Greater Mooses Tooth 2 Oil and Gas Development Project

Joint Record of Decision and Permit Evaluation
Bureau of Land Management
U.S. Army Corps of Engineers

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SUMMARY

This document constitutes the Joint Record of Decision (JROD) of the U.S. Department of Interior (DOI) Bureau of Land Management (BLM) and Department of the Army (DA) Corps of Engineers (Corps), for the Greater Mooses Tooth Two Development Project (GMT2 Project) proposed by ConocoPhillips Alaska, Inc. (ConocoPhillips, Applicant, or Permittee). The One Federal Decision policy mandated by Executive Order 13807 does not expressly apply to the Project, but the BLM and the Corps are voluntarily issuing a JROD in the spirit of that Executive Order.

This JROD outlines the BLM's and the Corps' decision, under the National Environmental Policy Act (NEPA), to select Alternative A for the Proposed Greater Mooses Tooth Two Development Project, as detailed in the August 2018 Final Supplemental Environmental Impact Statement for the Alpine Satellite Development Plan (ASDP)for the Proposed Mooses Tooth 2 Development Project (GMT2 Final Supplemental EIS) and subject to special conditions and the specified mitigation described below. The BLM's authorities include all components of the Project that occur on BLM-managed lands. The Corps authorities are specific to components of the Project proposed to be constructed within waters of the United States (WOUS). The decision will allow development of Federal oil and gas leases on BLM-managed land in the National Petroleum Reserve in Alaska (NPR-A).

The GMT2 Final Supplemental EIS analyzed ConocoPhillips's proposal to develop oil accumulations from the proposed GMT2 drill pad on BLM-managed lands. The decisions in this JROD are limited to Federal lands, and only address authorizations under the jurisdiction of the BLM and the Corps. Access to non-Federal lands is subject to landowner approval, and other Federal and State agencies will process applications for authorizations under their respective jurisdictions.

The GMT2 Final Supplemental EIS analyzed a full range of alternatives. These are:

- Alternative A: ConocoPhillips's proposed project, involving a multi-well drill pad and associated facilities located on BLM-managed lands accessed by a gravel road and pipeline connected to the GMT1 development, CD5, and the Alpine CPF.
- Alternative B: An alternative similar to Alternative A, but which would have an alternate road and pipeline alignment that traverses the watershed boundary between Fish Creek and the Tinmiaqsiugvik River drainage basins.
- Alternative C: An alternative which would not include gravel road access to GMT2, and would require a gravel airstrip and occupied structure pad, and use of annual ice-roads for the life of the project.
- Alternative D: The "No Action Alternative," that analyzed the current conditions and expected future condition if ConocoPhillip's application for permit to drill and application for discharge into WOUS would not be approved..

Each action alternative offered a different approach to development while protecting surface resources from unnecessary and undue degradation, as required by the Federal Land Policy and Management Act (FLPMA).

All available information related to surface and subsurface resources and impacts was presented in the GMT2 Final Supplemental EIS. Environmental modeling was conducted to predict specific impacts associated with proposed infrastructure, particularly potential impacts to air quality. The analysis utilized knowledge of impacts of past North Slope oil development, and benefited from studies and monitoring gained as a result of requirements from the 2004 ASDP Environmental Impact Statement (EIS) ROD. The findings in the GMT2 Final Supplemental EIS are based on an open and collaborative process that benefited from close coordination among the scientists and other resource specialists of the BLM, cooperating agencies, the DOI/Environmental Protection Agency (EPA)/U.S. Department of Agriculture Forest Service Air Quality Working Group, and by an ongoing dialogue with North Slope residents, particularly those in Nuiqsut (the closest community to the project). The evaluation resulted in a GMT2 Final Supplemental EIS that provides sufficient detailed analysis to adequately inform the decision makers for purposes of this JROD.

In the GMT2 Draft and Final Supplemental EIS, the BLM identified Alternative A as its Preferred Alternative; the Corps did not identify a preferred alternative. The BLM based its preference on the fact that the other action alternatives did not result in any appreciable environmental advantage over Alternative A.

As part of its decision to adopt Alternative A in this JROD, the BLM is also implementing a robust package of mitigation measures to add to the pre-existing protective measures applicable to all BLM-authorized projects in the NPR-A, including the GMT2 project. In addition to reducing impacts to the project area as a whole, and in recognition of the importance of the lease stipulations and best management practices (BMPs) established by the 2013 NPR-A Integrated Activity Plan (IAP) decision, the mitigation package will serve to minimize additional adverse impacts to resources and uses specific to the GMT2 project. In developing this mitigation package, the BLM considered its required existing protective measures, including previously identified BMPs, existing lease stipulations, and mitigation incorporated by the applicant via project design. The GMT2 project is subject to the lease stipulations adopted in the 2008 Northeast NPR-A ROD and the BMPs adopted in the 2013 NPR-A IAP/EIS ROD. In addition to the BMPs already applicable to the project, in this decision the BLM is adopting new measures as Supplemental BMPs designed to further avoid or reduce impacts from the proposed action.

The BLM decision made in this JROD emphasizes balanced and environmentally responsible development, and includes protections for physical and biological resources. The decision also addresses local residents' concerns regarding protection of their subsistence way of life and the subsistence resources on which they depend. At the same time, the decision enables leaseholders to reasonably develop the petroleum resources from Federally managed and Alaska Native Corporation-owned lands, providing revenue to the mineral subsurface estate managers, Arctic Slope Regional Corporation (ASRC) and the Federal Government, while helping to meet America's energy needs. Royalties received by ASRC will result in revenues to Alaska Native corporations from shared royalties, and the GMT2 development project will also lead to increased revenues to the North Slope Borough, Nuiqsut, and the State of Alaska resulting from shared federal royalties, State and local taxes, state-administered NPR-A Impact Fund Grants, and other fees.

DECISION

Introduction

In August 2015, ConocoPhillips submitted an application to the BLM for issuance of a permit to drill to construct, operate, and maintain a drill site, access road, pipelines, and ancillary facilities to support development of petroleum resources in the Greater Mooses Tooth Unit. The proposed GMT2 drill site location and a majority of the infield road and pipeline route are on BLM-managed lands in the NPR-A. The project is located on the North Slope of Alaska, immediately west of the Colville River Delta, approximately 11 miles northwest of the village of Nuiqsut. In order to process the applications, the BLM analyzed the environmental impacts of the proposed project and a reasonable range of alternatives in accordance with NEPA, the Council on Environmental Quality NEPA regulations, DOI NEPA regulations, and other applicable authorities.

Background and History of the Proposed Project

In 1980, Congress authorized petroleum production in the NPR-A and directed DOI to undertake “an expeditious program of competitive leasing of oil and gas” in the Reserve (P.L. 96-514). Since 1998, the BLM’s management of the NPR-A has been guided by integrated activity plans developed in consultation with key stakeholders and the public through the NEPA and Native Alaskan consultation processes. The first such plan was the 1998 Northeast NPR-A IAP/EIS, which included the area where GMT2 is currently proposed. That plan was amended by the 2008 Northeast NPR-A Supplemental IAP/EIS, which in turn was superseded by the 2012 NPR-A IAP/EIS and 2013 NPR-A IAP/EIS ROD that now governs all Federal lands in the NPR-A. The plans identified which areas are available to oil and gas leasing, and established various protective measures in the form of lease stipulations and BMPs designed to avoid and minimize impacts from oil and gas activities.

As envisioned by the 1998 Northeast NPR-A IAP/EIS, lease sales were held in 1999 and 2002, with ConocoPhillips receiving numerous leases, including the lease where the GMT2 drill site is located. ConocoPhillips began oil and gas production near the NPR-A on non-Federal lands in 2000 and 2001 with the construction and operation of facilities known as Alpine CD1 and CD2. In 2002, ConocoPhillips proposed an Alpine Satellite Development Plan (ASDP) that envisioned development of five satellite drilling pads: two in the Colville River Delta adjacent to the NPR-A (CD3 and CD4) and three in the NPR-A (CD5, GMT1, and GMT2). Under the ASDP, product from all five pads would be processed at the Alpine CPF located at CD1. Although within the boundaries of the NPR-A, CD5 is not on federally administered land, but GMT1 and GMT2 – which were known as “CD6” and “CD7” in the 2004 ASDP – are located on federally leased tracts. The BLM approved the plan for the two Federal sites in its 2004 ASDP EIS ROD. The 2004 decision tiered to the 1998 Northeast NPR-A IAP/EIS and also incorporated the stipulations adopted in the 1998 Northeast NPR-A IAP/EIS ROD and additional mitigation measures to protect potentially affected resources. In 2013, ConocoPhillips submitted the first application for permit to drill and an associated right-of-way application for GMT1, resulting in the BLM preparing a GMT1 Supplemental EIS (finalized in 2015) to the 2004 ASDP Final EIS. The GMT1 Project was approved by the BLM through a ROD signed in February 2015. Although that 2015 Supplemental EIS discussed development opportunities at GMT2 as an alternative to GMT1, no application for developing the GMT2 site had been filed at that time with the BLM or other permitting entities.

The GMT2 project has evolved since it was first discussed in the 2004 ASDP and its Suppplemental EIS, withchanges o the project design due to subsequent decisions (such as the approval of GMT1) and to reduce impacts to certain resources, and revised estimates of recoverable oil. Specifically, modifications include moving the pad location out of the Colville River Special Area, increasing the pad size and the number of wells, reducing the road and pipeline length from what was proposed in the GMT1

Supplemental EIS (and thereby reducing the amount of fill required and associated impacts to wetlands), and utilizing the existing ASRC Gravel Mine Site.

To further evaluate the specific GMT2 project proposed here, an additional supplement to the 2004 ASDP Final EIS was prepared. The *Federal Register* published the Notice of Availability (NOA) for the GMT2 Draft Supplemental EIS on March 29, 2018, and the NOA for the GMT2 Final Supplemental EIS was published on August 31, 2018.

BLM Management Responsibilities and Requirements in the NPR-A

As the Federal manager of the NPR-A, the BLM is responsible for land-use authorizations on Federal land in the NPR-A. The authority for management of NPR-A comes from several statutes including the Federal Land Policy and Management Act (FLPMA), the Naval Petroleum Reserves Production Act of 1976 (NPRPA), as amended by the Department of the Interior Appropriations Act for Fiscal Year 1981 (P.L. 96-514), and Title VIII of the Alaska National Interest Lands Conservation Act (ANILCA). These BLM authorities are further described below:

- Under FLPMA, the Secretary of the Interior has broad authority to regulate the use, occupancy, and development of public lands and to take whatever action is required to prevent unnecessary or undue degradation of public lands (43 U.S.C. 1732).
- The NPRPA, as amended, requires oil and gas leasing in the NPR-A while also requiring protection of important surface resources and uses. The NPRPA provides the Secretary of the Interior with the authority to: protect “environmental, fish and wildlife, and historical or scenic values” in the NPR-A (42 U.S.C. 6503(b)); and provide “conditions, restrictions, and prohibitions as the Secretary deems necessary or appropriate to mitigate reasonably foreseeable and significantly adverse effects on the surface resources of the National Petroleum Reserve in Alaska” (42 U.S.C 6506a(b)).
- Title VIII of ANILCA establishes procedures for Federal land managing agencies to evaluate impacts on subsistence uses and needs and means to reduce or eliminate such impacts (16 U.S.C. 3120).

Corps Authority in the NPR-A

The Applicant proposes to discharge fill material into waters of the United States (WOUS), including wetlands, which require authorization from the Corps.

This permit action is being undertaken through authority delegated to the District Engineer by 33 CFR 325.8, pursuant to Section 404 of the Clean Water Act (CWA) (33 USC 1344).

- The Corps has authority through Section 404 of the CWA to regulate the discharge of dredged or fill material into WOUS.

Under the Council on Environmental Quality regulations for implementing NEPA (40 CFR 1500-1508), the Corps participated in development of the GMT2 Supplemental EIS as a cooperating agency. The Corps has reviewed and evaluated the information in the GMT2 Final Supplemental EIS, including all supplemental data subsequently provided, in accordance with 40 CFR 1506.3 and 33 CFR 325, appendix b, and has found them to be sufficient and accurate assessments, and therefore adopts the EIS as appropriate for the purposes of NEPA and the public interest review and alternatives analysis required by 33 CFR 320.4(b)(4) and 33 CFR 325 Appendix B.

Summary of BLM Decision

This JROD approves the development of the GMT2 project as described in Alternative A of the GMT2 Final Supplemental EIS.

This JROD concludes the Supplemental EIS process for the BLM. It fulfills the NEPA requirements associated with consideration of ConocoPhillips's applications to develop oil accumulations on lands the BLM has leased to ConocoPhillips.

The JROD completes the required NEPA process for subsequent issuance of the appropriate BLM permits to drill on the GMT2 pad and other authorizations necessary for initial development of the GMT2 project. This includes:

- Construction and operation of the GMT2 drilling and production pad; and
- Construction and operation of a gravel road and a pipeline that will link the GMT2 pad to the GMT1 pad on BLM-managed lands with the CD5 pad on Kuukpik Corporation land and with the Alpine Central Production Facility (CPF) on State land.

The location of the GMT2 pad, road, and pipelines are described in Alternative A in the GMT2 Final Supplemental EIS (Section 2.5 and Appendix drawings). The pad would measure approximately 14 acres. The road accessing GMT2 from GMT1 would be approximately 8.2 miles long. A set of pipelines, power and communications lines would be mounted on a series of vertical support members (VSMs) parallel to the road. The exact specifications for these facilities may vary slightly from those shown in the GMT2 Final Supplemental EIS and on application drawings to meet the requirements of permits issued by other Federal and State agencies.

The BLM's decision approves deviations to one stipulation included in the 2008 Northeast NPR-A IAP/EIS ROD and one best management practice (BMP) from the 2013 NPR-A IAP/EIS ROD:

- Lease Stipulation 41 (now Lease Stipulation E-2): to allow oil infrastructure within 500 feet of water bodies; and
- Best Management Practice E-7(c): to allow less than a 500 foot separation distance between pipelines and roads.

Additional discussion of the rationale for approving these deviations is included in Section 3, Management Considerations. Notwithstanding these deviations, the BLM reaffirms the land use authorizations, stipulations, and best management practices established by the 2013 NPR-A IAP decision. All other lease stipulations and BMPs in place from the 2008 Northeast NPR-A IAP/EIS ROD and 2013 NPR-A IAP/EIS ROD, respectively, will remain in place. Additionally, the mitigation measures adopted by the 2004 ASDP ROD and have been incorporated into the project by the applicant as design features.

In addition to project design features, the BLM lease stipulations, and BMPs already applicable to the project, the BLM is adopting in this JROD Supplemental BMPs designed to further avoid or reduce impacts from this specific action. The Supplemental BMPs are selected from the potential new mitigation measures described and analyzed in the relevant resource sections in Chapter 4 of the GMT2 Final Supplemental EIS, which were developed through the NEPA process based on suggestions from cooperating agencies, stakeholders, the public, and BLM staff. A full description of the adopted Supplemental BMPs is provided in Appendix A of this JROD.

This decision will result in no unnecessary or undue degradation of public lands. Adverse impacts to these lands and the uses of these lands are minimized by:

- lease provisions and stipulations;

- required 2013 NPR-A IAP/EIS ROD BMPs;
- protections incorporated into the project design (such as the drill pad location outside of Colville River Special Area);
- Supplemental BMPs developed through the course of the Supplemental EIS and adopted by this JROD (as described above and in Appendix A); and,
- applicable Federal, State, and North Slope Borough (NSB) laws and regulations.

This decision also adopts the Reasonable and Prudent Measures (RPM) and the implementing Terms and Conditions (T&C), included by the U.S. Fish and Wildlife Service (USFWS or Service) in its amended Biological Opinion dated September 21, 2018, to protect polar bears (*Ursus maritimus*), spectacled eiders (*Somateria fischeri*), and Alaska-breeding Steller's eiders (*Polysticta stelleri*). The Biological Opinion can be found in Appendix F.

Summary of Corps Decision

A DA permit pursuant to Section 404 of the CWA (33 USC 1344), is being issued to ConocoPhillips for the discharge of fill material into waters of the United States (WOUS), including wetlands. The DA permit authorizes the Applicant's proposed action (Alternative A), as described in the GMT2 Final Supplemental EIS. The impacts as a result of the discharge of fill into WOUS and are described in Appendix D. This alternative incorporates all practicable avoidance and minimization measures.

A detailed description of proposed activities involving the discharge of fill in WOUS is included in Block 18 (Nature of Activity) in the December 2017 DA permit application. These activities include fill for construction of a gravel access road, drill pad, vehicle pullouts, and Vertical Support Members (VSMs) for pipeline and utility support. Principal impacts to WOUS resulting from construction of the Project include the placement of 674,300 cubic yards of gravel fill in 77.9 acres of WOUS.

The Corps' supporting analysis for this JROD is included as Attachment D.

ALTERNATIVES

The elements of the alternatives presented in the GMT2 Final Supplemental EIS are consistent with the purposes of the statutes governing the NPR-A and with the BLM's responsibilities under FLPMA. The action alternatives carried forward from the 2004 ASDP EIS were modified and updated for conditions specific to the GMT2 project as currently proposed, and based on the analysis tiered to and incorporated by reference from the 2015 GMT1 Supplemental EIS. Each alternative offers a different approach to approving ConocoPhillips's application to produce oil reserves on its leases. The following provides brief descriptions of the alternatives contained in Chapter 2 of the GMT2 Final Supplemental EIS.

Alternative A (ConocoPhillips's Proposed Action and the BLM's Environmentally Preferred Alternative): The proposed 14-acre GMT2 gravel pad would contain 48 drilling and injection wells. An 8.2-mile gravel road and 8.6-mile elevated pipeline would connect GMT2 to the existing GMT1 pad. Produced fluids would be transported by pipeline via GMT1 and CD5 for processing at the existing Alpine CPF. Personnel and equipment would be flown to the airstrip at the existing Alpine CPF and transported to GMT2 via the gravel road. Gravel used for construction of roads and pads would be obtained from the existing ASRC Mine Site. The proposed GMT2 road would require 46 culverts, three 0.4 acre vehicle pullouts, and no bridges. Aboveground pipelines would be supported on a set of VSMs between GMT2 and GMT1; pipelines would be at elevations of at least 7 feet above the tundra. Approximately 0.5 miles of pipeline would not meet the minimum mandatory separation of 500 feet from fish-bearing waterbodies and would require a deviation from Lease Stipulation 41 (Stipulation E-2 in the 2013 IAP/EIS ROD). Approximately 2.6 miles of road and pipeline would not be constructed to meet the minimum mandatory separation of 500 feet, and require a deviation from BMP E-7(c) in the 2013 IAP/EIS ROD. Both deviations are described in Management Considerations below. This alternative would require up to 53 miles of ice roads during the construction phase of the project. The total gravel footprint in USACE jurisdictional waters of the United States for this alternative would be approximately 78 acres.

Alternative B: Alternative B would feature the same GMT2 pad location, facility design and operational parameters, but would have a different road and pipeline alignment between GMT1 and GMT2 from that described in Alternative A. Instead, the road and pipeline follow the watershed boundary between Fish Creek and the Tinmiaqsiugvik River, in order to see whether environmental advantages could occur from having the road on potentially higher ground. The Alternative B alignment resulted in increasing the road length to 9.3 miles and the number of culverts to 50, and the pipeline length to 9.4 miles. Deviations for both Lease Stipulation 41 (Stipulation E-2) and BMP E-7(c) would also need to occur for Alternative B. The total gravel footprint for this alternative would be approximately 87.2 acres.

Alternative C: In Alternative C, the gravel road between GMT2 and GMT1 would be eliminated and the GMT2 production pad would be accessible only by aircraft or ice road. All personnel and equipment would be transported to the GMT2 pad via fixed-wing planes and helicopters or a seasonal ice road. The pipeline and VSMs would follow the same route and design as described for Alternative A. In addition to the facilities and features required for the GMT2 pad in all action alternatives, Alternative C would require that certain facilities, services, equipment, and supplies (otherwise provided at CPF) would need to be duplicated at or near the drill pad. Notably, the Alternative C pad would require its own 5,000-foot gravel airstrip and parking apron, 18.4-acre occupied structure pad to house additional infrastructure, and a 0.9-mile gravel access road between the GMT2 pad and the airstrip. Drilling would be supported by a crew based in a 225-man camp (workers to support drilling and well tie-in) on the occupied structure pad. In addition, a 25-man operation support camp would also be located on the occupied structure pad. This alternative would require construction of a 7-mile long annual resupply ice road, through the life of the project. The total gravel footprint for this alternative would be approximately 87.4 acres.

Alternative D (No Action): Under this alternative, ConocoPhillips's applications to construct, operate, and maintain a drill site, access road, pipelines, and ancillary facilities to support development of petroleum resources in the Greater Mooses Tooth Unit would not be approved by the BLM and the application to deposit fill in WOUS and impact navigable waterways would not be approved by the Corps. No oil would be produced from GMT2 in the near future, and no new roads, airstrips, pipelines, or other oil facilities would be constructed beyond what is currently authorized in connection with ConocoPhillips's current development. Under this alternative, the BLM analyzed the current conditions and expected future condition in the absence of the GMT2 project. Alternative D is the environmentally preferable alternative because it would prevent damage to the biological and physical environment, and would best preserve and protect historic, cultural, and natural resources. However, Alternative D is not a practicable alternative in the JROD, due to the fact that the BLM cannot select this alternative as its decision for GMT2. Once issued, oil and gas leases provide a right of development, subject to reasonable regulation.

MANAGEMENT CONSIDERATIONS

The GMT2 Final Supplemental EIS fulfills the obligation of the BLM and its Federal cooperating agencies under NEPA, to analyze the environmental impacts of Federal authorizations necessary for ConocoPhillips to undertake its proposed GMT2 development. Authorizing ConocoPhillips's development helps address the Nation's total energy needs. North Slope oil production, centered at Prudhoe Bay, is an important component of the Nation's domestic oil supply. The oil industry has discovered and developed other fields to the east and west of Prudhoe Bay. However, production has declined from these older fields and development of ConocoPhillips's project will help offset this decline and provide a new source of oil for the Trans-Alaska Pipeline System. Moreover, the authorization of development of leases in the NPR-A satisfies the purpose of the NPRPA to explore and develop oil and gas resources in the NPR-A. Specifically, the NPRPA, as amended, encourages oil and gas leasing in the NPR-A while requiring protection of important surface resources and uses. Development of satellite oil accumulations at GMT2, with appropriate environmental protection measures, is consistent with the President's commitment to expand domestic energy production.

Federal laws, including the NPRPA, FLPMA, ANILCA, and the Endangered Species Act (ESA), require the BLM to protect soil, water, air, vegetation, wildlife, archaeological and paleontological resources, and subsistence uses while fulfilling the agency's multiple-use mission. These resources are protected through:

- lease provisions and stipulations;
- required 2013 NPR-A IAP/EIS ROD BMPs;
- additional protections incorporated into the project design (such as the drill pad location outside of the Colville River Special Area);
- Supplemental BMPs developed through the course of the Supplemental EIS and adopted by this JROD (as described above and in Appendix A); and,
- applicable Federal, state, and NSB laws and regulations.

Implementation of applicant-proposed design elements, except where they are inconsistent with the adopted decision, is required of the applicant.

Rationale for Adopting Alternative A

Among the alternatives evaluated in the GMT2 Final Supplemental EIS, Alternatives A and B would result in fewer overall environmental impacts than Alternative C. Alternatives A and B would have a smaller development footprint than Alternative C. Alternative C would not result in impacts associated with a gravel road, such as disturbance to wildlife from ground vehicle traffic, impacts to vegetation from fugitive road dust, and hydrological impacts due to restriction of surface water flow. However, with Alternative C would result in increased noise and adverse impacts to air quality due to increased flights and emissions associated with the additional infrastructure required at the drill site. Alternative C would also require annual construction of an ice road connection to GMT1, resulting in increased noise, traffic, and emissions in and near Nuiqsut and increased surface water withdrawals used to construct ice roads. Additionally, Alternative C would not provide residents of Nuiqsut year round access to the GMT2 road, thus limiting opportunities for subsistence access. Alternatives B and C have higher estimated capital expenditure costs than Alternative A, with Alternative C substantially higher.

Alternative D would not allow ConocoPhillips to produce oil from accumulations on its oil and gas leases and would not fulfill regulatory requirements, legislative direction, national energy policy, or the purpose and objectives for which the NPR-A is managed.

Alternatives A and B are similar in their designs and impacts to most all environmental resources. However, Alternative A has a shorter road and an overall smaller development footprint. The shorter road and smaller footprint associated with Alternative A result in less impact to wetlands habitat and is the BLM's environmentally preferred alternative.

As discussed above in the Summary, the BLM identified Alternative A as its preferred alternative in the GMT2 Final Supplemental EIS. Given the similarities between Alternatives A and B with respect to resource impacts, and the fact that the Corps has determined that Alternative A is the Least Environmentally Damaging Practicable Alternative (LEDPA), this JROD adopts Alternative A as the federally coordinated decision.

Consistency with the National Petroleum Reserve in Alaska IAP/EIS

The NPR-A IAP/EIS ROD issued in 2013 required that numerous protections be provided through lease stipulations and BMPs for oil and gas development on Federal lands within the NPR-A. These protections address measures to mitigate potential impacts related to waste prevention, handling, and disposal; spills; water use; overland moves; facility design and construction, ground transportation; air traffic; oil field abandonment; subsistence, orientation program; and other activities. These stipulations and BMPs are required for ConocoPhillips's development, with the exception of deviations approved in this JROD for the one stipulation and one BMP discussed below.

The 2013 NPR-A IAP/EIS ROD lists the current BMPs applicable to oil and gas activities, and provides a process whereby an applicant can seek relief from the requirements and standards of a lease stipulation or BMP by requesting that the BLM approve a "deviation" from the measure. In this way, the IAP ROD provides flexibility to deal with unique aspects of oil and gas development proposals that are impossible to know prior to exploratory drilling. In order for a deviation to be approved, the BLM must determine that the objectives of the stipulation or BMP will be achieved by the applicant's alternative proposal.

Consistent with the requirements of the IAP/EIS, this JROD approves deviations from one stipulation and one BMP as requested by ConocoPhillips in a letter to the BLM dated October 30, 2017. Notwithstanding these deviations, the BLM reaffirms the land use authorizations, stipulations, and best management practices established by the 2013 NPR-A IAP decision.

