical, or biological functions for the watershed;
2. The resources preserved must contribute significantly to the ecological sustainability of the watershed. In determining the contribution of those resources to the ecological sustainability of the watershed, the district engineer must use appropriate quantitative assessment tools, where available;
3. Preservation is determined by the district engineer to be appropriate and practicable;
4. The resources are under threat of destruction or adverse modifications;
5. The preserved site will be permanently protected through an appropriate real estate or legal instrument (e.g., easement, title transfer to state resource agency or land trust).”

In determining parcel size and location, Donlin Gold sought preservation parcels that provided:

- Important physical, chemical, or biological functions within a watershed;
- Contained wetland and aquatic resources that contribute significantly to the ecological sustainability of the watershed; and
- Provided sufficient acreage to offset the Project’s permanent impacts to wetlands by at least an acre per acre.
To define ecological sustainability Donlin Gold consulted the Rule [33 CFR 332.3(d)(1) and 40 CFR 230.93(d)(1)]. In determining the ecological suitability, the following factors were considered:

“(i) Hydrological conditions, soil characteristics, and other physical and chemical characteristics;

(ii) Watershed-scale features, such as aquatic habitat diversity, habitat connectivity, and other landscape scale functions;

(iii) The size and location of the compensatory mitigation site relative to hydrologic sources and other ecological features;

(iv) Compatibility with adjacent land uses and watershed management plans;

(v) Reasonably foreseeable effects the compensatory mitigation project will have on ecologically important aquatic or terrestrial resources (e.g., shallow sub-tidal habitat, mature forests), cultural sites, or habitat for federal or state listed, threatened and endangered species;

(vi) Other relevant factors including, but not limited to, development trends, anticipated land use changes, habitat status and trends, the relative locations of the impact and mitigation sites in the stream network, local or regional goals for the restoration or protection of particular habitat types or functions (e.g., re-establishment of habitat corridors or habitat for species of concern), water quality goals, floodplain management goals, and the relative potential for chemical contamination of the aquatic resources.”

To help determine parcel size and location, Donlin Gold referred to the definitions (33 CFR 332.2) of “Riparian area” and “Buffer” to construct the boundaries of the parcel within the watershed, so the threats adjacent to the parcel would not degrade its features and functions. The definitions state:

- “Riparian areas are lands adjacent to streams, rivers, lakes, and estuarine marine shorelines. Riparian areas provide a variety of ecological functions and services and help improve or maintain local water quality.”

- “Buffer means an upland, wetland, and/or riparian area that protects and/or enhances aquatic resource functions associated with wetlands, rivers, streams, lakes, marine, and estuarine systems from disturbances associated with adjacent land uses.”

Using the regulatory framework of the Rule, Donlin Gold developed its site selection criteria to evaluate size, location, wetlands, aquatic resources, hydrology, and ecological sustainability of preservation parcels. Donlin Gold adopted the following site selection criteria:

*The site needs to supply watershed scale hydrology, wetlands, or soils providing aquatic habitat diversity, habitat connectivity, and aquatic and terrestrial resource habitats for Pacific Salmon and, if possible, federal or state listed, threatened and endangered species. The site needs to supply adequate wetland and riparian area to replace aquatic resources lost commensurate with project impacts. There must be sufficient parcel size to buffer preserved wetlands and streams from adjacent threat.*

**Preservation Area Location and Size**

The Preservation Area is located on the west side of Cook Inlet within the Cook Inlet Lowlands Major Land Resource Area (MLRA). The Preservation Area totals 5,870 acres, and includes 3,269 acres of
wetlands and 258,056 linear feet (48.87 miles) of streams, in part of the most densely populated region of the state. Existing and potential future land use within the MLRA includes agriculture, logging, commercial fishing, mining, and oil and gas extraction. Additionally, tourism, recreation, urban development, and subsistence activities contribute to impacts within the area (Natural Resources Conservation Service [NRCS] 2004).

The parcel contains wetlands and aquatic stream resources to sufficiently offset the potential losses of aquatic resources associated with the Project. In addition, the parcel includes buffers that further protect this key portion of the Chuitna watershed and the important physical, chemical, and biological functions of the wetlands and streams.

Mitigation credits can include both wetlands and buffers. “District engineers may require the restoration, establishment, enhancement, and preservation, as well as the maintenance, of riparian areas and/or buffers around aquatic resources where necessary to ensure the long-term viability of those resources. Buffers may also provide habitat or corridors necessary for the ecological functioning of aquatic resources. If buffers are required by the district engineer as part of the compensatory mitigation project, compensatory mitigation credit will be provided for those buffers.” [33 CFR 332.3(h)(2)(i)].

**Preservation Area Wetland Ecology**

The Preservation Area acreages in this Plan are rounded to the nearest whole number and will be further defined in the Chuitna Preservation Area Preliminary Jurisdictional Determination (PJD) anticipated in late July 2018. For comparison purposes, Project fill quantities in this Plan are also rounded to the nearest whole number; these data are from the 2016 PJD (Michael Baker 2016) and 2017 Department of Army (DA) Application (Donlin Gold 2017).

The Preservation Area linear feet and wetland acres have been calculated to avoid double-counting. Stream credits are calculated in linear feet, and wetland credits are calculated in acres. Streams visible in aerial imagery have been delineated as polylines and polygons. The polylines are used to calculate linear feet of stream length, while the polygons are used to delineate stream and wetland boundaries and to exclude stream acres from the overall credit calculation.

Wetlands have been classified using HGM (Brinson 1993) and National Wetland Inventory (NWI) (Cowardin et al. 1979) systems. The label “Riverine” is used in both classification systems.

- **HGM**: Following Brinson (1993), riverine HGM only applies to wetlands adjacent to streams where the dominant water source is hyporheic or overland flow from the stream. No streams delineated as polygons have been included in the riverine HGM wetland total. The riverine HGM applies only to wetlands.

- **NWI**: Following Cowardin et al. (1979), NWI riverine is a system level class that applies to habitats contained within a channel. Polylines classified under NWI as riverine correspond to stream systems, and count toward linear feet of stream. Polygons classified under NWI as riverine are not counted in the total wetland credit acres.
The Preservation Area contains wetlands and aquatic resources that are unique to the area and provide valuable ecosystem functions at the watershed level. The Preservation Area includes headwater streams flowing through large bogs, connecting to intermediate streams with highly productive salmon and riparian habitat, into an anadromous river, and to its outlet through an estuarine area into Cook Inlet. Most of the Preservation Area is located within the Chuitna River HUC-10 watershed (5,852 acres or greater than 99 percent), while a small portion at the mouth of the Chuitna River is located within the Old Tyonek Creek-Frontal Cook Inlet HUC-10 watershed (18 acres or less than 1 percent).

The two HUC-10 watersheds were mapped using the NWI and total 182,304 acres, of which 64,226 acres (35 percent) are WOUS. (Table 1). The Preservation Area totals 5,870 acres, of which 3,687 acres (62.8 percent) are WOUS (Table 2).

**Table 1**  
*Chuitna River and Old Tyonek Creek-Frontal Cook Inlet Watershed Wetlands and Waters (Acres, Percent)*

<table>
<thead>
<tr>
<th>Wetland Type (NWI)</th>
<th>Acres</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshwater Emergent Wetland</td>
<td>9,156</td>
<td>5</td>
</tr>
<tr>
<td>Freshwater Forested/Shrub Wetland</td>
<td>27,337</td>
<td>15</td>
</tr>
<tr>
<td>Estuarine and Marine Wetland</td>
<td>13,212</td>
<td>7</td>
</tr>
<tr>
<td>Freshwater Pond</td>
<td>1,104</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Lake</td>
<td>1,487</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Estuarine and Marine Deepwater</td>
<td>10,707</td>
<td>6</td>
</tr>
<tr>
<td>Riverine (Stream and River Area)</td>
<td>1,223</td>
<td>&lt;1</td>
</tr>
<tr>
<td><strong>Total Wetland and Waters</strong></td>
<td>64,226</td>
<td>35</td>
</tr>
<tr>
<td>Upland Riparian and Buffer</td>
<td>118,078</td>
<td>65</td>
</tr>
<tr>
<td><strong>Total Mapped Area</strong></td>
<td>182,304</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: National Wetlands Inventory (NWI) 2017

**Table 2**  
*Preservation Area Wetlands and Waters and Buffers (Acres, Percent)*

<table>
<thead>
<tr>
<th>Wetland Type</th>
<th>Acres</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wetlands and Ponds</td>
<td>3,269</td>
<td>55.7</td>
</tr>
<tr>
<td>Stream and River Area</td>
<td>418</td>
<td>7.1</td>
</tr>
<tr>
<td><strong>Total Wetlands and Waters</strong></td>
<td>3,687</td>
<td>62.8</td>
</tr>
<tr>
<td>Upland Riparian and Buffer</td>
<td>2,183</td>
<td>37.2</td>
</tr>
<tr>
<td><strong>Total Mapped Area</strong></td>
<td>5,870</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Field Verified Mapping, Michael Baker June 2018

Wetlands and waters within the Preservation Area have been characterized through field verified mapping by HGM classification (Brinson 1993), summarized in Table 3; vegetation type classification based on a modified Viereck Classification System (Viereck et.al. 1992), summarized in Table 4; and Cowardin classification (Cowardin et al. 1979), summarized in Table 5.

The most common NWI mapped wetland vegetation type in the two HUC-10 watersheds is freshwater forested/shrub followed by estuarine habitat, the majority of which is within the Old Tyonek Creek-Frontal Cook Inlet watershed.
The most common wetland types in the field verified Preservation Area are ericaceous shrub bog-string bog and low shrub bogs.

Table 3  
Preservation Area HGM Classification (Acres, Percent)

<table>
<thead>
<tr>
<th>HGM Classification</th>
<th>Acres</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depressional</td>
<td>79</td>
<td>1.3</td>
</tr>
<tr>
<td>Estuarine Fringe</td>
<td>29</td>
<td>0.5</td>
</tr>
<tr>
<td>Riverine</td>
<td>500</td>
<td>8.5</td>
</tr>
<tr>
<td>Riverine Channel</td>
<td>418</td>
<td>7.1</td>
</tr>
<tr>
<td>Slope</td>
<td>2,661</td>
<td>45.3</td>
</tr>
<tr>
<td><strong>Total Wetlands/WOUS</strong></td>
<td>3,687</td>
<td>62.8</td>
</tr>
<tr>
<td>Upland Riparian and Buffer</td>
<td>2,183</td>
<td>37.2</td>
</tr>
<tr>
<td><strong>Total Mapped Area</strong></td>
<td>5,870</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Field Verified Mapping, Michael Baker June 2018  
Notes: Apparent inconsistencies due to rounding
### Table 4 Preservation Area Vegetation Type Classification (Acres, Percent)

<table>
<thead>
<tr>
<th>Vegetation Type</th>
<th>Field Verified</th>
<th>Field Verified</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Forested Types</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open Black Spruce Forest</td>
<td>252</td>
<td>4.3</td>
</tr>
<tr>
<td>Black Spruce Woodland</td>
<td>206</td>
<td>3.5</td>
</tr>
<tr>
<td>Open Deciduous Forest</td>
<td>7</td>
<td>0.1</td>
</tr>
<tr>
<td>Closed Mixed Forest</td>
<td>5</td>
<td>0.1</td>
</tr>
<tr>
<td>Open Mixed Forest</td>
<td>523</td>
<td>8.9</td>
</tr>
<tr>
<td>Woodland Deciduous Forest</td>
<td>5</td>
<td>0.1</td>
</tr>
<tr>
<td>Woodland Mixed Forest</td>
<td>44</td>
<td>0.7</td>
</tr>
<tr>
<td><strong>Total Forest Type</strong></td>
<td><strong>1,041</strong></td>
<td><strong>17.7</strong></td>
</tr>
<tr>
<td><strong>Shrub Types</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Closed Alder Shrub</td>
<td>12</td>
<td>0.0</td>
</tr>
<tr>
<td>Closed Alder Willow Shrub</td>
<td>36</td>
<td>0.6</td>
</tr>
<tr>
<td>Ericaceous Shrub Bog-String Bog</td>
<td>802</td>
<td>13.7</td>
</tr>
<tr>
<td>Low Shrub Bog</td>
<td>548</td>
<td>9.3</td>
</tr>
<tr>
<td>Open Alder Shrub</td>
<td>268</td>
<td>4.6</td>
</tr>
<tr>
<td>Open Alder Willow Shrub</td>
<td>230</td>
<td>3.9</td>
</tr>
<tr>
<td>Open Willow Shrub</td>
<td>41</td>
<td>0.7</td>
</tr>
<tr>
<td><strong>Total Shrub Type</strong></td>
<td><strong>1,936</strong></td>
<td><strong>33.0</strong></td>
</tr>
<tr>
<td><strong>Herbaceous Types</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aquatic Herbaceous</td>
<td>1</td>
<td>0.0</td>
</tr>
<tr>
<td>Mesic Herb</td>
<td>97</td>
<td>1.7</td>
</tr>
<tr>
<td>Wet Herbaceous</td>
<td>140</td>
<td>2.4</td>
</tr>
<tr>
<td><strong>Total Herbaceous Type</strong></td>
<td><strong>239</strong></td>
<td><strong>4.1</strong></td>
</tr>
<tr>
<td>Open Water (Pond and Estuarine Fringe)</td>
<td>54</td>
<td>0.9</td>
</tr>
<tr>
<td><strong>Total Wetlands and Ponds</strong></td>
<td><strong>3,269</strong></td>
<td><strong>55.7</strong></td>
</tr>
<tr>
<td>Riverine System (Streams and Rivers)</td>
<td>418</td>
<td>7.1</td>
</tr>
<tr>
<td><strong>Total Wetlands/WOUS</strong></td>
<td><strong>3,687</strong></td>
<td><strong>62.8</strong></td>
</tr>
<tr>
<td><strong>Total Upland Riparian and Buffer</strong></td>
<td><strong>2,183</strong></td>
<td><strong>37.2</strong></td>
</tr>
<tr>
<td><strong>Total Mapped Area</strong></td>
<td><strong>5,870</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Source: Field Verified Mapping, Michael Baker June 2018
Notes: Apparent inconsistencies due to rounding
### Table 5: Preservation Area Cowardin Classifications (Acres, Percent)

<table>
<thead>
<tr>
<th>Cowardin Groups</th>
<th>Cowardin Classification</th>
<th>Cowardin Acres</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coniferous Forests</td>
<td>PFO4/SS1</td>
<td>163</td>
<td>2.8</td>
</tr>
<tr>
<td></td>
<td>PFO4</td>
<td>26</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>PFO4/SS4</td>
<td>6</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>PSS1/FO4</td>
<td>89</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Total Coniferous Forests</strong></td>
<td></td>
<td><strong>284</strong></td>
<td><strong>4.8</strong></td>
</tr>
<tr>
<td>Deciduous Forests</td>
<td>PFO1</td>
<td>3</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>PFO1/SS1</td>
<td>3</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>PSS1/FO1</td>
<td>4</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>PF01/EM1</td>
<td>2</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>PEM1/FO1</td>
<td>1</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Total Deciduous Forests</strong></td>
<td></td>
<td><strong>13</strong></td>
<td><strong>0.2</strong></td>
</tr>
<tr>
<td>Mixed Forests</td>
<td>PFO4/1</td>
<td>245</td>
<td>4.2</td>
</tr>
<tr>
<td></td>
<td>PFO1/4</td>
<td>283</td>
<td>4.8</td>
</tr>
<tr>
<td></td>
<td>PSS1/FO1</td>
<td>18</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>PEM1/FO1</td>
<td>9</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Total Mixed Forests</strong></td>
<td></td>
<td><strong>554</strong></td>
<td><strong>9.4</strong></td>
</tr>
<tr>
<td>Coniferous Scrub</td>
<td>PSS1/4</td>
<td>134</td>
<td>2.3</td>
</tr>
<tr>
<td></td>
<td>PSS4</td>
<td>5</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>PSS4/1</td>
<td>51</td>
<td>0.9</td>
</tr>
<tr>
<td><strong>Total Coniferous Scrub</strong></td>
<td></td>
<td><strong>190</strong></td>
<td><strong>3.2</strong></td>
</tr>
<tr>
<td>Shrub</td>
<td>PSS1</td>
<td>283</td>
<td>4.8</td>
</tr>
<tr>
<td></td>
<td>PSS1/EM1</td>
<td>1,570</td>
<td>26.7</td>
</tr>
<tr>
<td></td>
<td>PEM1/SS1</td>
<td>84</td>
<td>1.4</td>
</tr>
<tr>
<td><strong>Total Shrub</strong></td>
<td></td>
<td><strong>1,937</strong></td>
<td><strong>33.0</strong></td>
</tr>
<tr>
<td>Herbaceous</td>
<td>E2EM1</td>
<td>26</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>PEM1/2</td>
<td>3</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>PEM1</td>
<td>208</td>
<td>3.5</td>
</tr>
<tr>
<td><strong>Total Herbaceous</strong></td>
<td></td>
<td><strong>237</strong></td>
<td><strong>4.0</strong></td>
</tr>
<tr>
<td>Ponds</td>
<td>PUB/AB3</td>
<td>1</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>PUB</td>
<td>49</td>
<td>0.8</td>
</tr>
<tr>
<td><strong>Total Ponds</strong></td>
<td></td>
<td><strong>51</strong></td>
<td><strong>0.9</strong></td>
</tr>
<tr>
<td>Estuarine Waters</td>
<td>E2US</td>
<td>3</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Total Estuarine</strong></td>
<td></td>
<td><strong>3</strong></td>
<td><strong>0.0</strong></td>
</tr>
<tr>
<td><strong>Total Wetlands, Ponds, and Estuarine</strong></td>
<td></td>
<td><strong>3,269</strong></td>
<td><strong>55.7</strong></td>
</tr>
<tr>
<td>Rivers and Streams</td>
<td>R1UB</td>
<td>13</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>R3UB</td>
<td>404</td>
<td>6.9</td>
</tr>
<tr>
<td></td>
<td>R4SBC</td>
<td>1</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Total Rivers and Streams</strong></td>
<td></td>
<td><strong>418</strong></td>
<td><strong>7.1</strong></td>
</tr>
<tr>
<td><strong>Total Wetlands and Waters</strong></td>
<td></td>
<td><strong>3,687</strong></td>
<td><strong>62.8</strong></td>
</tr>
<tr>
<td><strong>Total Upland Riparian and Buffers</strong></td>
<td></td>
<td><strong>2,183</strong></td>
<td><strong>37.2</strong></td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td></td>
<td><strong>5,870</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Source: Field Verified Mapped, Michael Baker June 2018
Notes: Apparent inconsistencies due to rounding
*Note: Streams and Rivers acreage is not included within wetlands and ponds
The wetland systems within the Preservation Area include large areas of slope HGM wetlands including ericaceous shrub bog-string bog wetlands, riverine HGM riparian wetlands, estuarine fringe HGM wetlands, and a small number of depressional HGM wetlands.

- **Slope HGM Wetlands** – The largest HGM wetland type in the Preservation Area is slope HGM. This wetland type covers 2,661 acres, or about 45 percent of the area (Table 3). The dominant source of water in slope HGM wetlands is discharge of groundwater to the land surface. Functions performed by these wetlands include discharge of water, modification of stream flow and water quality, export of detritus, maintenance of plant communities, and habitat support (Hall et. al. 2003). Lone Creek, a tributary of the Chuitna River, flows through or near much of the slope HGM wetlands in the Preservation Area. These wetlands contribute to the stream base flow and nutrient outputs, which then flow to the Chuitna River.

- **Ericaceous Shrub Bog-String Bog Wetlands** – A type of slope HGM wetlands also known as patterned fens, these wetlands are a unique wetland type to the area, and only occur in a few very specific places worldwide. They are characterized by alternating ridges (strangs) dominated by shrubs and wet depressions (flarks). These features generally run perpendicular to the direction of water movement. Functions performed by these wetlands include discharge of water, water storage, particulate retention, export of carbon, cycling of elements, maintenance of plant communities, and habitat support including characteristic structures, interspersion, and connectivity (Hall et al. 2003). In the Preservation Area, 802 acres of the slope HGM wetlands are ericaceous shrub bog-string bog wetlands (Table 4).

