Block 23. Avoidance, Minimization, and Compensation

Donlin Gold has planned the proposed project to avoid and minimize impacts to 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: MA, TA, and PA. A description of compensatory mitigation follows the avoidance and minimization discussions.

Mine Area

The proposed facilities in the MA include the open pit, WRF, 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 following WOUS avoidance and minimization measures 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 (Michael Baker 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.

- 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 to Snow Gulch or Anaconda valley WOUS.

Figure 1 Watersheds within the Proposed Mine Area

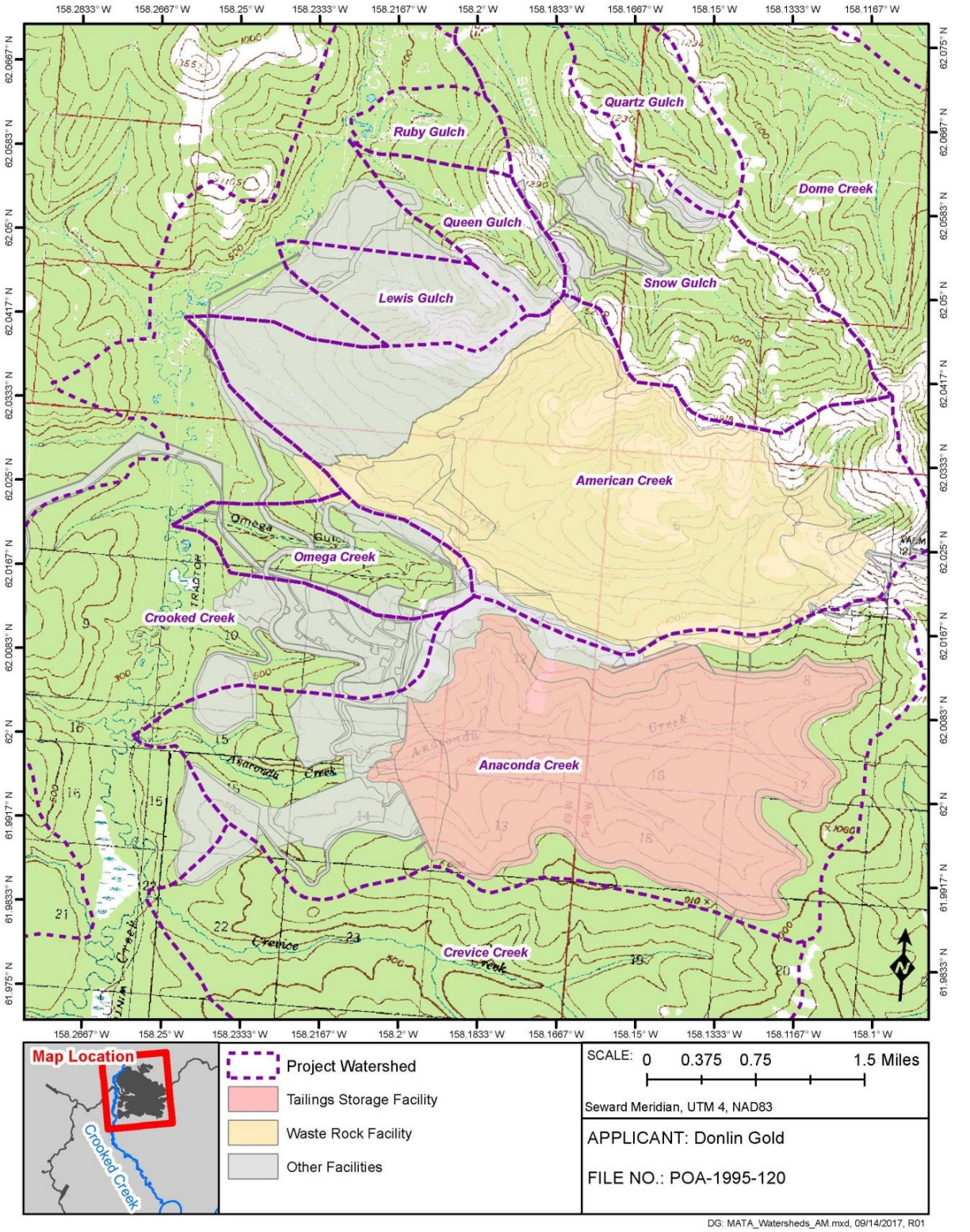
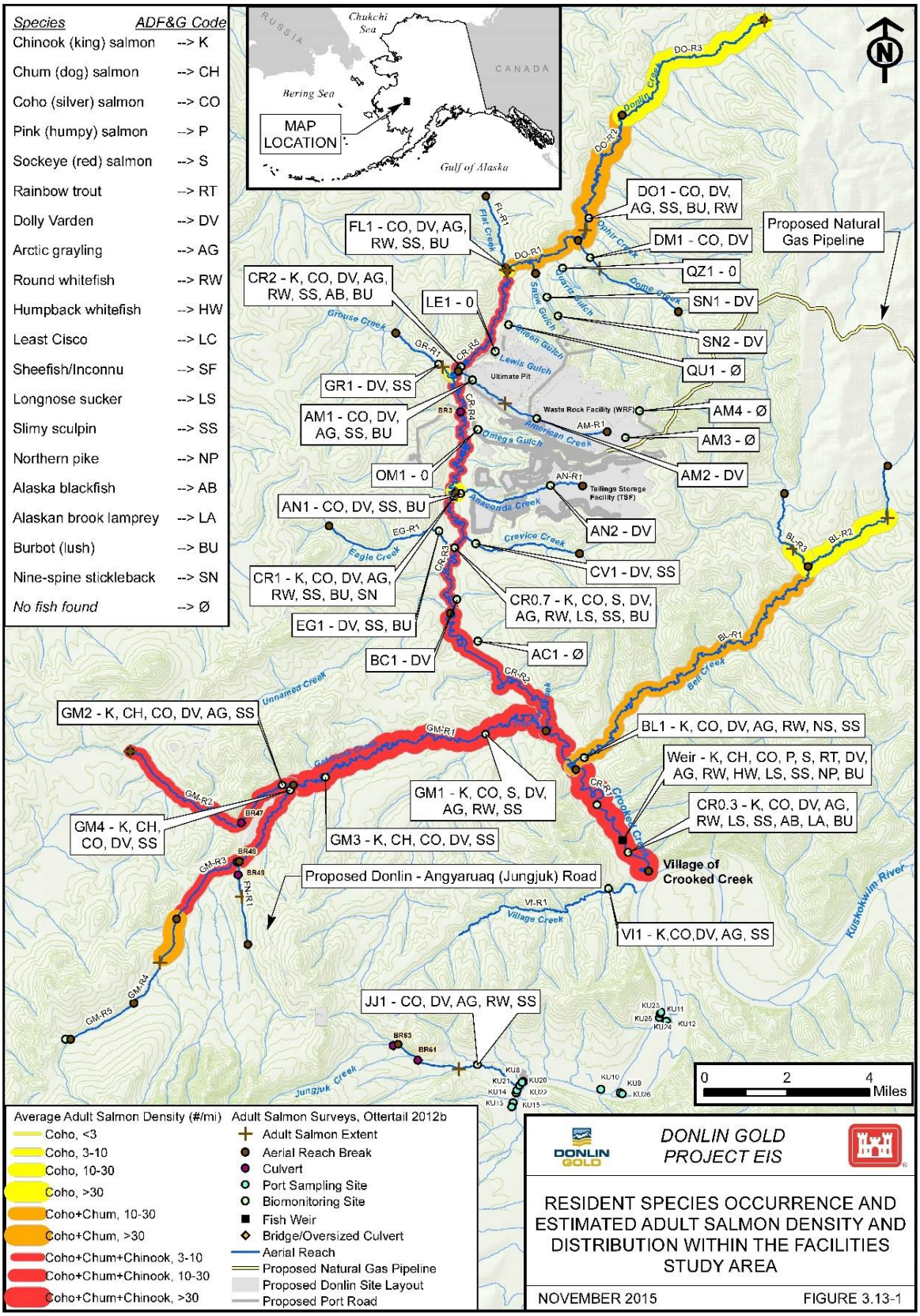


Figure 2 Anadromous and Resident Fish Habitat Extent

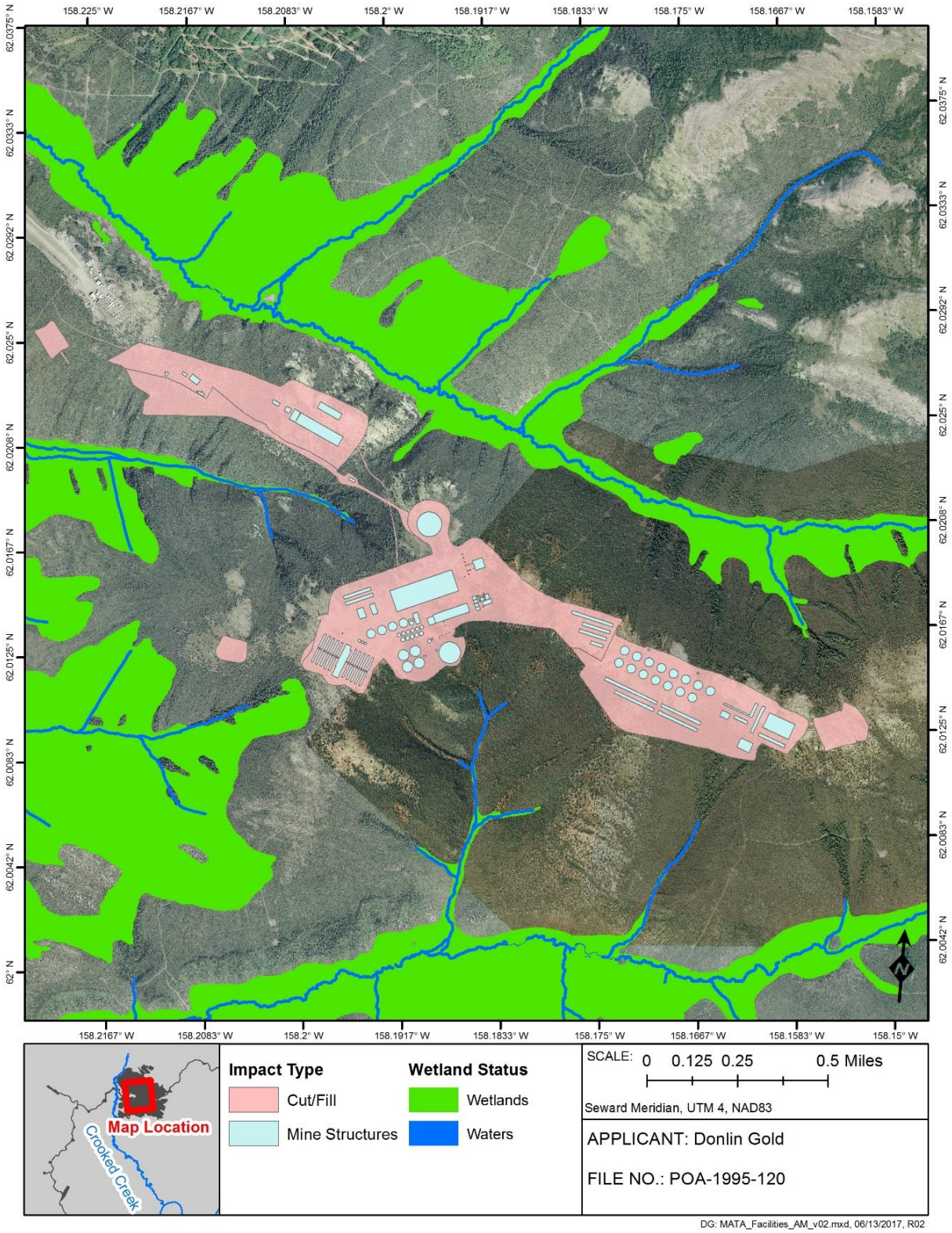


- Tailings Storage Facility – General design criteria for the TSF location included: capacity to store 334,298-acre-feet of tailings; proximity to the MA facilities to minimize tailings transportation costs; wetlands avoidance and minimization; and geotechnical factors such as hydrology, slope stability, and seismic stability. Potential locations for storage of tailings considered placement of all tailings in the Anaconda, Crevice Creek, and Snow Gulch valleys, or dividing the tailings between the Anaconda 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.

- 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 ridge because of proximity to the open pit and TSF. The lower American 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, Mine Facilities Footprint.

- 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 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 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 reduces the need for temporary long-term equipment and material storage at the proposed Jungjuk (Angyaruaq) Port.

- Facilities Collocated 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 and 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.

- Material Site 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 for a detailed description of proposed MA Wetland Impact Minimization Plans 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 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 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.

- 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:

- Source material testing for metal leaching and acid rock drainage potential will be completed 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.
- Material site and work area boundaries will be surveyed and monumented 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 will be provided between overburden berms and the active pit areas.
- 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.
- 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:
  - Grade overburden or unusable material piles 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:
    - 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, 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 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 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

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 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.

- Collocated 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.

- Material Sites 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. Donlin Gold has developed a Transportation and Pipeline Area Wetland Impact Minimization Plan detailing the restoration for these areas beyond the reclamation requirements established by the State of Alaska. See Block 23 CMP for a detailed description of proposed TA wetland impact minimization plans.

Figure 4 Transportation Corridor – Avoidance Measures

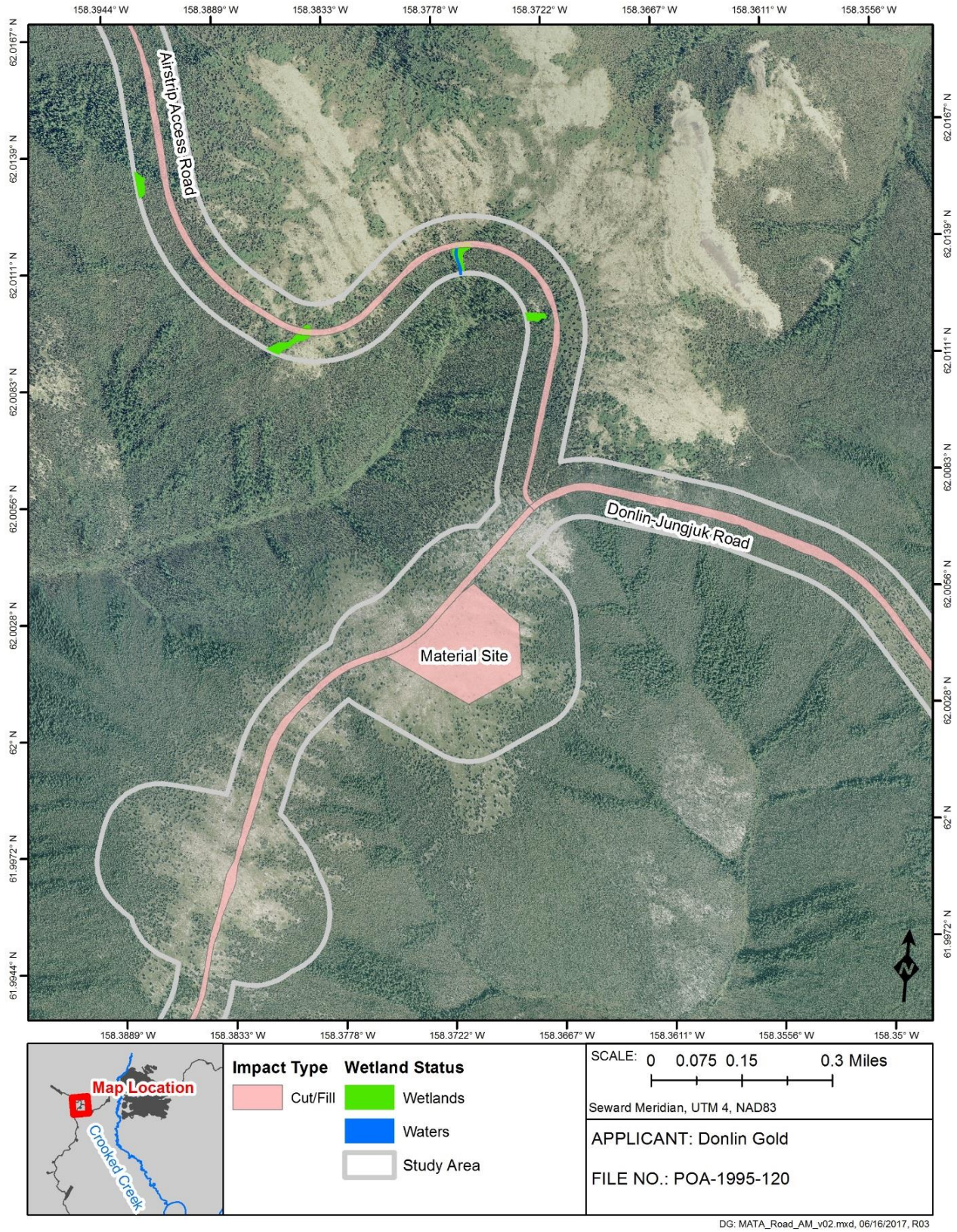


Figure 5 Camp Facilities Location

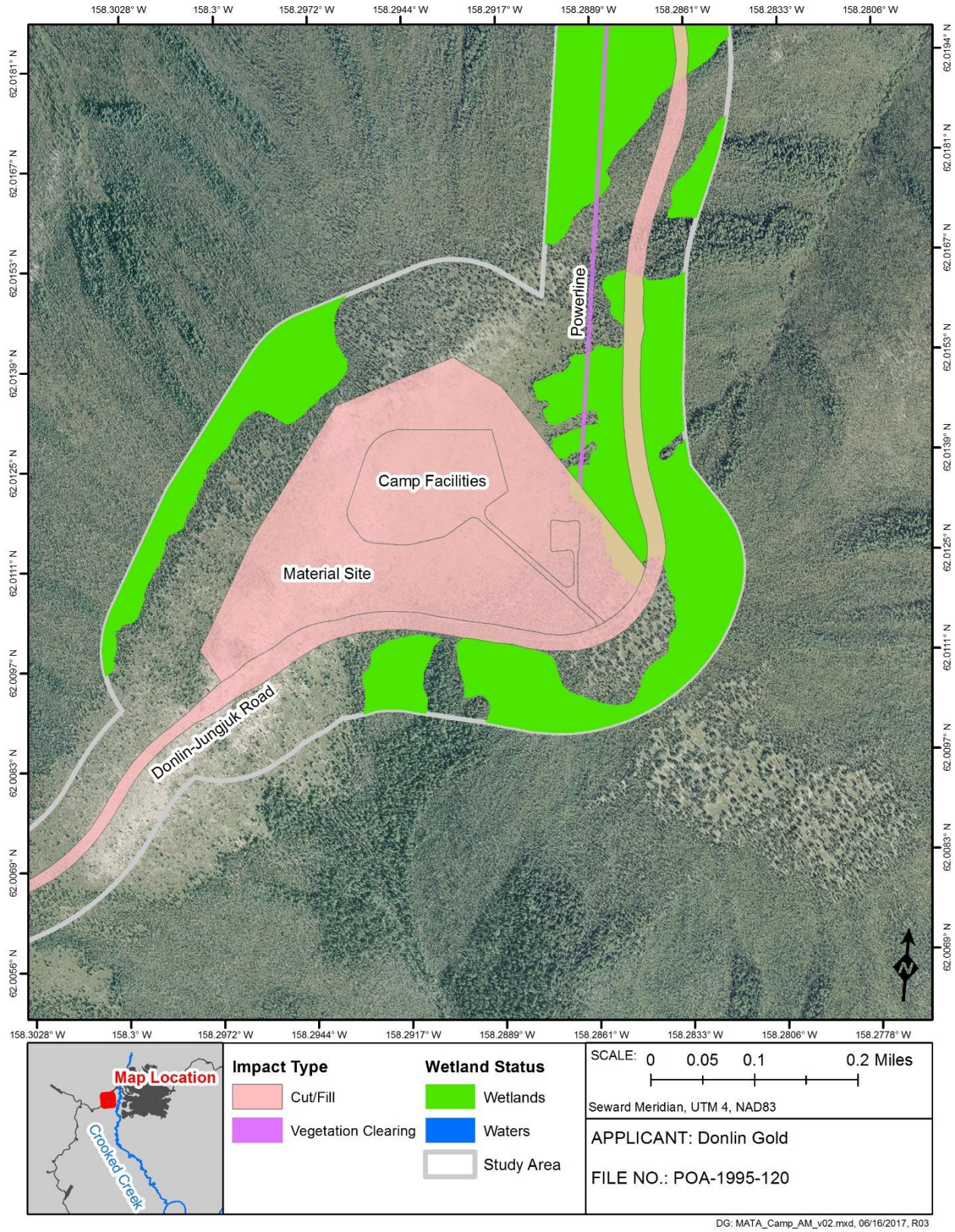
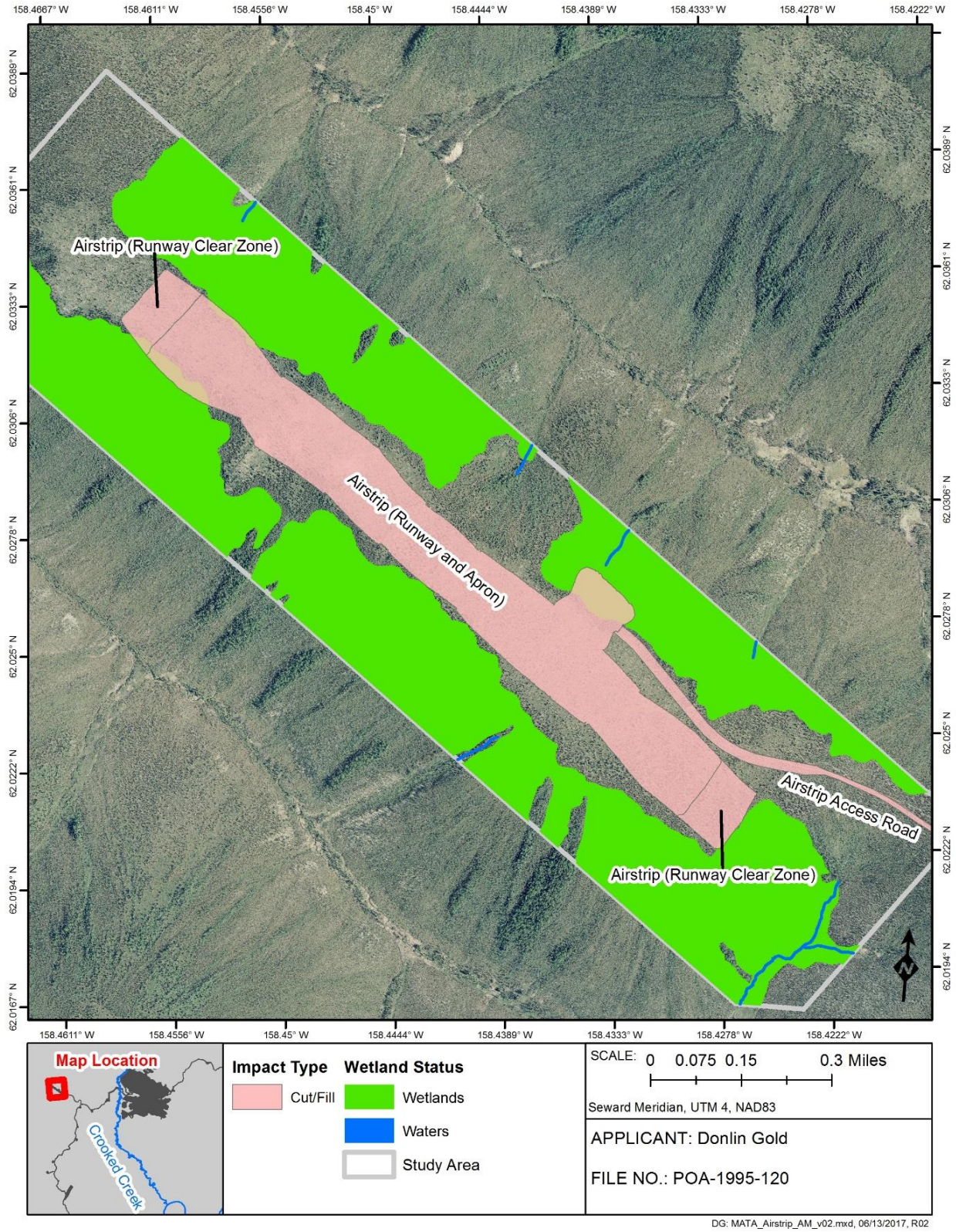


Figure 6 Airstrip Location



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.

- 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:

    - Source material testing for metal leaching and acid rock drainage potential will be completed 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.

    - Material site and work area boundaries will be surveyed and monumented 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 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

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, PSYs, shoofly and site access roads, HDD workspaces, WESs and access roads, work pads and the pipeline construction 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 23-1 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 23-1 Alaska Range Alternative Locations

Pipeline Route Alternative	General description	Estimated WOUS Acres Impacted
Dalzell Gorge	Route alternative from MP 106.1 to 153.1. Traverses Rainy Pass and parallels the South Fork Kuskokwim River.	257
Jones Route	Route alternative from MP 106.1 to 153.1. Diverges at Threemile Creek, crosses the Tatina River, and parallels the Jones River.	89
North Route (Proposed)	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.	44
Round Mountain Route	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.	65

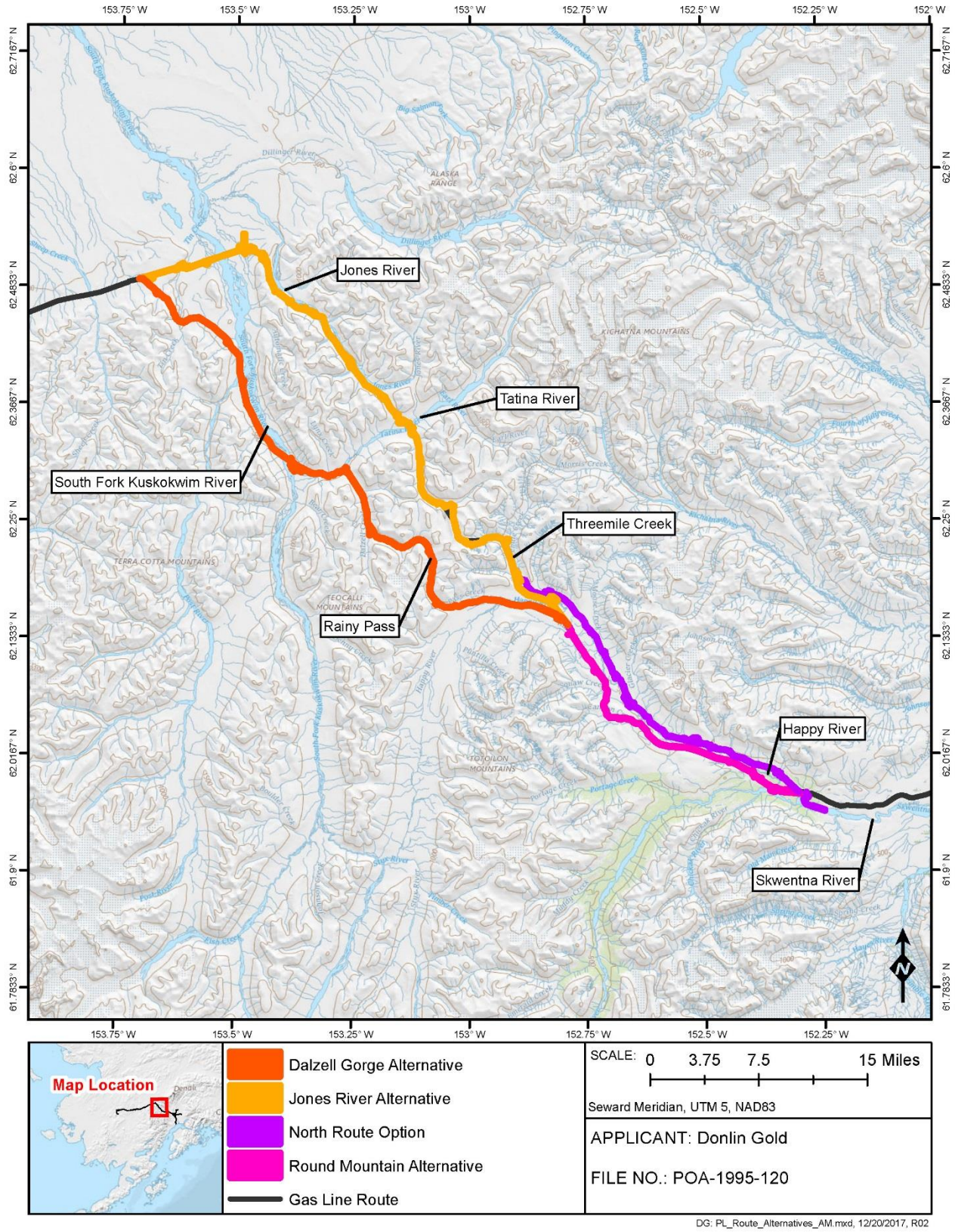
- Compressor Station – During design, the compressor station was converted from electric power to natural gas power. This eliminated the need for a transmission line. The transmission lines would have needed adjacent corridors with cleared vegetation. Transmission lines can lead to increased all-terrain 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 – 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.

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 OHW. The barge landing on Cook Inlet will include temporary mats below mean high tide. Cook Inlet barges will use ramps to 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. Donlin Gold has 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. See Block 23 CMP for a detailed description of proposed PA wetland impact minimization plans.

- 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.

- Collocated 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.

    - 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). Figures 9 and 10 illustrate the siting of these facilities in uplands to avoid wetlands and WOUS.
    - The Skwentna River HDD Exit will be located on a material site pad.
    - The Cook Inlet Barge Landing will be used for supplies transport in addition to stockpiling pipe and materials.

Figure 8 Pig Launcher/Receiver Site

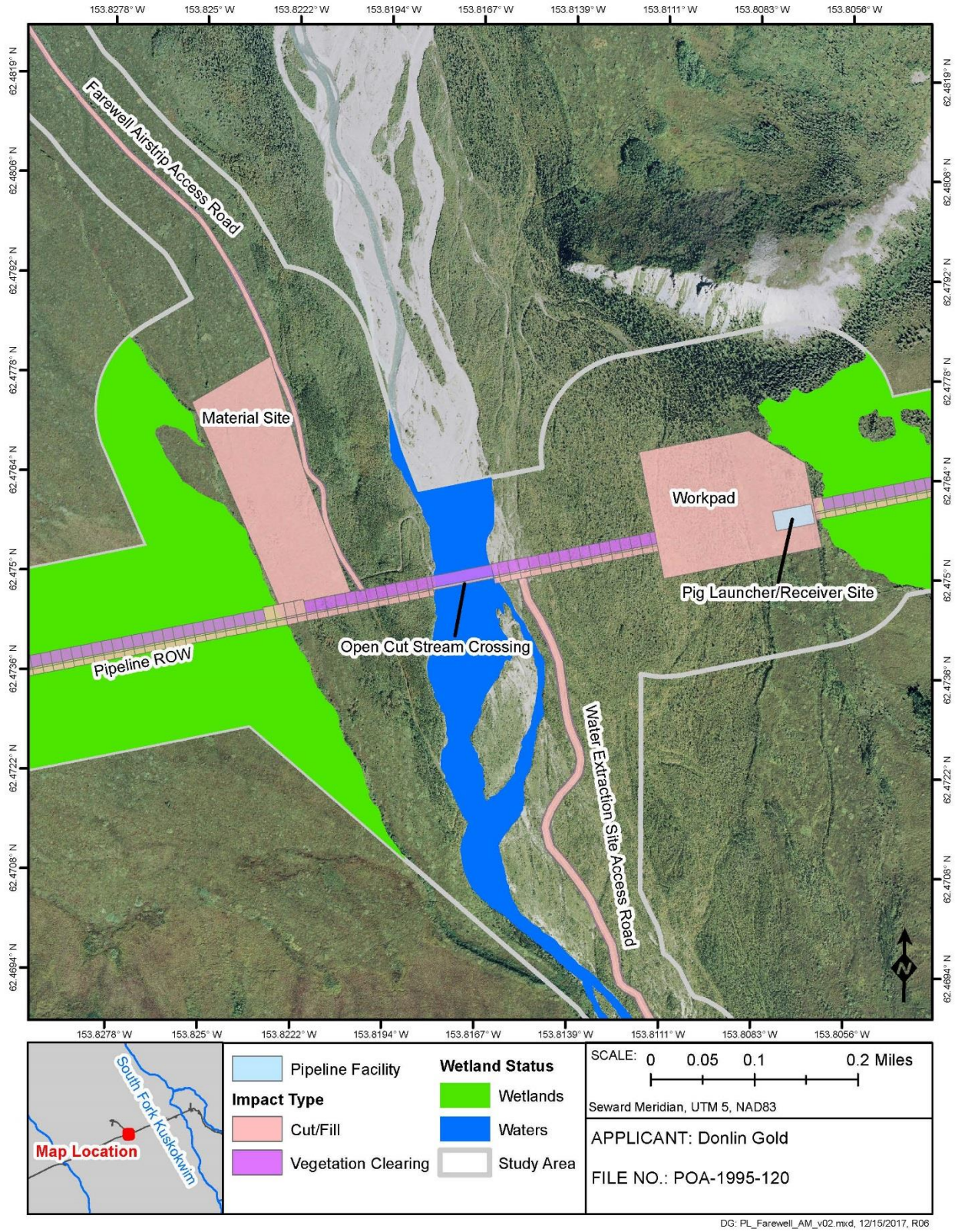


Figure 9 Compressor Station Location

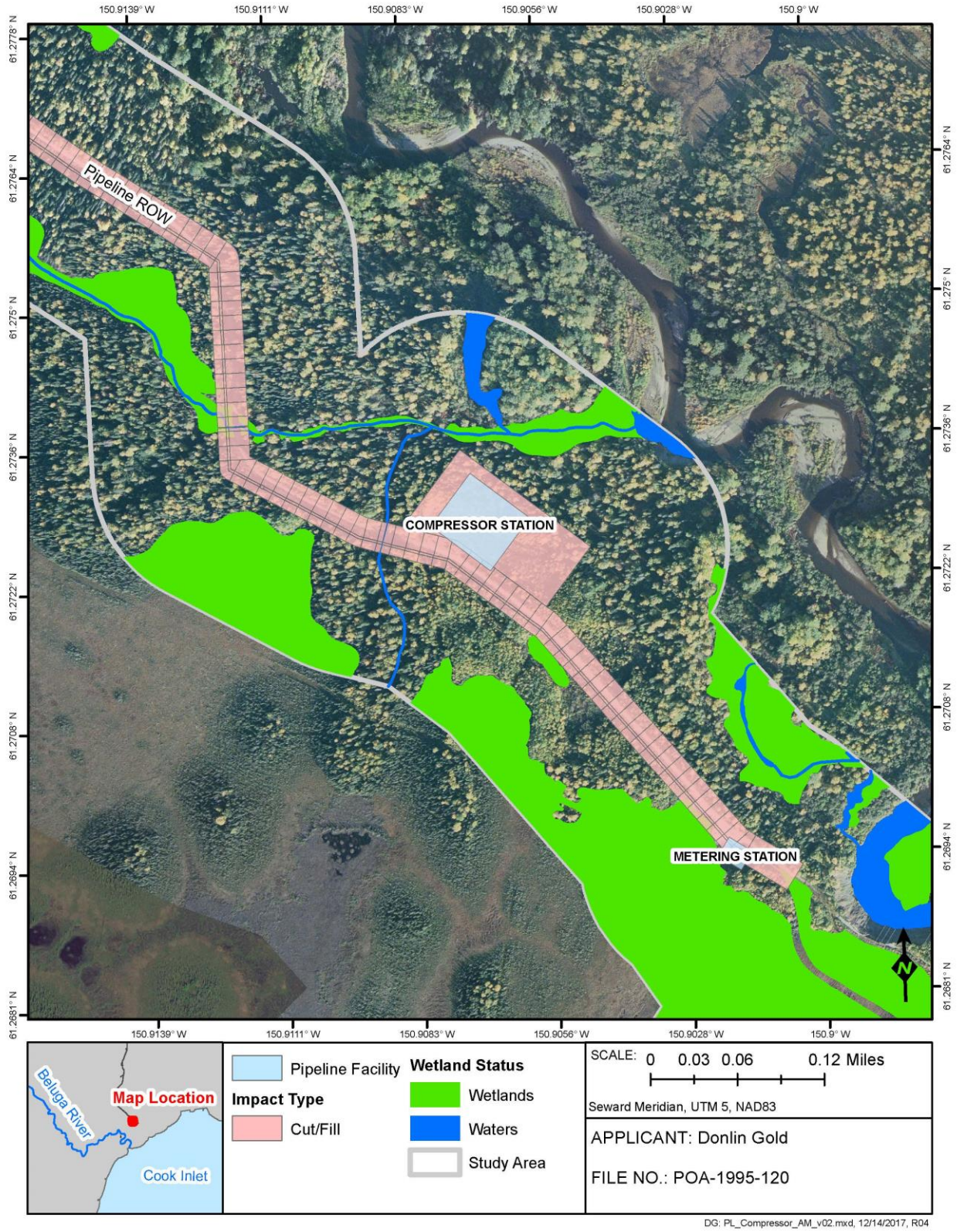
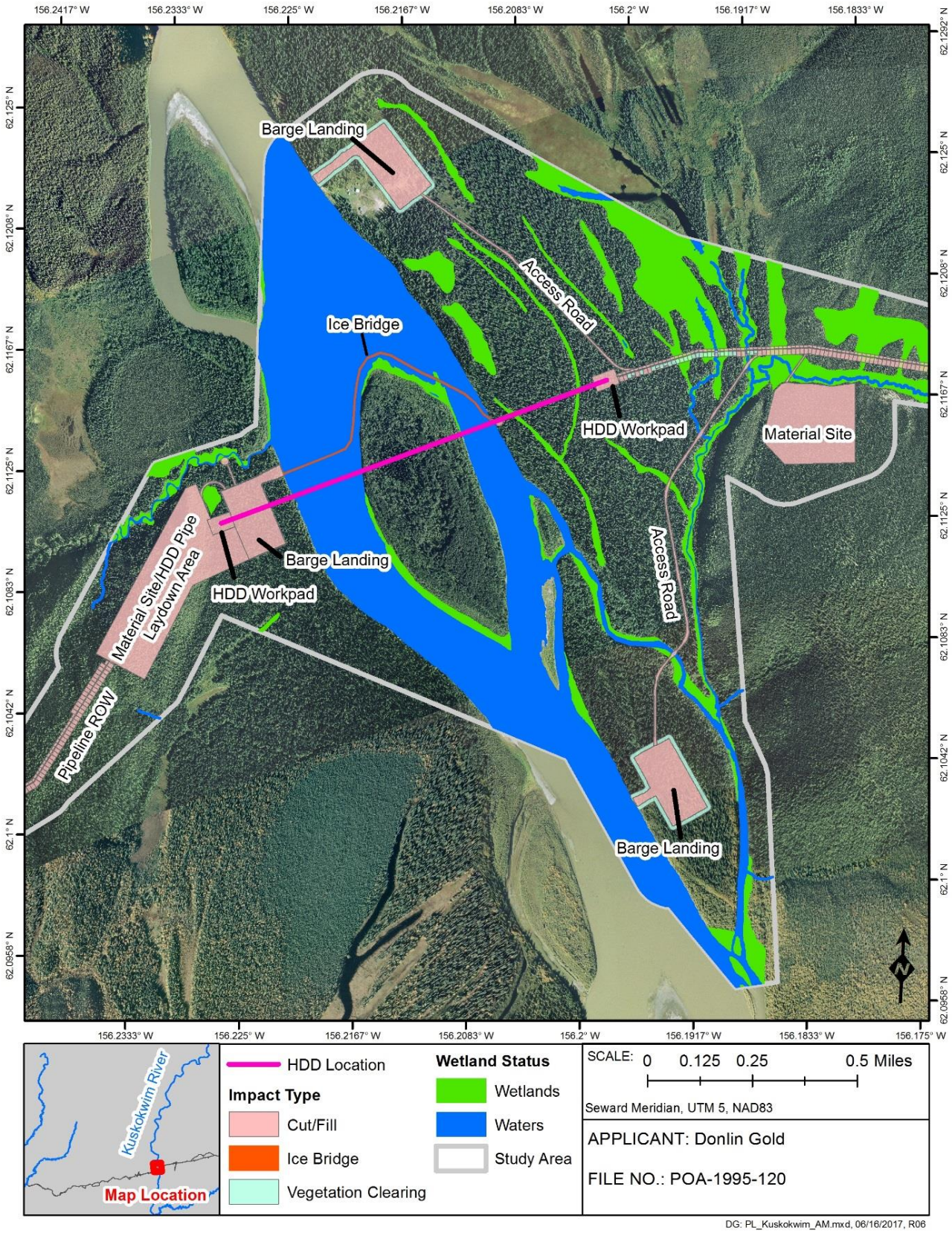


Figure 10 Kuskokwim River HDD Crossing Location



- 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, 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.

    - 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:

    - Source material testing for metal leaching and acid rock drainage potential will be completed 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.

    - Material site and work area boundaries will be surveyed and monumented 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 will be provided between overburden berms and the active pits.

    - 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.

    - 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:

    - 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.

Compensatory Mitigation

See attached compensatory mitigation plan in Block 23.

References

Michael Baker. 2017a. Preliminary Jurisdictional Determination- Donlin Gold Project-Southwest Alaska. December 2016.

Michael Baker. 2017b. North Route Addendum to the Preliminary Jurisdictional Determination – Donlin Gold Project – Southwest Alaska. August 2017.

Block 23. 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.

Donlin Gold submitted to the United States Army Corps of Engineer (USACE) in July 2012 a Preliminary Application for the Department of the Army (DA) Permit, 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 later revised its DA Permit application in December 2014 and August 2015. The latter was public noticed with the Draft EIS in November 2015, which also included Donlin Gold's Conceptual Compensatory Mitigation Plan (CMP). This 2017 Final CMP supersedes the Conceptual CMP. It includes revisions to the Project design and footprint, and an update to the Project's Waters of the United States (WOUS) impacts calculations to specifically include the North Route re-alignment of the pipeline.

The Project design avoids fill impacts to wetlands and streams to the maximum extent practicable. Some of the proposed Project activities in wetland areas include vegetation clearing, winter roads, and work areas where no placement of fill is proposed. There are 1,361-acres of wetlands temporarily filled either short-term or long-term in the Mine Area (MA), Transportation Area (TA) and Pipeline Area (PA). Wetland minimization activities include restoring wetlands following placement of fill by removing the fill at the end of the mine life and returning the areas to functioning wetlands similar to pre-mining conditions. These impact minimization activities specifically recover 831-acres of filled wetlands in the MA and TA. No compensatory mitigation is being proposed for vegetation clearing, winter roads, work areas, or short- or long-term temporary fill activities in WOUS.

The remaining fill impacts to wetlands in the Project area are defined as permanent for the purposes of this Final CMP. In the MA, TA, and PA, a total of 2,053-acres of wetlands and 156,816-linear feet (29.7-miles) of streams will be permanently filled.

In 2008, the USACE and the United States Environmental Protection Agency (EPA) published regulations (33 Code of Federal Regulations (CFR) Parts 325 and 332; 40 CFR Part 230) entitled, "Compensatory Mitigation for Losses of Aquatic Resources" (Mitigation Rule). The Mitigation Rule emphasized the selection of compensatory mitigation sites on a watershed basis and established operating standards for the mitigation providers and mechanisms: mitigation banks, In-Lieu Fee (ILF) programs, and Permittee-Responsible Mitigation (PRM) projects. For 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 no statewide ILF providers.

Hence, the Project is proposing all compensatory mitigation through PRM projects. 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) through PRM alternatives, focusing first on the immediate watershed (HUC-10), and then systematically assessing larger hydrologic units for compensatory mitigation opportunities. This assessment included a detailed examination of the current land conditions in the Crooked Creek drainage to determine restoration opportunities.

Donlin Gold proposes two PRM projects to offset the permanent fill impacts in the MA, TA, and PA including:

- Restore and preserve approximately 101.7-acres of wetlands and riparian areas with 8,501-linear feet (1.61-miles) of stream, and establish another 71.0-acres of riparian preservation buffers, in historical placer mining areas in the Upper Crooked Creek watershed.
- Preserve a total of 5,888-acres, of which it is estimated 2,558-acres are wetlands and ponds, with an additional 3,330-acres of upland riparian areas, stream area, and buffers, and 228,325-linear feet (43.24-miles) of streams in the Chuitna watershed.

This Final CMP is submitted to USACE as part of the DA Permit application.

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Attachment A Pipeline Area Wetlands Impacts by HUC-10 (acres) Before and After Construction
Attachment B Mine Area Wetland Impact Minimization Work Plan
Attachment C Transportation and Pipeline Areas Wetland Impact Minimization Work Plan
Attachment D Upper Crooked Creek Permittee-Responsible Mitigation Plan
Attachment E Chuitna Permittee-Responsible Mitigation Plan

Acronyms

ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
AMHT	Alaska Mental Health Trust Authority
amsl	above mean sea level
ANCSA	Alaska Native Claims Settlement Act
ATV	All-terrain vehicle
AWI	Alaska Wetlands Initiative
BLM	Bureau of Land Management
BSW	Black Spruce Woodland
Calista	Calista Corporation
CAS	Closed Alder Shrub
CBM	Coal Bed Methane
Cells	Material Site Excavation Area
CFR	Code of Federal Regulations
CIRI	Cook Inlet Regional Incorporated
CMP	Compensatory Mitigation Plan
CWA	Clean Water Act
DA	Department of the Army
Donlin Gold	Donlin Gold, LLC
DSSR	Disturbance-related shrub and sapling re-growth
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
HGM	Hydrogeomorphic
HUC	Hydrologic Unit Code
ILF	In-Lieu Fee
IR	Invasiveness Rank
LGL	LGL Alaska Research Associates, Inc.
LST	Low Shrub Tundra
m^2	meter-squared
MA	Mine Area
MH	Mesic Herbaceous
Michael Baker	Michael Baker International
Mitigation Rule	33 CFR Parts 325 and 332; 40 CFR Part 230
MLRA	Major Land Resources Areas
MSC	Material Site Closure
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
PJD	Preliminary Jurisdictional Determination
Plan	Permittee Responsible Mitigation Plan
PRC	PacRim Coal, LC
PRM	Permittee-Responsible Mitigation
Project	Donlin Gold Project
RHA	Rivers and Harbors Act of 1899
TA	Transportation Area
TKC	The Kuskokwim Corporation
TNC	Tyonek Native Corporation
TSF	Tailings Storage Facility
UCG	Underground Coal Gasification
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
WH	Wet Herbaceous
WMF	Woodland Mixed Forest
Work Plan	Wetland Impact Minimization Work Plan
WOUS	Waters of the United States
WRF	Waste Rock Facility
Y-K	Yukon-Kuskokwim

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 Final 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] Parts 325 and 332; 40 CFR Part 230) entitled, "Compensatory Mitigation for Losses of Aquatic Resources" (Mitigation Rule). The Mitigation 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) projects. Prior to the 2008 rule, EPA, USACE, United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service 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 Lower-48 states in Alaska. The 2008 Mitigation Rule recognizes the AWI as valid and unchanged for mitigation in Alaska.

This Final CMP discusses the proposed Project and permitting actions for compliance with the CWA Section 404 and the Rivers and Harbors Act of 1899 Section 10 undertaken by Donlin Gold and the USACE. It supports the National Environmental Policy Act review process. This Final CMP is submitted to USACE as part the Department of Army (DA) Permit application.

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 development 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.

The MA and TA 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 DA permit applications (Donlin Gold, 2012, 2014, 2015, and Block 18 of this application).

3.0 Donlin Gold Section 404 and Section 10 Permitting

Donlin Gold initiated the permitting process by submitting a Preliminary DA Permit Application under Section 404 of the CWA and Section 10 of the RHA to USACE on July 26, 2012. The permit application package included an initial Preliminary Jurisdictional Determination (PJD) and the DA Permit application. Donlin Gold subsequently submitted a revised application to USACE in December 2014. A further update to the application was submitted to USACE in August 2015, which was public noticed with the Draft Environmental Impact Statement. A revised PJD incorporating additional field work was submitted to USACE in January 2017. On February 27, 2017, USACE accepted the revised PJD, which re-established 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 map. Updated data reflecting the North Route was provided to USACE in August 2017 and accepted in October 2017. These data have been incorporated into this Final CMP for the Project. Table 1 summarizes the relevant Donlin Gold permit submittals.

Table 1 DA Permit Applications and Supporting Documentation

Document Name	Date Submitted to USACE
Preliminary Permit Application, including initial PJD and DA Permit Application (Engineer Form 4345)	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)	December 2017

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 all associated ancillary facilities. This Final CMP addresses the MA and TA as a single unit (because these areas are contained predominantly in a single Hydrologic Unit Code (HUC)-10, and addresses the PA as a linear feature that spans numerous watersheds (See Figures 1 and 2).

Figure 1 Mine Area and Transportation Area

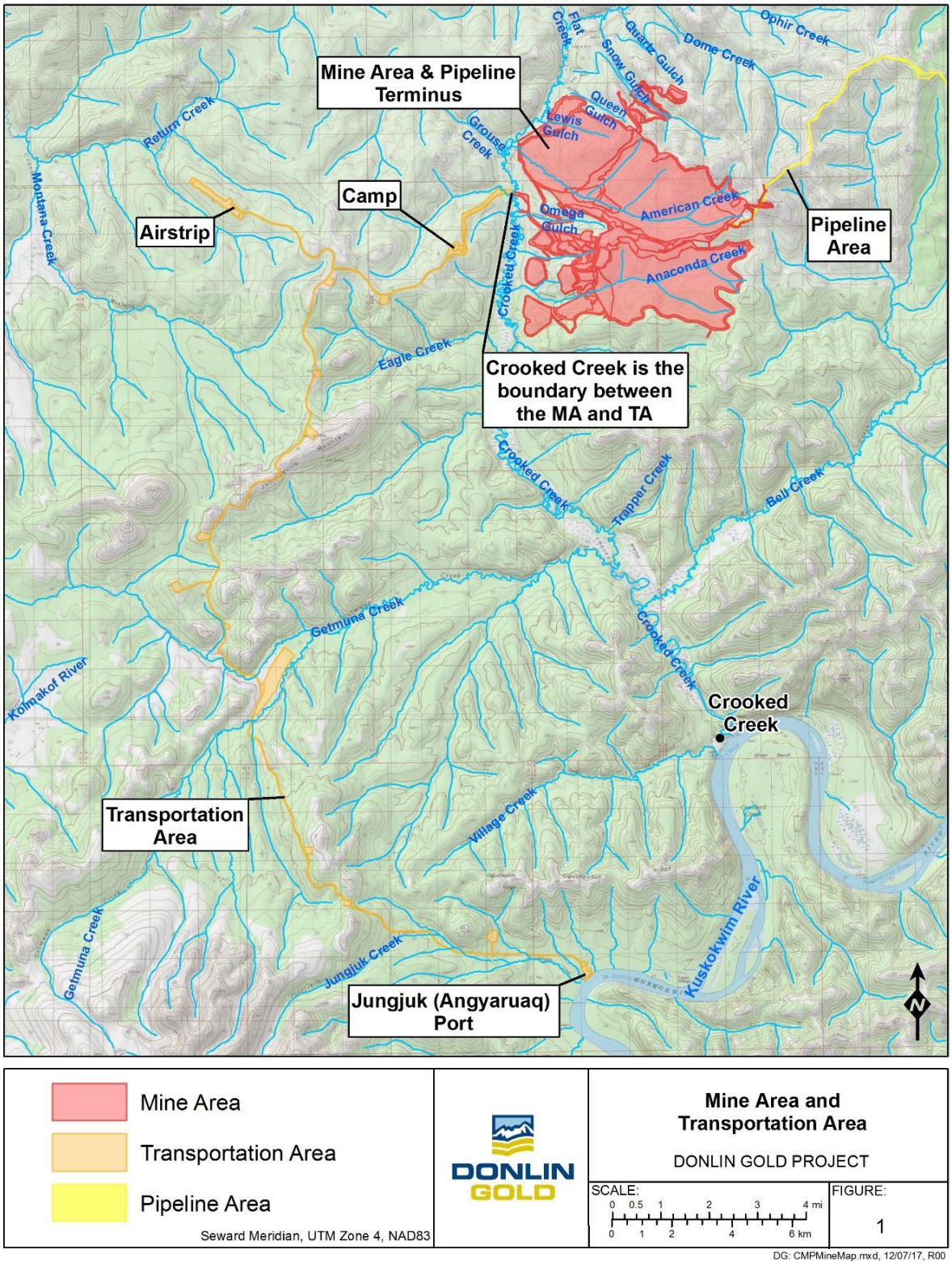
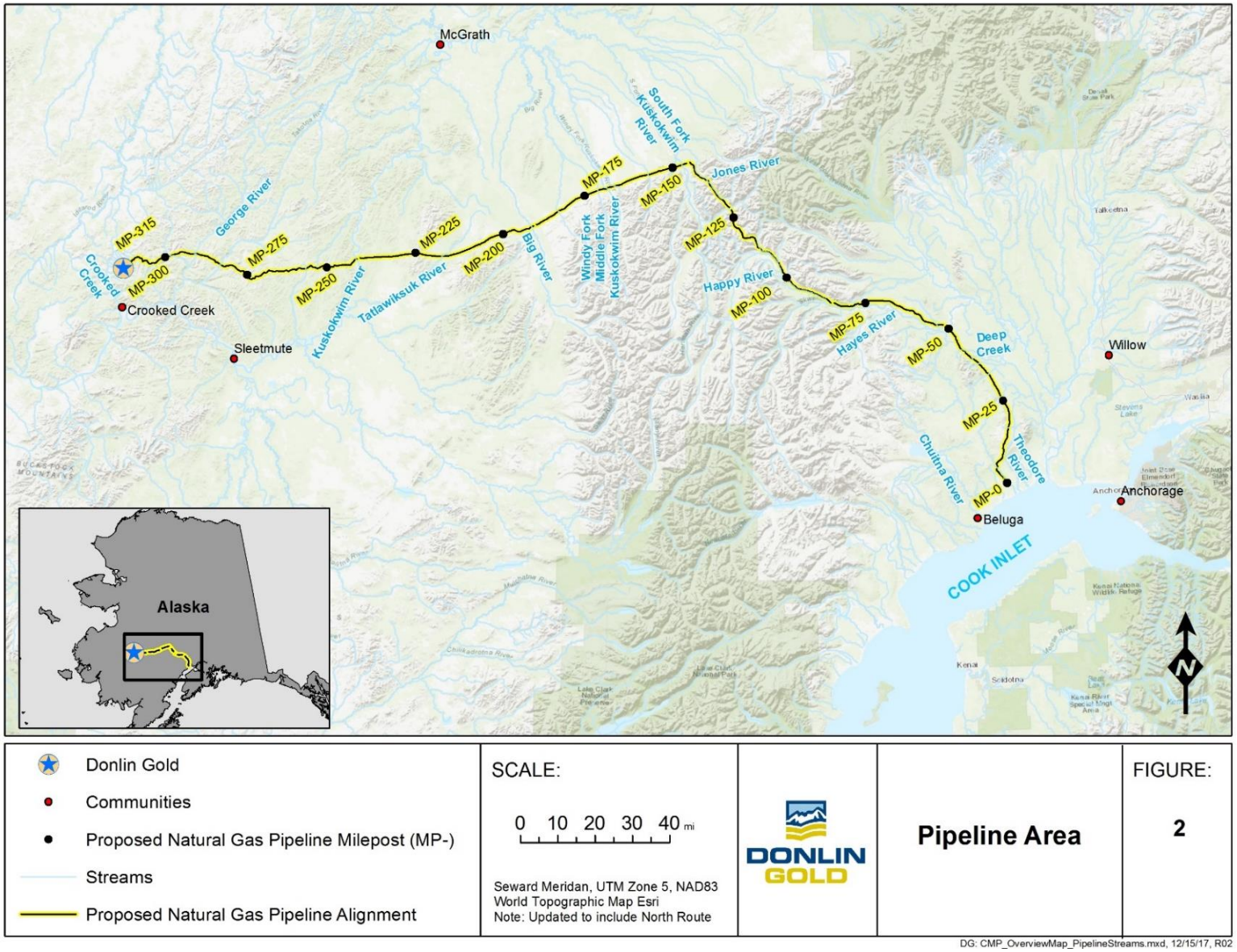


Figure 2 Pipeline Area



4.0 Wetland Fill Impacts from Proposed Project

The development of the Project will require the placement of fill material into WOUS. The calculated Project wetlands disturbance and fill activities (impacts) are described in Blocks 21 and 22 of the December 2017 application.