Deviations are approved in accordance with the following clause from the 2013 IAP/EIS ROD:

> Prior to approving an alternative procedure as part of the authorization, BLM's staff would analyze the proposal and determine if the proposal incorporating the alternative procedure would achieve the objectives of the stipulations and best management practices. If the BLM determines that the alternative procedure proposed by the applicant would meet the stipulation's or best management practice's objective, the BLM could approve the alternative procedure. If the BLM determines that the alternative procedure proposed by the applicant is unlikely to meet the objectives of a stipulation or best management practice, the requirements/standards would still be required. However, the Authorized Officer may allow a deviation from the objectives and requirement/standard in a new decision document supported by additional NEPA analysis.

Deviations are hereby approved for the following stipulations/BMPs based upon the above requirements.

Lease Stipulation E-2 (formerly Lease Stipulation 41)
Lease Stipulation E-2 of the 2013 NPR-A IAP/EIS ROD states:

> Permanent oil and gas facilities, including roads, airstrips, and pipelines, are prohibited upon or within 500 feet as measured from the ordinary high water mark of fish-bearing water bodies. Essential pipeline and road crossings will be permitted on a case-by-case basis.

Deviation of this stipulation is warranted because compliance is technically infeasible due to the hydrology and number of water bodies in the project area, and other measures are required that would protect water bodies (e.g., leak detection and use of secondary containment). While much of the major infrastructure is located away from lakes and streams, the project area between GMT2 and GMT1 is characterized by many small water bodies. As a result, it is not possible in all instances to avoid encroachment within 500 feet of every water body, and under Alternative A, the road route would run within 500 feet of one fish-bearing lake (Lake M9925).

The purpose of the 500-foot setback from water bodies is to protect fish, water quality, and aquatic habitat from impacts, including oil and fuel spills. On-the-ground inspections of the route of the road and pipeline prior to construction, along with existing stream and lake studies, will assist in agency determinations on facility design to minimize impacts to water bodies where facilities cannot be placed 500 feet from water bodies. In addition, aspects of the applicant's proposed action, such as use of containment tanks, tank and pipeline inspections, and other NPR-A IAP/EIS stipulations and BMPs (e.g., those dealing with the handling of fuel and other pollutants) substantially reduce the potential for impacts to water bodies. Therefore, this decision approves a deviation of Stipulation E-2.

Best Management Practice E-7(c)
Best Management Practice E-7(c) of the 2013 NPR-A IAP/EIS ROD states:

> Pipelines and roads shall be designed to allow the free movement of caribou and the safe, unimpeded passage of the public while participating in subsistence activities…
>
> (c) A minimum distance of 500 feet between pipelines and roads shall be maintained. Separating roads from pipelines may not be feasible within narrow land corridors between lakes and where pipelines and roads converge on a drill pad. Where it is not feasible to separate pipelines and roads, the authorized officer will consider alternative pipeline routes, designs, and possible burial within the road.

A 500-foot distance between pipelines may not be feasible within narrow land corridors amid lakes and where pipelines and roads converge on a drill pad. The route depicted in Map 2.5-1 in the GMT2 Final Supplemental EIS is based on topographic maps available to the BLM at the time of the Final Supplemental EIS publication. ConocoPhillips has not yet completed its final surveys of the Alternative A road route, and will be required to maintain a 500-foot separation between the road and pipeline during survey and construction of the road where it is technically feasible to do so.

The purpose of the 500-foot minimum distance between roads and pipelines is to minimize disruption of caribou movement and subsistence use. The physical location of GMT2 and its associated road and pipeline are not anticipated to have adverse impacts to caribou populations, though caribou may incur some disturbance during operations from infrastructure. Supplemental mitigation measures such as traffic controls during peak migration season and other design and operation features of the proposed project will further reduce impacts to subsistence resources. Accordingly the requested deviation from BMP E-7(c) is approved.

Endangered Species Consultation

Section 7(a)(2) of the ESA requires Federal agencies to consult with the USFWS and the National Marine Fisheries Service (NMFS or NOAA Fisheries), as appropriate, to ensure that their actions do not jeopardize the continued existence of species listed as threatened or endangered under the ESA, or destroy or adversely modify their critical habitat. The NOAA Fisheries, in a letter dated July 20, 2018, concurred with the BLM's determination that this project may affect, but is not likely to adversely affect, federally listed threatened, endangered, or candidate species or proposed critical habitat under its jurisdiction for Arctic ringed seals and Beringia DPS bearded seals. It also concurred with the BLM's determination that the project would have no effect on the endangered bowhead, humpback, or fin whale.

The USFWS issued its Biological Opinion (BO) on September 21, 2018. The BO determined that the GMT2 project is consistent with the management actions considered in the 2013 IAP/EIS BO; therefore, the USFWS determined that GMT2 is not likely to jeopardize the continued existence of spectacled eiders or polar bears or to destroy or adversely modify polar bear designated critical habitat. Further, the USFWS determined the proposed project is not likely to adversely affect Alaska-breeding Steller's eiders. While USFWS does not anticipate incidental take of Steller's eiders due to this project, the Incidental Take Statement in the 2013 IAP/EIS BO provides coverage under the ESA should Steller's eiders unexpectedly collide with structures associated with GMT2.

The USFWS determined the level of incidental take for spectacled eiders and polar bears for Alternative A in conjunction with the BO, and included Reasonable and Prudent Measures, Terms and Conditions, and Conservation Measures that will be applicable to the project for purposes of the Corps' and the BLM's authorizations.

Wetlands and Floodplains Executive Orders

If a proposed action is to be located in a floodplain and/or involves construction in wetlands, then Executive Orders *11988 -- Floodplain Management* (Floodplains EO) and/or *11990 -- Protection of Wetlands* (Wetlands EO) may be applicable. As discussed below, these executive orders contain requirements that Federal agencies must comply with when evaluating a proposed action, including requirements for: public review of proposals, certain findings, adoption of mitigation, and, in the case of floodplains, public notice. These requirements may be addressed and satisfied through an agency's NEPA process.

Wetlands (Executive Order 11990)

Executive Order 11990 concerning the protection of wetlands requires that the BLM and the Corps consider factors relevant to the proposal's effect on the survival and quality of wetlands. Factors to be considered include:

- Public health, safety, and welfare, including water supply, quality, recharge and discharge; pollution; flood and storm hazards; and sediment and erosion;

- Maintenance of natural systems, including conservation and long term productivity of existing flora and fauna, species and habitat diversity and stability, hydrologic utility, fish, wildlife, timber, and food and fiber resources; and,

- Other uses of wetlands in the public interest, including recreation, scientific, and cultural uses.

The BLM and the Corps are required to avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds:

1. There is no practicable alternative to such construction; and,
2. The proposed action includes all practicable measures to minimize harm to wetlands which may result from such use. In making this finding the head of the agency may take into account economic, environmental and other pertinent factors.

The following discussion summarizes the evaluation of impacts to wetlands for Alternative A, and the findings that are a result of that evaluation. In addition, the discussion presents specific protective mitigation developed to avoid or lessen impacts to wetlands.

The GMT2 project facilities and proposed drill site are located entirely within the northeastern NPR-A, on the North Slope of Alaska, west of the Colville River delta. The project area is depicted on Map 3.1-1 of the GMT2 Final Supplemental EIS and in this JROD in Appendix E. The project area extends approximately 2.5 miles in radius from proposed project facilities and covers 158,480 acres. Waters and wetlands occupy approximately 77 percent of the project study area; water bodies account for 19 percent of this total (GMT2 Final Supplemental EIS Table 3.3-1). The dominant wetland cover classes in the project study area include wet sedge meadow tundra (22.6 percent), tussock tundra (20.6 percent), and moist sedge-shrub tundra (16.4 percent).

Alternative A would result in placement of a gravel pad and road covering about 78 acres (see Table 2.3-2 Final Supplemental EIS). Indirect impacts from gravel spray and (or) dust deposition evaluated by GIS as a 328-foot (100 m) impact zone surrounding gravel infrastructure may impact an additional approximately 688.6 acres of jurisdictional waters/wetlands of the United States. All direct and indirect impacts would be within potential wetlands. The impacts to vegetation and wetlands are characterized as long-term duration; the resource is considered important in context because wetlands are protected by legislation; and the geographic extent is considered local and covers only a small proportion of the northeastern NPR-A. Because virtually the entire area consists of wetlands, it would not be possible to produce the oil reserves on ConocoPhillips's GMT2 leases without impacting wetlands.

Wetlands impacts will be mitigated through the BLM lease stipulations and BMPs already applicable to the project, design features of Alternative A, and Supplemental BMPs adopted in this JROD. These include provisions relevant to ConocoPhillips's proposal that protect the function and values of wetlands, including requirements and mitigating designs:

- waste management, spill prevention and response, and HazMat emergency contingency plans;
- winter travel and protection of soil, vegetation, and streams;
- facility design and requirements that permanent facilities minimize footprint and be reclaimed to ensure eventual restoration of ecosystem function;
- extraction of gravel and construction of gravel roads, pads, and pipelines in winter using ice roads, thus minimizing potential impacts to the tundra;
- road watering to help control dust;
- incorporation of the findings of fish surveys and hydrologic modeling into the design of proposed culverts and subsequent monitoring of culverts and remedial measures based on this monitoring; and,
- additional leak detection criteria.

Because of the protections identified in the GMT2 Final Supplemental EIS, the GMT2 Final Supplemental EIS determined that development and operation of ConocoPhillips's project would be unlikely to significantly impact any wetland plant species or community, cause significant soil loss, or result in other than short-term and localized loss of water resources or water quality. Therefore, no significant impacts are expected that would affect public health, safety, and welfare through changes in the supply, quality, recharge or discharge, and pollution of water or, flood and storm hazards or sedimentation and erosion.

This decision includes all practicable measures to minimize harm to wetlands when considering all technical, economic, environmental, and other pertinent factors. While Alternatives A and B are similar in terms of impacts to wetlands, Alternative A has a smaller gravel footprint than Alternative B. A reduction in impacts to hydrology under Alternative C may have resulted from the elimination of a road connection to the existing GMT1 pad. While this reduces some of the impacts to the surface, it creates other impacts, such as a larger gravel footprint than is required in alternatives with a gravel road. These alternatives would rely on air transportation and winter ice road transportation to GMT2. Regular ice road construction to these pads can result in impacts to the tundra. A lack of gravel road access to the existing Alpine facility would create a need for increased waste and chemical storage that enlarges the pad size and could delay spill response actions. Moreover, locating a road parallel to the pipeline facilitates pipeline leak detection and spill response, and provides access for any health and safety events at GMT2.

Therefore, the BLM and the Corps finds that there is currently no practicable alternative to construction of the GMT2 project in wetlands and that all practicable measures to minimize harm to wetlands have been taken, given the technical, economic, and environmental factors that must be weighed.

Floodplains (Executive Order 11988)

Executive Order 11988 concerning the protection of floodplains requires an agency to provide leadership and to take action to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities. In carrying out activities required by EO 11988, the agency has the following responsibilities:

1. Evaluate the potential effects of any actions that may take place in a floodplain;
2. Ensure that its planning programs and budget requests reflect consideration of flood hazards and floodplain management; and,
3. Prescribe procedures to implement the policies and requirements of EO 11988.

Additional requirements are as follows:

4. Before taking an action, each agency shall determine whether the proposed action will occur in a floodplain and the evaluation required will be included in any environmental impact statement prepared under NEPA.
5. If an agency has determined to, or proposes to, conduct, support, or allow an action to be located in a floodplain, the agency shall consider alternatives to avoid adverse effects and incompatible development in the floodplains. If the head of the agency finds that the only practicable alternative consistent with the law and with the policy set forth in this executive order requires siting in a floodplain, the agency shall, prior to taking action,
    a. design or modify its action in order to minimize potential harm to or within the floodplain, consistent with regulations, and,
    b. prepare documentation explaining why the action is proposed to be located in the floodplain.

The long-term effects, both direct and cumulative, on floodplains of ConocoPhillips's development on BLM-managed lands as approved in this JROD are expected to be minor, and would be mitigated to the greatest extent practicable. More than half of the project study area is located within the Tiŋmiaqsiġvik (Ublutuoch) River drainage basin, although the project study area is also located within the Fish Creek drainage basin, Judy Creek drainage basin, and the Colville River drainage basin. As with wetlands, total avoidance of floodplains is impossible due to the geography and hydrologic features of the project area.

This decision avoids and minimizes impacts to floodplains, including those of Tiŋmiaqsiġvik (Ublutuoch) River and the Fish Creek, the largest streams within the GMT2 project study area. Culverts are considered for all water crossings along the GMT2 road. Culverts will be installed at regularly spaced intervals to mitigate the risk of sheet flow interruption and thermokarst. Final design of the culverts for the GMT2-GMT1 road will also depend on breakup characteristics for those drainages that could affect the roads.

The impacts of increased stream velocities through culverts during flooding events were addressed in the 2004 ASDP EIS (See Section 4F.2.2.1). Constricting flows can result in increased stream velocities and a higher potential for ice jams, scour, and stream bank erosion. Impeding flows can result in a higher potential for bank overflows and floodplain inundation. Alternative A has the potential for long-term impacts to local water resources resulting from the placement of new infrastructure. Most impacts are related to changes in the drainage pattern, and to a lesser degree stream flow. There also would be short-term, temporary impacts from ice infrastructure (e.g., roads and pads). However, the intensity of impacts is characterized as minor and of localized extent.

The design of culverts along the GMT2 road will incorporate the findings of fish surveys and hydrologic modeling into their design. As part of this decision, ConocoPhillips will be required to undertake monitoring of culverts for the three summer seasons following fill placement in accordance with the Corps Special condition 5.b.

Specific measures to protect water resources are provided in the 2013 NPR-A IAP/EIS, which include requirements that roads, pipelines, and water crossings be designed to maintain existing hydrology including during flood periods. Also, gravel roads, culverts, and bridges must be designed with erosion control mechanisms. In addition to BLM lease stipulations and BMPs, project activities that could impact water resources will be subject to Federal, State, and local permit requirements. Thus, the facilities authorized in this JROD will avoid impacts to floodplains to the maximum extent practicable and will have minimal to negligible impacts on the functions and values of floodplains.

Environmental Justice (Executive Order 12898)

Executive Order 12898 requires that Federal agencies identify and address, as appropriate, any disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. The GMT2 Final Supplemental EIS identified direct and indirect impacts that may affect the community of Nuiqsut, which meets the demographic characteristics to be qualified as a minority population. Negative impacts to subsistence that were considered in the finding of impacts for Environmental Justice include the project footprint's direct and indirect impact to subsistence use areas, disruption to subsistence hunting activities caused by aircraft traffic, reduced access to and user avoidance of traditional subsistence use areas and reduced value of traditional subsistence use areas. Also, many residents identify the cumulative effects as the loss of traditional land and a sense of being surrounded by infrastructure. This context has substantially elevated the consequences of each subsequent development project.

The pipeline and road between GMT2 and GMT1 could result in an adverse impact to subsistence hunting of caribou if the infrastructure were to disturb, displace, or obstruct the movement of caribou in such a way that the animals become substantially more difficult to harvest. However, use of the road by local resident to assist with subsistence harvests could help to counteract or alleviate these impacts. In the unlikely event of a large spill on BLM-managed land that affects, or is perceived by local residents as affecting, important subsistence resources, impacts would be high and adverse for residents of Nuiqsut. Negative sociocultural impacts associated with GMT2 include intra-community conflict, anxiety and social disruption related to the permitting process for development, perceived inadequacy of mitigation systems, and distress associated with disruptions to the Nuiqsut cultural landscape. Some residents identify the flaring of natural gas, the risk of a blowout, and the lack of a clear emergency response plan as environmental justice issues.

Stipulations in the Federal leases and BMPs avoid or mitigate many of these impacts. Relevant stipulations include, but are not limited to, those that require ready access to spill cleanup materials, minimization of flights in the project area during the peak caribou hunting period, spill response training, the separation distance between roads and pipelines (reducing the potential of the combined facilities to obstruct caribou movement), and consultation with subsistence users.

Alternative A and its existing mitigation measures and Supplemental BMPs contribute to avoiding or mitigating impacts from disturbance, displacement, or obstruction of caribou movement on BLM-managed lands to the maximum extent practicable by design features and industry practices, including, but not limited to:

- using a non-reflective finish on all pipelines;
- establishing speed limits, pull-outs, and caravanning requirements on the GMT2-GMT1 road; and,
- minimizing helicopter flights during peak caribou harvest.

The question of whether environmental justice issues could potentially result from a project is highly sensitive to the history or circumstances of a particular community or population. The historical context within which environmental justice issues are considered for Nuiqsut includes the cumulative effects of oil development near the community.

Native Alaskan Consultation

Federally recognized tribes have a special, unique legal and political relationship with the Government of the United States as defined by the U.S. Constitution, treaties, statutes, court decisions, and EOs. These definitive authorities are also the basis for the Federal Government's obligation to acknowledge the status of federally recognized tribes in Alaska.

The BLM initiated government-to-government consultation and Alaska Native Corporation consultation processes as required by Presidential Executive Memorandums (April 29, 1994, and November 5, 2009), the Department of the Interior Policy on Consultation with Indian Tribes (Dec. 1, 2011), and the Department of the Interior Policy on Consultation with ANCSA Corporations (Aug. 10, 2012), with letters sent on August 1 2016 to the Native Village of Nuiqsut (NVN), Inupiat Community of the Arctic Slope (ICAS), Kuukpik Corporation, and ASRC, entities whose members could be substantially affected by the proposed development of GMT2.

The BLM held government-to-government consultation meetings on a monthly basis with the NVN tribal council throughout the NEPA process. Consultation with the tribal council will continue throughout the life of the GMT2 project, or until the council no longer wishes to hold consultation meetings. Throughout the planning process, comments and issues brought forward through formal government-to-government consultation with the NVN tribal council focused on impacts to resources such as subsistence, public health, and air quality, appropriate mitigation measures for these impacts, and emergency response capabilities in the unlikely event of a blowout or large spill. The BLM engaged in regular consultation with Kuukpik Corporation and ASRC, primarily through meetings between Corporation representatives and BLM/DOI leadership.

Management Decisions by Other Agencies

The GMT2 Supplemental EIS benefited from suggestions and careful review of the analysis in the Supplemental EIS by its cooperating agencies: NVN, ICAS, Corps, USFWS, US Environmental Protection Agency (EPA), US Bureau of Ocean Energy Management (BOEM), State of Alaska, and the North Slope Borough (NSB). Consultation also occurred during the Supplemental EIS process with subject matter experts at the USFWS, National Park Service, BOEM, EPA, and the State of Alaska Department of Environmental Conservation (ADEC) in accordance with the June 2011 "Memorandum of Understanding among the U.S. Department of Agriculture, U.S. Department of the Interior, and U.S. Environmental Protection Agency, Regarding Air Quality Analyses and Mitigation for Federal Oil and Gas Decisions through the National Environmental Policy Act Process" to model potential air quality impacts the GMT2 development project and to develop appropriate air quality protection measures. The BLM also consulted with the USFWS and NOAA Fisheries pursuant to the ESA.

ConocoPhillips's proposal is subject to approval by other Federal and State agencies, including many cooperating agencies on the GMT2 Final Supplemental EIS such as the North Slope Borough. The authorities of these agencies are described in Chapter 1 of the Final Supplemental EIS.

ANILCA: SECTION 810 SUMMARY

The Alaska National Interest Lands Conservation Act (ANILCA) § 810(a) requires that a subsistence evaluation be completed for any Federal determination to "withdraw, reserve, lease or otherwise permit the use, occupancy or disposition of public lands." ConocoPhillips's proposed GMT2 Development Project encompasses lands that are owned by the Kuukpik Corporation and the BLM (Federal or public lands). The evaluations of the subsistence effects of each alternative only apply to those lands that are BLM-managed lands. The ANILCA also requires that this evaluation include findings on three specific issues:

- The effect of such use, occupancy, or disposition on subsistence uses and needs;
- The availability of other lands for the purpose sought to be achieved; and
- Other alternatives that reduce or eliminate the use, occupancy, or disposition of public lands needed for subsistence purposes (16 U.S.C. 3120).

The following discussion summarizes the ANILCA § 810 evaluation for the decision in this JROD. The summary is based on the detailed ANILCA § 810 analysis in Appendix B of the GMT2 Final Supplemental EIS and tiers from the ANILCA § 810 analysis conducted for the ASDP EIS in 2004. The analysis and conclusions presented in the ANILCA § 810 evaluation in the GMT2 Final Supplemental EIS also applies to the decision in this JROD.

Without the Cumulative Case: The effects of Alternative A, adopted in this JROD, fall above the level of significantly restricting subsistence use for the community of Nuiqsut due to impacts to caribou and furbearer availability; therefore, a positive determination to ANILCA § 810 is required. The GMT1-GMT2 access road and aircraft traffic may alter late summer and fall movements of caribou in the vicinity of Nuiqsut. While the magnitude of the impact with respect to the Teshekpuk Caribou Herd as a whole would be small, it could be substantial given the significance of the portion of the herd that ranges close to Nuiqsut. Caribou movements could be altered through the life of the project, as high inter-annual variability and overall low use makes it unlikely that a caribou would encounter the road multiple times during its lifetime and become habituated to it. The extent of the impact could encompass important and easily accessible areas used by Nuiqsut hunters, namely along the Colville River and the area west of Nuiqsut and south of the proposed road. The basis for this finding relies heavily on the project's proximity to this core subsistence use area. Current research and preliminary reports by subsistence users suggest that caribou availability could be impacted. The likelihood of the impact occurring is difficult to determine, given the compounding uncertainty associated with caribou's reactions to roads, hunters' response to changing resource distribution, and natural variation at multiple geographic scales. Wolf and wolverine avoidance of infrastructure is well documented, and it is likely that subsistence hunters targeting furbearers would need to relocate trap lines due to reduced availability of these resources in the vicinity of the GMT2 project areas.

With the Cumulative Case: The ANILCA § 810 evaluation concludes that the Cumulative Case may result in a significant restriction to subsistence uses for the community of Nuiqsut due to impacts to caribou and furbearer availability and access thereof, and that it may result in a significant restriction to subsistence uses for the communities of Utqiagvik, Atqasuk, and Anaktuvuk Pass due to impacts to terrestrial and marine subsistence resources and access. This finding requires a positive determination pursuant to ANILCA § 810.

The ANILCA § 810 provides that no "withdrawal, reservation, lease, permit, or other use, occupancy or disposition of the public lands which would significantly restrict subsistence uses shall be effected" until the Federal agency gives the required notice and holds hearings in accordance with § 810(a)(1) and (2), and makes the three determinations required by § 810(a)(3)(A), (B), and (C). The BLM has found in this subsistence evaluation that all the alternatives considered in the GMT2 Final Supplemental EIS, except for the No Action alternative, may significantly restrict subsistence uses for the community of Nuiqsut. The subsistence evaluation for the cumulative case has also found that all alternatives, including the No Action alternative, may significantly restrict subsistence uses for the communities of Nuiqsut, Utqiagvik, Atqasuk, and Anaktuvuk Pass. Therefore, the BLM undertook the notice and hearing procedures required by ANILCA § 810(a)(1) and (2), as described above, and now must make the three determinations required by § 810(a)(3)(A), (B), and (C) and 16 U.S.C. 3120(a)(3)(A), (B), and (C). The BLM has determined that the Alternative (Alternative A) adopted in this JROD meets the following requirements (16 U.S.C. 3120(a)(3)(A), (B), and (C)) for Federal action that may result in a significant restriction on subsistence uses:

1. The significant restriction of subsistence uses is necessary, and consistent with sound management principles for the utilization of the public lands.

   The BLM drafted the GMT2 Supplemental EIS in response to ConocoPhillips' applications to develop and produce oil from leases in the Greater Mooses Tooth Unit, and to fulfill the BLM's responsibilities to manage these lands under authority of the NPRPA and the Federal Land Policy and Management Act (FLPMA) while providing protections for specific habitats and site-specific resources and uses identified and developed through a NEPA process. The GMT2 Supplemental EIS will provide the opportunity to evaluate options, subject to appropriate conditions, to construct the necessary infrastructure to produce oil from the Greater Mooses Tooth Unit.

   The BLM considered multiple factors with regard to the proposed activity on public lands, including the comments received during the public meetings and hearings, which stressed the importance of facilitating Nuiqsut residents' continued use of the project area and local preferences for development scenarios that contribute the lowest increase in aircraft traffic. The BLM determined that Alternative A best fulfills the purpose and need of the proposed action, while incorporating protective measures that serve to minimize impacts to important subsistence resources and use areas. Alternative A considers the necessity for economically feasible development while providing protections to minimize impacts to subsistence resources and uses. Under Alternative A, the lease stipulations and BMPs that accompany the alternative would be the primary mitigation measures to reduce the impact of the proposed action on subsistence uses and resources.

   The BLM determined that the significant restriction that may occur under Alternative A, when considered with all possible impacts of the cumulative case, is necessary, consistent with sound management principles for the use of these public lands, and for the BLM to fulfill the management goals of the NPR-A as directed by the 2013 NPR-A IAP/EIS, the NPRPA, and FLPMA.

2. The proposed activity will involve the minimal amount of public lands necessary to accomplish the purpose of such use, occupancy, or other disposition.

   The BLM analyzed four alternatives. Alternative D (No Action) would involve the minimal amount of public lands necessary, but it would not accomplish the purpose of the proposed action, nor would it fulfill the management goals of the NPR-A as directed by the 2013 NPR-A IAP/EIS, the NPRPA, or FLPMA. The federal lands that would be impacted are the same under Alternatives A, B, and C, although physical footprints of each would vary. Alternative C would involve the minimal amount of public lands necessary to accomplish the purpose of the proposed action, but it would not meet the requirement outlined in A.4.3. Alternative A would involve the minimal amount of public lands necessary to accomplish the purposes of the proposed action given that Alternative C does not qualify. Under Alternative B, the GMT1-GMT2 access road would be 1.8 miles longer than the road proposed under Alternative A. Therefore, alternative B would not involve the minimal amount of public lands necessary to accomplish the proposed action.

Other lands managed by the BLM are too distant to access the Greater Mooses Tooth Unit reservoir using current drilling technologies. Consideration of other lands, therefore, would not accomplish the purpose of the proposed action.

3. Reasonable steps will be taken to minimize adverse impacts upon subsistence uses and resources resulting from such actions.