- **Riverine HGM Wetlands** – Riverine HGM wetlands occur in floodplains and riparian areas. The dominant water sources are overbank flow from the channel or hyporheic flow between the stream and wetlands (NRCS 2008). Functions performed by riverine HGM wetlands include groundwater discharge and recharge of water, water storage, modification of stream flow and water quality, export of carbon, maintenance of plant communities, and habitat support (Powell et al. 2003). The Preservation Area contains 500 acres of riverine wetlands (Table 3).

- **Estuarine Fringe HGM Wetlands** – Estuarine fringe HGM wetlands occur along coastlines and are under the influence of sea water (NRCS 2008). Functions performed by estuarine fringe HGM wetlands include shoreline erosion control, nutrient absorption, maintenance of plant communities, and habitat support (EPA 2017). The Preservation Area contains 29 acres of estuarine fringe HGM wetlands surrounding the outlet of the Chuitna River into Cook Inlet (Table 3).

- **Depressional HGM Wetlands** – In the Preservation Area, there are 79 acres of the Preservation Area as depressional HGM wetlands (Table 3). These wetlands occur in topographic depressions. Functions performed by depressional HGM wetlands include groundwater discharge and recharge depending on landscape position, storm and floodwater storage, modification of streamflow and water quality, maintenance of plant communities, and habitat support (Powell et al. 2003).
The Preservation Area also protects areas adjacent to wetlands and streams. These uplands provide important ecosystem functions and values. Upland areas can be important for groundwater recharge, sometimes exceeding adjacent wetlands due to more permeable soil. Upland areas directly adjacent to slope HGM wetlands support groundwater discharge functions, helping to maintain the downgradient wetlands. Upland buffers adjacent to wetlands also protect and maintain wetland function. They act to slow and stop sediment and pollutants entering wetlands, provide organic matter to wetlands, and maintain wildlife habitat and movement corridors (McElfish et al. 2008). Figure 2 and Figure 3 show representative drawings of these areas and their functions.

Uplands and wetlands in the Preservation Area surrounding the Chuitna River and Lone Creek were selected to maximize the protection of wetlands, floodplains, anadromous streams, and riparian areas using a watershed approach. The Chuitna River floodplain includes back water sloughs, ponds, minor channels, riverine wetlands, and scrub and forested uplands in the bends of the river. The Preservation Area boundaries on the mainstem of the Chuitna River were selected to maximize full protection of the floodplain flow channels, which support the anadromous stream system. The protection of wetlands, streams, and upland riparian areas in the watershed provides a diversity of habitat and vegetation types, both terrestrial and aquatic, while protecting anadromous waters.

The boundaries around Lone Creek were established to maximize the amount of unique ericaceous shrub bog-string bog wetlands. This created a large contiguous undeveloped parcel of the stream and its tributaries and wetlands interspersed with uplands. This unfragmented parcel in the lower Lone Creek watershed protects the wetlands, baseflow, streams, and anadromous fisheries of both Lone Creek and the Chuitna River from development.

**Figure 2**  
*Representative Chuitna River Cross-Section in the Preservation Area*
Preservation Area Wetland Ecology Comparison to MA/TA

Approximately 44 percent of Interior Alaska consists of WOUS (Hall et al. 1994). The MA/TA is in the Kuskokwim Highlands ecoregion in the Interior and consists of 55.4 percent wetlands (Hall et al. 1994). Precipitation drives the hydrology of most of the Interior wetlands and waters (Alaska Department of Environmental Conservation [ADEC] 1999); these are classified as flat HGM (Brinson 1993, ADEC 1999).

As noted in Table 6, flat HGM wetlands comprise most wetlands impacted by the Project.

Slope wetlands comprise most wetlands in the Preservation Area. Buffer areas that provide similar functions as wetlands are also included in the Preservation Area; they are not shown in Table 6, but their functions are displayed in Figure 2 and Figure 3. The Preservation Area will permanently protect a parcel of land totaling 5,870 acres.

Table 6  Preservation Area HGM Classification Wetlands Comparison to MA/TA: Preserved and Permanently Filled (Acres)

<table>
<thead>
<tr>
<th>HGM Classification</th>
<th>Preservation Area(^1) Acres Preserved</th>
<th>MA/TA(^2) Acres Permanent Fill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>79</td>
<td>3</td>
</tr>
<tr>
<td>Estuarine Fringe</td>
<td>29</td>
<td>0</td>
</tr>
<tr>
<td>Flat</td>
<td>0</td>
<td>1,623</td>
</tr>
<tr>
<td>Riverine</td>
<td>500</td>
<td>160</td>
</tr>
<tr>
<td>Slope</td>
<td>2,661</td>
<td>888</td>
</tr>
<tr>
<td>Total Wetlands(^3)</td>
<td>3,269</td>
<td>2,676</td>
</tr>
</tbody>
</table>

Source: \(^1\)Field Verified Mapping, Michael Baker June 2018, \(^2\)DA (Donlin Gold 2017), \(^3\)Apparent inconsistencies due to rounding

Wetlands perform several functions including terrestrial support for plants/animals, geochemical retention and transformation, hydrologic functions, carbon/nutrient export, and fish/aquatic system support. Each HGM classification performs various functions within each class to differing degrees. The flat HGM wetlands in the MA/TA are comprised mostly of large black spruce vegetated hillsides, for the most part without streams. Streams would provide an outlet for nutrient/carbon export to the Crooked
Creek system, but without streams, there is no nutrient/carbon export and no opportunity for flat HGM wetlands to provide fish or aquatic system support. Within the Preservation Area, slope and riverine HGM wetlands are the dominant classes associated with groundwater systems that export carbon/nutrients, and contribute to adjacent streams which support the anadromous fish in the Chuitna River.

The slope HGM wetlands within the MA/TA are associated with small groundwater and precipitation driven hillside drainages, headwater intermittent and perennial streams, and black spruce wetlands at the toeslopes of the hills adjacent to the floodplains of the various valley streams. Slope wetlands are not supporting a large stream system. The upper swales and hillside drainages are vegetated with willow and alder, with bluejoint (*Calamagrostis canadensis*) understories (Photo 1).

In comparison, Lone Creek, a tributary of the Chuitna River, flows through or drains most of the slope HGM wetlands, including the ericaceous shrub bog-string bog wetland systems in the Preservation Area. These wetlands provide habitat support, nutrient cycling, flood water storage, and contribute to the stream base flow and nutrient outputs of the Chuitna River. Photo 2 shows an example of string bog systems within the Preservation Area.

*Photo 1  MA/TA Upper American Creek*
In the MA/TA, the American and Anaconda Creek drainages are small low-flow systems that appear to lack substantial winter flow. Each creek is associated with a narrow riverine HGM floodplain. The 160 acres of MA floodplains consist of willow, alder, and spruce/mixed forest types. Photo 3 shows the riverine HGM floodplain associated with the anadromous portion of American Creek.

Compared to the MA/TA’s low-flow streams and small associated floodplains, the Preservation Area provides over three times the riverine HGM floodplains, and these floodplains help support the salmon fisheries of the Chuitna River. Also associated with the wetland floodplains are the riparian uplands included in the Preservation Area, as shown in Photo 4.
The Chuitna River and Lone Creek, both anadromous streams, have 424 acres of associated riverine HGM floodplains (Table 7) while the MA/TA has 8 acres. Only 76 acres of riverine HGM wetlands in the Preservation Area are associated with non-anadromous streams compared to 152 acres in the MA/TA.

Table 7 Preservation Area Riverine HGM Wetlands Comparison to MA/TA

<table>
<thead>
<tr>
<th>HGM Classification</th>
<th>Preservation Area</th>
<th>MA/TA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riverine, Anadromous</td>
<td>424</td>
<td>8</td>
</tr>
<tr>
<td>Riverine, Non-Anadromous</td>
<td>76</td>
<td>152</td>
</tr>
<tr>
<td><strong>Total Riverine Wetlands</strong></td>
<td><strong>500</strong></td>
<td><strong>160</strong></td>
</tr>
</tbody>
</table>

Source: 1Field Verified Mapping, Michael Baker June 2018, 2DA (Donlin Gold 2017)

There are no estuarine HGM wetlands in the MA/TA. In the Preservation Area, these estuarine HGM wetlands and waters are connected to riverine HGM wetlands, the Chuitna River, and Cook Inlet. The critical habitat area of the Beluga whale encompasses intertidal and subtidal waters of Cook Inlet with depths less than 30 feet and within 5 miles of high and medium flow anadromous fish streams (National Oceanic and Atmospheric Administration [NOAA] 2011), including estuarine HGM waters at the mouth of the Chuitna River.

**Preservation Area Stream Ecology and Fisheries**

The streams and rivers in the Preservation Area provide habitat for Chinook, coho, chum, and pink salmon, as well as limited habitat for sockeye salmon, Dolly Varden, and rainbow trout. The mainstem of the Chuitna River includes Chinook, coho, chum, and pink salmon spawning habitat, and rearing habitat for all five Pacific salmon species. Tributaries to the Chuitna River within the Preservation Area also have documented use by all five Pacific salmon species. Acquisition of the Chuitna River drainage properties
will preserve 258,056 linear feet (48.87 miles) of field verified stream channels, of which at least 148,632 linear feet (28.15 miles) are documented as Pacific salmon habitat including spawning, rearing, and migration habitats in five streams, as shown in Table 8 and Table 9. Figure 4 shows the anadromous streams in the Preservation Area. Fisheries data was derived from the current Anadromous Waters Catalog (AWC) at the time the analysis was performed by Owl Ridge Consultants. The AWC assigns attributes for fish presence, utilization and habitat to stream reaches in the National Hydrography Dataset (NHD), and consequently stream lengths for fish presence and habitat do not exactly reflect the Michael Baker International field verified linear lengths of streams.

The Preservation Area includes 104,544 linear feet (19.80 miles) of the mainstem of the Chuitna River, within which, 49,262 linear feet (9.33 miles) of Chinook salmon spawning habitat, 69,115 linear feet (13.09 miles) of coho spawning habitat, 44,088 linear feet (8.35 miles) of chum spawning habitat, and 104,544 linear feet (19.80 miles) of pink spawning habitat are documented. The entire 104,544 linear feet (19.80 mile) reach contains documented rearing for Chinook and coho salmon juveniles. Some reaches of the mainstem are also documented as rearing habitats for other Pacific salmon, including 100,690 linear feet (19.07 miles) for sockeye, 12,514 linear feet (2.37 miles) for chum, and 13,253 linear feet (2.51 miles) for pink salmon (Table 8).

Table 8  Preservation Area Salmon Habitat Preserved in the Chuitna River Mainstem

<table>
<thead>
<tr>
<th>Species</th>
<th>AWC Presence Linear Feet (Miles)</th>
<th>AWC Spawning Linear Feet (Miles)</th>
<th>AWC Rearing Linear Feet (Miles)</th>
<th>Total AWC Linear Feet (Miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinook</td>
<td>55,282 (10.47)</td>
<td>49,262 (9.33)</td>
<td>104,544 (19.80)</td>
<td>104,544 (19.80)</td>
</tr>
<tr>
<td>Sockeye</td>
<td>100,690 (19.07)</td>
<td>0</td>
<td>100,690 (19.07)</td>
<td>104,544 (19.80)</td>
</tr>
<tr>
<td>Coho</td>
<td>49,526 (9.38)</td>
<td>69,115 (13.09)</td>
<td>104,544 (19.80)</td>
<td>104,544 (19.80)</td>
</tr>
<tr>
<td>Chum</td>
<td>80,414 (15.23)</td>
<td>44,088 (8.35)</td>
<td>12,514 (2.37)</td>
<td>104,544 (19.80)</td>
</tr>
<tr>
<td>Pink</td>
<td>29,885 (5.66)</td>
<td>104,544 (19.80)</td>
<td>13,253 (2.51)</td>
<td>104,544 (19.80)</td>
</tr>
</tbody>
</table>

Source: AWC, Owl Ridge 2017

In addition to the mainstem Chuitna River habitats, the Preservation Area includes important Pacific salmon habitats in Bass Creek (stream 2004 from Chuitna baseline surveys), Middle Creek (stream 2003 from Chuitna baseline surveys), Lone Creek (stream 2002 from Chuitna baseline surveys) and an unnamed anadromous stream (No. 247-20-10010-2020-3008) [LGL Alaska Research Associates, Inc (LGL) 2009], as shown in Table 9.
### Table 9  Preservation Area Salmon Habitat Preserved in Tributaries to the Chuitna River

<table>
<thead>
<tr>
<th>Species</th>
<th>AWC Presence Linear Feet (Miles)</th>
<th>AWC Spawning Linear Feet (Miles)</th>
<th>AWC Rearing Linear Feet (Miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinook</td>
<td>317 (0.06)</td>
<td>0</td>
<td>317 (0.06)</td>
</tr>
<tr>
<td>Sockeye</td>
<td>317 (0.06)</td>
<td>0</td>
<td>317 (0.06)</td>
</tr>
<tr>
<td>Coho</td>
<td>317 (0.06)</td>
<td>0</td>
<td>317 (0.06)</td>
</tr>
<tr>
<td>Chum</td>
<td>317 (0.06)</td>
<td>0</td>
<td>317 (0.06)</td>
</tr>
<tr>
<td>Pink</td>
<td>317 (0.06)</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Species</th>
<th>AWC Presence Linear Feet (Miles)</th>
<th>AWC Spawning Linear Feet (Miles)</th>
<th>AWC Rearing Linear Feet (Miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinook</td>
<td>0</td>
<td>1,426 (0.27)</td>
<td>1,426 (0.27)</td>
</tr>
<tr>
<td>Sockeye</td>
<td>1,426 (0.27)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Coho</td>
<td>0</td>
<td>1,426 (0.27)</td>
<td>1,426 (0.27)</td>
</tr>
<tr>
<td>Chum</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pink</td>
<td>0</td>
<td>1,426 (0.27)</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Species</th>
<th>AWC Presence Linear Feet (Miles)</th>
<th>AWC Spawning Linear Feet (Miles)</th>
<th>AWC Rearing Linear Feet (Miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinook</td>
<td>0</td>
<td>26,928 (5.10)</td>
<td>26,928 (5.10)</td>
</tr>
<tr>
<td>Sockeye</td>
<td>26,928 (5.10)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Coho</td>
<td>4,699 (0.89)</td>
<td>0</td>
<td>26,928 (5.10)</td>
</tr>
<tr>
<td>Chum</td>
<td>26,928 (5.10)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pink</td>
<td>26,928 (5.10)</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Species</th>
<th>AWC Presence Linear Feet (Miles)</th>
<th>AWC Spawning Linear Feet (Miles)</th>
<th>AWC Rearing Linear Feet (Miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinook</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sockeye</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Coho</td>
<td>6,336 (1.20)</td>
<td>0</td>
<td>15,418 (2.92)</td>
</tr>
<tr>
<td>Chum</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pink</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: AWC, Owl Ridge 2017
While only 317 linear feet (0.06 miles) of Bass Creek fall within the Preservation Area, juvenile Chinook, sockeye, coho, and chum salmon use this reach for rearing, while pink salmon have unspecified presence.

The lower 1,426 linear feet (0.27 miles) of Middle Creek fall within the Preservation Area and are documented spawning habitat for Chinook, coho, and pink salmon, as well as rearing habitat for Chinook and coho salmon. Unspecified pink salmon habitat is also documented in this reach.

Lone Creek has 26,928 linear feet (5.10 miles) and 15,418 linear feet (2.92 miles) of its downstream tributary stream (AWC Stream No. 247-20-10010-2020-3008) within the Preservation Area. The entire 26,928 linear feet (5.10 mile) reach of Lone Creek is documented as important Chinook salmon spawning habitat and Chinook and coho salmon rearing habitat. Sockeye, chum, and pink salmon are documented throughout the reach, but habitat uses have not been specified. The entire 15,418 linear feet (2.92 mile) reach of the Lone Creek tributary within the Preservation Area is documented as important coho salmon rearing habitat.

Salmon smolt production was estimated for coho salmon in the Chuitna River watershed and specifically for Lone Creek (2008), and Middle and Bass Creeks in 2008 through 2011 (LGL 2009, 2010, 2011, 2013a and 2013b). Average Chuitna River production ranged from 37,424 to 44,794 coho smolt, with Bass Creek accounting for 19 to 31 percent of production, Middle Creek accounting for 12 to 17 percent of total production, and Lone Creek accounting for up to 50% of production (LGL 2009).

Total salmon escapement for the Chuitna River and tributaries has been estimated with a variety of methods and in varying years for the different Pacific salmon species. Chinook salmon have the longest escapement record, with escapement data available between 1979 and 2015, ranging from 502 fish in 2012, to 4,043 fish in 1983 (Erickson et al. 2017). The Chuitna River did not meet the overall escapement goal of 750 fish in 2010, 2011, or 2012, which led to the stock being identified as a stock of management concern by the Alaska Board of Fisheries. However, Chinook salmon escapement increased to 1,690, 1,398, and 1,965 fish in 2013, 2014, and 2015, respectively.

In 2008, escapement for Chinook salmon was estimated at 217 to 341 fish in Lone Creek; 21 to 80 fish in Middle Creek; and 77 to 153 in Bass Creek. Coho, chum, sockeye, and pink salmon escapement estimates are not available for the entire Chuitna drainage; however, escapement has been estimated for the Chuitna River tributaries, including Bass, Middle, and Lone Creeks. Numbers of coho salmon entering these tributaries have been estimated at 2,336 to 2,903 fish in Lone Creek; 1,983 to 2,313 fish in Middle Creek, and 269 to 726 fish in Bass Creek (LGL, 2009 summarized by Owl Ridge 2017). These estimates are considerably higher than estimates from the early 1980s, when between 1,085 and 2,400 coho were estimated moving into the entire drainage (Erickson et al. 2017). Lone Creek has had the highest identified escapement of pink salmon among the tributaries. Chum salmon abundance has ranged from one to 100 fish in the drainage, while sockeye salmon were only found in 2008 and 2009 and in low numbers. In addition to Pacific salmon, anadromous Dolly Varden and resident rainbow trout are widely distributed throughout the drainage (Erickson et al. 2017).
Preservation Area Stream Ecology Comparison to MA/TA

American and Anaconda Creeks are the only Crooked Creek tributaries with documented fish use that will be directly impacted by the Project. Both drainages are small low-flow systems that appear to lack substantial winter flow. In American Creek, at least 1,320 linear feet (0.25 miles) used by rearing juvenile coho salmon and 10,930 linear feet (2.07 miles) of resident Dolly Varden habitat will be removed during pit development. In Anaconda Creek, 898 linear feet (0.17 miles) used by juvenile coho salmon and 13,200 linear feet (2.5 miles) of resident fish habitat used by Dolly Varden will be permanently filled by the tailings storage facility (TSF) construction. In total, 26,400 linear feet (5 miles) of habitat used by fish within the two drainages will be permanently filled with 2,218 linear feet (0.42 miles) being coho rearing habitat (Table 10).

Between 2004 and 2014, Crooked Creek drainage-wide baseline sampling of established 300-foot stream reaches averaged 405.1 coho for all stream reaches combined (OtterTail 2014). On average, American Creek contributed 6 (1.48 percent) coho per 300 feet and Anaconda Creek contributed 0.1 (0.02 percent) coho juveniles per 300 feet. All juvenile coho were captured in the lower reaches of both creeks, nearest their confluences with Crooked Creek. No other salmon species were captured in stream habitats that will be removed by MA development.