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, and the results are described in the following sections.

Wetlands Fill Impact Types

Wetland impacts for the Project are grouped into two main categories: non-jurisdictional and jurisdictional.

- Non-jurisdictional 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 included in this Final CMP.
- Jurisdictional Impacts – These impacts include the placement of fill into wetlands or WOUS. These fill impacts are addressed in this Final CMP.

The impact types are further divided based on the duration of the fill:

- *Temporary Short-term Fill* – These are areas where fill is placed into wetlands for a brief 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 for the PA, or up to five-years for the MA construction period.
- *Temporary Long-term Fill* – These are areas in which fill is placed for the duration of the mine life, after which the fill is removed, and the area is restored to a wetland or WOUS. This category occurs only in the MA and TA (no long-term fill impacts are proposed in the PA). The length of time for these fills is estimated to be between 27 and 30-years.
- *Permanent Fill* – This category of fill is the focus of the compensation in this Final CMP. While a number of these fills can result in the creation of waterbodies or other potential wetland features, they have been categorized as permanent. This includes areas such as the open pit, TSF, and WRF. Limited permanent fills occur in the PA.

Wetlands and Aquatic Resource Impacts in the Mine Area and Transportation Area

The MA and TA include a total of 2,676-acres of wetland fill, 823-acres are classified as temporary long-term, and 1,853-acres are classified as permanent. Table 2 provides a summary of the MA and TA wetland fill by Project area and duration. Stream impacts[1] are presented in Table 3. The MA and TA stream fills are 173,184-linear feet (32.8-miles), including 16,368-linear feet (3.1-miles) of temporary long-term fill and 156,816-linear feet (29.7-miles) of permanent fill. There is no temporary short-term fill identified in the MA and TA.

Table 2 MA and TA Wetlands Fill (Acres)

	Fill Duration		
Project Area	Temporary Short-term	Temporary Long-term	Permanent
Mine Area	0	786	1,786
Transportation Area	0	37	67
Total	**0**	**823**	**1,853**

Table 3 MA and TA Stream Fills in Linear Feet (Miles)

	Fill Duration		
Work Area	Temporary Short-term	Temporary Long-term	Permanent
Mine Area	0 (0)	14,784 (2.8)	156,816 (29.6)
Transportation Area	0 (0)	1,584 (0.3)	528 (0.1)
Total	**0 (0)**	**16,368 (3.1)**	**156,816 (29.7)**

Wetlands and Aquatic Resource Impacts in the Pipeline Area

The PA includes 538-acres of temporary fill, and 200-acres of permanent fill. Table 4 provides a summary of the PA wetland fill by duration. Wetland fill to streams is presented in Table 5. All the PA stream fills are temporary and total 53,328-linear feet (10.1-miles).

The PA traverses 28 HUC-10 watersheds. The 200-acres of permanent wetland impacts from the pipeline are located in 14 of those HUC-10 watersheds. These watersheds have very limited existing disturbance. The maximum impact from PA construction in any single HUC-10 watershed is 64-acres (Headwaters Tatlawiksuk River). In the PA construction, the maximum total disturbance in a watershed is 0.03-percent of the area. Additional detail on the PA impacts by HUC-10 watershed is 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 PJD prepared by Michael Baker International.

Table 4 PA Wetlands Fill (Acres)

	Fill Duration		
Project Area	Temporary Short-term	Temporary Long-term	Permanent
Pipeline Area	538	0	200

Table 5 PA Stream Fill by Duration in Linear Feet (Miles)

	Fill Duration		
Project Area	Temporary Short-term	Temporary Long-term	Permanent
Pipeline Area	53,328 (10.1[2])	0 (0)	0 (0)

The fills by duration for the MA, TA, and PA are summarized in Table 6.

Table 6 Fills by Duration Summary

	Fill Duration								
	Temporary Short-term			Temporary Long- term			Permanent		
Project Area	Linear Feet	Miles	Acres	Linear Feet	Miles	Acres	Linear Feet	Miles	Acres
Mine Area				14,784	2.8	786	156,288	29.6	1,786
Transportation Area				1,584	0.3	37	528	0.1	67
Pipeline Area	53,328	10.1	538						200

5.0 Wetland Impact Minimization Plans

Overview

Through facility design and optimization, fill impacts to wetlands and streams have been avoided to the maximum extent practicable. This is reflected in the wetland acre and stream mile fills shown in the previous sections. In addition, as part of fill minimization, Donlin Gold has developed specific reclamation and closure plans to ensure that the long-term fills are temporary, and areas are restored, wherever practicable, to wetlands in the MA and TA. The proposed reclamation and closure activities proposed by Donlin Gold exceed the reclamation requirements established by the State of Alaska. The wetland impact minimization activities are summarized in the following sections.

[2] Stream impacts for the PA are summarized by duration using the streams and rivers mapped in Donlin Gold's 2016 and 2017 PJDs prepared by Michael Baker International. Impacts for the pipeline are temporary because the pipeline has no permanent roads, bridges, or permanent features left at any stream crossings in the corridor or along access routes. The major river crossings are completed by horizontal directional drilling, and the pipeline will be under these waterways.

Impact Minimization Plans

Donlin Gold specifically proposes to minimize fill in the MA, TA, and PA through two Wetland Impact Minimization Work Plans. These plans include:

- *MA Impact Minimization Work Plan*. Areas of the lower Anaconda Creek and Snow Gulch watersheds will specifically be reclaimed to restore approximately 786-acres of wetland habitat impacted by proposed Project facilities. Stream restoration is also proposed. The proposed restoration sites include growth media and overburden stockpiles, material sites, and the Snow Gulch freshwater reservoir. In these areas, Donlin Gold proposes to restore, and where possible, enhance wetland and stream functions, including supporting aquatic habitat. Donlin Gold has assumed no wetland restoration for the TSF, WRF, open pit, and some other areas of permanent wetland impacts where restoration to pre-mining conditions is not practicable. Donlin Gold will conduct the proposed restoration and minimization activities as soon as practicable, but they will generally occur after the end of the mine life as part of overall site closure.

- *TA and PA Impact Minimization Work Plan*. Material sites were reviewed for the potential to restore the sites to wetlands upon abandonment in the TA. Three material sites where the final elevations are expected to be below the groundwater table, are included in this minimization plan. Under the plan, 34.7-acres of wetlands in the TA will be restored. At Material Site-16 in the TA, the access road will also be removed as part of the reclamation plan for the gravel pit; this is not included in the minimization plan (1.3-acres). In addition, the port face fill in the Kuskokwim River will be removed and the shore restored as part of the reclamation and restoration plan for the Jungjuk (Angyaruaq) Port (1.3-acres). Donlin Gold presumed no wetland creation in the minimization plans. However, it is expected some of the proposed reclamation will include wetland creation (e.g., ponds and stream channels) that could provide valuable aquatic habitat in areas that were uplands prior to site development. Three material sites in the PA will also be restored to re-create the pre-construction wetlands impacted by the development of the gravel pits. Wetland restoration at these sites totals 10.2-acres. In the PA, reclamation and restoration will occur as soon as practicable after construction is completed and, therefore, the fills are considered temporary short-term versus the temporary long-term fills associated with the MA and TA.

The detailed Wetland Impact Minimization Plans are provided in Attachment B (Mine Area Wetland Impact Minimization Work Plan), and Attachment C (Transportation and Pipeline Areas Wetland Impact Minimization Work Plan).

6.0 Evaluation of Compensatory Mitigation Options

Donlin Gold evaluated a range of options for compensatory mitigation for the Project. Donlin Gold has continuously sought to first avoid, and then minimize, fill impacts before proposing compensatory mitigation for unavoidable impacts to aquatic resources.

MA, TA, and PA

After implementation of all avoidance and minimization measures in the MA, TA, and PA, permanent WOUS fill impacts will be approximately 2,053-acres of wetlands, and 156,816-linear feet (29.7-miles) of streams. These filled wetland and stream acres served as the basis for Donlin Gold's assessment of potential compensatory mitigation options.

Donlin Gold evaluated numerous compensatory mitigation opportunities for the permanent fill associated with the MA, TA, and PA. First, Donlin Gold focused on opportunities within the HUC-10 watershed of the MA and TA (i.e., generally the Crooked Creek drainage). The only development areas in this hydrologic unit 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 only opportunity to provide compensatory mitigation for Project impacts to aquatic resources is to restore past placer mining disturbance 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 impacts, because they represent in-kind wetland and stream channel restoration, enhancement, and subsequent preservation within the HUC-10 of the MA and some of the TA activities. The proposed mitigation plan is designed to:

- Restore geomorphically stable channels and floodplains in the lower reaches of Quartz, Snow, Ruby, and Queen gulches.
- Remove barriers to fish passage and improve anadromous and resident fish-rearing habitat in the placer mining impacted reaches of Snow, Ruby, and Queen gulches.
- 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 mine site development. A detailed description of Donlin Gold's proposed approach is provided in Attachment D, Upper Crooked Creek PRM Plan.

Implementing the Upper Crooked Creek PRM Plan will yield substantive, near-term benefits to aquatic resources, including restoring 101.7-acres of wetlands and riparian areas with 8,501-linear feet (1.61-miles) of stream, and establishing another 71.0-acres of riparian preservation buffers, in historical placer mining areas in the Upper Crooked Creek watershed.

In addition to the Upper Crooked Creek PRM, Donlin Gold considered additional off-site mitigation opportunities. 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 impacts; specifically, restoration and/or

preservation of wetland acres and stream miles, with specific focus on anadromous and other important fish and wildlife populations.

- For restoration opportunities, consider options that can be demonstrated to yield ecological "lift" in both a practicable and measurable manner.

- For preservation opportunities, show a clear threat of development and that lands can be preserved over the long term.

- For all opportunities, show the compensatory mitigation can be performed in a manner that shows benefits are generated in an economically sound and reasonable manner, and can be maintained over the long term.

Donlin Gold followed USACE guidelines in considering the proximity of specific opportunities to the impacted watershed, by first considering those within the middle Kuskokwim River watershed and then expanding out co-centrically, eventually extending to the entire Yukon-Kuskokwim (Y-K) region and then to other watersheds in Alaska. As recognized by the 1994 AWI (EPA *et al.* 1994), Alaska is unique because of its remoteness, lack of development, high percentage of wetland area compared to the Lower-48 and the limited opportunities for off-site mitigation. The AWI acknowledged Alaska's unique nature by encouraging flexibility in the levels and types of appropriate compensatory mitigation that can be proposed.

Table 7 summarizes the types of off-site mitigation Donlin Gold considered for the Project and provides the rationale for their exclusion from this Final CMP. In general, the options consisted of the following:

- *Existing mitigation banks and ILF programs.* Donlin Gold evaluated the feasibility of purchasing credits from these 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 can no longer offer any mitigation credits in Alaska. Existing mitigation banks only have available credits in the Matanuska-Susitna Borough service area. Credit availability is limited and does not meet the scale of Project needs. As such, existing ILF programs and mitigation banks cannot meet the Project mitigation needs for the permanent fill impacts associated with the MA, TA, and PA.

- *Preservation opportunities.* Donlin Gold investigated many potential preservation opportunities throughout the Y-K region and the Cook Inlet region. Several significant challenges are associated with these options. First, is the ability to acquire the lands to ensure long-term preservation. Donlin Gold has focused on watershed-level mitigation opportunities with significant interconnected wetlands and stream miles that support important aquatic resources. In such watersheds, lands are often owned by multiple parties; all of which must be willing to make them available for preservation. Donlin Gold has found that gaining agreement among all ownership parties is often not feasible. Second, and more significant, is the need to demonstrate that potential preservation areas have a developmental threat. Very few large land parcels in the regions have a clear threat of development that could impact sizable areas of wetlands and/or streams. The USACE has consistently emphasized threat of development is essential to establishing compensatory mitigation credits. Only two large watershed-level parcels in the Y-K

region were identified as potential compensatory mitigation opportunities: preservation of the Fuller Creek watershed owned by Calista; and preservation of unmined mining claims in the Platinum Mining District whose mining leases are currently owned by Hansen Industries. The rationales for their exclusion from this plan are provided in Table 7.

- *Mining district restoration.* Much of the watershed level development in the Y-K region has been associated with historical and modern mining districts. To evaluate potential compensatory mitigation at the scale of the Project impacts, Donlin Gold considered the viability of restoring watersheds impacted by mining operations. This specifically included the: (1) Platinum Mining District, (2) Flat Mining District, (3) Nyac Mining District, (4) Red Devil Mine Area, and (5) Kolmakof Mine Area. In each of these areas, Donlin Gold considered the opportunity in terms of restoration feasibility and cost, land ownership and long-term durability, and the potential for ecological enhancement/lift to wetland areas, streams, and riparian areas. Rationales for their elimination from consideration are provided in Table 7.

- *Restoration within the PA watersheds.* Donlin Gold broadly considered the current surface conditions/disturbances in the watersheds of the PA for potential mitigation opportunities. Donlin Gold considered the viability of restoring locations in these watersheds previously impacted by development. An analysis by HUC of existing impervious cover was done to help facilitate potential restoration areas. The pipeline crosses 28 HUC-10 watersheds in 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 proximity of the pipeline corridor. See Attachment A for additional details.

- *Non-traditional mitigation opportunities.* As shown in Table 7, Donlin Gold evaluated a range of potential mitigation projects that would not directly involve 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. Such projects are very costly, given the remote access in the region. While these projects can lead to improvements in stream water quality and aquatic habitat, such results are not readily quantified into wetland acres for compensation nor do they lend themselves to demonstrating the net lift once the mitigation is completed. Therefore, long-term performance cannot be demonstrated, especially in terms of restored wetland acres and stream miles. Showing such performance and quantity is generally essential to obtain compensatory mitigation credits for affected wetland acres and stream miles.

Table 7 Compensatory Mitigation Options Evaluated by Donlin Gold

Mitigation Option	Description	Rationale for Elimination
Banks and ILF Programs		
Conservation Fund State-wide ILF Program	Instrument intended to provide mitigation credits for projects throughout Alaska.	No longer offering credits in Alaska per USACE decision to terminate the program in October 2017.
Great Land Trust ILF Program	Instrument intended to provide mitigation credits for projects throughout Alaska, although primarily focused on the Anchorage area. As of June 2017, 80 credits were available for purchase for the Matanuska-Susitna service area.	With only 80 credits available, the amount of credits available does not meet the Project needs.
State of Alaska ILF Program	Planned to provide credits associated with State lands.	In early stages of development; no guarantee credits will be available to Donlin Gold.
Su Knik Bank	Offers compensatory mitigation credits associated with high-value preservation areas in the Matanuska-Susitna Borough. As of April 2016, the bank had 600 credits available for purchase.	The Project is outside of the Service Area and the amount of credits available does not meet the Project needs.
Village Site Restoration		
Newtok Village Reclamation and Remediation	Donlin Gold reached out to the 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 and becoming 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.	While the many facilities with potential contamination have been inventoried for Newtok, 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 (potentially $10s of millions) 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 and ground and surface water. As such, it is not practicable for Donlin Gold to propose the Newtok village reclamation and remediation for compensatory mitigation. In addition, remediation activities likely have limited potential for wetlands restoration and thereby would not generate substantive wetland and stream mitigation credit.

Mitigation Option	Description	Rationale for Elimination
Mining/Mineral Development Area Restoration and Preservation		
Flat Mining District Restoration	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 the Bureau of Land Management (BLM), which administers the various claims/leases in the area.	Multiple claim and lease holders are in the area making the likelihood of a successful negotiation 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 promote 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.
Nyac Mine Restoration	The Nyac Mine is located on the Tuluksuk River and its tributaries about 60-miles east/northeast of Bethel. The underlying claims and some of the land area 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.	Because of its location in the Kuskokwim River watershed, Donlin Gold evaluated Nyac Mine restoration in detail. In the mined and impacted areas, existing natural processes have resulted in restoration of stream and aquatic habitat. Salmon are present in the stream system and restoration would pose a risk to them. The volume of tailings and lack of 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.
Red Devil Mine Remediation	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; the BLM has proposed a range of remedial actions to restore and protect Red Devil Creek and the Kuskokwim River.	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, mechanisms for participation and funding are uncertain and there is potential for future Contaminated Site liability. This makes Red Devil impracticable as a mitigation option.
Kolmakof Mine Site Remediation	The Kolmakof Mine is an historical cinnabar/mercury mine east of Aniak on the north shore of the Kuskokwim River. The last known production was 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.	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.

Mitigation Option	Description	Rationale for Elimination
Platinum Mining District Restoration and Preservation	The Platinum Mine site is just south of Goodnews Bay, on Kuskokwim Bay, west of Bristol Bay on the Bering Sea. The mine is comprised of 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 within the Togiak National Wildlife Refuge. Angler Mining Pty Ltd has entered into an agreement with the current leaseholder, Hansen Industries, to access the claims and conduct additional placer mining.	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 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 the BLM suggest the mined material would have to meet current mine reclamation standards, such as 70-percent re-vegetation success. This is not practicable given the types of materials and how the bucket-line dredge materials were laid down. 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 800-acres (600-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.
Fuller Creek Watershed Preservation	The Fuller Creek watershed is approximately 20-miles upriver from the Crooked Creek/Kuskokwim River confluence; in the same HUC-8 as the Donlin Gold MA. The USACE previously recognized the mineral development threat in the Fuller Creek watershed; 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 is unknown. The lands are owned by Calista.	Because of the potential for preservation of anadromous fish habitat, threat of 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.

Mitigation Option	Description	Rationale for Elimination
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, funding is very limited. 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 wetland acres. 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.
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 WOUS.	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.
Erosion Control Projects in the Kuskokwim River Watershed	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. The 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).	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 watershed. Designs can be complicated, materials availability scarce, and the project 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, these non-traditional options cannot reliably be shown to provide the mitigation credits (i.e., acres) necessary for the Project.

Mitigation Option	Description	Rationale for Elimination
All-terrain Vehicle (ATV) Trail Hardening Projects in the Y-K Region	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.	While this is a broad need in the region to protect wetlands and riparian systems, likely benefits are difficult to predict and performance cannot be readily measured. For the reasons cited for community water and wastewater system improvements, these non-traditional options cannot reliably be shown to provide the specific mitigation credits necessary for the Project.
Non-Native Species Plant Removal in the Crooked Creek Watershed	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 mine site colonized by non-native species.	While valuable ecologically, it is not possible to quantify how removal of invasive species would provide restoration or enhancement of wetland acres and/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, these non-traditional options cannot reliably be shown to provide the specific mitigation credits necessary for the Project.

After conducting this extensive review, to supplement the reclamation and restoration of placer mined areas in Upper Crooked Creek, Donlin Gold proposes to preserve lands within the Chuitna watershed as compensatory mitigation for the Project. The PRM Plan for the Chuitna 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 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 watershed provides important spawning and rearing habitat for all five major 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 Chuitna Preservation Area is 36 times more than the filled areas lost in the Crooked Creek watershed (Table 8). As discussed in the PRM Plan, observed salmon populations are much higher in the Chuitna watershed compared to Project drainages.

- 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. This has included 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 and there is a long history of development of these in the area (see Attachment E for an expanded discussion).

- Through ongoing discussions with the landowners (the State of Alaska Mental Health Trust Land Office and Tyonek Native Corporation (TNC)) as well as the owners of the underlying mineral leases (Cook Inlet Region, Inc.), Donlin Gold is confident it can secure durable deed restrictions for the proposed mitigation areas.

Table 8 Anadromous Stream Habitat Preservation and Loss Comparison

	Chuitna Drainage Anadromous Stream Linear Feet (Miles) Preserved			Crooked Creek Drainage Anadromous Stream Linear Feet (Miles) Lost		
	Spawning	Rearing	Total*	Spawning	Rearing	Total*
Chinook	77,616 (14.7)	133,056 (25.2)	133,056 (25.2)			
Sockeye		100,848 (19.1)	133,056 (25.2)			
Coho	70,752 (13.4)	148,896 (28.2)	148,896 (28.2)		3,696 (0.7)	3,696 (0.7)
Chum	44,352 (8.4)	12,672 (2.4)	132,000 (25.0)			
Pink	106,128 (20.1)	13,200 (2.5)	133,056 (25.2)			

* Includes migratory habitat

7.0 Summary of MA, TA, and PA Compensatory Mitigation

In the MA, TA, and PA, Donlin Gold will cause permanent impacts to 2,053-acres of wetlands and 156,816-linear feet (29.7-miles) of streams, primarily in the Crooked Creek HUC-10 watershed. Donlin Gold proposes to compensate for the unavoidable losses through two PRM Projects.

- First, Donlin Gold proposes to compensate for the loss of aquatic habitat and wetland functions through in-watershed restoration of approximately 101.7-acres of wetlands and riparian areas with 8,501-linear feet (1.61-miles) of stream, and establish another 71.0-acres of riparian preservation buffers with 370-linear feet (0.07-miles) of stream, in historical placer mining areas in the Upper Crooked Creek watershed.

- Second, Donlin Gold proposes out-of-watershed preservation of a parcel in the Chuitna watershed of which it is estimated there are 2,558-acres of wetlands and ponds, and an additional 3,330-acres of riparian area, stream area, and buffers, along with 228,325-linear feet (43.24-miles) of stream.

The proposed mitigation is summarized in Table 9. Wetland and pond acres have been grouped as acres of WOUS. Stream mitigation credits are reported in linear feet; acres of mapped stream polygons do not count towards WOUS acres and therefore have been grouped with riparian and buffer acres.

Table 9 Proposed Compensatory Mitigation

	Restoration			Preservation			Total		
PRM Area	Wetland and Pond Acres	Riparian, Stream, and Buffer Acres	Stream Linear Feet (Miles)	Wetland and Pond Acres	Riparian, Stream, and Buffer Acres	Stream Linear Feet (Miles)	Wetland and Pond Acres	Riparian, Stream, and Buffer Acres	Stream Linear Feet (Miles)
Upper Crooked Creek	59.7	42.0	8,501 (1.61)	59.5	11.5	370 (0.07)	119.2	53.5	8,871 (1.68)
Chuitna				2,558	3,330	228,325 (43.24)	2,558	3,330	228,325 (43.24)
Total	**59.7**	**42.0**	**8,501 (1.61)**	**2617.5**	**3,341.5**	**228,695 (43.31)**	**2,677.2**	**3,383.5**	**237,196 (44.92)**

8.0 References

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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

HUC-10	Watershed Acres	Existing Disturbed Wetland Acres	Existing Percent Disturbed	PA Permanent Impact Acres	Percent Disturbed After Pipeline Construction
Unnamed HUC 1903040510	127,053	0	0.00	0	0.00
Alexander Creek	210,480	1	0.00	0	0.00
Beluga River	211,588	134	0.06	0	0.06
Crooked Creek	215,234	1115	0.52	0	0.52
East Fork George River	262,717	0	0.00	0	0.00
George River	285,127	98	0.03	2	0.04
Happy River	224,527	2	0.00	0	0.00
Headwaters Middle Fork Kuskokwim River	232,387	2	0.00	36	0.02
Headwaters Tatlawiksuk River	239,536	0	0.00	64	0.03
Johnson Creek	96,681	7	0.01	1	0.01
Jones River	81,749	0	0.00	0	0.00
Khuchaynik Creek	94,198	0	0.00	22	0.02
Little South Fork	75,851	0	0.00	0	0.00
Lower Skwentna River	241,346	100	0.04	2	0.04
Lower South Fork Kuskokwim River	214,958	186	0.09	5	0.09
Middle Big River	128,994	0	0.00	25	0.02
Middle Skwentna River	236,827	0	0.00	0	0.00
Middle South Fork Kuskokwim River	177,205	23	0.01	0	0.01
Moose Creek	132,086	0	0.00	0	0.00
North Fork George River	93,624	0	0.00	0	0.00
Nunivak Bar-Kuskokwim River	245,153	14	0.01	1	0.01
Nunsatuk River	154,841	0	0.00	0	0.00
Pitka Fork Middle Fork Kuskokwim River	189,005	24	0.01	17	0.02
Sheep Creek	170,686	186	0.11	17	0.12
Susitna River-Frontal Cook Inlet	322,859	113	0.04	1	0.04
Tatina River	144,282	1	0.00	2	0.00
Theodore River	81,093	88	0.11	0	0.11
Windy Fork Middle-Fork Kuskokwim River	226,059	3	0.00	3	0.00
Total	**5,116,147**	**2097***	**0.04**	**200***	**0.04**

*Column is rounded to the nearest whole number.

Attachment B
Mine Area Wetland Impact Minimization Work Plan

Attachment B Mine Area Wetland Impact Minimization Work Plan

Objectives

In the MA, the Donlin Gold Project will fill wetlands with long-term storage in growth media stockpiles, overburden stockpiles in material sites, and the Snow Gulch freshwater reservoir. Donlin Gold has developed a specific Wetland Impact Minimization Work Plan (work plan) to restore the wetland habitat impacted by these facilities. Implementation of the restoration activities described in this work plan will exceed the reclamation requirements required by the State of Alaska. Donlin Gold has established specific performance standards and goals for wetland restoration and will conduct monitoring to provide a means to ensure these goals are met. The Donlin Gold MA is in the Crooked Creek HUC-10 watershed.

Restoration Sites

Potential restoration of all proposed facilities in the Donlin Gold MA has been considered, based on the expected occurrence of wetland-supporting hydrology at mine closure. All facility boundaries were examined with regard to the 2016 Donlin Gold wetlands map (Michael Baker International [Michael Baker] 2016). The open pit, WRF, and TSF are permanent features and impacts to wetlands cannot be further minimized at these facilities. Restoration of wetlands to pre-mining functions in these areas is not practicable. Impacts to wetlands from some other mining facilities and roads are also considered permanent, because of compaction of wetlands and addition of fill that cannot practically be removed and returned to functioning wetlands at mine closure. However, substantial restoration opportunities do exist in the MA as described below.

Restoration of wetlands in the MA will include the following types of sites:

- material sites
- growth media stockpiles
- overburden stockpiles
- Snow Gulch freshwater reservoir

Table 1 lists the wetland acres planned to be restored, by specific facility type, within the proposed MA. Figure 1 depicts the areas proposed for wetlands restoration within the proposed MA[1].

[1] The site photographs and overview images in this document are presented with all Project wetland data in the 2016 Preliminary Jurisdictional Determination Report (Michael Baker 2016).

Table 1 MA Facilities and Wetland Acres Proposed for Restoration

Facility	Wetland Acres
TSF Stockpile 1	113.5
TSF Material Site-06/TSF Stockpile 2	121.2
North Overburden Stockpile	209.3
Snow Gulch Freshwater Reservoir	41.8
South Overburden Stockpile	71.0
TSF Material Site-07/TSF Stockpile 3	229.0
Total	**786.1**

Note: Inconsistent sum is due to rounding.

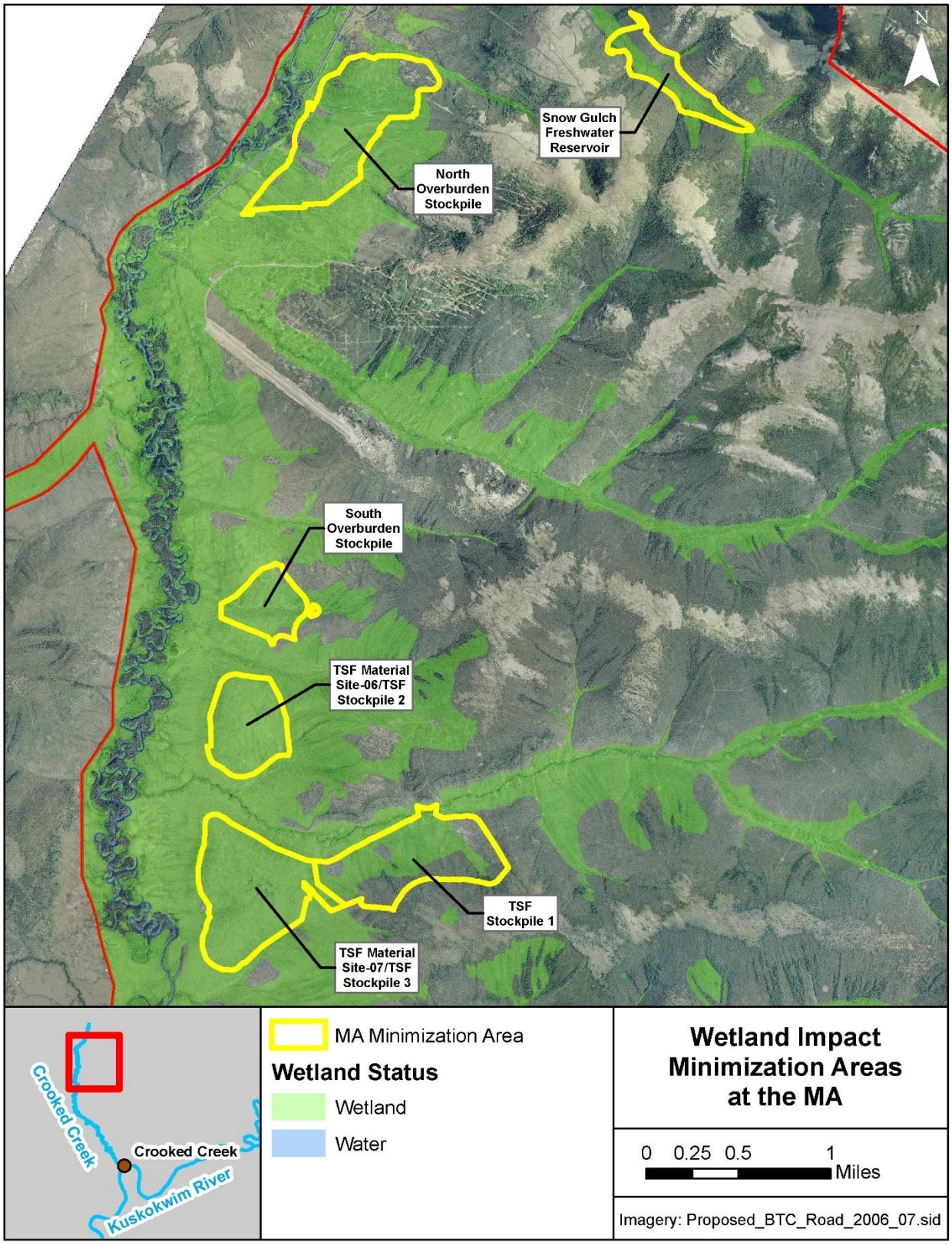
The majority of sites proposed for restoration with cut and fill impact are material sites and overburden and growth media stockpiles. Once construction in the MA begins, three sites will be established for long-term storage of overburden and growth media. In addition, two material sites will be developed 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. Once mine operations cease, the overburden and growth media will be removed and used for mine reclamation. These storage areas will then be restored to wetlands.

There is one piezometer (AH10-188) within the footprint of the TSF Material Site-06/TSF Stockpile 2 with data indicating the water elevation is 457-feet amsl. The estimated post-mining bottom elevation for this material site is currently planned to be between 410 and 450-feet amsl. Therefore, it is reasonable to expect positive groundwater hydrology in this area.

A freshwater reservoir is proposed for the upper reaches of Snow Gulch (Table 1). Upon mine closure, the dam associated with the reservoir will be breached, allowing Snow Gulch to flow freely. Wetland areas behind the reservoir will be restored. Natural surface and groundwater flow will resume in Snow Gulch.

The North Overburden Stockpile and TSF Stockpile 1 are in areas with hydrology from existing wetlands. Upon mine closure, stockpiles will be removed and hydrology will be returned to these areas to allow wetland vegetation to grow and wetland soils to form.

Figure 1 Wetland Impact Minimization Area at the MA



Baseline Wetlands Data

Wetlands in the MA are dominated by Open Black Spruce Forest (OBSF) and Black Spruce Woodland (BSW) vegetation types. 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 Cowardin Classifications (Cowardin et al. 1979) include PFO4/SS1B and PSS4/SS1B (Photo 1) (Michael Baker 2016).

Cowardin Classifications for areas of wetland impact minimization are shown in Table 2.

Table 2 Cowardin Classifications for Areas of Wetland Impact Minimization

Cowardin Group	Cowardin Code	Acres
Herbaceous	PEM1	3.4
Herbaceous/Deciduous Shrub	PEM1/SS1	2.8
Coniferous Forests	PFO4	85.9
	PFO4/SS1	129.3
	PSS1/FO4	55.4
Coniferous Scrub	PSS4	216.6
	PSS1/4	41.2
	PSS4/1	214.3
Deciduous Shrub	PSS1	22.1
Deciduous Shrub/Herbaceous	PSS1/EM1	14.9
Ponds	PUB	<0.1
Total		**786.1**

See Cowardin et al. 1979 for the definition of each Cowardin Classification.

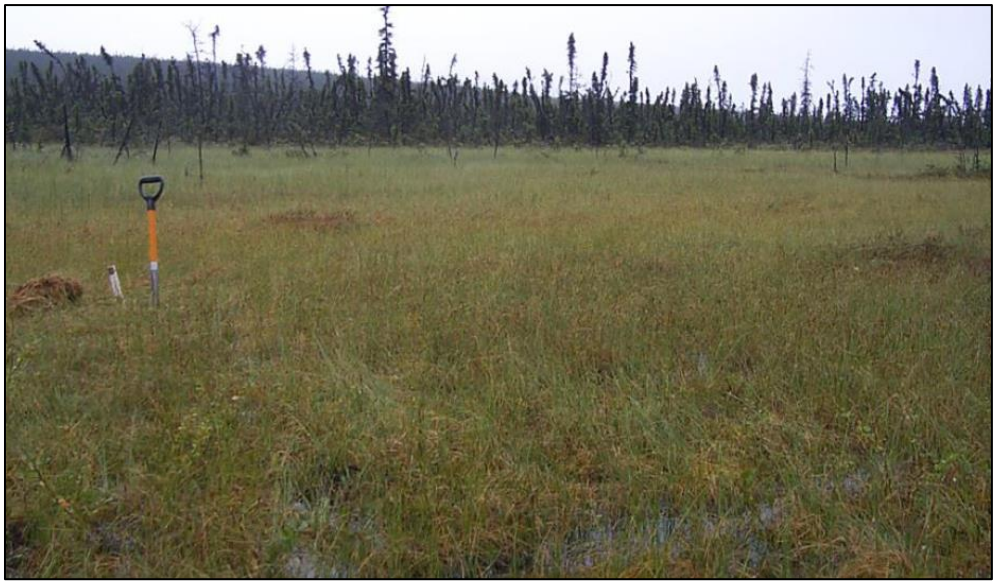
Photo 1 Open Black Spruce Forest Vegetation Type

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 Cowardin Classifications include PSS1/FO4B and PSS1/4B (Photo 2) (Michael Baker 2016).

Photo 2 Black Spruce Woodland Vegetation Type

The dominant source of water for post-disturbance restored wetlands in areas with cut and fill disturbance will be groundwater (Slope Hydrogeomorphic classification). These areas are expected to be dominated by the Wet Herbaceous 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 (Michael Baker 2016).

Photo 3 Wet Herbaceous Vegetation Type



Areas flooded by the Snow Gulch freshwater reservoir are expected to restore as Open Alder Willow Shrub (OAWS) and Open Willow Shrub (OWS) vegetation types. Species commonly found in wetland OAWS plots include speckled alder (*Alnus incana*), Sitka/green Alder (*Alnus viridus*), 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 (Michael Baker 2016).

Photo 4 Open Alder Willow Shrub Vegetation

Photo 5 Open Willow Shrub Vegetation

Wetland Impact Minimization Area

Table 1 lists the acres of planned wetland restoration areas by MA facility.

Wetland Impact Minimization Activities

Wetland impact minimization in the MA will generally begin after the cessation of mining activities. The activities will consist of planning and sequencing the loading, hauling, dumping, grading, and restoring of the excavated areas. The overburden material will be removed from the stored locations and be placed at

the final use site in reclamation. The proposed wetland restoration activities are summarized in Table 3. Throughout all phases of the Project, water and erosion control structures will be maintained to protect water quality in adjacent wetlands, streams, and rivers.

Table 3 Wetland Restoration Sites and Proposed Activities

	Wetlands Restoration Activities					
Facility (Impact Type)	Planning and Design	Fill Removal	Return to Original Contours	Grade to Increase Water Retention	Site Preparation	Re-vegetation
TSF Stockpile 1 (cut and fill)	x	x		x	a	x
TSF Material Site-06/TSF Stockpile 2 (cut and fill)	x	x		x	a	x
TSF Material Site-07/TSF Stockpile 3 (cut and fill)	x	x		x	a	x
North Overburden Stockpile (fill)	x	x	x		a	x
Snow Gulch Freshwater Reservoir (fill/pond)		x	x		a	a
South Overburden Stockpile (fill)	x	x	x		a	x

Notes: x – Planned restoration activity; a – If required

The following is a synopsis of each wetland restoration activity:

- Planning and Design – Includes planning the activity and functions, surveying, data collection, analysis, and the engineering design of roads, work fill pads, required facility grades for overburden and growth media deposition, and mine facilities for materials storage necessary to fulfill the final overburden placement. The level of planning, data collection, analysis, and design will depend on the complexity of the Project.

- Fill Removal – Removal of fill with the use of mechanized equipment. Fill removed will be used for mine reclamation. The overburden and growth media will be loaded into haul trucks and moved to final deposition locations.

- Return to Original Contours – After removal of fill, the area topography and elevations will be contoured similar to pre-construction conditions. Ditches will be filled or blocked. Overland surface drainage connectors will be re-established.

- Grade to Increase Water Retention – After removal of fill or gravel extraction activities, the area topography and elevations will be deeper than pre-construction. In these cases, the terrain will be modified to store the overland and precipitation flow, and maximize littoral zones. These 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). New drainage connectors to existing drainages or streams will be established.

- Site Preparation – Preparation of the substrate for re-vegetation. This may include layering the restoration site, or portions of the restoration site, with growth media and/or mulch. Mechanized equipment may 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).

- Re-vegetation – Re-establishment of plant cover by means of seeding, transplanting, 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).

Performance Standards

Vegetation Performance Standards

Vegetation performance standards have been developed to ensure restored and revegetated areas are following a trajectory to be stable and functioning biologically. The draft Oregon Department of State Lands Routine Monitoring Guidance for Vegetation (ODSL 2009) has been used as guidance to develop Donlin Gold vegetation performance criteria. Vegetation performance standards are outlined in Table 4, and will be applied to restored wetlands.

Table 4 Vegetation Performance Standards

Vegetation Type	Performance Standard
Emergent/Herbaceous Wetlands	Cover of native and/or revegetation 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.
	Prevalence Index is less than 3.0 and/or Dominance Test indicator is met.
Shrub-Dominated Wetlands	Cover of native and/or revegetation species is at least 60-percent.
	Cover of invasive species is no more than 10-percent
	Cover of woody vegetation is 25-percent or greater.
	Cover of bare substrate is no more than 20-percent
	Prevalence Index is less than 3.0 and/or Dominance Test indicator is met.

Wetland Hydrology Performance Standards

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 the available indicators as described in the Regional Supplement will be used during the monitoring period. This subset includes three of the four groups of indicators presented in the supplement (Table 5). 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 performance standards.

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 meter-squared (m^2) plots coinciding with the vegetation monitoring sampling.

Table 5 Wetland Hydrology Indicators

Group	Indicator	Category
Group A – Observations of Surface Water or Saturated Soils	A1 – Surface Water	Primary
	A2 – High Water Table	Primary
	A3 – Saturation	Primary
Group B – Evidence of Recent Inundation	B1 – Water Marks	Primary
	B2 – Sediment Deposits	Primary
	B3 – Drift Deposits	Primary
	B4 – Algal Mat or Crust	Primary
	B5 – Iron Deposits	Primary
	B6 – Surface Soil Cracks	Primary
	B7 – Inundation Visible on Aerial Imagery	Primary
	B9 – Water-stained Leaves	Secondary
	B10 – Drainage Patterns	Secondary
	B15 – Marl Deposits	Primary
Group C – Evidence of Current or Recent Saturation	C1 – Hydrogen Sulfide Odor	Primary
	C2 – Dry-season Water Table	Primary
	C3 – Oxidized Rhizospheres Along Living Roots	Secondary
	C4 – Presence of Reduced Iron	Secondary
	C5 – Salt Deposits	Secondary

Monitoring Requirements

Wetland and Pond 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 performance criteria described above and to determine whether remedial actions are necessary to assure the performance 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.

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-m^2 plot. Herbaceous species and percent cover will be recorded within a 1-m^2 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 may lead to active measures to remove non-native plants from restoration areas.

Monitoring Reports

Monitoring reports will be produced annually until the areas meet performance standards.

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Attachment C
Transportation and Pipeline Areas Wetland Impact Minimization Work Plan

Attachment C Transportation and Pipeline Areas Wetland Impact Minimization Work Plan

Objectives

The Donlin Gold Project will fill wetlands in material sites in the TA and PA. Donlin Gold has developed a specific work plan to restore wetland habitat impacted by the development of material sites in both areas. The restoration activities described in this work plan are beyond the reclamation requirements established by the State of Alaska for material sites. Donlin Gold has established specific performance standards and goals for wetland restoration and will conduct monitoring to provide a means to ensure these goals are met.

Restoration Sites

All proposed facilities in the Donlin Gold TA and PA were considered for inclusion in this work plan including: camps, airstrips, access roads, work pads, material sites, and work in the pipeline right of way. Material sites were identified as the most likely to provide feasible areas for wetland restoration based on proximity to groundwater hydrology (water table), favorable slope position, and the final shapes (concave) of the sites. Material site boundaries were examined with regard to the 2016 Donlin Gold PJD wetland mapping (Michael Baker 2016). As shown in Table 1, these areas selected to be restored include a total 34.7-acres of wetlands for three material sites in the TA, and 10.2-acres for three material sites in the PA. The goal of this plan is to restore a total of 44.9-acres of wetlands within the four HUC-10 watersheds in which they were originally impacted.

Table 1 Material Site Wetland Impact Minimization and Restoration

Area	Site Name	HUC-10	Figure	Wetland Acres Impacted	Wetland Acres Restored
TA	Material Site-10	Crooked Creek	1	25.3	25.3
	Material Site-12	Crooked Creek	2	1.5	1.5
	Material Site-16	Veahna Creek-Kuskokwim River	3	7.9	7.9
			Subtotal	*34.7*	*34.7*
PA	Material Site-01	Theodore River	4	2.2	2.2
	Material Site-38	Middle Big River	5	0.1	0.1
	Material Site-41	Headwaters Tatlawiksuk River	6	7.9	7.9
			Subtotal	*10.2*	*10.2*
Total				**44.9**	**44.9**

Transportation Area Material Sites

Transportation Area 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 overall 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)[1]. Three material site areas (cells) will be excavated, totaling 75.9-acres within TA Material Site-10. 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. Upon mine closure, the plan is to create ponds and littoral zone habitat and connect them to Getmuna Creek by engineered channels. Littoral zones are a productive area of 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 along the edges of the ponds. In total, 25.3-acres of wetlands will be restored to include ponds, emergent wetlands, and connecting channels for fish access, including 12.3-acres outside of the cells.

Several of the created ponds are expected to provide rearing and overwintering habitat for fish. 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 gravel 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 presently documented upstream from the forks 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).

Transportation Area 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 TA 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 wetland. The swale contains Slope Hydrogeomorphic (HGM) [Brinson 1993] wetlands that are seasonally flooded from an intermittent headwater stream.

The site comprises a total of 14.2-acres, including 1.5-wetland acres (Figure 2). The final material site pit design is for a 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.

[1] The site photographs and overview images in this document are labeled by the field plot number and project wetland data, found in the 2016 PJD Report (Michael Baker 2016).

Transportation Area 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 during fish surveys in Jungjuk Creek.

The site comprises a total of 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 and create a concave feature that 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.

Pipeline Area Material Sites

Pipeline Area Material Site-01

Material Site-01, in the Theodore River HUC-10, is on a high terrace above the Theodore River. The site is 14.7-acres and contains a side channel of the Theodore River and associated wetlands running through it, and a small Flat HGM wetland (Figure 4).

Excavation in wetlands in this material site will lower the ground surface below the water table. The reclamation plan includes converting the material site to ponds with surrounding associated littoral zone habitat, and replacing the existing wetland types on site with ponds and sedge marshes. These new wetlands will be reconnected to the swale/stream system that leads to the Theodore River.

Pipeline Area Material Site-38

Material Site-38, in the Middle Big River HUC-10, is on an upland terrace above the Big River, between the main channel and a side channel (Figure 5). The site is 5.2-acres: 0.1-acres are on existing wetlands, 1.4-acres are in abandoned channel features (which have aggraded to uplands), and 3.7-acres are on a high terrace.

The average depth of excavation in this site is projected to be 18-feet. In this landscape position, excavation will intersect the water table. At a minimum, the 0.1-acres of wetlands originally impacted will be restored.

Pipeline Area Material Site-41

Material Site-41, in the Headwater Tatlawiksuk River HUC-10, is on a wetland terrace and on an interfluve above a tributary to the Tatlawiksuk River. A steep bluff bisects the two landforms (Figure 6). The total size of the material site is 11.2-acres. The bluff is the only upland on the site and is 3.3-acres. The source of water for the 7.9-acres of wetlands is groundwater on the terrace (Slope HGM) and precipitation on the interfluve (Flat HGM).

The excavation in this material site will lower the ground surface to the water table. Upon restoration, the site will be converted back to wetlands (all Slope HGM) and re-establish the impacted wetland acreage at the site.

Figure 1 Transportation Area Material Site-10 Map and Site Photos

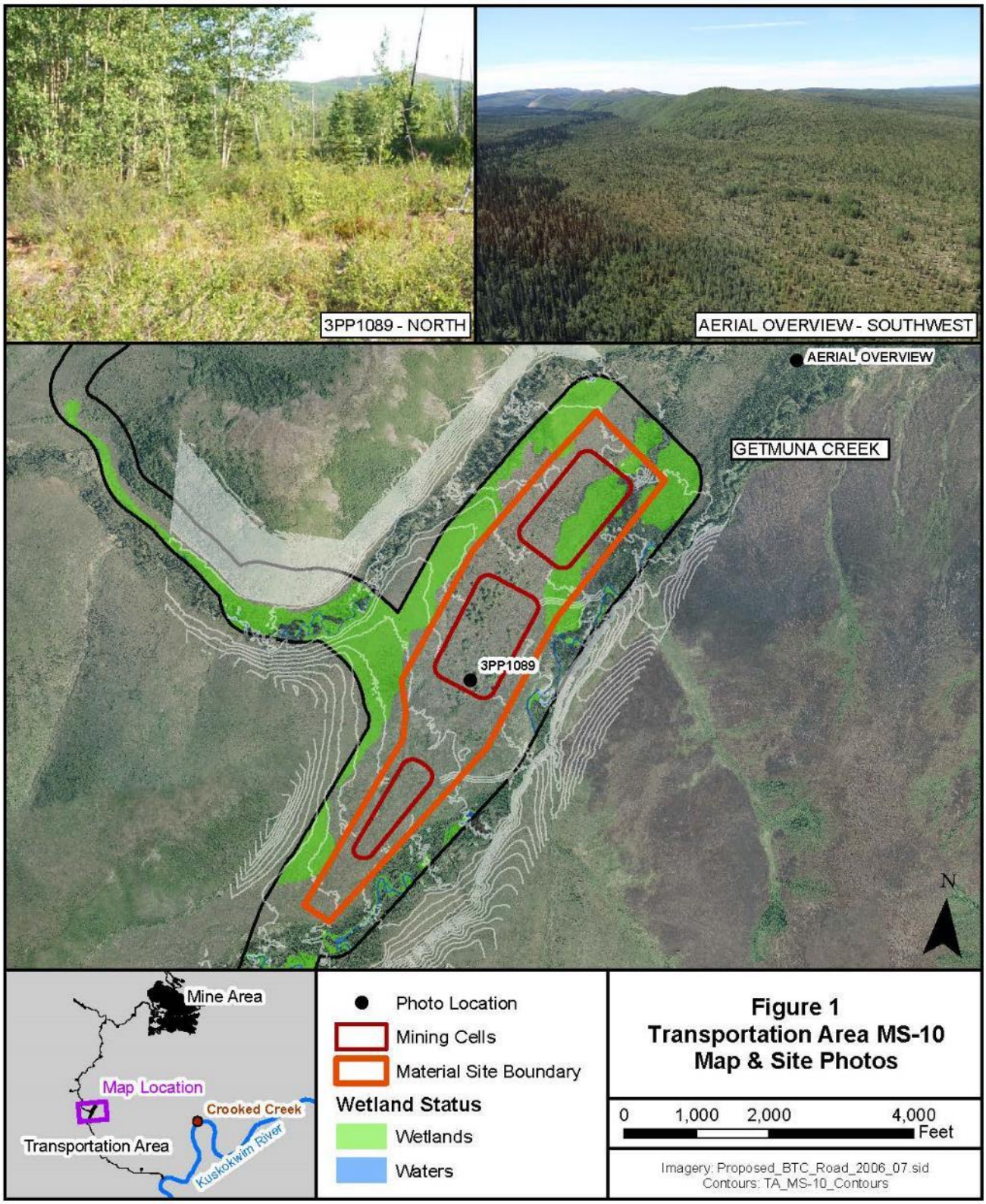
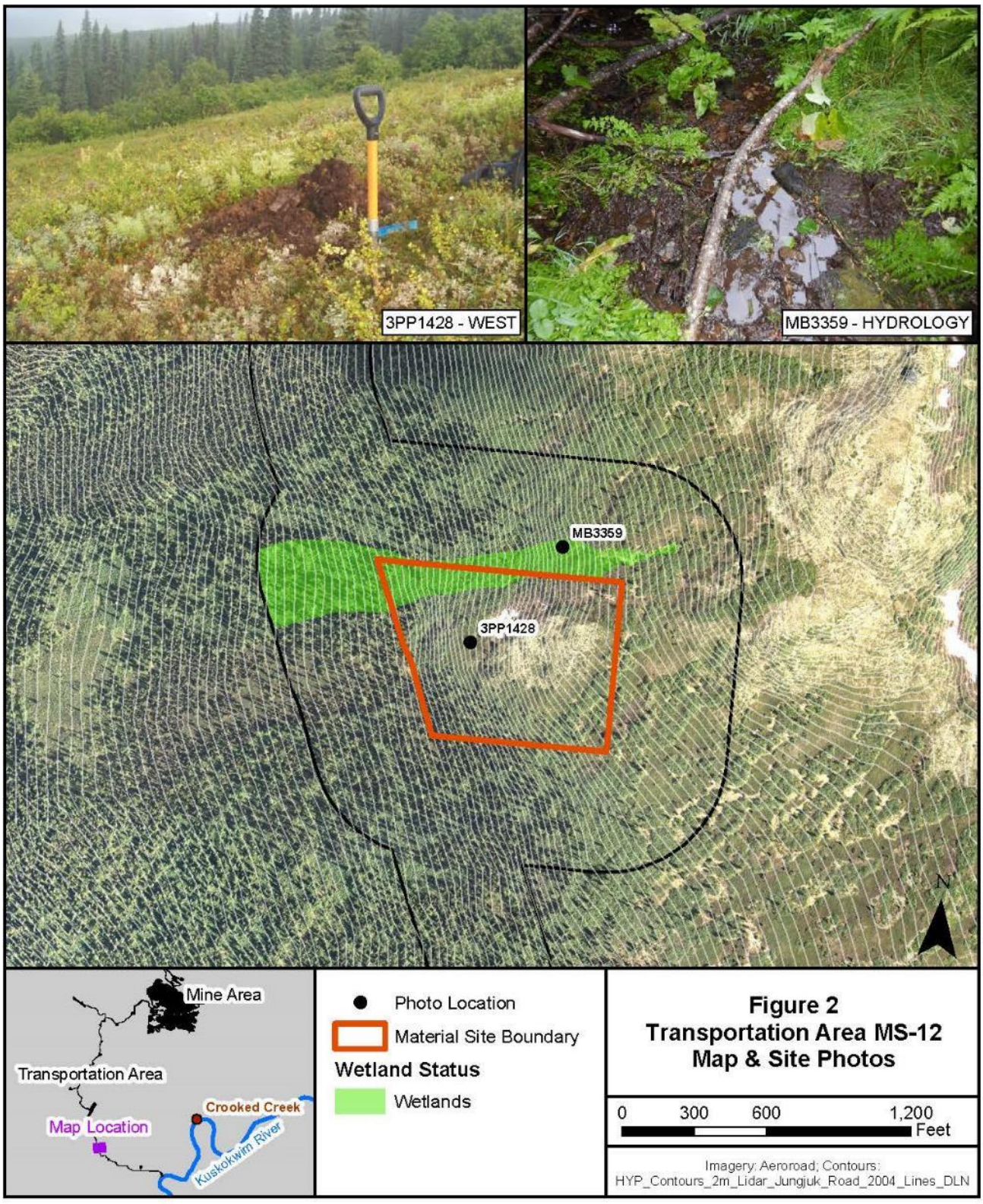


Figure 2 Transportation Area Material Site-12 Map and Site Photos


3PP1428 - WEST
MB3359 - HYDROLOGY
MB3359
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N
Mine Area
Transportation Area
Map Location
Crooked Creek
Kuskokwim River
Photo Location
Material Site Boundary
Wetland Status
Wetlands
Figure 2
Transportation Area MS-12
Map & Site Photos
0 300 600 1,200
Feet
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Figure 3 Transportation Area Material Site-16 Map and Site Photos