   The information acquired through analysis of impacts to subsistence, insight from public meetings and ANILCA § 810 hearings, meetings with the NPR-A Subsistence Advisory Panel, and consultation with tribal and local governments were used to analyze the impacts of Alternatives A, B, C, and D. Several existing mitigation measures would minimize adverse impacts to subsistence. In addition, ConocoPhillips proposes implementing various voluntary policies and measures which will further minimize impacts to subsistence. These stipulations, BMPs, and efforts are summarized herein, but are described in detail in the GMT2 Final Supplemental EIS § 4.3.4.1, § 4.4.5.6, and Appendix J.

   Existing stipulations and BMPs from the 2013 NPR-A IAP/EIS ROD that address subsistence include measures to ensure the continued health of wildlife, fish, and subsistence resources. Many of the measures established in the 2013 NPR-A IAP/EIS ROD are intended to ensure the continued health of fish, wildlife, and subsistence resources. Measures to mitigate impacts to fish are described in GMT2 Final Supplemental EIS § 4.3.2, those addressing impacts to birds are described in § 4.3.3, and those addressing impacts to mammals are described in § 4.3.4. Mitigation measures addressing impacts to water resources and vegetation are described in § 4.2.2 and § 4.3.1 respectively.

   Measures to avoid conflict with subsistence users:

   - E-1: All roads must be designed, constructed, maintained, and operated to create minimal environmental impacts and to protect subsistence use and access to subsistence hunting and fishing areas.
   - E-2: Permanent oil and gas facilities, including roads, airstrips, and pipelines, are prohibited upon or within 500 feet of fish-bearing water bodies.
   - E-3: Causeways and docks are prohibited in river mouths or deltas. Artificial gravel islands and bottom-founded structures are prohibited in river mouths, active stream channels, or river deltas.
   - E-7: Pipelines and roads shall be designed to allow the free movement of caribou and the safe, unimpeded passage of the public while participating in subsistence activities.
   - F-1: Permittee will ensure that aircraft used for permitted activities comply with the guidelines outlined therein.

- H-1: Permittee will consult directly with affected communities using the guidelines outlined therein.
- H-2: Permittee will notify the local search and rescue organizations of proposed seismic survey locations for that operation season, and will comply with the guidelines therein.
- H-3: Hunting and trapping by the permittee’s employees, agents, and contractors are prohibited when persons are on “work status”.
- I-1: All personnel involved in oil and gas and related activities shall be provided information concerning applicable stipulations, BMPs, standards, and specific types of environmental, social, traditional, and cultural concerns that relate to the region. The permittee shall ensure that all personnel involved in permitted activities shall attend an orientation program at least once a year and will consist of the guidelines therein.

ConocoPhillips has implemented voluntary policies and measures to address impacts to subsistence under previous authorizations, and proposes similar policies during development and operation of the GMT2 site. These include incorporating vehicle pullouts into the design of the GMT1-GMT2 access road, which would facilitate egress from the road and access to lands west of Nuiqsut. ConocoPhillips consistently attempts to coordinate aircraft operations both internally and with other regional oil development companies, and to minimize flights when possible, specifically during peak hunting season.

Given that these lease stipulations, BMPs, and voluntary policies directly protect or address subsistence resources and concerns, the BLM determines that any roaded alternative (i.e., Alternatives A or B) will include reasonable steps to minimize impacts upon subsistence uses and resources.

The BLM has determined that, after consideration of all alternatives, subsistence evaluations, and public hearings, such a significant restriction of subsistence uses is necessary, consistent with sound management principles for the utilization of this land, and that the selected alternative will involve the minimal amount of public lands necessary to accomplish Alternative A. Reasonable steps have and will be taken to minimize the adverse impacts upon subsistence uses and resources arising from this action.

MITIGATION AND MONITORING

Stipulations and BMPs designed to protect the resources and uses on BLM-managed land were described in the 2013 NPR-A IAP/EIS ROD and listed in the GMT2 Final Supplemental EIS in Appendix J. All action alternatives incorporated ConocoPhillips's existing lease stipulations for the Greater Mooses Tooth Unit, as well as the BMPs in the 2013 NPR-A IAP/EIS ROD. As the GMT2 applicant and primary petroleum development company in the Nuiqsut area, ConocoPhillips continues to strive to mitigate impacts from flights in its exiting Alpine development field, and contributes financially and otherwise to subsistence support programs in the community. ConocoPhillips has also incorporated project design features in a manner that reduces impacts to subsistence and other resources, detailed in Section 4.7 of the Final Supplemental EIS. In addition, this JROD adopts Supplemental BMPs as described in Appendix A. It has been determined that all practical means to avoid or minimize environmental harm from the project have been adopted in this JROD.

Monitoring will be undertaken to determine the status of the various resources in the project area, to ensure compliance with and enforcement of stipulations, BMPs, and other decisions in this JROD, and to measure the effectiveness of protective measures. The 2013 NPR-A IAP/EIS ROD requires applicants to fund monitoring to evaluate the effectiveness of project designs and mitigation measures and thereby guide BLM's adaptive management of the area. Additional studies and monitoring would not duplicate efforts already being performed by ConocoPhillips. Several monitoring measures, including aircraft data monitoring and monitoring measures for subsistence, have been adopted pursuant to the BLM's existing monitoring authority per the 2013 NPR-A IAP/EIS ROD.

PUBLIC INVOLVEMENT

The BLM considered public comments throughout the GMT2 Supplemental EIS planning process. The following list highlights major steps in the public involvement process. For more information on public involvement, see Chapter 5 of the GMT2 Final Supplemental EIS.

Scoping: The BLM solicited public scoping comments for 60 days from July 29 through September 27, 2016. The BLM received comments from private citizens, environmental organizations, and government agencies, including the NSB and the NVN. Scoping comments received after the scoping deadline were also considered in identifying the range of issues and additional mitigation measures addressed in the Supplemental EIS.

Public Review of the GMT2 Draft Supplemental EIS: The comment period for the GMT2 Draft Supplemental EIS was open for 55 days, from March 23 through May 17, 2018. During the public comment process, the BLM received a total of 1,333 written communications.

The BLM held public meetings during the comment period in four North Slope communities, plus Anchorage, and Fairbanks. Pursuant to ANILCA § 810(a)(1) and (2), the BLM also conducted hearings in North Slope communities to gather comments regarding potential impacts to subsistence use resulting from the alternatives considered in the GMT2 Supplemental EIS. The public meetings in North Slope communities that were also ANILCA § 810 hearings are noted by asterisk. A list of the meetings and meeting dates are provided below. In order to capture all relevant comments, the entirety of the public meetings in North Slope communities were captured by a court reporter and reviewed for substantive comments.

- Monday, April 9: Utqiaġvik *
- Tuesday, April 10: Atqasuk*
- Thursday, April 12: Anaktuvuk Pass *
- Monday, April 16: Anchorage
- Tuesday, April 17: Fairbanks
- Monday, April 30: Nuiqsut*

Comments were received after publication of the *Federal Register* Notice and distribution of the GMT2 Final Supplemental EIS on August 31, 2018, and prior to the issuance of the JROD on October 15, 2018. The comments came from ConocoPhillips, the EPA, and a coalition of environmental organizations. No comments identified any significant new circumstances or information bearing upon the proposed action or its impacts. The comments from ConocoPhillips and the EPA contained recommendations for the mitigation measures to be adopted and identified minor errors addressed in the errata sheet. Comments from the environmental coalition identified areas of the GMT2 Final Supplemental EIS that they felt were deficient. In reaching the decisions in this JROD, the BLM, and the Corps reviewed and fully considered all comments received.

In addition to the above, the plan benefited from suggestions and careful review of the analysis in the Supplemental EIS by eight cooperating agencies: the North Slope Borough, State of Alaska, Inupiat Community of the Arctic Slope, Native Village of Nuiqsut, USFWS, BOEM, USACE, and EPA.

FINAL AGENCY ACTION

Approval of Authorizations

It is my decision to approve the development by ConocoPhillips Alaska, Inc., of the Greater Mooses Tooth Two (GMT2) Project on BLM-managed lands as described in Alternative A of the GMT2 Final Supplemental EIS subject to the terms, conditions, stipulations, and environmental protection measures developed by the DOI, as reflected in this Joint Record of Decision.

Approved by:

Ted A. Murphy
Acting State Director
Bureau of Land Management, Alaska

Assistant Secretary Approval

I hereby approve this decision. My approval of this decision constitutes the final decision of the DOI and, in accordance with the regulations at 43 CFR 4.410(a)(3), is not subject to appeal under Departmental regulations at 43 CFR Part 4.

Approved by:

Joseph R. Balash
Assistant Secretary
Land and Minerals Management, DOI

Corps Approval

I find that the issuance of the U.S. Army Corps of Engineers' permit, as described by regulations published in 33 CFR Parts 320 through 332, with the scope of work as described in this document, is based on a thorough analysis and evaluation of all issues set forth in this Joint Record of Decision. There are no less-environmentally damaging, practicable alternatives available to ConocoPhillips Alaska, Inc., to construct the GMT2 Project than that under Alternative A. The issuance of this permit is consistent with National Policy, statutes, and administrative directives; and on balance, issuance of a Corps' permit to construct the GMT2 Project is not contrary to the public interest. As explained above, all practicable means to avoid and/or minimize environmental harm from the selected, permitted alternative have been adopted and required by terms and conditions of this permit.

Approving Official:

David S. Hobbie
Chief, Regional Regulatory Division, Alaska District

APPENDIX A

SUPPLEMENTAL BEST MANAGEMENT PRACTICES

Greater Mooses Tooth 2 Oil and Gas Development Project

Joint Record of Decision and Permit Evaluation
Bureau of Land Management
U.S. Army Corps of Engineers

October 2018

APPENDIX A: SUPPLEMENTAL BEST MANAGEMENT PRACTICES

The following list contains the final language of the new supplemental mitigation measures as adopted for the GMT2 project. The measures are organized by resource and numbered sequentially. These measures will only apply to the GMT2 project (in addition to existing Lease Stipulations and BMPs). However, some of the new mitigation measures amend existing BMPs from the 2013 NPR-A IAP/EIS ROD for the purposes of GMT2 by adding new paragraphs to them. The Glossary of the GMT2 Final Supplemental EIS contains applicable definitions. In some cases, language may have changed from the GMT2 Final Supplemental EIS language, and such measures are noted with an asterisk (*). Rationale for these changes can be found in Appendix B of this JROD, Modifications and Clarifications.

The permittee may propose a deviation from these requirements/standards as described above in the Decision section. If experience or additional study indicate that a requirement/standard is not achieving or is unlikely to achieve its protective objective, or would be less effective than the use of more recently proven technology or techniques, the BLM may allow other measures to meet the objective. This would be accomplished at the activity-level permitting stage and under the terms of the stipulation or best management practice deviation process outlined in the 2013 NPR-A IAP/EIS ROD.

Atmospheric Environment

*Supplemental Best Management Practice 1: Implementation of Air Quality Monitoring Data Review (new subparagraph to BMP A-10)**
Objective: Address concerns in the local community regarding oversight of air quality.

Requirement/Standard: Permittee will begin providing quarterly air quality monitoring reports and an annual trends analysis report on data collected at the Nuiqsut air quality monitoring station. Quarterly reports will begin with data collected during the first quarter of calendar year 2019, and the first trends analysis report will begin with data collected during calendar year 2019. The permittee will also provide a summary of any measured National Ambient Air Quality Standards (NAAQS) exceedance event (if an event occurs) at the Nuiqsut air quality monitoring station to the BLM within a reasonable amount of time after the event occurs. The format and exact content of the reports will be negotiated with permittee by January 30, 2019.

Potential Benefits and Residual/Unavoidable Impacts: As part of the GMT1 ROD, permittee is required to provide funding for monitoring to identify and address concerns related to air quality in the Nuiqsut area. Reports from the monitoring station in Nuiqsut are required to be provided to the BLM, the State, NSB, and the local community and tribal government pursuant to BMP A-10(h). Members of the public have expressed concern over air quality in the project vicinity. Implementing a technical review of the monitoring results provides certainty for the BLM and the community that air quality is being carefully considered and will help identify any potential project-related impacts that would cause exceedances of NAAQS, or fail to protect public health.

*Supplemental Best Management Practice 2: Use of Diesel Engines for GMT2 Project**
Objective: Reduce air quality impacts from diesel engines

Requirement/Standard: Stationary equipment utilizing steady state diesel-fired engines will be replaced with engines that meet EPA's current standards for the manufacture of new diesel engines when they have met their useful lifespan and are ready to be replaced. This requirement only applies to equipment owned by the permittee in situations where EPA's new engine standards are technically feasible for Arctic operations.

Potential Benefits and Residual/Unavoidable Impacts: For the emission inventories for Alternative A, B, and C, Tier 2 standards were assumed for all diesel-fired engines except for the routine operations emergency generator which was noted by ConocoPhillips to be a Tier 4 unit. Tier 4 engines have lower emission standards for NOx and PM, therefore resulting in less impacts from those pollutants. Impacts to air quality related values (AQRVs; visibility and atmospheric deposition) at Federal Class II areas could also be reduced.

Fish, Birds and Terrestrial Mammals

Supplemental Best Management Practice 3: Ensure Compliance with BMP E-6
Objective: Ensure that water flowing out of Lake M9925 and moving toward Blackfish Creek is not impeded by the road and that upstream fish passage by ninespine stickleback is possible, in accordance with requirements laid out in BMP E-6.

Requirement/Standard: Two weeks before placing culverts, submit to the BLM the technical drawings for this area that show the planned placement of culverts as well as the road line and culvert points overlain on high-resolution imagery in GIS.

Potential Benefits and Residual/Unavoidable Impacts: This additional measure will enable the BLM to further evaluate pre-construction plans to increase the likelihood that the objective of BMP E-6 is met.

Supplemental Best Management Practice 4: Roadkill Monitoring System for Birds and Wildlife

Objective: Implement a reporting system to monitor roadkill of birds and other wildlife on transportation routes.

Requirement/Standard: The permittee shall provide an annual report to the BLM Arctic District Manager and BLM Alaska Wildlife Program Lead reporting roadkill of birds and mammals to help the BLM to determine whether preventative measures on vehicle collisions are effective.

Potential Benefits and Residual/Unavoidable Impacts: Knowledge about bird and mammal mortality due to vehicle traffic will help managers to develop methods to reduce collision rates with vehicles.

Supplemental Best Management Practice 5: Directional Facility Lighting

Objective: To prevent episodic bird collisions with infrastructure, especially during migration and inclement weather.

Requirement/Standard*:* All facility external lighting, during all months of the year, shall be designed to direct artificial exterior lighting inward and downward or be fitted with shields to reduce reflectivity in clouds and fog conditions, unless otherwise required by the Federal Aviation Administration.

Potential Benefits and Residual/Unavoidable Impacts: Best Management Practice E-10 contained in the 2013 NPR-A IAP ROD contains very similar language to this proposed mitigation measure with that exception that E-10 is in effect between August 1 and October 31 only. In their comments the USFWS pointed out that "Lighted facilities (drill rigs and buildings) can cause episodic bird collisions with infrastructure, especially during migration and inclement weather" which is why this new mitigation measure removes the timing limitations and extends the BMP to being applicable year round. The benefit for including this new mitigation measure is to mitigate the collision risk to birds year round.

*Supplemental Best Management Practice 6: Reporting Requirements for Sightings of Marine Mammals**

Objective: To comply with reporting requirements outlined in the letter of concurrence from the National Marine Fisheries Service (NMFS) dated July 20, 2018.

Requirement/Standard*:* Permittee will submit an annual report of all marine mammal observations within 250 meters of project activities to NMFS for all project years in which an ice road across the Colville River is built to support construction of the GMT2 Project. The report will be submitted within one month of the close of the ice road season or July 1, whichever is earlier, and will include:

- Number of marine mammals observed (by species) within 250 meters of project vehicles, equipment, personnel or infrastructure
- Minimum distance between each observed marine mammal and project vehicles, equipment, personnel or infrastructure.
- Behavior of observed marine mammals.
- Numbers of marine mammals observed.
- Distribution of marine mammals around the action area (including within 250 meters of project vehicles, equipment, personnel or infrastructure).
- Project activities that were occurring within 250 meters of marine mammals at the time each marine mammal was observed.

If no marine mammals are observed during the ice road season, permittee will submit a signed letter documenting no observations.

Take is not authorized. If a listed marine mammal is observed to have been harassed, harmed, wounded or killed as a result of project activities, the take must be reported within one business day to NMFS and the BLM. If ConocoPhillips personnel observe an injured, sick, or dead marine mammal, they will notify the NMFS Alaska Region Marine Mammal Stranding Network at 877-925-7333. The ConocoPhillips personnel will take photos and record observational data that will be beneficial to the agency, including date/time, location, number of animals, event type (e.g., entanglement, dead, floating), species, and any behavior if the animal is alive.

Potential Benefits and Residual/Unavoidable Impacts: The BLM and NMFS do not expect that any marine mammals will be observed within the project area during the ice road season; however, if marine mammals are observed, it would be extremely beneficial for management agencies to know.

Supplemental Best Management Practice 7: (Adapted from BMP K-5.e.1 and 2): Minimize Potential Ground Vehicle Traffic Disturbance of Caribou

Objective: Minimize disturbance and hindrance of caribou, or alteration of caribou movements, by vehicle traffic on the GMT1-GMT2 gravel road during the oestrid fly-relief and fall-migration seasons.

Requirement/Standard: The following ground vehicle traffic restrictions shall apply to permitted activities using the GMT1-GMT2 road in the time periods indicated:

1. Along the GMT1-GMT2 road, from July 16 through November 30, traffic speed shall not exceed 15 miles per hour when caribou are within 0.5 mile of the road. Additional strategies may include limiting trips or using convoys, to the extent practicable.

2. The permittee or a contractor shall observe caribou movement from July 16 through November 30 to assess whether or not caribou may be trying to cross the road. Based on the assessment, traffic will be stopped temporarily if it is determined that 10 or more caribou are trying to cross the road. Sections of road will be evacuated whenever an attempted crossing by a large number of caribou appears to be imminent.

3. The permittee shall submit, prior to road construction, a vehicle use plan that considers these and any other appropriate mitigation measures. Adjustments will be required by the Authorized Officer if resulting disturbance is determined to be unacceptable.

4. The permittee will consult with the Authorized Officer every three years to determine if the seasonal restrictions, and restrictions described in paragraphs 1 and 2 above are still appropriate given possible changes in migration patterns. In light of ongoing caribou monitoring, the Authorized Officer may modify the restrictions as appropriate to achieve the objectives of this measure.

Potential Benefits and Residual/Unavoidable Impacts*:* Limiting vehicle traffic during caribou migration will help reduce impacts and disturbance to caribou. Unavoidable impacts would continue due to the presence of the road and continued traffic.

Sociocultural Systems

*Supplemental Best Management Practice 8: Nuiqsut Area Environmental Information Dissemination**
Objective: Make data and summary reports derived from local studies easily accessible.

Requirements/Standard: The permittee will submit reports related to required monitoring studies that pertain to the environment within 50 miles of Nuiqsut on BLM-managed land within 2 months of finalization. Reports will be submitted to the North Slope Science Initiative (NSSI), who will host a specific webpage for Nuiqsut Area Environmental Information where this information will be posted.

The permittee will notify residents every two months of the availability of new reports or other information distributed to NSSI using social media or other means designed for broad dissemination. Notifications will include a link to the new documents. If no documents or information are posted in a given two month period, no notification is required. The permittee will continue to print copies of reports and distribute them to Nuiqsut entities (including, but not restricted to, Trapper School, KSOP, Kuukpik, NVN, and City of Nuiqsut).

At a minimum, the permittee will include all reports related to required monitoring studies that pertain to the environment within 50 miles of Nuiqsut on BLM-managed land. The permittee is encouraged to make other research relevant to the community (research on non-federal land, etc.) accessible in the same manner. Environmental studies previously conducted to support GMT2 within 50 miles of Nuiqsut on BLM-managed land will be submitted to NSSI by January 2019.

Potential Benefits and Residual/Unavoidable Impacts: Much of the data used by federal agencies conducting NEPA analyses is either information derived from studies and research paid for by the applicant, or conducted by agencies (i.e., federal, state and local government entities). There is no systematic way that residents can review these studies. This measure would help mitigate confusion over which studies are being conducted and what the findings are.

Although not a part of the BLM requirement/standard, local entities have requested support to engage their own contractor who would be responsible for working with local entities and the school to disseminate information on the studies and to prepare research summaries that effectively communicate research and data in a manner that is understood by residents.

Subsistence

*Supplemental Best Management Practice 9: GMT2 Memorandum of Road Access Agreement**
Objective: Ensure that residents will have the right to use the GMT2 Access Road throughout the life of the project and that residents are aware of the safety policies regarding use of project-associated roads for subsistence activities. Ensure that oilfield employees understand the road use agreement and local residents' right to use the road.

Requirement/Standard: The permittee will provide the community of Nuiqsut with concise policies regarding use of the roads associated with the project and hunting prohibitions, if any, along the roads and near project components. Permittee will ensure that the road use guidelines are disseminated throughout the community. The permittee will also include a presentation on the road use policy in its employee orientation, will ensure that sub-contractors have the policy for their employee orientation, and will post the policy on the road itself. The policy should also be provided to the BLM for their records.

Potential Benefits and Residual/Unavoidable Impacts: Clear policies regarding use of project roads for subsistence activities will likely reduce misunderstandings about whether and to what extent local harvesters can use and/or hunt from the road. Residents will be more likely to use project roads if they are well informed about company policies and security restrictions.

*Supplemental Best Management Practice 10: Suspend Non-essential Helicopter Traffic during Peak Caribou Hunting Season**
Objective: To reduce the impacts of helicopter traffic on Nuiqsut caribou hunters and provide management consistency between GMT2 and GMT1.

Requirement/Standard: In consultation with the City of Nuiqsut, the North Slope Borough Department of Planning, Native Village of Nuiqsut, Kuukpik Corporation, and the Kuukpik Subsistence Oversight Panel, Inc., the BLM will establish an approximately one-month-long period during peak caribou hunting when non-essential helicopter flights will be suspended within a predetermined distance of rivers that have been documented as caribou subsistence use areas, or limit helicopter traffic during this time to established flyways.

- Current suspension dates for peak caribou harvest are July 15-August 15. Suspension dates may be revised every three years upon review of peak caribou season.

- Ongoing (multi-year, already planned) scientific/environmental studies that depend on access to study sites that are already planned could continue if there is no alternative access to sites.

Potential Benefits and Residual/Unavoidable Impacts: Reducing helicopter traffic or limiting the geographic area affected by helicopter traffic would reduce the incidence of conflicts between GMT2-related helicopter traffic and Nuiqsut subsistence activities. However, other operators on the North Slope may continue to fly during the suspension period.

Supplemental Best Management Practice 11: Consultation Regarding Aircraft Communication Protocols
Objective: Ensure communication protocols for helicopter and fixed-wing air traffic by the permittee are adequate in addressing Nuiqsut concerns about the impacts of air traffic on their hunting activities and provide management consistency between GMT2 and GMT1.

Requirement/Standard: In consultation with local hunters and local organizations, the permittee will continue to facilitate, improve, and expand communication protocols to inform subsistence users of daily flight patterns and identify potential conflict areas during peak hunting times. This consultation should include efforts to advertise these communication protocols within the community so that Nuiqsut subsistence harvesters are aware of them. The consultation results should be documented, distributed to the BLM and other stakeholders, and clearly identify actions to be implemented based on the consultation. This mitigation measure requires the continuance of an existing program; the protocols in place for GMT1 will be followed for GMT2.

Potential Benefits and Residual/Unavoidable Impacts: Strong communication protocols with the community of Nuiqsut regarding the timing, altitude, and location of air traffic should reduce the frequency of these impacts on subsistence users. However, such protocols will not remove impacts of air traffic altogether.

*Supplemental Best Management Practice 12: Aircraft Data Reporting Requirements**
Objective: Gather information on aircraft flight paths associated with the GMT2 development.

Requirement/Standard: The permittee will track and record aircraft flight data and provide quarterly reports of that data to the BLM in a manner that facilitates meaningful analysis of flight activities. The reports will highlight all flights that represent deviations from BMP F-1 and include explanations for any deviations.

The format and exact content of the quarterly flight reports will be negotiated between permittee and the BLM Arctic District Manager by December 31, 2018.

Background, Potential Benefits, and Residual/Unavoidable Impacts: Improved tracking of flight paths, altitudes and purposes will enable the BLM to better analyze the effects of GMT2-associated aircraft activity. FAA research, as described in Section 4.1.2.5, has found that people are less disturbed by helicopter traffic when they understand the reasons for it. The reports will improve the BLM's and industry's ability to convey to residents the reasons for GMT2-associated aircraft traffic.

*Supplemental Best Management Practice 13: Reduce Flights by Utilizing Unmanned Aerial Vehicles**
Objective: To reduce the impacts of aircraft traffic on Nuiqsut subsistence activities.

Requirement/Standard: The permittee will begin to employ unmanned aerial vehicles to conduct monitoring activities that otherwise require helicopters (i.e., pipeline inspections, studies, and other appropriate activities) where feasible. The permittee will consult with the authorized agency every three years to determine feasibility of this technology and appropriate monitoring activities for its use.

Background, Potential Benefits and Residual/Unavoidable Impacts: Much of the ecological monitoring required of lessees and permittees is supported by/requested by local residents, but there is less understanding and little support for the number of helicopter flights that are required to conduct those activities. The potential for using unmanned aerial vehicles for baseline monitoring was discussed at the September 2013 NPR-A Subsistence Advisory Panel meeting when a representative of Shell Oil announced that that company was experimenting with using them. The Subsistence Advisory Panel was supportive of their use to decrease impacts from helicopters. Unmanned aerial vehicles have been utilized for oil field studies at Prudhoe Bay, and have the potential for use in the NPR-A. Residents of Nuiqsut have requested that the latest technology be used for such studies as soon as and to the greatest extent possible in order to alleviate the high number of aircraft flights. The BLM would not have the authority to implement this best management practice on lands that are not BLM-managed in the Nuiqsut area, where much of the disturbance from aircraft occurs.

*Supplemental Best Management Practice 14: Subsistence Monitoring Studies**
Objective Monitor the impacts of GMT2 development on subsistence patterns, harvests, and associated subsistence activities for the community of Nuiqsut. Establish current baseline conditions from which to evaluate impacts of GMT2 and effectiveness of BLM mitigation.

Requirement/Standard:

1. Permittee will provide for a one time mapping study covering all subsistence resources to document current subsistence use patterns for Nuiqsut.

2. The permittee will monitor, through the life of the project, changes in subsistence activities in the community of Nuiqsut. The permittee will provide for annual research and monitoring to document changes to subsistence patterns and harvest levels resulting from the proposed project.