<table>
<thead>
<tr>
<th>Species</th>
<th>AWC Rearing Habitat Linear Feet (miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinook</td>
<td>0</td>
</tr>
<tr>
<td>Sockeye</td>
<td>0</td>
</tr>
<tr>
<td>Coho</td>
<td>2,218 (0.42)</td>
</tr>
<tr>
<td>Chum</td>
<td>0</td>
</tr>
<tr>
<td>Pink</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: OtterTail 2014

Development of the Project will permanently fill up to 26,400 linear feet (5 miles) of fish habitat, including about 2,218 linear feet (0.42 miles) of anadromous coho salmon rearing habitat. In-watershed mitigation for these impacts will be provided by the Upper Crooked Creek PRM Plan (see CMP, Attachment D). In addition, the Preservation Area will provide an additional 147,840 linear feet (28 miles) of off-site mitigation through preservation of the mainstem Chuitna River and tributary habitat identified as important for all five species of Pacific salmon, anadromous Dolly Varden, and resident rainbow trout (Table 11). The Preservation Area preserves habitat that is considerably more productive salmon habitat, as shown by the numbers of juvenile salmon produced in the Chuitna River versus the impacted habitat in the Crooked Creek drainage, as well as by adult escapement data (Table 12). Considering only Chinook salmon, preservation of the Chuitna River properties will protect a stock of management concern, as well as a population with consistently higher escapements (even during the lowest three years) than in the entire Crooked Creek drainage. Escapement for coho salmon from the three Chuitna River tributaries also exceeds those found in the entire Crooked Creek drainage.
Table 11  Summary of Anadromous Stream Habitat Preserved (Chuitna Drainage) and Permanently Filled (Crooked Creek Drainage)

<table>
<thead>
<tr>
<th>Species</th>
<th>Chuitna Drainage</th>
<th>Crooked Creek Drainage</th>
<th>Chuitna Drainage</th>
<th>Crooked Creek Drainage</th>
<th>Chuitna Drainage</th>
<th>Crooked Creek Drainage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spawning</td>
<td>Rearing</td>
<td>Total Anadromous Habitat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Preserved</td>
<td>Permanently Filled1</td>
<td>Preserved</td>
<td>Permanently Filled1</td>
<td>Preserved</td>
<td>Permanently Filled1</td>
</tr>
<tr>
<td></td>
<td>Linear Feet (miles)</td>
<td>Linear Feet (miles)</td>
<td>Linear Feet (miles)</td>
<td>Linear Feet (miles)</td>
<td>Linear Feet (miles)</td>
<td>Linear Feet (miles)</td>
</tr>
<tr>
<td>Chinook</td>
<td>77,616 (14.7)</td>
<td>0</td>
<td>133,214 (25.23)</td>
<td>0</td>
<td>133,214 (25.23)</td>
<td>0</td>
</tr>
<tr>
<td>Sockeye</td>
<td>0</td>
<td>0</td>
<td>101,006 (19.13)</td>
<td>0</td>
<td>133,214 (25.23)</td>
<td>0</td>
</tr>
<tr>
<td>Coho</td>
<td>70,541 (13.36)</td>
<td>0</td>
<td>148,632 (28.15)</td>
<td>2,218 (0.4)</td>
<td>148,632 (28.15)</td>
<td>2,218 (0.4)</td>
</tr>
<tr>
<td>Chum</td>
<td>44,088 (8.35)</td>
<td>0</td>
<td>12,514 (2.37)</td>
<td>0</td>
<td>131,789 (24.96)</td>
<td>0</td>
</tr>
<tr>
<td>Pink</td>
<td>106,128 (20.1)</td>
<td>0</td>
<td>13,253 (2.51)</td>
<td>0</td>
<td>133,214 (25.23)</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: 1 American and Anaconda Creeks in the MA/TA; Source: Table 8, Table 9, and Table 10.

Table 12  Salmon, Rainbow Trout, and Dolly Varden Comparison: Crooked Creek and Chuitna River

<table>
<thead>
<tr>
<th>Species</th>
<th>Crooked Creek Mainstem (2008-2012)1</th>
<th>Chuitna River Mainstem (2008-2015)2</th>
<th>Bass Creek (Stream 2004)3</th>
<th>Middle Creek (Stream 2003)3</th>
<th>Lone Creek (Stream 2002)3</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Max</td>
<td>Mean</td>
<td>21</td>
<td>341</td>
<td>574</td>
</tr>
<tr>
<td>Chinook</td>
<td>29</td>
<td>100</td>
<td>1,956</td>
<td>153</td>
<td>317</td>
<td>517</td>
</tr>
<tr>
<td></td>
<td>Min</td>
<td>Max</td>
<td>Mean</td>
<td>21</td>
<td>341</td>
<td>574</td>
</tr>
<tr>
<td></td>
<td>59</td>
<td>4,204</td>
<td>1,634</td>
<td>726</td>
<td>2,903</td>
<td>5,942</td>
</tr>
<tr>
<td></td>
<td>Min</td>
<td>Max</td>
<td>Mean</td>
<td>115</td>
<td>616</td>
<td>1,431</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>1,634</td>
<td>29</td>
<td>2,148</td>
<td>2,619.5</td>
<td>5,265</td>
</tr>
<tr>
<td>Pink</td>
<td>1</td>
<td>NA</td>
<td>6</td>
<td>24</td>
<td>4</td>
<td>28</td>
</tr>
<tr>
<td>Sockeye</td>
<td>1</td>
<td>NA</td>
<td>50</td>
<td>24</td>
<td>NA</td>
<td>50</td>
</tr>
<tr>
<td>Chum</td>
<td>1,907</td>
<td>3,755</td>
<td>1,822</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Rainbow Trout</td>
<td>Min</td>
<td>Max</td>
<td>Mean</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Dolly Varden</td>
<td>Min</td>
<td>Max</td>
<td>Mean</td>
<td>146</td>
<td>272</td>
<td>607</td>
</tr>
</tbody>
</table>

Notes: 1 Five-year average based on resistance board weir counts (Ottertail 2014)
2 Eight-year average based on Alaska Department of Fish and Game (ADF&G) aerial counts, includes lowest three years on record (ADF&G 2017)
3 Estimates based on camera trap passage, upper and lower bounds of estimate are presented as min/max (LGL 2009) NA – Not Available

Preservation Area Endangered and Protected Species

Belugas are small, toothed whales. They are about 5 feet long at birth and weigh 90 to 130 pounds. Adults grow to be 11 to 15 feet long. Females are smaller than males, rarely growing over 12 feet. Reports of adult Beluga weights vary from 1,000 to 3,300 pounds (ADF&G 2018).

The Beluga whale is a northern hemisphere species that inhabits fjords, estuaries, and shallow waters of the Arctic and subarctic oceans. Five distinct stocks of Beluga whales are currently recognized in Alaska: Beaufort Sea, eastern Chukchi Sea, eastern Bering Sea, Bristol Bay, and Cook Inlet. The Beaufort Sea and
eastern Chukchi Sea populations are considered healthy and stable. The Bristol Bay and eastern Beaufort Sea populations are stable or increasing (ADF&G 2018).

The Cook Inlet population is numerically the smallest of these, and is the only one of the five Alaskan stocks occurring south of the Alaska Peninsula in waters of the Gulf of Alaska. The Cook Inlet Beluga whale stock may once have numbered as many as 1,300 individuals but declined dramatically during the 1990s. Population abundance surveys indicated a 47 percent decline between 1994 and 1998. Annual population abundance surveys from 1999 to 2016 estimated abundance ranging between 278 and 435 Beluga whales, with a 2016 estimated abundance of 328 Beluga whales. Since 1999, the population has declined by 0.4 percent annually with a 10-year decline (2006-2016) of 0.5 percent annually (NOAA 2018 72 [Federal Register (FR) 19854]).

Cook Inlet is a unique biological setting in terms of these Beluga whales because it supports the southernmost of the five extant Beluga populations in Alaska, and is the only water south of the Alaska Peninsula, or within the Gulf of Alaska, which supports a viable population of Beluga whales. The ecological setting of Cook Inlet is also unique in that it is characterized as an incised glacial fjord, unlike other Beluga habitats to the north. Cook Inlet experiences large tidal exchanges and is a true estuary, with salinities varying from freshwater at its northern extreme to marine near its entrance to the Gulf of Alaska. No similar Beluga whale habitat exists in Alaska or elsewhere in the United States (NOAA 2018 [72 FR 19854]).

Potential threats to Beluga whales include hunting, interaction with fisheries, stranding, entrapment in sea ice, predation, underwater noise pollution, contaminants, and climate change. Alaska Natives hunt Belugas as part of their subsistence culture (ADF&G 2017). Belugas are harvested by Alaska Natives living in coastal villages from Tyonek in Cook Inlet to Kaktovik in the Beaufort Sea. Hunting is done in spring as whales travel northward through leads in the ice, as well as during the summer and autumn open-water period. Entanglement in gillnets can be a cause of mortality in some localized areas. There is also concern that Belugas may be competing with fisheries for their prey species. Strandings are a potential source of mortality for Beluga whales. Within estuaries, Belugas sometimes become stranded on tidal flats when tides retreat quickly. In Cook Inlet, numerous strandings on tidal flats have been documented. Mortality from these events is generally low, but larger whales are more likely to die in these situations than smaller whales. Belugas may also become trapped in sea ice. Beluga whales fall prey to orcas. Orca attacks on Belugas have been documented in Cook Inlet, Bristol Bay, and Hooper Bay. Belugas have been observed moving into shallow water or areas covered with sea ice to avoid orcas (ADF&G 2018).

On October 22, 2008, the National Marine Fisheries Service (NMFS) listed the Distinct Population Segment of Beluga whale found in Cook Inlet as endangered under the Endangered Species Act (ESA) of 1973, as amended. On April 11, 2011, NMFS designated critical habitat for the Cook Inlet Beluga whale under the ESA. Two areas were designated as critical habitat; both comprising 3,016 square miles (7,809 square kilometers) of marine and estuarine environments considered essential for the whales' survival and recovery. The designated critical habitat area encompasses intertidal and subtidal waters of Cook Inlet with depths less than 30 feet and within 5 miles of high and medium flow anadromous fish streams (NOAA 2011).
The Preservation Area includes 29 acres of estuarine fringe HGM wetlands at the mouth of the Chuitna River that support Cook Inlet Beluga whales (Figure 5) (NOAA 2018). Cook Inlet Belugas concentrate at rivers and bays in upper Cook Inlet in the summer and fall, moving offshore in winter (NMFS 2008). The mouth of the Chuitna River is characterized as having moderate use by Belugas during the summer and occasional winter use (Moore et al. 2000), with two Beluga whale carcasses found in the area in 1999 and 2000 (Moore et al. 2000) and a live siting reported in 1982 (Shelden et al. 2015). In 2017, a baby Beluga was rescued from the tidal flats just south of the mouth of the Chuitna River. It was transported to the Alaska Sea Life Center for rehabilitation and was given the name Tyonek.

Estuarine habitat has value for Beluga whale feeding and molting. Feeding occurs over the continental shelf, in nearshore estuaries, and in river mouths. Estuarine environments are considered essential for the whales' survival and recovery (NMFS 2008). Most feeding dives are shallow. Belugas are generally considered to be opportunistic feeders (ADF&F 2018). Stomach content diet studies have found Chinook, coho, and chum salmon (NMFS 2008 and Quakenbush et al. 2015), all of which are supported by streams within the Preservation Area. Salmon are among the most important food sources for Cook Inlet Beluga whales, as identified through research and Alaska Native traditional wisdom and knowledge (NMFS 2008). Overall, fish species make up a large part of their diet including salmon, herring, capelin, smelt, cod, flatfish, sculpin, lingcod, and eulachon.
Chuitna River

151.0667° W

151.0667° W

151.1° W

151.1° W

151.1333° W

151.1667° W

61.1° N

61.0833° N

Cook Inlet Beluga Whale Critical Habitat

Figure 5

0 1,000 2,000 Feet

1 inch = 2,000 feet

1:24,000

Cook Inlet Beluga Whale Critical Habitat

Figure 5

Seward Meridian, NAD 1983, UTM Zone 5N
Imagery: DigitalGlobe, 2014
Date: 07/03/18
Preservation Area Site Condition

The Preservation Area was reviewed both on the ground and by aerial photography to ascertain existing man-made disturbances. Areas of disturbance found in the aerial imagery, or by helicopter flights were confirmed on the ground, coded and mapped as part of the wetland field work. Existing disturbance within the Preservation Area includes a drill pad, trails, and small roads, but these disturbances are minimal. Within the Preservation Area, totaling 5,870 acres, only 6 acres were found to be disturbed. Table 13 presents the conditional analysis.

Table 13 Preservation Area Condition Analysis (Acres)

<table>
<thead>
<tr>
<th>Disturbance Type</th>
<th>Upland Acres</th>
<th>Wetland Acres</th>
<th>Total Acres</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Former Drill Pad</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>Beaver Activity has flooded 2 acres of the abandoned drill pad returning 2 acres to wetlands</td>
</tr>
<tr>
<td>Existing Roads</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>Two short roads access the Chuitna River near the mouth</td>
</tr>
<tr>
<td>Minor Trail Construction with Vegetation Cut</td>
<td>0</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>Three locations total less than 0.5 acres of vegetation clearing, two are in wetlands where soils appear undisturbed.</td>
</tr>
<tr>
<td><strong>Total Area</strong></td>
<td><strong>4</strong></td>
<td><strong>2</strong></td>
<td><strong>6</strong></td>
<td></td>
</tr>
</tbody>
</table>

Apparent inconsistencies in sums are the results of rounding.

A former drill pad is located within the Preservation Area and totals 5 acres. Alders are growing on a 3 acre upland portion of the drill pad, and beaver activity has flooded the remainder (2 acres), converting this area back to wetlands. There are two small access roads located at the mouth of the Chuitna River. Their footprint is confined to 1 acre. There are three locations in the Preservation Area where trail construction has adversely disturbed the soils and hydrology. At these trail locations ponding, soil disturbance, and/or erosion are visible. These three sites total less than 1 acre.

A few low use All-Terrain Vehicle (ATV) trails exist in the Preservation Area. Their use has not altered the soils or hydrology of the area and has not changed the wetland status, or created ponding, flooding, or erosional features. These trails were not mapped as a disturbance type and they are not listed in Table 13.

Preservation Area Threat of Development

The Chuitna River watershed is a drainage located on the west side of Cook Inlet 45 air miles from Anchorage, the largest city in Alaska, as shown in Figure 6 (inset). This area has a unique mix of existing and potential industrial activities that surround the Chuitna drainage. The area has two active areas for handling of marine transportation – the port at North Foreland to the south, which includes a beach barge landing area and a pile supported trestle and dock; and a barge beach landing area to the north known as Grant’s Landing. These areas have been used for the import of oil field pipe, equipment, fuel, and local supplies for Tyonek and Beluga, two local communities. A series of connecting service trails and roads connect Tyonek and Beluga for local uses. Resource development roads have been interspersed in the region to facilitate the harvest of timber, and for the development of the regional oil and gas industry. Temporary roads have been constructed for coal exploration and development. The
Beluga coal field and the Beluga oil and gas basin are centered here on the west side of Cook Inlet. Gas from the region is collected and shipped to the Beluga natural gas power plant or into the regional gas supply system for distribution to Anchorage, the Matanuska Susitna Borough, and the Kenai Peninsula for heating and power generation. The Chuitna River area is used by Alaskans and non-residents for recreational and guided fishing. Shore based set-net fishing along the beaches provides for both commercial and subsistence harvest of salmon. Offshore fisheries in Cook Inlet include salmon and halibut. As discussed earlier, the Chuitna River contains a productive salmon run including Chinook salmon (listed as a species of concern by ADF&G), coho, sockeye (minor use), chum, and pink salmon. While state and federal permit programs are in place that strive to balance development with land, habitat, and wildlife protection, the pressures on the Chuitna River merit special consideration for additional protection through preservation of portions of the watershed. The key threats to the area include the following.

**Oil and Gas Development**

With the discovery of oil in Cook Inlet in the 1960s, the west side of Cook Inlet has been an ongoing region for development. The northwestern portion of the basin, within which the Chuitna River watershed lies, is primarily a gas field. Numerous companies have a series of wells and collection pipelines that extend from as far north as the Theodore River south to Nicolai Creek, past Trading Bay to West Foreland. Oil and gas wells on TNC lands are in the Chuitna watershed along Lone Creek and south of the Chuitna River, and wells drilled just north of the watershed in the Threemile Creek drainage are on AMHT land. Oil and gas facilities also exist to the south and west of the Chuitna River on lands owned by TNC and AMHT, which were selected for their natural resource potential. Collection pipelines exist in the area to gather the product from these well sites. Access roads connect the drill pads and development facilities. Portions of the Chuitna River watershed remain under active lease for oil and gas development. Easements in the Preservation Area have been included at the request of the adjacent property owners to ensure continued access to resources.

**Coal Production**

Numerous companies have held coal leases in the Chuitna watershed and surrounding area dating back to the 1960s. The entire Chuitna watershed is underlain by extensive, world class coal deposits. Numerous coal outcrops are visible along the mainstem of the Chuitna River. The Diamond Shamrock Joint Venture permitted a 300-million-ton coal deposit between 1985 and 1990. An EPA-led Environmental Impact Statement (EIS) for a coal mine was completed for Diamond Shamrock’s Chuitna Coal project in the Beluga coal field in 1990. Legal challenges between 1990 and 1994 prevented the project from going into development. By the time the legal challenges were settled, the international coal markets softened and the project was shelved, but the leases remained intact. The owners of those leases formed PacRim Coal, LP (PRC) in 2005 and re-initiated permit efforts that continued until 2016. A Supplemental EIS to inform Clean Water Act Section 402 and 404 permitting was evaluated. The work was undertaken by EPA as the lead Federal Agency and then transferred to USACE in November 2010. PRC proposed a run-of-mine surface coal export project. The mine life was proposed at 25 years. The coal was to be hauled by truck from the pit, crushed, and put on a conveyor for transport and storage at Ladd Landing for shipment. A 10,000-foot long offshore pile-supported elevated conveyor was proposed to extend from the shoreline to a water depth that would allow tide-independent coal loading at
approximately minus 65 feet mean lower low water. Proposed infrastructure included mine roads, stream diversions, settling ponds, material sources, an airstrip, and a camp. Approximately 2,400 acres of WOUS would have been impacted and two stream tributaries removed during the proposed mine operations. Due to changing economic conditions, the proposal was suspended in 2016. The coal reserves remain available for lease and the threat of future development still exists. The operating mine plan and data could be acquired, and a new application brought before the agencies for review. The mine plan pursued by PRC proposed a Logical Mining Unit northwest of the Preservation Area. A future coal mine following the PRC plan would not be precluded by this Preservation Area. The new mine plan would, however, need to refine the transportation design (roads and conveyor) in accordance with the provisions of the Preservation Area. In addition, the Beluga Coal Company currently maintains coal leases in the watershed just west of the leases that were held by PRC.

**Coal Bed Methane and Underground Coal Gasification Development**
Numerous companies have expressed an interest in producing gas from the coal seams in the Beluga coal field. Linc Energy held exploration rights for the areas surrounding the surface coal leases within the past decade and conducted preliminary test work to develop Underground Coal Gasification (UCG). Cook Inlet Regional Incorporated (CIRI) explored UCG potential on its lands to the east of the Chuitna River in 2008. The Cook Inlet basin sub-bituminous coals found at shallow depths (less than 5,000 feet) in the Tyonek and overlying Beluga formations, contain methane and cover most of the central and southern basin. Estimates of the gas from the sub-bituminous coals at shallow depths along the margins of the basin have been as high as 140 trillion cubic feet of gas (Montgomery and Barker 2003). Coal extraction requires surface drill pads and roads with an infrastructure to separate the gas from the ground water. In addition, buried gas pipelines would be required to collect the gas and move the gas to market.

**Timber**
In the 1970s, Kodiak Lumber Mills signed an agreement with TNC and built a dock at North Foreland to export wood chips from timber logged on TNC lands. This included several hundred acres of timber logged from the Chuitna watershed. AMHT has supported logging operations from their lands. Birch and spruce are prevalent and are of ongoing interest to the forest industry. Port Mackenzie, which is east of the Beluga area near Anchorage has an ongoing history of exporting wood chips using these species of trees.

**Gravel and Placer Mining**
TNC conducts gravel mining in the area to support road construction for maintenance and expansion of oil and gas development. Several borrow pits are in the Chuitna watershed. Tyonek Contractors, a subsidiary of TNC, permitted a new multi-acre gravel source pit area just north of the Chuitna River and began development of the site within the past decade. The gravel in the majority of the watershed is glacially derived and is high in silt content. The gravels found closer to the mainstem of the Chuitna River tend to be cleaner (due to alluvial deposition) and more desirable for construction purposes.