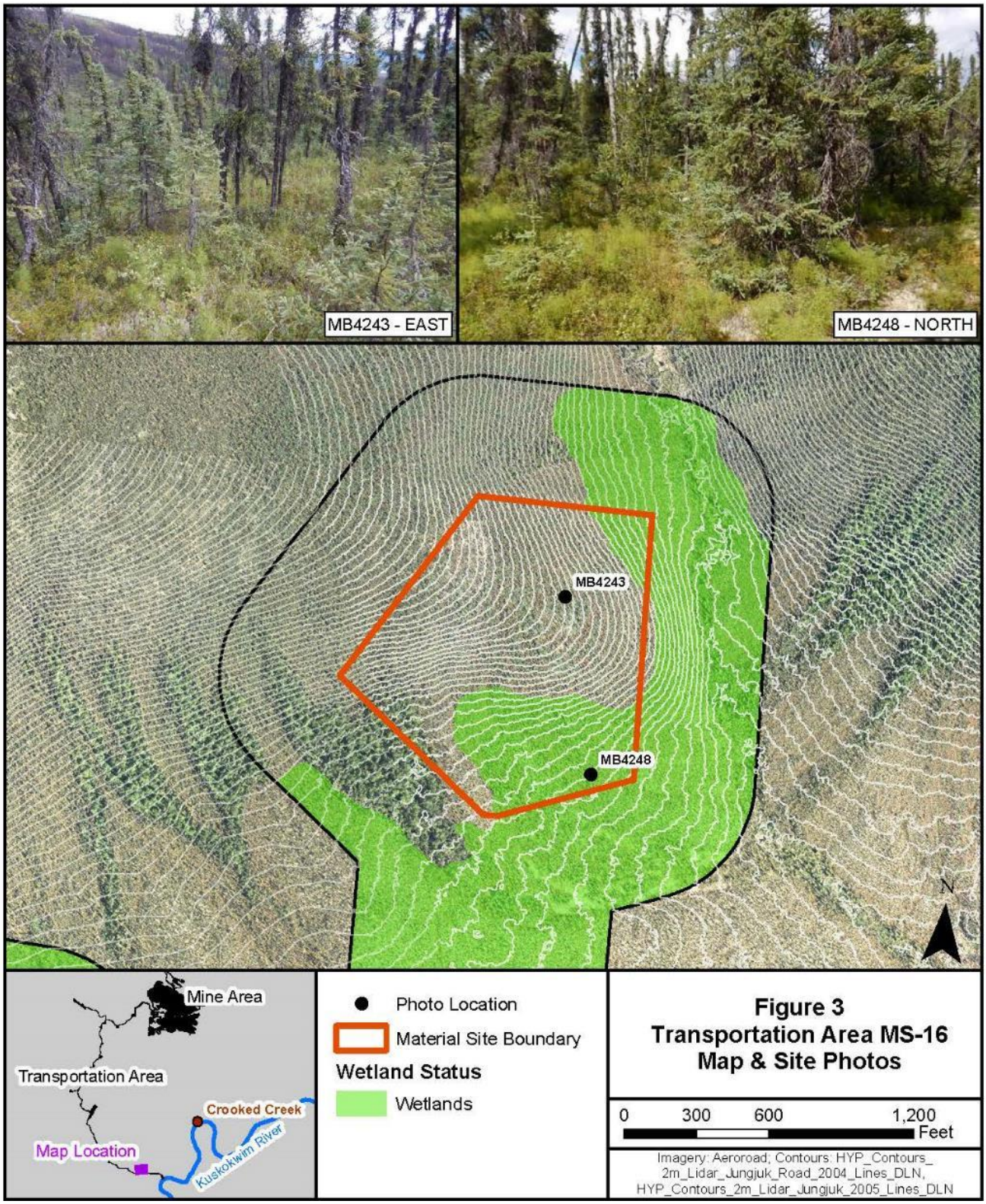


Figure 4 Pipeline Area Material Site-01 Map and Site Photos

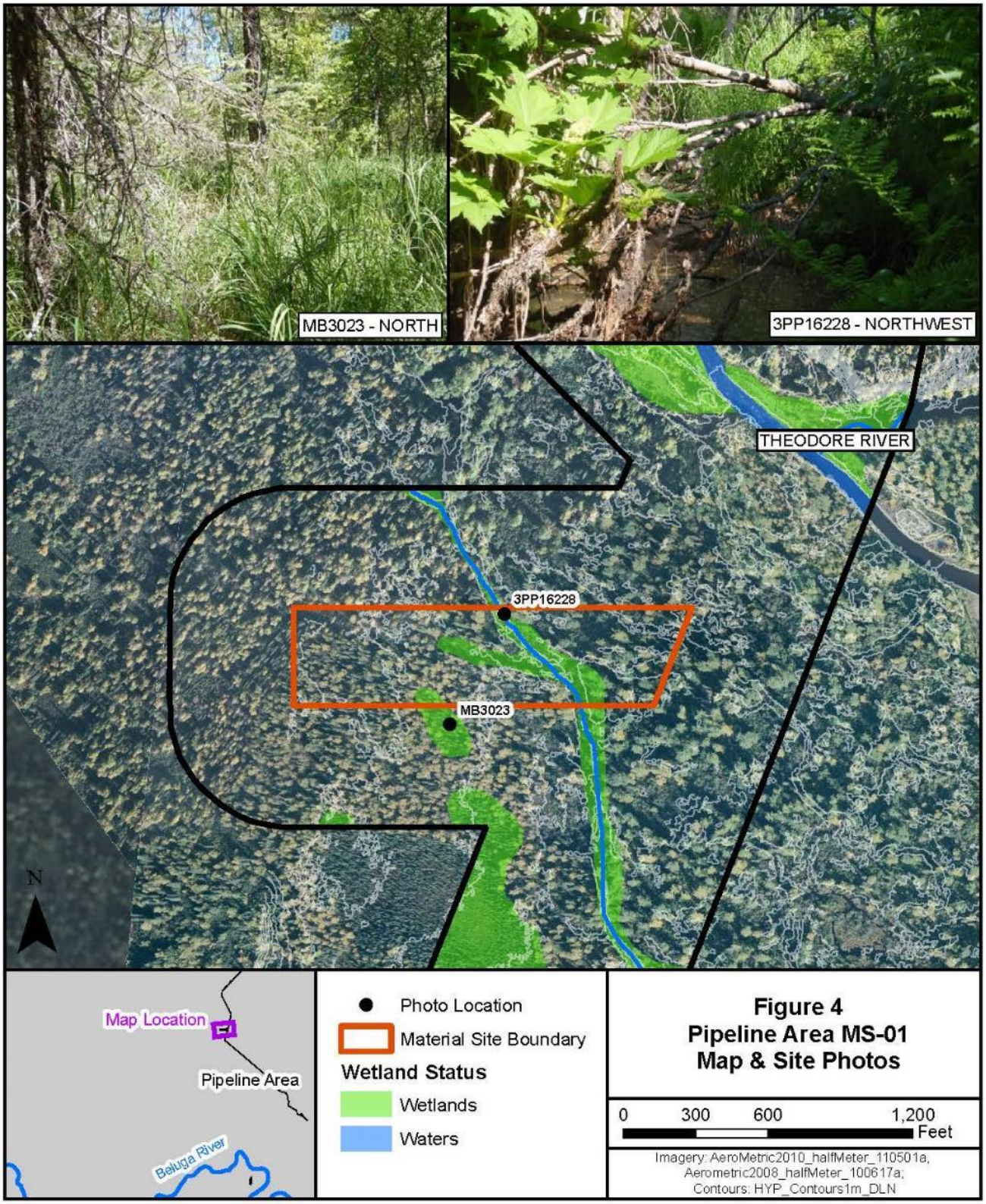


Figure 5 Pipeline Area Material Site-38 Map and Site Photos

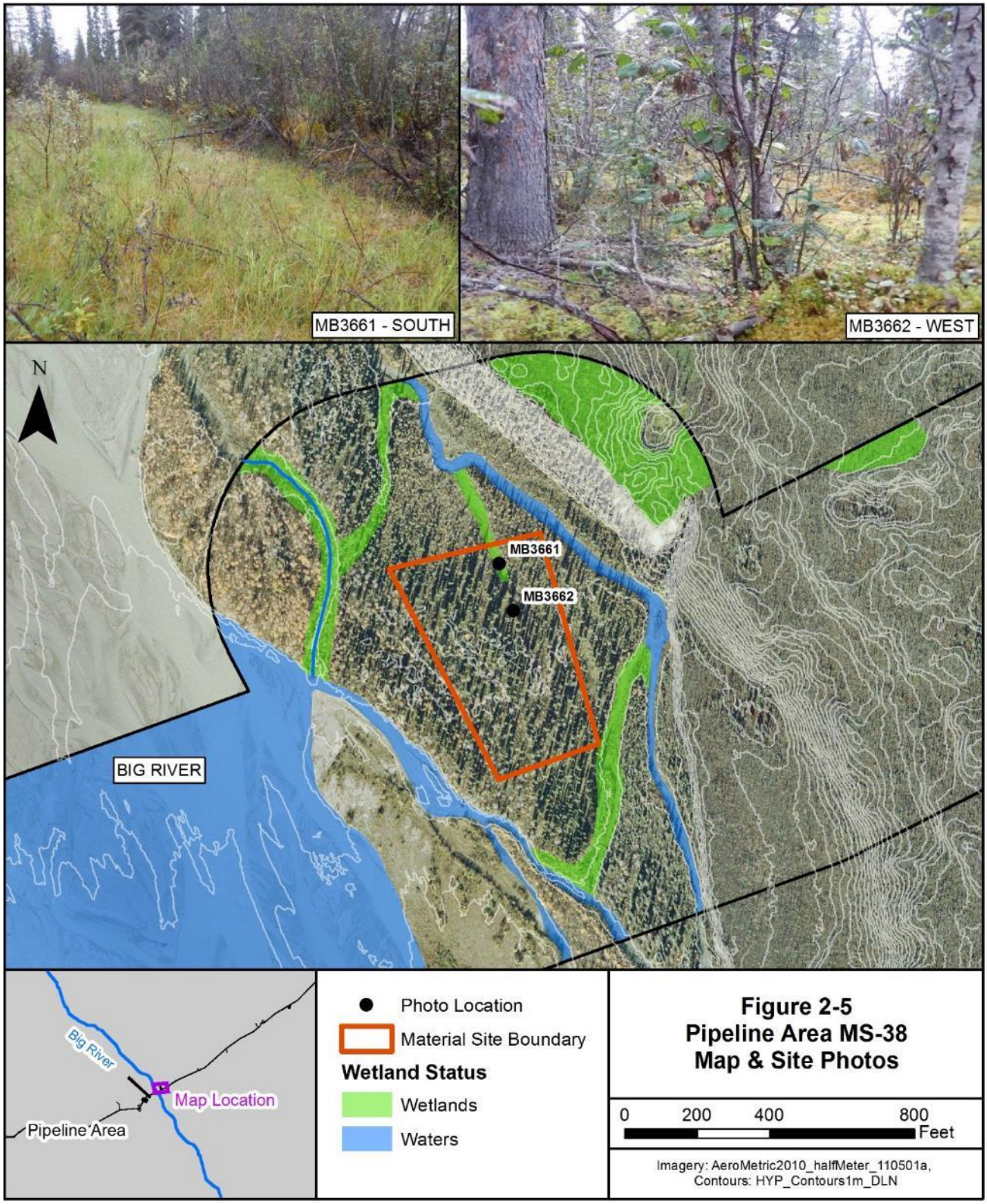
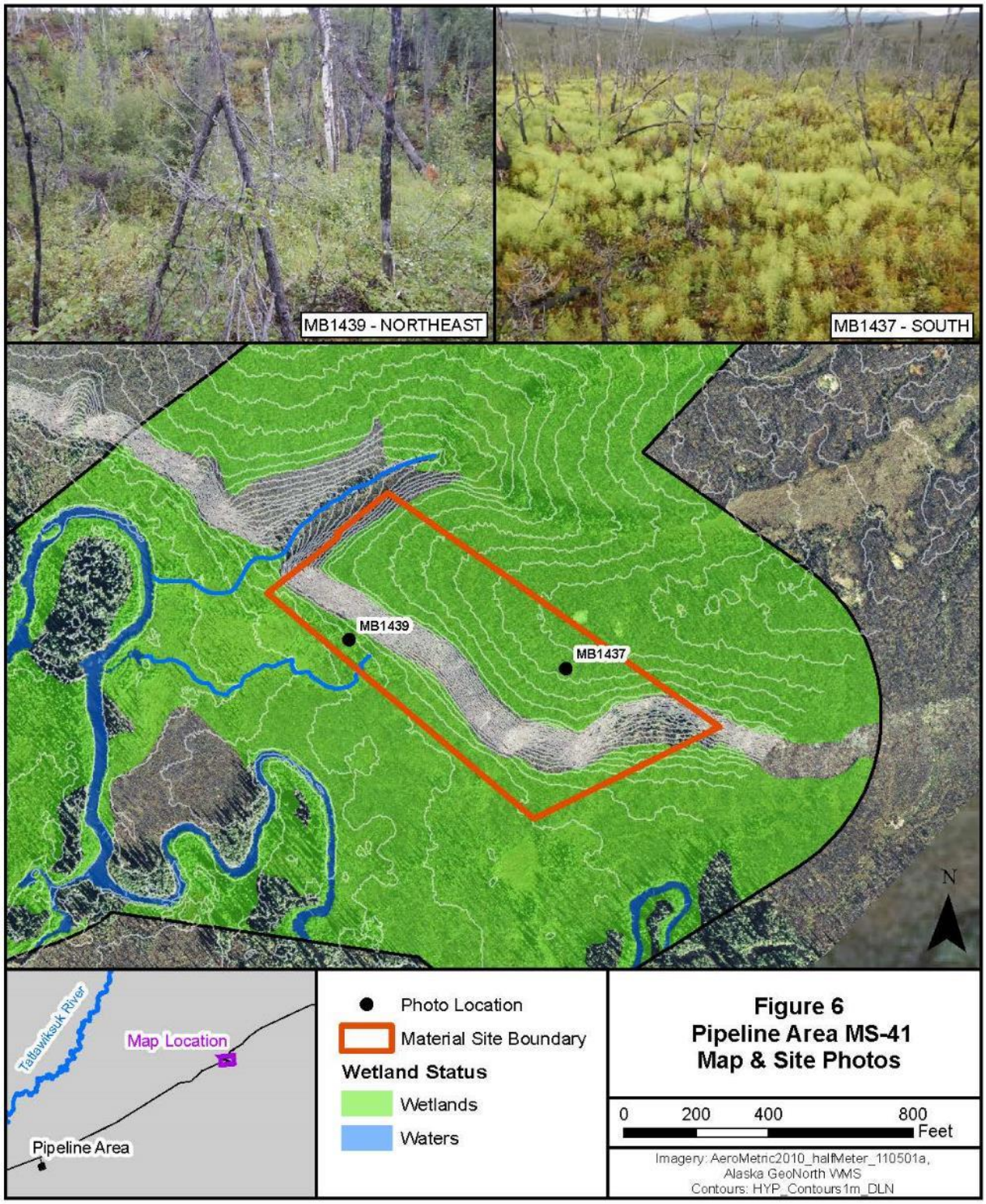


Figure 6 Pipeline Area Material Site-41 Map and Site Photos



Baseline Wetlands Data

The proposed wetland impact minimization areas include HUC-10 watersheds in the Cook Inlet Lowlands, Interior Alaska Lowlands, and Yukon-Kuskokwim Highlands Major Land Resources Areas (MLRA). Proposed material sites will impact a variety of wetland habitats (Table 2).

Low Shrub Tundra (LST), OBSF and BSW 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). The most prevalent wetland vegetation type in the PA material sites is LST. Other wetland vegetation types present in the PA sites include Open Alder Shrub (OAS), WMF, OAWS, OBSF, and Wet Herbaceous (WH). All vegetation types are described in the 2016 PJD (Michael Baker 2016).

Table 2 Baseline Summary

Area	Site Name	Wetland Vegetation 1		Wetland Vegetation 2		Wetland Vegetation 3		Total Acres
		Type	Acres	Type	Acres	Type	Acres	
TA	Material Site-10	OBSF/BSW	25.1	WMF	0.2	LST	<0.1	25.3
	Material Site-12	CAS	1.4	OWSF	0.1			1.5
	Material Site-16	BSW	7.9					7.9
PA	Material Site-01	OAS	1.8	WMF	0.2	OBSF	0.2	2.2
	Material Site-38	OAWS	0.1					0.1
	Material Site-41	LST	7.8	OAWS	0.1	WH	<0.1	7.9

Following excavation, the material sites will typically be restored as permanently flooded to semi-permanently flooded waterbodies with wetland margins composed primarily of emergent vegetation with a vegetation classification of WH. 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 Cook Inlet Lowlands MLRA (Lower Skwentna River and Theodore River HUC-10s), WH plots are typically dominated by bluejoint, water horsetail, and a variety of sedges including Leafy Tussock Sedge, Montana Sedge (*Carex media*), and loose-flower alpine sedge (*Carex rariflora*) [Photo 1] (Michael Baker 2016).

Photo 1 Wet Herbaceous Vegetation, Theodore River HUC-10

In the Interior Alaska Lowlands MLRA (Headwaters Tatlawiksuk, Middle Big, and Windy Fork Middle Fork Kuskokwim Rivers HUC-10s), dominant vegetation in WH plots can include leafy tussock sedge and Russet-Bristle Cotton-Grass (*Eriophorum russeolum*). A variety of other sedges including Bigelow's sedge, mud sedge (*Carex limosa*), loose-flower alpine sedge, few-flower sedge (*Carex pauciflora*), and Northwest Territory sedge (*Carex utriculata*) can also be dominant (Photo 2) [Michael Baker 2016].

Photo 2 Wet Herbaceous Vegetation, Middle Big River HUC-10

In the Yukon-Kuskokwim Highlands MLRA (Crooked Creek and Veahna Creek-Kuskokwim River HUC-10s), WH plots typically contain leafy tussock sedge, Northwest Territory sedge, bluejoint, and purple marshlocks as dominant plants (Photo 3) [Michael Baker 2016].

Photo 3 Wet Herbaceous Vegetation, Crooked Creek HUC-10

Wetland Impact Minimization Area

The wetland minimization is measured in acres. The restoration acreage at the material sites in the TA and PA totals 44.9-acres (Table 3).

Table 3 Wetland Impact Minimization and Material Sites

Area	Site Name	Wetland Acres
TA	Material Site-10	25.3
	Material Site-12	1.5
	Material Site-16	7.9
	Subtotal	*34.7*
PA	Material Site-01	2.2
	Material Site-38	0.1
	Material Site-41	7.9
	Subtotal	*10.2*
	Total	**44.9**

Wetland Impact Minimization Activities

Restoration of material sites in the TA and PA will vary based on timing and duration of material removal from the sources, and the sequence of the construction. Construction in the PA is projected for two years after permit issuance. 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 in the TA 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 as soon as practicable. Material Site-10 in the TA will provide material for road construction as well as aggregate for concrete for mine operations. Restoration will not occur at this site until the first cell can be restored or until mine closure. This is currently projected between 27 and 30-years after mining operations commence.

Work at the material sites will typically be completed in four phases: construction, operation, restoration, and monitoring (Table 4).

Table 4 Material Site Work Schedule

Years	Phases and Objectives
0 to 1	**Construction:** Design, plan, survey, construct the access road and facilities; grade, remove and stockpile organics and topsoil.
0 to MSC (Material Site Closure)	**Operation:** Maintain water and erosion control structures; excavate, stockpile, and use the material; complete interim reclamation; monitor.
Within First Year after MSC	**Restoration dirt work:** Re-grade and re-contour excavation; remove and reclaim roads, facilities, stockpiles, ditches, berms; spread topsoil and organics; create final water and erosion control structures.
Within Second Year after MSC	**Restoration vegetation:** Develop seed bed plans; preparation of bed, fertilizing, mulch additions, planting, and seeding; organic control for desired vegetation mix.
2 Years after MSC	**Monitoring:** Ensure site meets final performance standards.

Throughout all phases of the Project, 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. 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 all material sites included in this work plan is projected to intersect the water table. The cells are anticipated to be bailed 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 pit operations in areas 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).

Performance Standards

Vegetation Performance Standards

Vegetation performance standards have been developed to ensure restored and revegetated areas are following a trajectory to be stable and functioning biologically. The draft Oregon Department of State Lands Routine Monitoring Guidance for Vegetation (ODSL 2009) has been used as guidance to develop Donlin Gold vegetation performance criteria. Vegetation performance standards are outlined in Table 5, and will be applied to restored wetlands.

Table 5 Vegetation Performance Standards

Vegetation Type	Performance Standard
Emergent/Herbaceous Wetlands	Cover of native and/or revegetation 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.
	Prevalence Index is less than 3.0 and/or Dominance Test indicator is met.
Shrub-Dominated Wetlands	Cover of native and/or revegetation species is at least 60-percent.
	Cover of invasive species is no more than 10-percent
	Cover of woody vegetation is 25-percent or greater.
	Cover of bare substrate is no more than 20-percent
	Prevalence Index is less than 3.0 and/or Dominance Test indicator is met.

Wetland Hydrology Performance Standards

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 the available indicators as described in the Regional Supplement will be used during the monitoring period. This subset includes three of the four groups of indicators presented in the supplement (Table 6). 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 performance standards.

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-m^2 plots coinciding with the vegetation monitoring sampling.

Table 6 Wetland Hydrology Indicators

Group	Indicator	Category
Group A – Observations of Surface Water or Saturated Soils	A1 – Surface Water	Primary
	A2 – High Water Table	Primary
	A3 – Saturation	Primary
Group B – Evidence of Recent Inundation	B1 – Water Marks	Primary
	B2 – Sediment Deposits	Primary
	B3 – Drift Deposits	Primary
	B4 – Algal Mat or Crust	Primary
	B5 – Iron Deposits	Primary
	B6 – Surface Soil Cracks	Primary
	B7 – Inundation Visible on Aerial Imagery	Primary
	B9 – Water-stained Leaves	Secondary
	B10 – Drainage Patterns	Secondary
	B15 – Marl Deposits	Primary
Group C – Evidence of Current or Recent Saturation	C1 – Hydrogen Sulfide Odor	Primary
	C2 – Dry-season Water Table	Primary
	C3 – Oxidized Rhizospheres Along Living Roots	Secondary
	C4 – Presence of Reduced Iron	Secondary
	C5 – Salt Deposits	Secondary

Monitoring Requirements

Wetland and Pond 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 performance criteria described above and to determine whether remedial actions are necessary to assure the performance 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 the plant communities.

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-m^2 plot. Herbaceous species and percent cover will be recorded within a 1-m^2 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 may lead to active measures to remove non-native plants from restoration areas.

Monitoring Reports

Monitoring reports will be produced annually until the areas meet performance standards.

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Attachment D
Upper Crooked Creek Permittee-Responsible Mitigation Plan

Attachment D Upper Crooked Creek Permittee-Responsible Mitigation Plan

Objectives

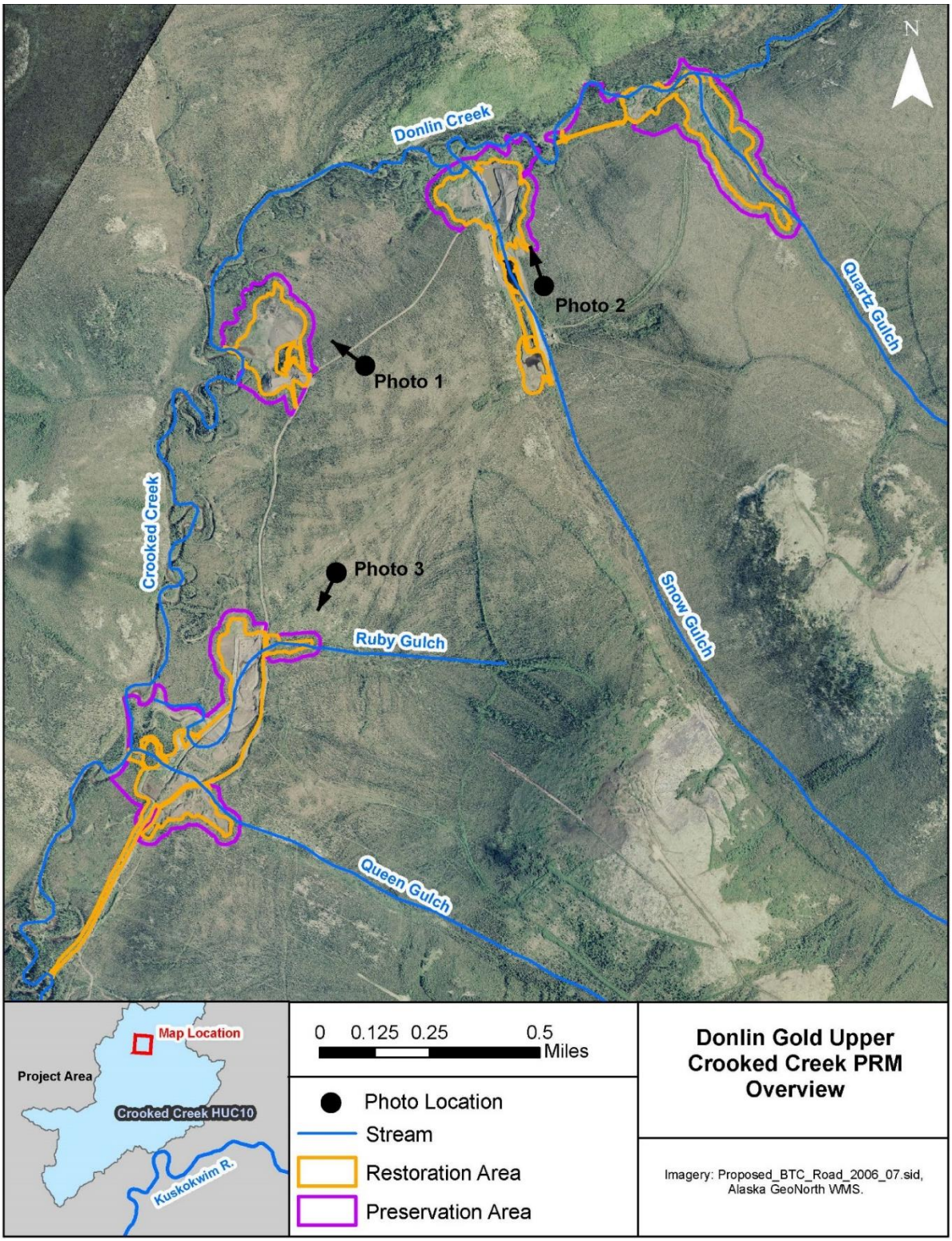
The objective of this PRM Plan (Plan) is to provide a means for restoring, improving (enhancing), and preserving stream habitat and associated wetlands and riparian areas in the Upper Crooked Creek watershed. All PRM restoration opportunities were evaluated within Project watersheds, and the Upper Crooked watershed was determined to be the only viable option. The restoration area is comprised of areas from past placer mining operations near Crooked Creek and along several of its tributaries (Quartz, Snow, Ruby and Queen Gulches, and Donlin Creek) [Figure 1]. Implementation of the plan will provide compensatory mitigation if the DA permit POA 1995-120 is issued for the Donlin Gold Project. This Plan addresses previous placer mining related adverse impacts to wetlands, streams, and other aquatic resources. It describes on-site and in-kind wetland and stream channel restoration and preservation methods, and includes the following components:

- Restore geomorphically stable channels and floodplains in the lower reaches of Quartz, Snow, Ruby, and Queen gulches.
- Remove barriers to fish passage and improve anadromous and resident fish-rearing habitat in the placer mine-impacted reaches of Snow, Ruby, and Queen gulches.
- Create habitat to replace estimated losses of fish habitat from mine construction, primarily in American Creek.
- Preserve restored wetlands and aquatic habitat that includes a riparian buffer around the restoration areas with concurrence from the landowners.
- Begin site restoration concurrently, or as soon as equipment is available, with the initiation of construction activities at the mine site.

The Upper Crooked Creek restoration and preservation area is in the Crooked Creek HUC-10 watershed, approximately 15-miles north of the village of Crooked Creek. The geographic centroid of the area is NAD83 Latitude 62.0735 North, and Longitude 158.1959 West. Riverine HGM wetlands are adjacent to the streams, with fringes of Slope HGM wetlands discharging water into the system, and large Flat HGM complexes on the hillsides. The 2016 PJD report and mapping of the study area describes and categorizes the wetlands and waters (Michael Baker 2016).

Placer mining has occurred in the upper Crooked Creek watershed since the early 20th century, causing adverse impacts to aquatic resources. This activity has resulted in the disturbance and reduction of aquatic habitats, including anadromous and resident fish-rearing habitat. No placer mining is currently ongoing in any of the targeted drainages. This Plan proposes to restore the previously placer mined areas to a higher standard than those currently required by the Alaska Department of Natural Resources (ADNR) for placer operations. The existing placer mined areas have been reclaimed and meet ADNR requirements for placer mining reclamation, but will be further restored to improve aquatic habitat.

Figure 1 Restoration Area Project Overview, Upper Crooked Creek Watershed



Site Selection Criteria

Selection of this PRM site to offset losses to aquatic resources from the Donlin Gold Project addresses the specific need for advancing and sustaining aquatic resource function. Functions include terrestrial and avian habitat enhancements, water quality improvements, flood control, and fisheries support. The PRM sites in the Upper Crooked Creek drainage previously disturbed by placer mining were selected based on the following factors:

1. *Proximity to the MA*. The proposed PRM sites are within the same HUC-10 watershed as the MA. These sites can be used to replace and restore aquatic resource functions and values lost during historical placer mining, and provide PRM opportunities to mitigate aquatic resources impacted by the MA and TA activities.

2. *Potential likelihood for success of site restoration.* Fish passage is currently inhibited by blockages created during placer mining activities in the area. As designed, restored aquatic habitats will be self-sustained by existing hydrologic inputs. The restoration areas are in direct proximity to perennial streams.

3. *Ecological site factors.* Mitigation will increase aquatic habitat diversity and connectivity, establish Riverine HGM aquatic habitat types, provide habitat for ecologically important wildlife species (e.g., salmonids), and maintain water quality. Additionally, the proposed mitigation is consistent with the 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."

4. *Potential threat to the aquatic habitat.* The Upper Crooked Creek area contains streams, wetlands, floodplains, and riparian resources that have been adversely impacted by historic placer mining. If the area is not restored, it may continue to be a source of sediment and erosion, and a likely place for invasive species to establish.

5. *The timing of the mitigation action*. Site restoration can begin concurrently, or as soon as equipment is available, with the initiation of construction activities at the MA.

The existing aquatic resources, including the vegetation types and streams in the study area, were delineated as part of the 2016 Donlin Gold PJD (Michael Baker 2016). The proposed mitigation measures in the disturbed areas are designed to improve and protect fish habitat, reduce sediment load into Crooked Creek, and increase riparian habitat along stream channels.

Site Protection Instrument

Donlin Gold will supply a detailed site protection instrument acceptable to the USACE in advance of Project construction. Donlin Gold has the concurrence of TKC (surface landowner), Calista (subsurface landowner) and the Lyman Family (leaseholder) to establish the site protection instrument following restoration activities. The following activities will be strictly prohibited by the site protection instrument:

- Any excavating of soils, sediments, and other substrates with the exception of any that may be related to approved habitat enhancement projects (i.e. building additional fish habitat).

- Any discharge of dredge or fill materials into WOUS except in PRM areas.
- 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.
- Storage, abandonment, stockpiling, or disposal of any earthen materials, debris, refuse, supplies, durable materials, or other manmade objects.
- Changing the surface hydrology of the area by ditching, pumping, damming, or other de-watering or hydrating methods.

Baseline Information

Historical Placer Mining

Historical gold placer mining has occurred in the proposed restoration area and vicinity since the early 20th 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 1 Placer Mining Tailings Area (View Toward Northwest)

Fisheries

Surveys in Snow Gulch have documented the presence of Dolly Varden and adult coho salmon. Surveys in Crooked Creek have documented presence of Chinook, coho, and chum salmon above Queen Gulch, and

coho and chum salmon above Snow Gulch. Additionally, Dolly Varden, Arctic grayling, slimy sculpin, burbot (*Lota lota*), and round whitefish are present in Crooked and Donlin creeks.

Hydrology

The site hydrology is controlled by Crooked Creek, Donlin Creek and the following drainages: Quartz Gulch (761-acres), Snow Gulch (2,183-acres), Ruby Gulch (303-acres), and Queen Gulch (458-acres). Quartz, Snow (Photo 2), Ruby, and Queen gulches (Photo 3) have been extensively degraded in their lower reaches from placer mining activity beginning in 1910.

Restoration plans (Appendix A) have been designed to maximize the probability of success with minimal management required after initial construction. Baseline hydrology survey transects were conducted in 2014 (Appendix B). Water sources for the proposed restoration sites are existing perennial streams and groundwater inputs associated with toe slopes adjacent to the streams.

Photo 2 Lower Snow Gulch Placer Disturbance (View Toward North)

Photo 3 Lower Ruby and Lower Queen Gulches Placer Disturbance (View Toward Southwest)

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 area includes two soil map units: 1) the Yukon-Kuskokwim Highlands, Boreal Flood Plains, and Terraces (R30FPA), and 2) the Yukon-Kuskokwim Highlands, and Boreal and Subalpine Mountains (R30MTC). For unit R30FPA, soil organic depths are typically zero to four inches, composed of peat and other organic matter for boreal scrub, silty terraces. For unit R30MTC, soil organic depths are typically zero to seven 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 PJD (Michael Baker 2016).

Vegetation Types

The disturbed areas are currently dominated by OWS and 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 in the area are described in the 2016 PJD (Michael Baker 2016).

Wetlands

After restoration, the wetland vegetation community is expected to be WH, OWS, and OAWS. Reference undisturbed wetland plot data are found in the 2016 PJD (Michael Baker 2016) and available for each of these vegetation types in the Crooked Creek HUC-10 watershed. Typical reference vegetative cover does not include standing water, dead vegetation, and/or mosses.

- WH communities are typically dominated by hydrophytic herbaceous plants including bluejoint, leafy tussock sedge, purple marshlocks, cottongrass, and other sedges (*Carex spp*.). Total vegetative cover is typically greater than 70-percent (Photo 4).
- Species commonly found in wetland OAWS plots include speckled alder, Sitka/green Alder, diamond-leaf willow, Steven's Meadowsweet, alpine blueberry, and bluejoint. Total vegetative cover is typically greater than 90-percent (Photo 5).
- Species commonly found in wetland OWS plots include several species of willow depending on landscape position such as diamond-leaf willow, felt-leaf willow, and little-tree willow. Understory shrubs include swamp birch and alpine blueberry. Understory herbaceous species include bluejoint and purple marshlocks. Total vegetative cover is typically greater than 90-percent (Photo 6).

Baseline upland communities are Mesic Herbaceous (MH), OWS, and OAWS. Reference MH vegetation communities in the Crooked Creek watershed are typically dominated by bluejoint, with other herbaceous species mixed in, most commonly narrow-leaf fireweed (*Chamaenerion angustifolium*) (Photo 7). Total vegetative cover is typically greater than 90-percent. Upland OWS and OAWS have a similar vegetation composition to wetland sites of the same types, except purple marshlocks is not found in uplands.

Photo 4 Wet Herbaceous Vegetation Type

Photo 5 Open Alder Willow Shrub Vegetation Type

Photo 6 Open Willow Shrub Vegetation Type

Photo 7 Mesic Herbaceous Vegetation Type

Non-Native Plant Species

Surveys in 2014 found eight non-native plant species present in the Upper Crooked Creek area (Table 1). 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 value: Invasiveness Rank (IR) (Carlson *et al.* 2008). An IR value greater than 70 is considered 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).

Table 1 Non-Native Plant Species in the Upper Crooked Creek Area

Species	Invasiveness Score	Invasiveness Ranking
Matricaria discoidea (pineapple-weed)	32	Very Weakly Invasive
Stellaria media (common chickweed)	42	Weakly Invasive
Plantago major (common plantain)	44	Weakly Invasive
Poa pratensis ssp. *pratensis* (Kentucky bluegrass)	52	Modestly Invasive
Trifolium hybridum (alsike clover)	57	Modestly Invasive
Taraxacum officinale (common dandelion)	58	Modestly Invasive
Leucanthemum vulgare (ox-eye daisy)	61	Moderately Invasive
Hordeum jubatum (foxtail barley)	63	Moderately Invasive

Determination of Credits

Restoration Area

Wetland restoration has been measured in acres, while stream restoration has been measured in linear feet and miles. The disturbed restoration area, totaling 101.7-acres, currently contains 37.0-acres of degraded aquatic habitat and 64.8-acres of disturbed uplands (Table 2). Restoration of disturbed habitats from historical placer mining will result in 59.7-acres of wetlands and ponds and 42.0-acres of upland riparian habitat and streams (Table 3). Ponds totaling 11.9-acres will provide fish-rearing habitat, while approximately 8,501-linear feet (1.61-miles) of streams will be restored to allow for proper hydrologic functioning with fish habitat and passage. In addition, two ditches will be filled. Littoral zones will be added to ponds. These 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). Tailing pile mounds and other disturbed sites will be modified by grading or excavating to reduce sedimentation, foster revegetation, and introduce hydrology.

Restoration within each mitigation site is focused on creating and improving wetland habitats and aquatic resources in the watershed, including herbaceous and shrubby Riverine HGM (floodplains and riparian) wetlands, and improving flow for perennial streams and ponds associated with anadromous and resident fish.

Table 2 Current Status of Restoration Area

Resource Type	Area (Acres)
Wetland	27.8
Stream	1.7
Pond (WOUS)	7.5
Upland, disturbed	64.8
Total	**101.7**

*Numbers have been rounded.

Table 3 Post-Mitigation Status of Restoration Area

Resource Type	Area (Acres)
Wetland	47.8
Stream	1.0
Pond (WOUS)	11.9
Upland Riparian	41.0
Total	**101.7**

*Numbers have been rounded.

Preservation Area

A wetland and upland riparian preservation area will be established around restoration areas to provide protection of the restored aquatic habitats from future disturbance including sedimentation, and to maintain permanent connections to Crooked Creek. Upstream of restoration areas, buffers are typically 100-feet, while downstream of restoration areas they are expanded to Crooked Creek and Donlin Creek. Riparian 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. Riparian areas process pollutants and prevent the area itself from serving as a source of pollution by slowing surface flow and allowing for infiltration before water reaches downslope wetlands and streams. The preservation area will aid in maintaining the long-term viability of the aquatic resource (33 CFR 332.3(i)). It totals 71.0-acres (Table 4). The buffer size was selected using guidance from the ADNR Kuskokwim Area Plan for State Lands (1988).

Table 4 Preservation Area

Resource Type	Area (Acres)
Wetland	59.0
Stream	0.1
Pond (WOUS)	0.5
Upland Riparian	11.4
Total	**71.0**

*Numbers have been rounded.

Overall a total of 172.7-acres of area will be restored or preserved. A total of 8,504-linear feet (1.61-miles) of streams will also be restored to allow for proper hydrologic function connecting fish habitat and passage.

Mitigation Work Plan

Mitigation work will take place under six categories of work, described in Table 33 and displayed in Appendix A. Mitigation work will occur in four areas: Ruby/Queen Gulches (Appendix A, Sheets 2-5), Tailings Area (Appendix A, Sheet 6), Snow Gulch (Appendix A, Sheets 7-8), and Quartz Gulch (Appendix A, Sheets 9-11).

Table 5 Mitigation Work Categories

Fill to restore and maintain stable hydrology
Placer mining in the Upper Crooked Creek area rerouted stream channels. Ruby Gulch and Queen Gulch were diverted into a single ditch connecting to Crooked Creek 5,600 to 5,800-feet downstream of their historical outlets. Snow Gulch was extensively rerouted during placer mining, obscuring the historical channel in the lowest 1/10th-mile of the stream. A ditch was excavated near the outlet of Quartz Gulch, creating a potential area where Donlin Creek could reroute. In each of these systems, fill will be placed in disturbed uplands, ditches, and ponds created by placer mining to restore stable hydrology. This will include placing ditch plugs, using berms to reroute streams, and placing check dams.
Cut/fill to restore and enhance wetlands and upland riparian areas
Fill from placer mining was placed into wetlands and streams in all systems. Areas will be recontoured to promote re-establishment of wetlands or properly functioning riparian areas.
Cut/fill to enhance ponds
Placer mining created several ponds in the restoration area. The existing ponds will be enhanced to promote fish habitat by excavating and re-establishing pond elevations and hydrology.
Cut/fill to restore and enhance stream channels
In areas where stream channels have been degraded or rerouted, streams will be regraded and recontoured to geomorphically stable conditions.
Revegetation/Non-native species control
Revegetation of streambanks, wetlands, and riparian areas will be conducted using guidance from the Interior Alaska Re-vegetation and Erosion Control Guide (Czapla and Wright 2012) and the Streambank Revegetation and Protection Guide (ADF&G 2005). Techniques used will be determined by site conditions including soils, hydrology, slope, and aspect. Mulches, topsoil, and fertilizer will be placed as conditions warrant. Certified weed-free seed mixes will be used.
Preservation
A preservation area will be established around the restoration sites to protect them from sediment and erosion following guidance from the ADNR Kuskokwim Area Plan for State Lands (1988).

Ruby and Queen Gulches

Ruby and Queen gulches were mined extensively, forming a series of large depressions. Streams from both watersheds empty into these depressions, forming a series of ponds before following a shared outlet to Crooked Creek through a long ditch that parallels Crooked Creek for 2,400-feet (Photo 3).

The work plan for Ruby and Queen gulches is to restore the streams to an historical outlet into Crooked Creek by separating the ponds with permanent water retention structures, plugging (filling in) the drainage ditch, and breaching a constructed berm in two locations to allow the streams to flow into the historical channel to Crooked Creek. This action will raise the water elevation of the ponds. Adjacent disturbed areas will also be re-contoured into shallow slopes running down to the ponds, allowing wetlands to establish at the lower elevations, and upland riparian habitat in the higher elevations. Disturbed areas above pond and stream high water elevations will be revegetated.

Tailings Area

Placer tailings were processed in an area between Snow and Ruby gulches, leaving separate stockpiles of coarse and fine-grained materials. Coarse-grained tailings were piled in wetlands and uplands while the fine-grained tailings were discharged into Slope HGM wetlands adjacent to the Crooked Creek floodplain, forming an alluvial fan-type deposit (Photo 1). At the lowest elevations of the fan, wetlands remain with hydrophytic vegetation reestablishing in the materials.

Coarse-grained material will be re-vegetated to upland riparian standards, and may require some re-grading to promote slope stability and vegetation establishment.

Fine-grained material covering wetlands will be removed in winter and the area will be re-vegetated with herbaceous hydrophytes to meet herbaceous wetland performance standards. Removed material will be utilized in other places in the wetland restoration area to facilitate development of hydric soils and growth of hydrophytic vegetation.

Snow Gulch

Lower Snow Gulch has been impacted by disturbance that began in 1910 and continued through 2016. A series of excavated ponds are connected by the stream, which has been diverted and channelized in several areas (Photo 2).

The work plan for this area is to: 1) excavate and improve the hydrology of four ponds to enhance fish habitat; 2) return two modified channels to a more stable channel design; 3) close off one channel and replace it with another to return the creek to its historical outlet, and 4) excavate placer tailings adjacent to ponds to create wetlands and enhance littoral zones. Stream channels will be designed to maintain channel stability. Adjacent disturbed upland areas will be recontoured and revegetated.

Quartz Gulch

Quartz Gulch was mined and recontoured leaving two ditches and a partially recontoured stream channel.

The work plan for Quartz Gulch is to re-contour the disturbed area to restore wetlands and return the stream to a stable channel. The diversion ditch in the Crooked Creek floodplain near the outlet of Quartz Gulch will be plugged to restore hydrology. Wetland and upland riparian areas will be revegetated.

Maintenance Plan

The mitigation work plans are designed to minimize the need for regular maintenance. No mechanical devices (pumps) will be used to regulate hydrology, so no physical maintenance is required. Biotic ecosystem engineers (*Castor canadensis* [Beaver]) could threaten newly constructed features by building dams within and below the mitigation area; beaver control will be conducted as necessary.

Performance Standards

Stream and Pond Physical Standards

Physical standards will be assessed for all streams and ponds within the restoration area. The goals for these areas are retention of designed channel lengths and pond acreages. Physical performance will be measured by establishment of stable channels, pond elevations, and outlet structures.

Stream and Pond Biological Standards

In the ponds and some stream reaches, performance standards will include biological standards. Biological performance will be measured primarily by fish use. Following restoration work, fish are expected to be present in the Snow Gulch ponds and restored stream sections, and in the streams and ponds of lower Ruby and Queen gulches, below the low water crossings for the road.

Currently, only ninespine stickleback have been identified in the Ruby Gulch project area; while resident Dolly Varden have inconsistently been documented in Snow Gulch. The restored habitats will be deemed successful when the fish species assemblage using the habitats is documented to be representative of the Crooked Creek drainage. Because the habitats are predominantly designed to produce rearing habitat for juvenile fish, consistent annual use by juvenile Arctic grayling, Dolly Varden, and/or coho salmon will be the performance standard. Use of channels for spawning by coho salmon or resident species, while not a goal of the projects, would indicate a higher than expected performance standard. Spawning by salmon is most likely to occur within the Snow Gulch restored habitat areas as more channels with higher flows will be created when compared with Ruby Gulch.

Pond habitats will provide highly productive aquatic habitats similar in productivity to existing backwaters along Crooked Creek. Invertebrate communities similar in richness and species composition to those found in connected backwaters will be the performance standard. Credit release will be when restored ponds meet or exceed 70-percent of species composition of reference areas. Because of the high annual variability common with aquatic macroinvertebrate populations, species composition rather than macroinvertebrate densities will be the performance standard.

Vegetation Performance Standards

Vegetation performance standards have been developed to ensure that restored and revegetated areas are following a trajectory to be stable and functioning biologically. The draft Oregon Department of State Lands Routine Monitoring Guidance for Vegetation (ODSL 2009) has been used as guidance to develop

Donlin Gold mitigation plan vegetation performance criteria. Vegetation performance standards are outlined in Table 6.

Table 6 Vegetation Performance Standards

Vegetation Type	Performance Standard
Emergent/Herbaceous Wetlands	Cover of native and/or revegetation 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.
	Prevalence Index is less than 3.0 and/or Dominance Test indicator is met.
Shrub-Dominated Wetlands	Cover of native and/or revegetation species is at least 60-percent.
	Cover of invasive species is no more than 10-percent
	Cover of woody vegetation is 25-percent or greater.
	Cover of bare substrate is no more than 20-percent
	Prevalence Index is less than 3.0 and/or Dominance Test indicator is met.
Riparian Areas	Cover of native and/or revegetation 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.

Wetland Hydrology Performance Standards

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 during the monitoring period. This subset includes three of the four groups of indicators presented in the supplement (Table 7). 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 performance standards.

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-m^2 plots coinciding with the vegetation monitoring sampling.

Table 7 Wetland Hydrology Indicators

Group	Indicator	Category
Group A – Observations of Surface Water or Saturated Soils	A1 – Surface Water	Primary
	A2 – High Water Table	Primary
	A3 – Saturation	Primary
Group B – Evidence of Recent Inundation	B1 – Water Marks	Primary
	B2 – Sediment Deposits	Primary
	B3 – Drift Deposits	Primary
	B4 – Algal Mat or Crust	Primary
	B5 – Iron Deposits	Primary
	B6 – Surface Soil Cracks	Primary
	B7 – Inundation Visible on Aerial Imagery	Primary
	B9 – Water-stained Leaves	Secondary
	B10 – Drainage Patterns	Secondary
	B15 – Marl Deposits	Primary
Group C – Evidence of Current or Recent Saturation	C1 – Hydrogen Sulfide Odor	Primary
	C2 – Dry-season Water Table	Primary
	C3 – Oxidized Rhizospheres Along Living Roots	Secondary
	C4 – Presence of Reduced Iron	Secondary
	C5 – Salt Deposits	Secondary

Monitoring Requirements

Stream and Pond Monitoring

Physical and biological monitoring will occur throughout the created habitats to determine physical and biological success of the restored habitats for credit release.

Physical monitoring of new channels, former diversions, check dams, ditch plugs, ponds, and constructed outlets will be conducted annually after spring break-up, and after each high-water event during the first three-years post-construction. All features will be photo-documented and measurements of stream width (wetted, ordinary high water, bankfull, floodplain), depth, and velocity collected to ensure features are conforming to design criteria.

Fish monitoring will be conducted, at minimum, annually in stream and pond habitats within the project areas. A combination of fyke nets in pond habitats and minnow traps in stream habitats will be employed to capture fish and produce catch per unit of effort comparisons and estimates of numbers of fish using the mitigation habitats. In addition, sampling will be timed to document various important life history phases for fish anticipated to use the habitats. For example, sampling each spring would detect spawning grayling, and sampling each fall would document spawning coho salmon. Generally, most fish sampling efforts would be mid-summer to identify peak uses by all species.

Aquatic invertebrate sampling will be conducted primarily with surber samplers in streams near pond outlets in mid-summer to capture the period of peak abundance and species diversity. Aquatic invertebrate sampling may also be conducted with benthic samplers and/or sweep nets in ponds to

document species using the ponds. Lower trophic level sampling for periphyton standing crop will be conducted in concert with aquatic invertebrate sampling.

Wetland and Upland Riparian Monitoring

Wetland and upland riparian 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 performance standards described above and to determine whether remedial actions are necessary to assure the performance standards are met.

Monitoring of restored wetlands 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 the establishing plant communities.

Monitoring will be established along transects. Points will be located where a wetland status transition is expected to occur. Additional points may be included to fully characterize the transect, especially along intervals where wetland status is not expected to change. Transects will be placed at sufficient density to fully characterize the restoration site.

Transect and 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-m^2 plot. Herbaceous species and percent cover will be recorded within a 1-m^2 quadrat placed at random in the plot area. Hydrology will be characterized at wetland sampling points. All non-native plant species and their relative cover will be recorded. Non-native plant recruitment data may lead to active measures to remove non-native plants from restoration areas.

Monitoring Reports

Monitoring reports will be produced annually until the areas meet performance standards for credit release. Pond and stream performance, based primarily on fish presence, will be contained in one report, while a separate report will document wetland and riparian performance. The reports will include a comparison between the proposed restoration activities and the on the ground results. The wetlands, ponds, acreage and stream length will be quantified and recorded. Credit release will be requested based on actual performance.

Long-term Management Plan

Long-term management of the PRM area is essential to meeting performance standards over the long-term.

Stream and Pond Long-term Management

Post-credit release monitoring will continue to track physical and biological conditions of the wetlands, ponds, and stream habitats. Over time, biological monitoring efforts may be reduced in frequency and intensity as consistent long-term performance is shown.

Wetland and Upland Riparian Long-term Management

The overall focus of long-term management in wetland and upland riparian areas is to ensure hydraulic contact between the plant community and the plant growth medium in wetlands, and the continued exclusion of non-native plant species. The plant growth medium and the regraded soils should not erode down-gradient causing water quality issues. Yearly inspections will be conducted concentrating on:

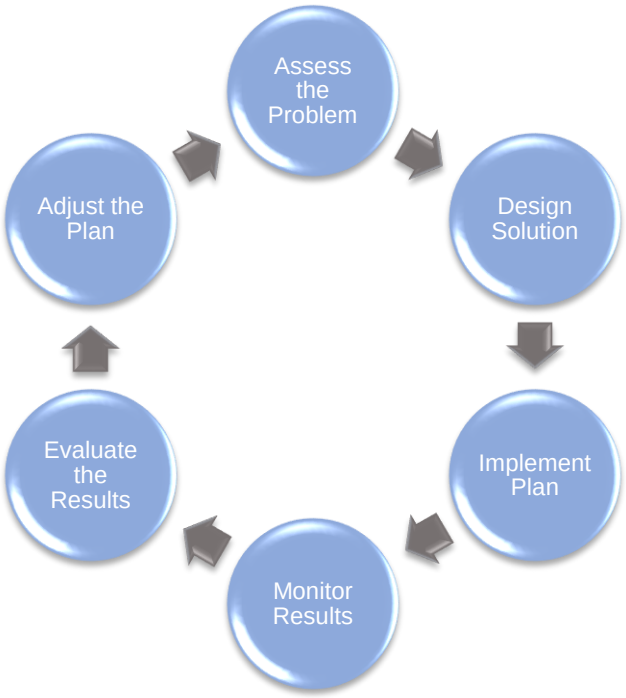
- Plant growth meeting performance standard
- Surface erosion and control noting if corrective action is required
- Beaver management
- Adverse events (flood, aufeis, fire, etc.)

Adaptive Management Plan

The adaptive management plan works toward a successful Project by adjusting and adapting to issues with implementation and onsite conditions. The restoration site will be monitored to determine if unanticipated conditions are found early in the process, such as excessive erosion, poor vegetation growth, or unexpected flow conditions that need to be addressed. If site conditions fail to meet performance standards during monitoring, the design and mitigation work plan will be reviewed and adjusted to implement a solution.

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 Project management. To have a successful PRM Project, Donlin Gold understands it will be necessary to follow six steps in an adaptive management process (Figure 2). Within each step, several essential elements will be completed. An adaptive management plan requires an adjustment if the original objectives are not met. Adaptive management is a process of connecting and linking the information from the PRM design, implementation, construction, monitoring, and evaluation phases to ensure the initial design functions and meets the intended standards and objectives. If monitoring demonstrates a corrective action is needed, Donlin Gold will adjust the maintenance plan or work plan to meet the performance standards of the PRM Plan. Adaptive management continually evaluates the results and adjusts work elements to meet the overall objective (Ministries of Forests and Range 2008). As part of adaptive management, other credit options may be evaluated. Donlin Gold is fully committed to this framework for a successful PRM Project.

Figure 2 Adaptive Management Cycle (Ministries of Forests and Range 2008)



Financial Assurances

Donlin Gold agrees to provide a financial assurance instrument acceptable to USACE prior to commencing work authorized by the DA permit.

Donlin Gold is fully responsible for:

- All permit acquisition and compliance
- Project design, set up, management, planning, support, and execution of the PRM Plan
- Site inventory, data collection, and monitoring
- Meeting and following the:
    - Mitigation Work Plan
    - Maintenance Plan
    - Performance Standards
    - Monitoring Requirements
    - Long-term Management Plan for Upper Crooked Creek
- Reporting to USACE

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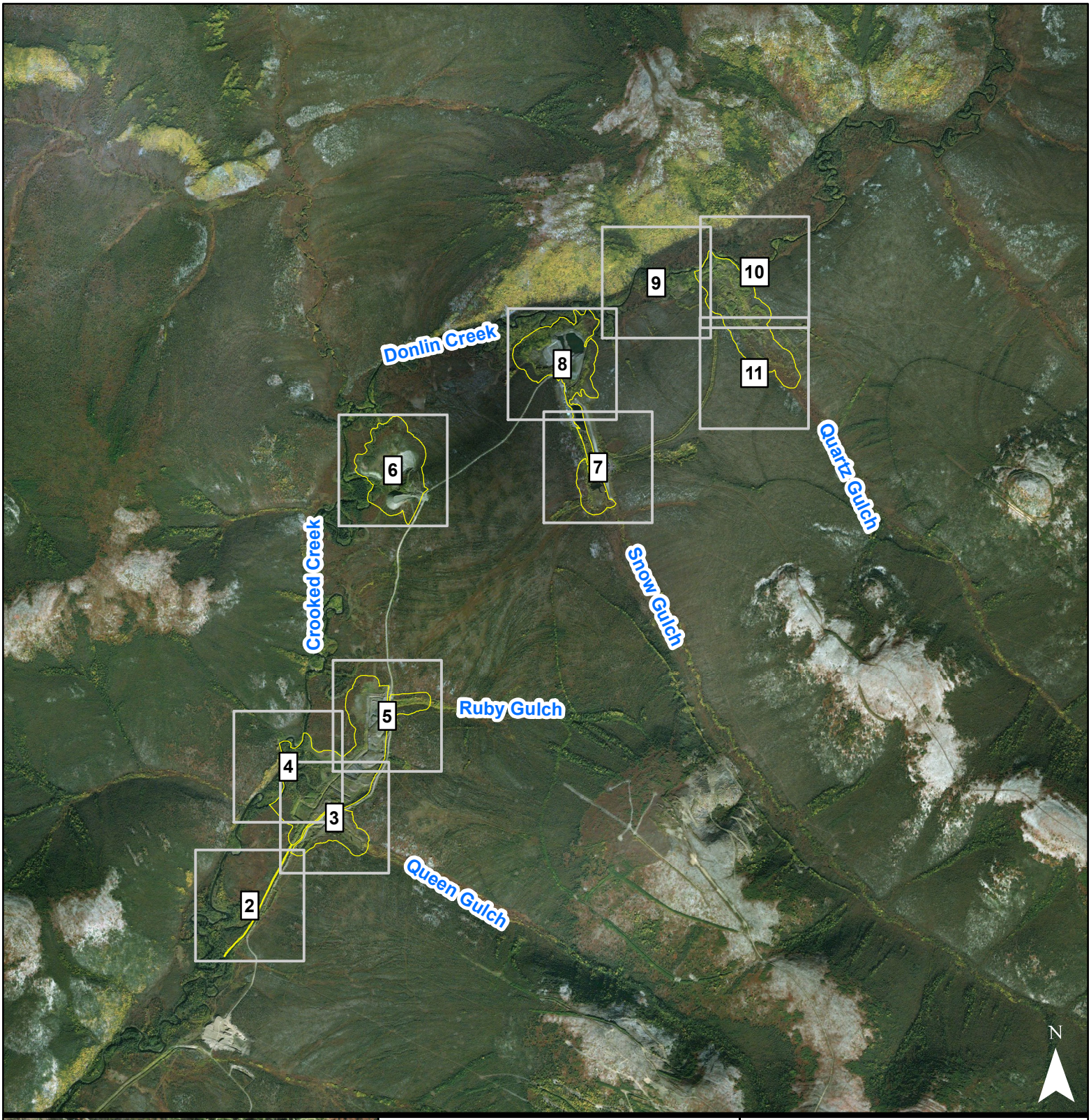
Appendix A

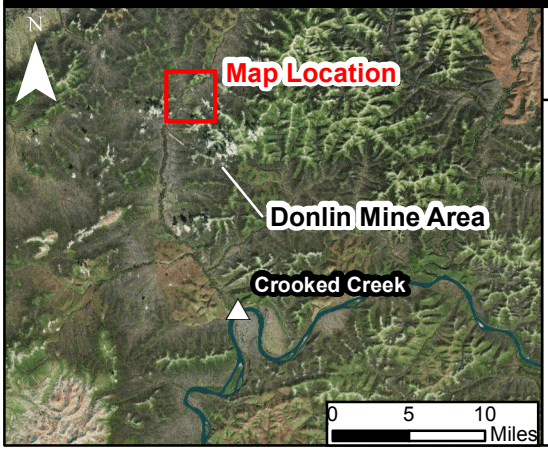
Appendix A presents maps and schematics for the Upper Crooked Creek Permittee-Responsible Mitigation plan.