Studies commissioned as part of the GMT2 development will be designed with community input and will identify changes resulting from the proposed project as well as, at a minimum, monitor impacts to caribou, fish, and bird harvests. Monitoring reports, aggregated harvest data, and overall use areas by resource will be made available to local residents and the public via the standards established by Supplemental BMP 9: Nuiqsut Area Environmental Information Dissemination.

Researchers will employ adaptive research and monitoring techniques, including flexibility to refine monitoring questions based on study findings on a year-to-year basis. Adaptive monitoring will include researcher discretion to establish or reformulate local resource expert panels.

The methodology for the monitoring studies will be approved by the North Slope Borough Department of Wildlife Management (NSB DWM) and the NSB DWM will conduct annual initial peer review of the monitoring reports. The draft report will also be provided to a local resource panel (e.g., the Nuiqsut Caribou Panel) for review and comment, and the permittee may provide comments after initial peer review. The contractor will incorporate comments from all entities before releasing a final report.

Potential Benefits and Residual/Unavoidable Impacts: The 2010 BOEM mapping study for all subsistence resources (SRB&A 2010a) established valuable baseline data from which to evaluate subsistence impacts from oil and gas development. The 2010 mapping study is based on data collected 1995-2006, thus the data is 12 years old and should not be used as a baseline to monitor impacts of GMT2, which will begin construction in 2019. The one time mapping study will include all subsistence species.

A subsistence monitoring study would help identify the impacts of GMT2-related activities on Nuiqsut subsistence activities. The nine years of data from the Nuiqsut subsistence caribou monitoring project (SRB&A 2010a-2018) is a valuable resource for evaluating impacts. The permittee may expand upon the Nuiqsut Caribou Subsistence Monitoring Project (initiated in 2008 and proposed for a total length of 10 years) to include additional resources (e.g., birds, fish) and to document both impacts related to GMT2 and cumulative impacts. The monitoring program would continue on an annual basis until 2024 and on a biennial basis after that. The Subsistence Fishery Monitoring on the Colville River project may be expanded to include Fish Creek and extended on a biennial basis. After 2033, the Authorized Officer and the permittee may agree to adjust the focus and duration of these subsistence monitoring studies. The results of an expanded subsistence monitoring project could be used to develop future mitigation measures aimed at lessening the impacts of GMT2 on Nuiqsut harvesters. Subsistence monitoring studies will continue throughout the life of the project, or until the Authorized Officer determines such studies are no longer necessary or prudent.

*Supplemental Best Management Practice 15: Design of Road Pullouts and Access Ramps along the GMT2 Road**

Objective*:* To ensure the GMT2 road pullouts are constructed in advantageous locations and that ramps constructed to provide ATV access to and from ground surface are designed to allow maximum benefit to local users and to protect tundra damage.

Requirement/Standard: Prior to construction of the GMT2 Access Road, the permittee will gather input from the Native Village of Nuiqsut (NVN) tribal government and the Kuukpik Subsistence Oversight Panel (KSOP) regarding the location and design of the three road pullouts and associated access ramps. Input from NVN and KSOP will be used by the permittee to ensure that the pullouts are properly located along the road to maximize access for subsistence users. Permittee will post the design and location of the ramps publicly and provide a mechanism for local community members to comment on the location of the ramps. The access ramps should be long and wide enough to allow safe ingress and egress to and from the road and/or pullout. In addition, the design of the ramps should account for multi-season subsistence-use while minimizing impacts to the adjacent ground surface. This may involve "hardening" of the tundra around the bottom of the ramps with geo-block or other acceptable methods.

Input derived from NVN, KSOP and community members will be provided to the BLM. Concurrence from KSOP on final location and design of the pullouts and ramps shall be obtained by the permittee.

At least once a year for three years after construction, the permittee will hold a public meeting in Nuiqsut to discuss use of the access road, pullouts, and ramps to solicit information on their use and any improvements that could be made to address health, safety, and access concerns. Permittee may incorporate this meeting into another planned public meeting. Permittee will notify the BLM at least two weeks prior to the meeting and inform them of the date, time and location of the meeting and will provide the BLM with the meeting materials and a summary of the comments received. Information gathered at these meetings will be provided to the BLM and KSOP, along with any planned improvements.

Potential Benefits and Residual/Unavoidable Impacts: Allowing potential users of the pullouts and access ramps a role in ramp location and design will ensure that the ramps provide a locally accepted mechanism for leaving the road surface and accessing tundra that is safe, feasible, and can minimize impacts to subsistence access and aid in search and rescue missions. Regular meetings with local resident who use the road will facilitate improved design features or other suggestions that can be incorporated to make use of the road, pullouts, and ramps safer and more effective for users and prevent tundra damage.

*Supplemental Best Management Practice 16: Annual Community Ice Road Information**
Objective: Provide the community of Nuiqsut with information on area ice roads on an annual basis

Requirement/Standard: Before ice road construction begins, the permittee and contractors associated with ice road construction will hold a community meeting to describe the routes and relevant information on all ice roads that will be constructed within the GMT2 project area. At the meeting, the permittee will distribute copies of maps of that winter's ice roads. The permittee will also submit the map for publication to NSSI and provide notice of availability of the map and a link to the online map on local social media (i.e., the Nuisagmiut Facebook group). Permittee will notify the BLM at least two weeks prior to the meeting and inform them of the date, time and location of the meeting, and will provide the BLM with the meeting materials and a summary of the comments received.

Potential Benefits and Residual/Unavoidable Impacts: Community members have no official system for learning about where ice roads are being constructed each winter and whether there are any relevant restrictions on those roads. Many winter hunters use the roads to facilitate access to hunting areas, and some may need to plan the locations for trap lines and other subsistence activities that could be affected by ice roads. This measure only applies to ice roads within the GMT2 project area, which does not adequately address the needs of the community. The permittee is therefore encouraged to include information on all ice roads within 50 miles of Nuiqsut.

Public Health

Supplemental Best Management Practice 17: Minimize Undue Idling of all Vehicles
Objective: Reduce air emissions and protect human health.

Requirement/Standard: To the extent practicable, engines of rolling stock (such as pick-up trucks, vans, buses, other trucks and trailers, and heavy machinery) used for oil and gas operations will be powered off when not in active use.

Potential Benefits and Residual/Unavoidable Impacts: Prohibiting unnecessary vehicle idling will reduce emissions associated with vehicle use, such as carbon monoxide, fine particulate matter, and volatile organic compounds. Additionally, this measure will decrease noise impacts associated with the GMT2 Project. Projected emissions associated with GMT2, including vehicle exhaust emissions, are subject to the regulatory oversight of the Environmental Protection Agency through emission standards for engines and vehicles.

*Supplemental Best Management Practice 18: Accident Prevention: Additional Requirement to BMP C-3**
Objective: Prevent accidents due to snowmachine operators trying to cross ice road bridges after they have been removed, breached or slotted in accordance with BMP C-3.

Requirement/Standard: For ice roads supporting the GMT2 Project, crossing of waterway courses shall be made using a low-angle approach. Crossings that are reinforced with additional snow or ice ("bridges") shall be removed, breached or slotted before spring break-up. <u>Trails leading to the snow or ice bridge shall be clearly marked on either side of the crossing once it has been removed, breached or slotted.</u> Applicant will coordinate with local entities (Kuukpik, NVN, City of Nuiqsut) to establish the best way to mark and communicate to Nuiqsut residents when the ice bridges are no longer passable.

Potential Benefits and Residual/Unavoidable Impacts: Clearly marking trails on either side of a crossing that has been removed, breached or slotted will ensure that local users as well as contractors are aware that the trail has been compromised and that the crossing should not be used, thereby minimizing the likelihood of an accident.

Solid Waste and Hazardous Materials Spills

Supplemental Best Management Practice 19: Trash Removal and Anti-Littering Campaign
Objective*:* Prevent unnecessary or undue degradation of the land.

Requirement/Standard: All solid waste and industry-derived trash originating from permitted activities is required to be properly containerized while on site, or removed from the area of operation/activity. Objects that have the potential to be left or forgotten (such as duck ponds, containments, or sorbent material caches) shall be clearly marked with the name of the company using the object.

The permittee will solicit ideas from the community of Nuiqsut to assist with addressing regular trash removal and inadvertent littering (including such things as ice-roads delineation markers, construction detritus, etc.) in order to ensure or adopt cost-effective methods that also minimize other identified impacts, such as those associated with helicopter use.

Potential Benefits and Residual/Unavoidable Impacts: Clearly marking movable objects associated with industrial development with the name of the company who utilized them will instill a greater sense of responsibility in employees in being good neighbors and ensuring the objects are not left or forgotten. In addition, it will also allow the permittee, the BLM, and local residents to track and assess the effectiveness of workers or contractors in following authorization requirements. By working with the community to identify new ideas or suggestions for the removal and handling of trash, the permittee may be able to save money while building effective partnerships.

Supplemental Best Management Practice 20: Oil Spill Response Equipment (new subparagraph to BMP A-3)
Objective: Minimize pollution through effective hazardous-materials contingency planning.

Requirement/Standard: Oil spill response equipment for use in winter conditions must meet the following standards:

a. Equipment must be designed to be effective in Arctic conditions.

b. Mechanisms must be available to prevent the freezing of response equipment (including the equipment used for storing, transferring, and treating recovered fluids) and/or to de-ice it.

Potential Benefits and Residual/Unavoidable Impacts: Potential benefits of these added measures above current protections include additional protection for vegetation, wetlands, and other surface resources by ensuring response equipment is operational under extreme weather conditions and other limiting factors such as ice and snow conditions.

Supplemental Best Management Practice 21: Leak Detection Criteria (new subparagraph to BMP E-4)
Objective: Implement leak detection systems for GMT2 facilities.

Requirement/Standard: To the extent practicable, the permittee will provide a specific description of the leak detections systems installed on all lines described in the development plan. The descriptions could be an addendum to the Alpine C-Plan or a stand-alone document. Monitoring would be via remote continual monitoring (e.g., camera or FLIR) of water crossings, or daily on-site visual inspections. The spill prevention section of the Alpine C-Plan must contain criteria to prevent and detect slow leaks.

Potential Benefits and Residual/Unavoidable Impacts: Automated and visual on-site leak inspections would reduce the extent of spills.

APPENDIX B

MODIFICATIONS AND CLARIFICATIONS

Greater Mooses Tooth 2 Oil and Gas Development Project

Joint Record of Decision and Permit Evaluation
Bureau of Land Management
U.S. Army Corps of Engineers

October 2018

APPENDIX B: MODIFICATIONS AND CLARIFICATIONS

The following describes clarifications and minor modifications that the BLM has made in this decision and Supplemental BMPs presented in the GMT2 Final Supplemental EIS. (Modifications that have been made to correct sentence structure, grammatical errors, sub-paragraph letters, and other non-substantive errors are not discussed below.)

- Supplemental BMP #1: This BMP was modified to change the annual reporting requirement to an initial report within one year of the JROD date and an updated report in the event of expansion or replacement of fuel burning equipment.

- Supplemental BMP #2: This BMP was modified to adjust the air quality data report format, content and timing to better meet the BMP objective.

- Supplemental BMP #3: This BMP was modified to allow for the technical difficulties of operating Tier 4 final diesel engines for highly variable speed engines on the North Slope. The exhaust fluid system's solution (catalyst diesel exhaust fluid) for highly variable speed engines freezes at 14 degrees Fahrenheit, making it difficult to regenerate properly in Arctic conditions. This mitigation measure was adjusted to apply only to steady state diesel fired engines.

- Supplemental BMP #7: This BMP was not included in the GMT2 Final Supplemental EIS and was included in the JROD to address requirements outlined by the National Marine Fisheries Service in their letter of concurrence pursuant to consultation under Section 7 of the Endangered Species Act.

- Supplemental BMP #8: This BMP was modified to match the requirements of the GMT1 ROD to ensure that requirements for road use between the Alpine CPF and the GMT2 pad are consistent for the CD5-GMT1 road and the GMT1-GMT2 road.

- Supplemental BMP #9: This BMP was modified to require the permittee to submit studies and reports to the North Slope Science Initiative rather than maintain a separate website managed by the permittee. The objective of the BMP is better met by having all studies, including government funded studies, available in a central location maintained by a government entity.

- Supplemental BMP #11: This BMP was modified to include the most current dates of the peak caribou harvest for the community of Nuiqsut.

- Supplemental BMP #13: This BMP was modified to provide the BLM flexibility to review and adjust the report format and content to better meet the objective of the BMP.

- Supplemental BMP #14: This BMP was modified to include the words “when feasible” to match language from the GMT1 ROD.

- Supplemental BMP #15: This BMP was modified to clarify the requirements of the monitoring studies and the process to be used in reviewing and publishing them.

- Supplemental BMP #16: This BMP was modified to require the permittee to consult with the Native Village of Nuiqsut and the Kuukpik Subsistence Oversight Panel, and dropped the requirement to hold a public meeting with a 30-day comment period.

- Supplemental BMP #17: This BMP was modified to require the permittee to notify the BLM prior to the meeting and provide a copy of the presentation and summary of comments received.

- Supplemental BMP #19: This BMP was modified to clarify that it only applies to ice roads supporting the GMT2 Project.

APPENDIX C

POTENTIAL MITIGATION MEASURES NOT ADOPTED

Greater Mooses Tooth 2 Oil and Gas Development Project

Joint Record of Decision and Permit Evaluation
Bureau of Land Management
U.S. Army Corps of Engineers

October 2018

APPENDIX C: POTENTIAL NEW MITIGATION MEASURES NOT ADOPTED

The decision in this JROD includes all practicable means to avoid or minimize environmental harm consistent with the purpose and need of the action, including potential impacts associated with cumulative impacts. Pursuant to 40 CFR 1505.2(c), the BLM provides the following explanations for not adopting the following mitigation measures considered in the GMT2 Final Supplemental EIS as Supplemental BMPs. All proposed mitigation measures can be found in Appendix Q of the GMT2 Final Supplemental EIS.

- <u>Potential Mitigation Measure 1 for Soils and Permafrost:</u> This potential mitigation measure would have required the permittee to conduct a soil survey that meets the requirements of the Alaska Natural Resources Conservation Service Level II soil survey within a 1,000-meter radius of all planned gravel infrastructure. This measure is designed to provide the BLM with better data for evaluating impacts of future projects; it does not mitigate impacts of GMT2 or provide a mechanism to monitor the effectiveness of existing mitigation measures, so it was not adopted.

- <u>Potential Mitigation Measure 1 for Air Quality:</u> This potential mitigation measure would have required the permittee to construct a heated building for vehicle storage in the winter to prevent vehicles running 24/7. This measure is not being adopted; potential impacts from GMT2 were estimated to be well under the NAAQS at Nuiqsut and the potential benefits of the measure were uncertain. More analysis would be required to determine the tradeoffs between emissions generated in heating a building vs. emissions generated from running vehicles.

- <u>Potential Mitigation Measure 3 for Air Quality:</u> This potential mitigation measure would have required the permittee to use alternatives to diesel fuel (electrification, natural gas, or gasoline) to the extent practicable to reduce the emission of air pollutants. This measure is not being adopted because the viability of equipment utilizing these fuel sources is not proven, and the BLM does not have the expertise to evaluate the permittee's determination of practicability. In addition, the EPA and Alaska Department of Environmental Quality already regulate best available control technology for mobile and stationary sources.

- <u>Potential Mitigation Measure 5 for Air Quality:</u> This potential mitigation measure would have required electrification of all equipment used for GMT2 to the greatest extent practicable. This measure is not being adopted because it is too vague to enforce, and making it more prescriptive would not be technologically feasible. Electric vehicles are not yet engineered to perform in Arctic conditions.

- <u>Potential Mitigation Measure 6 for Air Quality:</u> This potential mitigation measure would have required near real time monitoring of air pollutants at the GMT2 pad and in the community of Nuiqsut. It is not being adopted because monitoring and enforcement of air quality standards is the purview of the State of Alaska Department of Environmental Conservation.

- <u>Potential Mitigation Measure 7 for Air Quality:</u> This potential mitigation measure would have required the permittee to set up an air quality monitoring station at the GMT2 pad. It is not being adopted because it does not mitigate impacts of the GMT2 Project and does not provide information about the effectiveness of existing or proposed mitigation measures.

- <u>Potential Mitigation Measure 9 for Air Quality:</u> This potential mitigation measure would have required the use of selective and non-selective catalytic reduction devices for engines, heaters and other combustion engines. This measure is not being adopted because selective catalytic reduction devices are not technically feasible in the Arctic environment, and it also replicates the objectives of the ADEC regulations governing minor air permits.

- Potential Mitigation Measure 10 for Air Quality: This potential mitigation measure would have required the permittee to flare or capture natural gas emitted during hydraulic fracturing and pigging operations. This measure is not being adopted because it is not technically feasible to flare or capture 100 percent of natural gas during pigging operations, and hydraulic fracturing operations are already regulated under the EPA's 2016 New Source Performance Standards.

- Potential Mitigation Measure 11 for Air Quality: This potential mitigation measure would have required the use of low bleed or no bleed pneumatic devices to reduce the emissions of methane. This mitigation is not being adopted because the GMT2 Project will use instrument air rather than natural gas as the actuation source for pneumatic devices.

- Potential Mitigation Measure 1 for Vegetation and Wetlands: This potential mitigation measure would have required the permittee to consult with the BLM prior to abandonment and reclamation of any portion of the GMT2 Project. This mitigation measure was not adopted because it replicates existing regulations governing well abandonment.

- Potential Mitigation Measure 3 for Birds: This potential mitigation measure would have required a 3:1 side slope and perimeter berm during excavation on the ASRC pit. This measure is not being adopted because the BLM has no authority to enforce this requirement. The Best Management Practices in the NPR-A Integrated Activity Plan only apply to BLM-managed land.

- Locally Requested Potential Mitigation Measures for Sociocultural Systems: These potential mitigation measures would have required the permittee to provide funding for the following community services: building a heritage center, cultural and educational programs, administrative and technical support for city government, a drug rehabilitation program, a science center, job training programs, and housing development. Compensatory mitigation of this type is prohibited under the BLM's current guidance, and these measures are related to the impacts of development broadly, rather than the impacts of the GMT2 Project in particular.

- Locally Requested Potential Mitigation Measures for Sociocultural Systems: Search and Rescue Funding: This potential mitigation measure would have required the permittee to contribute funds to upgrade search and rescue equipment and to increase search and rescue response capabilities in Nuiqsut. Although the construction of the GMT1-GMT2 road will facilitate travel further afield into the NPR-A and could put additional burdens on local search and rescue in the event of an accident, the BLM's guidance on compensatory mitigation does not allow monetary compensation of this nature.

- Locally Requested Potential Mitigation Measures for Sociocultural Systems: A BLM Field Office: This potential mitigation measure would have required the BLM to establish a BLM Field Office in Nuiqsut staffed by a local who is charged with inspection and enforcement authority on behalf of the federal government. This measure is not being adopted because the federal hiring and budget process do not allow these decisions to be made in conjunction with a specific project.

- Locally Requested Potential Mitigation Measures for Sociocultural Systems: Postpone Approval of GMT2 Project: This potential mitigation measure would have required the BLM to postpone approval of the GMT2 Project until the GMT1 Project was in operation and its effects studied. This measure is not being adopted because the BLM is required by Onshore Order 1 to process permit applications in a timely manner when they receive them.

- Potential Mitigation Measure 8 for Subsistence: This potential mitigation measure would have required the permittee to develop a Subsistence User Monitoring Plan, which would be approved by the Nuiqsut Trilateral groups. The plan would identify subsistence indicators to be monitored through the life of the GMT2 Project and would provide a mechanism for adaptive management to respond to identified impacts. This measure is not being adopted because there is no way to distinguish and adapt to GMT2 specific impacts.

- Potential Mitigation Measure 9 for Subsistence: This potential mitigation measure would have prohibited airboat use for the GMT2 Project. This mitigation measure is not being adopted because there are no components of the GMT2 Project that would require airboats.

- Potential Mitigation Measure 2 for Public Health: This potential mitigation measure would have required the permittee to conduct a public health monitoring for the GMT2 Project. This measure is not being adopted because public health monitoring is the purview of the State of Alaska and North Slope Borough, and would require handling of sensitive information protected under the Health Insurance Portability and Accountability Act (HIPPA).

- Potential Mitigation Measure 3 for Public Health: This potential mitigation measure would have required water quality monitoring be conducted by the permittee. Drinking water quality protection and monitoring is the purview of the State of Alaska Department of Environmental Conservation.

- Potential Mitigation Measure 2 for Solid Waste and Hazardous Materials: This potential mitigation measure would have required the three phase pipeline carrying oil, water and gas from GMT2 to the Alpine CPF use the same leak detection technology as sales quality crude pipelines. This mitigation measure is not being adopted because it is not technically feasible. Pipeline standards are also regulated by the State of Alaska.

- Potential Mitigation Measure 3 for Solid Waste and Hazardous Materials: This potential mitigation measure would have required fuel and hazardous material storage containers with a capacity greater than 660 gallons to use impermeable linings and diking capable of containing 110 percent of the containers' capacity. This measure is not being adopted because the EPA regulations governing fuel and hazardous material storage accomplish the same objective.

- Potential Mitigation Measure 5 for Solid Waste and Hazardous Materials: This potential mitigation measure would have required the permittee to coordinate their design criteria with the BLM to ensure that it was sufficient to withstand Arctic conditions. This mitigation measure is not being adopted because State of Alaska regulations and other BLM regulations accomplish the same objective.

- Potential Mitigation Measure 7 for Solid Waste and Hazardous Materials: This potential mitigation measure would have required the development of an industrial disaster response plan for the community of Nuiqsut. This mitigation measure duplicates on ongoing process to develop a Small Community Emergency Response Plans (SCERP) for the community of Nuiqsut.

- Potential Mitigation Measure 8 for Solid Waste and Hazardous Materials: This potential mitigation measure would have required installation of HEPA and carbon air filters in schools and public buildings. This measure is not being required because it does not directly address the impacts of GMT2; it is designed to mitigate the impacts of development generally.

APPENDIX D

CORPS DETERMINATION

Greater Mooses Tooth 2 Oil and Gas Development Project

Joint Record of Decision and Permit Evaluation
Bureau of Land Management
U.S. Army Corps of Engineers

October 2018

APPENDIX D: CORPS DETERMINATION

ATTACHMENT D1

D.1 RESPONSE TO COMMENTS ON CORPS PUBLIC NOTICE POA-2015-486

The Corps received comments from four entities during the Corps' 45-day public comment period, March 23, 2018 -- May 7, 2018. An additional entity provided comments shortly after the close of the comment period, and the Corps considered those comments as well. The Corps received no requests for public meetings or extension of the comment period. Comments determined substantive are identified below, with responses from the Corps.

D1.1 Alaska Department of Natural Resources, Office of Project Management and Permitting

Comment: Has the US Army Corps of Engineers (Alaska District) determined whether compensatory mitigation is required under the 404(b)(1) guidelines, NEPA, or its analysis of the Public Interest Review factors?

> **Corps Response:** Extensive avoidance and minimization efforts have been incorporated, as project modifications, into the proposed GMT2 project. The Corps has determined that mitigation in the form of avoidance and minimization measures are sufficient and compensatory mitigation is not required to offset unavoidable impacts to aquatic resources for the GMT2 project. Analysis and conclusions are provided in the 404(b)(1) guidelines, Public Interest Review, appropriate sections of the JROD and GMT2 Final Supplemental EIS, as well as the 404 permit application and associated documents.

Comment: Because there are no known opportunities for wetlands restoration in the same 10-digit HUC, OPMP supports investigating potential mitigation projects in the adjacent 10-digit HUC and recommends that the Alaska District consider the conscientious effort of the applicant to adopt a watershed-based approach in identifying and proposing a compensatory mitigation project that also benefits the potentially affected community of Nuiqsut and offsets impacts associated with previous development activities.

> **Corps Response:** The Corps acknowledges the general difficulty in identifying practicable compensatory mitigation opportunities on many parts of the Arctic Coastal Plain, and as a programmatic issue, we will continue to encourage the identification of compensatory mitigation opportunities for project proposals when required. However, as provided in 33 CFR 320.4 (r), mitigation can be added to DA permits at the Applicant's request. The applicant has requested that voluntary mitigation be added as a special conditions to the DA permit. The applicant requested mitigation plan is included as Attachment D5.

Comment: The Alaska Department of Natural Resources (DNR) is conducting a desktop-level evaluation of known restoration, to include re-establishment and rehabilitation, and enhancement opportunities on DNR lands. We acknowledge that there are few to no potential mitigation projects on DNR lands in many watersheds on the North Slope, based on our anecdotal understanding of the Alaska District's current position on what constitutes appropriate compensatory mitigation. The regulatory agencies and other commenting parties might be better enabled to provide substantive comments on the availability of compensatory mitigation projects for GMT2, if the Alaska District were to publish a Special Public Notice, Regulatory Guidance Letter, or some other description of what screening criteria are applied to potential compensatory mitigation projects, generally.

Corps Response: The Corps appreciates and acknowledges this comment and will continue to explore ideas such as this. This is a general regulatory program issue and not resolvable here prior to the GMT2 permit decision.

D1.2 Environmental Protection Agency

The EPA's letter largely provides a history of the project, summation of applicable regulations, and recommendation of certain functional assessment methods in regard to the applicant's voluntary compensatory mitigation plan. Avoidance and minimization measures for this project are extensive and individual and cumulative impacts to aquatic resources are minimal within the proposed project area; therefore the Corps determined compensatory mitigation was not required for the GMT2 project (see information and analyses in the 404(b)(1) guidelines, Public Interest Review, appropriate sections of the JROD and GMT2 Final Supplemental EIS, as well as the 404 permit application and associated documents). As provided in 33 CFR 320.4 (r), mitigation can be added to DA permits at the Applicant's request, which has occurred. The Applicant's voluntary compensatory mitigation plan is included as Attachment D5 of the JROD.

D1.3 Native Village of Nuiqsut

Comment: The Corps has not met with, nor engaged with, the NVN in a meaningful way. No representatives from the Corps attended the community meeting on the GMT2 Draft Supplemental EIS held in Nuiqsut on April 30, and the Corps has not held any other meetings with the community on the project.

Corps Response: The Corps is a Cooperating Agency to the BLM, which is the Lead Federal Agency. The BLM held a community meeting in Nuiqsut and coordinated with NVN frequently during the Government-to-Government (G2G) consultation process. NVN, as a Cooperating Agency, participated with the Corps in multiple Cooperating Agency meetings. The NVN did not request additional meetings with the Corps.