**Summary**
AMHT and TNC manage their assets to generate income. Revenue-generating uses of their lands include: land leasing and sales; real estate investment and development; commercial timber sales; mineral
exploration and production; coal, oil and gas exploration and development; sand, gravel and rock sales; and other general land uses. There is ever-increasing resource development pressure in and surrounding the Chuitna watershed. This Plan restricts this development within its boundaries, but does not preclude development in adjacent areas, containing oil and gas leases and coal resources. The Preservation Area, however, ensures that any future development will not have direct impacts on important aquatic resources within the large contiguous Preservation Area in the watershed.
Site Protection Instrument

The following provides the language to be included in the deed restrictions for TNC and AMHT. These deed restrictions will be finalized and recorded prior to initiating Project construction. The instruments will “run with the land” for a substantial period of time in accordance with the USACE Compensatory Mitigation Site Protection Instrument Handbook (July 2016). Donlin Gold will provide for oversight by an independent third party in a manner acceptable to USACE, following the Long-term Management Plan (LMP).

Draft Language for TNC Lands

Description of Property

This deed restriction applies to lands owned by TNC with subsurface ownership held by CIRI. The lands are located in the Chuitna River watershed on the northwest shores of Cook Inlet. The deed restriction applies to 3,949 acres as shown on the attached Figure [Figure 7 in this document] (herein referred to as the Property).

Natural Conditions

The purpose of this deed restriction is to ensure the Property will be preserved in a “Natural Condition”, as defined as it exists at the time this document is recorded for 99 years.

Documentation of Current Conditions

The Current Conditions of the Property as of the date of this Deed are further documented in a "Present Conditions Report", dated, __________, 20__ and prepared by [preparer’s name], which report is acknowledged as accurate by Grantor and Grantee:

(a) a current aerial photograph of the Property at an appropriate scale taken as close as possible to the date the recording is made;

(b) on-site photographs taken at appropriate locations on the Property, including of major natural features;

(c) Wetlands mapping, conducted in 2018, documenting the streams and waters of the United States (WOUS) in the Preservation Area using USACE guidance in place at the time of the mapping; and

(d) Graphical depiction of the boundaries of the area being preserved at a scale and with a datum identified that can be used to overlay the Property on future site maps of the area.

Prohibitions

(a) There shall be no filling, flooding, excavating, mining or drilling; no removal of natural materials; no dumping of materials; and, no alteration of the topography in any manner except as provided for under Reserved Rights below.

(b) There shall be no clearing, burning, cutting or destroying of trees or vegetation, except as expressly authorized in the Reserved Rights; there shall be no planting or introduction of non-native or exotic species of trees or vegetation.
(c) There shall be no construction, erection, or placement of buildings, billboards, or any other structures, or any additions to existing structures, except small structures or additions in areas not mapped as WOUS and as otherwise provided for under Reserved Rights below.

(d) There shall be no construction of new roads, trails or walkways except as provided in the Reserved Rights below and only with the prior written approval of the USACE, including the manner in which they are constructed.

(e) There shall be no construction or placement of utilities or related facilities in WOUS without the prior written approval of the USACE.

Reserved Rights
Actions required to prevent or repair severe erosion or damage to the Property or portions thereof, or significant detriment to existing or permitted uses, is allowed, provided that such actions are generally consistent with preserving the natural condition of the Property.

Harvesting and management of timber by Landowner is limited to the extent necessary to protect the natural environment in areas where the forest is damaged by natural forces such as fire, flood, storm, insects, infestations, or infectious organisms.

Landowner reserves the right to engage in any outdoor recreational activities, including hunting (excluding planting or burning) and fishing, with cumulatively very small impacts, and which are consistent with the continuing natural condition of the Property.

Landowner specifically reserves a qualified mineral interest (as defined in § 170(h)(6) of the Internal Revenue Code) in subsurface oil, gas or other minerals and the right to access such minerals. However, there shall be no extraction or removal of, or exploration for, minerals by any surface mining method, nor by any method which results in subsidence or which otherwise interferes with the continuing natural condition of the Property.

Landowner reserves the right to maintain existing roads, trails or walkways. Maintenance shall be limited to: removal or pruning of dead or hazardous vegetation; application of permeable materials (e.g., sand, gravel, crushed rock) necessary to correct or impede erosion; grading; replacement of culverts, water control structures, or bridges; and maintenance of roadside ditches.

Landowner reserves the right to engage in the removal or trimming of vegetation downed or damaged due to natural disaster, removal of man-made debris, removal of parasitic vegetation (as it relates to the health of the host plant) and removal of non-native or exotic plant or animal species.

Landowner reserves the right to construct habitat improvements within the Property, including activities such as creating moose browse, replacing blocked culverts to improve fish passage, or constructing new fish habitat in the area. The Landowner will be required to obtain the necessary permits for these activities, including from the Alaska Department of Fish and Game (ADF&G) and the USACE, as required.
Landowner specifically reserves the right to reconstruct or, if needed, relocate the existing bridge crossing over the Chuitna River for safety and structural reasons, upon approval of the relocation from the USACE.

Landowner reserves the right to engage in all acts or uses not prohibited by the Restrictions, and which are not inconsistent with the conservation purposes of this grant, the preservation of the Property in its natural condition, and the protection of its environmental systems.
Draft Language for AMHT Lands

Description of Property
This deed restriction applies to lands owned by AMHT managed by the Trust Land Office. The lands are located in the Chuitna River watershed on the northwest shores of Cook Inlet. The deed restriction applies to 1,921 acres as shown on the attached Figure [Figure 8 in this document] (herein referred to as the Property).

Natural Conditions
The purpose of this deed restriction is to ensure the Property will be preserved in a “Natural Condition”, as defined as it exists at the time this document is recorded for 99 years.

Documentation of Current Conditions
The Current Conditions of the Property as of the date of this Deed are further documented in a "Present Conditions Report", dated, ________, 20__, prepared by [ preparer’s name], which report is acknowledged as accurate by Grantor and Grantee:

(a) a current aerial photograph of the Property at an appropriate scale taken as close as possible to the date the recording is made;

(b) on-site photographs taken at appropriate locations on the Property, including of major natural features;

(c) Wetlands mapping, conducted in 2018, documenting the streams and waters of the United States (WOUS) in the Preservation Area using USACE guidance in place at the time of the mapping; and,

(d) Graphical depiction of the boundaries of the area being preserved at a scale and with a datum identified that can be used to overlay the Property on future site maps of the area.

Prohibitions
(a) There shall be no filling, flooding, excavating, mining or drilling; no removal of natural materials; no dumping of materials; and, no alteration of the topography in any manner except as provided for under Reserved Rights below.

(b) There shall be no clearing, burning, cutting or destroying of trees or vegetation, except as expressly authorized in the Reserved Rights; there shall be no planting or introduction of non-native or exotic species of trees or vegetation.

(c) There shall be no construction, erection, or placement of buildings, billboards, or any other structures, or any additions to existing structures, except small structures or additions in areas not mapped as WOUS and as otherwise provided for under Reserved Rights below.

(d) There shall be no construction of new roads, trails or walkways except as provided in the Reserved Rights below and only with the prior written approval of the USACE, including the manner in which they are constructed.
There shall be no construction or placement of utilities or related facilities in WOUS without the prior written approval of the USACE.

Reserved Rights

Actions required to prevent or repair severe erosion or damage to the Property or portions thereof, or significant detriment to existing or permitted uses, is allowed, provided that such actions are generally consistent with preserving the natural condition of the Property.

Harvesting and management of timber by Landowner is limited to the extent necessary to protect the natural environment in areas where the forest is damaged by natural forces such as fire, flood, storm, insects, infestations, or infectious organisms.

Landowner reserves the right to engage in any outdoor recreational activities, including hunting (excluding planting or burning) and fishing, with cumulatively very small impacts, and which are consistent with the continuing natural condition of the Property.

Landowner specifically reserves a qualified mineral interest (as defined in § 170(h)(6) of the Internal Revenue Code) in subsurface oil, gas or other minerals and the right to access such minerals. However, there shall be no extraction or removal of, or exploration for, minerals by any surface mining method, nor by any method which results in subsidence or which otherwise interferes with the continuing natural condition of the Property.

Landowner reserves the right to maintain existing roads, trails or walkways. Maintenance shall be limited to: removal or pruning of dead or hazardous vegetation; application of permeable materials (e.g., sand, gravel, crushed rock) necessary to correct or impede erosion; grading; replacement of culverts, water control structures, or bridges; and maintenance of roadside ditches.

Landowner reserves the right to engage in the removal or trimming of vegetation downed or damaged due to natural disaster, removal of man-made debris, removal of parasitic vegetation (as it relates to the health of the host plant), and removal of non-native or exotic plant or animal species.

Landowner reserves the right to construct habitat improvements within the Property, including activities such as creating moose browse, replacing blocked culverts to improve fish passage, or constructing new fish habitat in the area. The Landowner will be required to obtain the necessary permits for these activities, including from the Alaska Department of Fish and Game (ADF&G) and the USACE, as required.

Landowner reserves the right to engage in all acts or uses not prohibited by the Restrictions, and which are not inconsistent with the conservation purposes of this grant, the preservation of the Property in its natural condition, and the protection of its environmental systems.
Baseline Information

The baseline data for the Preservation Area has been provided in the Site Selection section. Wetland ecology, stream, and fish data were summarized and then contrasted to the MA/TA. The fish data for the Preservation Area was summarized by Owl Ridge (2017) using the AWC and available resource data. The existing site disturbance conditions for the Preservation Area were summarized, including approximately 6 acres of pads, roads and trails.

Preservation Area Wetland Mapping

A seven-day field program was conducted to verify and update the preliminary desktop mapping in June 2018. Preliminary mapping was used to identify initial field targets. The wetland evaluation and collection of field data, wetland determinations, and the resulting digital maps were completed in accordance with guidance provided in the United States Army Corps of Engineers Wetland Delineation 1987 Manual (USACE 1987) and the Regional Supplement to the United States Army Corps of Engineers Wetland Delineation Manual: Alaska Region, 2007 Supplement Version 2.0 (2007 Supplement) (USACE 2007). All field data were reported using the 2016 National Wetlands Plant List (Lichvar et al. 2016).

All information required in SPN 2010-45 (USACE 2010) was collected in the field to complete a PJD report for the Preservation Area. Boundaries between wetlands and uplands were delineated, the preliminary mapping was used to identify and focus work in boundary areas including forest types, where wetland status is difficult to determine without field verification. Field plot locations were determined using the best available ESRI World Imagery collected by DigitalGlobe in 2014, preliminary mapping and by handheld Global Positioning System units. All field data were entered into a wetland database where the data was reviewed, and queries were generated to provide the information needed for the digital map and report. Detailed information was collected on one tenth of an acre plots (1/10) and was recorded in representative project vegetation types along wetland boundaries. Additional field data, notes, and photographs were gathered while walking through the study area to evaluate mapping areas with similar characteristics. Areas of disturbance were mapped and notes taken for inclusion in the PJD.

Field data were collected and recorded using four types of plots:

1. **Wetland Determination (WD) Plots.** At these sites investigators recorded detailed descriptions of vegetation, hydrology, and soils on field data forms. Wetland status for this plot type were determined based on the presence or absence of hydrophytic vegetation, hydrology, and hydric soils using the 2007 Supplement.

2. **Field Verification Points (FVP).** Photographs and Global Positioning System (GPS) locations were taken where investigators encountered vegetation communities and landscape positions that were clearly wetlands or upland based on WD results in nearby similarly situated areas. Project Vegetation Type, HGM, and Cowardin classifications were recorded.

3. **Stream Crossing (SC) Points.** Photographs and GPS locations were taken where investigators encountered streams and rivers. Information on the stream status as a seasonal or perennial
Relatively Permanent Waters (RPW) or Traditional Navigable Waters (TNW) and stream width at the ordinary high-water mark were recorded.

4. **Waterbody (WB) Points.** Photographs and GPS locations were taken where investigators encountered ponds, lakes, and Cook Inlet.

The Chuitna Preservation Area PJD (anticipated late July 2018) will include the detailed results of the final mapping.

**Preservation Area Site Condition Analysis**

The Preservation Area is almost entirely undisturbed. Maps of the existing condition showing the location of pads, roads, and trails will be supplied in the Chuitna Preservation Area PJD. The Preservation Area site condition survey noted 6 acres of existing disturbance with fill in wetlands or areas where hydrology and soils were adversely affected by man-made activity, see further discussion under Baseline Conditions.

**Determination of Credits**

The aquatic resource losses from the Project were quantified using the HGM and the Cowardin Classification systems by acres for wetlands and linear feet for stream loss (see 332.3(f)(1)). The aquatic resources preserved by the Plan have been described using the same HGM and the Cowardin Classification systems by acres for wetlands and linear feet for streams. The Preservation Area parcel includes 5,870 acres, including 3,269 acres of wetlands and ponds, 418 acres of streams and rivers, 2,183 acres of upland riparian and buffers, and 258,056 linear feet (48.87 miles) of streams, that will be permanently protected from development as shown in Table 14.

**Table 14**  
**Areas Permanently Protected by the Preservation Area**

<table>
<thead>
<tr>
<th>Land Description</th>
<th>Type</th>
<th>Acres</th>
<th>Linear Feet (Miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wetlands and Ponds</td>
<td>Preservation</td>
<td>3,269</td>
<td>-</td>
</tr>
<tr>
<td>*Streams and Rivers</td>
<td>Preservation</td>
<td>418</td>
<td>258,056 (48.87)</td>
</tr>
<tr>
<td>Upland Riparian and Buffer</td>
<td>Preservation</td>
<td>2,183</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>5,870</td>
<td>258,056 (48.87)</td>
</tr>
</tbody>
</table>

*Note: Streams and Rivers acreage is not included within wetlands and ponds*

**Mitigation Work Plan**

The Preservation Area will be protected in the existing pristine state. The Mitigation Work Plan consists of implementing the Site Protection Instruments (shown above) and LMP Section (described on the next page).

**Maintenance Plan**

There are no plans to actively undertake maintenance or rehabilitation activities within the Preservation Area. No maintenance is specifically planned for the minimal existing disturbance in the area, see Baseline Conditions. All existing disturbed sites will be allowed to naturally revegetate. See the LMP
Section for the actions to be taken to ensure compliance with the deed restrictions, including any maintenance arising from observations during the annual site visits.

**Performance Standards**

Donlin Gold has proposed Site Protection Documents for the Preservation Area. Donlin Gold will execute preservation of the parcel concurrently with work authorized under the DA application for the Project. The Performance Standards consist of documenting compliance with the requirements of the deed restrictions through implementation of the LMP.

**Monitoring Requirements**

See the Long-term Management Plan Section (below) for discussion of the proposed site monitoring to ensure compliance with the deed restriction requirements.

**Long-term Management Plan (LMP)**

As part of finalizing the Site Protection Instruments for TNC and AMHT lands, Donlin Gold will prepare a LMP for the Preservation Area. This LMP will be implemented by a third party to conduct inspections and provide reports to demonstrate compliance with the deed restrictions. Finalizing the LMP and selection of the third party will be subject to USACE review and approval based on their qualifications to serve in this role.

Donlin Gold will submit the LMP to USACE at least six months prior to the start of Project construction. Project construction will not be initiated until the deed restrictions are in place and the LMP is approved by USACE.

Specifically, the LMP will be designed to ensure that the Preservation Area is monitored, managed, and maintained for the long-term sustainability and preservation of its baseline conditions. Existing conditions were delineated in June 2018 as described in the Chuitna Preservation Area PJD (anticipated late July 2018). Prior to construction, Donlin Gold will be responsible for confirming and updating the baseline conditions as needed. The LMP will be intended to extend for the duration of the deed restrictions. The LMP will also specifically describe the mechanism by which the proposed third party’s inspections and reporting will be funded over the term of the restrictions.

To support preparation of the LMP (and finalize the deed restrictions), Donlin Gold will complete a metes and bounds survey of the Preservation Area or other method of identification and documentation according to methods acceptable to the USACE. The survey is expected to closely resemble the boundaries represented within this CMP and will be used to establish the exact property boundaries for the deed restrictions and LMP. The survey will specifically define the boundaries of the easements that have been excluded from the Preservation Area. Under the provisions of the LMP, the third party and the landowners will implement methods to limit access to, and restrict activities in, the Preservation Area where appropriate.

Donlin Gold shall implement the approved LMP for the purposes stated above. The LMP will require annual monitoring site visits by the third party to qualitatively monitor the general conditions of the
Preservation Area and compliance with the terms of the deed restrictions. The conditions of the Preservation Area will be evaluated, documented, and mapped during the site visits. The third party will be responsible for preparing annual monitoring reports detailing the existing conditions of the Preservation Area, and any recommended management actions. In the annual reports, the third party will specifically describe if there have been any anthropogenic changes to the status of the Preservation Area’s conservation values including: WOUS, wetlands, and streams. The annual monitoring reports will be available to the USACE upon request.

As described in the LMP, the landowners will not be responsible for changes to the site conditions attributable to natural catastrophes such as flood, fire, drought, disease, regional pest infestation, and others that are beyond their reasonable control. Active management will not be required for ecological changes that come about because of processes such as climate change, fluctuating river levels, and sedimentation due to overbank flood deposits that many affect the Preservation Area’s wetlands. Over time, natural successional processes could occur that may affect stream channels and wetland functions or total wetland acreages.

Finally, the LMP will describe how Donlin Gold and the third party will work with the landowners to ensure that any activities proposed to occur in the Preservation Area comply with the requirements of the deed restrictions. This will include preventing any activities that are specifically prohibited by the deed restrictions, see the Site Protection Instrument Section.

In summary, Donlin Gold proposes that the LMP include the following specific sections:

1. Introduction and Purpose
2. Third Party and Responsibilities
3. Preservation Area Description
   a. Location and boundaries
   b. Ownership
   c. Existing land use and disturbance
   d. Baseline conservation values, including wetlands, streams, and WOUS
4. Management and Monitoring
   a. Annual site visits, including scope, documentation, and action items
   b. Security, safety, and public access
   c. Limits of responsibility, including exclusions of natural events
5. Allowable Improvements and Activities
   a. Permitted and prohibited actions
   b. Third party and landowner coordination
6. Adaptive Management
7. Reporting and Administration
8. Amendments, Transfer, Replacement/Termination, and Notice Provision
9. Funding
10. USACE Rights, Responsibilities, and Authorities
11. Signatures (Donlin Gold, Landowners, and USACE)
Adaptive Management Plan

Preservation Area site conditions are expected to change over time due to natural events. As discussed above under the Long-term Management Plan Section, monitoring reports will be completed yearly showing updated site conditions. The annual reports will identify any areas of concern (i.e., occurrence of prohibited activities) along with any necessary corrective or remedial actions.

Financial Assurances

The LMP will include an estimate of the annual third party costs required to implement its provisions. Prior to initiating Project construction, Donlin Gold will obtain financial assurance using an instrument acceptable to the USACE for the cost of 30 years of LMP implementation.
References

Alaska Department of Environmental Conservation (ADEC) and USACE. 1999. Operational Draft Guidebook for Reference Based Assessment of the Functions of Precipitation-Driven Wetlands on Discontinuous Permafrost in Interior Alaska. Waterways Experiment Station Technical Report WRP-DE-.


Donlin Gold. 2017. DA Permit Application (Section 404 CWA and Section 10 of RHA). Engineer Form 4345.