Sheet 1 displays an overview of the area and a sheet index.

Sheets 2-11 each have three sub-sheets (a-c) that display baseline conditions (a), restoration plans (b), and expected final wetland status (c).

Sheets 12-20 display conceptual schematic cross sections of restoration work.





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Sheet Location

Mitigation Area Boundaries

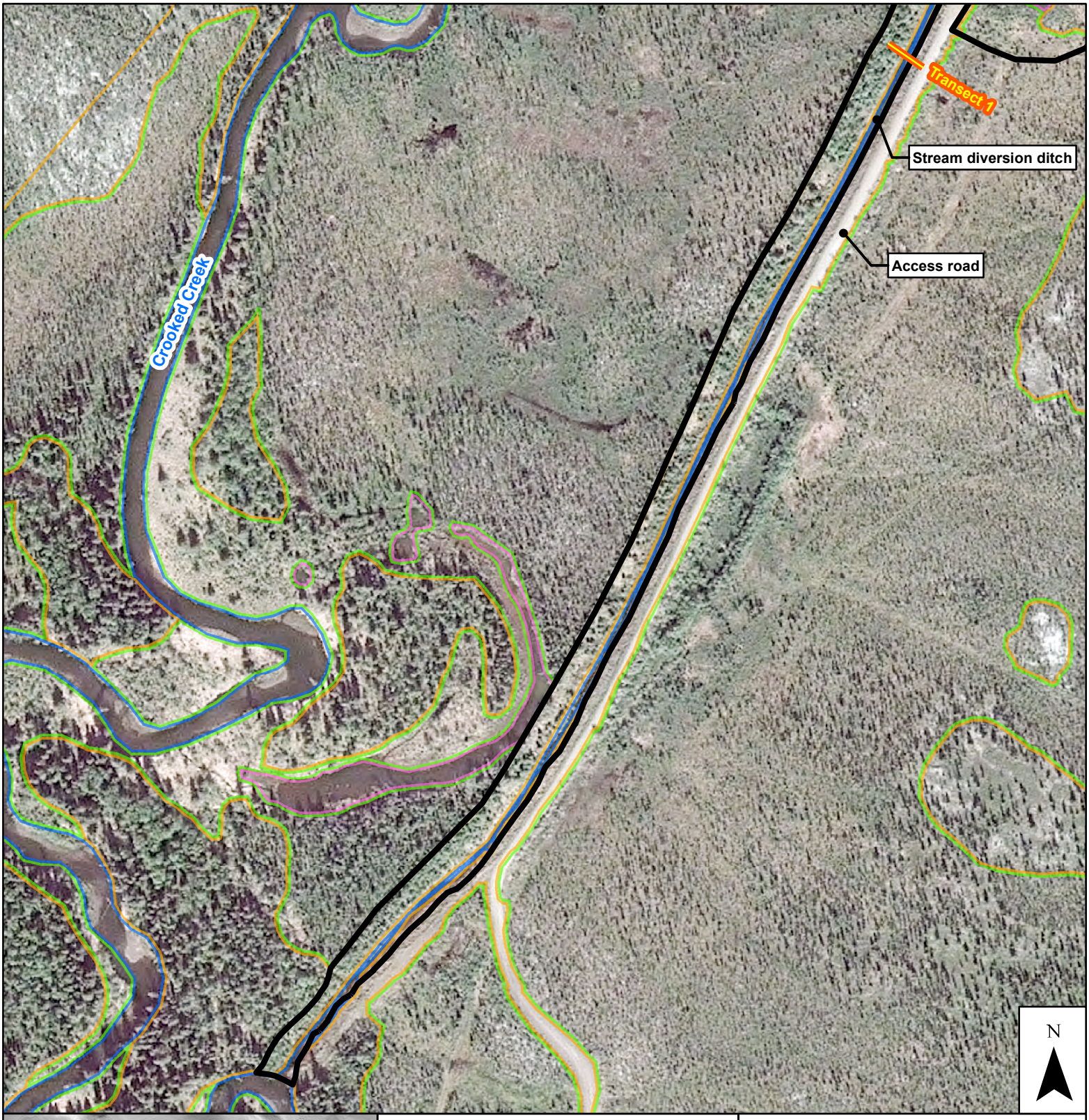
Chapter 23. Compensatory Mitigation Plan, Appendix A

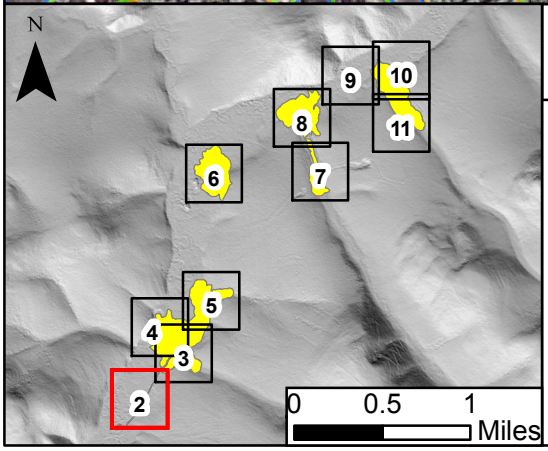
Upper Crooked Creek PRM
Plan View - Index

NAD 1983 UTM Zone 4N;
Imagery: ESRI World Imagery Layer

DONLIN GOLD

Sheet 1





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Baseline Transect (Appendix B)

Mitigation Area Boundary

Wetland Status (2016 PJD)

Wetland

Upland

Pond

Stream

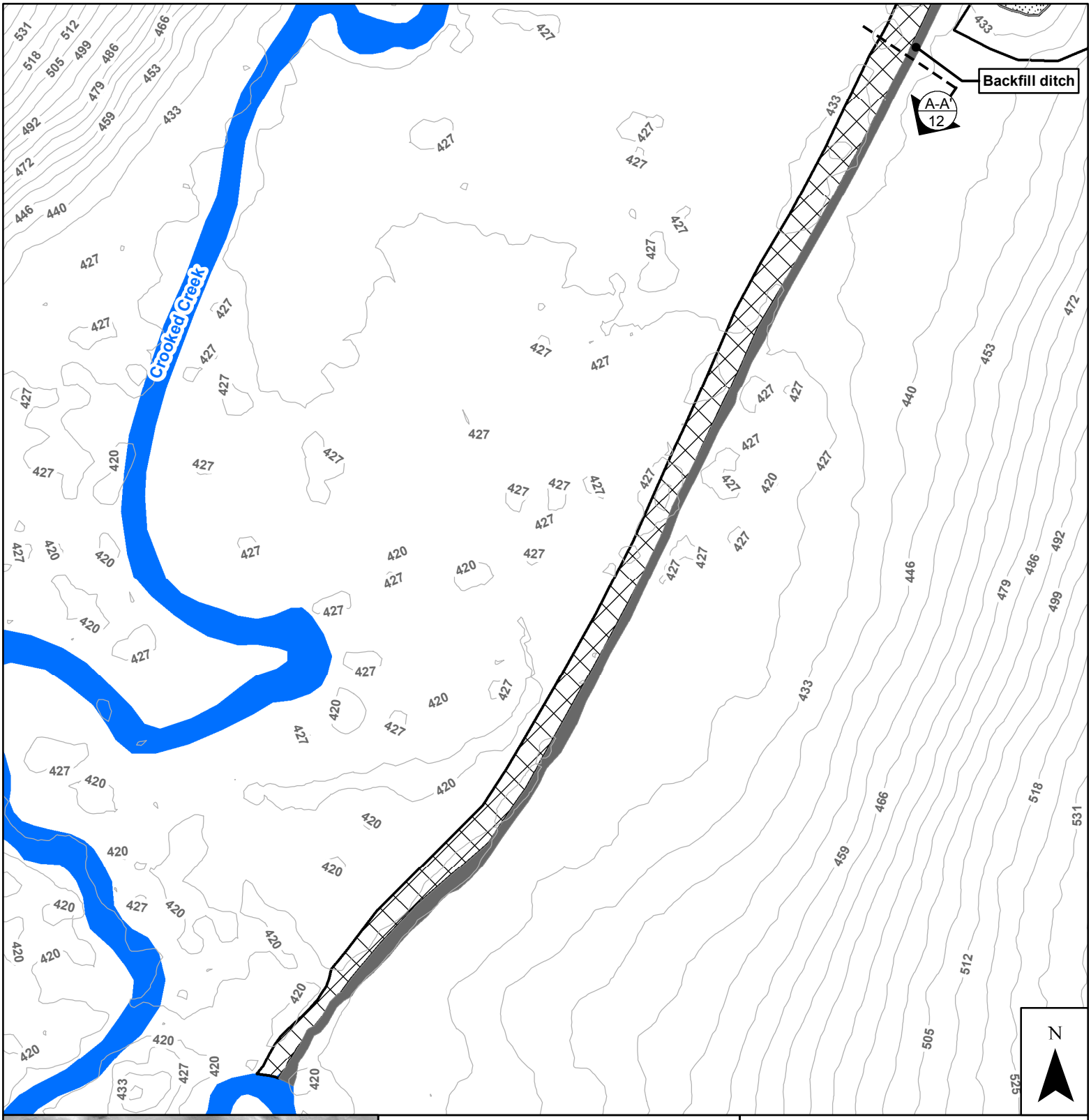
Chapter 23. Compensatory Mitigation Plan, Appendix A

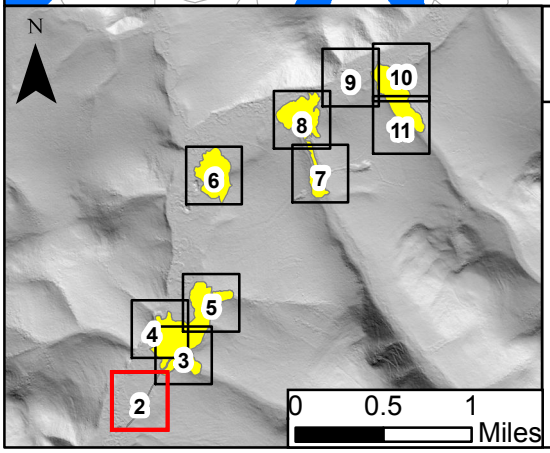
Upper Crooked Creek PRM
Plan View - Baseline

NAD 1983 UTM Zone 4N;
Imagery 0.5m resolution, capture date 5/29/16;
Digital Elevation Model from ArcticDEM;
Wetland Status from 2016 Donlin Gold PJD

DONLIN GOLD

Sheet 2a





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CROSS SECTION

RESTORATION ACTIVITY

- FILL TO RESTORE/MAINTAIN HYDROLGY
- WETLAND & UPLAND RIPARIAN CUT/FILL
- POND CUT/FILL
- CHANNEL CUT/FILL
- REVEGETATION
- PRESERVATION

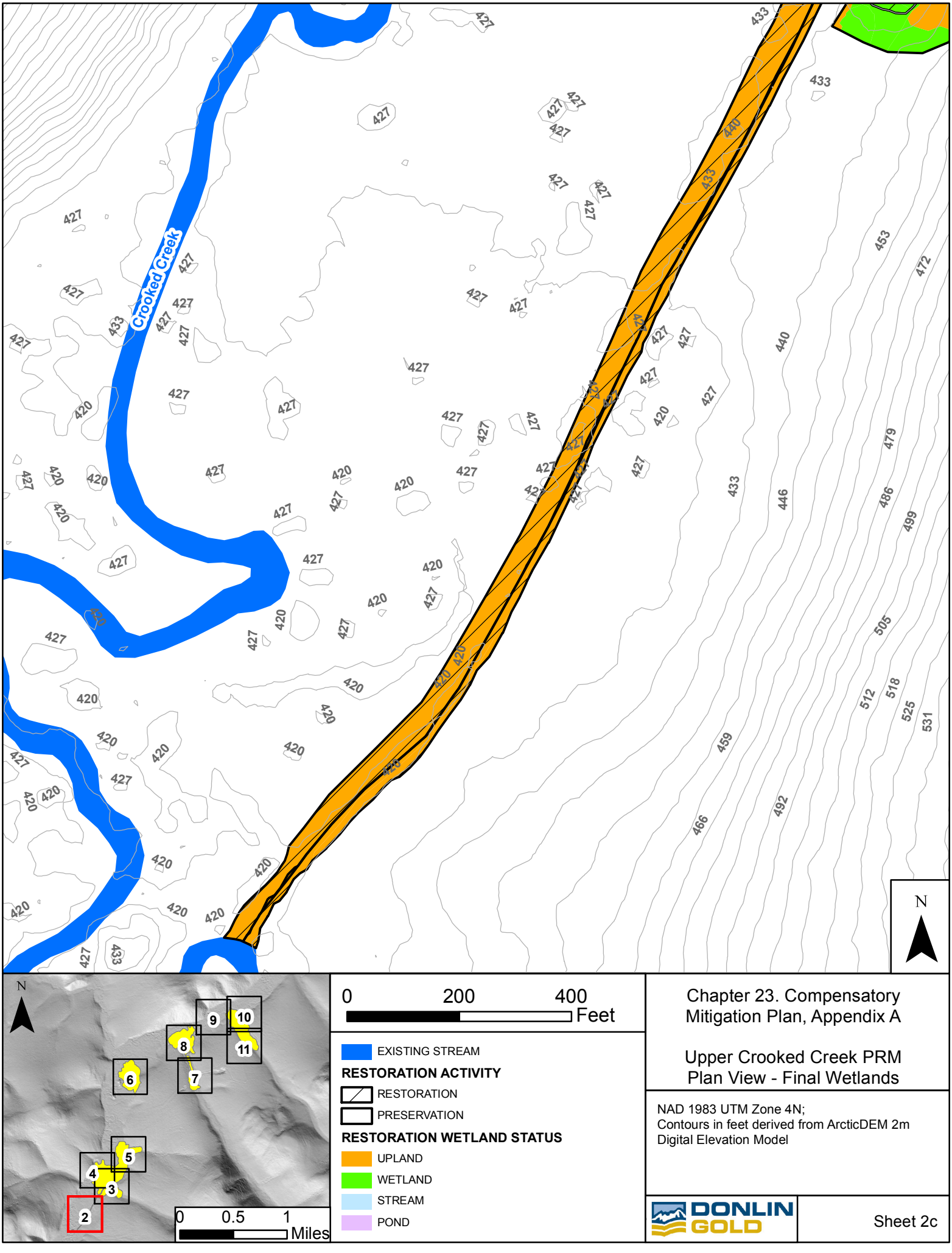
Chapter 23. Compensatory Mitigation Plan, Appendix A

Upper Crooked Creek PRM
Plan View - Restoration

NAD 1983 UTM Zone 4N;
Contours in feet derived from ArcticDEM 2m Digital Elevation Model;
Crooked Creek OHW From 2016 PJD

DONLIN GOLD

Sheet 2b



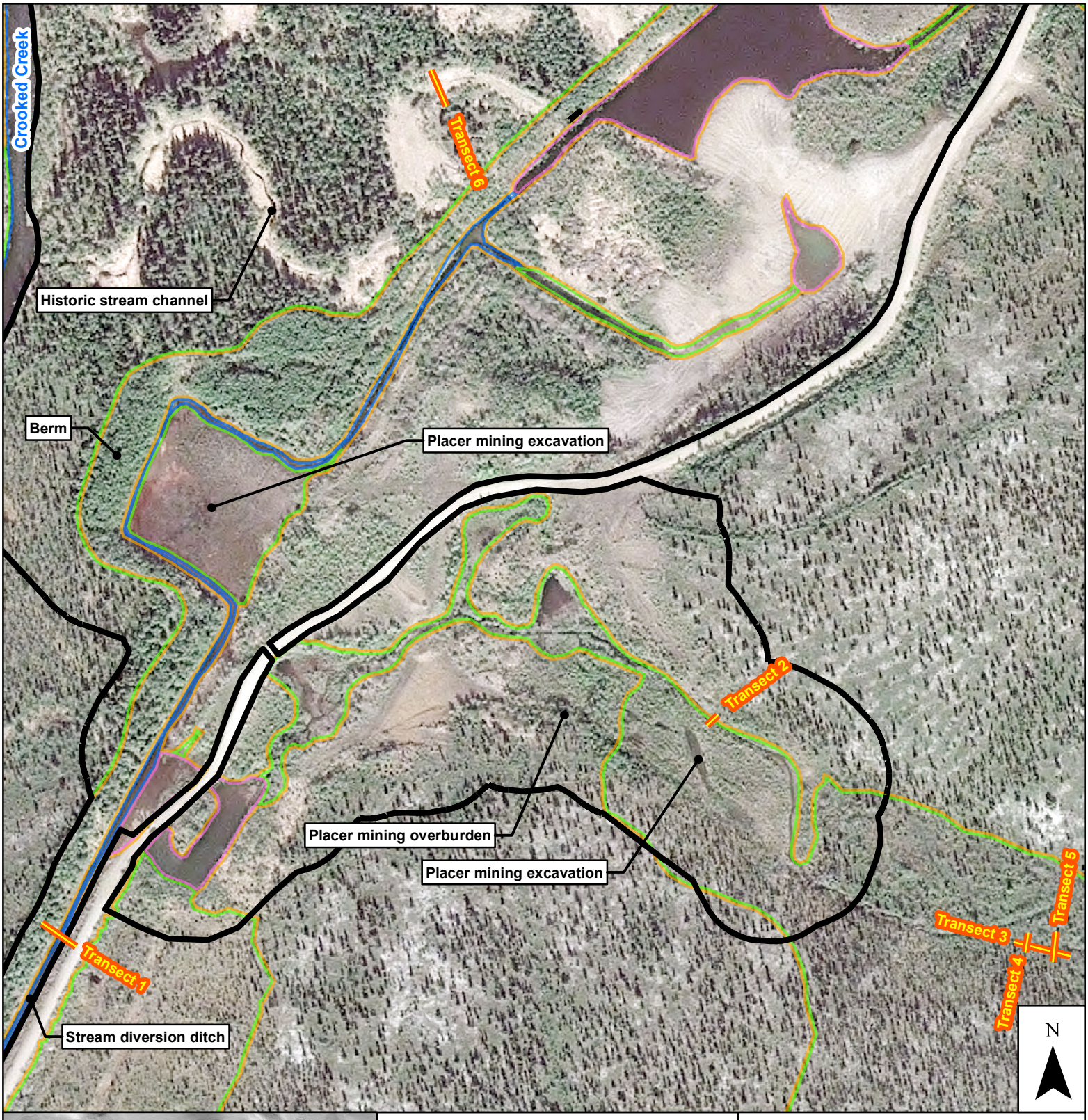
Chapter 23. Compensatory Mitigation Plan, Appendix A

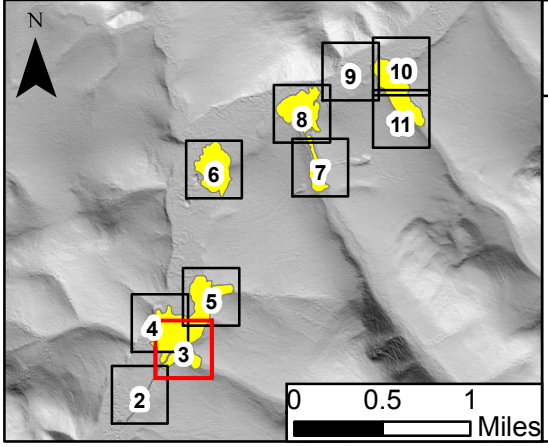
Upper Crooked Creek PRM
Plan View - Final Wetlands

NAD 1983 UTM Zone 4N;
Contours in feet derived from ArcticDEM 2m Digital Elevation Model

DONLIN GOLD

Sheet 2c





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Baseline Transect (Appendix B)

Mitigation Area Boundary

Wetland Status (2016 PJD)

Wetland

Upland

Pond

Stream

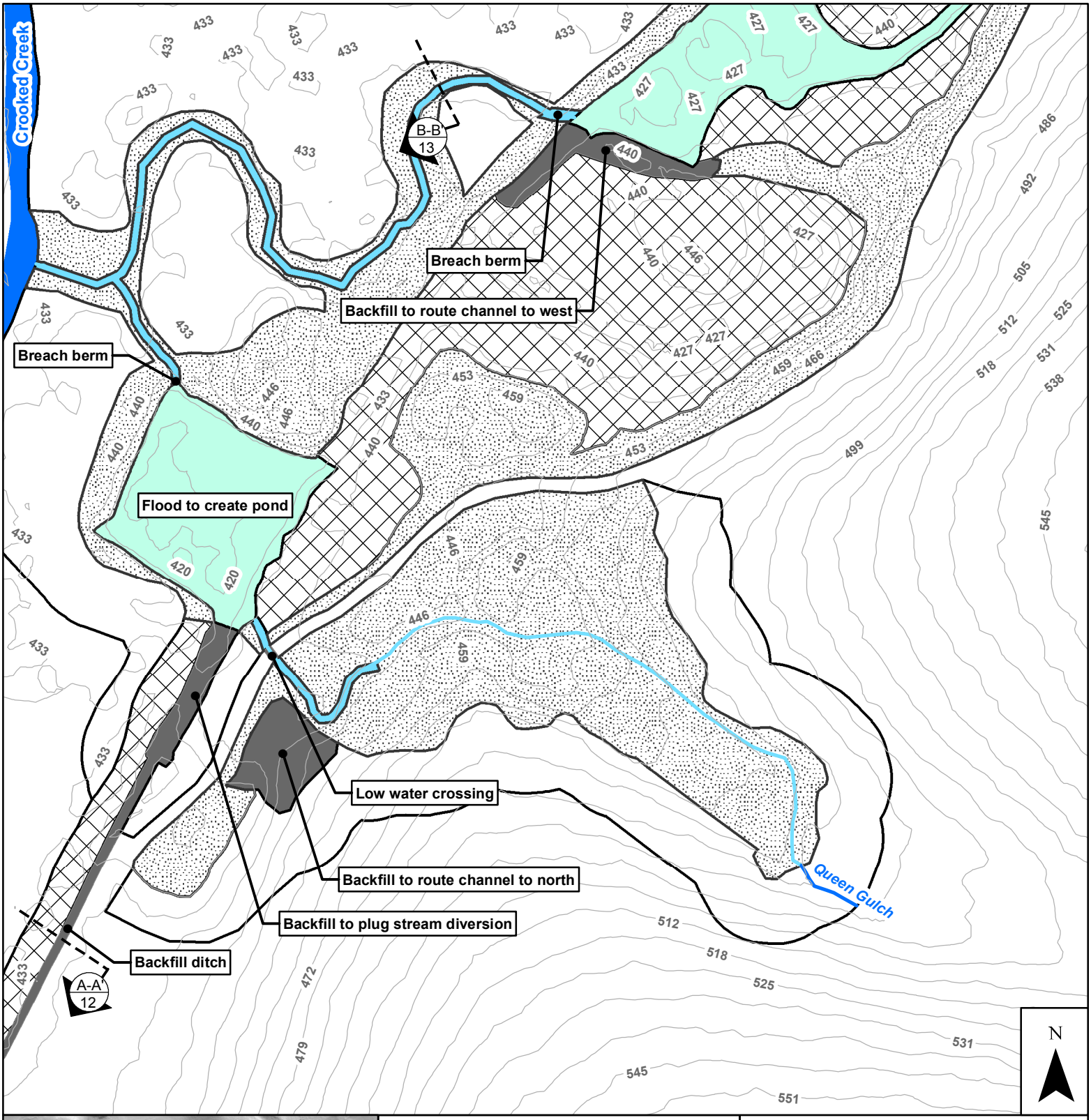
Chapter 23. Compensatory Mitigation Plan, Appendix A

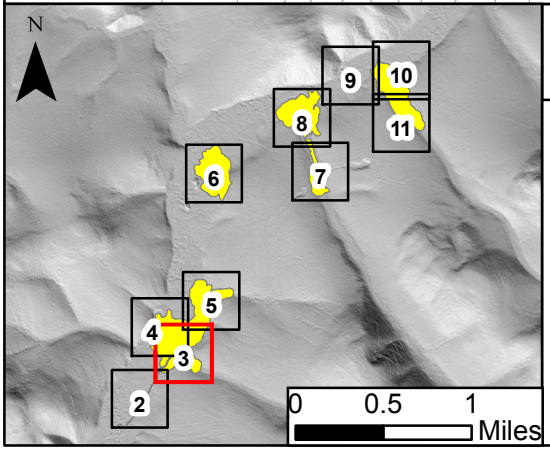
Upper Crooked Creek PRM
Plan View - Baseline

NAD 1983 UTM Zone 4N;
Imagery 0.5m resolution, capture date 5/29/16;
Digital Elevation Model from ArcticDEM;
Wetland Status from 2016 Donlin Gold PJD

DONLIN GOLD

Sheet 3a





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CROSS SECTION

RESTORATION ACTIVITY

- FILL TO RESTORE/MAINTAIN HYDROLGY
- WETLAND & UPLAND RIPARIAN CUT/FILL
- POND CUT/FILL
- CHANNEL CUT/FILL
- REVEGETATION
- PRESERVATION

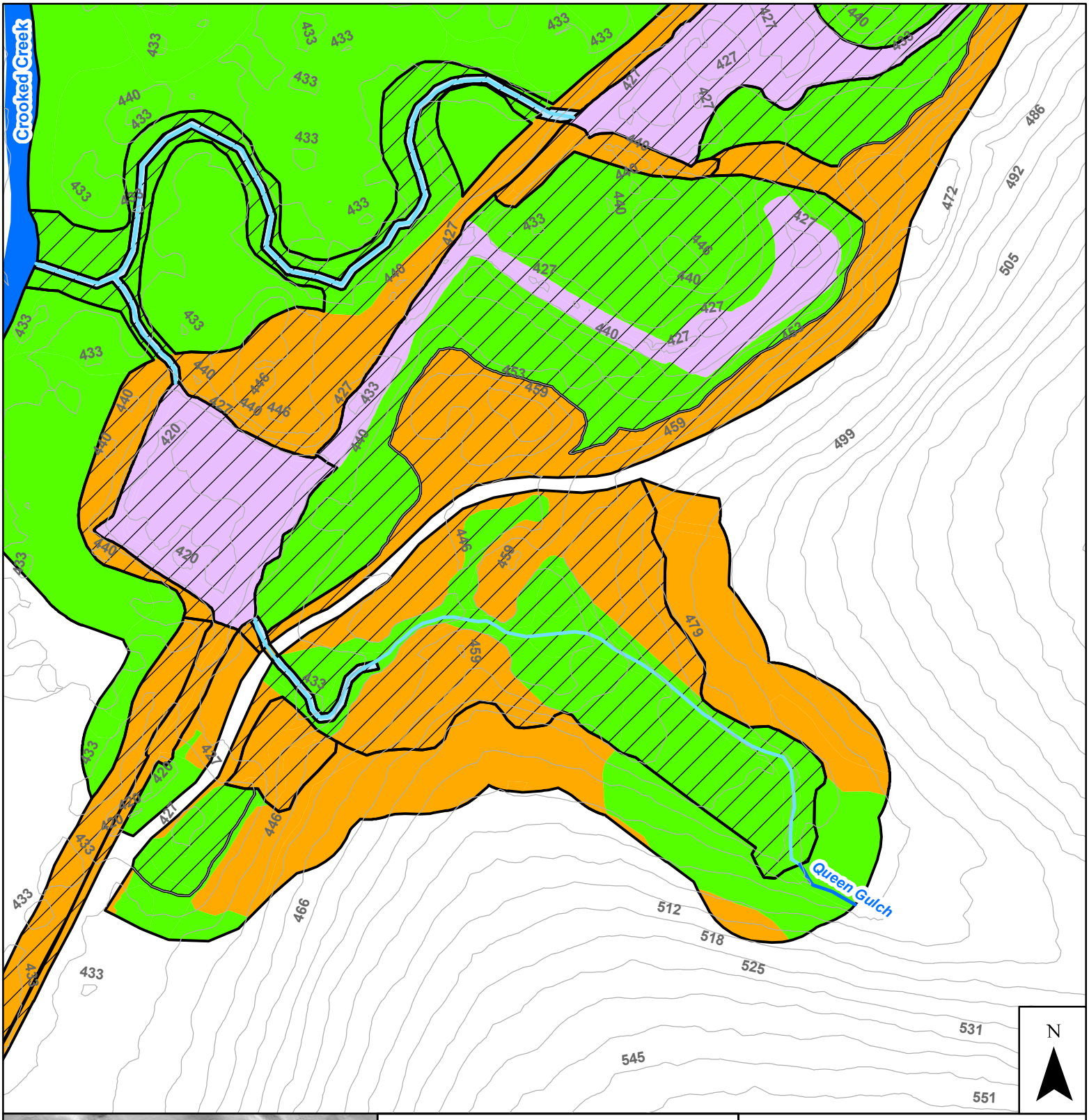
Chapter 23. Compensatory Mitigation Plan, Appendix A

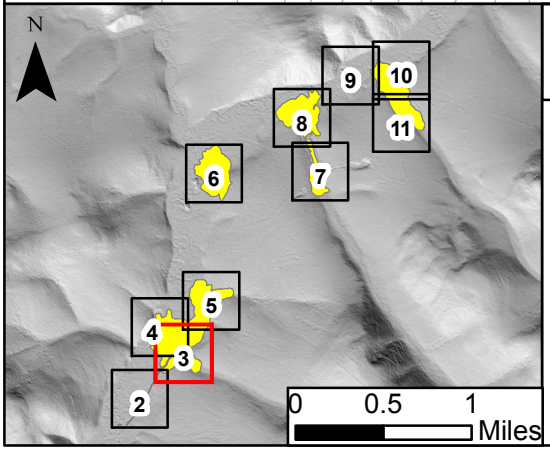
Upper Crooked Creek PRM
Plan View - Restoration

NAD 1983 UTM Zone 4N;
Contours in feet derived from ArcticDEM 2m Digital Elevation Model;
Crooked Creek OHW From 2016 PJD

DONLIN GOLD

Sheet 3b





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EXISTING STREAM

RESTORATION ACTIVITY

RESTORATION

PRESERVATION

RESTORATION WETLAND STATUS

UPLAND

WETLAND

STREAM

POND

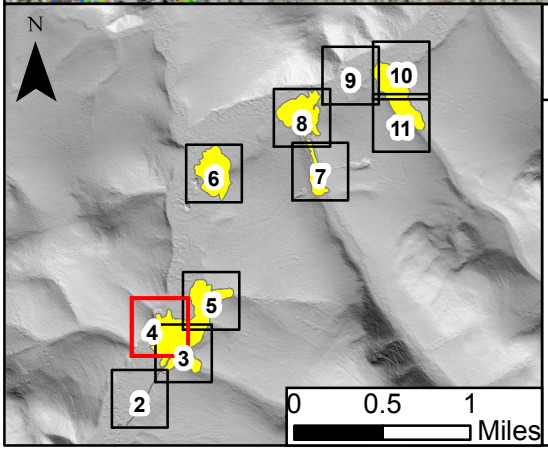
Chapter 23. Compensatory Mitigation Plan, Appendix A

Upper Crooked Creek PRM Plan View - Final Wetlands

NAD 1983 UTM Zone 4N;
Contours in feet derived from ArcticDEM 2m Digital Elevation Model

DONLIN GOLD

Sheet 3c



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Baseline Transect (Appendix B)

Mitigation Area Boundary

Wetland Status (2016 PJD)

Wetland

Upland

Pond

Stream

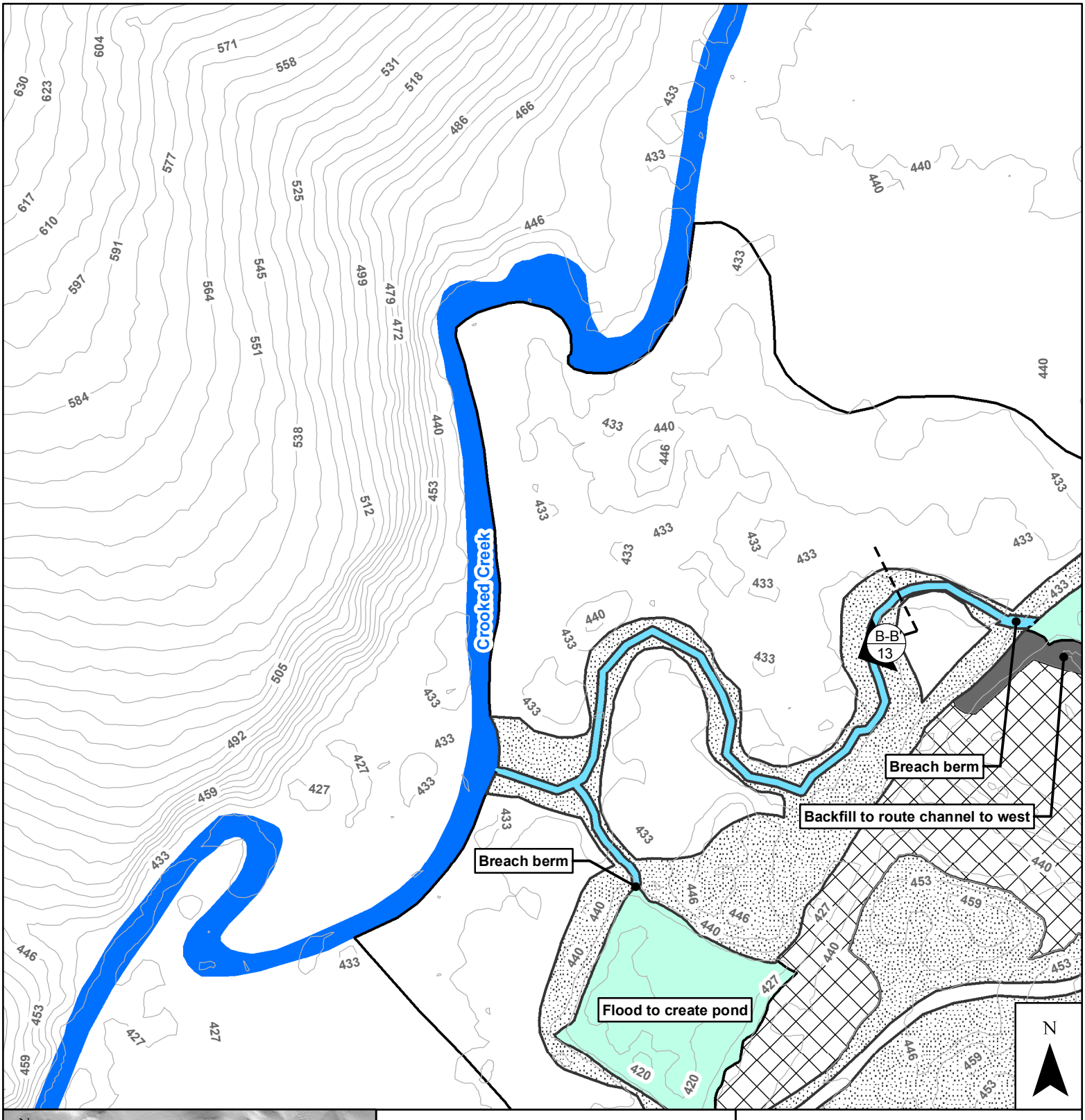
Chapter 23. Compensatory Mitigation Plan, Appendix A

Upper Crooked Creek PRM
Plan View - Baseline

NAD 1983 UTM Zone 4N;
Imagery 0.5m resolution, capture date 5/29/16;
Digital Elevation Model from ArcticDEM;
Wetland Status from 2016 Donlin Gold PJD

DONLIN GOLD

Sheet 4a

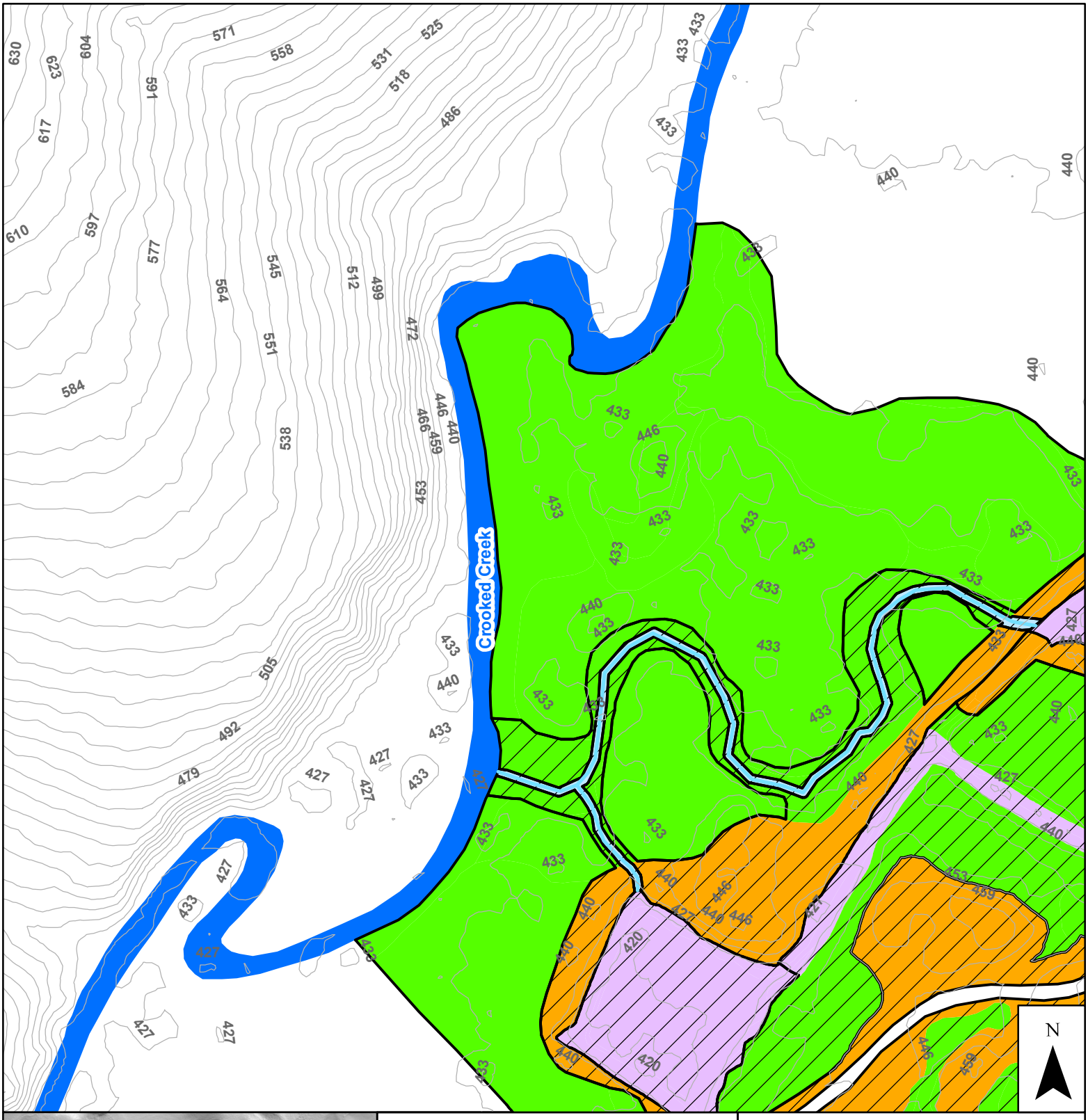


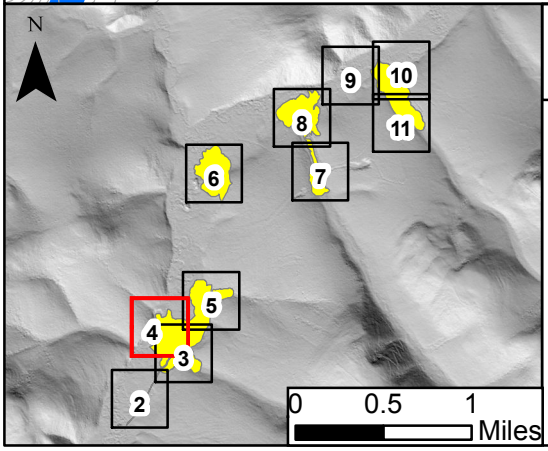
Chapter 23. Compensatory Mitigation Plan, Appendix A

Upper Crooked Creek PRM
Plan View - Restoration

NAD 1983 UTM Zone 4N;
Contours in feet derived from ArcticDEM 2m Digital Elevation Model;
Crooked Creek OHW From 2016 PJD

DONLIN GOLD





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EXISTING STREAM

RESTORATION ACTIVITY

RESTORATION

PRESERVATION

RESTORATION WETLAND STATUS

UPLAND

WETLAND

STREAM

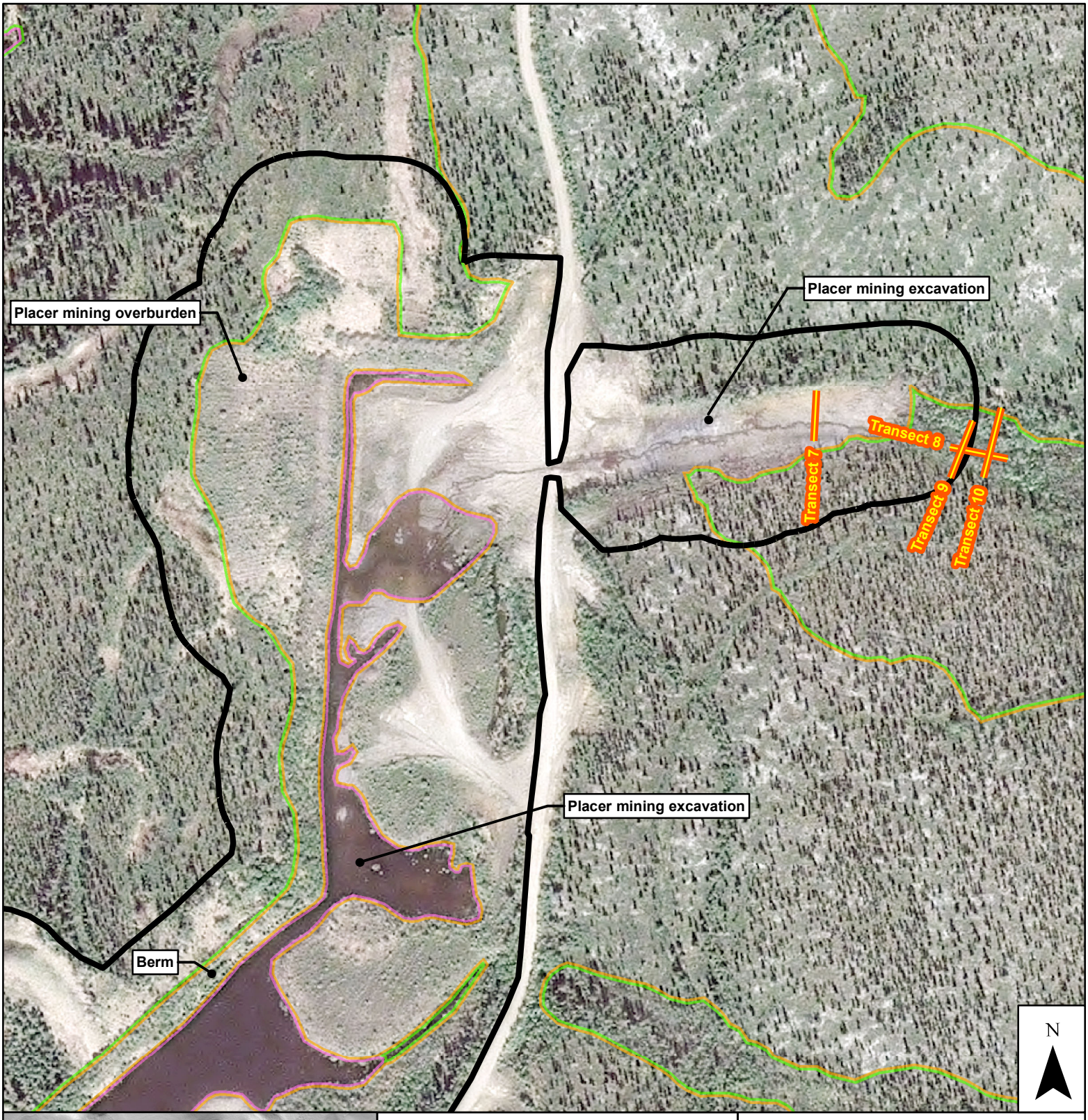
POND

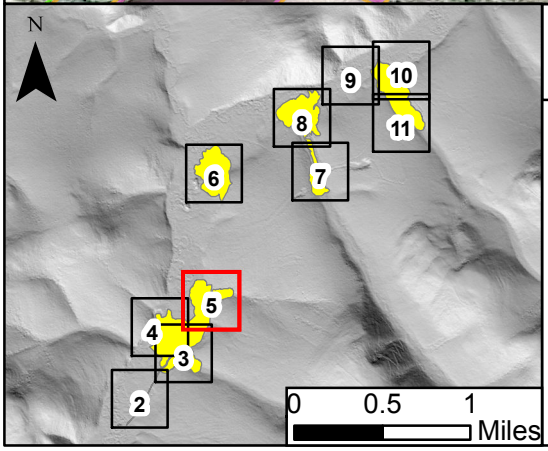
Chapter 23. Compensatory Mitigation Plan, Appendix A

Upper Crooked Creek PRM Plan View - Final Wetlands

NAD 1983 UTM Zone 4N;
Contours in feet derived from ArcticDEM 2m Digital Elevation Model

DONLIN GOLD





0 200 400 Feet

Baseline Transect (Appendix B)

Mitigation Area Boundary

Wetland Status (2016 PJD)

Wetland

Upland

Pond

Stream

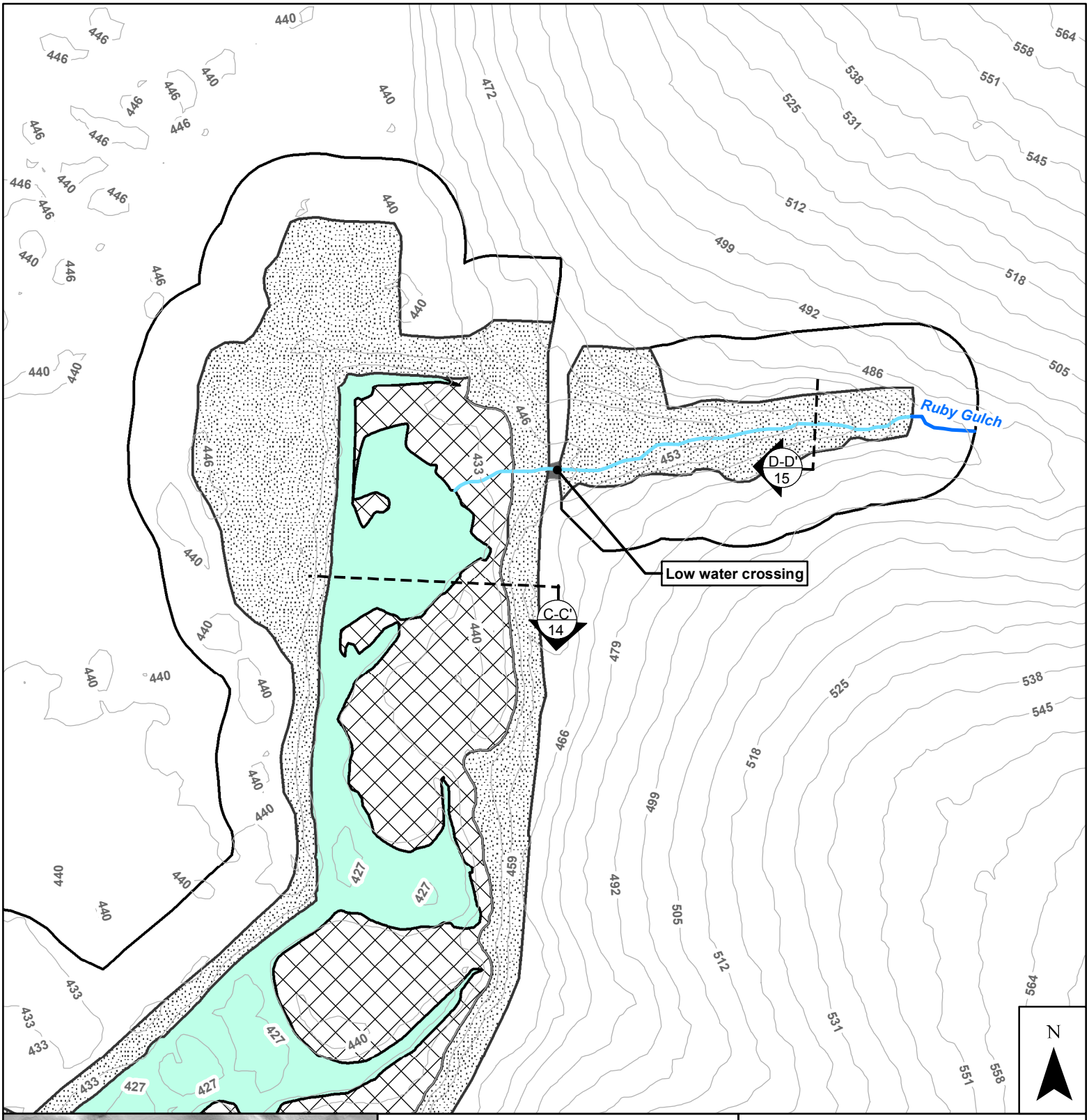
Chapter 23. Compensatory Mitigation Plan, Appendix A

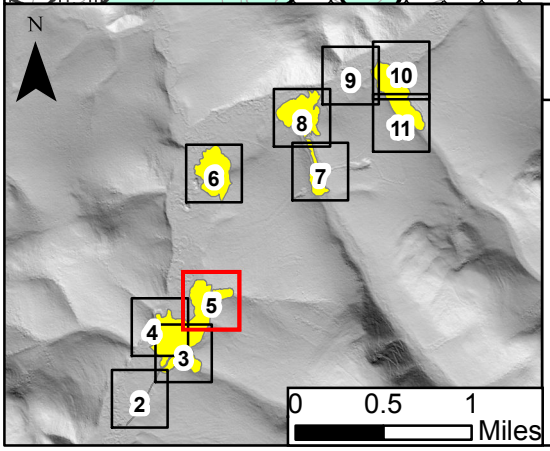
Upper Crooked Creek PRM
Plan View - Baseline

NAD 1983 UTM Zone 4N;
Imagery 0.5m resolution, capture date 5/29/16;
Digital Elevation Model from ArcticDEM;
Wetland Status from 2016 Donlin Gold PJD

DONLIN GOLD

Sheet 5a





0 200 400 Feet

CROSS SECTION

RESTORATION ACTIVITY

- FILL TO RESTORE/MAINTAIN HYDROLGY
- WETLAND & UPLAND RIPARIAN CUT/FILL
- POND CUT/FILL
- CHANNEL CUT/FILL
- REVEGETATION
- PRESERVATION

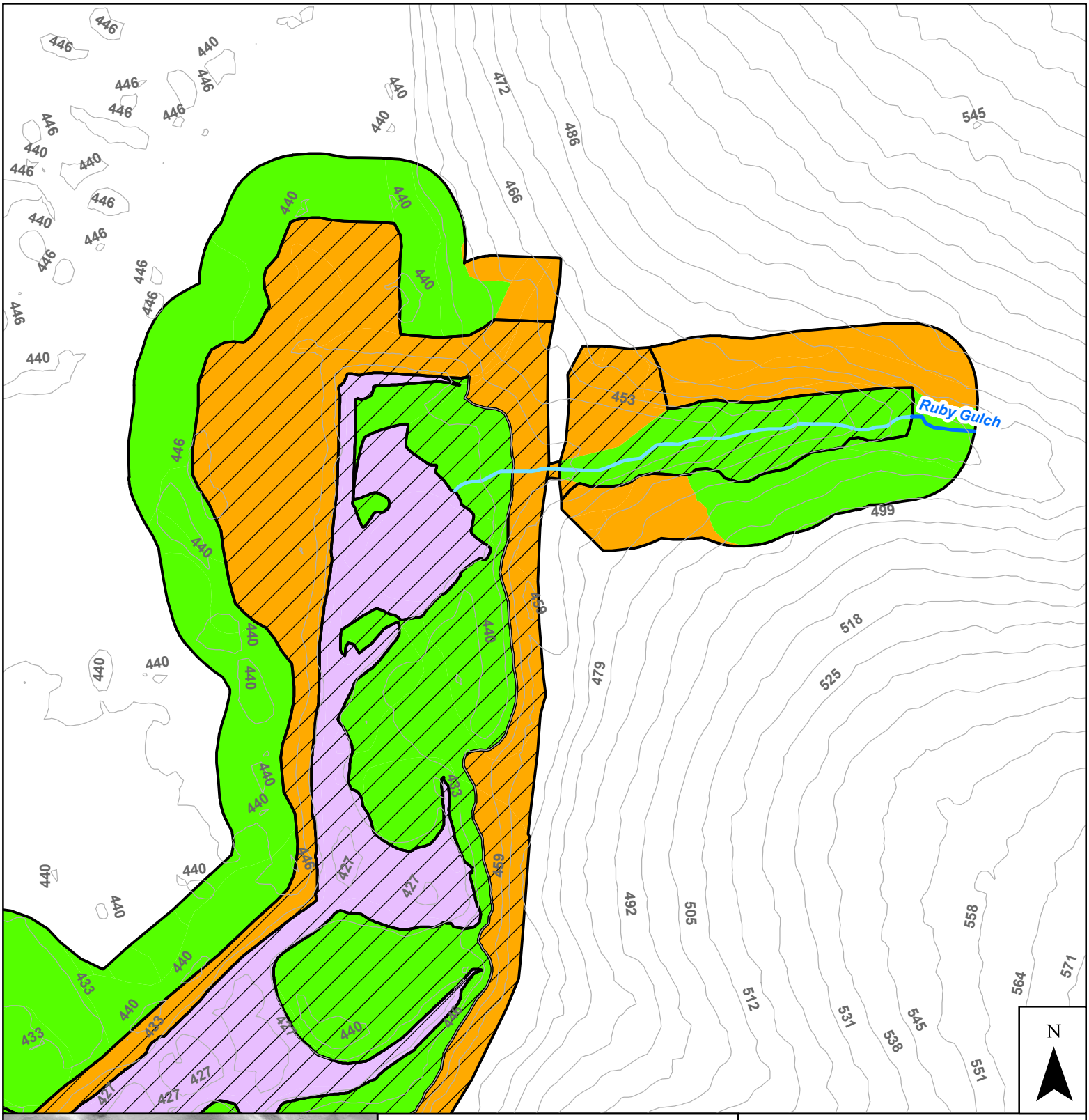
Chapter 23. Compensatory Mitigation Plan, Appendix A