Comment: The Corps should not issue the 404 permit for the GMT2 project. We believe, that like with GMT1 and other development projects in the region, GMT2 will have significant negative effects on our community. The area where ConocoPhillips proposes to place GMT2's road, pipeline, and pads are frequently used for subsistence purposes. We are already experiencing negative impacts from existing development in the region and are feeling the effects from infrastructure and development activities circling our community. It is not in the public interest for the Corps to allow this project.

Corps Response: The Corps has noted the comment and believes the information contained in the GMT2 Final Supplemental EIS and JROD fully addresses this issue. We acknowledge that the NVN impacts are of a different scale than the overall definition of "public". Based upon the information discussed in the PIR section of this JROD (Attachment D3), the Corps finds the project to be in the public interest.

Comment: There are also additional, significant projects like Willow on the horizon. ConocoPhillips is moving forward with the permitting process for that project. The Corps should not permit GMT2 until after it has additional information on the table related to Willow. That development is likely to tie into GMT2 and significantly expand the impacts to our community. There may be other options and alternatives to GMT2 that cannot be considered if GMT2 is permitted in isolation instead of in a way that takes the full scale of development into consideration. It is not in the public interest for the Corps to permit this project at this time.

Corps Response: The Corps has noted the comment and believes the information contained in the GMT2 Final Supplemental EIS and the JROD fully addresses this issue. Based upon the findings found at in Attachment D3 of the GMT2 JROD, the Corps finds the project is in the public interest.

D1.4 Alaska Wilderness League, Center for Biological Diversity, Defenders of Wildlife, Northern Alaska Environmental Center, Sierra Club, and The Wilderness Society

Comment: The project does not meet the Section 404 Guidelines because it is not in the public interest and the Corps does not have sufficient information to determine if the proposal is the Least Environmentally Damaging Practicable Alternative.

Corps Response: Compliance with the 404 (b)(1) Guidelines and the public interest review determination are discussed at Section D2 of the JROD.

Comment: Commenters are deeply concerned about the Corps' premature release of the GMT2 permit for public comment.

Corps Response: The Alaska District (Corps) attempts to issue the public notice as close as possible to the Notice of Availability (NOA) of a given Draft EIS, to provide additional information for evaluation and comment. The public notice contained sufficient information as required by regulation. The 45-day comment period was 15 days longer than typical public notice comment periods. Additional information needed to inform the Corps' decision making was adequately provided for in the GMT2 Final Supplemental EIS.

Comment: The Corps should not issue the permit for GMT2 at this time because it cannot fully assess whether the proposal is the LEDPA.

Corps Response: The GMT2 Final Supplemental EIS, the JROD, and other referenced information are sufficient for an adequate comparison of alternatives and a LEDPA determination.

Comment: The Corps should not issue the permit for GMT2 at this time because it cannot fully assess whether the proposal is the LEDPA. In January 2017, ConocoPhillips announced a significant new discovery within the Greater Mooses Tooth Unit at Willow, which is located just west of the GMT2 project.

Corps Response: Like the BLM, the Corps has concluded that although the Willow development may use GMT2 and Alpine infrastructure to the maximum extent possible, this project has independent utility from GMT2 and is not considered a connected action under NEPA. The Willow find is sufficiently large that even in the absence of a road connection between GMT2 and GMT1, the Willow project could be developed and operated independently. Accordingly, an appropriate analysis and determination of a LEDPA for GMT2 can be made independently of such an analysis for a future development such as Willow.

Comment: Suspending issuance of the GMT2 permit at this time would also be consistent with the Corps' obligation to consider the public interest in reviewing this project.

Corps Response: The Corps finds that there is sufficient information in the GMT2 Final Supplemental EIS for an appropriate analysis of public interest review factors. Based upon the information found in Attachment D3 of this JROD, the Corps finds the project is not contrary to the public interest.

Comment: The Corps should require that Conoco Phillips adopt further mitigation and design measures to address the significant safety concerns likely to result from both heavy industrial use and community use of the road.

> **Corps Response:** Safety was considered and addressed as a Public Interest factor in Section D3 of the JROD. However, the Corps does not have the regulatory authority to require mitigation and design measures specific to roadway and vehicle operation.

Comment: The Corps should analyze the potential impacts of climate change on each of the alternatives to determine how that alternative should be designed or how mitigation measures should be incorporated into that alternative to address the potential impacts from climate change in a region that is experiencing the effects of climate change first-hand.

> **Corps Response:** The proposed activities within the Corps Federal control and responsibility would result in a negligible release of greenhouse gases into the atmosphere when compared to global greenhouse gas emissions. Greenhouse gas emissions have been shown to contribute to climate change Aquatic resources can be sources and/or sinks of greenhouse gases. For instance, some aquatic resources sequester carbon dioxide whereas others release methane; therefore, authorized impacts to aquatic resources can result in either an increase or decrease in atmospheric greenhouse gas. These impacts are considered de minimis. Greenhouse gas emissions associated with the Corps federal action may also occur from the combustion of fossil fuels associated with the operation of construction equipment, increases in traffic, etc. The Corps has no authority to regulate emissions that result from the combustion of fossil fuels. These are subject to federal regulations under the Clean Air Act and/or the Corporate Average Fuel Economy (CAFE) Program. Greenhouse gas emissions from the Corps action have been weighed against national goals of energy independence, national security, and economic development and determined not contrary to the public interest. Further information on climate change can be found in Section 3.2.4 of the GMT2 Final Supplemental EIS.

Comment: The GMT2 project is not in the public interest. The project involves significant, unresolved conflicts as to resource use and will result in major adverse impacts to subsistence uses and other values. The GMT2 project will extend existing infrastructure directly into the heart of one of Nuiqsut's primary subsistence use areas.

> **Corps Response:** The Corps has determined that the project is not contrary to the public interest, based upon the analysis of public interest review factors. See Public Interest Review at section D3 of the JROD, including subsistence at Section D3.4.1.

Comment: The GMT2 Draft Supplemental EIS for this project does not adequately account for the potential impacts from the gravel mining activities associated with the GMT2 project.

> **Corps Response:** The gravel source for the project, the existing ASRC mine, was evaluated and permitted under Corps permit POA-1996-869-M11. The proposed GMT2 development would only use approximately 35 acres or 7.5 percent of the recent Phase 3 expansion of the ASRC mine under this permit. Further discussion of the gravel mine is found in the GMT2 Final Supplemental EIS and the Public Interest Review at section D3 of the JROD.

D1.5 Kuukpik Corporation

Kuukpik provided 35 pages of comments to both the Draft Supplemental EIS and the Corps 404 Public Notice in one combined letter. The majority of these comments were determined to not be substantive to the Corps' 404 analyses (many of these were responded to by the BLM in Volume 4 of the GMT2 Final

Supplemental EIS) or similar to comments previously provided and responded to above. Substantive comments to our evaluation are provided here.

Comment: An oil industry project that doesn't factor warming trends into its design is highly likely to face real (and costly) problems later when the project has to be updated, expanded, or retro-fitted with design components that should have been identified during the NEPA process. Such omissions also mean that stakeholders (including the Corps in its effort to determine the Least Environmentally Damaging Practicable Alternative (LEDPA)) would not be getting an accurate description of potential impacts and consequences of the project.

> **Corps Response:** The proposed activities within the Corps' Federal control and responsibility likely will result in a negligible release of greenhouse gases into the atmosphere when compared to global greenhouse gas emissions. Greenhouse gas emissions have been shown to contribute to climate change. Aquatic resources can be sources and/or sinks of greenhouse gases. For instance, some aquatic resources sequester carbon dioxide whereas others release methane; therefore, authorized impacts to aquatic resources can result in either an increase or decrease in atmospheric greenhouse gas. These impacts are considered de minimis. Greenhouse gas emissions associated with the Corps federal action may also occur from the combustion of fossil fuels associated with the operation of construction equipment, increases in traffic, etc. The Corps has no authority to regulate emissions that result from the combustion of fossil fuels. These are subject to federal regulations under the Clean Air Act and/or the Corporate Average Fuel Economy (CAFE) Program. Greenhouse gas emissions from the Corps action have been weighed against national goals of energy independence, national security, and economic development and determined not contrary to the public interest. Further information on climate change can be found in Section 3.2.4 of the GMT2 Final Supplemental EIS.

Comment: A prime example is the evolving understanding of how gravel roads and pads may need to be designed to accommodate warming temperatures. Less than a year ago, the Corps of Engineers concluded in at least one instance that pads only 35 miles away from GMT2 would need to be about 30-35 percent thicker than previously constructed (6.4 feet deep instead of the usual 5 feet) in order to prevent the pads from excessively and unevenly settling into the tundra, which could damage the structures and equipment on those pads.

> **Corps Response:** In the applicant's response to GMT2 public comments, dated August 3, 2018, ConocoPhillips responds to a similar comment regarding road thickness: "There is no identified need to design and build the roads thicker than the proposed 5 feet minimum, which is sufficient for the level and type of traffic expected on the GMT2 road. At the Kuparuk River Unit, where drilling rigs are moved at all times of the year, a road specification of 6.5 feet of gravel can be desirable to reduce potential for road rutting after spring and late summer rig moves, when conditions are typically wet. At GMT2, in contrast, rig moves are planned to occur during winter, and the 5-foot minimum gravel thickness specification is sufficient." The Corps does not have any design requirements in regard to permafrost conditions. In general, the applicant is responsible for the engineering of their projects.

ATTACHMENT D2

Evaluation of the Discharge of Dredge and Fill Material in accordance with the 404(B)(1) Guidelines (40 CFR 230, Subparts B through H)

The Department of the Army (DA) permit application evaluation requires compliance with the U.S. Environmental Protection Agency's (EPA) Section 404(b)(1) Guidelines (40 CFR 230). The GMT2 Final Supplemental EIS contains appropriate analysis of all factors within the Guidelines, except as supplemented herein as specifically needed to comply with the Guidelines.

D2.1 COMPLIANCE WITH THE GUIDELINES (40 CFR 230, Subpart B)

D2.1.1 Restrictions on Discharge (40 CFR 230.10)

D2.1.1.1 (40 CFR 230.10(a))

The Corps finds that the basic purpose of the GMT2 Project is not water dependent, but that practicable alternatives that do not impact waters of the U.S. (WOUS) and / or special aquatic sites (including wetlands) do not exist based on the constraints of geography and technology.

As described in detail in Chapter 2 of the GMT2 Final Supplemental EIS, three action alternatives and a no action alternative were identified and described in detail. These four alternatives are summarized on page 1 of this document.

An alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall project purpose. The Corps determined that Alternatives A, B, and C are practicable because these alternatives are believed to be available and can be accomplished from a cost, existing technology, and logistics standpoint.

The No Action Alternative, Alternative D, did not meet the overall project purpose and need, and was not carried further for additional analysis by the Corps.

Environmental Analysis of Practicable Alternatives

Mapping, classification and description of wetland types in the project area is provided in Section 3.3.1 of the GMT2 Final Supplemental EIS. Additionally, a wetland delineation and aquatic site assessment was prepared by ABR on behalf of the applicant and submitted as part of the Corps 404 permit application.

Alternative A, Alternative B, and Alternative C would have very similar impacts and only minor differences, both direct and indirect, to the same types of WOUS when evaluated on a per-acre basis. The key differentiating factor between the three alternatives is the overall acreage of direct impacts (i.e. total gravel footprint) between the alternatives (GMT2 Final Supplemental EIS, Sections 4.3.1.4 and 2.9, Table 14).

Direct impacts to aquatic resources for each alternative is synonymous with total gravel footprint for this project. Alternative A has a total gravel footprint on WOUS of 78 acres, Alternative B has a total gravel footprint on WOUS of 87.2 acres, and Alternative C has a total gravel footprint on WOUS of 92 acres. Alternative A is identified in Section 4.2.1.1 of the GMT2 Final Supplemental EIS as being the least impactful of the action alternatives.

When comparison of alternatives would not result in discernable or identifiable differences in impacts to the aquatic ecosystem, those alternatives may be dismissed from further analysis. With the discernable difference of impacts to WOUS between alternatives being total gravel footprint, Alternatives B and C are dismissed from further analysis. Alternative A, with the smallest overall acreage of both direct and indirect impacts, is carried further for additional analysis to determine compliance with the Guidelines.

D2.1.1.2 40 CFR 230.10(b)

No discharge of dredged or fill material shall be permitted if it:

1. Violates any applicable state water quality standard.

   The state water quality agency, Alaska Department of Environmental Conservation (ADEC), is responsible for issuing or denying a Certificate of Reasonable Assurance for placement of the fill material. ADEC issued a Certificate of Reasonable Assurance for Alternative A of the project on September 11, 2018.

2. Violates toxic effluent standards or prohibitions under Section 307 of the Clean Water Act.

   The fill material would come from a local source gravel mine known to be free of human or natural pollution.

3. Jeopardizes the continued existence of any species listed as endangered or threatened under the Endangered Species Act of 1973, or their critical habitat.

   The USFWS issued a Biological Opinion BO for Alternative A of the project to both the Corps and BLM (Action Agencies) on September 21, 2018 and concluded the project is not likely to jeopardize the continued existence of any these species, nor is it likely to destroy or adversely modify critical habitat.

4. Violates any requirement imposed by the Department of Commerce to protect marine sanctuaries under Title II of the Marine Protection, Research, and Sanctuaries Act of 1972.

   There are no marine sanctuaries in the proposed project area.

D2.1.1.3 40 CFR 230.10(c)

Except as provided under CWA Section 404(b)(2), no discharge of dredged or fill material shall be permitted that will cause or contribute to significant degradation of WOUS. Findings of significant degradation related to the proposed discharge shall be based upon appropriate factual determinations, evaluations, and tests required by Subparts B and C, after consideration of Subparts C through F. The discharge shall not be permitted if it:

1. Causes significant adverse effects through pollutants on human health or welfare, municipal water supplies, plankton, fish, shellfish, wildlife, and special aquatic sites.

   These factors for the proposed action have been thoroughly evaluated. See discussion in sections D2.5.1–D2.5.4, below.

2. Causes significant adverse effects through pollutants on life stages of aquatic life and other wildlife dependent on aquatic ecosystems.

   See discussion in sections D2.1.2.5, D2.1.2.7, and D.21.2.8 below.

3. Causes significant adverse effects through pollutants on aquatic ecosystem diversity, productivity, and stability to the loss of fish and wildlife habitat or loss of the capacity of a wetland to assimilate nutrients, purify water, or reduce wave energy.

   See discussion in section D2.2 below.

4. Causes significant adverse effects through pollutants on recreational, aesthetic, and economic values.

   See discussion in sections D2.5.1-D2.5.4, below.

D2.1.1.4 40 CFR 230.10(d)

Except as provided under CWA Section 404(b)(2), no discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken that will minimize potential adverse impacts of the discharge on the aquatic ecosystem.

Such steps are identified in 40 CFR 230, Subpart H (Actions to Minimize Adverse Effects), discussed below in section D2.7.

D2.1.2 Factual Determinations (40 CFR 230.11)

The USACE will determine the potential short-term or long-term effects of a proposed discharge of dredged or fill material on the physical, chemical, and biological components of the aquatic environment in light of subparts C through F of the Guidelines. Such factual determinations will be used by the USACE in making findings of compliance or non-compliance with the restrictions on discharge per 40 CFR 230.10 (see section D2.1.1 above). The evaluation and testing procedures described in 40 CFR 230.60 and 40 CFR 230.61 of subpart G (see section D2.6 below) shall be used as necessary to make the USACE's determination.

Sections D2 1.2.1-D2.1.2.8 below present information on the nature and degree of the effects of the proposed discharge on the aquatic environment as presented in the GMT2 Final Supplemental EIS and information submitted and evaluated as part of the Corps 404 permit application. Measures to mitigate potential effects are discussed in section D2.7, below.

D2.1.2.1 PHYSICAL SUBSTRATE DETERMINATIONS (40 CFR 230.11[a])

Section 3.2.1 of the GMT2 Final Supplemental EIS, Terrestrial Environment, describes the existing substrate under the proposed project. Section 4.2.1.1 of the GMT2 Final Supplemental EIS, Physiography and Geomorphology/Soils and Permafrost, evaluates impacts of the proposed project on the physical substrate.

The proposed project would place clean fill material into 78 acres wetland. The area potentially impacted by permanent indirect effects, estimated to occur within 328 feet of the proposed project footprint, is approximately 688.6 acres.

The project has incorporated design elements to avoid and minimize impacts to the physical substrate. Further reductions to minimize impacts will be realized through use of Best Management Practices (BMPs) and permit conditions.

With proposed design features and inclusion of special conditions, the project would comply with this section of the guidelines.

D2.1.2.2 WATER CIRCULATION, FLUCTUATION, AND SALINITY DETERMINATIONS (40 CFR 230.11[b])

Information regarding the potential impacts of the proposed project activities on water circulation, fluctuation, and salinity in the project area is presented in Section 4.2.2 of the GMT2 Final Supplemental EIS, Water Resources.

The proposed project would result in long-term alterations to current patterns, water circulation, and fluctuation. The construction of gravel pads, gravel roads, ice roads, and VSMs has the potential to lead to the formation of impoundments or redirection of surface water flow and may cause deposition or erosion of sediment. Cross-drainage culverts would be installed to avoid water impoundments.

Direct or indirect impacts to salinity gradients are unlikely, as the material from the ASRC Mine Site is similar in character to the proposed project site.

With proposed design features and inclusion of special conditions, the project would comply with this section of the guidelines.

D2.1.2.3 SUSPENDED PARTICULATE/TURBIDITY DETERMINATIONS (40 CFR 230.11[c])

Section 4.2.2 of the GMT2 Draft Supplemental EIS, Water Resources, evaluates potential impacts of the proposed project in terms of potential changes in turbidity and the kinds and concentrations of suspended particulates in the vicinity of the project site.

The proposed project would result in the discharge of 647,300 cyds of coarse mineral fill material, composed primarily of sand and gravel, into waters and wetlands. The discharge would occur in winter, minimizing direct impacts from increased suspended particulates and turbidity. Indirect impacts could include gravel spray, dust deposition, runoff, erosion, or flooding. See section D2.2.2 below for details regarding direct and indirect impacts of the proposed fill on suspended particulates and turbidity as presented in the GMT2 Final Supplemental EIS.

With proposed design features and inclusion of special conditions, the project would comply with this section of the guidelines.

D2.1.2.4 CONTAMINANT DETERMINATIONS (40 CFR 230.11[d])

Construction of gravel infrastructure as part of the proposed project would include placement of clean gravel fill that has been determined to be free of contaminants. The ASRC Mine Site is proposed as the primary source of gravel fill for the proposed project. The existing ASRC Mine Site has been evaluated and previously permitted; therefore, there is no reason to anticipate that the proposed fill material would contain contaminants that could affect surrounding water quality or cause State of Alaska water quality standards to be exceeded.

With proposed design features and inclusion of special conditions, the project would comply with this section of the guidelines.

D2.1.2.5 Aquatic ecosystems and organisms determinations (40 CFR 230.11[e])

Section 4.3.2 of the GMT2 Final Supplemental EIS, Fish, evaluates potential impacts of the proposed project on aquatic ecosystems and organisms.

Direct impacts to fish and fish habitat would not occur from the proposed project. Indirect impacts could occur to fish and fish habitats adjacent to the proposed project.

With proposed design features and inclusion of special conditions, the project would comply with this section of the guidelines.

D2.1.2.6 Proposed disposal site determinations (40 CFR 230.11[f])

The project does not involve open water disposal of material; this factual determination does not apply.

D2.1.2.7 Determination of cumulative effects on the aquatic ecosystem (40 CFR 230.11[g])

Section 4.6.7.2 of the GMT2 Draft Supplemental EIS, Fish and Fish Habitat, evaluates potential cumulative impacts of the proposed project on aquatic ecosystems and organisms.

Permanent impacts to 78 acres of waters and wetlands are expected from the proposed project. Reasonably foreseeable future actions include continued hydrocarbon exploration and development on the North Slope, as listed in Table 140 of the GMT2 Final Supplemental EIS.

The placement of the fill material due to the reasonably foreseeable future actions would directly impact the physical substrate, water, and vegetation, and also cause indirect impacts to the aquatic ecosystem, such as dust deposition along roads contributing to increased turbidity, or snowdrifts along gravel and infrastructure that could increase wintertime soil temperatures (GMT2 Final Supplemental EIS, Section 4.6.4.2). These other potential impacts would be similar to those identified for the proposed project. Overall, the project, when combined with past, present, and reasonably foreseeable future projects, with the appropriate avoidance, minimization, and permit special conditions, would not result in significant adverse cumulative impacts to aquatic resources within the area of cumulative effect (GMT2 Final Supplemental EIS, Table 140).

Any proposed future projects requiring a DA permit would be evaluated as separate permit actions, and the appropriate environmental analysis, including a cumulative effects analysis, would be required. Permitting of these projects would be subject to Section 404 of the CWA, including the Guidelines and/or other appropriate laws and regulations. If the appropriate avoidance, minimization, and potential compensatory mitigation measures do not result in a project that is in compliance with the above regulations, authorization under Section 404 of the CWA could not be granted.

BMPs and permit special conditions to reduce direct and secondary impacts related to the proposed project would serve to reduce cumulative impacts to those same resources. Actions taken to avoid and minimize impacts are discussed below.

With proposed design features and inclusion of special conditions, the project would comply with this section of the guidelines.

D2.1.2.8 Determination of secondary effects on the aquatic ecosystem (40 CFR 230.11[h])

Potential secondary effects on the aquatic ecosystem would be avoided and minimized as described in Applicant Proposed Mitigation Statements, and Attachment D, Avoidance, Minimization, and Mitigation Measures Table, submitted as part of the DA permit application.

Secondary effects are effects on an aquatic ecosystem that are associated with a discharge of fill materials, but do not result from the actual placement of the dredged or fill material. Secondary effects to the aquatic environment include impacts to physical substrate, water quality, vegetation, and aquatic ecosystems and organisms.

Secondary effects may include impacts on wetlands, vegetation, and waterbodies as a result of dust, snow buildup, impoundments, or thermokarst effects; the disturbance of wildlife populations as a result of noise or human activity; or a change in wildlife survival or productivity. Secondary effects could also include potential increases in resource competition among aquatic species due to habitat loss resulting from water withdrawal, increases in turbidity associated with erosion or discharge, or barriers to movement (USACE 2015).These impacts are discussed in sections D2.2, D2.3, and D2.4 below.

Consideration of secondary effects also includes the potential for a spill of hydrocarbon or other toxic materials. Spills related to construction activities are anticipated to be relatively small in volume, and primarily related to vehicle and construction equipment fueling and maintenance. Spills that could occur during drilling and operation could result in larger volume spills than construction activities as discussed in Section 4.5 of the GMT2 Final Supplemental EIS.

With proposed design features and inclusion of special conditions, the project would comply with this section of the guidelines.

D2.1.3 Findings of Compliance or Non-Compliance with the Restrictions on Discharge (40 CFR 230.12)

On the basis of the Guidelines (Subparts C through G after consideration of Subparts B through H), the proposed disposal site for the discharge of dredged or fill material complies with the Section 404 (b)(1) Guidelines with the inclusion of the appropriate and practicable discharge conditions to minimize pollution or adverse effects to the affected aquatic ecosystem.

With proposed design features and inclusion of special conditions, the project would comply with this section of the guidelines.

D2.2 POTENTIAL IMPACTS ON PHYSICAL AND CHEMICAL CHARACTERISTICS OF THE AQUATIC ECOSYSTEM (40 CFR 230, Subpart C)

D2.2.1 Substrate (40 CFR 230.20)

The discharge of dredged or fill material can result in changes to the complex physical, chemical, and biological characteristics of the substrate. The amount and composition of the discharged material and the location, method, and timing of discharges influence the degree of impact on substrates.

Direct impacts. The proposed project would place fill 78 acres of water and wetland substrates. These productive saturated water and wetland organic soil substrates would be converted to upland, and permanently lost and replaced with coarse permeable gravel fill material. This would effectively cover the substrate surface and inhibit light penetration that allows vegetation to exist, smother existing vegetation, and compress the softer substrates through compaction by the weight of the fill material (GMT2 Final Supplemental EIS, Section 4.3.1.2).

Direct impacts of the placement of fill on the substrate include compaction and damage to soil during construction of gravel pads and roads and installation of VSMs. Construction of the 64.0-acre gravel road (including vehicle pullouts) and 14.0-acre GMT2 drill pad represents the majority of the area of impact from the proposed project. Although the substrate would be covered with the discharge of fill material, the underlying permafrost would remain frozen due to the depth of fill material (minimum of 5 feet thick; GMT2 Final Supplemental EIS Section 2.4.3). Pipeline construction would displace soil during installation of VSMs. Each new VSM would displace approximately 3.1 square feet of substrate (GMT2 Final Supplemental EIS Section 4.3.1.2). The project would require approximately 1,000 new VSMs, resulting in direct impact to 0.1 acre. VSMs would be installed in winter, and spoil material would be collected from the surface for proper disposal.

Construction of ice roads and pads would cause compression of soils within the direct ice roads and pads footprint. This compression would be single-season, and impacts from ice pads, ice roads, and snow trails would be negligible to the health of the soils (GMT2 Final Supplemental EIS Section 4.3.1.2).

Indirect impacts. The ice-rich soils near the fill area may also be indirectly impacted by vegetation changes, water impoundment, gravel spray, dust deposition, salinity effects from gravel, snowdrifts, and blockage of or changes to natural drainage patterns, resulting in the substrate becoming either wetter or drier (GMT2 Final Supplemental EIS, Section 4.2.1.1). Direct or indirect exposure of permafrost to the air and sunlight can result in permafrost degradation and thaw settlement (thermokarst). Substrates adjacent to proposed pipelines could be indirectly affected by altered snow accumulation patterns and by shading of vegetation (GMT2 Final Supplemental EIS Section 4.3.1.2). The area potentially impacted by indirect effects from the proposed project, estimated using a 328-foot buffer from proposed gravel fill, is approximately 688.6 acres (Table 116 of the GMT2 Final Supplemental EIS).

With proposed design features and inclusion of special conditions, the project would comply with this section of the guidelines.

D2.2.2 Suspended Particulates/Turbidity (40 CFR 230.21)

The discharge of dredged or fill material can result in elevated levels of suspended particulates in the water column for varying lengths of time. Impacts to receiving waters are dependent on the nature and degree of effect that the proposed discharge would have on the kinds and concentrations of suspended particulates, and turbidity in the vicinity of the disposal site.