Attachment F
Transportation Area Restoration Plan
Contents

Objectives ..................................................................................................................................................... 4
Site Selection Criteria ................................................................................................................................. 4
  Material Site-10......................................................................................................................................... 8
  Material Site-12......................................................................................................................................... 8
  Material Site-16......................................................................................................................................... 8
Vegetation..................................................................................................................................................... 8
Wetlands ..................................................................................................................................................... 10
Sites After Restoration ................................................................................................................................ 11
  Material Site-10....................................................................................................................................... 11
  Material Site-12....................................................................................................................................... 11
  Material Site-16....................................................................................................................................... 11
Restored Wetlands ..................................................................................................................................... 12
Restoration Plan .......................................................................................................................................... 12
Reclamation Criteria ................................................................................................................................... 14
  Vegetation Criteria .................................................................................................................................. 14
  Wetland Hydrology Criteria .................................................................................................................... 15
Monitoring .................................................................................................................................................. 15
References .................................................................................................................................................. 17
Figures
Figure 1  TA Material Site-10 Map and Site Photos
Figure 2  TA Material Site-12 Map and Site Photos
Figure 3  TA Material Site-16 Map and Site Photos

Tables
Table 1  TA Material Site Wetland Impact Restoration Sites
Table 2  Field Data in TA Restoration Sites; HGM and Cowardin Classifications and Hydrology Notes
Table 3  Baseline Wetland Types Impacted, by TA Site
Table 4  HGM Classifications and Cowardin Groups of TA Restoration (Acres)
Table 5  TA Material Site Work Schedule
Table 6  Wetland and Upland Seed Mixes
Table 7  TA Vegetation Reclamation Criteria and Timing
Table 8  TA Wetland Hydrology Indicators

Photos
Photo 1  Open Black Spruce Forest Vegetation Type
Photo 2  Black Spruce Woodland Vegetation Type
Photo 3  Wet Herbaceous Vegetation, Crooked Creek HUC-10
Objectives
Donlin Gold, LLC (Donlin Gold) has developed a Restoration Plan (Plan) to address wetlands lost by Transportation Area (TA) facility development from the Donlin Gold Project (Project). The Plan provides restoration of wetlands in impacted watersheds with in-kind restoration. The TA is in the Crooked Creek, Veahna Creek-Kuskokwim River, and Headwaters Iditarod River HUC-10 watersheds. The actions are designed to exceed reclamation requirements imposed by the State of Alaska upon material site closure in these watersheds.

The material sites selected for restoration in the TA are all located on State Land. Donlin Gold cannot secure long term legal use exclusions and preservation on State Land. The Alaska Department of Natural Resources (ADNR) does not require the establishment of wetlands in material site reclamation plans (ADNR 2014). However, ADNR encourages restoring sites to ponds with littoral edges to enhance fish habitat associated with material sites. In its reclamation site plans, Donlin Gold proposes to restore wetland areas, where feasible. Donlin Gold is conducting this work as minimization and not requesting compensatory mitigation credits for the material site wetland restoration, and this no financial or preservation instruments or performance standards will be filed with United States Army Corps of Engineers (USACE).

Site Selection Criteria
Material site candidates were identified as those most likely to provide wetland restoration opportunities based on groundwater hydrology (water table), favorable slope position, and the final shape (concave) after material removal. Each proposed material site in the TA was considered for restoration at closure. Not all can be restored because of location and the ability to remove fill. As shown in Table 1, the material sites selected for wetland restoration will restore 34.7 acres of wetlands.

Table 1  TA Material Site Wetland Impact Restoration Sites

<table>
<thead>
<tr>
<th>TA Facility</th>
<th>HUC-10</th>
<th>Wetland Acres Impacted</th>
<th>Wetland Acres Restored</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Site-10</td>
<td>Crooked Creek</td>
<td>25.3</td>
<td>25.3</td>
</tr>
<tr>
<td>Material Site-12</td>
<td>Crooked Creek</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Material Site-16</td>
<td>Veahna Creek-Kuskokwim River</td>
<td>7.9</td>
<td>7.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>34.7</strong></td>
<td><strong>34.7</strong></td>
</tr>
</tbody>
</table>

Figure 1 through Figure 3 are maps and site photos of the three selected material sites.
Figure 1  TA Material Site-10 Map and Site Photos
Figure 3  TA Material Site-16 Map and Site Photos
Material Site-10
Material Site-10, in the Crooked Creek HUC-10, is on a terrace between the confluence of the North and South forks of Getmuna Creek. The site is 208.3 acres. Wetlands associated with an abandoned channel of the South Fork of Getmuna Creek are at the northeast end of the site and total 25.3 acres (Figure 1). Three material site areas (cells) will be excavated, totaling 75.9 acres. Each excavation is projected to intersect the water table; the depth of water in each cell will vary along the gradient of the land surface, from less than three feet to greater than 17 feet.

Anadromous and resident fish populations are documented in both forks of Getmuna Creek indicating a diversity of species using the reaches above and below the proposed material site for spawning, rearing, and migration. Coho (Oncorhynchus kisutch), chum (Oncorhynchus keta), and Chinook ( Oncorhynchus tshawytscha) salmon are documented throughout Getmuna Creek downstream from the confluence of the North and South forks; however, only coho salmon are documented upstream from the confluence, adjacent to the material site. Coho salmon are likely to be present throughout the year. Dolly Varden (Salvelinus malma), arctic grayling ( Thymallus arcticus), and slimy sculpin ( Cottus cognatus) are documented or expected to exist throughout the Getmuna Creek drainage and are also likely present throughout the year (USACE 2015).

Material Site-12
Material Site-12, in the Crooked Creek HUC-10, is on a hillside above a tributary to Getmuna Creek. Aquatic life is the same as described for the Material Site-10 site. The northern edge of the material site is a wetland swale, with at least two seeps at the head of the wetlands. The swale contains slope hydrogeomorphic (HGM) wetlands that are seasonally flooded from an intermittent headwater stream. The site is 14.2 acres, including 1.5 acres of wetlands within the swale (Figure 2).

Material Site-16
Material Site-16, in the Veahna Creek-Kuskokwim River HUC-10, is on a hillside and footslope above a tributary to Jungjuk Creek. Coho salmon, Dolly Varden, arctic grayling, round whitefish (Prosopium cylindraceum) and slimy sculpin have been recorded in Jungjuk Creek. The site comprises 27.7 acres and contains 7.9 acres of flat and slope HGM wetlands (Figure 3). Excavation in wetlands in this material site is projected to intersect the water table.

Vegetation
Low shrub tundra (LST), open black spruce forest (OBSF) (Photo 1, all photos Michael Baker 2016) and black spruce woodland (BSW) (Photo 2) are the most prevalent wetland vegetation types in the TA material sites. Other wetland vegetation types present in the TA sites include closed alder shrub (CAS), woodland mixed forest (WMF), and open white spruce forest (OWSF). Vegetation types are described in the 2016 Preliminary Jurisdictional Determination (PJD) (Michael Baker 2016).
Following excavation, the material sites will be restored as permanently flooded to semi-permanently flooded waterbodies with wetland margins composed primarily of emergent vegetation with a vegetation classification of wet herbaceous (WH) (Photo 3). Excavation of material will create concave features that will hold water, thus creating the waterbodies and associated sedge/grass marshes adjacent to them.

In the Yukon-Kuskokwim Highlands Major Land Resources Area (MLRA) (Crooked Creek and Veahna Creek-Kuskokwim River HUC-10s), WH plots typically contain leafy tussock sedge (*Carex aquatilis*),
northwest territory sedge (*Carex utriculata*), bluejoint (*Calamagrostis canadensis*), and purple marshlocks (*Comarum palustre*) as dominant plants (Photo 3) (Michael Baker 2016).

**Photo 3**  
**Wet Herbaceous Vegetation, Crooked Creek HUC-10**

---

**Wetlands**

The wetland impact restoration areas include HUC-10 watersheds in the Yukon-Kuskokwim Highlands MLRA. The material sites will impact a variety of wetland types based on HGM and Cowardin Classifications. Table 2 shows field data collected at the restoration sites. Table 3 lists the wetland acres, by HGM and Cowardin Groups impacted by each TA site.

**Table 2  Field Data in TA Restoration Sites; HGM and Cowardin Classifications and Hydrology Notes**

<table>
<thead>
<tr>
<th>Plot Number</th>
<th>HGM</th>
<th>Cowardin Classification</th>
<th>TA Restoration Area</th>
<th>Hydrology Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>3PP1804</td>
<td>Flat</td>
<td>PSS4B</td>
<td>Material Site 10</td>
<td>Saturation at 8&quot;, Water table at 20&quot;</td>
</tr>
<tr>
<td>MB0253</td>
<td>Flat</td>
<td>PFO4/SS1B</td>
<td>Material Site 10</td>
<td>Surface water at 0&quot;, Water table at 15&quot;, Saturation at 10&quot;</td>
</tr>
<tr>
<td>MB3358</td>
<td>Slope</td>
<td>PSS1C</td>
<td>Material Site 12</td>
<td>Spring seeps with surface water</td>
</tr>
<tr>
<td>MB3359</td>
<td>Slope</td>
<td>PSS1C</td>
<td>Material Site 12</td>
<td>Spring seeps with surface water</td>
</tr>
<tr>
<td>MB4248</td>
<td>Flat</td>
<td>PSS1/FO4B</td>
<td>Material Site 16</td>
<td>Saturation present</td>
</tr>
<tr>
<td>MB4250</td>
<td>Slope</td>
<td>PSS1/FO4B</td>
<td>Material Site 16</td>
<td>Water table at 10&quot;</td>
</tr>
</tbody>
</table>

---

F10
Table 3  Baseline Wetland Types Impacted, by TA Site

<table>
<thead>
<tr>
<th>Facility</th>
<th>HGM Class</th>
<th>Cowardin Groups</th>
<th>Acres</th>
<th>Total Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Site-10</td>
<td>Flat</td>
<td>Coniferous Forests</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scrub Shrub</td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td><strong>2.7</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Slope</td>
<td>Coniferous Forests</td>
<td>15.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scrub Shrub</td>
<td>7.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td><strong>22.7</strong></td>
<td></td>
</tr>
<tr>
<td>Material Site-12</td>
<td>Slope</td>
<td>Coniferous Forests</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scrub Shrub</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td><strong>1.5</strong></td>
<td></td>
</tr>
<tr>
<td>Material Site-16</td>
<td>Flat</td>
<td>Scrub Shrub</td>
<td>7.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Slope</td>
<td>Scrub Shrub</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td><strong>7.9</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Grand Total</strong></td>
<td><strong>34.7</strong></td>
<td></td>
</tr>
</tbody>
</table>

Sites After Restoration

Based on the information presented in Table 2 (Michael Baker 2016), it is expected wetland hydrology will be re-established at the material sites after site closure and restoration.

Material Site-10

The Plan is to create ponds and littoral zone habitat and connect them to Getmuna Creek by engineered channels. Littoral zones (emergent wetlands along the shoreline) are productive areas of the ponds, allowing for nutrient retention and cycling of elements, shoreline and sediment stabilization, aquatic vegetation growth, refuge for juvenile fish, and organic material inputs (Peters and Lodge 2009). Side slopes of the cells will be graded to create littoral zone habitat, with shallow sedge marshes expected along the edge of the ponds. In total, 25.3 acres of wetlands will be restored to include ponds, emergent wetlands, and connecting channels for fish. Several of the created ponds are expected to provide rearing and overwintering habitat for fish.

Material Site-12

The final material site pit design will leave a concave depression in the remaining upland hillside. The surface contour of the swale will be re-graded to convey surface water downhill. The material site depression next to the swale will be excavated to proper depth so water will funnel into the depression to create a new wetland. With hydrology in place, the overburden can be returned to the wet depression and an emergent wetland is expected. However, this restoration Plan is only for the re-establishment of the original wetland swale.

Material Site-16

Upon restoration, a concave feature will capture and slowly release water downhill. After the material site is reclaimed, the 7.9 acres of wetlands will be restored as slope HGM.
Restored Wetlands
The aquatic resource losses from the Project have been described using HGM and the Cowardin Classification system by acres for wetlands and linear feet for stream loss. The same methods are used to identify aquatic resources restored by this Plan.

Final acres of HGM and Cowardin Groups for TA restoration areas are shown in Table 4. The dominant Cowardin and HGM classification when completed is slope palustrine forested/scrub shrub.

Table 4  HGM Classifications and Cowardin Groups of TA Restoration (Acres)

<table>
<thead>
<tr>
<th>HGM Classification</th>
<th>Cowardin Group</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depressional</td>
<td>Palustrine Emergent</td>
<td>13.0</td>
</tr>
<tr>
<td>Flat</td>
<td>Palustrine Scrub Shrub</td>
<td>10.4</td>
</tr>
<tr>
<td>Slope</td>
<td>Palustrine Scrub Shrub</td>
<td>11.3</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>34.7</td>
</tr>
</tbody>
</table>

Restoration Plan
Restoration timing of material sites in the TA will vary based on the duration of material removal from the sources and the sequence of the construction. As material is no longer required from these sites, they will be restored as soon as practicable. Material from Material Site-12 and Material Site-16 will be used for construction of the Jungjuk Road. After the road is constructed and fill material needs are met, these sites will be restored. Material Site-10 will provide material for road construction and aggregate for concrete for mine operations. Restoration will not occur at this site until the first cell can be restored or until mine closure.

Work at the material sites will typically be completed in four phases: construction, operation, restoration, and monitoring (Table 5).
Throughout all phases, water and erosion control structures and measures will be maintained to protect water quality in adjacent wetlands, streams, and rivers. The following is a synopsis of each activity:

- During construction of required access roads to the material site and construction of facilities, organics and topsoil will be removed and stockpiled in the mining areas. Organics and topsoil will be stockpiled on site to be used in final reclamation and restoration of each site. Facility work includes installing fueling locations, constructing storm water controls, and placing crushing or screening plants in the material site pits as required.

- Cells will be excavated and sand and gravel will be stockpiled on-site before being transported to work areas. Water and erosion control structures and measures will be installed and maintained during this phase to protect water quality in adjacent streams and rivers. Excavation of the material sites is projected to intersect the water table. The cells are anticipated to be excavated below ground water on site to minimize pumping impacts on adjacent wetlands and streams. Surface drainage from operations will be controlled to protect adjacent streams. Interim reclamation and stabilization will be conducted during operations where mining has been completed.

- Following cell excavation, side slopes will be flattened to promote establishment of littoral zones and herbaceous emergent vegetation around the newly formed ponds. The pits will be designed to maintain surface hydrology and contoured to maximize vegetated wetlands. Cell edges will be completed in irregular shapes to promote edge habitat. The stockpiled topsoil or surface organic material will be returned to promote vegetation regrowth. Additional segregated organics removed from adjacent project areas may be placed when additional carbon is desirable. If necessary, fertilizer will be added to promote re-vegetation. Seeding and planting will be conducted using guidelines from A Re-Vegetation Manual for Alaska (Wright 2008) and the Interior Alaska Re-vegetation and Erosion Control Guide (Czapla and Wright 2012). Seed mixes will be cultivated from both the seedbank in stockpiled wetland topsoil (growth media) and from commercially available native wetland seed mixes. Species present in currently available wetland and upland seed mixes are shown in Table 6. Egan American Sloughgrass, a primary component of the seed mix, has been shown to be successful for revegetation in wetlands in Interior Alaska (Czapla and Wright 2012).

\[
\begin{array}{|c|c|c|c|c|}
\hline
\text{Species Name} & \text{Latin Name} & \text{National Wetlands Inventory (NWI)} & \text{Upland Mix, Percent} & \text{Wetland Mix, Percent} \\
\hline
\text{Arctic Red Fescue} & \text{Festuca rubra} & \text{Facultative} & 50 & 20 \\
\text{Tundra Glaucous Bluegrass} & \text{Poa glauca} & \text{Not Listed} & 20 & 0 \\
\text{Gruening Alpine Bluegrass} & \text{Poa alpina} & \text{Facultative Upland} & 20 & 0 \\
\text{Nortran Tufted Hairgrass} & \text{Deschampsia caespitosa} & \text{Facultative} & 10 & 40 \\
\text{Egan American Sloughgrass} & \text{Beckmannia syzigachne} & \text{Obligate} & 0 & 40 \\
\hline
\end{array}
\]
Re-vegetation – Re-establishment of plant cover by means of seeding, or natural re-invasion. If necessary, fertilizer will be added to promote re-vegetation. Uplands will be re-vegetated to control sediment and nutrient loading to wetlands. Detailed re-vegetation techniques are included in the Interior Alaska Re-vegetation and Erosion Control Guide (Czapla and Wright 2012). Depressional, palustrine emergent wetlands will be the primary established wetland type in the former material sites. Over time, native seeds will germinate from the growth media seed bank or from natural colonization from adjacent vegetation; black spruce and shrubs may return to the restoration areas over time as palustrine scrub shrub and forested wetlands.

Reclamation Criteria
Vegetation and hydrology reclamation criteria are modified from General Permit (GP) POA-2014-55: Mechanical Placer Mining Activities within the State of Alaska (USACE 2014). No soil reclamation criteria are proposed; development of hydric soils typically lags the other two parameters following creation or restoration of wetlands.

Vegetation Criteria
Vegetation criteria will ensure restored and re-vegetated wetland areas and upland berms are following a trajectory to be stable and functioning biologically. Table 7 contains the Plan vegetation reclamation criteria and timing.

Table 7  **TA Vegetation Reclamation Criteria and Timing**

<table>
<thead>
<tr>
<th>Restoration Area</th>
<th>Reclamation Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upland Berms</td>
<td>Achieve 30% live plant cover of the upland berm by the end of three (3) growing seasons.</td>
</tr>
<tr>
<td></td>
<td>Achieve 70% live plant cover of the upland berm by the end of five (5) growing seasons.</td>
</tr>
<tr>
<td></td>
<td>Cover of invasive species is no more than 10%.</td>
</tr>
<tr>
<td>Wetlands</td>
<td>Achieve 30% live plant cover of constructed wetland areas by the end of three (3) growing seasons.</td>
</tr>
<tr>
<td></td>
<td>Achieve 70% live plant cover of constructed wetland areas with vegetation community meeting the Dominance Test or Prevalence Index for hydrophytic vegetation by the end of five (5) growing seasons.</td>
</tr>
<tr>
<td></td>
<td>Cover of invasive species is no more than 10%.</td>
</tr>
</tbody>
</table>
Wetland Hydrology Criteria

Wetland hydrology indicators as described in the Alaska Regional Supplement (USACE 2007) will be used as evidence of sufficient hydrology to support wetland and pond formation and function. However, only a subset of those indicators will be used during the monitoring period. This subset includes three of the four groups of indicators presented in the supplement (Table 8). The fourth group, Group D – Evidence from Other Site Conditions or Data, will not be used to monitor hydrologic conditions within the restored wetland areas because landscape variables for the group were derived for natural settings and are not applicable for use in recently constructed wetlands. Additionally, the indicator Sparsely Vegetated Concave Surface will be excluded because it is counter to the vegetation reclamation criteria.

One primary indicator from any group is sufficient to conclude that wetland hydrology is present. Secondary indicators have been excluded from the reclamation criteria. Monitoring for hydrologic indicators will occur within 10-meter-squared (m²) plots coinciding with the vegetation monitoring sampling.

<table>
<thead>
<tr>
<th>Group</th>
<th>Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A – Observations of Surface Water or Saturated Soils</td>
<td>A1 – Surface Water</td>
</tr>
<tr>
<td></td>
<td>A2 – High Water Table</td>
</tr>
<tr>
<td></td>
<td>A3 – Saturation</td>
</tr>
<tr>
<td></td>
<td>B1 – Water Marks</td>
</tr>
<tr>
<td></td>
<td>B2 – Sediment Deposits</td>
</tr>
<tr>
<td></td>
<td>B3 – Drift Deposits</td>
</tr>
<tr>
<td>Group B – Evidence of Recent Inundation</td>
<td>B4 – Algal Mat or Crust</td>
</tr>
<tr>
<td></td>
<td>B5 – Iron Deposits</td>
</tr>
<tr>
<td></td>
<td>B6 – Surface Soil Cracks</td>
</tr>
<tr>
<td></td>
<td>B7 – Inundation Visible on Aerial Imagery</td>
</tr>
<tr>
<td></td>
<td>B15 – Marl Deposits</td>
</tr>
<tr>
<td>Group C – Evidence of Current or Recent Saturation</td>
<td>C1 – Hydrogen Sulfide Odor</td>
</tr>
<tr>
<td></td>
<td>C2 – Dry-season Water Table</td>
</tr>
</tbody>
</table>

Monitoring

Wetland monitoring will include periodic inspections, once a year for five years following restoration. The inspections will occur during the growing season. The purpose of the monitoring is to assess the success of the restored habitats using the reclamation criteria described above and to determine whether remedial actions are necessary to assure the reclamation criteria are met.