Upper Crooked Creek PRM
Plan View - Restoration

NAD 1983 UTM Zone 4N;
Contours in feet derived from ArcticDEM 2m Digital Elevation Model;
Crooked Creek OHW From 2016 PJD

DONLIN GOLD

Sheet 5b



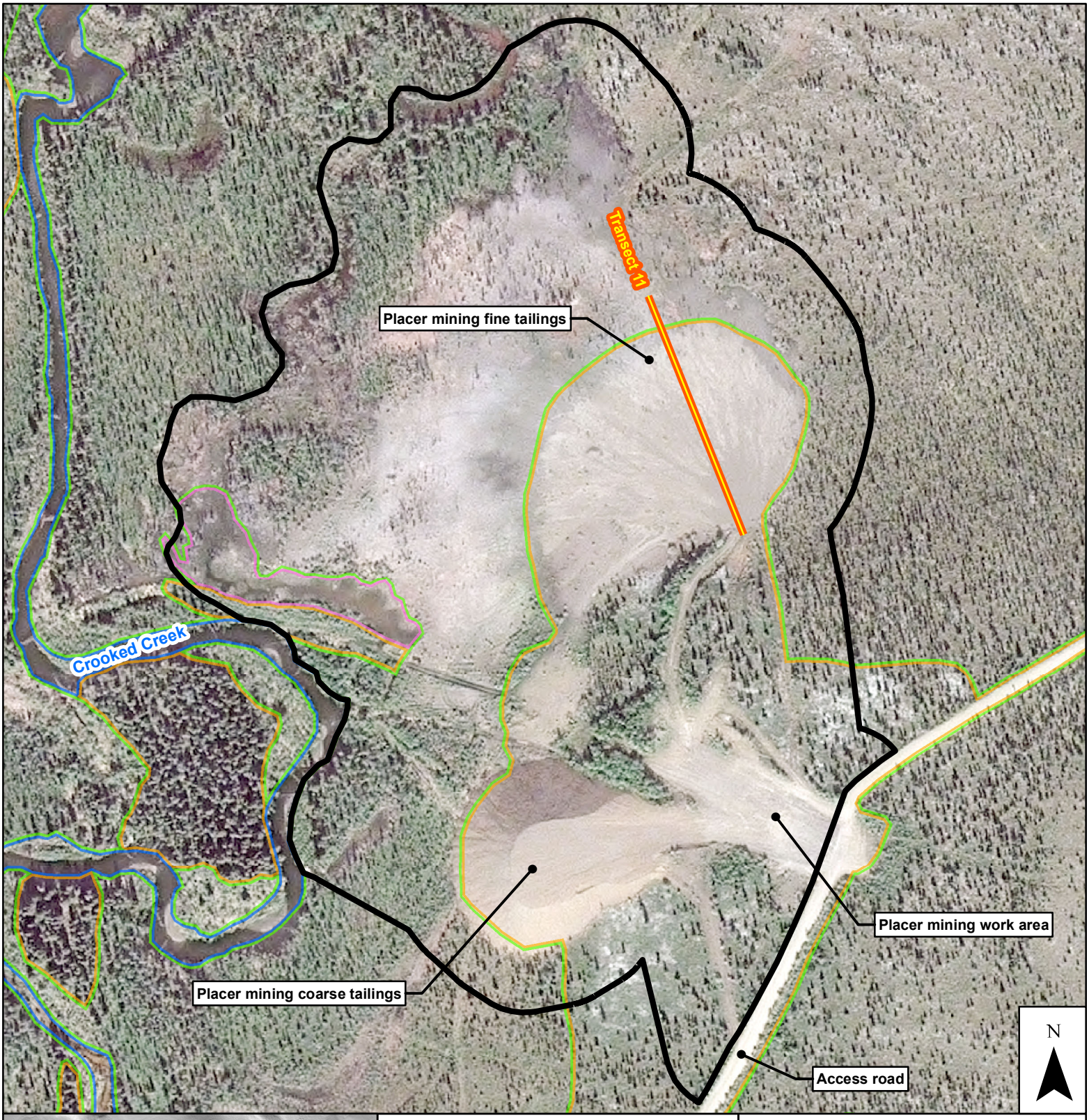
Chapter 23. Compensatory Mitigation Plan, Appendix A

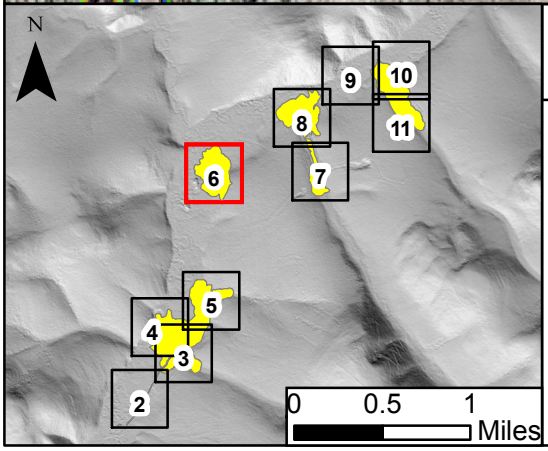
Upper Crooked Creek PRM Plan View - Final Wetlands

NAD 1983 UTM Zone 4N;
Contours in feet derived from ArcticDEM 2m Digital Elevation Model

DONLIN GOLD

Sheet 5c





0 200 400 Feet

Baseline Transect (Appendix B)

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Wetland

Upland

Pond

Stream

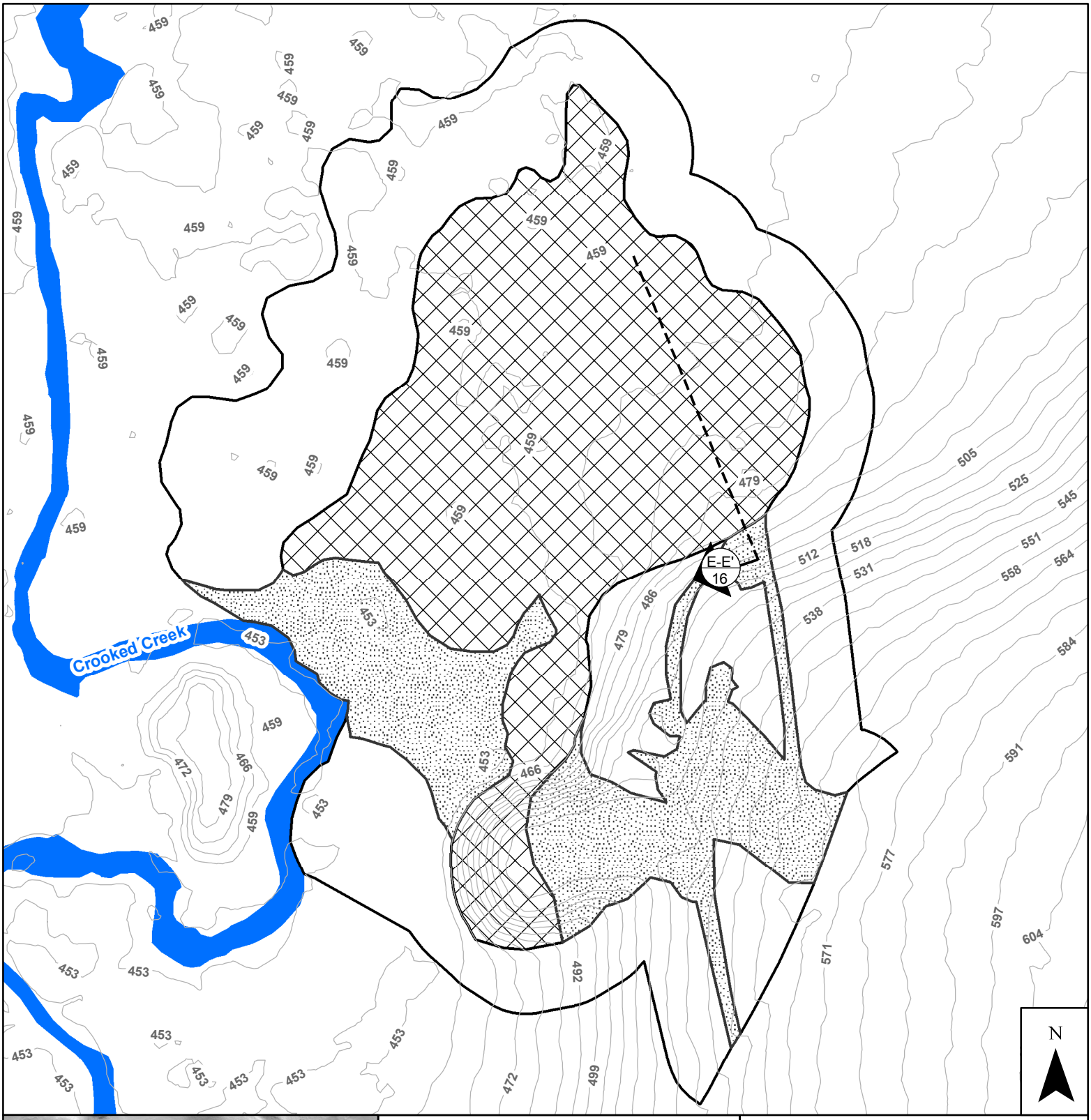
Chapter 23. Compensatory Mitigation Plan, Appendix A

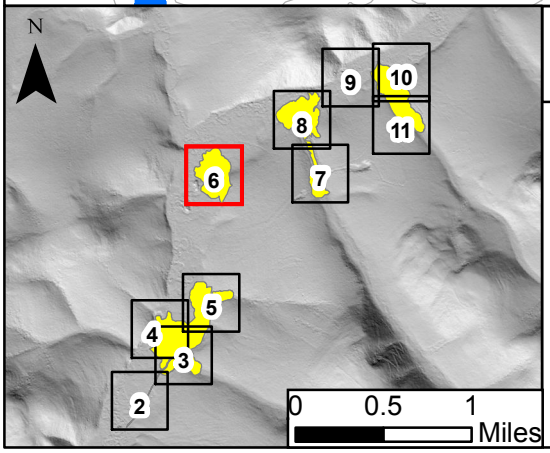
Upper Crooked Creek PRM
Plan View - Baseline

NAD 1983 UTM Zone 4N;
Imagery 0.5m resolution, capture date 5/29/16;
Digital Elevation Model from ArcticDEM;
Wetland Status from 2016 Donlin Gold PJD

DONLIN GOLD

Sheet 6a





0 200 400 Feet

CROSS SECTION

RESTORATION ACTIVITY

- FILL TO RESTORE/MAINTAIN HYDROLGY
- WETLAND & UPLAND RIPARIAN CUT/FILL
- POND CUT/FILL
- CHANNEL CUT/FILL
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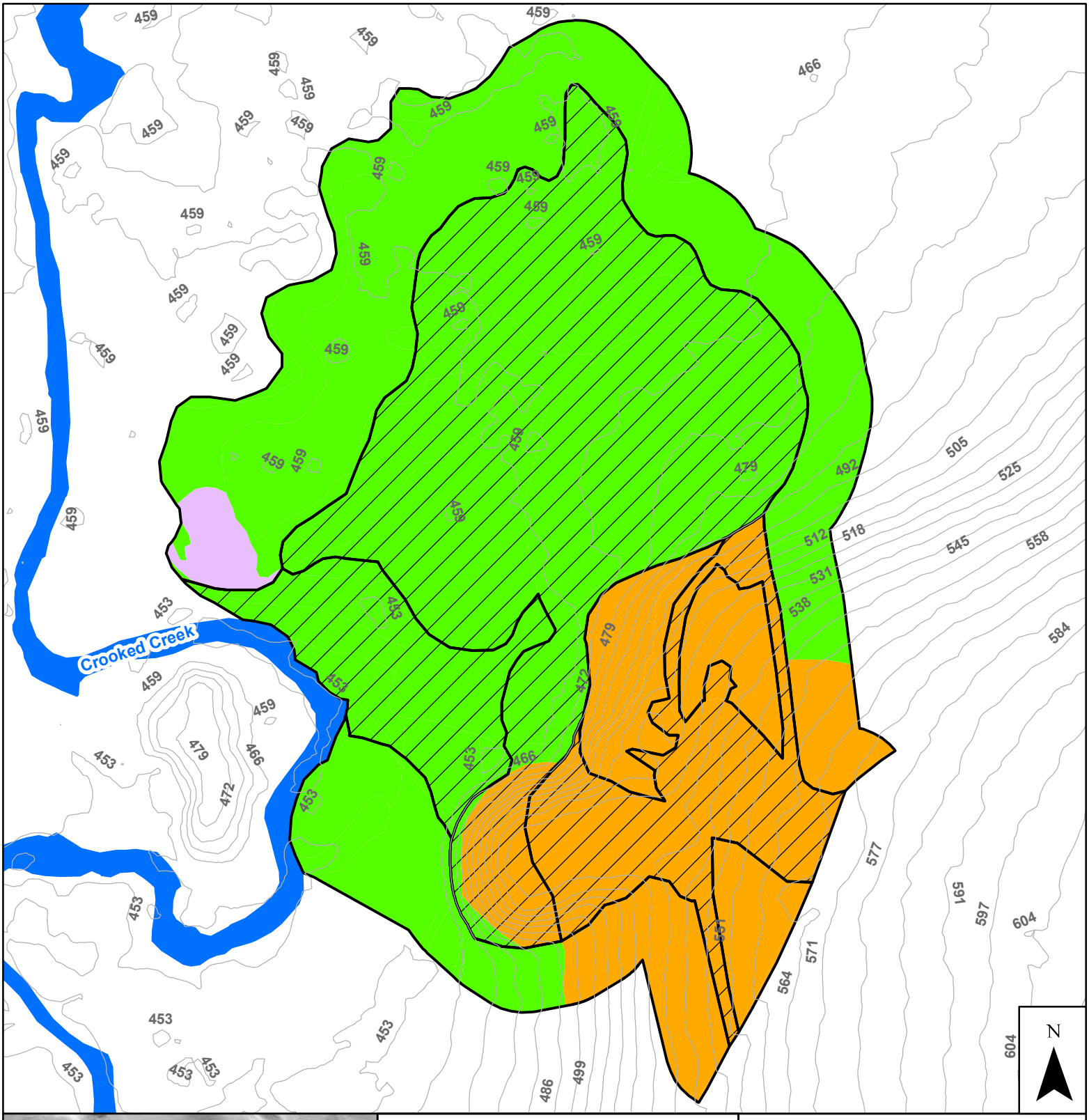
Chapter 23. Compensatory Mitigation Plan, Appendix A

Upper Crooked Creek PRM
Plan View - Restoration

NAD 1983 UTM Zone 4N;
Contours in feet derived from ArcticDEM 2m Digital Elevation Model;
Crooked Creek OHW From 2016 PJD

DONLIN GOLD

Sheet 6b



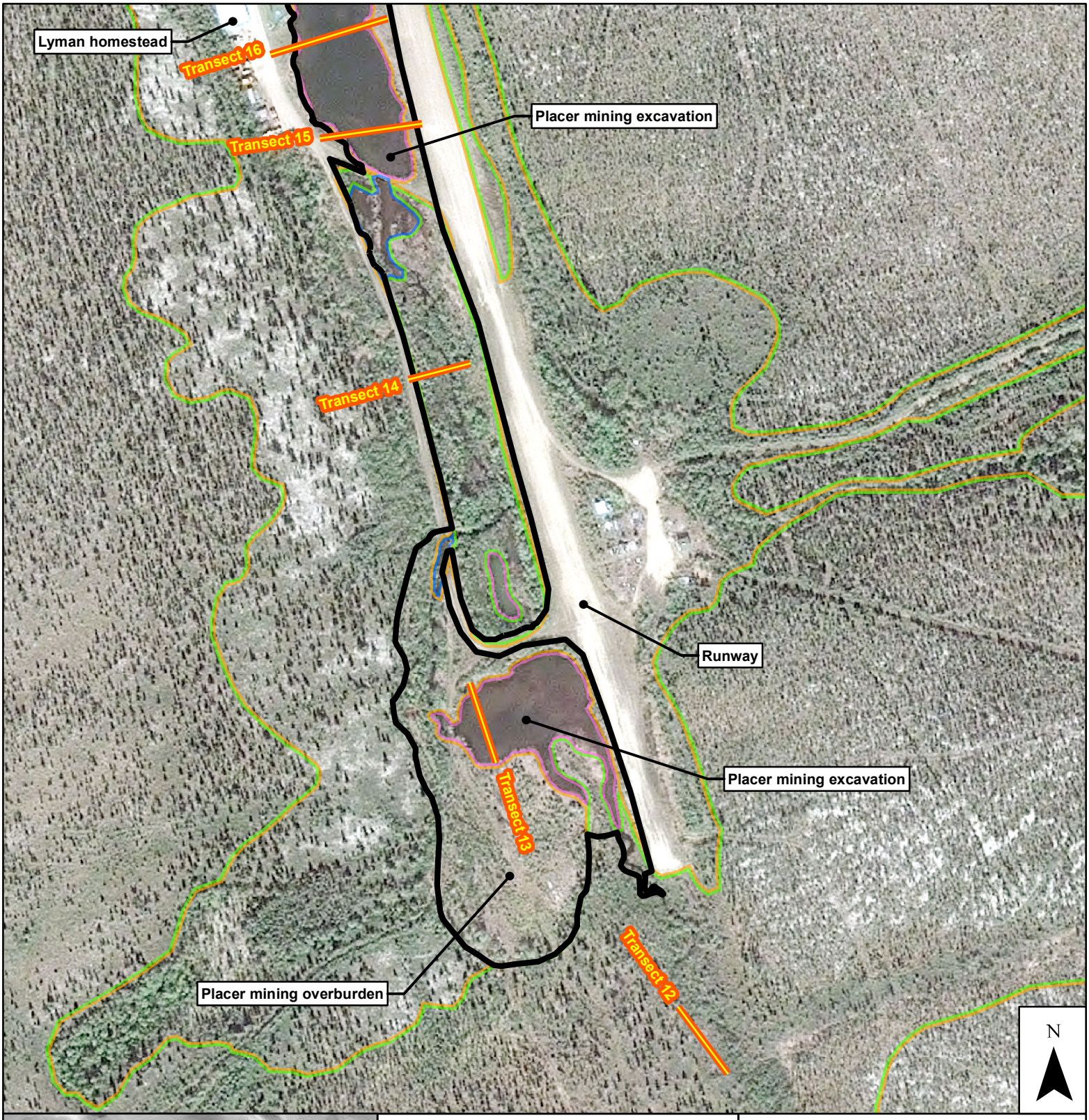
Chapter 23. Compensatory Mitigation Plan, Appendix A

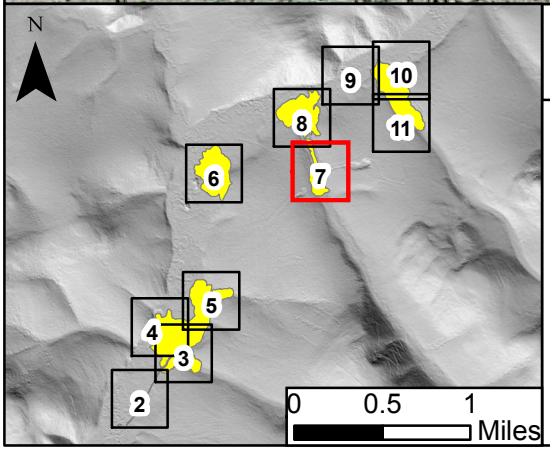
Upper Crooked Creek PRM Plan View - Final Wetlands

NAD 1983 UTM Zone 4N;
Contours in feet derived from ArcticDEM 2m Digital Elevation Model

DONLIN GOLD

Sheet 6c





0 200 400 Feet

Baseline Transect (Appendix B)

Mitigation Area Boundary

Wetland Status (2016 PJD)

Wetland

Upland

Pond

Stream

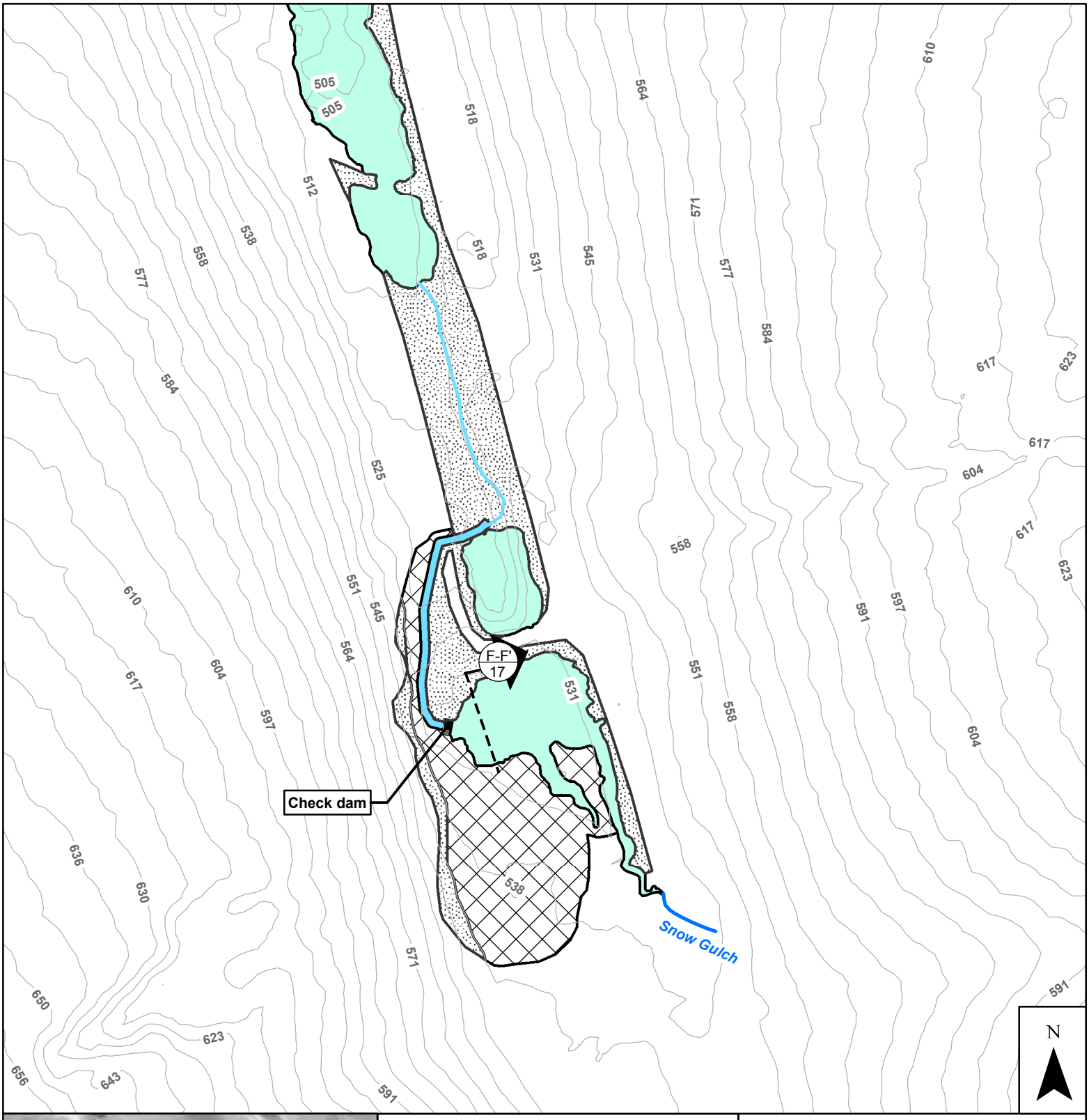
Chapter 23. Compensatory Mitigation Plan, Appendix A

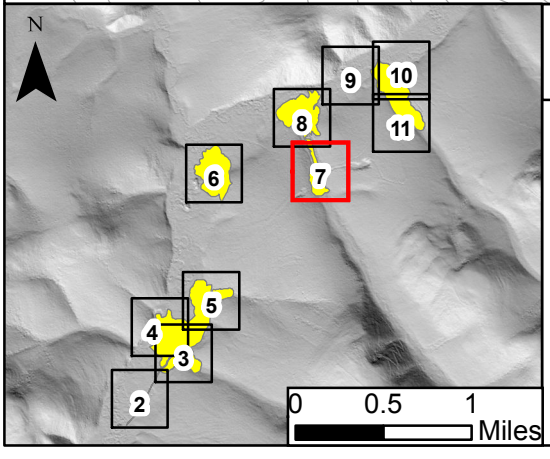
Upper Crooked Creek PRM
Plan View - Baseline

NAD 1983 UTM Zone 4N;
Imagery 0.5m resolution, capture date 5/29/16;
Digital Elevation Model from ArcticDEM;
Wetland Status from 2016 Donlin Gold PJD

DONLIN GOLD

Sheet 7a





0 200 400 Feet

CROSS SECTION

RESTORATION ACTIVITY

- FILL TO RESTORE/MAINTAIN HYDROLGY
- WETLAND & UPLAND RIPARIAN CUT/FILL
- POND CUT/FILL
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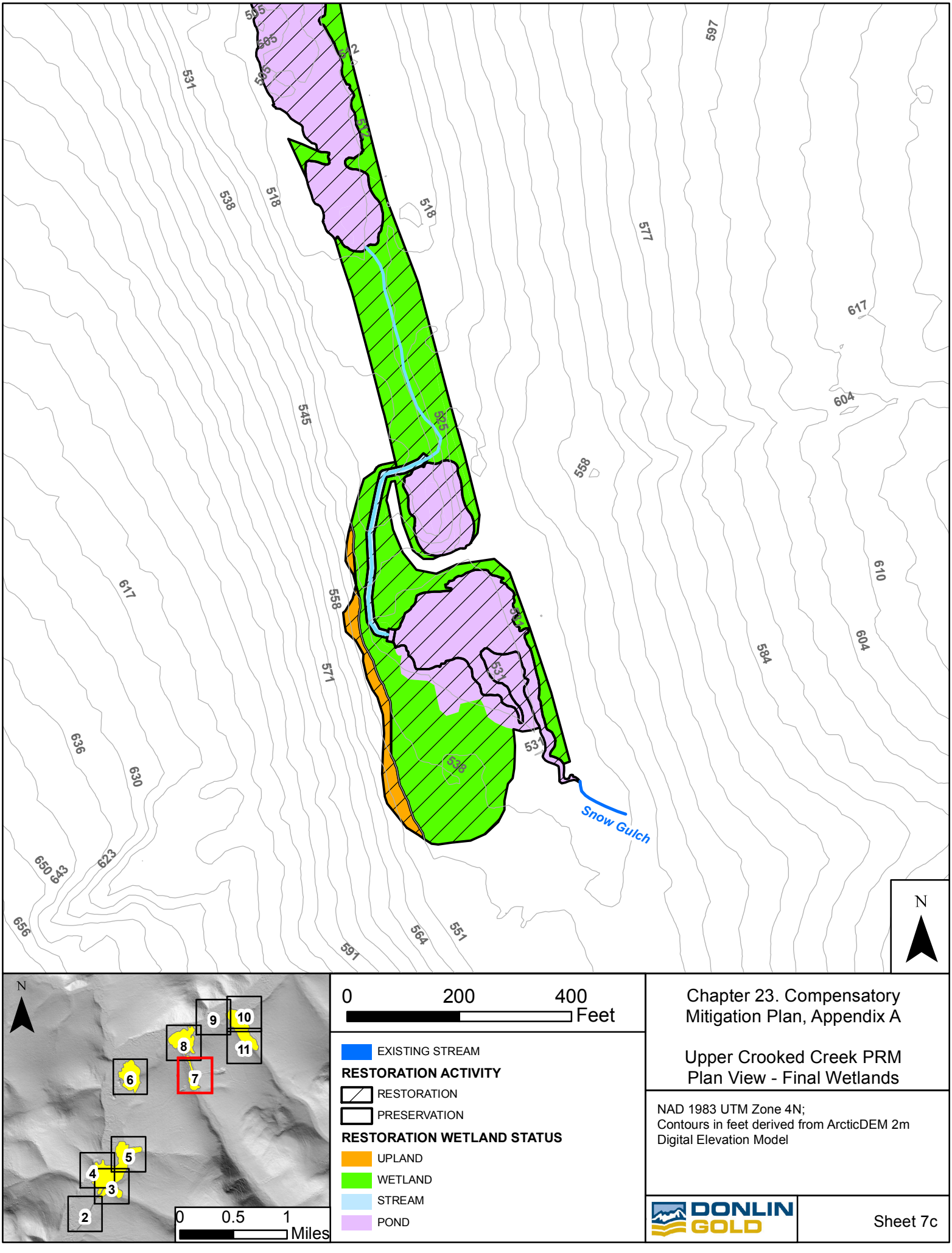
Chapter 23. Compensatory Mitigation Plan, Appendix A

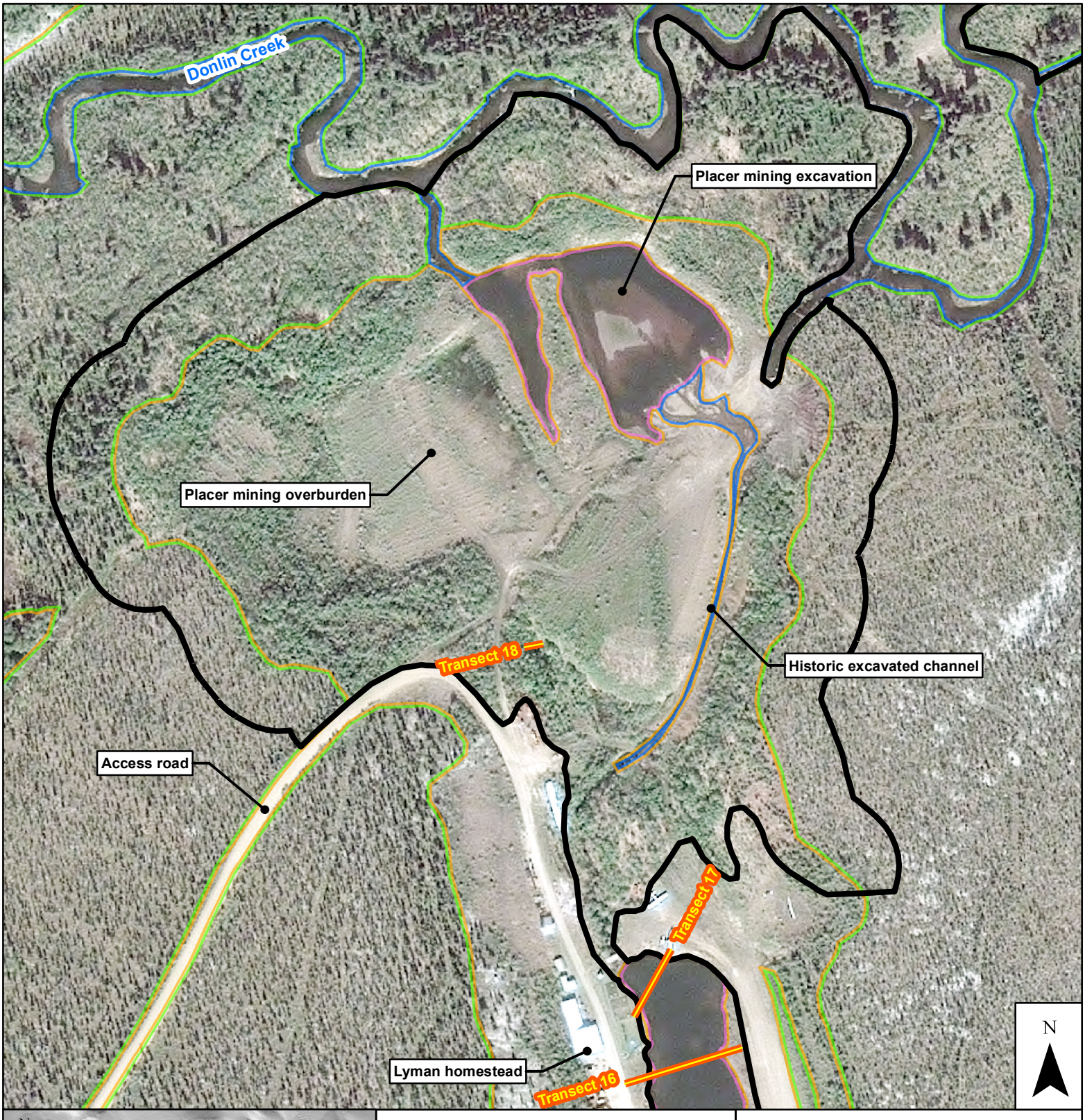
Upper Crooked Creek PRM Plan View - Restoration

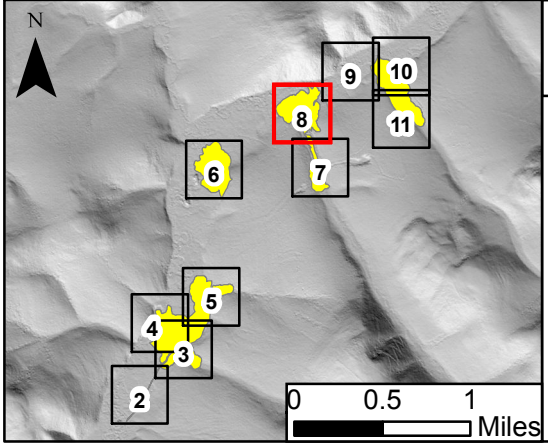
NAD 1983 UTM Zone 4N;
Contours in feet derived from ArcticDEM 2m Digital Elevation Model;
Crooked Creek OHW From 2016 PJD

DONLIN GOLD

Sheet 7b


Snow Gulch
N
0 200 400 Feet
EXISTING STREAM
RESTORATION ACTIVITY
RESTORATION
PRESERVATION
RESTORATION WETLAND STATUS
UPLAND
WETLAND
STREAM
POND
0 0.5 1 Miles
Chapter 23. Compensatory Mitigation Plan, Appendix A
Upper Crooked Creek PRM
Plan View - Final Wetlands
NAD 1983 UTM Zone 4N;
Contours in feet derived from ArcticDEM 2m Digital Elevation Model
DONLIN GOLD
Sheet 7c





0 200 400 Feet

Baseline Transect (Appendix B)

Mitigation Area Boundary

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Wetland

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Pond

Stream

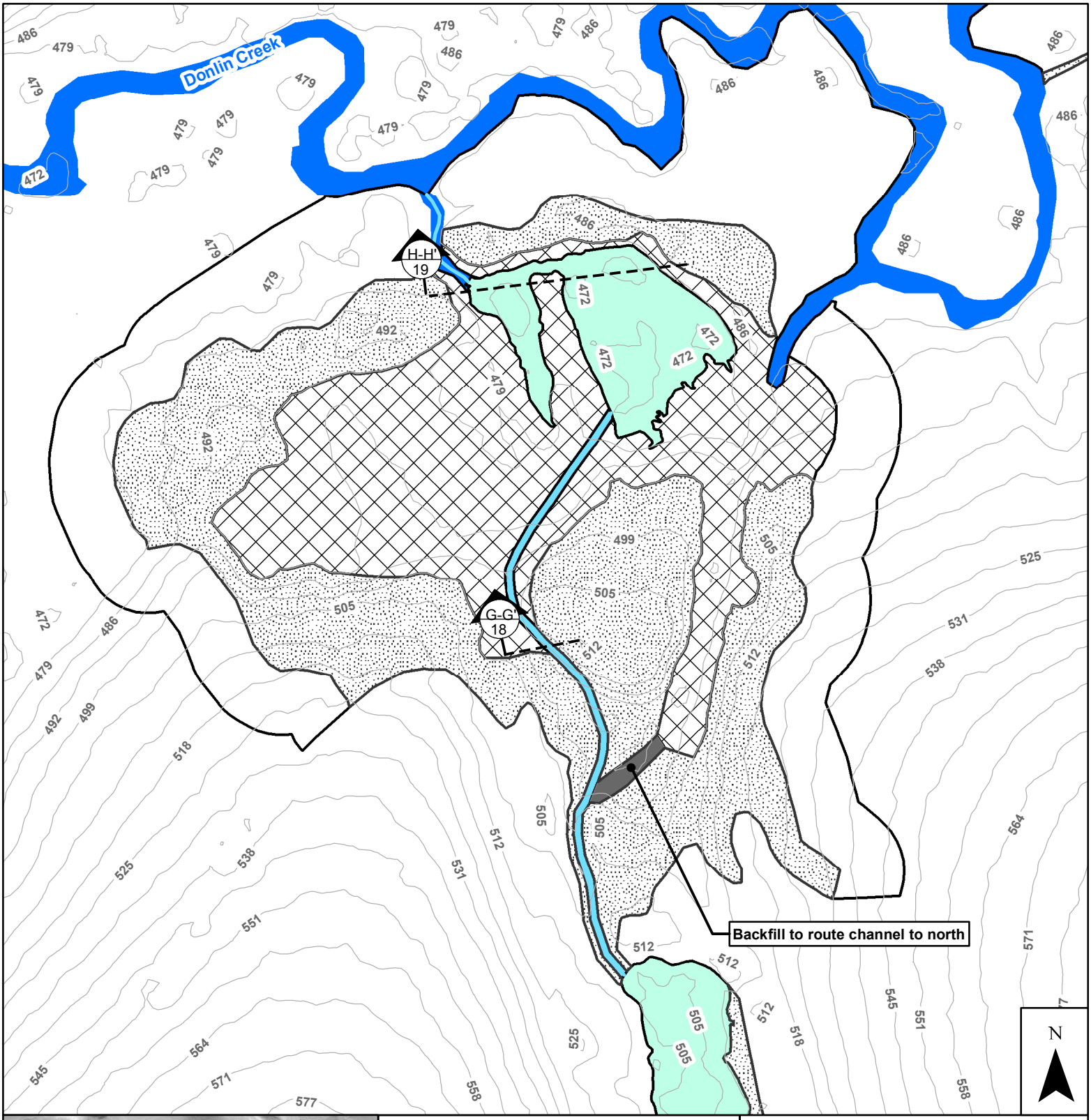
Chapter 23. Compensatory Mitigation Plan, Appendix A

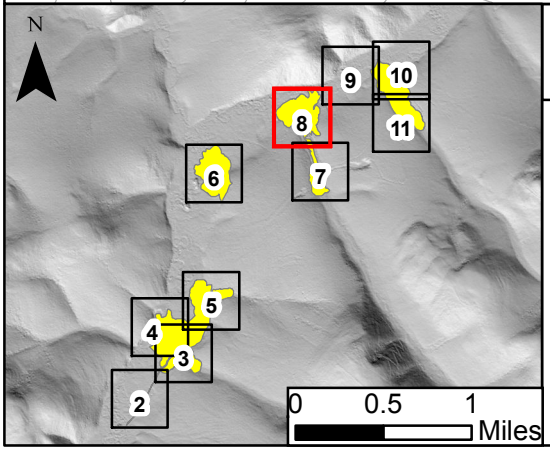
Upper Crooked Creek PRM
Plan View - Baseline

NAD 1983 UTM Zone 4N;
Imagery 0.5m resolution, capture date 5/29/16;
Digital Elevation Model from ArcticDEM;
Wetland Status from 2016 Donlin Gold PJD

DONLIN GOLD

Sheet 8a





0 200 400 Feet

CROSS SECTION

RESTORATION ACTIVITY

- FILL TO RESTORE/MAINTAIN HYDROLGY
- WETLAND & UPLAND RIPARIAN CUT/FILL
- POND CUT/FILL
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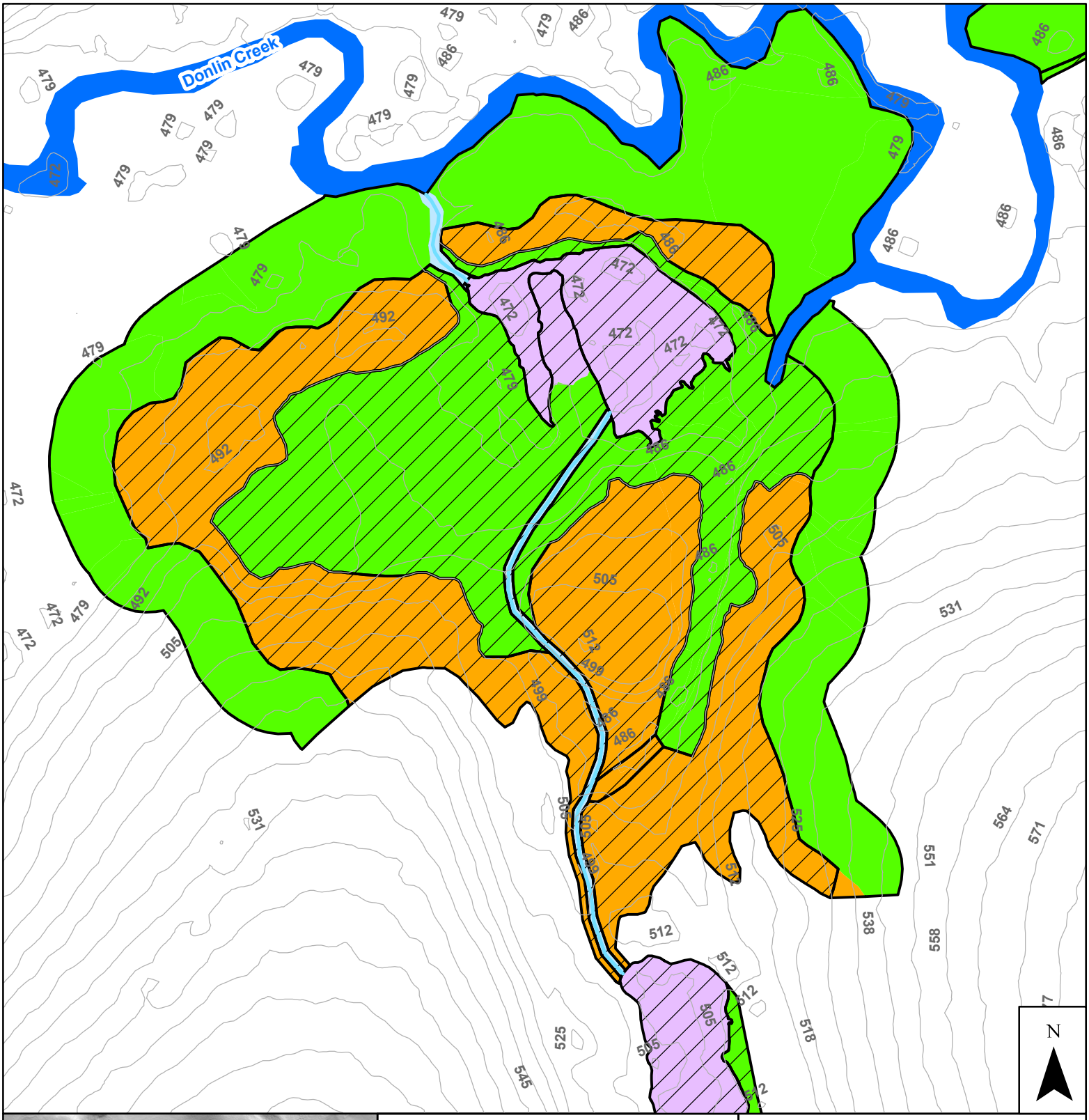
Chapter 23. Compensatory Mitigation Plan, Appendix A

Upper Crooked Creek PRM
Plan View - Restoration

NAD 1983 UTM Zone 4N;
Contours in feet derived from ArcticDEM 2m Digital Elevation Model;
Crooked Creek OHW From 2016 PJD

DONLIN GOLD

Sheet 8b



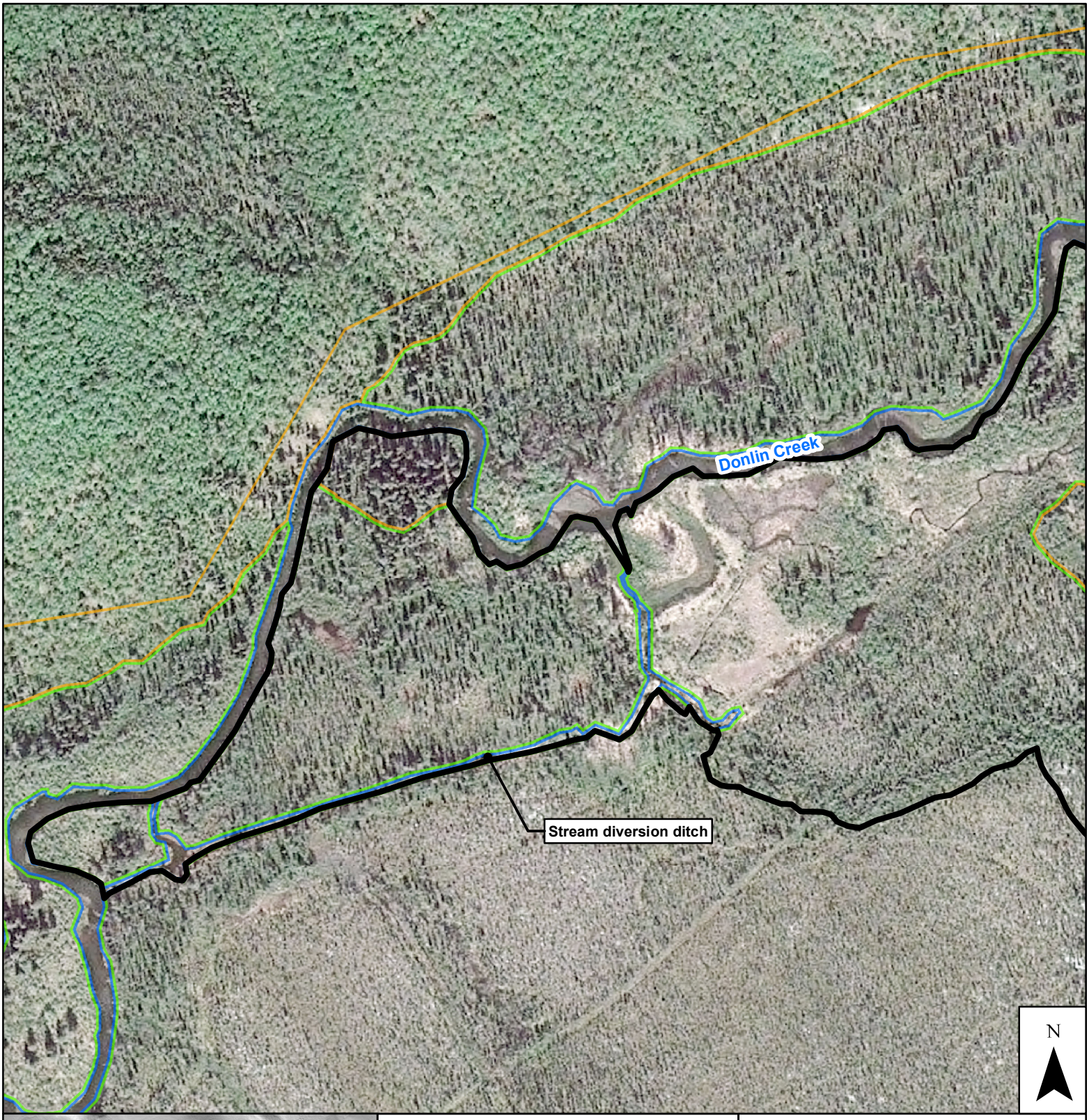
Chapter 23. Compensatory Mitigation Plan, Appendix A

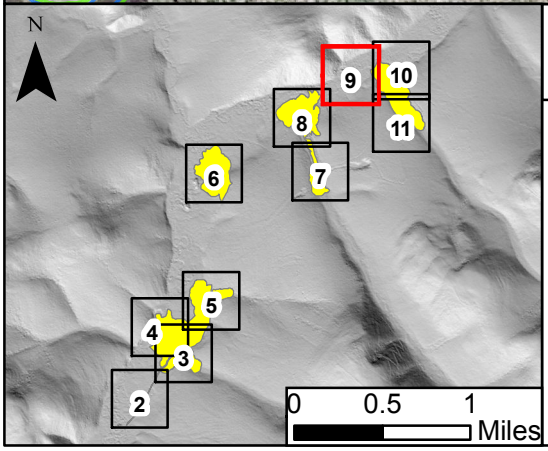
Upper Crooked Creek PRM Plan View - Final Wetlands

NAD 1983 UTM Zone 4N;
Contours in feet derived from ArcticDEM 2m Digital Elevation Model

DONLIN GOLD

Sheet 8c





0 200 400 Feet

Baseline Transect (Appendix B)

Mitigation Area Boundary

Wetland Status (2016 PJD)

Wetland

Upland

Pond

Stream

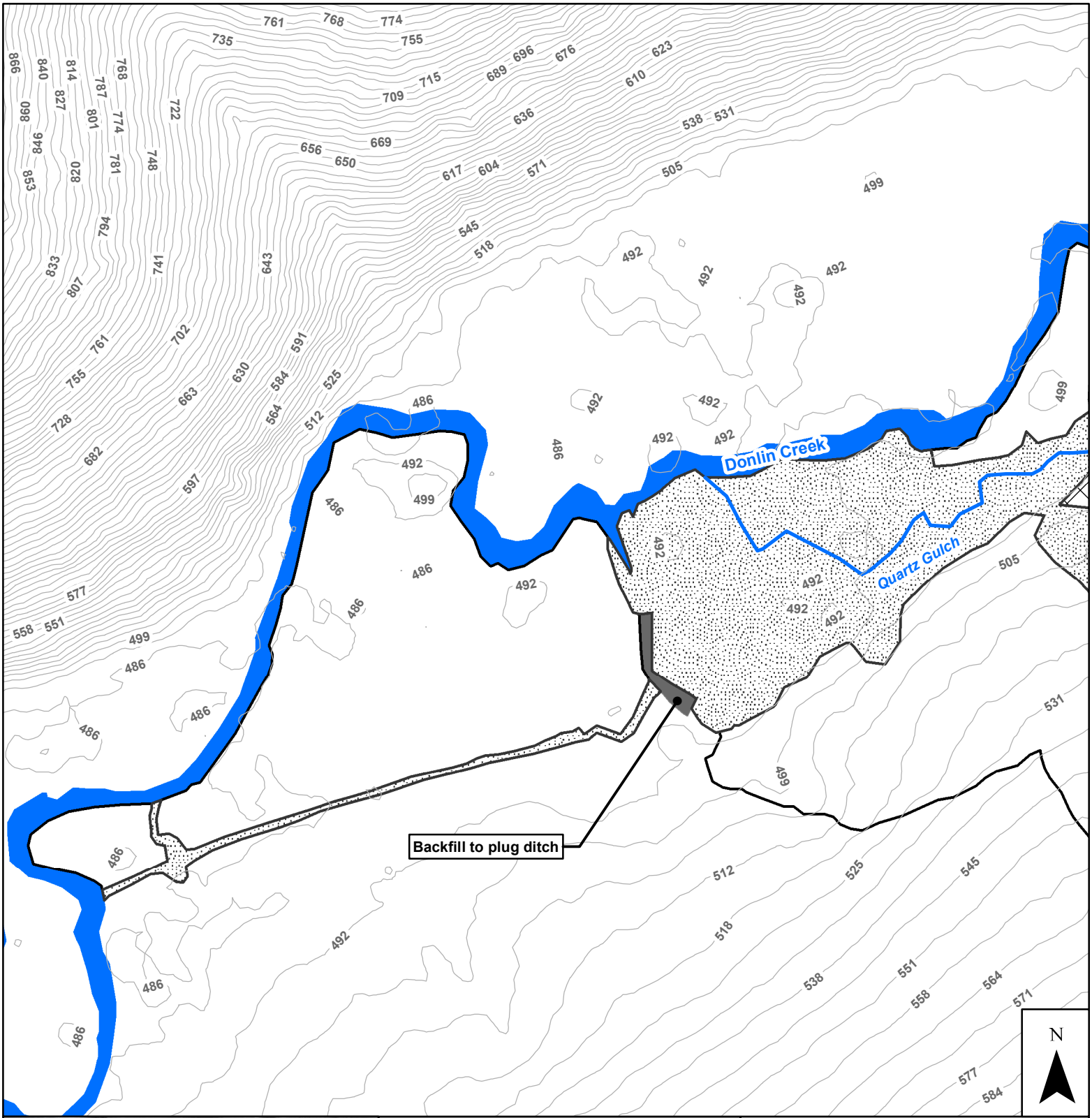
Chapter 23. Compensatory Mitigation Plan, Appendix A

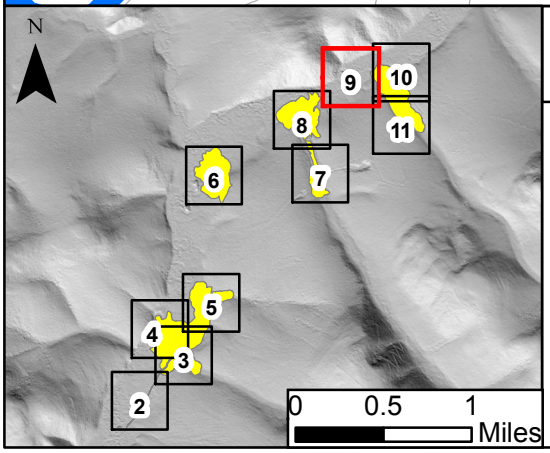
Upper Crooked Creek PRM
Plan View - Baseline

NAD 1983 UTM Zone 4N;
Imagery 0.5m resolution, capture date 5/29/16;
Digital Elevation Model from ArcticDEM;
Wetland Status from 2016 Donlin Gold PJD