Direct impacts. Coarse mineral fill material composed primarily of sand and gravel would be discharged during winter, when frozen conditions would substantially reduce the introduction of fine materials in the fill into the water column. Construction activities associated with placement of fill material may also disturb tundra soils and vegetation. Disturbed and exposed soils would be more susceptible to erosion and subsequent sedimentation during spring breakup (GMT2 Final Supplemental EIS, Section 4.2.2.2). Placement of fill material would occur during winter when soils and vegetation are protected by at least 6 inches of snow and ice, as required by the NSB.

Indirect impacts. Increased suspended particulates and turbidity of waterbodies adjacent to the fill discharge sites would result from gravel spray, dust deposition, runoff, erosion at fill slopes, or flooding. The large waterbody closest to the proposed project is Lake M9925, immediately south of the GMT1 drill pad. During the first seasonal thaw period following fill placement, the potential for erosion and siltation of waters would increase due to fill material melt, settling, precipitation, and erosion. Flow blockages or other obstructions at culverts could lead to decreased water velocity, potentially resulting in inundation and increased sedimentation (GMT2 Final Supplemental EIS, Section 4.2.2.2).

With proposed design features and inclusion of special conditions, the project would comply with this section of the guidelines.

D2.2.3 Water (40 CFR 230.22)

The discharge of dredged or fill material can change the chemical, physical, and biological characteristics of a receiving water.

Direct impacts. Approximately 78 acres of WOUS and wetlands would be converted to uplands through the discharge of fill material. Discharges of gravel fill material into waters would occur for construction of the drill pad, access road, vehicle pullouts, and placement of VSMs. Most discharges would occur in saturated or moist tundra wetland areas.

Indirect impacts. Water withdrawals for drilling and/or operations may have short-term (lasting only two or three single construction seasons) impacts on alkalinity, pH, or oxygen content in the water source. Typically, water for drilling and operations would be provided by CD1, using permitted sources. Discharges of treated domestic wastewater to the tundra, if needed, would occur in accordance with Alaska Pollutant Discharge Elimination System permit requirements, so an increase in fecal coliform counts over the naturally occurring concentrations is not expected.

Potential impacts to water resources could occur in the event of an oil spill. Potential impacts to water resources resulting from increased suspended particulates and turbidity are addressed above.

With proposed design features and inclusion of special conditions, the project would comply with this section of the guidelines.

D2.2.4 Current Patterns and Water Circulation (40 CFR 230.23) and Normal Water Fluctuations (40 CFR 230.24)

Current patterns and water circulation are the physical movements of water in the aquatic ecosystem. The discharge of dredged and fill materials can obstruct flow, change the direction of velocity, or change the dimensions of a waterbody, including wetland areas.

Direct impacts. The proposed gravel infrastructure could impact hydrology through changes in natural drainage patterns, stream stage and streamflow, and stream velocity. These effects would most likely occur as a result of the proposed gravel access road. Gravel fill on tundra could change recharge potential, block natural drainage, and change the existing hydrologic regime. Placing fill transversely across grade would block the natural drainage of sheet flow runoff, shallow groundwater, stream input, or rain catchment. Placing fill transversely across grade may also change snow accumulation patterns, which, in turn, may change drainage patterns once the snow melts (GMT2 Final Supplemental EIS, Section 4.2.2.2).

The access road is routed west of and within 1.5 miles of the hydraulic divide between the Tiŋmiaqsiġvik (Ublutuoch) River hydrologic drainage basin and the Outlet Fish Creek hydrologic drainage basin. The road route is parallel to the predominant northeast surface water gradient for both of these hydraulic basins. The road route does not cross any of the larger primary creeks or rivers within these drainage basins and is not situated in lowlands potentially prone to flooding. The road would include a culvert crossing over the small unnamed beaded stream pool outlet draining from Lake M9925. The road route traverses the localized hydraulic gradient within the larger hydraulic drainage basin in those areas where relatively small surface water flow is generated by contributing surface area located above the elevation of the road, and could result in localized increased inundation (flooding) upgradient of the road, and decreased inundation downgradient of the road. These localized inundation effects would be small in comparison to the potential inundation effects if the road alignment were instead routed transverse to the overall northeast surface flow gradient for the hydrologic drainage basin (GMT2 Final Supplemental EIS, Section 4.2.2.2). The proposed road has been designed to accommodate predicted water flow by incorporating culverts in areas of channelized flow that would sustain both low and high water flows. The structures would accommodate fluctuating water levels and maintain circulation and fish passage.

The GMT2 Final Supplemental EIS concludes that impacts on current patterns and water circulation as a result of the proposed project would be long term and minor (GMT2 Final Supplemental EIS, Section 4.2.2.6).

Indirect impacts. There would be short-term, temporary impacts from ice infrastructure (e.g., roads and pads). Only permitted lakes, rivers, or reservoirs (under state temporary water use authorizations and, if required, state fish habitat permits) would serve as water sources. As the ice roads melt in spring, the water would be dispersed across the road corridors and drain into the many lakes or other areas of natural inundation. Construction of ice roads that do not result in the discharge of dredge or fill material, including water withdrawal, is not a USACE-regulated activity.

Normal water fluctuations in a natural aquatic system consist of daily, seasonal, and flood fluctuations in water level. The discharge of dredged or fill material can alter the normal water-level fluctuations pattern of an area, resulting in periods of inundations and exaggerating high and low water stages, or a static non-fluctuating water level.

Direct impacts. The proposed project could alter normal water fluctuations from placement of fill material across several drainages. The access road and drill pad fill areas could impede or impound downgradient water flow if not adequately bridged and culverted. The proposed gravel road could impound springtime breakup sheet flows and shallow groundwater flow, resulting in increased inundation (flooding) upgradient and decreased inundation (drying) downgradient of the road. Increased inundation adjacent to gravel infrastructure can increase erosion and sedimentation, and can lead to thermokarst or creation of deeper, open waterbodies (GMT2 Final Supplemental EIS, Section 4.2.2.2).

Potential impacts to water fluctuations that may be caused by the proposed infrastructure were evaluated using a snowmelt water equivalent inundation analysis (GMT2 Final Supplemental EIS, Section 4.2.2.2, Table 72). This analysis showed that the maximum area of potentially altered inundation would be 178.6 acres upgradient and 83.4 acres downgradient from the proposed infrastructure. These potential impacts would be minimized by installing cross-drainage culverts to mitigate the risk of sheet flow interruption and potential thermokarst. Culvert locations would be located in the field based on observations of sheet flow patterns during spring breakup. Cross-drainage culverts would also be placed under the road approximately every 500 to 1,000 feet. Approximately 46 cross-drainage culverts would be placed along the 8.2-mile gravel access road, although the number ultimately placed will be determined based on field observations to optimize their placement in order to maintain natural hydrological conditions (GMT2 Final Supplemental EIS, Section 4.2.2.4)

Pipelines would be installed on VSMs. Once installed, above-ground pipelines would have no impact on stream and water flow characteristics (GMT2 Final Supplemental EIS, Section 4.2.2.3).

The GMT2 Final Supplemental EIS concludes that impacts on normal water fluctuations as a result of the proposed project would be long term and minor (GMT2 Final Supplemental EIS, Section 4.2.2.6).

With proposed design features and inclusion of special conditions, the project would comply with this section of the Guidelines.

D2.2.5 Salinity Gradients (40 CFR 230.25)

Salinity gradients primarily occur where saltwater from oceans meets and mixes with freshwater from lands. On Alaska’s North Slope, some substrates have a naturally occurring salt component. These substrates may be present at the discharge site or at the source of fill materials (USACE 2015 GMT1 ROD § 5.3.6).

Direct impacts. Alterations to salinity gradients within wetlands, waterbodies, or substrates could occur from the construction of ice roads and pads, and gravel infrastructure. Freshwater is used to construct ice infrastructure, which could dilute salinity gradients when the ice melts. Placement of gravel for the proposed road and pads could increase salinity gradients if saline material were used as fill. Water draining off of or leaching through saline material within gravel roads or pads could alter water quality or soil properties in the immediate vicinity of the gravel structure. The ASRC Mine gravel is similar in character to gravel at the proposed placement sites, and an increase in the salinity of water or soils from fill material placement would be unlikely.

The proposal complies with this factor of the Guidelines.

D2.3 POTENTIAL IMPACTS ON BIOLOGICAL CHARACTERISTICS OF THE AQUATIC ECOSYSTEM (40 CFR 230, Subpart D)

D2.3.1 Threatened and Endangered Species (40 CFR 230.30)

The project area is within the known or historic range of the following threatened or endangered species: spectacled eider (*Somateria fischeri*; threatened), Steller's eider (*Polysticta stelleri*; threatened), and polar bear (*Ursus maritimus*; threatened). The proposed project is in the established critical habitat of the polar bear. The area for evaluation under Section 7 of the ESA includes all areas to be affected directly or indirectly by the project and not merely the immediate area involved in the project.

Threatened and endangered species are discussed in Section 4.3.6 of the GMT2 Final Supplemental EIS, the USFWS BO (Appendix F, dated September 21, 2018) and above at the Endangered Species Section (page 12).

The USACE has accepted the findings of the BO and included the Terms and Conditions in our evaluation and permit conditions to protect listed species. With inclusion of these measures, the proposed project complies with this factor of the 404(b)(1) Guidelines.

D2.3.2 Fish, Crustaceans, Mollusks, and Other Aquatic Organisms in the Food Web (40 CFR 230.31)

The discharge of fill material can variously affect populations of fish, crustaceans, mollusks, and other food web organisms by direct removal of habitats and release of contaminants.

Direct and indirect impacts to fish and fish habitat would occur from the proposed project near Lake M9925, Outlet Fish Creek drainage basin, and the Ublutuoch River drainage basin. Potential direct and indirect impacts to freshwater fish could result from barriers to fish passage, erosion, siltation, increased turbidity, road dust fallout, water withdrawal from lakes, and possible oil spills and fuel leaks.

The proposed GMT2 access road would include 25.6 acres of fill within the Outlet Fish Creek drainage basin and 52.3 acres of fill with in the Ublutuoch River drainage basin. Based on the aquatic site assessment functional rankings, the proposed access road would directly impact 4.4 acres of wetland and waterbody types that may provide high-value habitat for fish (ABR 2017 Wetland Delineation, Final Report 2017).

With proposed design features and inclusion of special conditions, the project would comply with this section of the guidelines.

D2.3.3 Other Wildlife (40 CFR 230.32)

The discharge of fill material can result in the loss or change of breeding and nesting areas, escape cover, travel corridors, and preferred food sources of resident and transient wildlife species associated with the aquatic ecosystem.

The terrestrial mammal species most likely to be affected by the proposed GMT2 Development Project include caribou (*Rangifer tarandus*), grizzly bear (*Ursus arctos*), Arctic and red foxes (*Vulpes lagopus* and *V. vulpes*), and small mammal species such as Arctic ground squirrels (*Urocitellus parryii*). While muskoxen (*Ovibos moschatus*) have been observed near the proposed project area, these sightings have been extremely sporadic (GMT2 Final Supplemental EIS, Section 3.3.4.1). Consequently, the proposed project has very little possibility of disturbing muskox populations (GMT2 Final Supplemental EIS, Section 4.3.4.1).

Use of the proposed project area by caribou from the Teshekpuk herd occurs predominantly during fall migration and winter. However, small numbers of caribou are expected in the project area throughout the year (GMT2 Final Supplemental EIS, Section 3.3.4.1). In late June to early August, caribou from the Teshekpuk herd move across the proposed project area from summer calving areas located near Teshekpuk Lake to the Colville River Delta in search of relief from insect harassment. This southeasterly movement continues after insect harassment season, until animals from the Teshekpuk herd reach their wintering areas located on the south side of the Brooks Mountain Range (GMT2 Final Supplemental EIS, Section 3.3.4). However, in general, more caribou are likely to occur in the western portion of the NPR-A than in the southeastern section where the Alpine facilities exist and where the proposed project would occur (GMT2 Final Supplemental EIS Section 3.3.4).

Potential impacts to caribou from the proposed GMT2 Development Project would likely be long term and of medium intensity (GMT2 Final Supplemental EIS Section 4.3.4.1) but would, overall, be considered minor. These potential impacts include:

- The loss of primarily tussock tundra and moist sedge-shrub tundra, both of which are preferred caribou summer habitat, due to the placement of fill (GMT2 Final Supplemental EIS Section 4.3.4.1)
- Barriers to movement from the proposed pad, road, and pipeline
- Disturbance caused by noise, road traffic, and human movements
- Disturbance from air traffic
- Insect harassment relief

Predators, including grizzly bears and Arctic and red foxes, are also likely to be found in the proposed project area. Reliable estimates of population sizes and distributions for these species are not available. The primary impacts of the proposed project to these species would be associated disturbance of dens and den habitat. These impacts would be of low intensity, but long term (GMT2 Final Supplemental EIS Section 4.3.4.1). Attraction to human food waste could result in increased conflicts between humans and wildlife, and consequent injury to wildlife due to increased time spent in or around the project area (GMT2 Final Supplemental EIS Section 4.3.4.1). In addition, increases in the local populations of predatory species, such as grizzly bears and foxes, resulting from attraction to anthropogenic foods, could have cascading adverse effects on prey species.

The Applicant has created a Wildlife Avoidance and Interaction Plan that includes strategies and protocols to contain and dispose of substances that are potentially attractive to wildlife. When implemented, this plan would help mitigate mitigate potentially adverse effects to wildlife from attraction to anthropogenic food and waste.

The project area also contains potential seasonal and year-round habitat for approximately 80 bird species (GMT2 Final Supplemental EIS Section 3.3.3,). Impacts of the proposed project to bird species would be of low intensity and long term (GMT2 Final Supplemental EIS Section 4.3.3.5). The proposed GMT2 Development Project would permanently remove 78 acres of potential nesting and breeding habitat due to construction of the gravel pads and road. Dust deposition from the gravel pads and road could extend up to 328 feet from the edge of the gravel footprint, thus extending the area of bird habitat potentially altered to 688.6 acres.

Other potential impacts to birds from the proposed project include potentially harmful attraction to sources of illumination (depending on lighting design); disturbance and displacement from noise, road traffic, and human movements associated with gravel placement; and increased nest depredation from predator populations attracted to human activities (GMT2 Final Supplemental EIS Section 4.3.3.5).

With proposed design features and inclusion of special conditions, the project would comply with this section of the guidelines.

D2.4 POTENTIAL IMPACTS ON SPECIAL AQUATIC SITES (40 CFR 230, Subpart E)

D2.4.1 Sanctuaries and Refuges (40 CFR 230.40)

Sanctuaries and refuges consist of areas designated under state or federal laws or local ordinances to be managed principally for the preservation and use of fish and wildlife resources.

There are no sanctuaries or refuges located in the proposed project area.

D2.4.2 Wetlands (40 CFR 230.41)

Wetlands are present on approximately 99 percent of the project area (GMT2 Final Supplemental EIS, Section 4.6.7.1).

The wetland types and their characteristics are listed below in order based on the amount of acreage that would be impacted. Some wetland functions and ecological services provided by the functions are described and related to human values for the specific aquatic resource (wetland or water type). Some wildlife values per wetland or water type are also described, in recognition of the regional importance for wildlife production and subsistence harvesting. Additional information can be found in the wetlands delineation report that was included as part of the Corps 404 permit application (ABR Wetland Delineation, Final Report 2017).

PEM1/SS1B (Saturated Persistent Emergent and Broad-leaved Deciduous Scrub-Shrub Wetland)

These wetlands are among the highest and driest in the proposed project area and are known as moist tussock tundra wetlands. They occupy convex micro-relief and gently rolling slopes between drained lake basins. They display limited pattern ground features or high center polygons with less than 5 percent aerial cover of inundated depressions. These scrub-shrub wetlands are typically dominated by tall grass (*Eriophorum angustifolium*), sedges (*Carex bigelowii*), and shrubs such as willows (*Salix pulchra*), dwarf birch (*Betula glandulosa*), and Cassiope (*Cassiope tetragona*).

This wetland type offers a high diversity of plant species when compared with inundated wetlands dominated by graminoids. Due to the abundance of this wetland type in a large non-fragmented landscape, it provides habitat for a variety of common wildlife species in conjunction with other similar wetland types in the area. It offers free range for large mammals, and nesting habitat to several bird species, including passerine birds, known to nest on the tundra ground. A limitation for some wildlife species may be a lower interspacing between surface water and drier vegetated grounds when compared to similar wetland types.

These wetlands provide high functions for social use; moderate functions for flood flow regulation; and low functions for sediment/toxicant removal, organic matter production/export, threatened and endangered species support, and wildlife habitat. These wetlands do not provide shoreline stabilization or fish habitat functions.

The proposed GMT2 Development Project would involve placement of fill in 49.7 acres of PEM1/SS1B wetlands.

PEM1/SS1E (Seasonally Flooded/Saturated Persistent Emergent and Broad-leaved Deciduous Scrub-Shrub Wetland)

Relief on this wetland type is dominated by high centered-low relief polygons, low centered polygons, and basin wetland complex. These wetlands provide a complex micro-topography supporting good surface water/ground interspersion. Surface water is present in low-lying troughs and accounts for 5 to 20 percent areal cover in the early season, drying out by fall. Vegetation is dominated by Bigelow’s sedge (*Carex bigelowii*) and white mountain avens (*Dryas integrifolia*). Active layers are relatively shallow, and soils have moderate organic horizons. The high centers of the polygons support a more diverse plant community consisting of a variety of low and dwarf shrubs and herbs. The combination of wet flooded types and moist diverse plant communities increases the value for a wide range of both mammals and birds, thus increasing the value of this type for general habitat suitability.

These wetlands provide high functions for flood flow regulation, wildlife habitat, and social use; moderate functions for sediment/toxicant removal and organic matter production/export; and low functions for ESA-listed species support. These wetlands do not provide functions for shoreline stabilization or fish habitat.

The proposed project would involve placement of fill in 23.7 acres of PEM1/SS1E wetlands.

PEM1F (Semi-permanently Flooded Persistent Palustrine Emergent Wetland)

PEM1F wetlands provide a good mix of surface water and graminoid ground cover on non-patterned or low centered polygon micro-relief areas. In the project area, non-patterned and patterned (low center polygons with raised edges) wet sedge meadow communities occupy depressions formed in drained lake basins or abandoned flood plains. This wetland type is typically flooded throughout the growing season, sometimes drying in the early fall. Vegetated communities are dominated by aquatic environment obligate sedge species, including water sedge (*Carex aquatilis*) and tall cottongrass (*Eriophorum angustifolium*), and soils have moderately thick organic layers over sand or loamy sand.

These wetlands are typically a flat or depressional hydrogeomorphic type with a thick organic horizon and abundant herbaceous cover. They typically have a low center polygonal surface form, which can provide high value in flood storage capacity, sediment, toxicant, and nutrient removal; and organic matter production and export. Though not a preferred habitat for spectacled eiders, these wetlands do provide habitat for a high diversity of avian species, as well as potential shelter and spawning habitat for fish.

These wetlands provide high functions for flood flow regulation, sediment/toxicant removal, organic matter production/export, fish habitat, and social use; moderate functions for wildlife habitat; and low functions for threatened and endangered species support. These wetlands do not provide for shoreline stabilization.

The proposed project would involve placement of fill in 4.3 acres of PEM1F wetland.

PEM1H (Permanently Flooded Emergent Marsh Wetland)

PEM1H wetlands in the proposed project area are found as aquatic vegetation communities occurring along the edges of permanently flooded ponds in the area usually dominated by water sedge and tall cottongrass or in low-lying drained lake basin complexes. In lake basin complexes, they function primarily as depressional wetlands, which are similar in function to thaw ponds, and the dominant species present is water sedge. These wetlands provide high function for erosion control because of their characteristic thick herbaceous vegetation bordering waterbodies. Avian and mammalian habitat suitability was rated as high because, although the plant diversity is low, these wetlands support a wide diversity of avian species and are relatively less common on the landscape.

No fill placement is proposed within this wetland type; however, PEM1H wetlands could be impacted indirectly by dust, noise, and potential hydrocarbon leaks or spills.

PUBH (Permanently Flooded Unconsolidated Bottom Ponds)

Shallow ponds and lakes generally begin to freeze in September, freeze to the bottom by mid-winter, and become ice-free between by mid-June to early July, about a month earlier than deeper lakes. Although generally shallow, ponds do replenish during spring breakup and store substantive volumes of water through summer, decreasing peak flows in the lower sections of the watershed.

Spectacled eiders feed primarily by dabbling in shallow freshwater or brackish ponds, where they find insect larvae, benthic organisms, and aquatic plants or seeds; pre-nesting eiders prefer shallow ponds with islands, emergent grasses, and sedges.

PUBH waters provide high functions for fish habitat and social use; moderate functions for flood flow regulation, sediment/toxicant removal, ESA-listed species support, and wildlife habitat; and low functions for organic matter production/export. PUBH waters also provide important summer rearing fish habitat when connected to a stream by a channel or intermittently flooded by nearby streams. They provide important habitat to emergent vegetation, invertebrates, and migratory birds due to the earlier availability of ice-free areas.

The proposed project would result in a loss of 0.1 acre to PUBH waters.

Effects on wetlands

The direct effects of the proposed project would result in the loss of aquatic resources from the placement of gravel for the following project components:

Drill Pad -- 14 acres
Access Road -- 8.2 miles, 62.8 acres
Tundra Access Road Pullouts -- 3 pullouts, 1.2 total acres
Vertical Support Members (VSMs) -- 8.6 miles, 0.1 total acre
Total acreage -- Approximately 78 acres

Oil and gas development and operation would cause the following long-term impacts: burial of vegetation under gravel pads, roads, and airstrips; excavation of materials at mine sites; construction of vertical support members for elevated oil pipelines; and excavation of trenches for buried gas and utility lines. Construction of gravel pads and roads could also result in indirect effects by altering the moisture regime of vegetation near the structures due to dust and snow accumulation and modification of natural drainage patterns. Impacts to floodplains could occur from river channel crossings by pipelines and roads, which could destroy vegetation where bridge pilings or vertical support members are required for the crossing. These factors could combine to warm the soil, deepen thaw, and cause thermokarst adjacent to roads and other gravel structures (GMT2 Final Supplemental EIS, Section 4.6.7.1).

Indirect effects of the proposed project would include reductions in aquatic resources' functionality, impacts on the hydrologic regime (wetting or drying), gravel spray and dust effects, subsistence resources effects, erosion and siltation, noise effects, visual effects, vegetation community changes, thermokarsting, and/or changes in natural drainage patterns. Other indirect effects include displacement of wildlife from wetlands habitats, off-road tundra travel during the snow-free season, and potential oil spill impacts (USACE 2015 GMT1 ROD § 5.5.2.12).

To minimize impacts on aquatic resources, the applicant would:

1. Minimize fill acreage of the gravel pads by project design and equipment layout.
2. Utilize ice roads and pads for construction access.
3. Water gravel roads and pads to control dust generation.
4. Slot ice roads at stream crossings to maintain natural drainage patterns during breakup.
5. Installing more or relocating culverts as needed after initial construction.

With applicant design features and inclusion of special conditions, the proposed project would comply with this factor of the Guidelines.

D2.4.3 Mudflats (40 CFR 230.42)

Mudflats are broad flat areas along the sea coast and in coastal rivers to the head of tidal influence and in inland lakes, ponds, and riverine systems. The substrate of mudflats contains organic material and particles smaller than sand. They are either unvegetated or vegetated only by algal mats.

There are no mudflats located in the proposed project area.

D2.4.4 Vegetated Shallows (40 CFR 230.43)

Vegetated shallows are permanently inundated areas that, under normal circumstances, support communities of rooted aquatic vegetation, such as turtle grass and eel grass in estuarine or marine systems, as well as a number of freshwater species in rivers and lakes.

Permanently flooded emergent wetlands (PEM1H) may act as vegetated shallows since they are associated with thaw ponds and thaw basins throughout the proposed project area. The proposed project would not directly impact vegetated shallows. Indirect impacts to vegetated shallows would total 17.0 acres. Indirect impacts to vegetated shallows would be minor and associated with gravel spray and dust generation within 328 feet of the edge of the access road and pad.

With proposed design features, the project would comply with this section of the guidelines.

D2.4.5 Coral Reefs (40 CFR 230.44)

Coral reefs consist of the skeletal deposit, usually of calcareous or silicaceous materials, produced by the vital activities of anthozoan polyps or other invertebrate organisms present in growing portions of a reef.

There are no coral reefs located in the proposed project area.

D2.4.6 Riffle And Pool Complexes (40 CFR 230.45)

Steep gradient sections of streams are sometimes characterized by riffle and pool complexes. Such stream sections are recognizable by their hydraulic characteristics.

There are no riffle and pool complexes located in the proposed project area.

D2.5 POTENTIAL EFFECTS ON HUMAN USE CHARACTERISTICS (40 CFR 23, Subpart F)

D2.5.1 Municipal and Private Water Supplies (40 CFR 230.50)

Municipal and private water supplies consist of surface or groundwater that is directed to the intake of a municipal or private water supply system.

There are no municipal or private water supplies in the proposed project area.

D2.5.2 Recreational and Commercial Fisheries (40 CFR 230.51)

Recreational and commercial fisheries consist of harvestable fish and other aquatic organisms used by man.

The discharge of dredged or fill material can affect the suitability of recreational and commercial fishing grounds as habitat for populations of consumable aquatic organisms.

There are no commercial fisheries currently operating within the proposed project area.

Recreational fishing within the project area occurs predominately opportunistically by people in the area, primarily for recreational purposes such as big game hunting or float trips. As of 2012, there were no commercial sport fishing recreation permit requests or authorizations for the area (BLM 2012 NPR-A IAP/EIS § 3.4.6.1). No specific use numbers for sport fishing are available for the project area. Fish species sought by visitors include the Arctic char, Arctic grayling, lake trout, northern pike, whitefish, and various species of salmon. The majority of recreational fishing takes place in non-winter months.

The proposed project would result in minimal impacts to recreational fishing during construction, drilling, and operations (GMT2 Final Supplemental EIS Section 4.4.4.3).

With proposed design features, the project would comply with this section of the guidelines.

D2.5.3 Water-Related Recreation (40 CFR 230.52)

Water-related recreation encompasses activities undertaken for amusement and relaxation. The activities include consumptive and non-consumptive uses.