Monitoring of restored wetlands and ponds will consist of collecting and evaluating quantitative data on the hydrology and plant communities within the restored wetlands. Monitoring points will be established to monitor trends in plant communities. Transects at monitoring points will be run to determine vegetation cover across the restoration area.
Monitoring point locations will be monumented with Global Positioning System and physically using rebar stakes and flagging to facilitate revisit. At shrub vegetation sampling points, the percent cover of shrub species, bare ground, and open water, as well as the number of species will be recorded within a 10-m² plot. Herbaceous species and percent cover will be recorded within a 1-m² quadrat placed at random in the plot area. Hydrology will be characterized at wetland and pond sampling points. All non-native plant species and their relative cover will be recorded. Non-native plant recruitment data will be used to assess the need for active measures to remove non-native plants from restoration areas.

Monitoring reports will be produced annually and submitted to USACE December 31 of each year until the areas meet reclamation criteria.
References


This page intentionally left blank.
This page intentionally left blank.
August 10, 2018

Donlin Gold, LLC
Attention: Andy Cole
4720 Business Park Blvd, Suite G-25
Anchorage, AK 99503
(via email)

Re: Donlin Gold, LLC, Donlin Gold Mine
POA-1995-120, Crooked Creek

Dear Mr. Cole:

In accordance with Section 401 of the Federal Clean Water Act of 1977 and provisions of the Alaska Water Quality Standards, the Department of Environmental Conservation (DEC) is issuing the enclosed Certificate of Reasonable Assurance for placement of dredged and/or fill material in waters of the U.S., including wetlands and streams, associated with the development of a gold mine 10 miles north of the village of Crooked Creek, Alaska.

DEC regulations provide that any person who disagrees with this decision may request an informal review by the Division Director in accordance with 18 AAC 15.185 or an adjudicatory hearing in accordance with 18 AAC 15.195 – 18 AAC 15.340. An informal review request must be delivered to the Director, Division of Water, 555 Cordova Street, Anchorage, AK  99501, within 20 days of the permit decision. Visit http://dec.alaska.gov/commish/review-guidance/ for information on Administrative Appeals of Department decisions.

An adjudicatory hearing request must be delivered to the Commissioner of the Department of Environmental Conservation, 410 Willoughby Avenue, Suite 303, PO Box 111800, Juneau, AK 99811-1800, within 30 days of the permit decision. If a hearing is not requested within 30 days, the right to appeal is waived.

By copy of this letter we are advising the U.S. Army Corps of Engineers of our actions and enclosing a copy of the certification for their use.

Sincerely,

James Rypkema
Program Manager, Storm Water and Wetlands

Enclosure: 401 Certificate of Reasonable Assurance
cc: (with enclosure via email) Faith Martineau, ADNR
    Dan Graham, Donlin Gold
    Jamie Hyslop, USACE, Anchorage
    Shelia Newman, USACE Anchorage
    Calvin Alvarez, USACE Anchorage
    Megan Marie, ADF&G
    USFWS Field Office Anchorage
    Matthew LaCroix, EPA Operations, Anchorage
    Mark Douglas, EPA Operations, Anchorage
STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
CERTIFICATE OF REASONABLE ASSURANCE

In accordance with Section 401 of the Federal Clean Water Act (CWA) and the Alaska Water Quality Standards (18 AAC 70), a Certificate of Reasonable Assurance, is issued to Donlin Gold, LLC, attention: Andy Cole, at 4720 Business Park Blvd, Suite G-25, Anchorage, Alaska 99503, for placement of dredged and/or fill material in waters of the U.S. including wetlands and streams in association with the development of a gold mine located 277 miles west of Anchorage, 145-miles northeast of Bethel, and 10 miles north of the village of Crooked Creek in the Kuskokwim watershed. There is no existing overland year-round access to the site, or a utility service to supply the mine.

Donlin Gold is proposing the development of an open pit, hard rock gold mine. The proposed Donlin Gold project includes land leased from Calista Corporation (Calista), The Kuskokwim Corporation and CIRI Inc. All three are Alaska Native Claims Settlement Act (ANCSA) regional corporations. The remainder of potentially affected lands (principally pipeline impacts) are owned primarily by the State of Alaska or U.S. Bureau of Land Management (BLM).

A U.S. Army Corps of Engineers (USACE) permit pursuant to Section 10 of the River Harbors Act of 1899 (33 USC 403) and pursuant to Section 404 of the CWA (33 USC 1344) is to be issued to Donlin Gold for the discharge of fill material into waters of the U.S., including wetlands, and the construction of structures in and under navigable waters. The USACE permit will authorize the Applicant’s proposed action (Alternative 2 North Option) which incorporates the North Route Pipeline option as detailed in the April 2018 Final Environmental Impact Statement (FEIS). This alternative incorporates all practicable avoidance and minimization measures.

To the extent practicable, the proposed project has been designed and modified to avoid impacts to waters of the U.S. and important cultural resources and wildlife habitats. The construction of all Project components (Mine Site, Transportation Corridor, and Pipeline) will result in the discharge of 4,368,300 cubic yards (cy) of fill material, permanently impacting 2,877 acres of wetland, 3 acres of fill below the Ordinary High Water Mark (OHWM) of the Kuskokwim River, and 172,844 linear feet of stream, and temporarily impacting 538 acres of wetland and 53,346 linear feet of stream.

The Project would have an average process throughput of 59,000 tons of ore per day, an estimated operational life of 27 years, and would produce approximately 30 million ounces of gold. Construction of the Project would take 3 to 4 years. Final reclamation and closure activities will take six years post operations. Approximately 45 years post-reclamation the mine pit will fill and there will be need for treatment in perpetuity of the wastewater discharged from the mine pit.

Major Project components include the proposed Mine Site, Transportation Corridor, and Pipeline. See the Donlin Gold FEIS, Section 2.3.2, Alternative 2 – Donlin Gold’s Proposed Action with incorporation of the North Route Pipeline option (referred to as the Alternative 2 North Option) for a detailed description of the Project. The three major project components are summarized as follows:

Mine Site

The Mine Site construction will result in the discharge of 2,943,005 cy of fill material, resulting in the permanent loss of 2,572 acres of wetland and 171,100 linear feet of stream. The primary Project subcomponents of the Mine Site include Donlin-Jungjuk road (East of Crooked Creek), Laydown areas,
Mine Internal Roads, North and South Overburden Stockpile, Open Pit, Snow Gulch Freshwater Reservoir, Tailings Storage Facility (TSF), Treated Water Discharge Facility, Material sites and Stockpiles, and Waste Rock Facility (WRF).

Transportation Corridor

The Transportation Corridor construction will result in the discharge of 156,280 cy of material, resulting in the permanent impact to 105 acres of wetland, 3 acres below the OHWM of the Kuskokwim River, and 1,844 linear feet of stream. The primary Project subcomponents of the Transportation Corridor include a port facility at Angyardaq (Jungjuk), a 30-mile mine access road from the port (West of Crooked Creek), a 5,000 foot airstrip, airstrip spur road, material sites.

Pipeline

The Pipeline construction will result in the discharge of 1,269,015 cy of material, resulting in the permanent loss of 200 acres of wetland and temporary impacts to 538 acres of wetland and 53,346 linear feet of stream. The Pipeline component includes the construction of a 14-inch-diameter steel Pipeline to transport natural gas approximately 316 miles from an existing 20-inch gas pipeline tie-in near Beluga, Alaska to the Mine Site power plant. Natural gas will be supplied to the Pipeline from existing Cook Inlet infrastructure. The Pipeline will require one compressor station at Milepost (MP) 0.4. An associated fiber optic line will be installed in the right-of-way corridor parallel to the natural gas pipeline for operational needs and communications. The primary Project subcomponents of the Pipeline include access routes, airstrips, block valves, work camps, horizontal directional drill (HDD) workspace, material sites, pipeline storage yards, pipeline, water extraction sites, and work pads.

The permit requires compensatory mitigation for the direct impacts to waters of the U.S., including wetlands.

Project Location: The Mine Site is located at Latitude 62.0179° N., Longitude 158.1884°W, 277-miles west of Anchorage and 10-miles north of Crooked Creek village. The river port (Jungjuk) is located on the north bank of the Kuskokwim River approximately 9-river miles south of Crooked Creek village at Latitude 61.7952° N, Longitude 158.2142° W. The Mine Site airstrip is located approximately 15.5-miles northwest of Crooked Creek village at Latitude 62.0319°N, Longitude 158.2351°W. The natural gas pipeline tie in near the community of Beluga at Latitude 61.2694° N Longitude 150.9017°W.

A state issued water quality certification is required under Section 401 because the proposed activity will be authorized by a U.S. Army Corps of Engineers permit (POA-1995-120) and a discharge of pollutants to waters of the U.S. located in the State of Alaska may result from the proposed activity. Public notice of the application for this certification was given as required by 18 AAC 15.180 in the Corps Public Notice POA-1995-120-M20 posted from November 25, 2015 to April 30, 2016, and April 27, 2018 to May 29, 2018. DEC publically noticed intent to issue 401 Certificate from June 13, 2018 to July 13, 2018.

Donlin Gold submitted a Preliminary Section 404 and Section 10 permit application to the USACE in July 2012. In December 2012, USACE published a Notice of Intent to prepare an Environmental Impact Statement (EIS) for the Donlin Gold Project. Donlin Gold revised the application in December 2014, and again in August 2015. The latter revision was public-noticed along with the Draft EIS in November 2015. After agency comments were received, Donlin Gold revised the application again December 20, 2017. The updated application includes revisions and refinements to the project design and footprint resulting, in part, from the NEPA process review, and supersedes all previous applications.
The most significant changes included in the updated application are:

- Modified natural gas pipeline alignment to include the “North Route” option through the Alaska Range;
- Refined project footprint;
- Updated calculations of the project’s impacts to waters of the U.S. using USACE preliminary determined wetlands data;
- Inclusion of a final and detailed Compensatory Mitigation Plan;
  - Restore and preserve approximately 102-acres of wetlands and riparian areas with 8,501-linear feet (1.61-miles) of stream, and establish another 71-acres of riparian preservation buffers, in historic placer mining areas in the Upper Crooked Creek watershed (within the HUC-10 of the MA).
  - Preserve a total of 5,888-acres of important and productive habitat, of which it is estimated 2,558 acres are wetland and ponds, with an additional 3,330-acres of riparian areas, stream area, and buffers, and 228,325-linear feet (43.24-miles) of streams in the Chuitna watershed.
- Streamlined application format.

**State Certification and Conditions**

The Department of Environmental Conservation (DEC) reviewed the application and certifies that there is reasonable assurance that the proposed activity, as well as any discharge which may result, will comply with applicable provisions of Section 401 of the CWA and the Alaska Water Quality Standards, 18 AAC 70, provided that the following additional measures are adhered to.

1. Reasonable precautions and controls must be used to prevent incidental and accidental discharge of petroleum products or other hazardous substances. Fuel storage and handling activities for equipment must be sited and conducted so there is no petroleum contamination of the ground, subsurface, or surface waterbodies.
2. During construction, spill response equipment and supplies such as sorbent pads shall be available and used immediately to contain and cleanup oil, fuel, hydraulic fluid, antifreeze, or other pollutant spills. Any spill amount must be reported in accordance with Discharge Notification and Reporting Requirements (AS 46.03.755 and 18 AAC 75 Article 3). The applicant must contact by telephone the DEC Area Response Team for Central Alaska at (907) 269-3063 during work hours or 1-800-478-9300 after hours. Also, the applicant must contact by telephone the National Response Center at 1-800-424-8802.
3. If the industrial activity of this project includes storm water discharges associated from mineral or metal mining, or open-cut gravel quarries, the permittee will need to obtain additional discharge coverage from an appropriate Alaska Pollutant Discharge Elimination System (APDES) permit. Further information in regards to the Multi-Sector General Permit (MSGP) authorization, please see http://dec.alaska.gov/water/wastewater/stormwater/MultiSector.aspx and/or contact William Ashton, 907-269-6283, William.Ashton@alaska.gov for more information. The applicant currently has received an APDES MSGP authorization (AKR06AA92) for storm water discharges.
4. All surface runoff from areas disturbed during the stripping of overburden or moving of existing overburden piles shall be diverted to existing mine cuts or stabilized areas, such as settling ponds, using berms, diversion channels, or brush barriers. Surface runoff containing sediment from disturbed areas shall not be discharged without treatment into any water body.

5. Construction equipment shall not be operated below the ordinary high water mark if equipment is leaking fuel, oil, hydraulic fluid, or any other hazardous material. Equipment shall be inspected and recorded in a log on a daily basis for leaks. If leaks are found, the equipment shall not be used and pulled from service until the leak is repaired.

6. For culverts that carry waters that are discharging or will discharge into fish-bearing waters, installation shall not occur within the flowing waters of the stream. Culvert installation techniques such as stream diversion, dam and pump, or stream fluming shall be incorporated into the installation activity to insure that silt laden water is not carried into sensitive fish habitat.

7. All work areas, material access routes, and surrounding wetlands involved in the construction project shall be clearly delineated and marked in such a way that equipment operators do not operate outside of the marked areas.

8. Excavated or fill material, including overburden, shall be placed so that it is stable, meaning after placement the material does not show signs of excessive erosion. Indicators of excess erosion include: gullying, head cutting, caving, block slippage, material sloughing, etc. The material must be contained with siltation best management practices (BMPs) to preclude reentry into any waters of the U.S., which includes wetlands.

9. If a BMP is not working properly (for instance, sediment runoff) corrective measures shall be implemented as soon as possible.

10. A minimum 50-foot wide, vegetated buffer zone should be maintained between a snow storage area and any surface water bodies. This distance could be decreased if adequate stormwater/sediment catchment basins, coarse gravel berms, or sediment traps/barriers/filters are built to reduce impacts on surface water bodies from snowmelt that may potentially run off from these sites.

11. Accumulated trash and debris need to be removed from the snow storage area in the spring as they become visible when the snow melts. This may need to be done several times over the course of the summer as the snow piles continue to melt. Wastes and litter that become uncovered as the snow melts need to be picked up before off-site migration of the waste becomes a problem.

This certification expires five (5) years after the date the certification is signed. If your project is not completed by then and work under U.S. Army Corps of Engineers Permit will continue, you must submit an application for renewal of this certification no later than 30 days before the expiration date (18 AAC 15.100).

Date: August 10, 2018

James Rypkema, Program Manager
Storm Water and Wetlands
This page intentionally left blank.
ATTACHMENT C BLM’S SUPPORTING ANALYSIS AND DOCUMENTATION

Attachment C includes the following section:

- Attachment C1 – BLM Selected Mitigation from Chapter 5 of the Final EIS
- Attachment C2 – ANILCA Section 810 Summary
This page intentionally left blank.
ATTACHMENT C1  BLM SELECTED MITIGATION FROM CHAPTER 5 OF THE FINAL EIS

As required by the Corps, any impacted WOUS on BLM-managed lands in the ROW corridor is factored into the overall CMP. The ROW development involves impacts to wetlands. The Corps’ special conditions listed in Section 6.2.8 of the JROD include mitigation to off-set unavoidable impacts to WOUS. BLM is not requiring any compensatory mitigation from Donlin Gold LLC.

In addition to the Design Features described in the Final EIS Chapter 5, Table 5.2-1, Best Management Practices and Permit Requirements described in Section 5.3, the BLM has selected mitigating measures from the Final EIS Chapter 5 to avoid, minimize, or reduce impacts identified in the environmental analysis. These selected mitigations from Final EIS Chapter 5, Tables 5.5 and 5.7, will apply only to lands under BLM jurisdiction and authority (BLM-managed lands). While some of these mitigating measures provide general guidance and expectations for the Donlin Gold Project as a whole, they will be further defined and clarified in the ROW Grant offer to Donlin Gold as they apply specifically to BLM-managed lands. The ROW Grant stipulations are additional terms and conditions that must be complied with for all activities involved with the natural gas pipeline and associated fiber optic cable construction, operation, maintenance, and termination on BLM-managed lands, within the parameters of the Final EIS.3

Table C1: BLM Selected Mitigation Measures from Final EIS Chapter 5

<table>
<thead>
<tr>
<th></th>
<th>Train site construction managers to oversee work of specialists in wetland recognition, permit stipulations, and BMPs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Prior to pipeline construction, the specific location of potentially contaminated soils should be mapped compared to final grading plans at the Farewell airstrip (all action alternatives), North Foreland barge landing, Tyonek-Beluga pipeline trench segment, and Puntilla airstrip (Alternative 3B). Disturbance of these soils can then be avoided if possible, and the impacts reduced. Clear documentation of the current, contaminated sites would also reduce liability for the developer.</td>
</tr>
<tr>
<td>3</td>
<td>Develop Plans and Procedures for notification, documentation, sampling, and curation in the event that scientifically important paleontological resources (e.g., dinosaur fossils) are found during ground disturbing activities.</td>
</tr>
<tr>
<td>4</td>
<td>Schedule Pipeline component Closure Phase activities to occur during the winter season (similar to how Construction Phase activities are scheduled) to minimize surface disturbances to soil and erosion potential.</td>
</tr>
<tr>
<td>5</td>
<td>Where practicable, leave riparian bank vegetation material intact or, where needed and practicable, store for replacement on the disturbed banks to stabilize and restore the crossing. Monitoring of crossing sites to identify sites that need additional restoration to prevent bank erosion should be implemented after construction. At stream bank crossings, placement of riparian mats or root masses would be placed to facilitate rapid vegetation regrowth to prevent bank erosion.</td>
</tr>
<tr>
<td>6</td>
<td>Mark wetland boundaries and vegetation clearing limits with flagging or other markers to prevent crews from damaging more vegetation than needed during construction.</td>
</tr>
</tbody>
</table>

3 Some mitigating measures from the Final EIS Chapter 5 were assessed by the Corps as “Not Likely to be Required” based on likelihood of implementation, effectiveness, and reasonable/practicable. Despite this assessment, BLM feels many are effective, reasonable and practicable, and has selected many of the mitigating measures for inclusion in the JROD as they will apply to BLM-managed land. These mitigating measures will be further defined and clarified in ROW Grant stipulations.
| 7  | Where practicable, for winter pipeline construction access roads, frost pack muskegs and wetlands (the combination of covering with snow and driving on it causes freezing at depth and provides a slightly elevated running surface) to minimize impacts to vegetative ground cover and wetlands. |
| 8  | Where practicable, promote salvaging and re-spreading topsoil over the overburden piles and allowing native vegetation and native seed planting vegetation growth to keep topsoil viable until it is needed during final reclamation. In pipeline reclamation practices, segregate windrowed organic soils as cover material (where present). |
| 9  | Install signs that clearly distinguish trails from the pipeline ROW at points where the pipeline crosses trails to guide trail users to stay on the trail and off of the pipeline ROW where the two are not collocated. As practicable, revegetate, or otherwise block access to, a narrow strip of the pipeline ROW where it crosses the trail to help steer and keep trail users on the trail and reduce the visual effect of the pipeline ROW crossing. |
| 10 | Where practicable, when clearing brush and shrubs as required to maintain the operations ROW, introduce variation in the edges of clearing (i.e., avoid extended straight lines) to minimize effects to visual resources. |
| 11 | Include measures to mitigate visual impacts to known sensitive cultural resource areas, such as clearing a narrower construction ROW, using HDD drilling under a sensitive site, minor realignment of the construction ROW, or other appropriate measures to avoid known sensitive areas. |
| 12 | Apply measures to reduce substantial grading of hillsides for the pipeline ROW, on a site-specific basis. |
| 13 | Apply measures to reduce the initial clearing requirements for the ROW, on a site-specific basis. Avoid vegetation clearing during the bird nesting season. |
| 14 | Evaluate use of slope breakers and trench breakers at wetlands boundaries to prevent trenches from draining wetlands. |
| 15 | During final design locate any potential vegetation buffers to reduce visual impacts. |
| 16 | To the extent practicable, avoid wetlands in the positioning of temporary construction facilities, including camps. |
| 17 | Where appropriate, employ seasonal timing restrictions on blasting, as stipulated by resource agencies, to reduce noise related effects of blasting during sensitive subsistence hunting activities (e.g., fall moose hunting). |
| 18 | Develop a sampling and analysis plan to ensure PAG rock and other sources of contaminants are not used for construction at the mine or for road surfacing (i.e., where such construction could lead to surface water quality impacts). |
| 19 | Frost pack the pipeline trench cover in bogs and fens, cut the trench cover in blocks, set the blocks aside during construction and replace them over the trench fill afterwards. |
| 20 | Segregate wetlands soil for use in wetland mitigation to the maximum amount practicable. |
| 21 | During construction of the pipeline, avoid wetlands impacts by placing above ground appurtenances away from floating bogs and fens. |
| 22 | Restore flat-to-gently sloping wetlands by removal of fill at Project closure where practicable. Removed fill would be transported to approved upland areas for disposition. |
| 23 | Restore riparian areas at stream crossings along the pipeline. |
### Table C1: BLM Selected Mitigation Measures from Final EIS Chapter 5