DONLIN GOLD

Sheet 9a





0 200 400 Feet

CROSS SECTION

RESTORATION ACTIVITY

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- POND CUT/FILL
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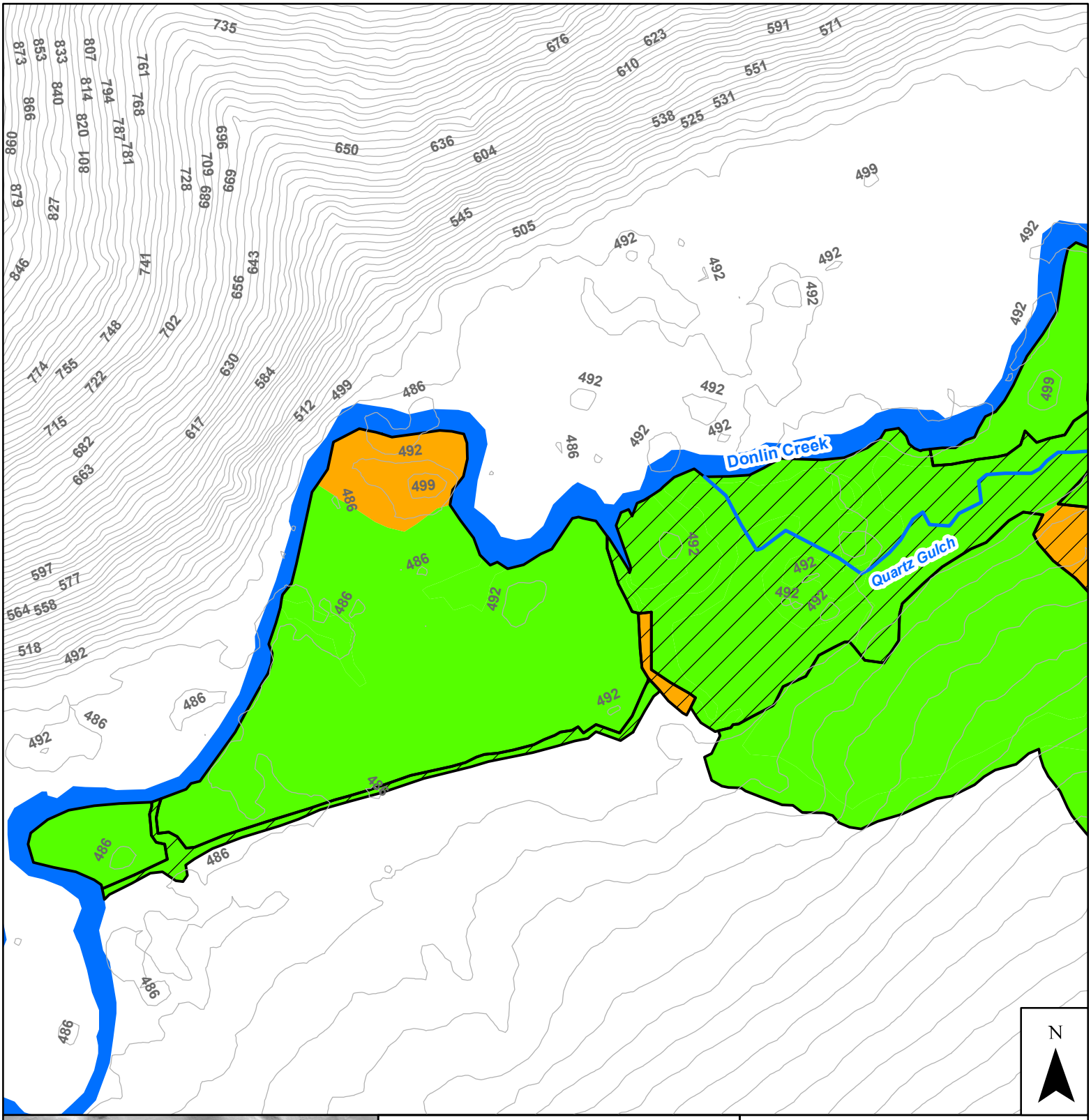
Chapter 23. Compensatory Mitigation Plan, Appendix A

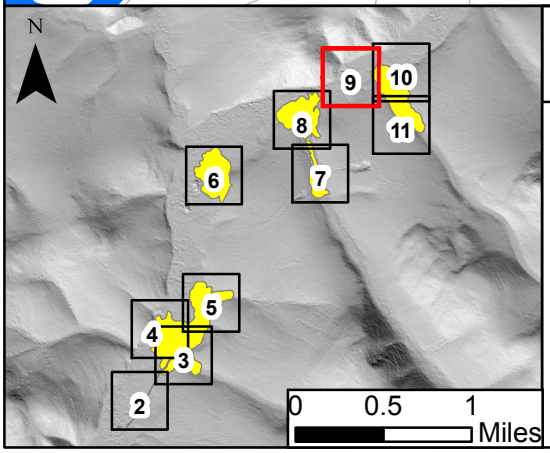
Upper Crooked Creek PRM
Plan View - Restoration

NAD 1983 UTM Zone 4N;
Contours in feet derived from ArcticDEM 2m Digital Elevation Model;
Crooked Creek OHW From 2016 PJD

DONLIN GOLD

Sheet 9b





0 200 400 Feet

EXISTING STREAM

RESTORATION ACTIVITY

RESTORATION

PRESERVATION

RESTORATION WETLAND STATUS

UPLAND

WETLAND

STREAM

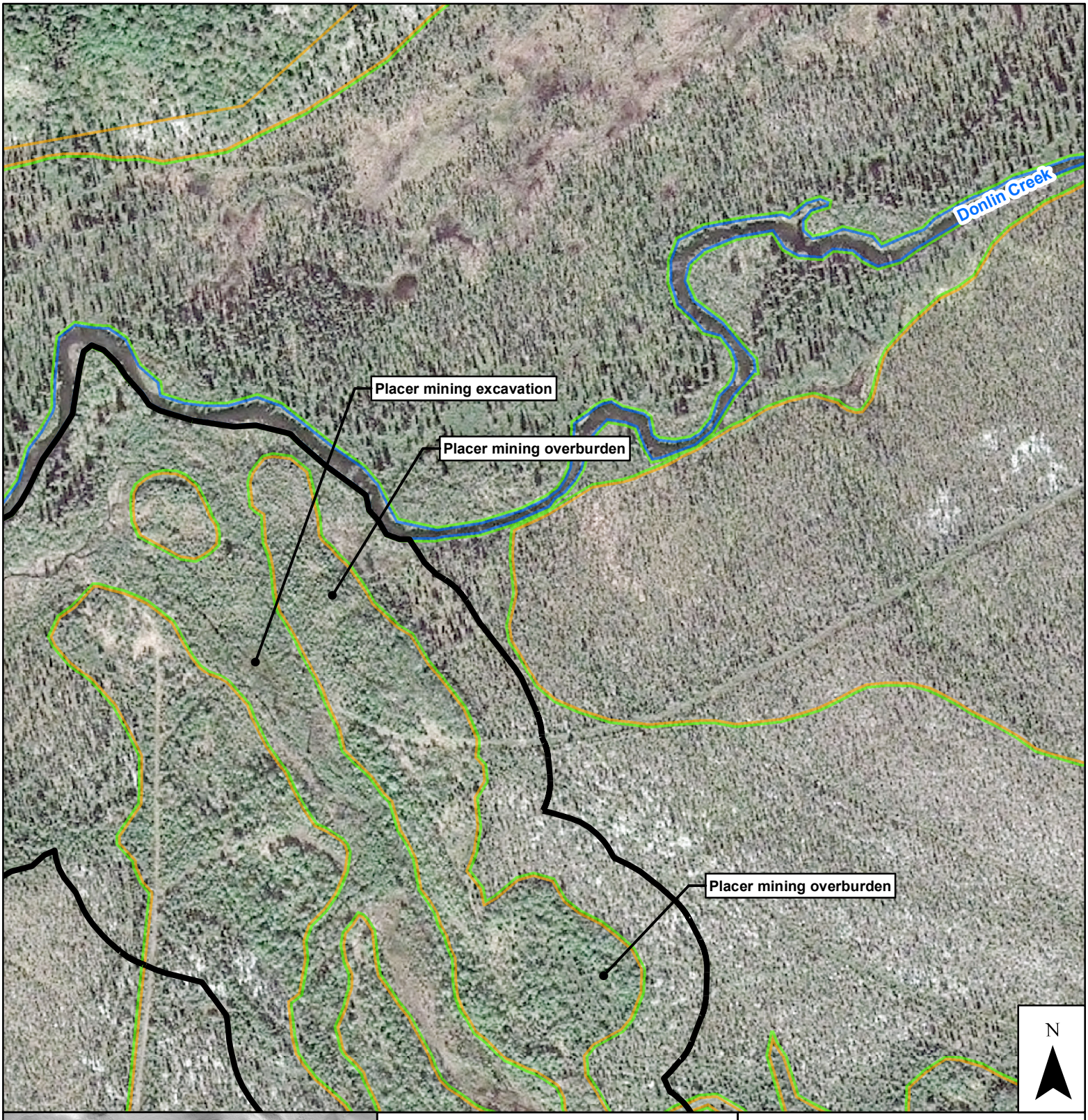
POND

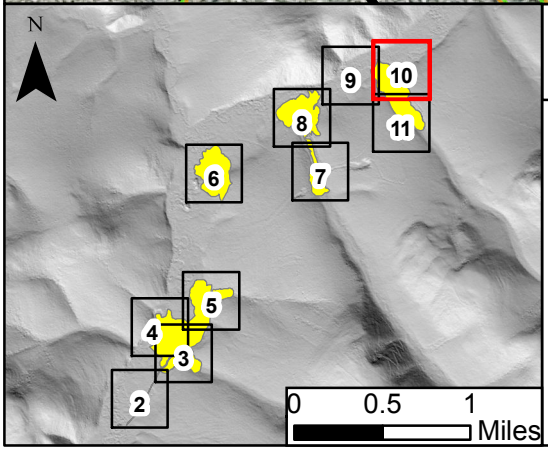
Chapter 23. Compensatory Mitigation Plan, Appendix A

Upper Crooked Creek PRM
Plan View - Final Wetlands

NAD 1983 UTM Zone 4N;
Contours in feet derived from ArcticDEM 2m Digital Elevation Model

DONLIN GOLD





0 200 400 Feet

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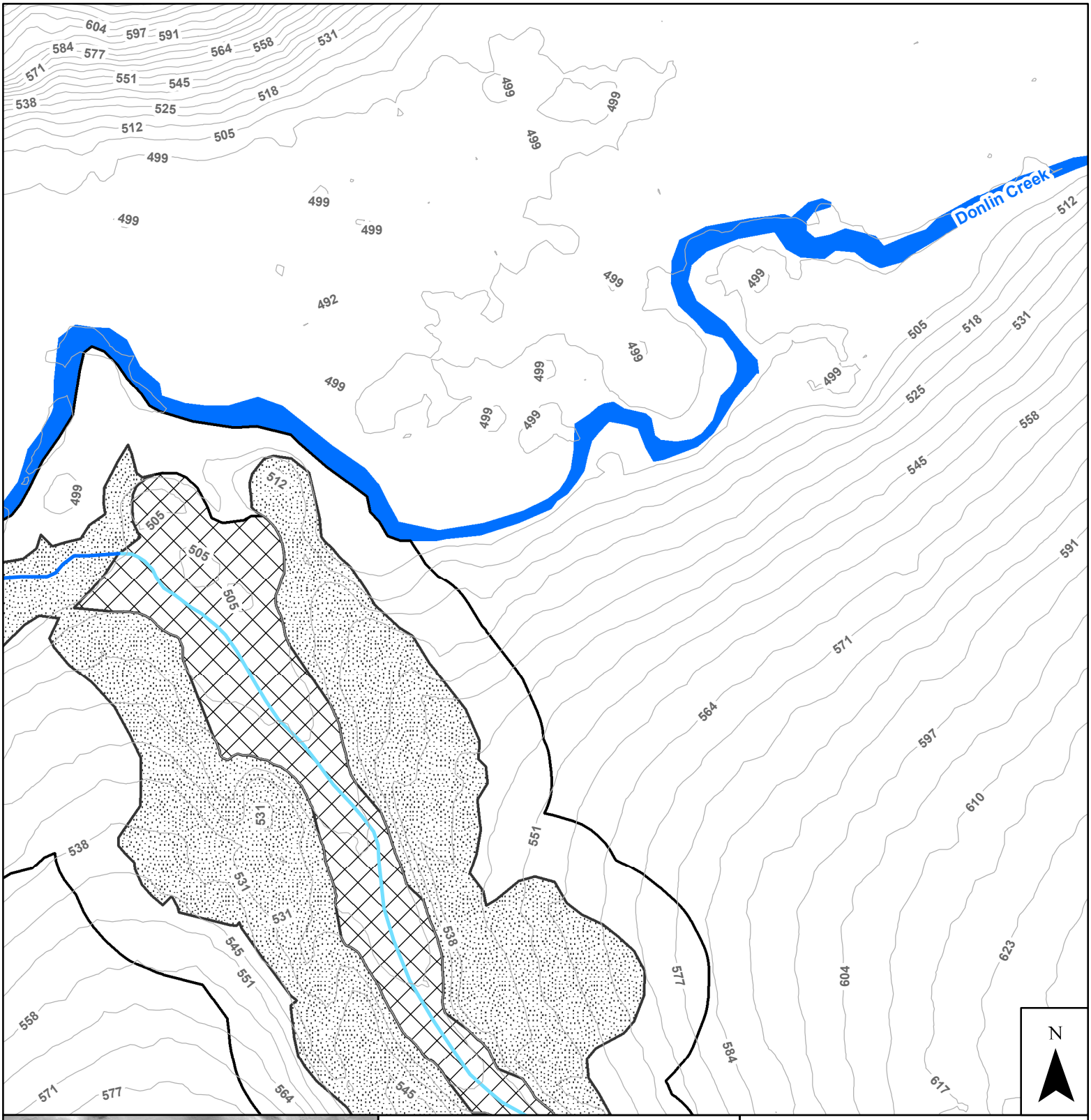
DONLIN GOLD

Sheet 10a



Chapter 23. Compensatory Mitigation Plan, Appendix A

Upper Crooked Creek PRM
Plan View - Restoration

NAD 1983 UTM Zone 4N;
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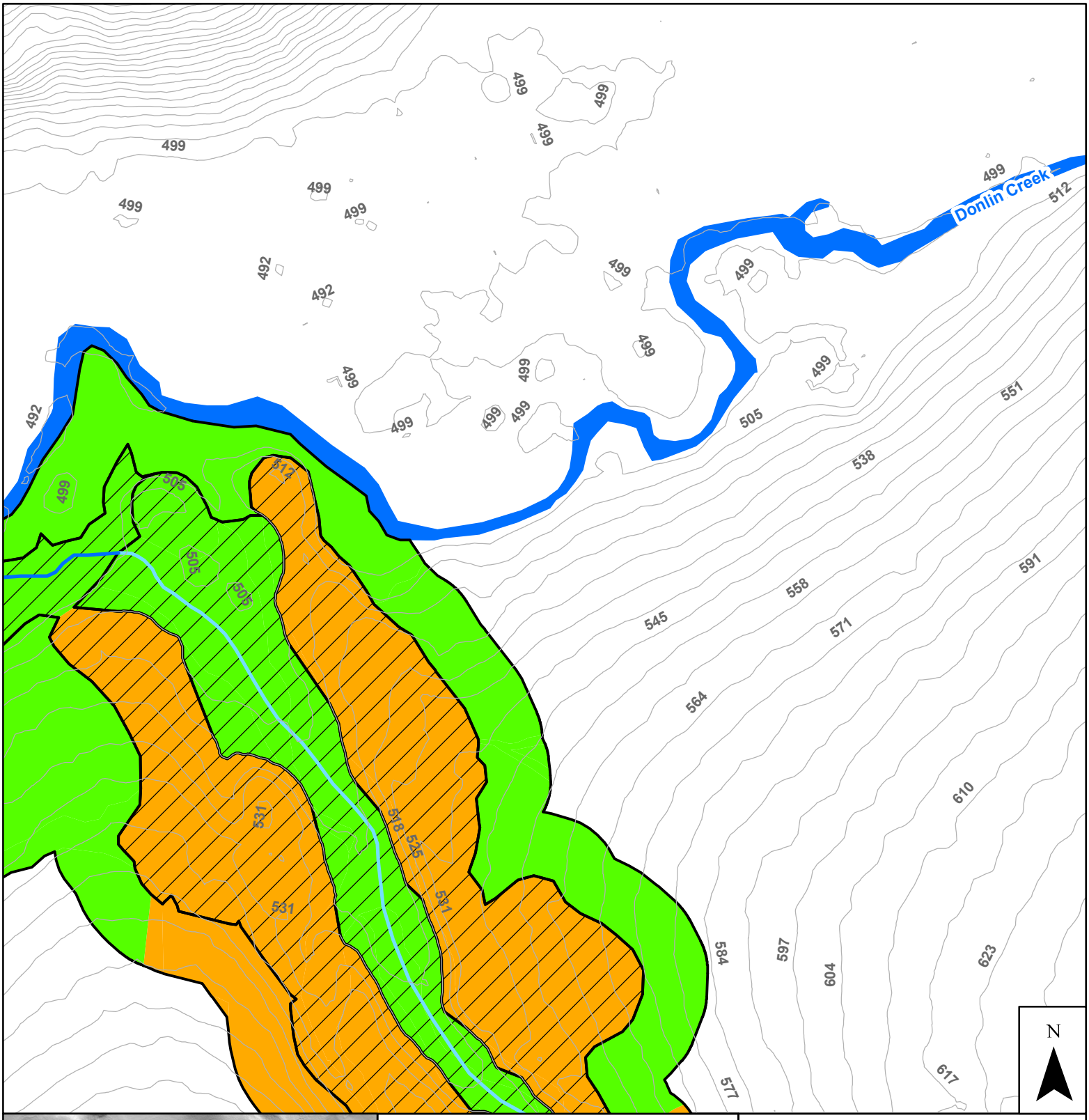
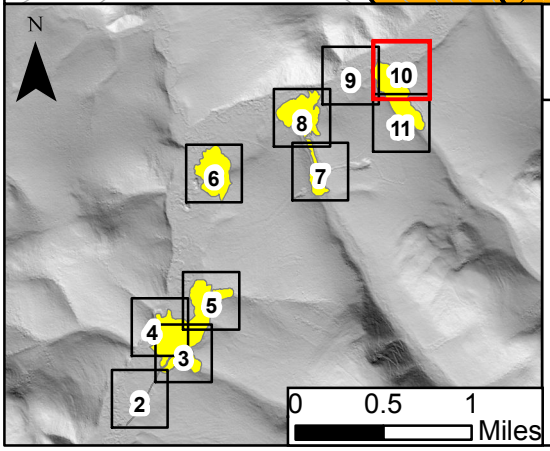
Crooked Creek OHW From 2016 PJD

DONLIN GOLD

Sheet 10b





0 200 400 Feet

EXISTING STREAM

RESTORATION ACTIVITY

RESTORATION

PRESERVATION

RESTORATION WETLAND STATUS

UPLAND

WETLAND

STREAM

POND

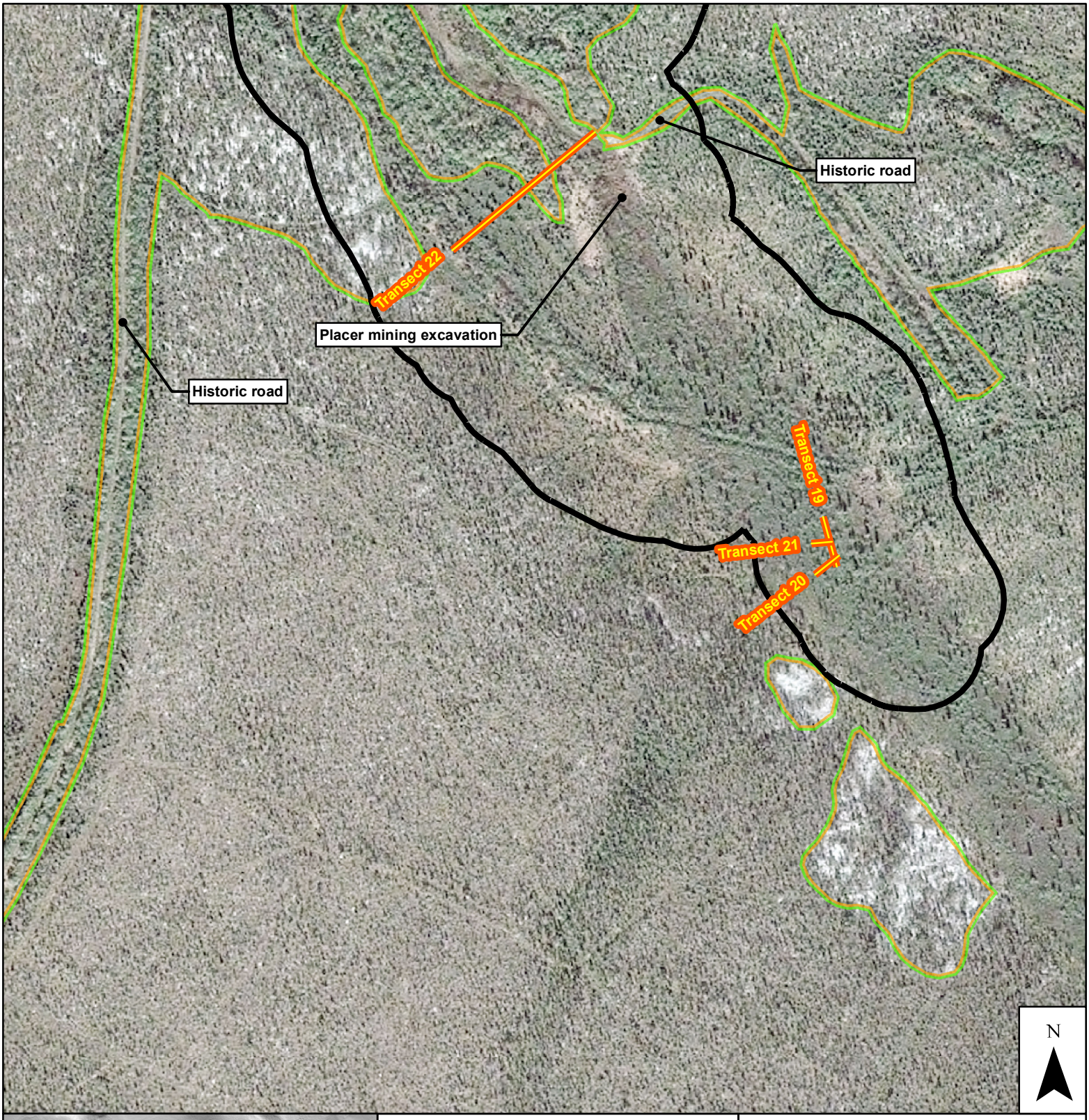
Chapter 23. Compensatory Mitigation Plan, Appendix A

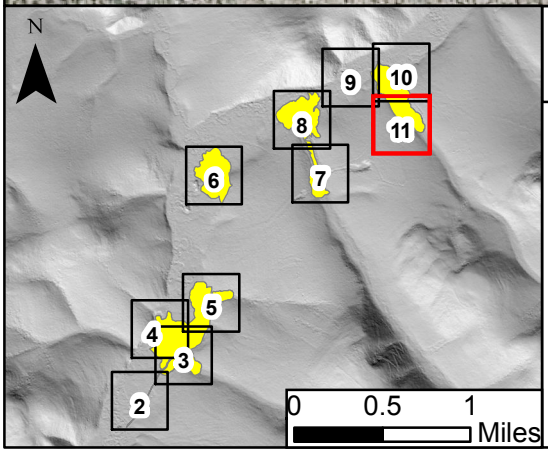
Upper Crooked Creek PRM Plan View - Final Wetlands

NAD 1983 UTM Zone 4N;
Contours in feet derived from ArcticDEM 2m Digital Elevation Model

DONLIN GOLD

Sheet 10c





0 200 400 Feet

Baseline Transect (Appendix B)

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Stream

Chapter 23. Compensatory Mitigation Plan, Appendix A

Upper Crooked Creek PRM
Plan View - Baseline

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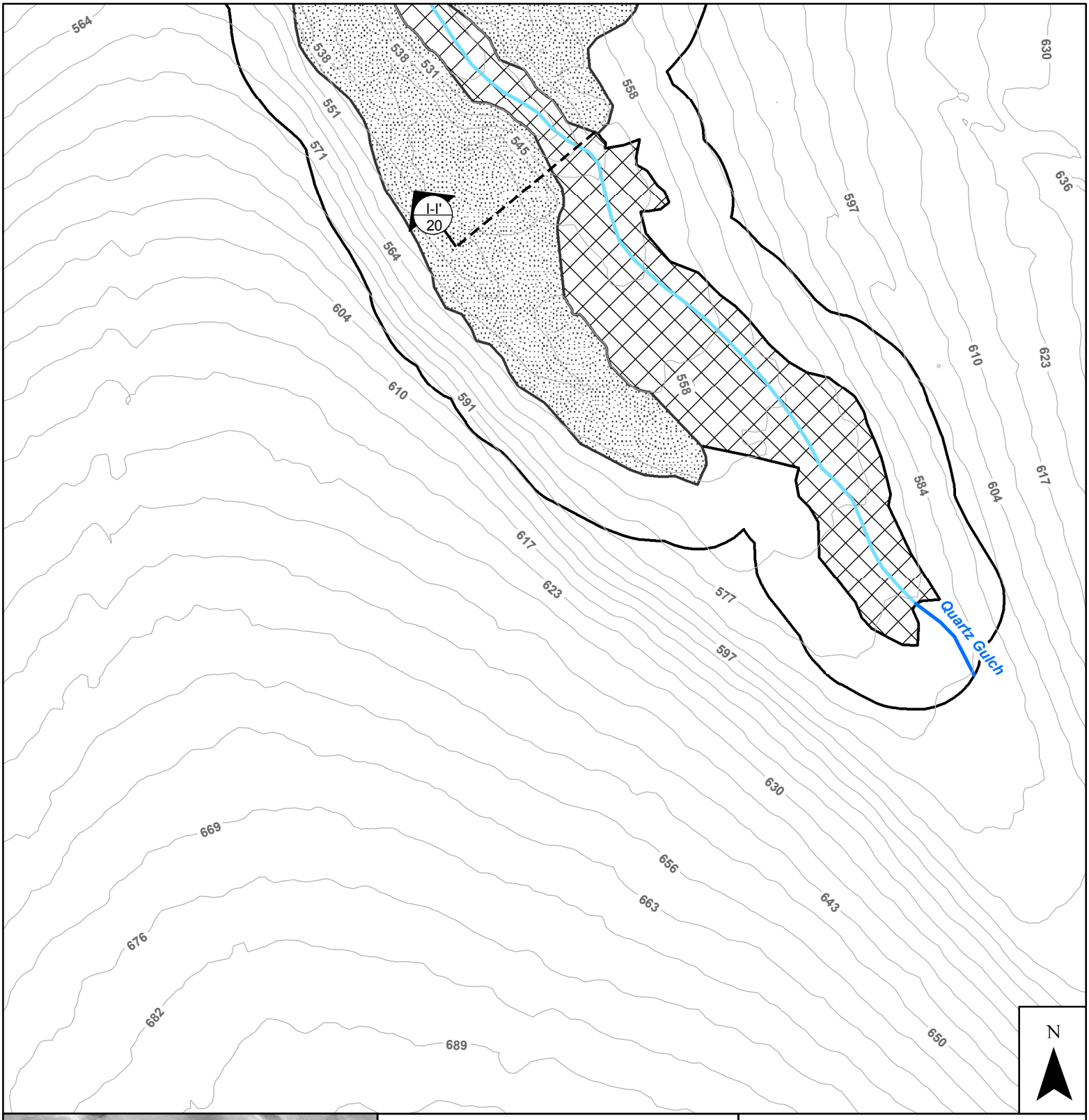
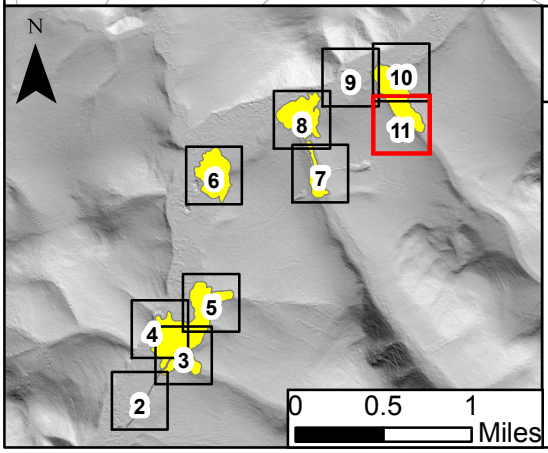
Imagery 0.5m resolution, capture date 5/29/16;
Digital Elevation Model from ArcticDEM;
Wetland Status from 2016 Donlin Gold PJD

DONLIN GOLD

Sheet 11a





0 200 400 Feet

CROSS SECTION

RESTORATION ACTIVITY

- FILL TO RESTORE/MAINTAIN HYDROLGY
- WETLAND & UPLAND RIPARIAN CUT/FILL
- POND CUT/FILL
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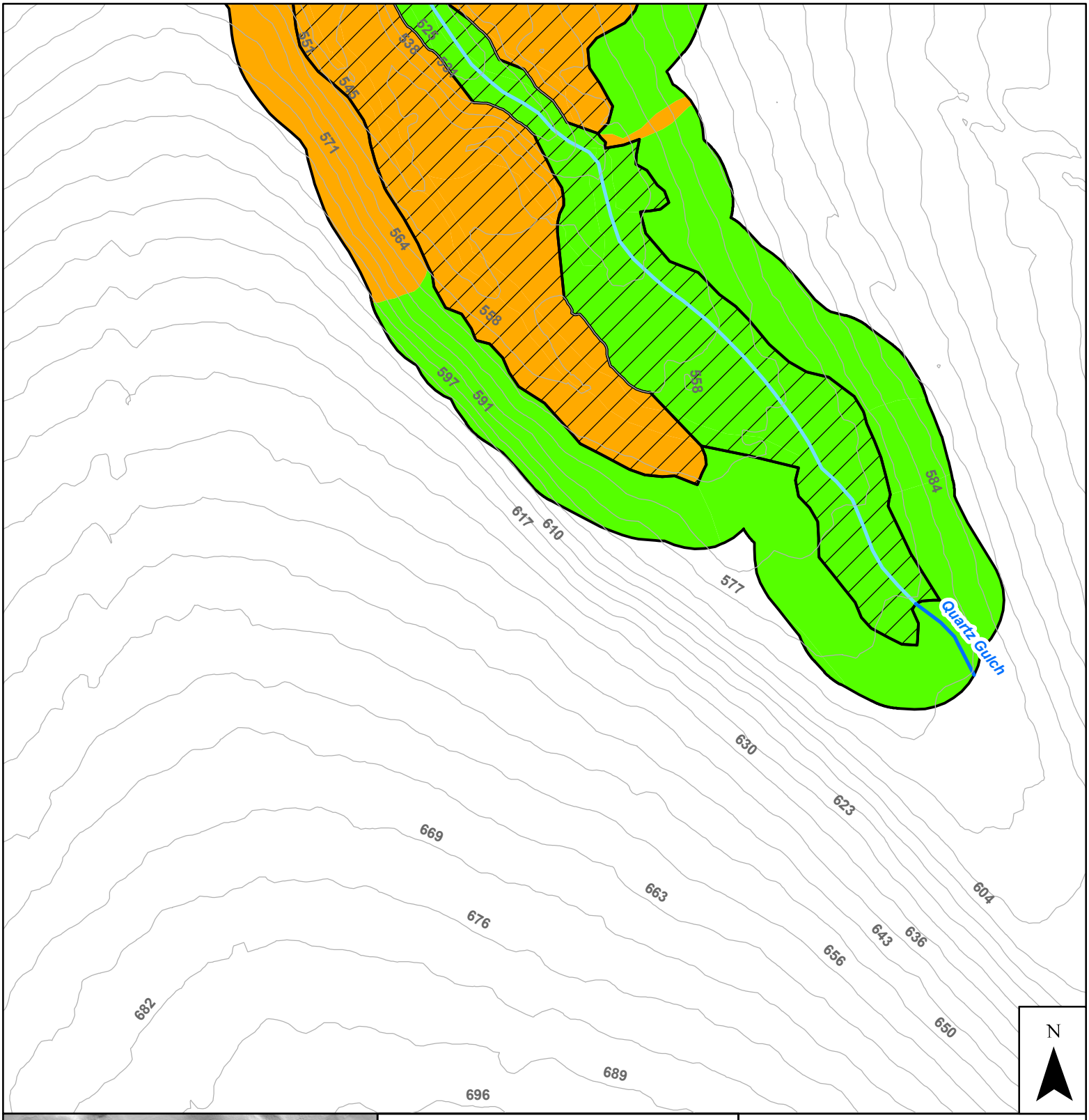
Chapter 23. Compensatory Mitigation Plan, Appendix A

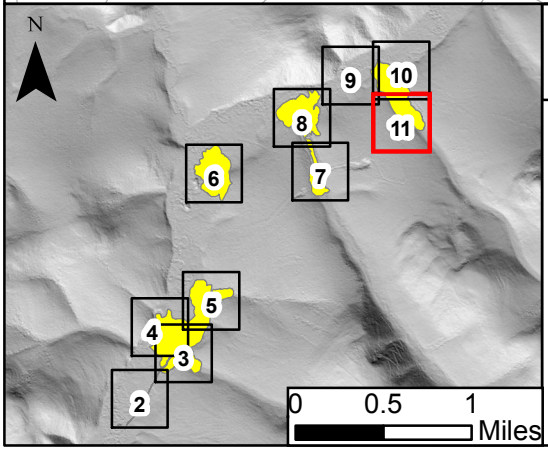
Upper Crooked Creek PRM
Plan View - Restoration

NAD 1983 UTM Zone 4N;
Contours in feet derived from ArcticDEM 2m Digital Elevation Model;
Crooked Creek OHW From 2016 PJD

DONLIN GOLD

Sheet 11b





0 200 400 Feet

EXISTING STREAM

RESTORATION ACTIVITY

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PRESERVATION

RESTORATION WETLAND STATUS

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Upper Crooked Creek PRM
Plan View - Final Wetlands

NAD 1983 UTM Zone 4N;
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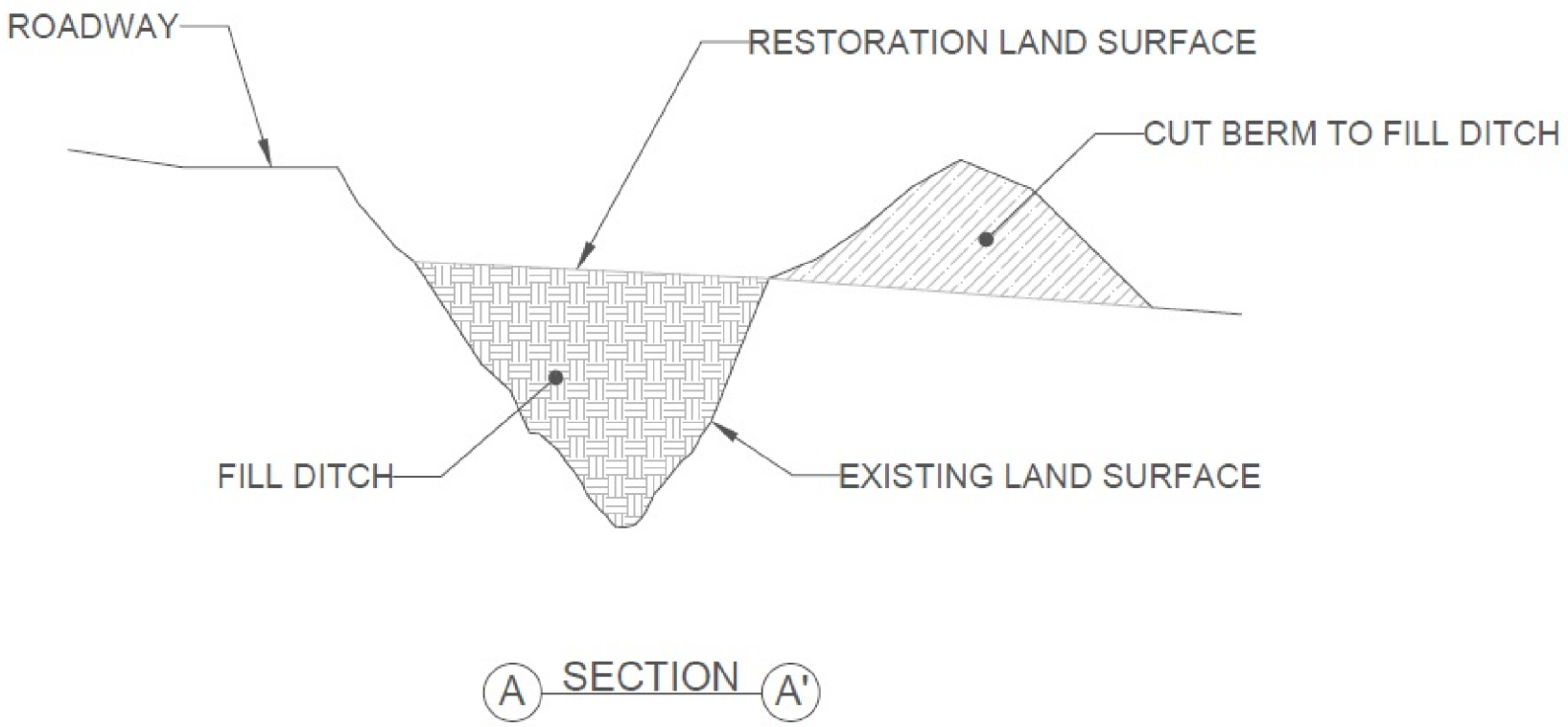
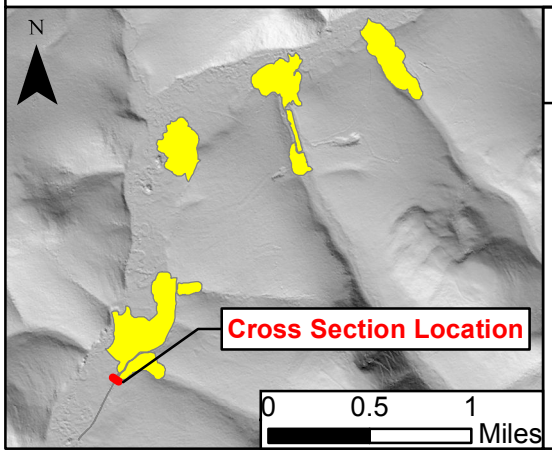
DONLIN GOLD

Sheet 11c





Stream Diversion Plug Conceptual Schematic

Notes: Drawing is not to scale. Vertical exaggerated to show detail.

Not for construction. Plans are conceptual and require field verification prior to restoration activities.

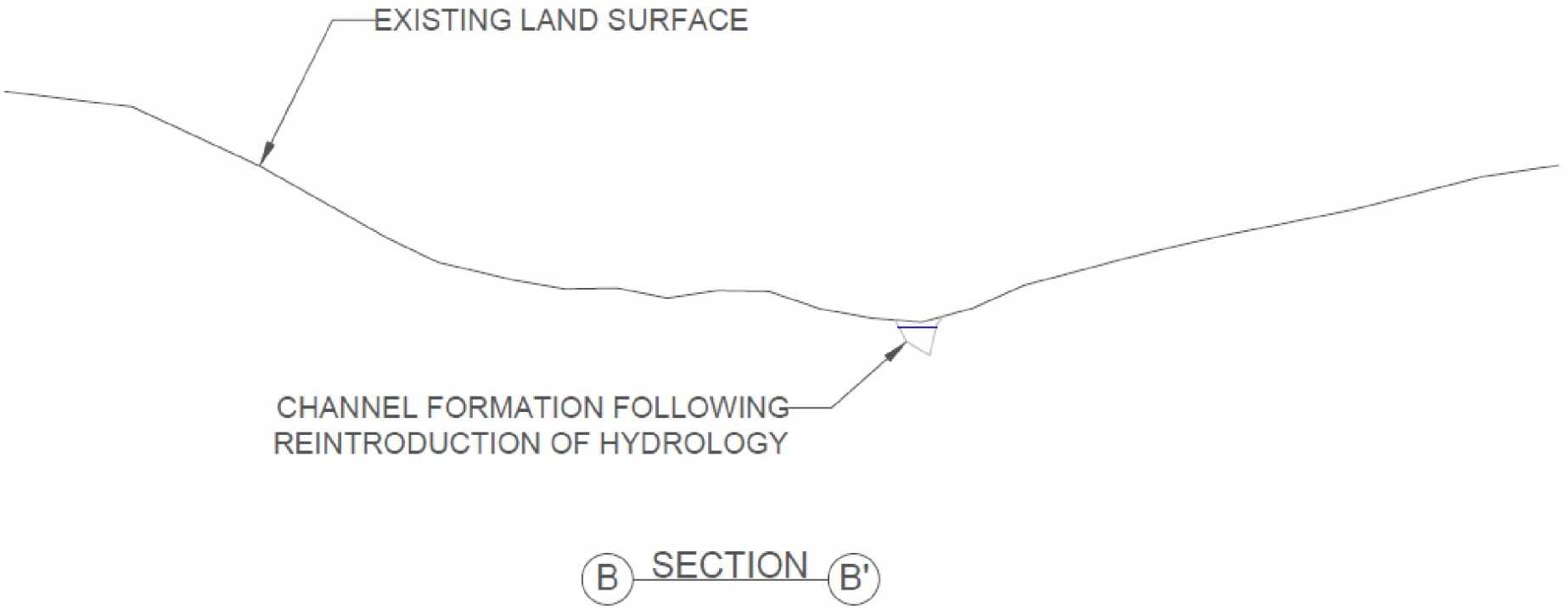
Chapter 23. Compensatory Mitigation Plan, Appendix A

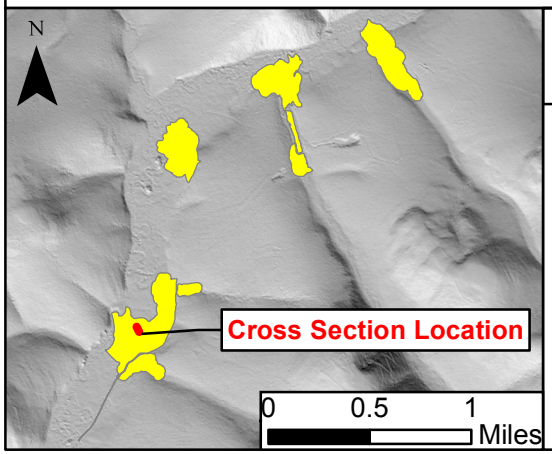
Upper Crooked Creek PRM
Section A-A'

Drawn by: **ZLB**

Date: **12/13/17**

DONLIN GOLD





Ruby Gulch Historic Channel Conceptual Schematic

Notes: Drawing is not to scale. Vertical exaggerated to show detail.

Not for construction. Plans are conceptual and require field verification prior to restoration activities.

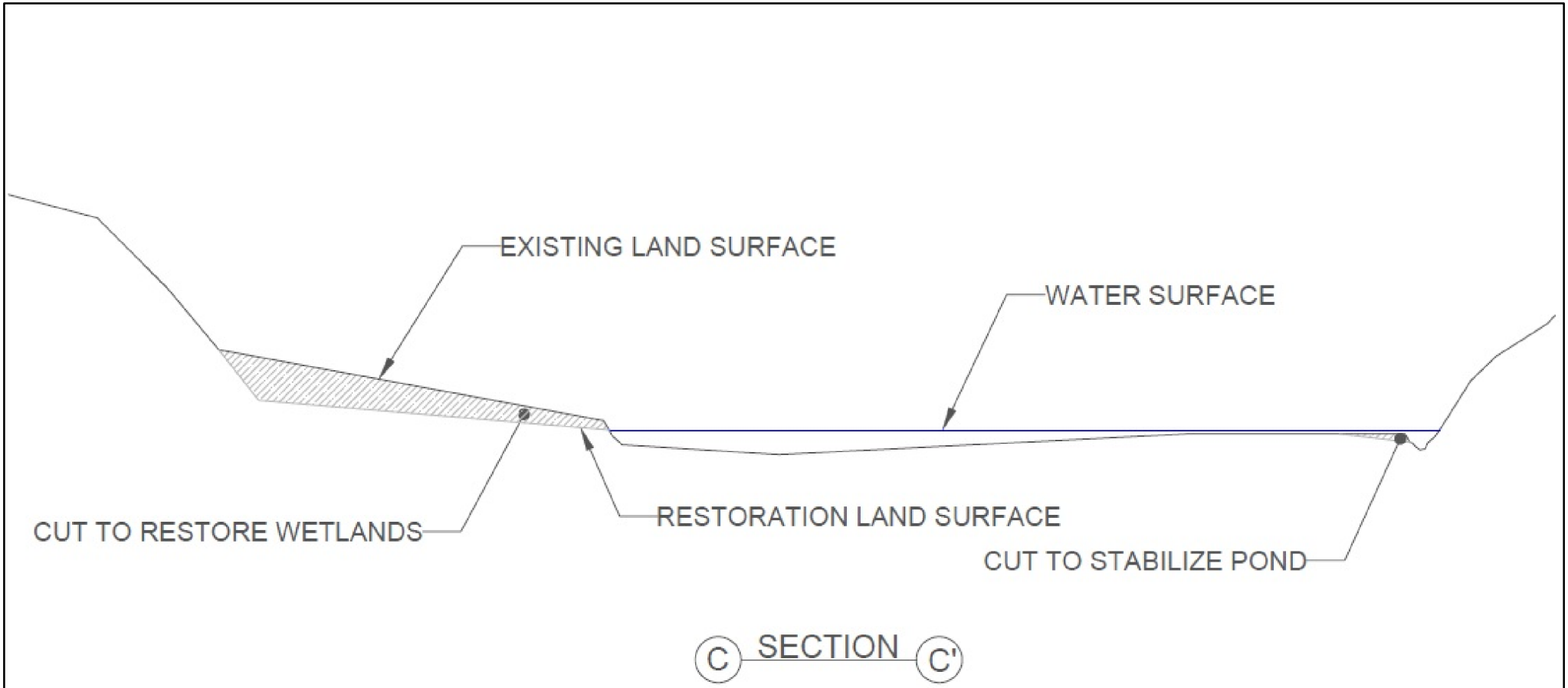
Chapter 23. Compensatory Mitigation Plan, Appendix A

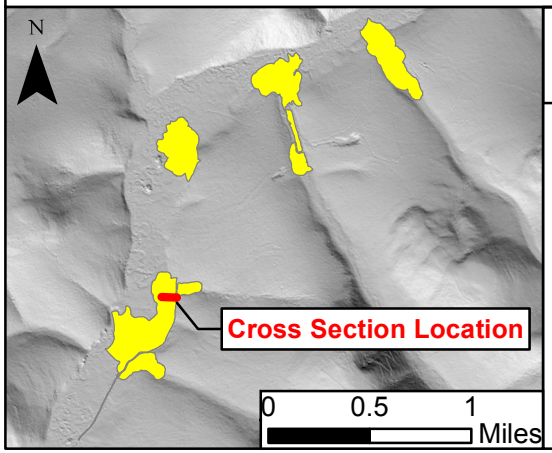
Upper Crooked Creek PRM
Section B-B'

Drawn by: **ZLB**

Date: **12/13/17**

DONLIN GOLD





Ruby Gulch Pond Conceptual Schematic

Notes: Drawing is not to scale. Vertical exaggerated to show detail.

Not for construction. Plans are conceptual and require field verification prior to restoration activities.

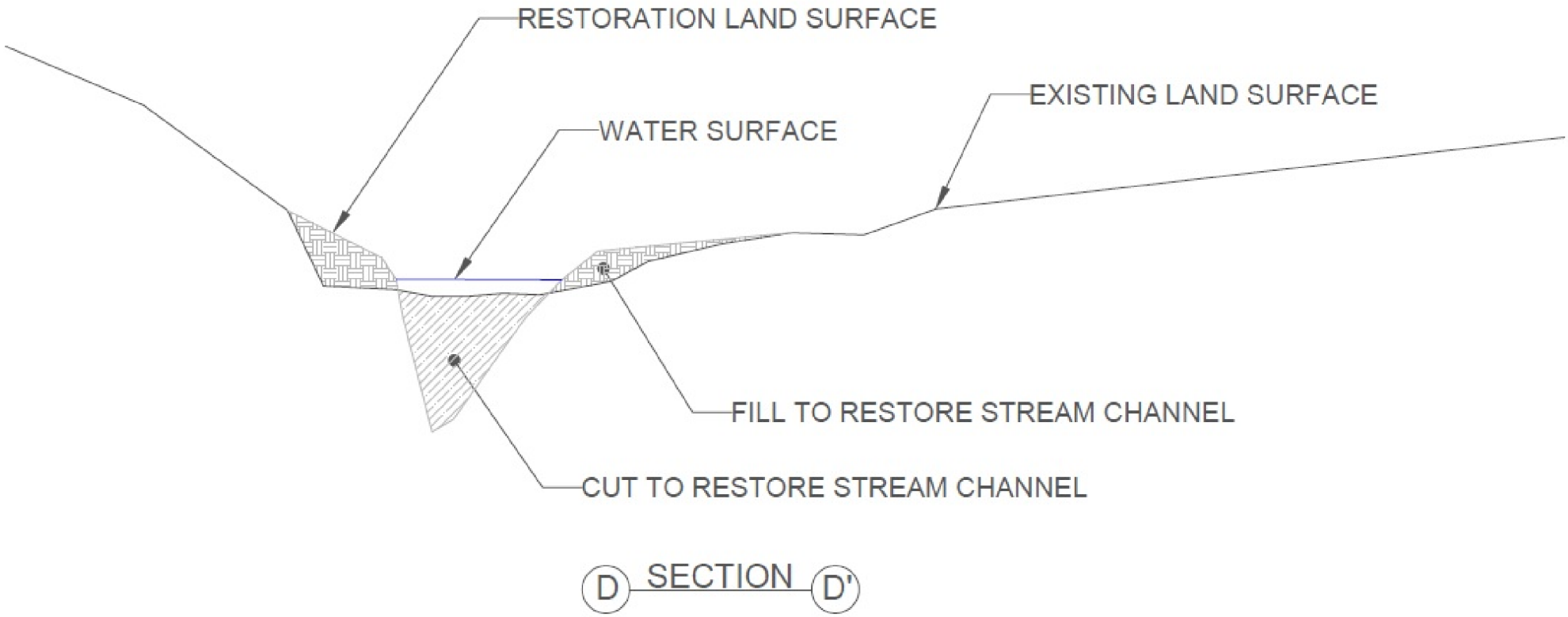
Chapter 23. Compensatory Mitigation Plan, Appendix A

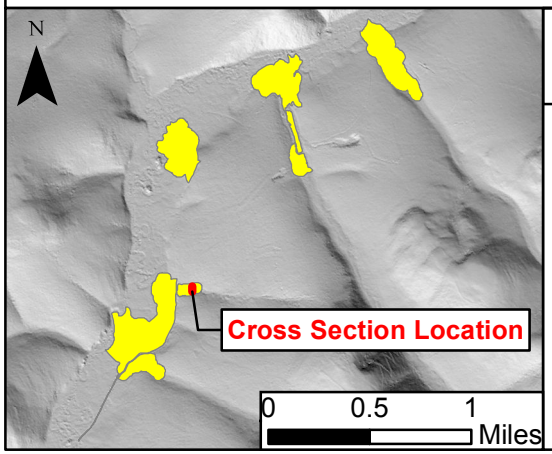
Upper Crooked Creek PRM
Section C-C'

Drawn by: **ZLB**

Date: **12/13/17**

DONLIN GOLD





Ruby Gulch Mined Stream Conceptual Schematic

Notes: Drawing is not to scale. Vertical exaggerated to show detail.

Not for construction. Plans are conceptual and require field verification prior to restoration activities.

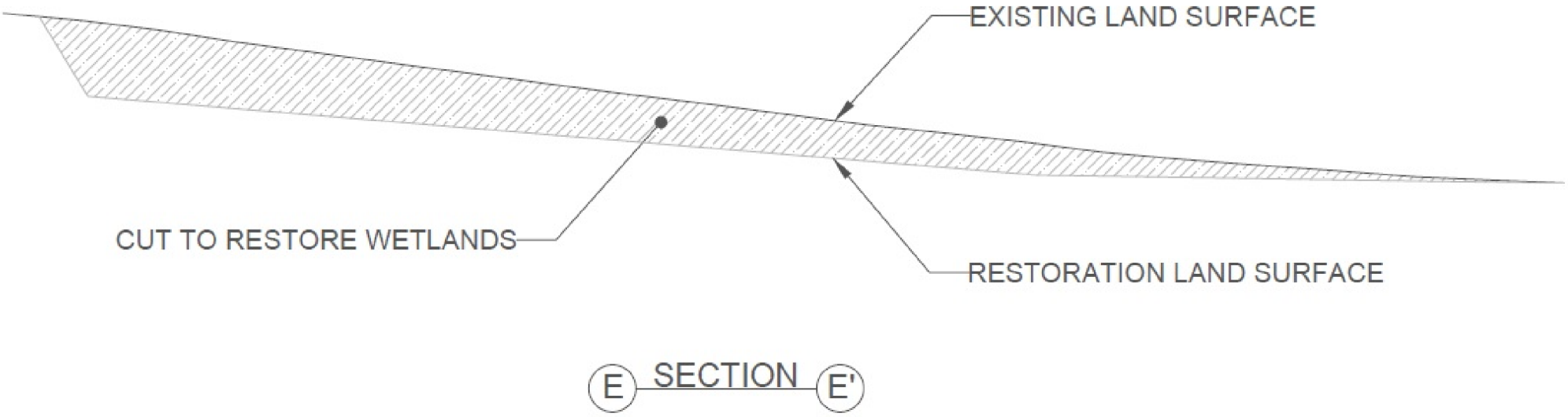
Chapter 23. Compensatory Mitigation Plan, Appendix A

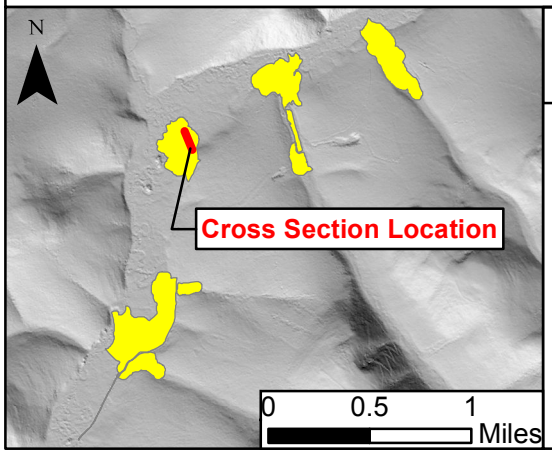
Upper Crooked Creek PRM
Section D-D'

Drawn by: **ZLB**

Date: **12/13/17**

DONLIN GOLD





Tailings Alluvial Fan Conceptual Schematic

Notes: Drawing is not to scale. Vertical exaggerated to show detail.

Not for construction. Plans are conceptual and require field verification prior to restoration activities.