Public recreational use in the project area is low intensity and primarily represented by non-local visitors who float the Colville River between Umiat and Nuiqsut (BLM 2018 § 4.4.4.3, p. 410). The project area offers opportunity, but limited access, for primitive unconfined recreation, including backpacking and hiking, wildlife viewing, hunting, fishing, and boating. No federal, state, or NSB public recreational facilities exist in the project area, and the lack of a developed public road system into or through the area limits recreational access almost exclusively to charter aircraft during summer or snowmachine/dog sled during winter. In 2010, there were 10 special recreational permit holders authorized to conduct backpacking, hiking, boating, and other recreational activities within the larger NPR-A area (BLM 2012 NPR-A IAP/EIS § 3.4.6.).

Potential effects of the proposed project on water-related recreation include the loss of area available for recreational activities and the loss of opportunities to experience wilderness-like values such as naturalness and solitude through changes in noise, visual aesthetics, dust, or odor. During winter construction for fill placement, the activity and noise would make the project more conspicuous for recreationists. Long-term effects of project operation are expected to be greatest within 1 mile of gravel roads and 2 miles of the production pad, due to the presence of permanent facilities and associated noise (USACE 2015 GMT1 ROD § 5.6.3).

The proposed project complies with this factor of the Guidelines.

D2.5.4 Aesthetics (40 CFR 230.53)

Aesthetics associated with the aquatic ecosystem consist of the perception of beauty by one or a combination of the senses of sight, hearing, touch, and smell. Aesthetics of aquatic ecosystems apply to the quality of life enjoyed by the general public and property owners (GMT2 Final Supplemental EIS, Section 5.6.4).

The discharge of dredged or fill material can mar the beauty of natural aquatic ecosystems by degrading or destroying vital elements that contribute to the compositional harmony or unity, visual distinctiveness, or diversity of an area, including property values (GMT2 Final Supplemental EIS, Section 5.6.4).

Visual Resource Management (VRM) classes have been assigned to lands within the NPR-A, with the exception of village-owned lands. The project area falls within VRM Class IV, or private land. VRM Class IV is the least restrictive visual classification, allowing high relative change to the existing visual character of the area. Developments in VRM IV may attract attention and dominate the view but are still mitigated (GMT2 Final Supplemental EIS, Section 4.4.4.6).

Construction and operation of the proposed project would result in moderate effects to visual resources. Construction activities such as gravel placement would have minor impact on visual resources, as most construction activities would occur in winter when snow and darkness make viewing these activities difficult, and few people other than the workforce are expected to view construction activities, except in a transient way (GMT2 Final Supplemental EIS, Section 4.4.4.6).

The aesthetics impact of the fill material and associated structures would be permanent. During drilling, the presence of drill rigs during summer would create a moderate contrast against the surrounding landscape at a distance of 5 miles or less by introducing vertical lines. Once production facilities (e.g., well houses, miscellaneous buildings) are in place, they would provide a strong contrast with the natural landscape (including color). Most buildings would be less than three stories high. Communication towers would be much taller than the buildings, at up to 200 feet high, introducing vertical lines into the landscape.

With applicant design features, including construction timing, the proposed project would comply with this factor of the Guidelines.

D2.5.5 Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves (40 CFR 230.54)

Parks, national and historic monuments, national seashores, wilderness areas, research sites, and similar preserves consist of areas designated under federal or state laws or local ordinances to be managed for their aesthetic, educational, historical, recreational, or scientific value.

There are no designated or proposed Wild and Scenic Rivers located within the GMT2 Development Project area. The proposed project would not be located within or near any federally designated wilderness areas, federal lands previously designated for Special Areas, or Land Use Emphasis areas.

There are no parks, national and historic monuments, national seashores, wilderness areas, research sites, or similar preserves in the proposed project area.

With proposed design features and inclusion of special conditions, the project would comply with this section of the guidelines.

D2.6 EVALUATION AND TESTING (40 CFR 230, SUBPART G)

General Evaluation of Dredged or Fill Material (40 CFR 230.60)

To determine if additional chemical or biological testing is required, available information regarding the source of the proposed dredged and fill material, including prior evaluations, chemical and biological tests, scientific research, and past experience must be considered. The following information was considered in evaluating the potential presence and biological availability of contaminants in the proposed fill material.

The Applicant's proposed source for fill material is the ASRC Mine Site, located about 4.5 miles east-northeast of Nuiqsut, Alaska. The ASRC Mine Site is an existing commercial gravel source located on the East Channel of the Colville River, and has been evaluated and permitted previously (POA-1996-869-M11). The mine site vicinity and watershed are not known to be contaminated with chemical or naturally occurring pollutants. The watershed is largely undeveloped and pristine in character and is removed from sources of pollution to provide reasonable assurance that the material is not a carrier of contaminants (USACE 2015 GMT1 ROD § 5.7.1,).

Physical characteristics of materials. The ASRC Mine Site contains mineral alluvium ranging from gravelly sand to sandy gravel to with inter-bedded discontinuous layers of silt. The coarseness of the site's mineral material lends it to be less susceptible to retaining chemical, biological, or other pollutants, as compared to organic and/or finer-grained materials. Gravel fill material proposed for placement would be "pit run" or in raw form and not screened, crushed, or graded by material size particle. Gravel used for construction would be selected by visual and on-site testing and be clean material, free of ice and snow concentrations, overburden, clay or silt seams, and organic matter. The desired silt/clay fraction in the gravel is 15 percent; however, actual pit run gravel would be used and may vary from this specification (USACE 2015 GMT1 ROD § 5.7.1)

Federal, state, and local records indicating significant introduction of pollutants. Inside the NPR-A, hazardous and solid waste locations, including landfills, reserve pits, formerly used defense sites, and privately owned sites, have been identified and mapped. No hazardous and solid waste locations are located near the proposed fill sources. Sites with potential for hazardous materials and solid waste inside and outside the NPR-A (e.g., Nuiqsut community sources, winter travel routes, recreational trails, and oil and gas exploration sites) are described by the BLM (GMT2 Final Supplemental EIS, Section 3.1.3).

Based upon this information, there is no reason to believe the proposed fill material would contain contaminants, and the project would comply with this factor of the Guidelines.

D2.6.1 Chemical, Biological, and Physical Evaluation and Testing (40 CFR 230.61)

The fill material has been excluded from the evaluation procedures of this section based on general evaluation in section D2.6 above, which concludes that it would not be expected to contain contaminants.

With proposed design features and inclusion of special conditions, the project would comply with this section of the guidelines.

D2.7 ACTIONS TO MINIMIZE ADVERSE EFFECTS (40 CFR 230, Subpart H)

The applicant has implemented mitigation measures to avoid and minimize impacts from the project, as detailed in ConocoPhillips 2017 (Attachment C, Applicant Proposed Mitigation Statements, and Attachment D, Avoidance, Minimization, and Mitigation Measures Table).

The proposed project would avoid impacts to WOUS, including wetlands by site design and selection, facility relocation, use of existing infrastructure, use and construction of ice roads and pads as opposed to additional permanent fill, winter construction activities, avoiding river crossings, installing culverts to minimize the chance of standing water, and the avoidance of adding treatment substances to discharged gravel material.

The proposed project would minimize impacts to WOUS, including wetlands, by designing the proposed access road connecting GMT1 and GMT2 to maintain the hydrologic flow, using machinery and equipment techniques that minimize wetlands impacts, implementing erosion control procedures through design and spill prevention and response planning.

With proposed design features and inclusion of special conditions, the project would comply with this section of the guidelines.

D2.7.1 Actions concerning the Location of the Discharge (40 CFR 230.70)

The effects of the discharge can be minimized by choosing placement sites that minimize smothering of aquatic organisms; by avoiding disruption of periodic water inundation patterns; by minimizing or preventing the creation of standing water in areas of normal fluctuation water levels; and by minimizing or preventing the drainage of areas subject to such fluctuations. Efforts to minimize and avoid discharge impacts are addressed by mitigation measure 16 in ConocoPhillips 2017 (Avoidance, Minimization, and Mitigation Measures Table).

Under the proposed project, a total of 674,300 cubic yards of clean fill material would be placed into approximately 78 acres of WOUS. The sites for placement of fill would include the GMT2 drill site pad, a gravel access road with vehicle pullouts, and the sand slurry mixture for VSM installations. Additional details regarding the size and volume of fill by site are discussed above.

The placement sites for construction of the project have been chosen by surveying the topography, water drainages, and surface waters to avoid and minimize the effects of the fill material, including smothering of aquatic organisms. The route of the access road, location of the drill site pad, and culverts have been designed to minimize creation of standing waters and drainage of areas subject to water fluctuation (ConocoPhillips 2017: Avoidance, Minimization, and Mitigation Measures Table and Applicant Proposed Mitigation Statement).

The proposed project would comply with this factor of the Guidelines.

D2.7.2 Actions Concerning the Material to be Discharged (40 CFR 230.71)

The effects of a discharge can be minimized by the treatment of, or limitations on, the material itself and the methods used to reduce the availability of pollutants.

The general characteristics of proposed fill material are described above. Discharge of the sand and gravel fill material would occur during winter when the material is frozen, and the material would not be subject to movements until thaw season, when it would dewater and settle. Some erosion protection would be necessary to prevent runoff and siltation of finer components, especially in or near lotic and lentic waters, before breakup. The Alpine Facilities Erosion Control Plan has been updated to include GMT2, and outlines erosion control methods and procedures to minimize impacts to the aquatic environment. Alpine's Storm Water Pollution and Prevention Plan would be amended to include the GMT2 Development Project.

The project is designed to avoid adding treatment substances to the discharge materials collected from the ASRC Mine Site (ConocoPhillips 2017: Attachment D, Avoidance, Minimization, and Mitigation Measures Table).

With applicant design features and inclusion of special conditions, the proposed project would comply with this factor of the Guidelines.

D2.7.3 Actions Controlling the Material after Discharge (40 CFR 230.72)

The effects of the discharge of dredged or fill material may be controlled by selecting methods and sites where the potential for erosion, slumping, or leaching of material into the surrounding aquatic ecosystem would be reduced; maintaining and containing discharged materials; and timing the discharge to minimize impacts to aquatic resources. The selection of the fill material discharge sites is addressed above.

Fill would be placed during frozen winter conditions, using large side-dump trucks accessed by seasonal ice roads. Gravel roads and pads would be watered, as necessary, to minimize dust impacts on the vegetation and maintain the roads. Temporary erosion protection would be placed before breakup, following the first construction season, to provide protection from a flood event. The temporary erosion protection would be replaced with permanent erosion protection once the gravel has been allowed to settle and drain (GMT2 Final Supplemental EIS, Section 2.4.9). The Alpine Facilities Erosion Control Plan has been updated to include GMT2, and outlines erosion control methods and procedures to minimize impacts to the aquatic environment. Alpine's Storm Water Pollution and Prevention Plan would be amended to include GMT2.

With applicant design features and inclusion of special conditions, the proposed project would comply with this factor of the Guidelines.

D2.7.4 Actions Affecting the Method of Dispersion (40 CFR 230.73)

There are no proposed discharges of dredged or fill materials into open waterbodies where materials would be dispersed into open water columns or fine materials could migrate any substantial distance. All fill would be placed during winter frozen conditions. Discharges into ponds or flooded wetlands where the VSM piles would be placed would be solid frozen soils and ice. Excess material from auguring the VSM pile holes would be removed and disposed of at an off-site upland location.

With applicant design features and inclusion of special conditions, the proposed project would comply with this factor of the Guidelines.

D2.7.5 Actions Related to Technology (40 CFR 230.74)

Discharges of dredged or fill material should be adapted to the needs of each site and sufficiently minimize adverse environmental impacts by use of appropriate equipment and machinery, maintenance, techniques, and design of roads and channel-spanning structures and culverts, and by methods of transport of the material to be discharged.

The proposed project includes standard North Slope construction methods and machinery to transport, discharge, and spread the fill material in a manner that minimizes impacts to the aquatic environment. The design has been adapted to the needs of the fill sites to be minimized. Winter ice roads would be constructed parallel to an authorized surveyed road alignment, and frozen material would be dumped and spread with machinery designed to not disturb tundra waters and wetlands. Culverts are designed to pass stream flow and overland cross drainage in appropriate locations. Final cross-drainage culvert locations would be determined more precisely through field work, to better locate low-drainage areas.

Design and techniques to avoid and minimize impacts are found in ConocoPhillips 2017 (Applicant Proposed Mitigation Statements, Avoidance, Minimization, and Mitigation Measures).

The proposed action uses best available technology, methods, maintenance, techniques, and timing to minimize adverse impacts caused to the aquatic environment. With inclusion of these measures and special conditions, the project complies with this factor of the Guidelines.

D2.7.6 Actions Affecting Plant and Animal Populations (40 CFR 230.75)

Minimization of adverse effects of discharges on populations of plants and animals can be achieved by avoiding changes in water currents and circulation patterns; selecting and managing discharge sites; avoiding unique habitats; and timing discharges to avoid biologically critical time periods.

The proposed project includes measures to avoid or minimize impacts to aquatic flora and fauna by using existing infrastructure and reducing the size of fill areas and pipeline length. Wildlife surveys and habitat analyses, including aquatic site assessments, were used to identify and avoid sensitive fish and wildlife and unique habitats. Measures have been incorporated into the design and would be incorporated into construction elements to prevent or reduce erosion, slumping, runoff, and dust generation from fill areas. These can be found in ConocoPhillips 2017 (Applicant Proposed Mitigation Statements and the Avoidance, Minimization, and Mitigation Measures Table).

With inclusion of these measures and special conditions, the project complies with this factor of the Guidelines.

D2.7.7 Actions Affecting Human Use (40 CFR 230.76)

Minimization of adverse effects on human use potential may be achieved by preventing damage to aesthetically pleasing features of the aquatic viewscapes; avoiding the more important aquatic areas; timing discharges to minimize adverse impacts to human use periods; and selecting sites to be compatible with human activities. Human use includes public water supplies, water recreation, and aesthetics associated with the aquatic ecosystem. The GMT1–GMT2 Access Road would connect with the CD5 Road, which connects to the Nuiqsut Spur Road, allowing residents to travel further into the NPR-A for subsistence hunting and fishing (GMT2 Final Supplemental EIS, Section 4.4.4.2). Nuiqsut residents would be authorized to travel subject to coordination rules that provide for the safety of all users.

The proposed project would be constructed along several aesthetically pleasing aquatic areas, including ponds, lakes, creeks, a river, and highly complex water and wetland vegetated sites. The proposed project would minimize adverse impacts to human use, to the extent practicable, by locating fill areas away from open waters. Preventive measures to avoid unnecessary ground disturbances and water pollution would protect the natural aesthetics of the project area. Lighting impacts would be reduced by using low-intensity lighting and shading externally facing building windows (GMT2 Final Supplemental EIS, Section 4.4.4.6).

Mitigation measures to reduce impacts to recreational fishing and subsistence activities include measures to minimize impacts to fish and fish habitats, and to minimize noise. Facilities have been designed to minimize development and reduce impacts to drainage patterns, reduce impacts to higher value aquatic resources, and minimize disruption of caribou movement to protect recreational uses (GMT2 Final Supplemental EIS, Section 4.4.4.3).

With inclusion of these measures, the proposed project complies with this factor of the Guidelines.

D2.7.8 Other Actions (40 CFR 230.77)

This section includes actions to control runoff of water from fill areas and other discharges from activities to be conducted on the fill areas.

The proposed project involves primarily linear impacts from construction of an access road where water runoff would be limited to each side of the narrow road fill. The largest fill area would be the drill site where other pollutants would be used in construction, drilling, equipment and vehicle operations, and maintenance operations. The activities and materials used for the project would be regulated by the State of Alaska for pollution prevention and control during drilling for hydrocarbons and production, as well as pipeline maintenance and operation, which would minimize the potential to pollute the fill or runoff to adjacent water and wetland areas.

With inclusion of these measures, the proposed project complies with this factor of the Guidelines.

Attachment D3

GENERAL POLICIES FOR EVALUATING PERMIT APPLICATIONS (33 CFR 320.4)

The analysis of impacts on the physical, chemical, human, and biological environment is contained in BLM's GMT2 Final Supplemental EIS. The NEPA review of project impacts in the GMT2 Final Supplemental EIS also covers many public interest factors.

D3. PUBLIC INTEREST REVIEW (33 CFR 320.4(a)(1))

The decision of whether to issue a permit will be based on an evaluation of the probable impacts, including cumulative impacts, of the proposed activity and its intended use on the public interest. The relevant factors are discussed below.

D3.1 Conservation

Federal laws, EOs, and agency regulations and policy guidance frequently address the need for conservation of natural resources. The USACE Regulatory Program, by authority, is focused on conservation of waters of the U.S., including wetlands. Responsibilities and evaluations for DA permit evaluation must include direct and indirect impacts caused by the authorized project. This can include many other natural resources. This action would result in negligible impacts to waters and wetlands, fish and wildlife, vegetation, soils, air, land, minerals, subsistence plants and animals, and hydrocarbons.

Conservation of natural resources is addressed in the following sections of this Attachment: cultural resources in section D3.6, fish and wildlife resources in section D3.7, water and water supply in section D3.14, energy in section D3.16, and minerals in section D3.19.

D3.2 Economics

Although it is presumed, under the Corps' permit regulations, that a private enterprise's proposal is economically viable when a private enterprise makes an application for a DA permit, the district engineer may make an independent review of the need for the project from the perspective of the overall public interest. In this instance, facility construction and drilling are expected to cost approximately $1.5 billion. These expenditures would increase economic activity at a state, borough, and local level to varying degrees. The overall effect on the economies is expected to be relatively minor. Development of the GMT2 facility would create temporary jobs during construction. The peak workforce during each winter construction period for the proposed project is estimated at 700. The proposed project could have an indirect positive effect on local area employment through increased NSB and city tax revenues. It would also have a positive indirect effect through increased Kuukpik Corporation or ASRC dividends from increased revenues from project-related construction contracts, land use agreements, and royalties. Taxes and royalties from oil sales, state corporate income taxes, property taxes, bed taxes, and other fees would benefit the City of Nuiqsut, NSB, the State of Alaska, and Native corporations. The City of Nuiqsut is projected to benefit from increased bed tax revenue resulting from higher hotel occupancy during construction and operation phases of the proposed project. The State of Alaska receives lease sale revenues, royalties, and other revenues from oil production in the NPR-A. The State of Alaska and the NSB would receive property tax payments based on the assessed value of taxable oil infrastructure facilities estimated at approximately. Economic and sociocultural effects of past and present oil and gas activities have been both positive and negative. Completion of the Nuiqsut Spur Road would allow residents of Nuiqsut to travel via road to employment opportunities at Alpine or GMT1 and provide residents with improved access to subsistence resources. Further development within the Alpine Field, GMT1, and GMT2 would increase revenues for Kuukpik as a result of land use agreements and would benefit ASRC through oil and gas royalties.

The proposed action would have beneficial effects on the Village, Borough, and State economies and employment opportunities.

D3.3 Aesthetics

Based on the analysis described in section 3.4.5.3 of the GMT2 Final Supplemental EIS, and with consideration for actions taken to minimize impacts, BLM determined that negative impacts to aesthetics would be moderate. Noticeable disturbances to visual resources in the aesthetic viewshed would likely be seen up to 2.5 miles from project developments (BLM 2018 § 4.4.4.6).

Based on the analysis described in section 3.4.5.3 of the GMT2 Final Supplemental EIS, and with consideration for actions taken to minimize impacts, it is determined that impacts to aesthetics would be negligible.

D3.4 General Environmental Concerns

Concerns that may be addressed under "general environmental concerns" include those not addressed in other sections of this document, such as subsistence, climate change, general health, air quality, noise, and prime and unique farmland and are addressed below:

D3.4.1 SUBSISTENCE

Primary impacts to subsistence and traditional use activities in the community of Nuiqsut include reducing the availability of subsistence resources, changing access to subsistence use areas (both positive and negative effects), hunter avoidance of industrial areas, and reducing overall community participation in subsistence activities.

These impacts could result in: increased investments in time, money, fuel, and equipment required to obtain subsistence resources; changes in hunting success; and changes in community cohesion. Access to subsistence harvest areas by road increases accessibility to some areas and may result in reduced investment costs to obtain some subsistence resources. Negative effects could also occur as a result of an oil spill depending upon the size and location of the spill.

Nuiqsut residents would experience direct impacts to subsistence use areas, particularly areas used for harvesting caribou, geese, and furbearers. Project construction would result in the direct loss of subsistence use areas. The access road would be used by subsistence hunters and pullouts for safety and parking would be provided. Some impacts to winter fishing activities may also occur. Subsistence harvesters often avoid areas of development due to concerns about contamination and discomfort with hunting near human or industrial activity. However, the proposed project would also provide beneficial effects by increased year-round access to subsistence resource areas.

Subsistence activities play a very important role in the sociocultural environment of Nuiqsut. Adverse impacts to specific subsistence resources are important in context and a high concern to the local residents who rely on these resources for food supplies.

Subsistence mitigation measures have been included in the design, construction, and operation of the proposed project to reduce impacts to subsistence resources and resource availability. Impacts to subsistence activities and resources are mitigated also through the BLM stipulations and BMPs. The applicant has also developed processes to consult with subsistence users on daily planned oil and gas activities to avoid interference with subsistence activities.

Adverse impacts to subsistence resources and harvesters would be largest during the construction phase, particularly during the winter within the linear project areas. Summer construction activities at the culvert locations and drillsite would also affect subsistence resources and harvesters. Disturbances to fish and wildlife resources and harvesters would then diminish with the transition from construction to operations when traffic, noise, and construction activities are less. Access to subsistence hunting areas by Nuiqsut residents would increase with all-season roads provided by the applicant's GMT1 to GMT2 Access Road.

More specific analysis is provided in Section 4.4.5 of the GMT2 Final Supplemental EIS. Based on this information impacts to subsistence activities are believed to be neutral.

D3.4.2 CLIMATE CHANGE

The proposed activities within the Corps federal control and responsibility likely will result in a negligible release of greenhouse gases into the atmosphere when compared to global greenhouse gas emissions. Greenhouse gas emissions have been shown to contribute to climate change. Aquatic resources can be sources and/or sinks of greenhouse gases. For instance, some aquatic resources sequester carbon dioxide whereas others release methane; therefore, authorized impacts to aquatic resources can result in either an increase or decrease in atmospheric greenhouse gas. These impacts are considered de minimis. Greenhouse gas emissions associated with the Corps federal action may also occur from the combustion of fossil fuels associated with the operation of construction equipment, increases in traffic, etc. The Corps has no authority to regulate emissions that result from the combustion of fossil fuels. These are subject to federal regulations under the Clean Air Act and/or the Corporate Average Fuel Economy (CAFE) Program. Greenhouse gas emissions from the Corps action have been weighed against national goals of energy independence, national security, and economic development and determined not contrary to the public interest.

D3.4.3 GENERAL HEALTH

Rapid modernization has led to significant changes in diet, housing, employment, and traditional culture of North Slope communities (BLM 2018 § 4.6.8.10). This has led to both positive and negative health changes. Positive health changes include an increase in life expectancy, a decrease in infant mortality and infectious disease rates, and improvements in health care services, public health programs, and municipal health infrastructure such as sanitation and water treatment facilities (BLM 2018 § 4.6.8.10). This same transition has also led to negative health outcomes, including increases in chronic diseases such as cancer, cardiovascular disease, and metabolic disorders, and increases in alcohol and substance misuse, suicide, violence, and other social dysfunctions (BLM 2018 § 4.6.8.10).

Health-related air quality concerns in rural Alaska villages include diesel emissions, indoor air quality, road dust, solid waste burning, and wood smoke. Residents in the NSB have also expressed concern about air pollution generated by nearby oil and gas extraction activities (BLM 2018 § 3.4.7.1). Air pollution assessments have found pollutants in the vicinity of Nuiqsut to be below National Ambient Air Quality Standards ([NAAQS]; BLM 2018 § 3.4.7.1), and air monitoring data are not available to support claims that industrial development from oil and gas is contributing to air quality concerns. Instances of asthma and cancer are lower in North Slope communities than the statewide average (BLM 2018 § 3.4.7.1), despite higher rates of cigarette and smokeless tobacco use. Food security is of large concern to North Slope communities. While some communities report high rates of food insecurity, Nuiqsut is one of the most food-secure communities on the North Slope (BLM 2018 § 3.4.7).

Direct and indirect impacts of oil and gas development on public health could include potential changes in diet and nutrition from the introduction of commercial food products, environmental exposures, infectious diseases due to an influx of non-local workers, safety, acculturative stresses, economic impacts, and changes in the capacity of local health care services (BLM 2018 § 4.4.6.1).

D3.4.4 AIR QUALITY

The proposed GMT2 Development Project will require air permits from the ADEC. The NPR-A is designated as unclassified under NAAQS and Alaska Ambient Air Quality Standards (AAAQS); however, the area is assumed to be in attainment including attainment of the particulate matter (PM) standards. Air quality is generally good, due to the few sources of both man-made and naturally occurring emissions and the dispersion by prevailing winds. West of the Colville River, existing emission sources include diesel fired generators, engines, heaters and vehicle traffic in Nuiqsut. The majority of housing in Nuiqsut is heated by natural gas and the primary power source is natural gas fired. Arctic haze generated in Europe and Russia is periodically observed. The applicant has collected criteria pollutant ambient monitoring data in Nuiqsut since 1999. This data was reviewed as needed by ADEC to support Alpine-related permitting.

Construction emissions would consist of fuel combustion related to heavy equipment used in site preparation and construction, smaller support equipment (such as heaters), and fugitive dust sources. Drilling emissions would run concurrently with a portion of the construction phase. During and after construction, electric power would be provided to the site from existing, off-site generation, which would limit total project site emissions.

Operational emissions would be low as few permanent stationary source emission units are proposed for installation after the completion of construction. Ongoing emissions would include a heater, fugitive dust from vehicle travel to transport workers and materials to the site, and minor fugitive emission of field gas from equipment and pipeline components. Production activities would also include periodic well interventions and potential well infill drilling which would require fuel fired heaters, boilers, engines, temporary storage tanks for flow back fluids, and additional mobile sources.

Detailed analysis of Air Quality can be found in Section 4.2.3.2 of the GMT2 Final Supplemental EIS.

The Corps finds that the effects of the project would be neutral.

D3.4.5 NOISE

Noise in the project area is described in terms of potential effects as unwanted sound resulting from project-related activities. Noise disturbance would result from two principal noise-generating sources: stationary and mobile activities. The acoustical environment is also subject to natural sounds caused by wildlife, wind, human activities, and flowing water (BLM 2018 § 3.2.3.6).