<table>
<thead>
<tr>
<th></th>
<th>Specific plans for borrow site reclamation would be completed in a later phase of the Project. In addition to standard BMPs for contouring, drainage, and erosion controls (Section 3.2, Soils), reclamation should create ponds and/or stream connections for fish and wildlife habitat at borrow sites in low lying areas (e.g., at Getmuna Creek) in accordance with ADEC and ADF&amp;G guidance (McClean 1993; Shannon &amp; Wilson 2012; Owl Ridge 2017c).</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>Include additional erosion and sediment control measures such as settling ponds, silt fences, or sediment barriers to minimize the amount of sedimentation from snowmelt.</td>
</tr>
<tr>
<td>25</td>
<td>Where needed and practicable, use mats or other appropriate types of ground protection to minimize disturbance to ground vegetative cover during non-winter construction.</td>
</tr>
<tr>
<td>26</td>
<td>Where practicable, salvage and replace the native vegetation mat in wetlands, and/or re-establish wetland vegetation that is typical of the general area.</td>
</tr>
<tr>
<td>27</td>
<td>Where practicable and in compliance with FAA and safety requirements, establish appropriate minimum flight altitudes to minimize impacts to wildlife when animals are present in the vicinity of the work (both &gt;1,000 feet and &gt; 1,500 have been specified for other projects in Alaska).</td>
</tr>
<tr>
<td>28</td>
<td>Review the success and practicability of measures that were taken to prevent or minimize adverse effects on visual resources on other linear projects, including the Trans-Alaska Pipeline System (TAPS), the Dalton Highway, the Elliott and Parks Highways, and the Anchorage-to-Fairbanks Intertie, and incorporate successful measures into the design and location of the pipeline where reasonable and appropriate.</td>
</tr>
<tr>
<td>29</td>
<td>Work with communities to make equipment and parts available at Closure, and remaining material should be shipped off site for recycling or disposal.</td>
</tr>
<tr>
<td>30</td>
<td>Agencies should coordinate to refine clearing practices that both meet PHMSA regulations and protect ecological values.</td>
</tr>
<tr>
<td>31</td>
<td>Develop a Fugitive Dust Control Plan for the Pipeline component.</td>
</tr>
<tr>
<td>32</td>
<td>Reduce the total number of material sites by increasing their size and maximizing haul distance between them.</td>
</tr>
<tr>
<td>33</td>
<td>Use raincoatings to cover stockpiles or other areas expected to produce runoff to reduce potential seepage of contaminants.</td>
</tr>
<tr>
<td>34</td>
<td>Establish scientifically based thresholds or quantitative indicators for construction operations (e.g., number of days below freezing, depth of ground frost penetration, minimum thickness of surface water freeze-up) to promote accomplishment of minimum impact winter construction techniques, above which construction activities would be postponed until these conditions are met. Such practices have already been established and successfully implemented in cases such as the permitting and development of ice roads on the North Slope of Alaska where these practices have been assessed to be feasible and practicable.</td>
</tr>
<tr>
<td>35</td>
<td>Place valve stations to avoid visual impacts to local businesses, the INHT, hunting/guiding camps and cabins, as necessary on a site-specific basis.</td>
</tr>
<tr>
<td>36</td>
<td>Construct temporary access roads using geotextile, “Chip Seal,” “High Float,” paving, or similar design feature and controls to reduce erosion, sedimentation and dust impacts.</td>
</tr>
<tr>
<td>37</td>
<td>Inert solid wastes that are proposed to be permanently disposed of onsite after the Project is completed should be transported offsite to a licensed landfill facility, if feasible.</td>
</tr>
<tr>
<td>38</td>
<td>Apply restoration practices to vegetation in wetland areas in trenches along the pipeline route to prevent permanent water filled trenches with no vegetative cover as seen at the Beluga to Anchorage Pipeline.</td>
</tr>
</tbody>
</table>
### Table C1: BLM Selected Mitigation Measures from Final EIS Chapter 5

<table>
<thead>
<tr>
<th></th>
<th>Measure Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>Apply measures to further restrict public access to the ROW to reduce indirect effects, such as closing the pipeline ROW to Off Highway Vehicle (OHV) and snowmachine use, where appropriate based on landowner approval.</td>
</tr>
<tr>
<td>41</td>
<td>Add training for staff or construction managers in identification of NNIS for the full Project area (especially along the pipeline route, all Project and local roads, and the mine area.)</td>
</tr>
</tbody>
</table>
ATTACHMENT C2 ANILCA SECTION 810 SUMMARY

The Alaska National Interest Lands Conservation Act (ANILCA) Section 810(a) requires that an evaluation of subsistence uses and needs should be completed for any federal determination to “withdraw, reserve, lease, or otherwise permit the use, occupancy or disposition of public lands.” As such, an evaluation of potential impacts to subsistence under ANILCA Section 810(a) must be completed for the Final EIS because the project requires a BLM ROW grant for the natural gas pipeline’s proposed crossing of federally managed lands. BLM conducted the required ANILCA Section 810 analysis for the Final EIS. ANILCA requires that this evaluation include findings on three specific issues:

1) The effect of use, occupancy, or disposition on subsistence uses and needs;
2) The availability of other lands for the purposes sought to be achieved; and,
3) Other alternatives that would reduce or eliminate the use, occupancy, or disposition of public lands needed for subsistence purposes (16 USC Section 3120(a)).

C2.1 NOTICE AND HEARINGS

A finding that the proposed action may significantly restrict subsistence uses imposes additional requirements, including provisions for notices to the State of Alaska and appropriate regional and local subsistence committees, as well as a hearing in the vicinity of the area involved.

ANILCA Section 810(a) provides that no “withdrawal, reservation, lease, permit, or other use, occupancy or disposition of the public lands which would significantly restrict subsistence uses shall be effected” until the federal agency gives the required notice and holds a hearing in accordance with ANILCA Section 810(a)(1) and (2), and makes the three determinations required by ANILCA Section 810(a)(3)(A), (B), and (C). The three determinations that must be made are: 1) That such a significant restriction of subsistence use is necessary, consistent with sound management principles for the utilization of the public lands; 2) That the proposed activity will involve the minimal amount of public lands necessary to accomplish the purposes of such use, occupancy, or other such disposition; and 3) That reasonable steps will be taken to minimize adverse impacts to subsistence uses and resources resulting from such actions [16 USC Section 3120(a)(3)(A), (B), and (C)].

Through feedback provided during the scoping meetings, the BLM, as part of the Draft EIS, made a preliminary determination that Alternatives 2, 3A, 3B, 4, 5A and 6A may significantly restrict subsistence uses for the communities of Tyonek, Skwentna, McGrath, Nikolai and Takotna, Bethel, Tuntutuliak, Napakiak, Napaskiak, Oscarville, Kwethluk, Akiachak, Akiak, Tuluksak, Upper and Lower Kalskag, Aniak, Chuathbaluk, Napaimute Red Devil, Sleetmute, Stony River, and Crooked Creek.

The BLM also made a preliminary determination that the cumulative case may significantly restrict subsistence uses for the communities of Bethel, Tuntutuliak, Napakiak, Napaskiak, Oscarville, Kwethluk, Akiachak, Akiak, Tuluksak, Upper and Lower Kalskag, Aniak, Chuathbaluk, Napaimute and Crooked Creek.

Therefore, the BLM undertook the notice and hearing procedures required by ANILCA Section 810 (a)(1) and (2) in conjunction with release of the Donlin Gold Project Draft EIS in order to
solicit public comment from the potentially affected communities of Aniak, Crooked Creek, Bethel, Quinhagak, Akiak, Nunapitchuk, Tyonek, McGrath, Lower Kalskag, Holy Cross, and Chuathbaluk, as well as from all subsistence users. A public meeting and hearing was also held in Anchorage. The following discussion summarizes the ANILCA Section 810 evaluation for the decision to select Alternative 2 North Option in this JROD. The summary is based on the detailed ANILCA Section 810 analysis in Appendix N of the Donlin Gold Project Final EIS.

C2.2 ALTERNATIVE 2 NORTH OPTION – SUMMARY OF FINDINGS

The positive finding for Alternative 2 North Option of a significant restriction to subsistence for the communities of Bethel, Tuntutuliak Napakiak, Napaskiak, Oscarville, Kwethluk, Akiachak, Akiak, Tuluksak, Upper and Lower Kalskag, Aniak, Chuathbaluk, Napaimute, and Crooked Creek would be due to a substantial reduction in the opportunity to continue uses of subsistence resources on the Kuskokwim River. Barging on the Kuskokwim River during construction and operation of the mine may cause extensive interference with access to the Kuskokwim River by subsistence users from villages along the river. It may cause a major redistribution of salmon, rainbow smelt, and whitefish, which are important subsistence resources for those villages.

The positive finding for Alternative 2 North Option of a significant restriction to subsistence use for the communities of McGrath, Takotna and Nikolai would be due to a substantial increase in competition for subsistence resources along the natural gas pipeline at the Farewell Airstrip. Increased activity and access at the Farewell Airstrip and along the nearby gas pipeline right-of-way may cause major increases in the disturbance and use of moose, caribou, black bear and furbearer subsistence resources by recreational sport hunters and commercial outfitters. These are important subsistence resources for the villages of McGrath, Takotna, and Nikolai.

C2.3 CUMULATIVE CASE - FINDINGS

With the implementation of Alternative 2 North Option, there would be direct and indirect impacts to subsistence practices and a contribution to cumulative effects on subsistence resources and practices. Overall, the impact on subsistence resources from the proposed project and past, present, and reasonably foreseeable future actions could result in some harvest decrease and slightly increase competition for resources, although there would be minimal impact to access.

The cumulative case for the proposed Donlin Gold Project may result in significant restriction to subsistence uses for the communities of Bethel, Tuntutuliak, Napakiak, Napaskiak, Oscarville, Kwethluk, Akiachak, Akiak, Tuluksak, Upper and Lower Kalskag, Aniak, Chuathbaluk, Napaimute, and Crooked Creek on the Kuskokwim River due to large reductions in the abundance of Chinook salmon and a major redistribution of salmon resources on the Kuskokwim River.

C2.4 SIGNIFICANT RESTRICTION OF SUBSISTENCE USE IS NECESSARY, CONSISTENT WITH SOUND MANAGEMENT PRINCIPLES FOR THE UTILIZATION OF PUBLIC LANDS

The BLM authorizes ROWs to fulfill its responsibilities under the authority of Section 28 of the Mineral Leasing Act of 1920, as amended. Donlin Gold filed a ROW application with the BLM
for the proposed project across federal lands. The BLM is responsible for providing a ROW across federal lands for the proposed natural gas pipeline, while providing protections for specific habitat, resources and uses. Therefore, the BLM finds that issuance of a ROW for this action would be necessary and consistent with sound principles for the utilization of public lands. Authorization of this project by BLM is also necessary to effectuate the purposes of ANCSA (i.e., to allow the Native Corporations a reasonable opportunity to economically develop their lands).

C2.5 THE PROPOSED ACTIVITY WILL INVOLVE THE MINIMUM AMOUNT OF PUBLIC LANDS NECESSARY TO ACCOMPLISH THE PURPOSES OF SUCH USE, OCCUPANCY OR OTHER DISPOSITION

The BLM has determined that Alternative 2 North Option involves the minimum amount of public lands necessary to accomplish the purpose of the proposed activity, which is to grant a ROW for a natural gas pipeline for the project. The pipeline would be necessary to supply energy to operate the proposed Donlin Gold Mine. An alternative that varied the pipeline route (Dalzell Gorge route, Alternative 6A), and the no action alternative were also analyzed. All other action alternatives (3A-LNG trucks, 3B-Diesel pipeline, 4-Birch Tree Crossing Port, 5A-Dry Stacking of Tailings) would not change the proposed pipeline route, nor the need for a ROW across federal public lands.

Alternatives that would reduce or eliminate the use of public lands needed for subsistence purposes include Alternative 1 (No Action). Section 2.4 in the Final EIS, Alternatives Considered but Eliminated from Detailed Analysis, discusses other alternatives that were considered that involve less federal public lands, but were eliminated from analysis due to economic or technological disadvantages, lack of feasibility, or because they did not meet the purpose of the proposed action to produce the gold resource discovered on Calista and TKC lands at the Donlin Gold site.

C2.6 REASONABLE STEPS WILL BE TAKEN TO MINIMIZE ADVERSE IMPACTS UPON SUBSISTENCE USES AND RESOURCES RESULTING FROM SUCH ACTIONS

The design features, best management practices, agency mitigation, monitoring, and adaptive management opportunities are discussed in Chapter 5 of the Final EIS. These proposed measures are designed to protect various subsistence resources and their habitat and to reduce negative impacts from the proposed Donlin Gold mine.

Attachment B to this JROD, Corps’ Supporting Analysis and Documentation, describes in detail the mitigating measures Donlin Gold will undertake to avoid, minimize, and mitigate impacts to subsistence. Donlin Gold has committed to certain mitigation measures they intend to undertake even though language within the Final EIS and Appendix N (ANILCA 810 analysis) of the Final EIS indicates that they are merely being “considered” or “may” happen. The language in Attachment B provides clarification for those measures that Donlin Gold will implement despite the Final EIS listing them as not “effective” and/or not “reasonable/practicable.”

Table C2 lists the mitigation measures referenced in Chapter 5 of the Final EIS that Donlin Gold has committed to, to avoid and minimize impacts to subsistence.
### Table C2: Donlin Gold Mitigation Measures Relevant to Subsistence Uses and Resources

<table>
<thead>
<tr>
<th>Number</th>
<th>Mitigation Measure</th>
<th>References</th>
<th>Clarification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Agreements with Alaska Native landowners create contractual commitments to shareholder hire and revenue flows for Alaska Native shareholders.</td>
<td>1) Final EIS Table 5.2-1: Design Features (A-3)</td>
<td>Comments from the public during scoping and Draft EIS indicate that employment income is important to support subsistence activities.</td>
</tr>
<tr>
<td>2</td>
<td>The project design includes consultation with the public and tourism and recreation businesses to minimize impacts to current uses and operations.</td>
<td>1) Final EIS Table 5.2-1: Design Features (A-7)</td>
<td>Current uses include subsistence activities.</td>
</tr>
<tr>
<td>3</td>
<td>Where practicable, construction and maintenance schedules would seek to minimize impacts on subsistence hunting and fishing, with the understanding that some construction activities must also take advantage of seasonal and environmental conditions.</td>
<td>1) Final EIS Appx. N (ANILCA 810) 2) Final EIS Table 5.2-1: Design Features (A-12)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Donlin Gold would implement a “no hunting/fishing policy” for employees at work sites to minimize competition from employees for local resources.</td>
<td>1) Final Appx. N (ANILCA 810) 2) Final EIS Table 5.2-1: Design Features (A-13)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>The project design includes the development and implementation of a Construction Communications Plan to inform the public and commercial operators of construction activities.</td>
<td>1) Final EIS Appx. N (ANILCA 810) 2) Final EIS Table 5.2-1: Design Features (A-14)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Shareholder preference in hiring maximizes economic benefit to local communities (minority and low income); along with enclave work place, this minimizes risk of influx of non-local workers into nearby communities.</td>
<td>1) Final EIS Table 5.2-1: Design Features (A-18)</td>
<td>Reducing the potential for influx of non-local workers into local communities also reduces the potential for an influx of non-local subsistence users.</td>
</tr>
<tr>
<td>7</td>
<td>The project design includes shift work schedules to maximize opportunities for employees to remain active in subsistence harvest efforts during Construction and Operations Phases.</td>
<td>1) Final EIS Appx. N (ANILCA 810) 2) Final EIS Table 5.2-1: Design Features (A-19)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Surfaces would be progressively reclaimed throughout operation. Sediment controls would include site grading and capping of erodible material, revegetation, and re-routing of surface runoff to reestablish natural conditions.</td>
<td>1) Final EIS Appx. N (ANILCA 810) 2) Final EIS Table 5.2-1: Design Features (A-23)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Donlin Gold’s surface use agreements with Calista and TKC include the DATROC, which is active and meets quarterly. Appropriate project communications would be managed under the purview of the DATROC, ultimately in the form of advisory subcommittees. Donlin Gold has committed to two subcommittees, the Barge Subcommittee and</td>
<td>1) Final EIS Table 5.2-1: Design Features (A-31)</td>
<td>Donlin Gold has initiated planning with the DATROC partners (TKC and Calista) to establish the format, structure, membership and process to be followed by the barge and subsistence subcommittees.</td>
</tr>
</tbody>
</table>
## Table C2: Donlin Gold Mitigation Measures Relevant to Subsistence Uses and Resources

<table>
<thead>
<tr>
<th>Number</th>
<th>Mitigation Measure</th>
<th>References</th>
<th>Clarification</th>
</tr>
</thead>
</table>
|        | Subsistence Subcommittee, which would act in parallel to engage and inform local communities. The primary function of these committees is to engage the local communities to identify locations and times when subsistence activities occur, and opportunities to avoid, eliminate, or reduce conflicts that serve to restrict access to subsistence resources during construction, operations and post-closure. The Subsistence Subcommittee would also contribute to the identification of practical and effective monitoring measures to address concerns of subsistence users that subsistence resources may be adversely affected by project-related activities and would support development of an information-sharing framework to efficiently and effectively share results of monitoring (and other project-related technical information), at a practical level, with local subsistence users. The long duration of the project, the wide range of resources involved, and the varied interests among participants may require that the form and function of the subcommittees and the processes they oversee, evolve with time. The subcommittees would be encouraged to work through the DATROC to identify and/or recommend adaptive management needs. (Donlin Gold 2018a). | 1) Final EIS Appx. N (ANILCA 810)  
2) Final EIS Table 5.2-1: Design Features (M-11) |                                                                                               |
| 10     | Numerous locations and combinations of locations were analyzed for TSF and WRF layouts during the alternatives development process. These are summarized in Appendix C. The layout of major mine facilities was designed to minimize wetland impacts and limit effects on water quality to the American and Anaconda Creek watersheds. The 404(b)(1) analysis will document the steps taken to minimize wetlands impacts. | 1) Final EIS Appx. N (ANILCA 810)  
2) Final EIS Table 5.2-1: Design Features (M-11) |                                                                                               |
| 11     | Water management planning at the mine site would assist in controlling the flow of groundwater at the pit and other major facilities (WRF, TSF), as well as controlling the potential effects of groundwater flow on water quality downgradient of the mine. This would be accomplished through design. | 1) Final EIS Appx. N (ANILCA 810)  
2) Final EIS Table 5.2-1: Design Features (M-13) |                                                                                               |
### Table C2: Donlin Gold Mitigation Measures Relevant to Subsistence Uses and Resources