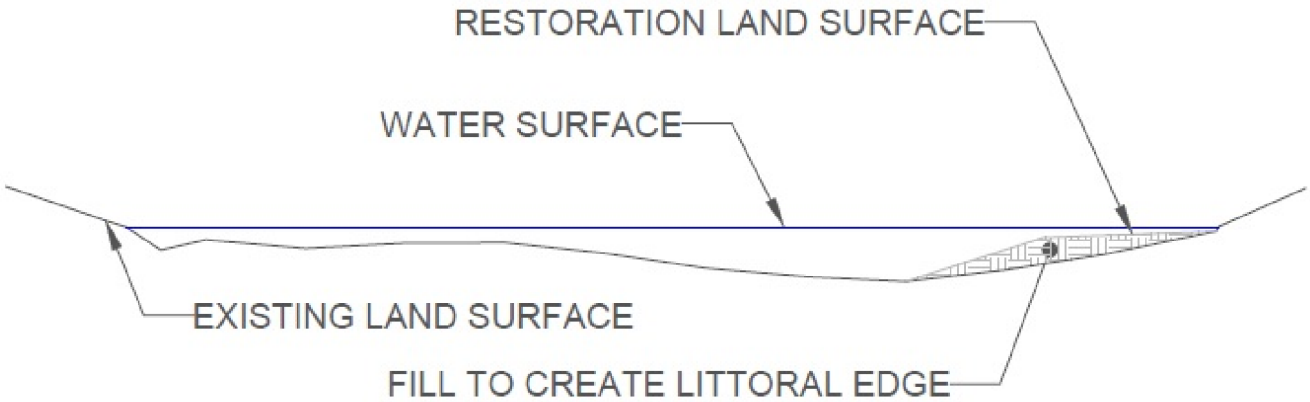
Chapter 23. Compensatory Mitigation Plan, Appendix A

Upper Crooked Creek PRM
Section E-E'

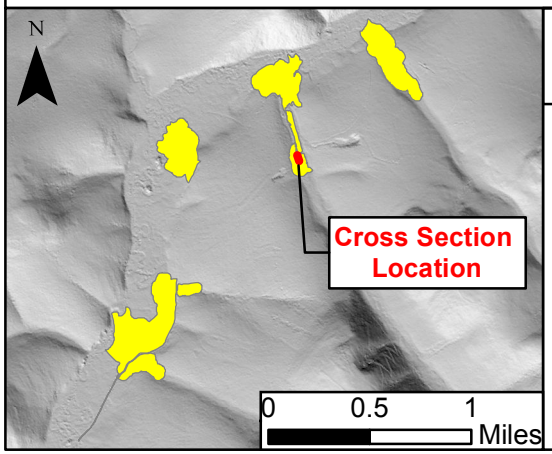
Drawn by: **ZLB**

Date: **12/13/17**

DONLIN GOLD



F SECTION F'



Upper Snow Gulch Pond Conceptual Schematic

Notes: Drawing is not to scale. Vertical exaggerated to show detail.

Not for construction. Plans are conceptual and require field verification prior to restoration activities.

Chapter 23. Compensatory Mitigation Plan, Appendix A

Upper Crooked Creek PRM
Section F-F'

Drawn by: **ZLB**

Date: **12/13/17**

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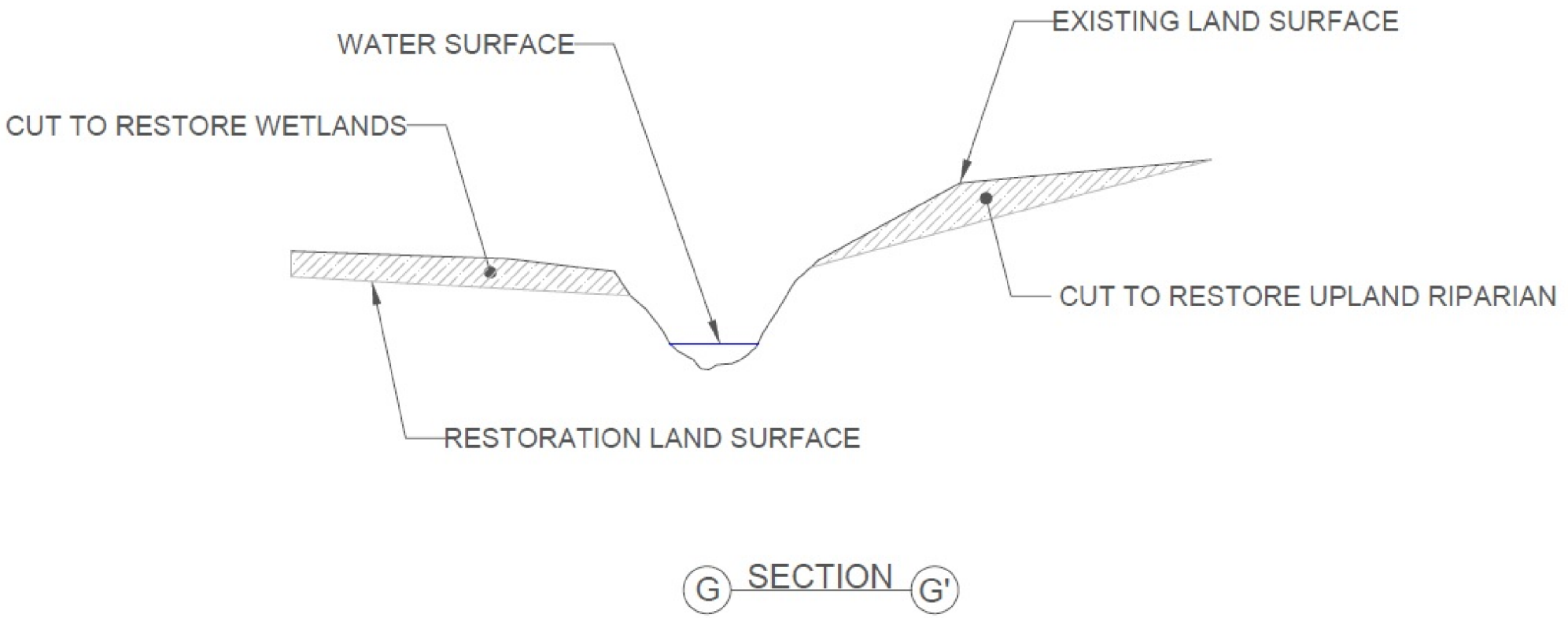
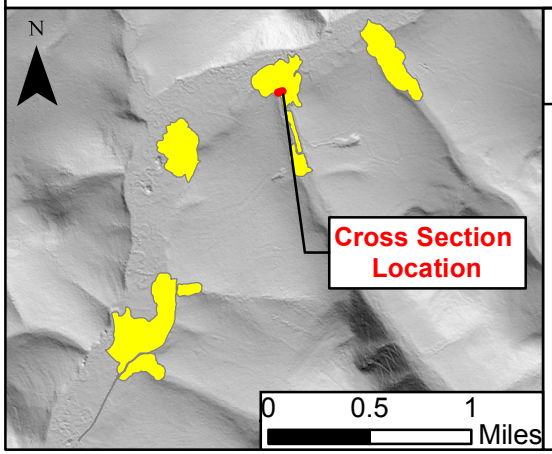




Snow Gulch Historic Channel Conceptual Schematic

Notes: Drawing is not to scale. Vertical exaggerated to show detail.

Not for construction. Plans are conceptual and require field verification prior to restoration activities.

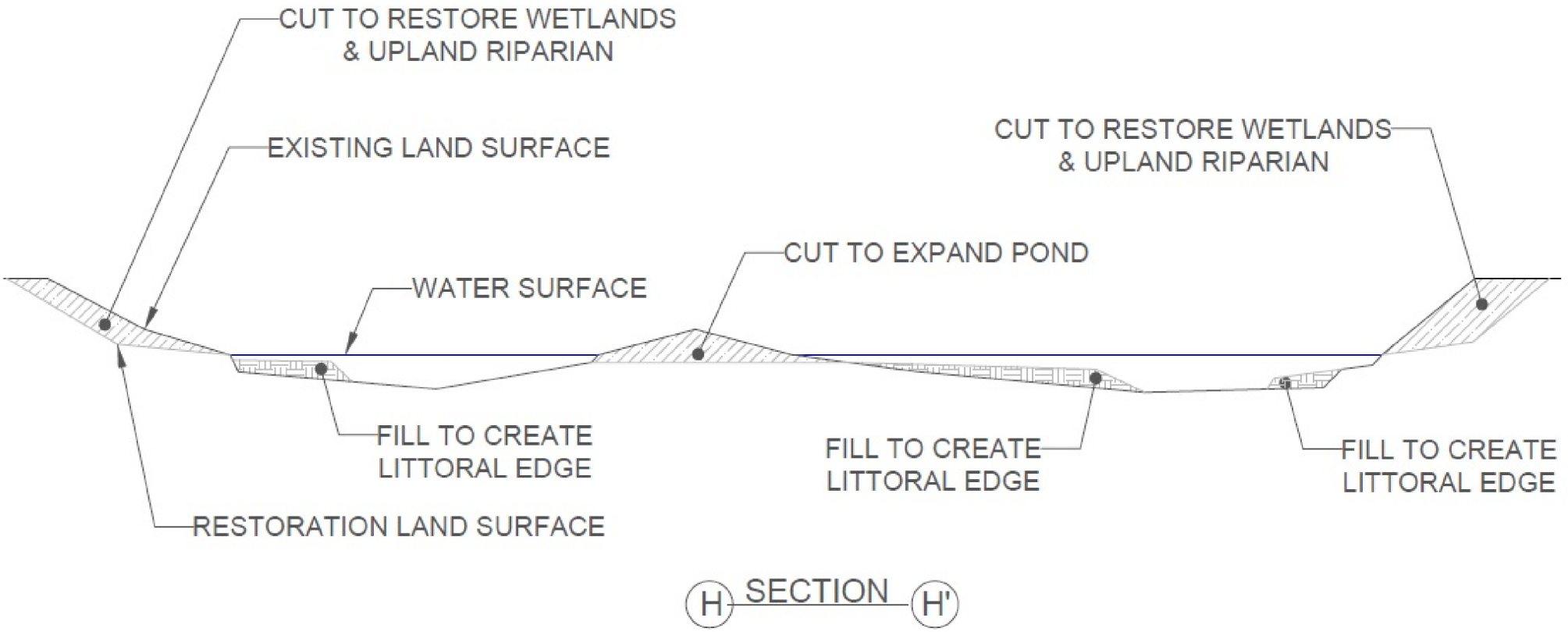
Chapter 23. Compensatory Mitigation Plan, Appendix A

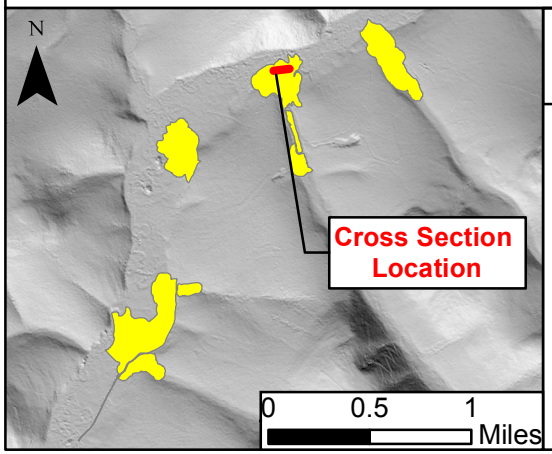
Upper Crooked Creek PRM
Section G-G'

Drawn by: **ZLB**

Date: **12/13/17**

DONLIN GOLD





Lower Snow Gulch Pond Conceptual Schematic

Notes: Drawing is not to scale. Vertical exaggerated to show detail.

Not for construction. Plans are conceptual and require field verification prior to restoration activities.

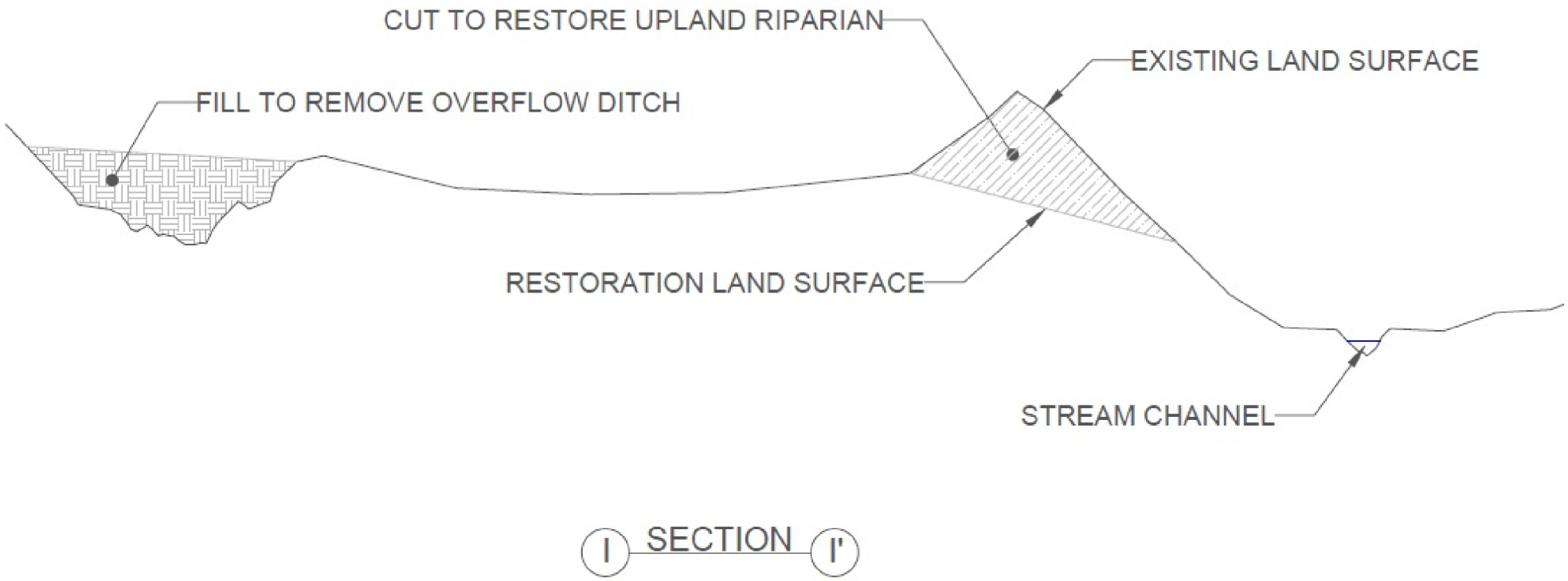
Chapter 23. Compensatory Mitigation Plan, Appendix A

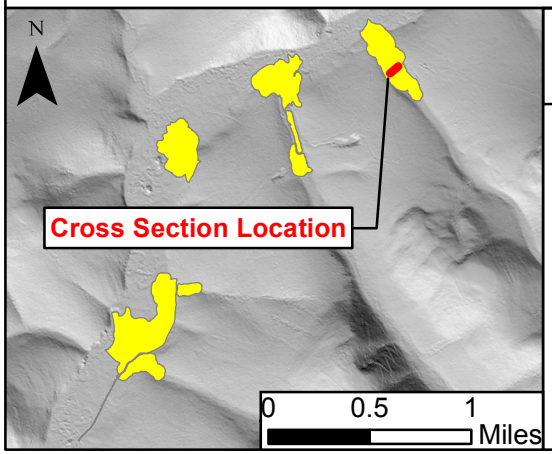
Upper Crooked Creek PRM
Section H-H'

Drawn by: **ZLB**

Date: **12/13/17**

DONLIN GOLD





Quartz Gulch Conceptual Schematic

Notes: Drawing is not to scale. Vertical exaggerated to show detail.

Not for construction. Plans are conceptual and require field verification prior to restoration activities.

Chapter 23. Compensatory Mitigation Plan, Appendix A

Upper Crooked Creek PRM
Section I-I'

Drawn by: **ZLB**

Date: **12/13/17**

DONLIN GOLD

Appendix B

In July 2014, Donlin Gold conducted surveys of hydrologic and disturbance features in the Upper Crooked Creek area. These included:

- Longitudinal and cross-section transects of reference stream reaches for Ruby, Queen, Snow, and Quartz Gulches
- Cross-section transects of disturbed stream reaches for Ruby, Queen, Snow, and Quartz Gulches
- A cross-section transect of the Ruby/Queen Gulch ditch
- An elevation transect of the fine tailings alluvial fan

These survey data were used to develop conceptual work plans for the Upper Crooked Creek restoration area.

Transect 1

Survey Data: Cross-section

Site: Queen Gulch Ditch

Date: July 11, 2014

Location: Survey occurs at road edge through the ditch. (Plots 3PP18325, 18326)

Watershed: Queen Gulch

Party: Justin Miner, Doug Reynolds

Station	Back Sight	Height of Instrument	Fore Sight	Elevation	Notes
BM1	4.15	104.15			
0			4.15	100	
2			5.94	98.21	
4			7.09	97.06	
6			8.28	95.87	
8			9.07	95.08	
10			10.58	93.57	
15			14.39	89.76	
18			15.77	88.38	
18	7.37	95.75	7.37	88.38	Turning point
20			17.97	86.18	
21			9.61	86.14	
23			10.5	85.25	
24			11.19	84.56	
25			11.83	83.92	
25.5			12.23	83.52	Top of water
26			12.78	82.97	
27			13.4	82.35	
28			13.91	81.84	
29			14.49	81.26	
30			14.52	81.23	Thalweg
31			14.39	81.36	
32			13.85	81.9	
33			12.81	82.94	
34			12.23	83.52	Top of water
35			11.61	84.14	
36			11	84.75	
37			10.61	85.14	
38			9.67	86.08	
39			17.39	86.76	
42			13.58	90.57	
45			9.94	94.21	
50			8.92	95.23	
55			7.24	96.91	
60			5.15	99	
65			3.75	100.4	Top of berm

Notes:

Typical cross-section of ditch, deeply entrenched. Cross-section begins at the edge of the road.

Wetted width of the channel is 8.5-feet. Maximum depth of wetted channel (water surface-thalweg) is 2.29-feet.

No floodplain.

Evidence of recent dredging and maintenance.

Elevation difference from thalweg to top of the berm is 19.17-feet.

Transect 2

Survey Data: Cross-section

Site: Queen Gulch Placer Mined area

Date: July 11, 2014

Location: Survey occurs above road in the mined area. (Plots 3PP18320, 18321)

Watershed: Queen Gulch

Party: Justin Miner, Doug Reyno

Station	Back Sight	Height of Instrument	Fore Sight	Elevation	Notes
BM1	5.96	105.96			
0			5.96	100	
2			5.95	100.01	Edge of willows
4			6.47	99.49	
6			6.9	99.06	
8			7.98	97.98	
9.5			8.59	97.37	Bankfull
10.5			8.95	97.01	Top of water
11			9.47	96.49	
12			9.45	96.51	Thalweg
12.5			9.38	96.58	
13			9.09	96.87	
13.3			8.95	97.01	Top of water
13.5			8.89	97.07	
14			8.62	97.34	
15			8.58	97.38	Bankfull
16			7.9	98.06	Edge of willows
18			7.2	98.76	
20			6.42	99.54	
22			4.51	101.45	End of transect

Notes:

Typical cross-section of stream through the disturbed area.

No floodplain. Area could be graded back to connect a floodplain.

Width of wetted channel is 2.7-feet. Width of bankfull channel is 5.5-feet.

Maximum depth of channel (bankfull-thalweg) is 0.87-feet. Willows extend for only 14-feet.

Transect 3

Survey Data: Longitudinal Profile Valley Length: 92-feet

Site: Queen Gulch Reference Reach

Date: July 11, 2014

Location: Upstream of any impact, approximately 100-yards upstream of placer mined valley. (Plots 3PP18311,18312)

Watershed: Queen Gulch

Party: Justin Miner, Doug Reynolds

Station	Back Sight	Height of Instrument	Thalweg Fore Sight	Thalweg Elevation	Water Surface Fore Sight	Water Surface Elevation	Bankfull Fore Sight	Bankfull Elevation	Notes
BM1	6.12	106.12							
0			7.27	98.85	6.99	99.13	6.12	100	Riffle
5			7.39	98.73	7.11	99.01	6.06	100.06	Riffle/run
10			7.73	98.39	7.4	98.72	6.77	99.35	Riffle/run
15			8.04	98.08	7.67	98.45	6.98	99.14	Run
16			8.4	97.72					Bottom of pool
19			8.11	98.01	7.86	98.26			Glide
20			8.29	97.83	7.95	98.17	6.98	99.14	Riffle
25			8.53	97.59	8.01	98.11	7.65	98.47	Riffle
30			8.65	97.47	8.11	98.01	7.69	98.43	Run
31			8.77	97.35	8.18	97.94			Riffle crest
34			9.28	96.84	8.62	97.5			Riffle
37			9.23	96.89	8.63	97.49	8.24	97.88	Run
40			9.53	96.59	8.75	97.37	8.32	97.8	Run
45			9.4	96.72	8.79	97.33	8.46	97.66	Run
50			9.44	96.68	8.91	97.21	8.6	97.52	Run
55			9.85	96.27	8.99	97.13	8.67	97.45	Run
60			9.75	96.37	9.26	96.86	8.9	97.22	Run
65			10.15	95.97	9.47	96.65	9.15	96.97	Riffle crest
70			9.85	96.27	9.64	96.48	9.04	97.08	Riffle
75			10.61	95.51	9.89	96.23	9.26	96.86	Run
80			10.59	95.53	10.13	95.99	9.59	96.53	Run
85			11.02	95.1	10.3	95.82	10	96.12	Run
90			10.85	95.27	10.38	95.74	10.05	96.07	Riffle crest
95			12.72	93.4	11.56	94.56			Pool
98			12.08	94.04	11.58	94.54			Top of glide, end of pool
100			12.23	93.89	11.64	94.48	11.16	94.96	End of transect

Notes:

Stream is root controlled by willows.

Morphology is mostly a run with fast moving water dominating.

Very few pools. Cut/overhanging banks prevalent.

Water surface slope is 4.7-percent.

Bankfull slope is 5.0-percent.

Average channel depth (bankfull-thalweg) is 1.04-feet.

Channel sinuosity is 1.09.

Transect 4

Survey Data: Cross-section

Site: Queen Gulch Reference Reach

Date: July 11, 2014

Location: Survey occurs at station 76 (Plots 3PP18315, 18316)

Watershed: Queen Gulch

Party: Justin Miner, Doug Reynolds

Station	Back Sight	Height of Instrument	Fore Sight	Elevation	Notes
BM1	6.12	106.12			
0			7.24	98.88	
1			7.4	98.72	
3			8.85	97.27	Edge of willows
5			9.41	96.71	Bankfull
7			9.65	96.47	
8			9.93	96.19	Top of water, riffle
8.5			10.51	95.61	Thalweg
9			10.49	95.63	
10			10.4	95.72	
10.1			10	96.12	Top of water
10.5			9.25	96.87	Bankfull
11			8.25	97.87	
13			7.25	98.87	
15			7.19	98.93	
17			7.3	98.82	
19			7.87	98.25	
21			8.34	97.78	
23			8.84	97.28	
25			9.07	97.05	
27			8.13	97.99	End of willows
30			7.95	98.17	End of transect

Notes:

Width of bankfull channel is 5.5-feet. Width of wetted channel is 2.1-feet.

Maximum depth of riffle (bankfull-thalweg) is 1.26-feet.

Willows extend for a total width of 24-feet.

Transect 5

Survey Data: Cross-section

Site: Queen Gulch Reference Reach

Date: July 11, 2014

Location: Survey occurs at station 31 (Plots 3PP18313, 18314)

Watershed: Queen Gulch

Party: Justin Miner, Doug Reynolds

Station	Back Sight	Height of Instruction	Fore Sight	Elevation	Notes
BM1	6.12	106.12			
0			4.91	101.21	
5			5.2	100.92	Edge of willows
10			7.03	99.09	
15			6.99	99.13	
16			7.64	98.48	Bankfull
17			7.95	98.17	
17.5			7.93	98.19	
18			8.16	97.96	Edge of water, top of water
18.5			8.61	97.51	
19			8.72	97.4	Thalweg
19.5			8.5	97.62	
20			8.27	97.85	
20.5			8.24	97.88	
21			8.15	97.97	Top of water
21.5			8.1	98.02	
22			7.82	98.3	
23			7.67	98.45	Bankfull
24			7.45	98.67	
26			6.71	99.41	
28			6.57	99.55	
30			7.53	98.59	Edge of willows
35			6.13	99.99	Small mound with black spruce and dwarf birch
40			4.97	101.15	
45			4.9	101.22	End of transect

Notes:

Width of bankfull channel is 7.0-feet. Width of wetted channel is 3.0-feet. Maximum depth of riffle (bankfull-thalweg) is 1.05-feet.
Willows extend for a total width of 25-feet.

Transect 6

Survey Data: Cross-section

Site: Ruby Gulch historic channel

Date: July 12, 2014

Location: Survey occurs at typical historic channel for Ruby Gulch. (Plots 3PP18333, 18334)

Watershed: Ruby Gulch

Party: Justin Miner, Doug Reynolds

Station	Back Sight	Height of Instrument	Fore Sight	Elevation	Notes
BM1	3.8	103.8			
0			3.8	100	
5			4.1	99.7	
10			5.26	98.54	
15			6.67	97.13	Top of bank
17			7.15	96.65	
20			7.5	96.3	
22			7.67	96.13	
24			7.65	96.15	
26			7.85	95.95	
28			7.7	96.1	
30			7.72	96.08	
32			8.06	95.74	
34			8.24	95.56	
36			8.32	95.48	Thalweg
38			8.05	95.75	
40			7.6	96.2	
42			7.34	96.46	
44			7.07	96.73	
46			6.83	96.97	Top of bank
48			6.61	97.19	
53			6.11	97.69	
58			5.47	98.33	
61			5.25	98.55	

Notes:

Historic channel is now grass-dominated.

No water present at time of visit.

The channel morphology remains; the channel continues to Donlin Creek.

Alder and willow present on historic banks.

Maximum depth of channel (bankfull-thalweg) is 1.65-feet.

Bankfull width is 31.0-feet. Broad swale feature.

Transect 7

Survey Data: Cross-section

Site: Ruby Gulch Mined area

Date: July 10, 2014

Location: Survey occurs in a recently placer mined area, soil removed. (Plots 3PP18305, 18306)

Watershed: Ruby Gulch

Party: Justin Miner, Doug Reynolds

Station	Back Sight	Height of Instrument	Fore Sight	Elevation	Notes
BM1	5.5	105.5			
0			5.5	100	Area bladed to bedrock
2			6.43	99.07	
4			8.05	97.45	
6			9.51	95.99	
6.5			10.56	94.94	Top of water, river left
7.5			10.61	94.89	
8			10.7	94.8	
8.5			10.7	94.8	Thalweg
9			10.66	94.84	
9.5			10.68	94.82	
10			10.59	94.91	
10.5			10.49	95.01	Top of water, river right
11			10.22	95.28	
12			9.98	95.52	
13			9.82	95.68	
14			9.85	95.65	
15			9.49	96.01	
20			8.55	96.95	
25			7.9	97.6	
30			7.52	97.98	
35			7.28	98.22	
40			6.99	98.51	
45			6.61	98.89	
50			6.25	99.25	
55			6.63	98.87	
60			6.18	99.32	
65			5.38	100.12	
70			4.65	100.85	
75			3.93	101.57	Edge of disturbance
77			1.62	103.88	

Notes:

Area bladed to bedrock, recent disturbance.

Width of wetted channel is 4.0-feet.

No bankfull features remain.

Maximum depth of stream (top of water-thalweg) is 0.21-feet.

The stream is wider and shallower than reference reach.

Transect 8

Survey Data: Longitudinal Profile Valley Length: 86-feet

Site: Ruby Gulch Reference Reach

Date: July 10, 2014

Location: Upstream of any impact, approximately 100-yards upstream of placer-mined valley. (Plots 3PP18299,18300)

Watershed: Ruby Gulch

Party: Justin Miner, Doug Reynolds

Station	Back Sight	Height of Instrument	Thalweg Fore Sight	Thalweg Elevation	Water Surface Fore Sight	Water Surface Elevation	Bankfull Fore Sight	Bankfull Elevation	Notes
BM1	12.09	112.1							
0			12.09	100	10.41	101.68	10.1	102.03	Run
5			11.57	100.52	10.45	101.64	9.97	102.12	
10			11.57	100.52	10.56	101.53	10.1	101.99	
16			11.58	100.51	10.93	101.16	10.3	101.81	
21			12.14	99.95	11	101.09	10.6	101.46	
25			12.41	99.68	11.17	100.92	10.8	101.26	
30			13.1	98.99	11.37	100.72	10.8	101.27	
34			13.12	98.97	11.38	100.71	11	101.12	
40			12.53	99.56	11.39	100.7	11.1	100.96	
45			12.47	99.62	11.58	100.51	11.2	100.86	All run
50			13.47	98.62	11.52	100.57	11.1	100.98	Deep pool
54			11.93	100.16	11.52	100.57	11	101.07	Riffle crest
60			14.51	97.58	12.58	99.51	11.4	100.71	
65			14.13	97.96	12.64	99.45	11.9	100.24	
70			14.43	97.66	12.77	99.32	12.3	99.83	
76			14.01	98.08	12.82	99.27	12.2	99.87	
80			13.71	98.38	12.87	99.22	12.6	99.51	
85			14.77	97.32	12.97	99.12	12.7	99.43	
90			13.73	98.36	13.19	98.9	12.9	99.22	
95			13.44	98.65	13.32	98.77	12.5	99.62	
100			13.95	98.14	13.47	98.62	13.1	98.98	

Notes:

Stream is root controlled by willows and cottonwoods, morphology is mostly a run with fast moving water dominating.

Very few pools. Cut/overhanging banks prevalent.
Water surface slope is 3.1-percent. Bankfull slope is 3.1-percent. Average channel depth (bankfull-thalweg) is 1.7-feet. Channel sinuosity is 1.16

Transect 9

Survey Data: Cross-section
Site: Ruby Gulch Reference Reach
Date: July 10, 2014
Location: Survey occurs at station 82 (Plots 3PP18301, 18302)
Watershed: Ruby Gulch
Party: Justin Miner, Doug Reynolds

Station	Back Sight	Height of Instrument	Fore Sight	Elevation	Notes
BM1	5.64	105.64			
0			5.64	100	
5			8.45	97.19	
10			10.81	94.83	
13			11.74	93.9	Edge of willows
20			12.07	93.57	
25			12.29	93.35	
30			12.47	93.17	
35			12.78	92.86	Bankfull
40			12.55	93.09	Cross section occurs at LP station 82
40.6			12.96	92.68	Top of water
41			13.14	92.5	Left bank bottom
41.5			13.25	92.39	
42			13.85	91.79	
42.7			13.9	91.74	Thalweg, right bank bottom, vertical bank
43			12.96	92.68	Top of water
44			12.78	92.86	Bankfull
46			12.83	92.81	
48			12.65	92.99	
50			12.71	92.93	
52			12.94	92.7	
54			12.74	92.9	
56			12.96	92.68	Top of water, side channel
57			13.65	91.99	Thalweg, side channel
58			13.51	92.13	
58.5			12.97	92.67	Top of water, side channel
59			12.81	92.83	
60			12.95	92.69	
66			12.85	92.79	
68			12.62	93.02	Bankfull
70			12.25	93.39	
74			11.49	94.15	
79			11.74	93.9	
84			11.72	93.92	
89			11.6	94.04	
95			10.15	95.49	Edge of cottonwoods and willows

Notes:

Width of bankfull channel is 9.0-feet.

Width of wetted channel is 2.4-feet.

Maximum depth of run (bankfull-thalweg) is 1.12-feet.

Willows extend for a total width of 82-feet.

Transect 10

Survey Data: Cross-section

Site: Ruby Gulch Reference Reach

Date: July 10, 2014

Location: Survey occurs at station 31 (Plots 3PP18303, 18304)

Watershed: Ruby Gulch

Party: Justin Miner, Doug Reynolds

Station	Back Sight	Height of Instrument	Fore Sight	Elevation	Notes
BM1	5.64	105.64			
0			5.16	100.48	
5			6.1	99.54	
10			7.45	98.19	
15			8.97	96.67	Edge of willows
20			9.95	95.69	
25			10.38	95.26	
30			10.81	94.83	
35			10.99	94.65	Bankfull
36			11	94.64	Top of bank
36.2			11.3	94.34	Top of water, crossing occurs at LP station 31
36.3			11.85	93.79	
36.7			13.42	92.22	Thalweg
37			13.24	92.4	
37.5			12.53	93.11	
38			11.83	93.81	Right bank, vertical, cut bank
38.5			11.31	94.33	Top of water
39			10.91	94.73	
40			11	94.64	Bankfull
45			11.4	94.24	
50			11.45	94.19	
55			10.87	94.77	
60			11.01	94.63	
65			11	94.64	
70			11.14	94.5	Edge of floodplain
75			9.82	95.82	
80			9.61	96.03	
85			9.23	96.41	
90			9.72	95.92	
95			9.79	95.85	
100			9.4	96.24	Edge of cottonwoods and terrace
110			8.75	96.89	

Notes:

Width of bankfull channel is 5.0-feet.

Width of wetted channel is 2.3-feet.

Maximum depth of run (bankfull-thalweg) is 2.43-feet.

Willows extend for a total width of 85-feet.

Transect 11

Survey Data: Longitudinal Profile

Site: Alluvial Fan, Lyman's Wash Station Area

Date: July 08, 2014

Location: Begins at top of alluvial fan, continues to edge of vegetation and into adjacent wetland (Plots 3PP18251,18252)

Watershed: Donlin Creek

Party: Justin Miner, Doug Reynolds

Station	Back Sight	Height of Instrument	Fore Sight	Elevation	Notes
BM1	6.12	106.12			
0			6.75	99.37	Top of alluvial fan, plot 18251
20			7.65	98.47	
40			8.89	97.23	
60			10.45	95.67	
80			11.79	94.33	
100			13.15	92.97	
120			14.46	91.66	
140			15.82	90.3	
160			17.12	89	
180			18.33	87.79	Estimated that wetland conditions could continue to this elevation.
200			19.65	86.47	
220			20.97	85.15	
240			22.02	84.1	
260			23.14	82.98	
280			24.44	81.68	
300		88.27	7.5	80.77	Turning point foresight 23.65, back sight 5.80
320			8.26	80.01	Edge of wetland vegetation
340			8.96	79.31	
360			9.75	78.52	
380			10.17	78.1	
400			10.57	77.7	Soil saturated at the surface, end of transect, plot 18252
			1.8	86.47	Edge of natural vegetation, north side, midpoint, plot 18253
			14.52	73.75	Edge of natural vegetation, south side, standing water, plot 18254

Transect 12

Survey Data: Longitudinal Profile Valley Length: 126-feet

Site: Snow Gulch Reference Reach

Date: July 08, 2014

Location: Upstream of any impact, approximately 100-yards upstream of airstrip. (Plots 3PP18258,18260)

Watershed: Snow Gulch

Party: Justin Miner, Doug Reynolds

Station	Back Sight	Height of Elevation	Thalweg Fore Sight	Thalweg Elevation	Water Surface Fore Sight	Water Surface Elevation	Bankfull Fore Sight	Bankfull Elevation	Notes
BM1	13.1	113.1							
0			13.1	100	10.98	102.12	10.55	102.55	Run
10			12.82	100.28	11.07	102.03	10.36	102.74	Run
20			12.96	100.14	11.5	101.6	10.8	102.3	Head of riffle
30			13.77	99.33	11.81	101.29	10.96	102.14	Riffle
40			14.23	98.87	12.32	100.78	11.8	101.3	Run
50			14.35	98.75	12.88	100.22	11.75	101.35	Run
60			14.77	98.33	13.4	99.7	12.29	100.81	Run
70			15.17	97.93	13.82	99.28	12.81	100.29	Run
80			14.92	98.18	13.82	99.28	13	100.1	Run
90			15.15	97.95	13.87	99.23	13.17	99.93	Run
100			15.31	97.79	14.13	98.97	13.58	99.52	Run
110			15.52	97.58	14.19	98.91	13.69	99.41	Run
120			15.85	97.25	14.42	98.68	13.85	99.25	Run
131			15.88	97.22	14.64	98.46	14.1	99	Run
140			16.14	96.96	14.73	98.37	14.45	98.65	Run
150			15.87	97.23	14.75	98.35	14.5	98.6	End of LongPro

Notes:

Stream is root controlled by willows, morphology is mostly a run with fast moving water dominating.

Very few pools. Cut/overhanging banks prevalent.

Water surface slope is 3.8-percent. Bankfull slope is 3.9-percent.

Average channel depth (bankfull-thalweg) is 2.13-feet.

Channel sinuosity is 1.19.

Transect 13

Survey Data: Cross-section

Site: Snow Gulch Upper Pond

Date: July 09, 2014

Location: Survey occurs near the outlet, estimated at deepest portion of the pond. (Plots 3PP18262, 18263)

Watershed: Snow Gulch

Party: Justin Miner, Doug Reynolds

Station	Back Sight	Height of Instrument	Fore Sight	Elevation	Notes
BM1	3.04	103.04			
0			3.04	100	Long pro station 65, edge of willows
10			4.75	98.29	
12			5.06	97.98	Top of water
15.5			6.22	96.82	Edge of vegetation
20			5.71	97.33	
30			6.14	96.9	
40			5.87	97.17	
50			5.85	97.19	
60			6.39	96.65	
70			7.12	95.92	
80			7.55	95.49	
90			7.79	95.25	Thalweg
100			7.22	95.82	
110			6.42	96.62	
121			5.29	97.75	Edge of vegetation
121.3			5.05	97.99	Top of water
130			3.13	99.91	

Notes:

Width of pond is 109.3-feet. Maximum depth of pond is 2.74-feet.

Shallow, silt bottomed pond.

Transect 14

Survey Data: Cross-section

Site: Snow Gulch

Date: July 09, 2014

Location: Survey occurs at typical incised area between the two ponds. (Plots 3PP18267, 18269)

Watershed: Snow Gulch

Party: Justin Miner, Doug Reynolds

Station	Back Sight	Height of Instrument	Fore Sight	Elevation	Notes
BM1	11.77	111.77			
0			11.77	100	Cross section begins at road edge.
10			12.43	99.34	
20			12.72	99.05	
27			11.54	100.23	Top of berm
30			13.17	98.6	
35			15.28	96.49	Base of berm
40			15.51	96.26	Edge of willows
50			14.98	96.79	
55			15.25	96.52	Bankfull
56			15.6	96.17	
57			15.97	95.8	Waters edge, top of water, riffle/run, very few pools in system
57.5			16.22	95.55	
58			16.31	95.46	
59			16.35	95.42	
60			16.43	95.34	
61			16.55	95.22	
62			16.57	95.2	
63			16.55	95.22	
63.3			15.95	95.82	Waters edge, vertical bank, top of water
63.5			15.55	96.22	Bankfull
65			15.2	96.57	
66			15.13	96.64	
67			15.03	96.74	
70			15.09	96.68	Base of berm
75			13.8	97.97	
80			12.23	99.54	
85			11.15	100.62	
90			9.68	102.09	
95			8.23	103.54	
100			5.88	105.89	Top, side of airstrip, willows continue through end of transect

Notes:

Width of bankfull channel is 8.5-feet. Width of wetted channel is 6.3-feet. Maximum depth of run (bankfull-thalweg) is 1.32-feet.

Willows extend for a total width of 60-feet.

Transect 15

Survey Data: Cross-section

Site: Snow Gulch Lower Pond

Date: July 09, 2014

Location: Survey occurs at upper 1/3 of pond (Plots 3PP18271, 18272)

Watershed: Snow Gulch

Party: Justin Miner, Doug Reynolds

Station	Back Sight	Height of Instrument	Fore Sight	Elevation	Notes
BM1	5.03	105.03			
0			5.03	100	Upper end of lower pond
5			5.71	99.32	
10			7.27	97.76	
15			8.76	96.27	
20			8.95	96.08	
25			9.02	96.01	
30			9.45	95.58	
31.5			10.13	94.9	Top of water
35			11.47	93.56	
40			13.05	91.98	
45			13.3	91.73	Thalweg
50			13.1	91.93	
55			12.9	92.13	
60			12.75	92.28	
65			12.8	92.23	
70			12.23	92.8	
75			11.96	93.07	
80			12.33	92.7	
85			12.57	92.46	
90			12.72	92.31	
95			13.18	91.85	
100			12.35	92.68	
105			12.46	92.57	
110			12.65	92.38	
115			12.48	92.55	
120			12.8	92.23	
125			11.78	93.25	
131			10.15	94.88	Water edge, top of water
135			9.17	95.86	
140			6.62	98.41	
145			5.38	99.65	
150			4.35	100.68	
160			4	101.03	Top of airstrip

Notes:

Width of pond is 99.5-feet. Maximum depth of pond transect is 3.17-feet.

Shallow, silt bottomed, upper end of pond.

Pond elevation could rise to end of transect increasing the depth to 9.3-feet.

Transect 16

Survey Data: Cross-section
Site: Snow Gulch Lower Pond
Date: July 09, 2014
Location: Survey occurs at midpoint of pond (3PP18273, 18274)
Watershed: Snow Gulch
Party: Justin Miner, Doug Reynolds

Station	Back Sight	Height of Instrument	Fore Sight	Elevation	Notes
BM1	5.03	105.03			
0			3.45	101.58	Middle of lower pond
5			3.8	101.23	
10			4.15	100.88	
15			4.8	100.23	
20			5.36	99.67	
25			6.47	98.56	
30			7.14	97.89	
35			7.64	97.39	
40			8.8	96.23	
44.5			10.13	94.9	Top of water, edge of pond
50			11.14	93.89	
55			12.08	92.95	
60			12.44	92.59	
65			12.72	92.31	
70			13.25	91.78	
75			14.05	90.98	
80			16.6	88.43	
85			7.4	87.49	Thalweg; switched to measuring depth of water
90			5.7	89.19	Subtract from top of water
95			5.65	89.24	
100			6.3	88.59	
105			5.95	88.94	
110			6	88.89	
115			4.5	90.39	
120			4.9	89.99	
125			5.5	89.39	
130			5.55	89.34	
135			5.4	89.49	
140			4.6	90.29	
145			3.15	91.74	
150			1.05	93.84	
151			10.13	94.9	Switched back to survey height of instrument, top of water, edge of pond

Station	Back Sight	Height of Instrument	Fore Sight	Elevation	Notes
155			8.72	96.31	
160			6.8	98.23	
165			6.38	98.65	
170			5.89	99.14	
175			5.28	99.75	
180			4.3	100.73	
185			4	101.03	
190			3.8	101.23	Edge of airstrip

Notes:

Width of pond is 106.5-feet. Maximum depth of pond transect is 7.41-feet.

Silt bottomed, center of pond.

Pond elevation could rise to end of transect increasing the depth to 13.74-feet.

Transect 17

Survey Data: Cross-section
Site: Snow Gulch Lower Pond
Date: July 09, 2014
Location: Survey occurs at lower third of pond (Plots 3PP18275, 18276)
Watershed: Snow Gulch
Party: Justin Miner, Doug Reynolds

Station	Back Sight	Height of Instrument	Fore Sight	Elevation	Notes
BM1	5.03	105.03			
0			3.22	101.81	Lower end of lower pond
5			4.92	100.11	
10			7.01	98.02	
15			8.88	96.15	
16			10.13	94.9	Edge of pond, top of water
20			1.56	93.34	Switched to measuring depth of water
25			2.9	92	Subtract from top of water
30			4.34	90.56	
35			4.55	90.35	
40			5.64	89.26	
45			5.55	89.35	
50			5.8	89.1	
55			6.4	88.5	
60			6.6	88.3	
65			6.95	87.95	
70			7.15	87.75	Thalweg
75			6.9	88	
80			6.77	88.13	
85			6.4	88.5	
90			6.15	88.75	
95			6.2	88.7	
100			4.1	90.8	
105			0.9	94	
106			10.13	94.9	Top of water, switched back to survey height of instrument
108			9.2	95.83	
110			8.33	96.7	
115			5.52	99.51	
120			5.64	99.39	Edge of airstrip

Notes:

Width of pond is 90-feet. Maximum depth of pond transect is 7.15-feet.

Silt bottomed, lower end of pond.

Pond elevation could rise to end of transect increasing the depth to 11.64-feet.

Transect 18

Survey Data: Cross-section

Site: Snow Gulch

Date: July 10, 2014

Location: Survey occurs at abandoned location of original channel. (Plots 3PP18291, 18292)

Watershed: Snow Gulch

Party: Justin Miner, Doug Reynolds

Station	Back Sight	Height of Instrument	Fore Sight	Elevation	Notes
BM1	4.72	104.72			
0			4.72	100	Historic channel
2			6.2	100.93	
4			7.74	99.39	
6			8.6	98.53	
8			9.87	97.26	
9			10.77	96.36	Edge of willows, possible bankfull
10			11.26	95.87	
12			11.8	95.33	
13			12.39	94.74	
14			12.45	94.68	Thalweg
15			12.15	94.98	
16			12.1	95.03	
17			12.06	95.07	
18			11.83	95.3	
19			11.48	95.65	
20			11.03	96.1	Bankfull, possible
21			10.04	97.09	Edge of willows
23			8.49	98.64	
25			6.82	100.31	
27			5.93	101.2	
28			5.47	101.66	Top terrace

Notes:

Width of bankfull channel is 11-feet.

No water in channel at cross-section location at time of visit. Water does exist in pools up- and downstream of cross-section location.

Maximum depth of run (bankfull-thalweg) is 1.68-feet.

Willows extend for a total width of 12-feet.

Cross-section is the abandoned existing channel of Snow Gulch.

Transect 19

Survey Data: Longitudinal Profile Valley Length: 74

Site: Quartz Gulch Reference Reach

Date: July 12, 2014

Location: Upstream of any impact, approximately 100 yards upstream of placer-mined valley. (Plots 3PP18335,18336).

Watershed: Quartz Gulch

Party: Justin Miner, Doug Reynolds

Station	Back Sight	Height of Instrument	Thalweg Fore Sight	Thalweg Elevation	Water Surface Fore Sight	Water Surface Elevation	Bankfull Fore Sight	Bankfull Elevation	Notes
BM1	5.9	105.9							
0			6.94	98.96	6.31	99.59	5.9	100	Run
5			6.99	98.91	6.37	99.53	6.16	99.74	Run
10			7.15	98.75	6.62	99.28	6.16	99.74	Run
14			7.59	98.31	6.79	99.11	6.47	99.43	Riffle crest
15			8.14	97.76	7.18	98.72	6.51	99.39	Top of pool
19			7.63	98.27	7.18	98.72	6.77	99.13	Top of glide, riffle crest
25			8.06	97.84	7.48	98.42	6.93	98.97	Riffle
30			8.77	97.13	7.62	98.28	6.95	98.95	Lateral meander pool, cut bank, root controlled
35			8.53	97.37	7.86	98.04	7.05	98.85	run
40			8.84	97.06	7.99	97.91	7.29	98.61	run
45			8.79	97.11	8.02	97.88	7.5	98.4	run
50			9.07	96.83	8.34	97.56	7.82	98.08	run
53			9.51	96.39	8.51	97.39	7.97	97.93	Lateral meander pool, cut bank, root controlled
56			8.95	96.95	8.57	97.33	8.07	97.83	Top of glide, riffle crest
60			9.68	96.22	8.79	97.11	8.12	97.78	Run
63			9.97	95.93	8.87	97.03	8.49	97.41	Lateral meander pool, cut bank, root controlled
65			9.24	96.66	8.87	97.03	8.59	97.31	Top of glide, riffle crest
68			9.46	96.44	9.02	96.88	8.63	97.27	Riffle crest
70			10.48	95.42	9.4	96.5	8.73	97.17	Plunge pool, meander

Station	Back Sight	Height of Instrument	Thalweg Fore Sight	Thalweg Elevation	Water Surface Fore Sight	Water Surface Elevation	Bankfull Fore Sight	Bankfull Elevation	Notes
74			10.06	95.84	9.42	96.48	9	96.9	Top of glide, riffle crest
80			10.6	95.3	10.02	95.88	9.09	96.81	Run
85			10.93	94.97	10.07	95.83	9.58	96.32	Run
89			11.41	94.49	10.13	95.77	9.64	96.26	Lateral meander pool, cut bank, root controlled
93			11.24	94.66	10.22	95.68	9.77	96.13	Riffle crest, root controlled
100			11.24	94.66	10.47	95.43	10.05	95.85	Run

Notes:

Water surface slope is 4.2-percent. Bankfull slope is 4.2-percent

Average channel depth (bankfull-thalweg) is 1.3-feet.

Channel sinuosity is 1.35.

Root controlled with cobble/gravel substrate.

Transect 20

Survey Data: Cross-section

Site: Quartz Gulch Reference Reach

Date: July 12, 2014

Location: Survey occurs at station 17 (Plots 3PP18337, 18338).

Watershed: Quartz Gulch

Party: Justin Miner, Doug Reynolds

Station	Back Sight	Height of Instrument	Fore Sight	Sight Elevation	Notes
BM1	5.9	105.9			Willows extend across the full valley bottom
0			4.73	101.17	Cross-section begins at elevation break associated with the stream
5			4.97	100.93	
10			5.55	100.35	
17			4.95	100.95	
19			5.2	100.7	Bankfull
21			6.13	99.77	
22			6.94	98.96	
22.5			7.18	98.72	Top of water
23			7.74	98.16	
23.5			7.77	98.13	
24			7.89	98.01	Thalweg
24.5			7.81	98.09	
25			7.92	97.98	
25.5			7.9	98	Right bank, cut bank
25.5			7.18	98.72	Top of water
26			6.7	99.2	
27			6.31	99.59	
28			5.74	100.16	
29			5.55	100.35	Bankfull
30			5.6	100.3	
35			4.92	100.98	
40			4.55	101.35	
45			3.7	102.2	End of transect, willows extend beyond this elevation break

Transect 21

Survey Data: Cross-section

Site: Quartz Gulch Reference Reach

Date: July 12, 2014

Location: Survey occurs at station 55 (Plots 3PP18339, 18340)

Watershed: Quartz Gulch

Party: Justin Miner, Doug Reynolds

Station	Back Sight	Height of Instrument	Fore Sight	Elevation	Notes
BM1	5.9	105.9			Willows extend across the full valley bottom
0			6.31	99.59	
5			6.67	99.23	
8			7.45	98.45	
9			7.9	98	Bankfull
10			8.31	97.59	
10.7			8.6	97.3	Top of water
11			8.97	96.93	
11.5			9.08	96.82	
12			9.2	96.7	
12.5			9.45	96.45	
13			9.53	96.37	
13.5			9.52	96.38	Right bank, cut bank
13.5			8.61	97.29	Top of water
13.8			8.24	97.66	Bankfull
14			7.5	98.4	
15			7.12	98.78	
20			6.81	99.09	
25			6.32	99.58	
30			5.67	100.23	End of transect, willows continue beyond this elevation break

Notes:

Width of bankfull channel is 4.8-feet. Width of wetted channel is 2.8-feet. Maximum depth of run (bankfull - thalweg) is 1.63-feet.
Willows extend well beyond the transect.

Transect 22

Survey Data: Cross-section

Site: Quartz Gulch Ditch

Date: July 12, 2014

Location: Survey occurs at typical ditch and valley location (Plots 3PP18342, 18343, 18344)

Watershed: Quartz Gulch

Party: Justin Miner, Doug Reyn

Station	Back Sight	Height of Instrument	Fore Sight	Elevation	Notes
BM1	6.96	106.96			
0			6.96	100	
3			8.55	98.41	
4			9.42	97.54	
10			9.85	97.11	
12			10.34	96.62	
14			11.75	95.21	
15			11.94	95.02	
17			11.29	95.67	
19			12.3	94.66	
20			12.16	94.8	
21			12.3	94.66	
22			12.35	94.61	
22.5			12.64	94.32	Top of water
23			12.81	94.15	
24			13.1	93.86	
25			13.11	93.85	
26			13.1	93.86	
27			12.96	94	
28			13.01	93.95	Right bank, bottom of channel
28			12.65	94.31	Top of water
28.5			12.46	94.5	
29			11.98	94.98	
30			11.16	95.8	
32			10.12	96.84	
34			9.07	97.89	
36			9.8	97.16	Ground fracture
38			9.43	97.53	
40			9.04	97.92	Edge of fractured ground
41			7.28	99.68	
45			5.36	101.6	
50			4.83	102.13	Top of berm
75			7.86	99.1	Base of west berm
100			8.43	98.53	
125			8.27	98.69	
160			6.45	100.51	Base of east berm
175			1.1	105.86	Top of berm

Station	Back Sight	Height of Instrument	Fore Sight	Elevation	Notes
175		113.2	7.34	105.86	Turning point, top of bermed material
180			5.02	108.18	
185			6.72	106.48	
200			14.56	98.64	
210			19.17	94.03	
220			24.1	89.1	
220		95.46	6.36	89.1	Turning point
230			9.41	86.05	
240			9.6	85.86	Bank down to a small channel
242			10.68	84.78	
244			11.61	83.85	
245			11.71	83.75	Top of bank
245.3			11.92	83.54	Top of water
245.6			12.05	83.41	Thalweg
246			11.92	83.54	Top of water
246.5			11.69	83.77	
247.5			11.25	84.21	
248.5			10.21	85.25	
250			9.5	85.96	
260			9.74	85.72	
270			8	87.46	
280			7.72	87.74	
290			5.9	89.56	End of transect, base of bermed material

Notes:

Lateral ditch has caused ground fractures and hillside slumping into the stream.

Width of the wetted channel for the ditch is 6.0-feet.

Maximum depth of the wetted channel for the ditch is 0.47-feet.

Sidecast material along the edge of the ditch extends for approximately 30-feet in width.

Large stockpile of overburden parallels valley approximately 80-feet wide and 25-feet tall.

Narrow stream channel exists in valley bottom, approximately 1-foot in width.

Attachment E
Chuitna Permittee-Responsible Mitigation Plan

Attachment E Chuitna Permittee-Responsible Mitigation Plan

Objectives

The objective of the Chuitna PRM Plan is to permanently protect parcels of land totaling 5,888-acres, including approximately 2,558-acres of wetlands and 228,325-linear feet (43.24-stream miles), from disturbance activities that would degrade WOUS; and to provide compensatory mitigation for the wetland and aquatic resource impacts associated with the Donlin Gold Project. Resource development on the proposed mitigation parcels would be detrimental to aquatic habitat and wetland-dependent wildlife species, including all five species of Pacific salmon. The Chuitna mitigation parcels are on land owned by Tyonek Native Corporation (TNC) and the Alaska Mental Health Trust Authority (AMHT) as shown on Figure 1.

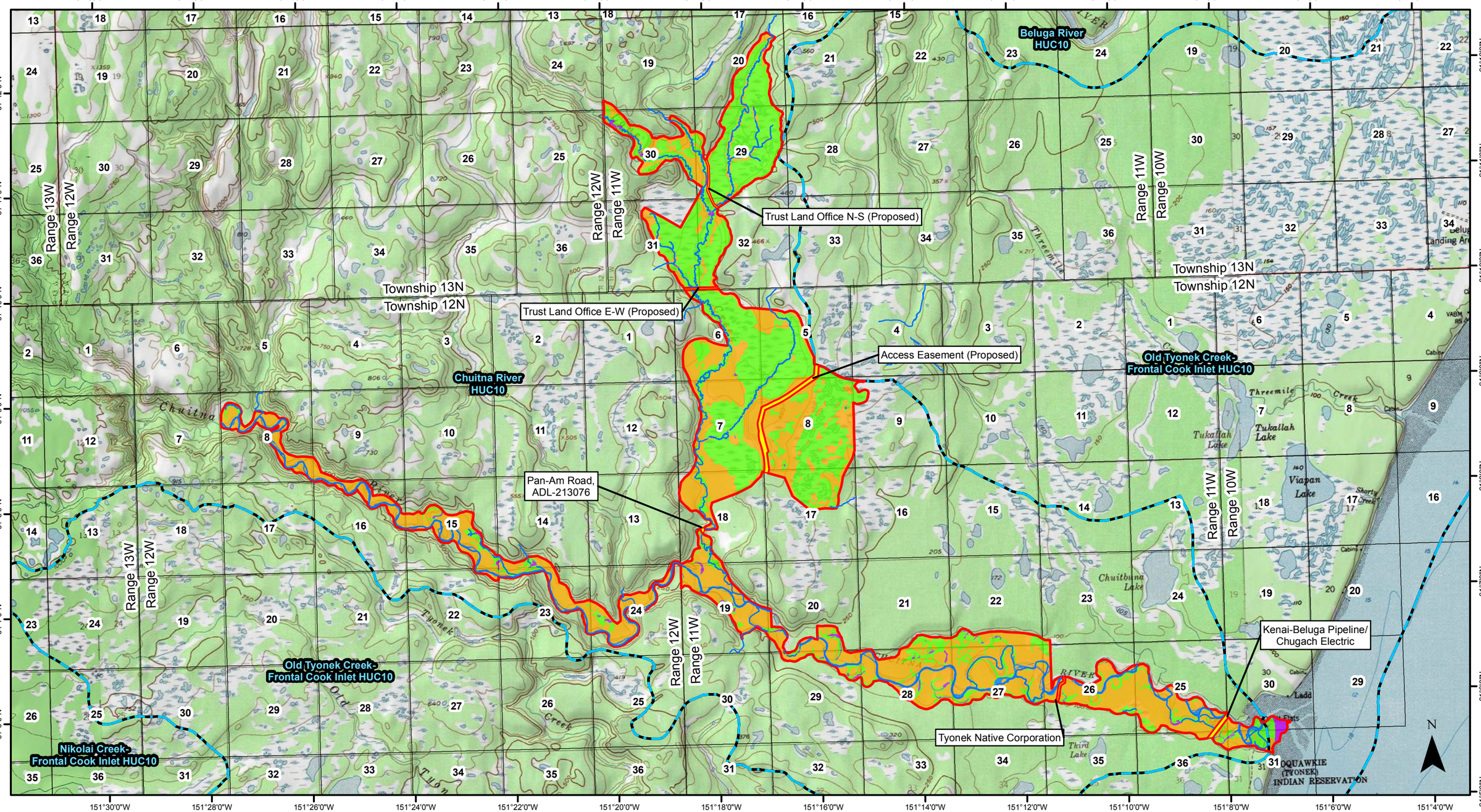
The method of legal conservation proposed is land preservation via deed restrictions. The resources proposed for preservation contribute to the ecological sustainability of the watershed and specifically to Pacific salmon. Preservation is appropriate under the 2008 Mitigation Rule under the criteria of 33 CFR 332.3 (h) (USACE and EPA 2008) and supported by the 1994 Alaska Wetland Initiative (EPA *et al.* 1994).

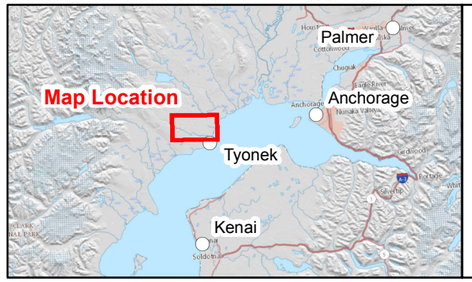
Site Selection Criteria

Location and Size

The Chuitna Preservation Area is located on the west side of Cook Inlet within the Cook Inlet Lowlands MLRA. The proposed Chuitna Preservation Area totals 5,888-acres, and includes approximately 2,558-acres of wetlands and 228,325-linear feet (43.24-stream miles), in the most densely populated region of the state. Land use within the MLRA is extensive and includes agriculture, logging, commercial fishing, mining, and oil and gas extraction. Additionally, tourism, recreation, subsistence activities, and urban development contribute to impacts within the area (NRCS 2004).

The parcel contains wetlands and aquatic stream resources to sufficiently offset the potential losses of aquatic resources associated with the proposed Donlin Gold Project. In addition, the parcel allows for a buffer that further protects the Chuitna watershed and the important physical, chemical, and biological functions of the wetlands and streams.





Easement
Proposed Preservation Area
HUC 10 Watershed Boundary
Public Land Survey Section

Wetland Status

Upland
Wetland
Pond/Lake/Ocean
River/Stream

0 0.5 1 2 3 Miles

Seward Meridian, NAD 1983 UTM Zone 5N
National Geographic Society 2011 1:63,000 TOPO

Chuitna PRM Preservation Area

Figure 1

Wetland Ecology

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 mitigation area includes headwater streams flowing through large bogs, connecting to intermediate streams with 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 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 (36-acres or 1-percent). The two watersheds total 182,304-acres, of which 64,226-acres (or 35-percent) are wetlands and waters. The most common wetland type is freshwater forested/shrub followed by estuarine habitat, the majority of which is within the Old Tyonek Creek-Frontal Cook Inlet watershed (Table 1). The Preservation Area totals 5,888-acres, of which 2,558-acres (or 43-percent) are wetlands and ponds plus an additional 336-acres of mapped streams and rivers (Table 2).

Table 1 Chuitna River and Old Tyonek Creek-Frontal Cook Inlet Watershed Wetlands and Waters

Wetland Type (NWI)	Acres	Percent
Freshwater Emergent Wetland	9,156	5
Freshwater Forested/Shrub Wetland	27,337	15
Estuarine and Marine Wetland	13,212	7
Freshwater Pond	1,104	<1
Lake	1,487	<1
Estuarine and Marine Deepwater	10,707	6
Riverine (Stream and River Area)	1,223	<1
Total Wetland and Waters	**64,226**	**35**
Uplands	118,078	65
Total Area	**182,304**	**100**

Source: National Wetlands Inventory (NWI) 2017

Table 2 Chuitna Preservation Area Wetlands and Waters

Wetland Type	Acres	Percent
Wetlands and Ponds	2,558	44
Stream and River Area	336	5
Total Wetlands and Waters	**2,894**	**49**
Upland Riparian and Wetland Buffer	2,994	51
Total Area	**5,888**	**100**

Source: Preliminary Mapping, Michael Baker International

Wetlands and waters within the Chuitna Preservation Area have been characterized through preliminary mapping by HGM classification (Brinson 1993), summarized in Table 3, vegetation 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.

Table 3 Chuitna Preservation Area HGM Classification

HGM Classification	Number of Acres	Percent of Study Area	Percent Wetlands and WOUS
Depressional	14	0.2	0.5
Estuarine Fringe	59	1.0	2.0
Riverine	661	11.2	22.8
Riverine Channel	336	5.7	11.6
Slope	1,824	31.0	63.0
Total Wetlands/WOUS	**2,894**	**49.1**	**100.0**
Total Non-wetland	**2,994**	**50.9**	
Total Mapping Area	**5,888**	**100.0**	

Source: Preliminary Mapping, Michael Baker International

Table 4 Chuitna Preservation Area Vegetation Classification

Vegetation Type	Number of Acres	Percent of Study Area	Percent Wetlands and WOUS
Aquatic Herbaceous	7.5	0.1	0.3
Black Spruce Woodland	151.2	2.6	5.2
Closed Alder Willow Shrub	109.1	1.9	3.8
Closed Willow Shrub	6.5	0.1	0.2
Ericaceous Shrub Bog-String Bog	770.9	13.1	26.7
Low Shrub Bog	680.8	11.6	23.6
Open Alder Willow Shrub	234.1	4.0	8.1
Open Black Spruce Forest	181.9	3.1	6.3
Open Mixed Forest	0.4	0.0	0.0
Open Willow Shrub	198.8	3.4	6.9
Wet Herbaceous	132.7	2.3	4.6
Woodland Deciduous Forest	3.6	0.1	0.1
Woodland Mixed Forest	8.5	0.1	0.3
Bare Ground	12.8	0.2	0.4
Open Water (Pond and Ocean)	59.5	0.9	1.9
Riverine System (Streams and Rivers)	335.6	5.7	11.6
Total Wetlands and Waters	**2,893.9**	**49.1**	**100.0**
Uplands Total	**2,994.0**	**50.9**	
Grand Total	**5,887.8**	**100.0**	

Source: Preliminary Mapping, Michael Baker International

Table 5 Chuitna Preservation Area Cowardin Classification

Cowardin Groups	Cowardin Code	Cowardin Acres	Percent of Study Area	Percent Wetlands and WOUS
Coniferous Forests	PFO4/SS1	170.0	2.9	5.9
	PSS1/FO4	123.4	2.1	4.3
Total Coniferous Forests		**293.3**	**5.0**	**10.1**
Deciduous Forests	PSS1/FO1	12.1	0.2	0.4
Total Deciduous Forests		**12.1**	**0.2**	**0.4**
Mixed Forests	PFO4/1	0.4	0.0	0.0
Total Mixed Forests		**0.4**	**0.0**	**0.0**
Coniferous Scrub	PSS1/4	35.8	0.6	1.2
	PSS4/1	3.9	0.1	0.1
Total Coniferous Scrub		**39.7**	**0.7**	**1.4**
Shrub	PSS1	148.0	2.5	5.1
	PSS1/EM1	1,848.5	31.4	63.9
	E2SS1/EM1	3.2	0.1	0.1
	PEM1/SS1	0.5	0.0	0.0
Total Shrub		**2,000.2**	**34.0**	**69.1**
Herbaceous	E2AB3	0.4	0.0	0.0
	E2EM1	37.0	0.6	1.3
	PEM1/2	5.3	0.1	0.2
	PEM1	90.4	1.5	3.1
	PEM2/AB3	4.2	0.1	0.1
Total Herbaceous		**137.3**	**2.3**	**4.7**
Ponds	PAB3/UB	3.3	0.1	0.1
	PUB/AB3	21.4	0.4	0.7
	PUB/EM2	2.3	0.0	0.1
	PUB	29.8	0.5	1.0
Total Ponds		**56.8**	**1.0**	**2.0**
Ocean	E1UB	5.7	0.1	0.2
	E2US	12.8	0.2	0.4
Total Ocean		**18.5**	**0.3**	**0.6**
Total Wetlands, Ponds, and Ocean		**2,558.3**	**43.5**	**88.4**
Rivers and Streams	R1UB	15.6	0.3	0.5
	R3UB	320.0	5.4	11.1
Total Rivers and Streams		**335.6**	**5.7**	**11.6**
Total Wetlands and Waters		**2,893.9**	**49.1**	**100.0**
Total Uplands		**2,994.0**	**50.9**	
Grand Total		**5,887.8**	**100.0**	

Source: Preliminary Mapping, Michael Baker International

The wetland systems within the Chuitna Preservation Area include large areas of Slope HGM wetlands including Ericaceous Shrub Bog-String Bog wetlands, Riverine HGM wetlands, Estuarine Fringe HGM wetlands, and a small number of Depressional HGM wetlands.

- Slope HGM Wetlands – The largest HGM wetland type in the Chuitna Preservation Area is Slope HGM. This wetland type covers 1,824-acres, or about 31-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 (Magee and Hollands 1998).
    - Ericaceous Shrub Bog-String Bog Wetlands – A specific 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). Preliminary mapping indicates 771-acres of Slope HGM wetlands in the Chuitna Preservation Area are Ericaceous Shrub Bog-String Bog wetlands (Table 5).
- Riverine HGM Wetlands – Riverine 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 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 (Magee and Hollands 1998). The Chuitna Preservation Area contains approximately 661-acres of Riverine wetlands (Table 3).
- Estuarine Fringe HGM Wetlands – Estuarine Fringe wetlands occur along coastlines and are under the influence of sea water (NRCS 2008). Functions performed by Estuarine Fringe wetlands include shoreline erosion control, nutrient absorption, maintenance of plant communities, and habitat support (EPA 2017). The Chuitna Preservation Area contains approximately 59-acres of Estuarine Fringe wetlands surrounding the outlet of the Chuitna River into Cook Inlet (Table 3).
- Depressional HGM Wetlands – Preliminary mapping categorizes 14-acres of the Chuitna 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 (Magee and Hollands 1998).

The Chuitna Preservation Area also protects areas adjacent to wetlands and streams. Within the riparian zone along streams, uplands provide many of the same functions as wetlands. These include moderation of stream temperature, streambank stabilization, sources of organic matter to streams, wildlife habitat,

pollutant filtering, and flood control. These functions contribute to the ability of streams to support anadromous fish. Riparian areas also act as transition areas between upland and aquatic communities and often have higher species richness than neighboring habitats (NRCS 2003). 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).

Stream Ecology and Fisheries

The Chuitna Preservation Area streams and rivers provide habitat for Chinook, coho, chum, and pink salmon, as well as limited 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.

Acquisition of the Chuitna River drainage properties will preserve approximately 228,325 linear feet (43.24-miles) of stream channel, of which at least 148,896 linear feet (28.2-miles) are documented as Pacific salmon habitat including spawning, rearing, and migration habitats in five streams (Table 6, Table 7). The Preservation Area includes 104,544 linear feet (19.8-miles) of the mainstem of the Chuitna River, all of which is documented habitat used by Chinook, sockeye, coho, chum, and pink salmon. Within the mainstem portion of the Preservation Area, 49,104 linear feet (9.3-miles) of Chinook salmon spawning habitat, 68,640 linear feet (13-miles) of coho spawning habitat, 44,352 linear feet (8.4-miles) of chum spawning habitat, and 104,544 linear feet (19.8-miles) of pink spawning habitat are documented (Table 6). In addition, the entire 104,544 linear feet (19.8-mile) reach contains documented rearing for Chinook and coho salmon juveniles. Some reaches of the mainstem of the Chuitna River within the Preservation Area are also documented as important rearing habitats for other Pacific salmon, including 100,320 linear feet (19-miles) for sockeye, 12,672 linear feet (2.4-miles) for chum, and 13,200 linear feet (2.5-miles) for pink salmon.

Table 6 Salmon Habitats Preserved in the Chuitna River

Chuitna River Mainstem

Species:	Presence linear feet (miles)	Spawning linear feet (miles)	Rearing linear feet (miles)	Total AWC linear feet (miles)
Chinook	55,282 (10.47)	49,262 (9.33)	104,544 (19.8)	104,544 (19.8)
Sockeye	100,690 (19.07)	0	100,690 (19.07)	104,544 (19.8)
Coho	49,526 (9.38)	69,115 (13.09)	104,544 (19.8)	104,544 (19.8)
Chum	80,414 (15.23)	44,088 (8.35)	12,514 (2.37)	104,544 (19.8)
Pink	29,885 (5.66)	104,544 (19.8)	13,253 (2.51)	104,544 (19.8)

Table 7 Salmon Habitats Preserved in tributaries to the Chuitna River

Bass Creek (Stream 2004)

Species:	Presence linear feet (miles)	Spawning linear feet (miles)	Rearing linear feet (miles)	Total AWC linear feet (miles)
Chinook	317 (0.06)	0	317 (0.06)	317 (0.06)
Sockeye	317 (0.06)	0	317 (0.06)	317 (0.06)
Coho	317 (0.06)	0	317 (0.06)	317 (0.06)
Chum	317 (0.06)	0	317 (0.06)	317 (0.06)
Pink	317 (0.06)	0	0	317 (0.06)

Middle Creek (Stream 2003)

Species:	Presence linear feet (miles)	Spawning linear feet (miles)	Rearing linear feet (miles)	Total AWC linear feet (miles)
Chinook	0	1,426 (0.27)	1,426 (0.27)	1,426 (0.27)
Sockeye	1,426 (0.27)	0	0	1,426 (0.27)
Coho	0	1,426 (0.27)	1,426 (0.27)	1,426 (0.27)
Chum	0	0	0	0
Pink	0	1,426 (0.27)	0	1,426 (0.27)

Lone Creek (Stream 2002)

Species:	Presence linear feet (miles)	Spawning linear feet (miles)	Rearing linear feet (miles)	Total AWC linear feet (miles)
Chinook	0	26,928 (5.1)	26,928 (5.1)	26,928 (5.1)
Sockeye	26,928 (5.1)	0	0	26,928 (5.1)
Coho	4,699 (0.89)	0	5.1	26,928 (5.1)
Chum	26,928 (5.1)	0	0	26,928 (5.1)
Pink	26,928 (5.1)	0	0	26,928 (5.1)

Unnamed Creek – AWC 247-20-10010-2020-3008 (Stream 200201)

Species:	Presence linear feet (miles)	Spawning linear feet (miles)	Rearing linear feet (miles)	Total AWC linear feet (miles)
Chinook	0	0	0	0
Sockeye	0	0	0	0
Coho	6,336 (1.2)	0	15418 (2.92)	15418 (2.92)
Chum	0	0	0	0
Pink	0	0	0	0

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 2009]. While only 528 linear feet (0.1-miles) of Bass Creek fall within the Preservation Area, juvenile Chinook, sockeye, coho and chum salmon use the reach for rearing, while pink salmon have unspecified presence (Table 7). The lower 1,320 linear feet (0.25- 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 the reach. Approximately 26,400 linear feet (five-mile) of Lone Creek and 15,840 linear feet (three-miles) of its downstream tributary stream (AWC Stream No. 247-20-10010-2020-3080) fall within the Preservation Area. The entire 26,400 linear feet (five-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 15,312 linear feet (2.9-mile) reach of the Lone Creek tributary within the Preservation Area is documented as important coho salmon rearing habitat (Table 7).

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 and Middle Creek accounting for 12 to 17-percent of total production. In 2008, 3,237 juvenile Chinook salmon were captured in the Chuitna River drainage, accounting for 20-percent of the total catch. Lone Creek was the highest producer of juvenile Chinook salmon between Bass, Middle, and Lone creeks, with peak catches in Lone Creek of 31 fish per day. Chinook salmon in the area has been designated as a stock of management concern by the Alaska Board of Fisheries.

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 has since 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 (Table 8).

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 (Table 8). Numbers of coho salmon entering these tributaries alone 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) [Table 8]. 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. Sockeye, pink, and chum salmon were also identified moving into the tributaries, with Lone Creek having the

highest identified escapement of pink salmon (Table 8). 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 (Table 8).

Finally, the mainstem of the Chuitna River is a prized area for sport fishing.

Table 8 Salmon, Rainbow Trout, and Dolly Varden Escapement in Crooked Creek and the Chuitna River Mainstem

	Chinook			Coho			Pink			Sockeye			Chum			Rainbow Trout			Dolly Varden		
Drainage	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**
Crooked Creek Mainstem (2008 to 2012)[1]	29	100	59	591	4204	1634	4	59	20	1	60	18	832	3755	1907	-	-	1.4	-	-	31.6
Chuitna River Mainstem (2008 to 2015)[2]	502	1956	1069	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chuitna River Tributaries Combined (2008)[3]	315	574	444.5	4588	5942	5265	233	342	287.5	42	50	64	4	-	-	203	828	515.5	607	1152	879.5
Bass Creek (Stream 2004) (2008)	77	153	115	269	726	497.5	0	0	0	6	50	28	0	-	-	38	340	189	189	406	297.5
Middle Creek (Stream 2003) (2008)	21	80	50.5	1983	2313	2148	1	4	2.5	24	-	24	0	-	-	73	172	122.5	146	306	226
Lone Creek (Stream 2002) (2008)	217	341	279	2336	2903	2619.5	232	338	285	12	-	12	4	-	-	92	316	204	272	440	356

Notes: [1]: Five-year average based on resistance board weir counts (Ottertail 2014)

[2]: Eight-year average based on 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)

For comparison to the Donlin Gold Project, approximately 42,240 linear feet (eight-miles) of tributary stream habitat within the Crooked Creek drainage will be removed by constructing the TSF and WRF, and excavating the pit. American and Anaconda creeks are the only tributaries with documented fish use that will be directly removed by mining. 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 eliminated by TSF construction. In total, approximately 26,400 linear feet (five-miles) of habitat used by fish within the two drainages will be eliminated with 3,696 linear feet (0.7-miles) being coho rearing habitat (Table 9). Between 2004 and 2014, 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 six (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 sampling 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 9 *Crooked Creek Anadromous Fish Habitats Potentially Affected or Eliminated by Mine Development*

	Habitat Potentially Affected (Crooked Creek between Snow Gulch and Crevice Creek)				Habitat Eliminated (American and Anaconda creeks)
Species	Presence linear feet (miles)	Spawning linear feet (miles)	Rearing linear feet (miles)	Total AWC linear feet (miles)	Rearing Habitat linear feet (miles)
Chinook	0	71,438 (13.53)	49,949 (9.46)	71,438 (13.53)	0
Sockeye	0	0	0	0	0
Coho	0	71,438 (13.53)	75,451 (14.29)	75,451 (14.29)	3,696 (0.7)
Chum	0	71,438 (13.53)	0	71,438 (13.53)	0
Pink	0	0	0	0	0

In summary, development of the Project will eliminate up to 26,400 linear feet (five-miles) of fish habitat, including about 3,696 linear feet (0.7-miles) of anadromous coho salmon rearing habitat (Table 10). Acquisition of the Chuitna River drainage area properties will preserve approximately 147,840 linear feet (28-miles) of mainstem Chuitna River and tributary habitat identified as important for all five species of Pacific salmon, anadromous Dolly Varden, and resident rainbow trout. The Chuitna River acquisition preserves considerably more productive salmon habitat, as shown by the numbers of juvenile salmon produced in the Chuitna versus the Crooked Creek drainage, as well as adult escapement. 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 10 Summary of Linear Feet (Miles) of Anadromous Stream Habitat Preserved (Chuitna Drainage) and Potentially Affected and Eliminated (Crooked Creek Drainage)

	Spawning Habitat			Rearing Habitat			Total Anadromous Habitat		
	Chuitna Drainage	Crooked Creek		Chuitna Drainage	Crooked Creek		Chuitna Drainage	Crooked Creek	
Species	Habitat Preserved	Habitat Potentially Affected (Crooked Creek between Snow Gulch and Crevice Creek)	Habitat Eliminated (American and Anaconda creeks)	Habitat Preserved	Habitat Potentially Affected (Crooked Creek between Snow Gulch and Crevice Creek)	Habitat Eliminated (American and Anaconda creeks)	Habitat Preserved	Habitat Potentially Affected (Crooked Creek between Snow Gulch and Crevice Creek)	Habitat Eliminated (American and Anaconda creeks)
Chinook	77,616 (14.7)	71,438 (13.53)	0	133,214 (25.23)	49,949(9.46)	0	133,214 (25.23)	71,438 (13.53)	0
Sockeye	0	0	0	101,006 (19.13)	0	0	133,214 (25.23)	0	0
Coho	70,541 (13.36)	71,438 (13.53)	0	148,632 (28.15)	75,451 (14.29)	3,696 (0.7)	148,632 (28.15)	75,451 (14.29)	3,696 (0.7)
Chum	44,088 (8.35)	71,438 (13.53)	0	12,514 (2.37)	0	0	131,789 (24.96)	71,438 (13.53)	0
Pink	106,128 (20.1)	0	0	13,253 (2.51)	0	0	133,214 (25.23)	0	0

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 2 (inset). This area has a unique mix of existing and potential industrial activities that surround the Chuitna drainage. The area has two active ports – one at North Foreland to the south, that 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 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. 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 the 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 surface 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 for leases 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 402 and 404 permitting was evaluated. The work was undertaken by EPA as the lead Federal Agency and then transferred to USACE. PRC proposed a run-of-mine 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. The coal reserves remain available for lease and the threat of future development still exists. The operating 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 proposed Preservation Area. A future coal mine following the PRC plan would not be precluded by this Preservation Area. The new mine plan would, however, have to refine the transportation design (roads and conveyor) in accordance with the provisions of the Preservation Area. 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 5000-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, a company 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 industry. Port Mackenzie, which is east of the Beluga area near Anchorage has a recent history of exporting wood chips using these species of trees.

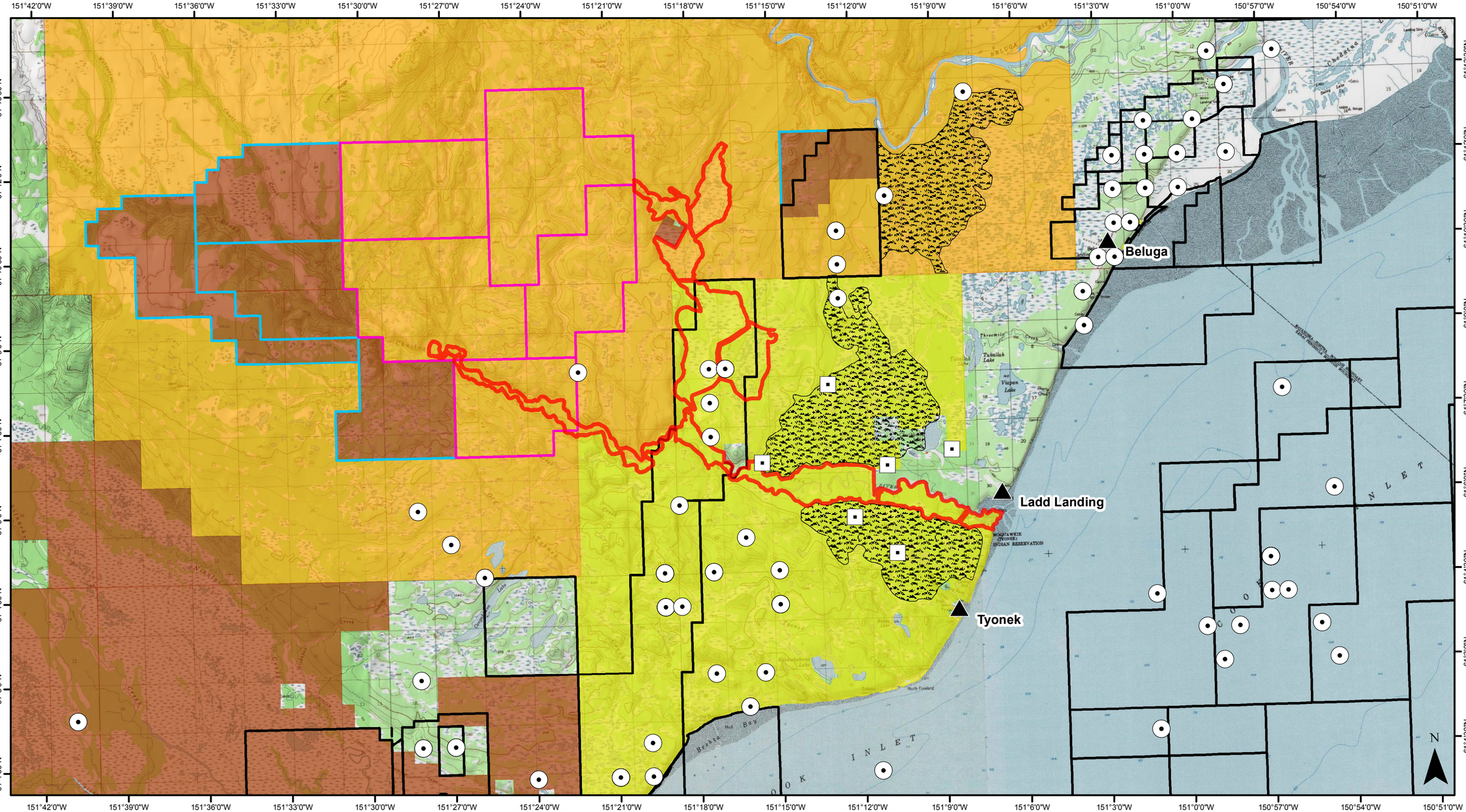
Gravel and Placer Mining

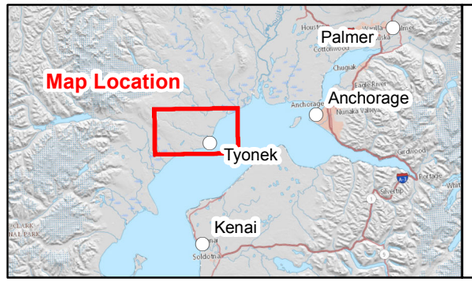
TNC conducts gravel mining in the area to support road construction for maintenance and expansion of oil and gas development. Several borrow pits are in the Chuitna watershed. Tyonek Contractors, a subsidiary of TNC, permitted a new multi-acre gravel source pit area just north of the Chuitna River and

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

In 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. The Chuitna PRM Plan restricts this development within its boundaries, but does not preclude development in adjacent areas, containing oil and gas leases and coal resources, including PRC's former Chuitna Coal Project leases. The Preservation Area, however, ensures that any future development will not have direct impacts on important aquatic resources in the watershed.





Proposed Preservation Area

Landowner

- TNC (Surface)/CIRI (Subsurface)
- Alaska Mental Health Trust
- Alaska DNR

All other landowners unspecified

- Place Name
- Oil Well Site (ADNR 2008)
- Gravel Operation
- Logged Area

- Former PacRim Coal Lease
- Current Coal Lease
- Oil & Gas Lease

0 0.75 1.5 3 Miles

Seward Meridian,
NAD 1983 UTM Zone 5N
National Geographic Society 2011
1:63,000 TOPO

Chuitna PRM Threat Map

Figure 2

Site Protection Instrument

The following provides the language proposed to be included in the deed restrictions for TNC and AMHT. These deed restrictions will be finalized and recorded prior to initiating construction.

Proposed 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 3,967 acres as shown on the attached Figure 3 (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.

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 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 Preservation Area 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 nor 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 without 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.

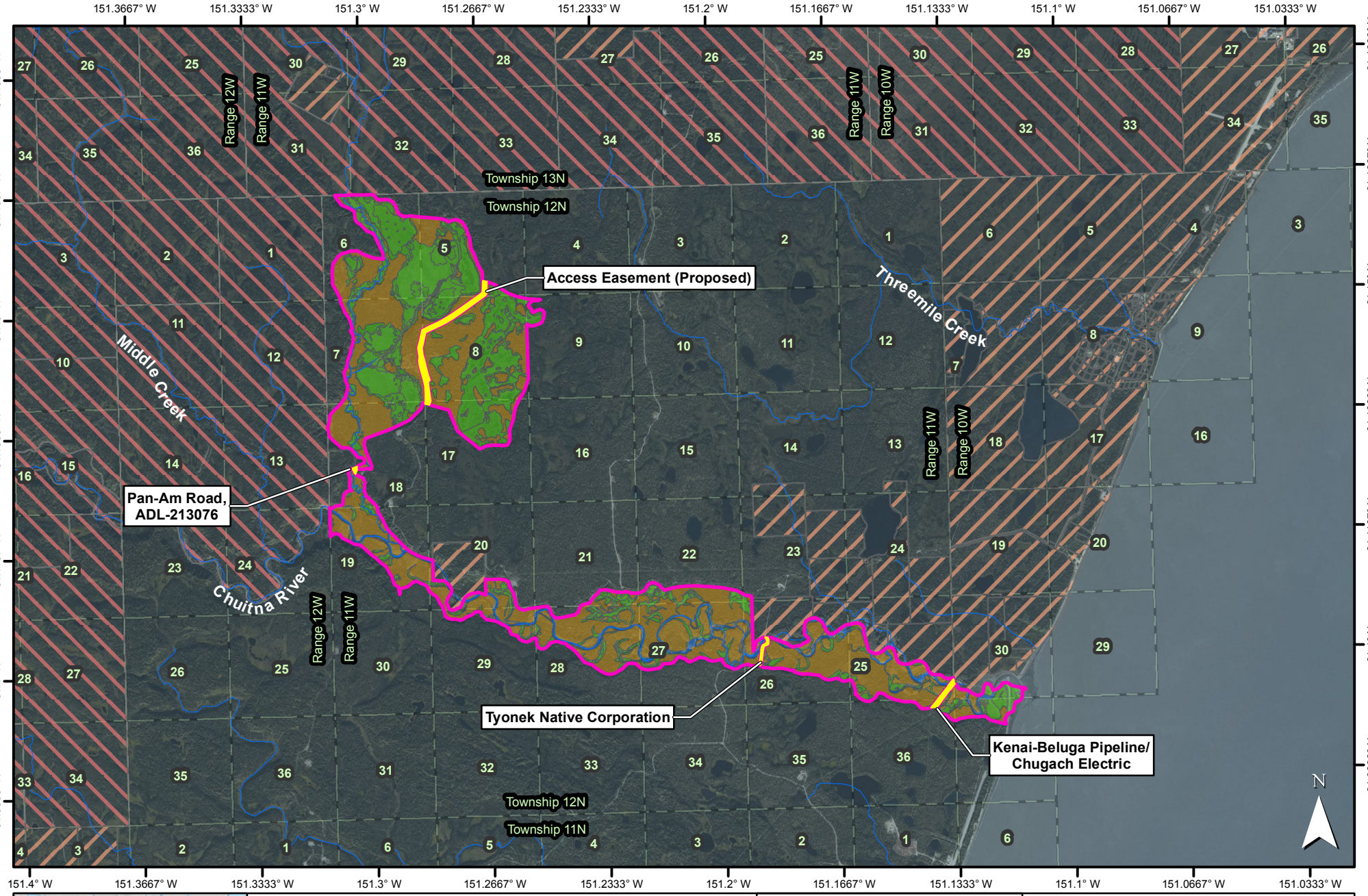
Landowner reserves the right to maintain existing roads, trails or walkways. Maintenance shall be limited to: removal or pruning of dead or hazardous vegetation; application of permeable materials (e.g., sand, gravel, crushed) necessary to correct or impede erosion; grading; replacement of culverts, water control structures, or bridges; and maintenance of roadside ditches.

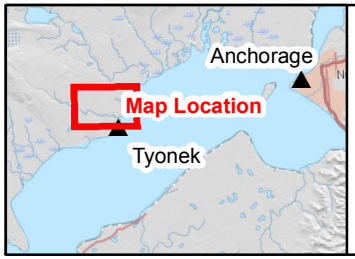
Landowner reserves the right to engage in the removal or trimming of vegetation downed or damaged due to natural disaster, removal of man-made debris, removal of parasitic vegetation (as it relates to the health of the host plant) and removal of non-native or exotic plant or animal species.

Landowner reserves the right to construct habitat improvements within the Property, including activities such as adding 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 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.





Anadromous Stream

Wetland Status

- Stream/River
- Upland
- Wetland/Pond

- Easement
- Preservation Area Boundary
- Public Land Survey Section

Adjacent Land Owner

- Alaska Mental Health Trust
- State of AK/Private

Miles
0 0.5 1 2

1 inch = 6,667 feet

1:80,000

Chuitna Wetland and Stream Tyonek Native Corporation Preservation Area Figure 3

NAD 1983, UTM Zone 5N;
Seward Meridian
Date: 12/18/17

Proposed language for AMHT:

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 4 (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.

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; and,

(c) Wetlands mapping, conducted in 2018, documenting the streams and WOUS in the Preservation Area using USACE guidance in place at the time of the mapping;

(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 Preservation Area 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 is 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 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.

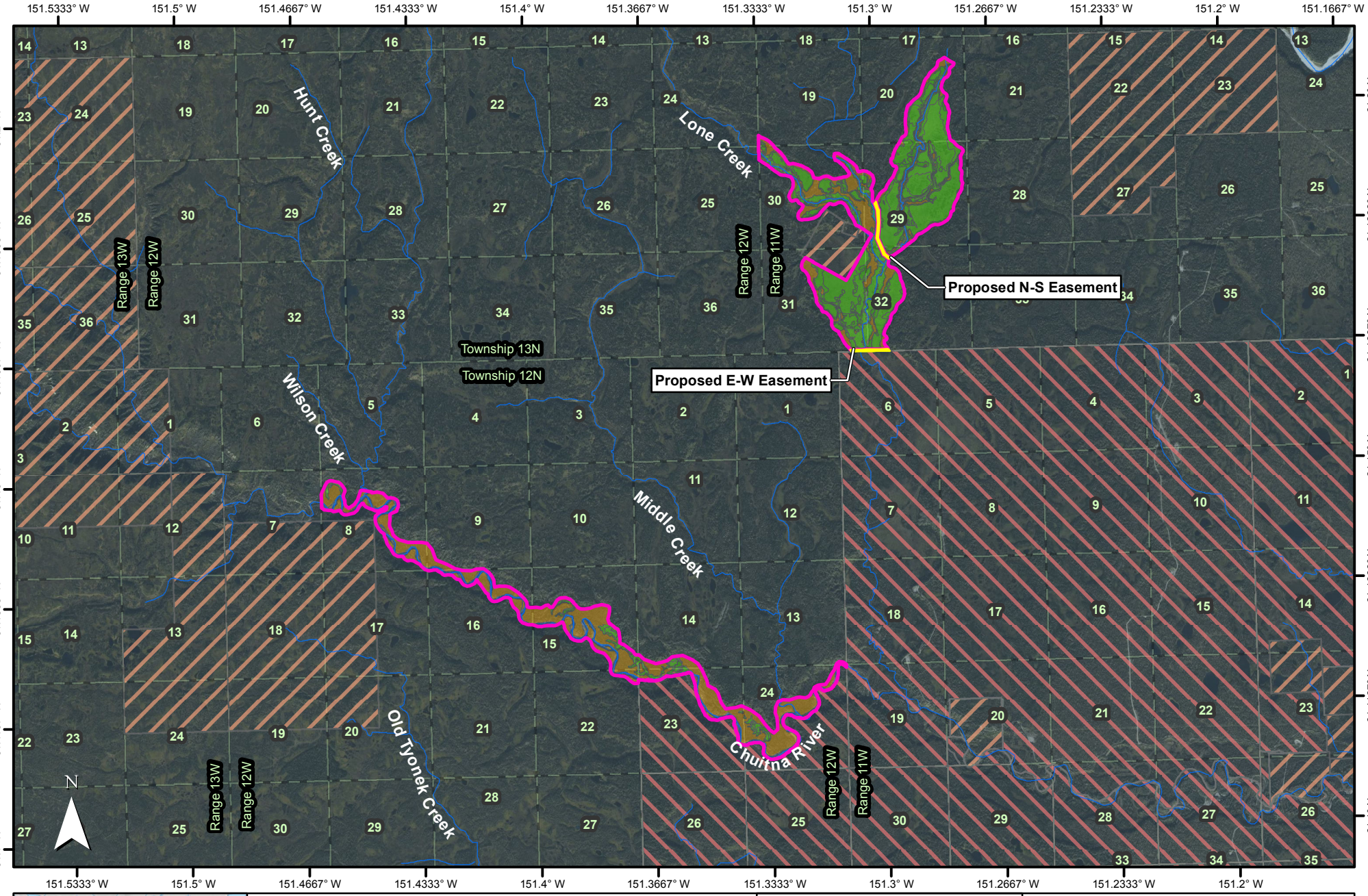
Landowner specifically reserves a qualified mineral interest (as defined in § 170(h)(6) of the Internal Revenue Code) in subsurface oil, gas or other minerals and the right to access such minerals. However, there shall be no extraction or removal of, or exploration for, minerals by any surface mining method, nor by any method which results in subsidence or which otherwise interferes with the continuing natural condition of the Property.

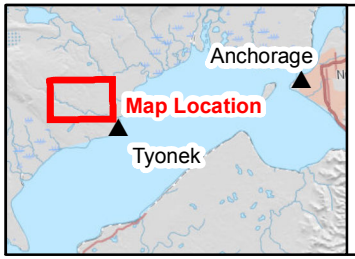
Landowner reserves the right to construct habitat improvements within the Property, including activities such as adding moose browse, replacing blocked culverts to improve fish passage, or constructing new fish habitat in the area. The Landowner will be required to obtain the necessary permits for these activities, including from the ADF&G and the USACE, as required.

Landowner reserves the right to maintain 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) 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 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.





Anadromous Stream

Wetland Status

Stream/River

Upland

Wetland/Pond

Easement

Preservation Area Boundary

Public Land Survey Section

Adjacent Land Owner

Tyonek Native Corp.

State of AK/Private

Miles

0 0.5 1 2

1 inch = 6,667 feet

1:80,000

Chuitna Wetland and Stream Alaska Mental Health Trust Preservation Area Figure 4

NAD 1983, UTM Zone 5N;
Seward Meridian
Date: 12/18/17

Baseline Information

Preliminary wetland and stream mapping has been completed for the proposed Chuitna Preservation Area based on aerial photography and contour data. The preliminary mapping identified 2,558-acres of wetlands and ponds and another 336-acres of stream area that was visible in aerial imagery (Table 2). Smaller streams were mapped using contour data. Preliminary mapping and analysis identified approximately 228,325 linear feet (43.24-miles) of stream channel including a minimum of 148,896 linear feet (28.2-miles) documented as Pacific salmon habitat. An updated description of the wetland types and their abundances will be provided when a wetland delineation is completed in mid-2018.

Determination of Credits

The Chuitna Preservation Area includes 5,888-acres, including 2,558-acres of wetlands and ponds and 228,325 linear feet (43.24-miles) of streams, that will be permanently protected from development as shown in Table 11.

Table 11 Areas Permanently Protected by the PRM Plan

Land Description	Type	Acres	Linear Feet (Miles)
Wetlands and Ponds	Preservation	2,558	-
Streams and Rivers	Preservation	336	228,325 (43.24)
Riparian and Wetland Buffer	Preservation	2,994	-
Total		**5,888**	**228,325 (43.24)**

Mitigation Work Plan

Donlin Gold is not proposing a mitigation work plan in the Preservation Area.

Maintenance Plan

Donlin Gold is not providing a maintenance plan for this PRM. No maintenance will be necessary, because the protection instrument will provide for long-term preservation.

Performance Standards

Donlin Gold is not proposing any performance standards. No performance standards are necessary, because no restoration work is required and the protection instrument provides for preservation.

Monitoring Requirements

A wetland delineation will be completed for the site and submitted to USACE. The landowners will complete helicopter and/or aerial surveys of the Chuitna Preservation Area every two years to document that there is no violation of the deed restrictions.

Long-term Management Plan

Donlin Gold is not proposing performance standards; therefore, a long-term management plan is not proposed. Donlin Gold will establish the protection instrument for preservation; the prohibited activities as mentioned in the Site Protection Instrument section will be enforced as described.

Adaptive Management Plan

Site changes are only expected to occur due to natural events. Donlin Gold is not proposing an adaptive management plan for changes caused by natural processes.

Financial Assurances

Donlin Gold agrees to establish the protection instrument in advance of the Project construction. No financial instrument is proposed.

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Block 25. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody

This block contains complete names and full mailing addresses of property owners, lessees, etc. adjoining the proposed project's waterbodies or aquatic sites.

Owner - Entity Name	Address	City, State Zip
Alaska Pipeline Company	PO Box 190288	Anchorage, AK 99519
Alexie Balassa Heirs, FF-14513 c/o Bureau of Indian Affairs Realty Services Division	3601 C Street, Suite 100	Anchorage, AK 99503
Anne Worthington	PO Box 150	Ganado, AZ 86505
Arlene Wood	3416 West 83rd	Anchorage, AK 99502
Barry Scott Mileur Commercial Recreation Camp for Big Game Guiding	PO Box 2661	Palmer, AK 99645
Bob Robinson	PO Box 1032	Willow, AK 99688-1032
Brett Lounsbury	PO Box 8947	Kodiak, AK 99615
BRI Alaska Corporation	101 E. 9th Ave. Suite 12-B	Anchorage, AK 99501
Bureau of Land Management	222 W. 7th Ave 13	Anchorage, AK 99501
Calista Corporation Land Department	301 Calista Ct. A	Anchorage, AK 99518
Carl and Kirsten Dixon Within The Wild Adventure Company	PO Box 91419	Anchorage, AK 99509
Carl Thomas	HC 89 Box 8320	Talkeetna, AK 99676
Caroline Rogers	4950 South Chicago Beach Drive #13A	Chicago, IL 60615
Charles Irwin	HC 89 Box 406B	Willow, AK 99688
Charles Poulson (Last Chance 8)	3016 W. 29th Avenue	Anchorage, AK 99517
Conoco Phillips Alaska, Inc. Land Department	700 G Street	Anchorage, AK 99501
Cook Inlet Energy, LLC.	601 W. 5th Ave. #310	Anchorage, AK 99501
Cook Inlet Region, Inc. Land Department	PO Box 93330	Anchorage, AK 99509-3330
David Baker	3140 Delta	Anchorage, AK 99502
David Orlando	PO Box 2196	Volcano, HI 96785
Dennis and Evelyn Thomas, FF-16757 c/o Bureau of Indian Affairs Realty Services Division	3601 C Street, Suite 100	Anchorage, AK 99503
Diane Sanderlin	1532A North Pittman Road	Wasilla, AK 99654
Doyon, Limited Lands & Natural Resources	1 Doyon Place, Suite 300	Fairbanks, AK 99701-2941
Edmund McMillan (AMTEC, Inc.)	4011 Arctic Blvd. Suite 201	Anchorage, AK 99503
Eleanor Magowan	12931 Aro Circle	Anchorage, AK 99515
Federal Aviation Administration- Alaska Region, Real Estate and Utilities Group	222 W. 7th Ave 14	Anchorage, AK 99513-7587

Owner - Entity Name	Address	City, State Zip
Geoinformatics AK Exploration Inc./Kiska Metals	510 Burrard St., Suite 575	Vancouver, BC V6C 3A8
Grant's Landing, LLC	PO Box 876865	Wasilla, AK 99687
Gregory Gullickson	7924 Brentwood Dr.	Anchorage, AK 99502
Henry Chandler	840 N. Park Street	Anchorage, AK 99508
Hillcorp Alaska, LLC.	3800 Centerpoint Dr., Ste. 100	Anchorage, AK 99503
Ingrid Murto	PO Box 478	Willow, AK 99688-0478
Jack & Jennifer Duclos Family Trust	16962 Bedford Chase Circle	Anchorage, AK 99516
Jeromie Sandall	836 Mago Vista Road	Arnold, MD 21012
Jerry and Leora Harrison	3060 East Kings Way	Pahrump, NV 89061
John Balassa Heirs, FF-14451 c/o Bureau of Indian Affairs Realty Services Division	3601 C Street, Suite 100	Anchorage, AK 99503
Jon Rogers, et al.	347 Lane 12	Powell, WY 82435
Joseph Beech	PO Box 1228	Willow, AK 99688-1228
Joseph George Phillips, FF-000989 c/o Bureau of Indian Affairs Realty Services Division	3601 C Street, Suite 100	Anchorage, AK 99503
Joshua Jelliff	3043 County Route 7	Montour Falls, NY 14865
Kay Sanderlin	2101 S. Ruth St	Wasilla, AK 99654
Kenai Peninsula Borough	114 N. Binkley Street	Soldotna, AK 99669
Kenai Peninsula Borough Land Department	144 N. Binkley St	Soldotna, AK 99669
Linda Bookout	3887 Manford Circle	Las Vegas, NV 89104
Mark Lounsbury	12640 Shelburne Road	Anchorage, AK 99516
Martin Krebs	PO Box 8924	Goleta, CA 93118
Mary Core	PO Box 100363	Anchorage, AK 99510
Matanuska Susitna Borough	350 E. Dahlia Ave.	Palmer, AK 99645
Michael Fulton	4122 N. Gunflint Trail	Wasilla, AK 99654
Michael Just	2744 Iliamna Avenue	Anchorage, AK 99517
Nicholai Wasky Heirs, F-029382 c/o Bureau of Indian Affairs, Realty Services Division	3601 C Street, Suite 1100	Anchorage, AK 99503
Nick Bobby, F-16491 c/o Bureau of Indian Affairs, Realty Services Division	3601 C Street, Suite 1100	Anchorage, AK 99503
Noricum Corporation Land Department	1875 Century Park East, Suite 700	Los Angeles, CA 90067
Patricia Ferguson	1125 Colonial Drive	Wasilla, AK 99654
Patrick Flanigan	PO Box 81	Skwentna, AK 99667
Richard Halford	PO Box 771208	Eagle River, AK 99577
Richard Sanderlin	2101 S. Ruth St	Wasilla, AK 99654

Owner - Entity Name	Address	City, State Zip
Sakar Bedusha Heirs, FF-18067 c/o Bureau of Indian Affairs Realty Services Division	3601 C Street, Suite 100	Anchorage, AK 99503
Seth M. Kroekne Alaska's River Wild Lodge/Adventures	101 Pilot Lane	Port Alsworth, AK 99653
Soya Choi	2840 Northside Drive	Atlanta, GA 30305
State of Alaska Department of Natural Resources	550 W. 7th Ave, Suite 1430	Anchorage, AK 99501
State of Alaska DOT&PF Design and Construction Central Region	PO Box 196900	Anchorage, AK 99519-6900
Steven Flanigan	General Delivery: Owl Creek	Skwentna, AK 99667
Steven Perrins	6654 McGill Way	Anchorage, AK 99502
Susan Stroebel	B 1532 N. Pittman Rd.	Wasilla, AK 99654
The Kuskokwim Corporation Land Department	4300 B St., Suite 207	Anchorage, AK 99503
The Perrins' Rainy Pass Lodge, LLC	PO Box 221267	Anchorage, AK 99552-1267
Wallis Brockert	PO Box 873224	Wasilla, AK 99687
Ward Knous	PO Box 485	Girdwood, AK 99587
Wassilie Kameroff, AA083225B c/o Bureau of Indian Affairs, Realty Services Division	3601 C Street, Suite 1100	Anchorage, AK 99503

Permit submittals and approvals by other agencies.

Agency	Application Type	Facility or Activity	Application Number	Submittal Date	Approval Date	Status
ADEC	Integrated Waste Management Permit	Waste Management Permit for Tailings Storage Facility, Waste Rock Facility, inert landfills, and overburden stockpiles	----	9/16/2015	----	Processing
ADEC	Alaska Pollutant Discharge Elimination System	Treated Water Discharge from Mine Dewatering Activities and Water Management	AK0055867	4/4/2017	----	Processing
ADEC	Air Quality Control Construction Permit Application	Air Emissions from Mine Operations	AQ0934CPT01	10/15/2015	6/30/2017	Approved
ADF&G	Fish Habitat Permit Application	American Creek Area Facilities	----	Planned 2017	----	----
ADF&G	Fish Habitat Permit Application	Anaconda Creek Area Facilities	----	Planned 2017	----	----
ADF&G	Fish Habitat Permit Application	Snow Gulch Area Facilities	----	Planned 2017	----	----
ADF&G	Fish Habitat Permit Application	Ruby Creek Area Aquatic Mitigation	----	Planned 2017	----	----
ADF&G	Fish Habitat Permit Application	Alaska Pollution Discharge Elimination System Discharge Point Construction	----	Planned 2017	----	----
ADF&G	Fish Habitat Permit Application	Crooked Creek Bridge Construction	----	10/8/2015	----	Processing
ADF&G	Fish Habitat Permit Application	Getmuna North Fork Bridge Construction	----	10/8/2015	----	Processing
ADF&G	Fish Habitat Permit Application	Getmuna South Fork Bridge Construction	----	10/8/2015	----	Processing
ADF&G	Fish Habitat Permit Application	Unnamed Getmuna South Tributary Bridge Construction	----	10/8/2015	----	Processing
ADF&G	Fish Habitat Permit Application	Fish Habitat Permit - Lower Jungjuk Creek Bridge Construction	----	10/8/2015	----	Processing
ADF&G	Fish Habitat Permit Application	Fish Habitat Permit - Upper Jungjuk Creek Bridge Construction	----	10/8/2015	----	Processing
ADF&G	Fish Habitat Permit Application	Jungjuk (Anyaruaq) Port Wharf Construction	----	10/8/2015	----	Processing
ADNR	Certificate of Approval to Construct a Dam	7 dams within the Mine Area	----	4/12/2013	----	Processing
ADNR	Water Rights Application	Tailings Storage Facility Interceptor and Seepage Collection Wells	LAS 29175	5/16/2013	----	Processing
ADNR	Water Rights Application	Upper Contact Water Dam	LAS 29168	5/16/2013	----	Processing
ADNR	Water Rights Application	Snow Gulch Freshwater Dam	LAS 29169	5/16/2013	----	Processing
ADNR	Water Rights Application	Lower Contact Water Dam	LAS 29170	5/16/2013	----	Processing
ADNR	Water Rights Application	Jungjuk (Anyaruaq) Port Site Surface Water-Kuskokwim River	LAS 29171	5/16/2013	----	Processing
ADNR	Water Rights Application	Construction Camp/Shop, Office, Warehouse, & Mill	LAS 29172	5/16/2013	----	Processing
ADNR	Water Rights Application	Pit Perimeter & In-Pit Dewatering Wells & Drains	LAS 29173	5/16/2013	----	Processing
ADNR	Water Rights Application	Getmuna Creek Surface Water	LAS 29174	5/16/2013	----	Processing
ADNR	Water Rights Application	Jungjuk (Anyaruaq) Port Site Well	LAS 29176	5/16/2013	----	Processing
ADNR	Water Rights Application	Tailings Storage Facility	LAS 29177	5/16/2013	----	Processing
ADNR	Water Rights Application	Permanent Camp Potable Water Well Field	LAS 29178	5/16/2013	----	Processing

Agency	Application Type	Facility or Activity	Application Number	Submittal Date	Approval Date	Status
ADNR	Application for Pipeline Right-of-Way Lease	Natural Gas Pipeline ROW (State of Alaska Lands)	ADL 231908	4/9/2014	----	Processing
ADNR	Application for Easement	Fiber Optic ROW (State of Alaska Lands)	ADL 232368	11/16/2015	----	Processing
ADNR	Reclamation Plan Approval	Reclamation of Mine Area and Transportation Area Facilities	----	5/22/2012	----	Processing
ADNR	Application for Lease or Purchase of State Land	Airstrip Land Lease (on State Land)	ADL 232199	10/9/2015	----	Processing
ADNR	Application for Lease or Purchase of State Land	Land Lease for Submerged State of Alaska Lands at Jungjuk (Anyaruaq) Port	ADL 232200	10/9/2015	----	Processing
ADNR	Land Use Permit Application	Temporary Access Road to Donlin-Jungjuk Road Material Site-8	ADL 232361	5/19/2016	----	Processing
ADNR	Land Use Permit Application	Temporary Access Road to Donlin-Jungjuk Road Material Site-16	ADL 232366	5/19/2016	----	Processing
ADNR	Application for Easement	Donlin-Jungjuk Road (State Land Portions)	ADL 232346	10/9/2015	----	Processing
ADNR	Material Sites and Reclamation Plan	Donlin-Jungjuk Road Material Site-04	ADL 232334	10/9/2015	----	Processing
ADNR	Material Sites and Reclamation Plan	Donlin-Jungjuk Road Material Site-08	ADL 232335	10/9/2015	----	Processing
ADNR	Material Sites and Reclamation Plan	Donlin-Jungjuk Road Material Site-09	ADL 232336	10/9/2015	----	Processing
ADNR	Material Sites and Reclamation Plan	Donlin-Jungjuk Road Material Site-10	ADL 232337	10/9/2015	----	Processing
ADNR	Material Sites and Reclamation Plan	Donlin-Jungjuk Road Material Site-12	ADL 232338	10/9/2015	----	Processing
ADNR	Material Sites and Reclamation Plan	Donlin-Jungjuk Road Material Site-13	ADL 232339	10/9/2015	----	Processing
ADNR	Material Sites and Reclamation Plan	Donlin-Jungjuk Road Material Site-16	ADL 232340	10/9/2015	----	Processing
ADNR	Reclamation Plan Approval	Donlin-Jungjuk Road Material Site-01	LAS 30533	10/9/2015	----	Processing
ADNR	Reclamation Plan Approval	Donlin-Jungjuk Road Material Site-02	LAS 30534	10/9/2015	----	Processing
ADNR	Reclamation Plan Approval	Donlin-Jungjuk Road Material Site-03	LAS 30535	10/9/2015	----	Processing
ADNR	Reclamation Plan Approval	Donlin-Jungjuk Road Material Site-05	LAS 30536	10/9/2015	----	Processing
ADNR	Reclamation Plan Approval	Donlin-Jungjuk Road Material Site-06	LAS 30537	10/9/2015	----	Processing
ADNR	Reclamation Plan Approval	Donlin-Jungjuk Road Material Site-07	LAS 30538	10/9/2015	----	Processing
BLM	Application for Transportation and Utility Systems and Facilities on Federal Lands	Natural Gas Pipeline ROW (Bureau of Land Management Lands)	AA-92403	3/11/2010	----	Processing
BLM	Application for Transportation and Utility Systems and Facilities on Federal Lands	Fiber Optic ROW (Bureau of Land Management Lands)	AA-93815	1/8/2014	----	Processing
DOT	Special Permit	Natural Gas Pipeline Special Permit - Strain-based Design	----	11/11/2016	----	Processing