<table>
<thead>
<tr>
<th>Number</th>
<th>Mitigation Measure</th>
<th>References</th>
<th>Clarification</th>
</tr>
</thead>
</table>
| 12     | During the Operations Phase, concurrent reclamation activities (e.g., certain tiers and areas within the WRF) would be conducted immediately after construction and stabilization and whenever practicable in disturbed areas no longer required for active mining. | 1) Final EIS Appx. N (ANILCA 810)  
2) Final EIS Table 5.2-1: Design Features (M-14) |               |
| 13     | The mine plan incorporates the concept of design for closure. This incorporates methods for safe and efficient closure of the mine as an integral part of the planned mine design and operations. Implementing design for closure can have the effect of minimizing disturbance and the re-handling of materials. | 1) Final EIS Appx. N (ANILCA 810)  
2) Final EIS Table 5.2-1: Design Features (M-21) |               |
| 14     | Ocean and river fuel barges would be double-hulled and have multiple isolated compartments for transporting fuel to reduce the risk of a spill. | 1) Final EIS Appx. N (ANILCA 810)  
2) Final EIS Table 5.2-1: Design Features (T-1) |               |
| 15     | The barge operations system was designed to avoid the need for dredging the navigation channel in the river. | 1) Final EIS Appx. N (ANILCA 810)  
2) Final EIS Table 5.2-1: Design Features (T-3) |               |
| 16     | Donlin Gold would implement barge guidelines for operating at certain river flow rates, and conduct ongoing surveys of the Kuskokwim River navigation channel to identify locations that should be avoided to minimize effects on bed scour and the potential for barge groundings. As part of the proposed operation, equipment will be available to free or unload/lighten barges in the event of groundings. The equipment will be available as part of ongoing operations; it will not all be dedicated standby equipment. | 1) Final EIS Appx. N (ANILCA 810)  
2) Final EIS Table 5.2-1: Design Features (T-6) |               |
| 17     | To reduce impacts on existing river traffic and potential for groundings and accidents, Donlin Gold would | 1) Final EIS Appx. N (ANILCA 810)  
2) Final EIS Table 5.2-1: |               |
### Table C2: Donlin Gold Mitigation Measures Relevant to Subsistence Uses and Resources

<table>
<thead>
<tr>
<th>Number</th>
<th>Mitigation Measure</th>
<th>References</th>
<th>Clarification</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Establish navigational aids and develop procedures for queuing in narrow channels. Donlin Gold vessels would use state-of-the-art navigation and communication equipment.</td>
<td>Design Features (T-10)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>River pilots would be used for all tug and barge traffic between the mouth of the Kuskokwim River and Bethel (see Appendix W for Donlin Gold's Barge Communication Plan).</td>
<td>1) Final EIS Appx. N (ANILCA 810) 2) Final EIS Table 5.2-1: Design Features (T-14)</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>The project design includes a natural gas pipeline to decrease the amount of barging needed to transport diesel fuel. The design decision to use a natural gas pipeline instead of barging 110 Mgal of diesel per year was developed in response to community concern about barge traffic levels.</td>
<td>1) Final EIS Appx. N (ANILCA 810) 2) Final EIS Table 5.2-1: Design Features (P-3)</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Appropriate notices, warning signs, and flagging would be used to promote public safety. Barricades may also be used around dangerous areas such as open trenches during construction.</td>
<td>1) Final EIS Appx. N (ANILCA 810) 2) Final EIS Table 5.2-1: Design Features (P-7)</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>The project design includes routing of the pipeline and siting of the related compressor station along an existing corridor in Susitna Flats State Game Refuge to minimize impacts.</td>
<td>1) Final EIS Appx. N (ANILCA 810) 2) Final EIS Table 5.2-1: Design Features (P-12)</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Donlin Gold will coordinate with and help educate people who want to travel in the area during the pipeline construction period through its Public Outreach Plan to either allow controlled access through or within construction zones or provide alternate access.</td>
<td>1) Final EIS Appx. N (ANILCA 810) 2) Final EIS Table 5.2-1: Design Features (P-16)</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>At the TSF dry beach, the project design includes installing silt fences, removing snow from active placement areas only, and using polymer suppressant to minimize dust. In addition, an air blast evaporation system or sprinklers would be used to minimize fugitive dust emissions from TSF beaches during dry conditions.</td>
<td>1) Final EIS Appx. N (ANILCA 810) 2) Final EIS Table 5.2-1: Design Features (M-2)</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>The project design includes a communication program to keep local communities informed of the schedules and current status of barge traffic, as well as to minimize displacement of subsistence fishing by barges (see Appendix W for Donlin Gold's Barge Communication Plan). Donlin Gold would consult with Donlin Gold has initiated planning with the DATROC partners (TKC and Calista) to establish the format, structure, membership and process to be followed by the barge subcommittee. The subcommittee is both a communication link as well as a</td>
<td>1) Final EIS Appx. N (ANILCA 810) 2) Final EIS Table 5.2-1: Design Features (T-9)</td>
<td></td>
</tr>
</tbody>
</table>
Table C2: Donlin Gold Mitigation Measures Relevant to Subsistence Uses and Resources

<table>
<thead>
<tr>
<th>Number</th>
<th>Mitigation Measure</th>
<th>References</th>
<th>Clarification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>people experienced with navigation on the Kuskokwim River to incorporate local knowledge as the company designs its barging operations and guidelines.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>In addition, as contained in the communication plan, potential conflict would be avoided through the following steps:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Community Meeting Plan – annual community meetings before and after every barge season to outline the needs and expectations going into a season and debrief how things went after each season;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Additional Barging Status updates – in-season communications via community meetings, newsletters, website, social media;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Barge Location Information System – system to view the current location and movement of project barges available to users of the river;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Stakeholder Communication with Barges – published VHF channels and vessel cellular phone numbers to contact the barges directly; and</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Barge Communication with Stakeholders – deployment of pilot boat in congested and high use areas ahead of the barge arrival to coordinate safe passage of the barge.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>In the event of any barging-related conflict or concern, Donlin Gold is committed to resolving issues with stakeholders through an established conflict or concern resolution process (outlined in Section 6.0 of Donlin Gold's Barge Communication Plan).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Implement a two-way communications strategy to keep local communities informed of the schedules and current status of barge traffic, and keep Donlin Gold informed of the location and timing of commercial and subsistence fishing activities. The communication plan should include Bethel, due to the volume of traffic moving through Bethel Port. (Donlin Gold's Barge 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1) Final EIS Appx. N (ANILCA 810) 2) Final EIS Table 5.2-1: Design Features (T-9)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
|        | Donlin Gold has initiated planning with the DATROC partners (TKC and Calista) to establish the format, structure, membership and process to be followed by the barge subcommittee. The subcommittee is both a communication link as well as a key part of the dispute resolution process. The
Table C2: Donlin Gold Mitigation Measures Relevant to Subsistence Uses and Resources

<table>
<thead>
<tr>
<th>Number</th>
<th>Mitigation Measure</th>
<th>References</th>
<th>Clarification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Communication Plan is available in Appendix W).</td>
<td></td>
<td>planning for the subcommittee’s under DATROC is ongoing.</td>
</tr>
<tr>
<td></td>
<td>In addition, the project design includes a communication program, managed under purview of the DATROC Barge Subcommittee (see Design Feature A31), to keep local communities informed of the schedules and current status of barge traffic as well as minimize displacement of subsistence fishing by barges (see Appendix W for Donlin Gold's Barge Communication Plan). Donlin Gold would consult with people experienced with navigation on Kuskokwim River to incorporate local knowledge as they are designing their barging operations and guidelines.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Designing and installing culverts and bridges on transportation routes for fish passage.</td>
<td>1) Final EIS Appx. N (ANILCA 810)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2) Final EIS 5.3.2 Best Management Practices</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Implementation of Stormwater Pollution Prevention Plans (SWPPPs) and/or Erosion and Sediment Control Plans (ESCPs), and use of industry standard Best Management Practices (BMPs) for sediment and erosion control.</td>
<td>1) Final EIS Appx. N (ANILCA 810)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2) Final EIS 5.3.2 Best Management Practices</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Development and maintenance of Oil Discharge Prevention and Contingency Plans, Spill Prevention, Control and Countermeasure Plans, and Facility Response Plans.</td>
<td>1) Final EIS Appx. N (ANILCA 810)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2) Final EIS 5.3.2 Best Management Practices</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Use of BMPs, such as watering and use of dust suppressants, to control fugitive dust.</td>
<td>1) Final EIS Appx. N (ANILCA 810)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2) Final EIS 5.3.2 Best Management Practices</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Compliance with ADNR Dam Safety requirements through certificates of approval to construct and operate dams to include preparation of Emergency Action Plans and completion of a FMEA.</td>
<td>1) Final EIS Appx. N (ANILCA 810)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2) Final EIS 5.3.2 Best Management Practices</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Appropriate bonding/financial assurance required by ADNR and BLM.</td>
<td>1) Final EIS Appx. N (ANILCA 810)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2) Final EIS 5.3.2 Best Management Practices</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Compliance with ADNR Temporary Water Use Authorization conditions for water withdrawal, such as screening requirements to avoid fish entrainment or injury, establishing water withdrawal rates and volumes,</td>
<td>1) Final EIS Appx. N (ANILCA 810)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2) Final EIS 5.3.2 Best Management Practices</td>
<td></td>
</tr>
</tbody>
</table>
Table C2: Donlin Gold Mitigation Measures Relevant to Subsistence Uses and Resources

<table>
<thead>
<tr>
<th>Number</th>
<th>Mitigation Measure</th>
<th>References</th>
<th>Clarification</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>and as appropriate timing of water withdrawal to avoid fish migration, spawning, and incubating eggs;</td>
<td>1) Final EIS Appx. N (ANILCA 810) 2) Final EIS 5.3.2 Best Management Practices</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Monitoring of water withdrawals to ensure permitted limits are not exceeded.</td>
<td>1) Final EIS Appx. N (ANILCA 810) 2) Final EIS 5.3.2 Best Management Practices</td>
<td>A Wildlife Avoidance and Human Encounter Interaction Plan is required as part of the construction planning documents prior to receiving a Notice to Proceed</td>
</tr>
<tr>
<td>35</td>
<td>Preparation of a Wildlife Avoidance and Human Encounter/Interaction Plan.</td>
<td>1) Final EIS Appx. N (ANILCA 810) 2) Final EIS 5.3.2 Best Management Practices</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>Verification that project vessels are equipped with proper emergency towing equipment in accordance with 18 AAC 75.027(f)</td>
<td>1) Final EIS Appx. N (ANILCA 810) 2) Final EIS 5.3.2 Best Management Practices</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>Development of Blasting Plans.</td>
<td>1) Final EIS Appx. N (ANILCA 810) 2) Final EIS 5.3.2 Best Management Practices</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>Development of ISPMPs and application of industry-standard BMPs relating to NNIS prevention and management.</td>
<td>1) Final EIS Appx. N (ANILCA 810) 2) Final EIS 5.3.2 Best Management Practices</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>Compliance with Section 106 Programmatic Agreement and Cultural Resources Management Plan, including adequate survey prior to ground-breaking activities and protocol for inadvertent discovery of cultural resources.</td>
<td>1) Final EIS Appx. N (ANILCA 810) 2) Final EIS 5.3.2 Best Management Practices</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Verifying pipeline integrity with visual and other non-destructive inspections of welds, hydrostatic testing, use of in-line inspection tools, and aerial inspections.</td>
<td>1) Final EIS Appx. N (ANILCA 810) 2) Final EIS 5.3.2 Best Management Practices</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>Use of cathodic protection (specific method to be determined in final design) for corrosion protection of the steel pipeline.</td>
<td>1) Final EIS Appx. N (ANILCA 810) 2) Final EIS 5.3.2 Best Management Practices</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>Preparation and implementation of a Stabilization, Rehabilitation, and Reclamation Plan.</td>
<td>1) Final EIS Appx. N (ANILCA 810) 2) Final EIS 5.3.2 Best Management Practices</td>
<td>Donlin Gold will work will landowners to implement.</td>
</tr>
</tbody>
</table>
Table C2: Donlin Gold Mitigation Measures Relevant to Subsistence Uses and Resources

<table>
<thead>
<tr>
<th>Number</th>
<th>Mitigation Measure</th>
<th>References</th>
<th>Clarification</th>
</tr>
</thead>
</table>
| 43     | crosses the trail to help steer and keep trail users on the trail, and to reduce the visual effect of the pipeline ROW crossing.                                                                                   | 1) Final EIS Appx. N (ANILCA 810)  
2) Final EIS Table 5.5-1A: Mitigation Measures Being Considered                               | Donlin Gold will work will BLM to implement.                                                   |
| 44     | Where appropriate, employ seasonal timing restrictions on blasting, as stipulated by resource agencies, to reduce noise related effects of blasting during sensitive subsistence hunting activities (e.g., fall moose hunting). | 1) Final EIS Appx. N (ANILCA 810)  
2) Final EIS Table 5.7-1A: Monitoring and Adaptive Management being Considered                 | Donlin Gold will incorporate adaptive management principles into many aspects of planned mitigation. For example, Donlin Gold’s Aquatic Resources Management Plan, Wetlands Compensatory Mitigation Plan, and Barge Communication Plan all incorporate adaptive management principles. |
| 45     | Develop adaptive management plan(s) in conjunction with local communities. Involve residents when determining parameters and performance standards, as appropriate.                                                      | 1) Final EIS Appx. N (ANILCA 810)  
2) Final EIS Table 5.5-1B Mitigation Measures Assessed as Not Likely to be Required           | Although Donlin Gold cannot restrict access to land it does not own or control, Donlin Gold has committed to taking the following steps to limit use of the ROW: (1) make provisions for suitable permanent and clearly delineated crossings for the public where the ROW or access roads cross existing roads, foot trails, winter trails, easements or other rights-of-way, unless otherwise authorized by the Authorized Officer during all Pipeline Activities. (2) where the ROW crosses authorized trails, a screen of material or vegetation native to the specific setting shall be maintained, or established over disturbed areas to minimize recreational use of the ROW. |
| 46     | Maintain communication throughout all project phases with subsistence users concerning perception of ecological risk or potential exposure of waterfowl or fish to contamination. A communication method is important to address concerns and perceptions about contamination. DATROC may serve to facilitate communication, as     | 1) Final EIS Appx. N (ANILCA 810)                                                            | Donlin Gold is committed to working with DATROC to determine the most effective modes of communication to address perceptions of ecological risk and exposure. |
### Table C2: Donlin Gold Mitigation Measures Relevant to Subsistence Uses and Resources

<table>
<thead>
<tr>
<th>Number</th>
<th>Mitigation Measure</th>
<th>References</th>
<th>Clarification</th>
</tr>
</thead>
<tbody>
<tr>
<td>47</td>
<td>Donlin Gold should consult with the Alaska Department of Fish and Game and local subsistence users for current information and traditional knowledge to identify locations and times when subsistence activities occur, and to the extent practicable, minimize impacts to these activities. The DATROC may serve to facilitate consultation, as appropriate.</td>
<td>1) Final EIS Appx. N (ANILCA 810)</td>
<td>Donlin Gold is currently in the process of forming DATROC subcommittees on barging and subsistence to engage the local communities to identify locations and times when subsistence activities occur, and opportunities to avoid, eliminate, or reduce conflicts that serve to restrict access to subsistence resources. (See Donlin Gold Technical Memorandum: Additional Final EIS Design Features, January 15, 2018)</td>
</tr>
<tr>
<td>48</td>
<td>Smelt monitoring program: Donlin Gold would develop and implement a rainbow smelt monitoring program to establish additional baseline data for a better understanding of the species’ occurrence and the character, use, and distribution of spawning habitat along the Kuskokwim River. Survey methodology would likely include documenting sex ratio and age structure of the population and if possible, fecundity of females. Initially, surveys would be conducted annually to document the age structure of the rainbow smelt population and further document spawning patterns. Once an adequate baseline is established, regular sampling would be used to monitor for changes to existing patterns. The frequency of surveys over the long-term would depend on previous results and whether the data indicate a potential shift. If rainbow smelt population changes are observed over a defined time period, additional work would need to be undertaken to investigate the reason for those changes. If observed changes were attributed to project-related activities, Donlin Gold would implement an assessment of measures available to address or mitigate those activities. Such activities would be coordinated with the DATROC Subsistence Subcommittee.</td>
<td>1) Final EIS Table 5.2-1: Design Features</td>
<td>Donlin Gold initiated the first round of data collection in May 2018. The data is being compiled and analyzed and the first report from the project should be available this fall documenting the results. Donlin Gold will focus future rainbow smelt monitoring activities by working with local fishers to sample harvested rainbow smelt to establish age distribution patterns within the spawning population. Donlin Gold’s goal with the program will be to document age distributions prior to initiating barge traffic that will be associated with project construction. Survey methodology will likely include documenting sex ratio and age structure of the population and if possible, fecundity of females. Initially, surveys would be conducted annually to document the age structure of the rainbow smelt population and further document spawning patterns. Once an adequate baseline is established, regular sampling will be used to monitor for changes to existing patterns. The frequency of surveys over the long-term will depend on previous results and whether the data indicate a potential shift. (See Donlin Gold Technical Memorandum: Additional Final EIS Design Features, January 15, 2018)</td>
</tr>
</tbody>
</table>
Table C2: Donlin Gold Mitigation Measures Relevant to Subsistence Uses and Resources

<table>
<thead>
<tr>
<th>Number</th>
<th>Mitigation Measure</th>
<th>References</th>
<th>Clarification</th>
</tr>
</thead>
<tbody>
<tr>
<td>49</td>
<td>A Crooked Creek ARMP would be developed in conjunction with Alaska Department of Fish and Game (ADF&amp;G) and ADNR through habitat and water rights permitting processes. The objectives of the plan are to: 1) monitor for major changes to aquatic communities, 2) monitor for smaller scale and incremental changes to aquatic communities, and 3) guide results-based refinement to the monitoring program. The plan would build on the existing baseline dataset and include both biological and flow components, including: fish presence/abundance, invertebrate and periphyton sampling, and fish metals analysis; flow monitoring and winter surface water sampling to characterize fish habitat/passage and freezdown patterns; sediment sampling; and collection of additional geology and hydrology data to refine understanding of dewatering and groundwater/surface water flow dynamics (Donlin Gold 2018a,b; Owl Ridge 2017c). The ongoing data collection would be used in an adaptive management approach to refine the understanding of the dynamics surrounding Crooked Creek flow in winter as well as the open water seasons and to identify the most effective measures that can be used to ensure that minimum flows in Crooked Creek are maintained. If the project results in minimal losses to Crooked Creek flows, adaptive management measures may be unnecessary. If flow losses warrant a response, a range of measures could be considered that include but would not be limited to: lining or relocating portions of the stream channel; augmenting flows from the Snow Gulch Reservoir; pumping water from the Kuskokwim River, or grouting areas of bedrock demonstrating high flow rates.</td>
<td>1) Final EIS Table 5.2-1: Design Features 2) Donlin Gold. 2018a. Letter to Richard Darden, US Army Corps of Engineers, RE: Donlin Gold’s Comments to the November 2, 2017 National Marine Fisheries Service (NMFS) Essential Fish Habitat (EFH) Recommendations. Daniel Graham, PE. January 4, 2018. 3) Donlin Gold. 2018b. Technical Memorandum: Additional Final EIS Design Features. Gene Weglinski, Senior Permitting Coordinator to Richard Darden, US Army Corps of Engineers. January 15, 2018. 4) Owl Ridge. 2017c. Essential Fish Habitat Assessment. Draft Version 2.4. June 2017. Prepared for Donlin Gold, Anchorage, AK by Owl Ridge Natural Resource Consultants, Inc., Anchorage, AK. 75 pp.</td>
<td>Donlin Gold has submitted a framework for this plan to the State of Alaska agencies for their review and input. Comments are expected back soon and will be used to further advance the ARMP as part of the Project’s monitoring commitments.</td>
</tr>
</tbody>
</table>

The agreements Donlin Gold has made for mitigation not only provide direct financial compensation to the native corporations, but also include terms that allow the corporations to be involved in the project to ensure responsible and sustainable development for the benefit of
their shareholders. The establishment of the DATROC with Barge and Subsistence Subcommittees to address barge impacts to aquatic resources demonstrates Donlin Gold’s commitment to avoid and minimize impacts to subsistence. Both Calista and TKC have strongly advocated for the project to realize ANCSA’s vision of Alaska Native economic development and self-sufficiency. This is an instance where a ROW across public lands is necessary to achieve the fundamental purposes of a related statutory scheme, namely, to allow for development of ANCSA-selected lands and mineral resources by and for the benefit of Alaska Native communities.

Given these steps, the BLM has determined that the proposed action includes all reasonable steps to minimize adverse impacts on subsistence uses and resources.