Equipment operation for drilling and construction would contribute to increased levels of noise in the project area. The proposed GMT2 Development Project area is remote and sparsely populated, with few anthropogenic-derived sources of noise (USACE 2015). Proposed GMT2 Development Project activities, in addition to construction at GMT1, may result in temporary impacts to ambient noise levels in the project area.

Noise levels are anticipated to be consistent with other North Slope oil production facilities once production and development operations commence. As noted in BLM (2018 § 3.2.3.6,), human-caused noise emissions were attributable primarily to aircraft during 2016 field studies.

Based on these effects, and with consideration for actions taken to minimize impacts, overall impacts to noise are anticipated to be negligible. These impacts are within the range described and incorporated by reference in BLM (2004 § 4.2.3.3). Overall impacts to noise are anticipated to be minor. A summary of noise generated by the construction, drilling, and operation of the proposed project is provided in BLM (2018 § 4.2.3.3).

D3.4.6 PRIME AND UNIQUE FARMLAND

Federal agencies must consider adverse effects of their programs on the preservation of farmland and consider alternative actions, as appropriate, that could lessen such adverse effects. Based on information published by the Natural Resources Conservation Service, there are no designated prime and unique farmlands in the State of Alaska. The proposed project would have no adverse effects on prime and unique farmlands.

D3.5 Wetlands

The proposed project would involve placement of permanent fill in approximately 78 acres of wetlands. Descriptions and effects of this fill are discussed in Section D.4.2. With project design and permit conditions, the Corps finds that the effects of the project would be neutral.

D3.6 Historic Properties

There are no known historic properties, Alaska Heritage Resources Survey sites, or Traditional Land Use Inventory sites within the direct area of potential effect of the proposed project. Three Traditional Land Use Inventory sites are located within the 2.5-mile buffer, but are unlikely to experience any substantial or prolonged disturbance. Two more Traditional Land Use Inventory sites are located at the far northwestern margin of the 5-mile buffer and would experience minor, local, temporary noise and visual impacts (BLM 2018 § 4.6.8.1, p. 511).

The GMT2 Final Supplemental EIS analysis resulted in a determination of “No Historic Properties Affected” (36 CFR 800.4[d][1]) under Section 106 of the NHPA.

D3.7 Fish And Wildlife Values (33 CFR 320.4 (c))

Potential impacts by the proposed project on fish and wildlife values are discussed in sections D2.3.1, D2.3.2 and D2.3.3.

The Corps finds that the project would not have adverse effects on fish and wildlife values.

D3.8 Flood Hazards (33 CFR 320.4 (a)(1))

There are no streams along the GMT2 proposed road and pipeline corridor. There are no new stream or river crossings proposed for the GMT2 Development Project, although smaller, seasonally flooded areas would be crossed. The road is designed to maintain existing hydrology during flood periods. There are no human settlements or infrastructure within the potential upstream inundation area for the proposed project (BLM 2018, Map 4.2-2).

With the project location outside of open water, project design to maintain natural drainage patterns and permit special conditions, the Corps finds that the effects of the project would be neutral.

D3.9 Floodplain Values

There are floodplain values associated with the proposed actions. The land form and topography of project area is a coastal plain with very low reliefs. The project area's floodplain's most important value is for accommodating the passage of high water flows, and rehydration of wetlands, ponds, and lakes.

With the proper positioning and maintenance of culverts, floodplain values would remain much the same and impacts would be minor.

With the project location outside of open water, project design to maintain natural drainage patterns and permit special conditions, the Corps finds that the effects of the project would be neutral.

D3.10 Land Use

The proposed GMT2 drill site, road, and pipeline corridors are located on federal land and private land held by Kuukpik within the northeastern portion of the NPR-A (BLM 2018 § 3.4.5). The northern portion of the pipeline corridor between CD1 and CD4N is on land owned by the State of Alaska and managed by the Alaska Department of Natural Resources. Kuukpik owns land along the southern portion of the pipeline corridor between CD1 and CD4N and from CD4N to CD5 (BLM 2018 § 4.1.1).

The NPRPA encourages oil and gas leasing in the NPR-A while requiring protection of important surface resources and uses (BLM 2018 § 1.3). The NSB would manage the rezoning process to declare the project area a Resource Development District via a Master Plan. Land owned by Kuukpik is designated for mixed use, including the oil and gas production facilities associated with the Alpine Field (BLM 2014 § 4.4.4). Each non-federal landowner has its own permitting or approval processes that provide for resource development and associated infrastructure development to be recognized as a land use for the site while also being protective of the overall environment and other potential surface use by local residents and wildlife. All future resource development land use would be subject to the permits and approvals process with federal, state, and local authorities.

With project design and permit special conditions, the Corps finds that the effects of the project would be neutral.

D3.11 Navigation

No navigable water ways exist within the project area. No crossing of potentially navigable streams or rivers are proposed for the GMT2 Development Project (BLM 2018 § 2.5.4.1).

D3.12 Shore Erosion and Accretion

Marine waters do not occur in the project area, and no direct impacts to the physical conditions or the processes within the estuarine or nearshore environments are expected. The project area is located more than 5 miles inland from the Beaufort Sea. Shoreline erosion and accretion in the project vicinity may occur on relatively small, shallow, inland freshwater ponds and lakes from windstorms. The proposed GMT2 Development Project would not impact these waters.

D3.13 Recreation

Public recreational use in the project study area is low intensity and primarily limited to non-local visitors (BLM 2018 § 4.6.8.5) Public access to the project area is limited to those who access the community of Nuiqsut by aircraft landing at the Native Village of Nuiqsut airport or small, fixed-wing aircraft that can land on the tundra, and there are no developed recreation facilities within the NPR-A (BLM 2018

§ 3.4.5.2). Activities that do not interfere with the NPR-A's purpose are permitted by the BLM under special recreation permits. The identified locations for the GMT1–GMT2 pipeline and GMT2 pad are on wholly undeveloped land.

Water-related recreation in the vicinity is low intensity and primarily represented by non-local visitors that float the Colville River between Umiat and Nuiqsut (BLM 2018 § 4.4.4.3). Potential effects of the proposed GMT2 Development Project on water-related recreation include the loss of area available for recreational activities and the loss of opportunities to experience wilderness-like values such as naturalness and solitude through changes in noise, visual aesthetics, dust, or odor. However, the project is not within a federally designated wilderness area, is not adjacent to an existing wilderness area, and does not include lands recommended for wilderness designation (BLM 2018 § 4.4.4.5). During winter construction for fill placement, the activity and noise would make the project more conspicuous for recreationists. Impacts to water-related recreation would be negligible. There are no designated or proposed Wild and Scenic Rivers located in the GMT2 Development Project area (BLM 2018 § 3.4.5.2).

Refer to section D2.5.2 above for discussion regarding recreational fishing.

The Corps finds that the project would have negligible effects on recreation.

D3.14 Water Supply and Conservation

Water supply for the proposed GMT2 Development Project would come from local surface waters sourced during construction, drilling, and production. Ice chips and freshwater for construction would come from local lakes as permitted by State of Alaska regulatory agencies, primarily within the NPR-A. Water for ice road and pad construction, drilling, and potable water would be withdrawn from lakes in the vicinity of the project area as authorized with state temporary water use authorizations and state fish habitat permits. Large quantities of water for construction of ice roads and pads would be needed for winter construction. Drilling and operations would also require large quantities of fresh water.

Construction (including construction and maintenance of ice roads and pads, and camp water usage) would occur over either two or three ice road construction seasons. The two-year schedule would require approximately 122.7 million gallons (MG) of fresh water in Year 1 and 116.3 MG in Year 2. The three-year schedule would require approximately 65.8 MG of fresh water in Year 0, 61.6 MG in Year 1, and 116.3 MG in Year 2. Drilling (including drilling needs, camp support, and miscellaneous requirements) would require approximately 19.8 MG per year, totaling 140.6 MG over 7.1 drilling years. Post-construction operations (for a 2-acre ice pad every year after first oil) would require 0.5 MG per year, totaling 15 MG over 30 operation years. The approximate total water usage of the proposed project would be 395 MG for a two-year ice road construction schedule, or 400 MG for a three-year schedule.

Freshwater would be required for domestic use at remote construction camps as well as for construction and maintenance of ice roads and pads. Potable water requirements are based on a demand of 100 gallons per day per person (estimated up to 100 people at a remote camp), totaling approximately 10,000 gallons per day during construction seasons. Freshwater may be used for hydrostatic testing.

The water use during the road and pipeline construction and drilling would put large demands on local freshwater sources. After completion of drilling, when full operations begin, the freshwater demand from local lakes would substantially reduce. When the pipeline is operational, produced water from the ACF would be delivered to the GMT2 drill site for use. Water withdrawals are regulated by the State of Alaska, limiting the amount of water removed from each withdrawal location so as to not adversely impact the resource. Ice chips are used from lake surfaces and water pumped from below the lake surface. The withdrawal areas would be recharged each year at breakup flooding periods.

The Corps finds that the project would have no adverse effects on water supply and conservation.

D3.15 Water Quality

Potential impacts to water quality are discussed in sections D2 1.1.2, D2 1.2.4, and D2 1.2.8 above.

With conditions on fill placement, containment, and indirect impacts caused by runoff siltation, dust, snow removal operations, and gravel spray from vehicle use, water quality would be maintained.

The Alaska Department of Environmental Quality issued water quality certification on September 11, 2018.

With the project location outside of open water, project design to maintain natural drainage patterns and permit special conditions, the Corps finds that the effects of the project would be neutral.

D3.16 Energy Conservation and Development

The proposed project would require large amounts of fuel for the first 2 years of construction during gravel fill and pipeline infrastructure placement. Fuel is necessary to operate vehicles and heavy machinery, as well as aircraft, electric generators, and other equipment. As construction ends, less fuel is anticipated for drilling and operations needs. Drilling would require more fuel than the production phase, and small amounts of fuel would be needed to transport personnel for operations and maintenance work during the production phase (USACE 2015). Energy needs of the proposed GMT2 Development Project would be powered via the existing Alpine electrical power system, using power lines suspended from pipeline horizontal support members via messenger cable. The on-site drill rig would be fueled by ultra-low sulfur diesel until a permanent GMT2 power supply is commissioned.

The NPRPA directs the U.S. Department of the Interior to undertake "an expeditious program of competitive leasing of oil and gas" in the NPR-A. The GMT2 Development Project helps satisfy the purpose to develop oil and gas resources in the NPR-A. The GMT2 Development Project would produce three-phase hydrocarbons (oil, gas, and water) that would be carried by pipeline to the ACF at CD1. Sales-quality crude oil produced would be transported from CD1 via the existing Alpine Sales Oil Pipeline and Kuparuk Pipeline to the Trans-Alaska Pipeline for shipment to market (BLM 2018 § 1.3).

Development and production of hydrocarbons from GMT2 would produce resources needed to help meet U.S. domestic energy demand. Development would also help offset declines in production from the Alaska North Slope, as well as providing other economic benefits (BLM 2018 § 1.3). The amount of fuel consumed for the proposed project is not expected to cause shortages to local or regional communities (USACE 2015).

Crude oil from ancient geologic formations underground would be produced by the proposed project for business profits for approximately 30 years to supply the U.S. domestic raw hydrocarbon market. Crude oil energy resources would not be conserved but would be extracted by the latest technological methods to obtain all recoverable oil. No energy conservation of crude oil would occur. Substantial quantities of energy resources would be developed.

The Corps finds that the project would have a beneficial effect on energy conservation and development.

D3.17 Safety

Industrial oil and gas construction, drilling, and operational activities in the Arctic can be hazardous to humans due to extreme weather conditions (e.g., cold, wet, dark, windy), machinery operations, transportations, wildlife, and other factors. The Applicant would follow safety precautions to ensure safe conditions for all employees, contractors, and visitors. Construction and operational activities would follow standard North Slope safety practices, as outlined in the 2018 Alaska Safety Handbook and Applicant internal policies. The Applicant would provide employees with safety training and frequent safety meetings.

Providing safe conditions for facility users includes construction of an all-season access road connection between the drill site and the emergency response facilities available at the ACF. Facilities at the ACF include medical emergency response equipment and personnel, fire and hazardous material response and personnel, and other hydrocarbon spill and emergency response equipment and personnel. Ground access would allow transport for lifesaving or medical evacuation of on-site personnel.

The access road would provide for pipeline or well control incidents to deploy personnel and equipment to the drill site. The orientation of the gravel access road near parallel to the production pipeline would facilitate pipeline inspection, providing a more rapid detection of leaks or other problems that could cause a spill incident.

The Corps finds that the project would have neutral effects on safety.

D3.18 Food and Fiber Production

Frozen soils and limited growing seasons in Arctic climates are not conducive to food and fiber production. Soils are saturated, and no forests or agricultural lands are present in the proposed project area. There is no commercial cultivation of food or fiber across the Arctic Coastal Plain, although subsistence activities such as harvesting wild plants and berries do occur.

The Corps finds that the project would have neutral effects on food and fiber production.

D3.19 Mineral Needs

The proposed GMT2 Development Project would require large quantities of gravel mineral materials and sand to construct the drill pad and access road and place pipeline VSMs. The existing ASRC Mine Site would serve as the proposed project's gravel source. Approximately 671,300 cubic yards of gravel would be needed to construct the proposed pads and access road (BLM 2018 § 4.3.2.1) with an additional 3,000 cubic yards of sand/slurry mixture needed to support pipeline VSM infrastructure. The ASRC Mine Site is not known to be contaminated and has been used as a resource for recent infrastructure projects in the local area, including CD5, the Nuiqsut Spur Road, and GMT1, which began construction in February 2017 (BLM 2018 § 2.4.6).

The proposed project has been minimized to construct the development footprint with the least amount of mineral resources, as it reduces project costs and environmental impacts. ASRC maintains an existing USACE permit (POA-1996-869-M11, independent of this proposed project) and is responsible for reclamation of the gravel extraction site based on its permit.

The Arctic Coastal Plain is largely composed of sand and gravel alluvium. The proposed project would not provide for mineral needs of others; it would only consume them for fill area construction. The material could be retrieved and reused for similar purposes if and when the proposed project became abandoned. The Corps finds that the project would have negligible adverse effects on mineral needs.

D3.20 Considerations of Property Ownership

Authorization of work or structures by USACE does not convey a property right, nor authorize any injury to property or invasion of other rights.

The Applicant is responsible for acquiring authorizations from all property owners for work associated with the GMT2 Project.

The Corps finds that the proposed GMT 2 project would be consistent with land use on the North Slope, provided the applicant obtains and adheres to all property owner stipulations.

D3.21 Needs and Welfare of the People

Development and production of hydrocarbons from GMT2 would produce resources needed to help meet U.S. domestic energy demand. Development would also help offset declines in production from the Alaska North Slope and provide benefits to local, state, and national economies through local hire for jobs created during construction and operations, tax revenues, revenue sharing, and royalties to the federal government and Alaska Native Claims Settlement Act corporations (BLM 2018 § 1.3). Impacts to NVN and subsistence are discussed above at D3.4.1.

The Corps finds that the effects of the project would be neutral to the needs and welfare of the people.

D3.22 Recommended Public Interest Determination

The public need is for the development of facilities that can produce petroleum products that are used across the nation, and for the economic benefits generated by tax revenues from labor and purchases of goods and services necessary for the proposed construction. The private need for the proposed project is for the economic benefit of the applicant which would result from the petroleum production that would occur at the proposed project as well as for the economic benefit of the private landowners within the proposed project area. There are no unresolved conflicts as to resource use. Practicable alternatives are evaluated in Section D2.1, above. As discussed above, the project area is suited to the public uses of recreation and subsistence. The area has also been designated for use in oil and gas development, which is being proposed by a private applicant. The benefits resulting from the proposed project, namely the production of oil and gas, would last as long as the underlying petroleum resource remained productive. The detrimental effects of the proposed discharges of fill would be long term to permanent within the footprint of the proposed project. If the development is ever closed, then the permittee would be required to restore areas to their previous conditions. The proposed project would result in the long term to permanent loss of the functions and values, including recreation and subsistence, which are provided by the existing wetlands and waters in the project area.

Based on the public interest review herein, and inclusion of the above special conditions on the DA permit, the beneficial effects of the project outweigh the detrimental effects on the public interest. The project is not contrary to the public interest.

ATTACHMENT D4

COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

D4.1 Clean Water Act (33 U.S.C. 1341) Section 401 Certificate of Reasonable Assurance (33 CFR 320.4[D])

The ADEC issued a conditioned 401 Water Quality Certification for the placement of the fill material for the Applicant's proposed Project on September 11, 2018 (Alternative A, described in our Public Notice); see Attachment B6 -- State of Alaska Certificate of Reasonable Assurance for the GMT2 project.

D4.2 Coastal Zone Management Consistency Determination (33 CFR 320.4[H])

By operation of Alaska State law, the federally approved Alaska Coastal Management Program expired on July 1, 2011, resulting in a withdrawal from participation in the Coastal Zone Management Act’s (CZMA) National Coastal Management Program. The CZMA federal consistency provision, section 307, no longer applies in Alaska. *Federal Register* Notice published July 7, 2011, Volume 76, No. 130, page 39857.

D4.3 Endangered Species Act of 1973 (16 U.S.C. 1531)

Impacts to endangered species and the outcome of consultation with the USFWS are discussed under Subpart D (Attachment D2.3 and Attachment D6, and Section 4.3.6 of the GMT2 Final Supplemental EIS).

A Biological Opinion that the action “may affect, but is not likely to adversely affect listed species or their critical habitat” was provided by the USFWS to the BLM and Corps. The Department of the Army permit would be conditioned to require compliance with all of the mandatory terms and conditions associated with incidental take of the BO.

ESA consultation is complete.

D4.4 Fish and Wildlife Coordination Act (16 U.S.C. 661)

Coordination with the USFWS, NMFS, and ADF&G, and completion of the process and analyses contained within the JROD and signature by the authorizing official completes the Corps’ Fish and Wildlife Coordination Act responsibilities.

D4.5 Magnuson-Stevens Fishery Conservation and Management Act (Public Law 94-265)

No marine or estuarine essential fish habitat impacts are probable based on the scope of the proposed action. Further discussion is found in Appendix E of the GMT2 Final Supplemental EIS.

Signature of this JROD by the authorizing official completes the Corps’ responsibilities under this act.

D4.6 National Environmental Policy Act of 1969 (42 Usc 4321 – 4347)

Signature of this JROD by the authorizing official completes the Corps’ NEPA requirements and responsibilities.

D4.7 NATIONAL HISTORIC PRESERVATION ACT OF 1966 (16 USC 470 ET SEQ.)

Completion of consultation with the Alaska Office of History and Archaeology and signature of the Programmatic Agreement completes the Corps' NHPA requirements.

D4.8 Clean Water Act (33 U.S.C. 1251 et seq. 404[B][1] Guidelines 40 CFR 230 Subpart B)

Completion of the process and analysis contained within the JROD (Attachment D2) completes the Corps' 404(b)(1) requirements.

D4.9 Clean Water Act (33 U.S.C. 1251 et seq.) Section 404 (33 U.S.C. 1344)

Completion of the process and analysis contained within the JROD and signature by the authorizing official completes the Corps' CWA 404 requirements.

D4.11 Marine Mammal Protection Act of 1972 (16 U.S.C 1361 et seq., 1401-1407, 1538, 4107)

The Proposed Action does not involve the transport of dredged material for disposal or any construction in marine waters.

D4.12 Executive Order 13175 Consultation and Coordination with Indian Tribal Governments

This EO was designed to establish regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications and to strengthen the U.S. government-to-government relationships with Indian tribes.

A summary of consultation efforts by the BLM is included in the GMT2 Final Supplemental EIS Section 5.1.2 (Tribal Consultation) and pages 21-22 of the JROD.

The Corps received one comment letter from the Native Village of Nuiqsut during the public notice period. The Corps is a Cooperating Agency to the BLM, which is the Lead Federal Agency. The BLM held a community meeting in Nuiqsut, and coordinated with NVN frequently during the Government-to-Government (G2G) consultation process. NVN, as a Cooperating Agency, participated with the Corps in multiple Cooperating Agency meetings. A request for a face-to-face meeting or other direct coordination between the Corps and NVN was not made.

Consultation with federally recognized Tribes and completion of the process and analysis contained within this document and signature by the authorizing official completes the Corps' Executive Order 13175 requirements.

D4.13 Clean Air Act (42 U.S.C. 7401 – 7671 Section 176[C])

The proposed permit action has been analyzed for conformity applicability pursuant to regulations implementing Section 176(c) of the Clean Air Act. It has been determined that the activities proposed under this permit would not exceed de minimis levels of direct or indirect emissions of a criteria pollutant or its precursors and are exempted by 40 CFR Part 93.153. Any later indirect emissions are generally not within the Corps' continuing program responsibility and generally cannot be practicably controlled by the Corps.

D4.14 Executive Order 12898 (Environmental Justice)

The community of Nuiqsut, as discussed in Section 3.3.2.4, meets the demographic characteristics to be qualified as a minority population, and requires evaluation for disproportionate impacts under environmental justice. Specific impacts to this population are discussed in pages 21-22 of the JROD and GMT2 Final Supplemental EIS sections 3.4.8 and 4.4.7.

Stipulations in the Federal leases and BMPs avoid or mitigate many of these impacts. Relevant stipulations include, but are not limited to, those that require ready access to spill cleanup materials, minimization of flights in the project area during the peak caribou hunting period, spill response training, the separation distance between roads and pipelines (reducing the potential of the combined facilities to obstruct caribou movement), and consultation with subsistence users.

In accordance with Title Ill of the Civil Right Act of 1964 and Executive Order 12898, it has been determined that the project would not directly or through contractual or other arrangements, use criteria, methods, or practices that discriminate on the basis of race, color, or national origin nor would it have a disproportionate effect on minority or low-income communities.

Completion of the process and analysis contained within this JROD and GMT2 Final Supplemental EIS and signature by the authorizing official completes the Corps Executive Order 12898 requirements.

D4.15 Executive Order 11988 (Flood Plain Management)

See Attachment D3, Section D3.9. The Proposed Action would not be constructed in designated floodplains and would not create flood hazards in floodplains. Completion of the process and analysis contained within this JROD and signature by the authorizing official completes the Corps Executive Order 11988 requirements.

D4.16 Executive Order 13112, Invasive Species

BLM requirement Best Management Practice (BMP) M2 requires that measures to be taken to prevent the introduction, or spread, of non-native, invasive plant species in NPR-A.

Completion of the process and analysis contained within this JROD and signature by the authorizing official completes the Corps Executive Order 13112 requirements.

D4.18 Other Federal, State and/or Local Authorizations (if issued)

ADEC – Certificate of Reasonable Assurance (POA-2015-486)

Date Issued: 9/11/2018

Conditions for issuance: Yes

D4.19 Significant National Issues (33 CFR 325.2[A][6])

Corps' regulations state that if a district engineer makes a decision on a permit application that is contrary to State or local decisions, the district engineer will include in the decision document the significant national issues, and explain how they are overriding in importance.

This decision document and final decision are not contrary to State or local decisions, and there are no significant issues of overriding national importance.

ATTACHMENT D5

MITIGATION (33 CFR 320.4(r))

The Corps has responsibility to consider mitigation (which includes avoiding, minimizing, rectifying, reducing, or compensating for resources losses) throughout the permit application review process. Mitigation requirements fall into three categories, per 33 CFR 320.4(r):

1. Project modifications to minimize adverse project impacts;
2. Mitigation measures to ensure compliance with the 404(b)(1) Guidelines; and,
3. Measures required to ensure that the project is not contrary to the public interest, to the extent they are reasonable and justified.

"All compensatory mitigation will be for significant resource losses which are specifically identifiable, reasonably likely to occur, and of importance to the human or aquatic environment." (33 CFR 320.4 R(2))

The placement of sites for construction of the project have been chosen by surveying the topography, water drainages, and surface waters to avoid and minimize the effects of the fill material, including smothering of aquatic organisms. The route of the access road, location of the drill site pad, and culverts have been located to avoid open water and designed to maintain natural drainage patterns. Due to the abundance of wetlands in the project area, avoiding discharges into WOUS is not practicable.

Specifically, avoidance and minimization measures include:

1. Designing the GMT2 Development Project so that all power lines and communication cables will be hung underneath the horizontal support members via messenger cables to avoid the need to install power poles, thereby eliminating the potential impact to vegetation and wetlands for this aspect of the project's infrastructure.
2. Using existing infrastructure to the maximum extent practicable.
3. Using ice roads and pads for construction and drilling activities and limiting construction to the winter season.
4. Avoiding locations having unique habitat or other value, including critical habitat of threatened or endangered species.
5. Relocating the GMT2 road and drill site out of the Colville River Special Area and avoiding the Fish Creek setback.
6. Avoiding river and stream crossings.

The project has avoided and minimized impacts to the extent practicable.

The GMT2 project would result in the unavoidable loss of 78 acres of wetlands, spanning both the Outlet Fish Creek and Ublutuoch River watersheds. A 10 digit Hydrologic Unit Code (HUC) size was utilized for watershed analysis. No anthropogenic impacts have occurred in the Outlet Fish Creek watershed. Existing and quantifiable anthropogenic impacts have occurred in the Ublutuoch River watershed as a result of the previously permitted and constructed GMT1 project. Accounting for this existing disturbance, and including both direct and indirect impacts from the GMT2 project, total anthropogenic disturbance would be 0.34% of the Outlet Fish Creek watershed and 0.23% of the Ublutuoch River watershed. See Table 1, below.

Table 1. Total Anthropogenic Disturbance in Subject Watersheds.

Subject Watersheds	Hydrologic Basin	
	1906020507 Outlet Fish Creek	**1906020506- Ublutuoch River**
Total Watershed Area	137,576 acres	150,954 acres
Aquatic Resource Coverage	135,486 acres	150,938 acres
Existing Impervious Cover	0 acres	42 acres
GMT2 Direct Impact to Watershed	52.3 acres[1] (0.04%)	25.6 acres[1] (0.02%)
GMT2 Indirect Impact to watershed	413.16 acres	275.52 acres
Cumulative Anthropogenic Disturbance w/ GMT 2	465.9 acres (0.34%)	343.12 acres (0.23 %)[2]

[1] Approximate footprint per watershed
[2] Includes 42 acre existing impervious cover (GMT1)

In addition to evaluating the anthropogenic disturbance in the proposed GMT2 watersheds, the Corps considered the following:

- The watersheds do not have indicators of being degraded (i.e. impaired, listed under CWA 303(d) or identified in a watershed management plan).
- The wetlands within the proposed project areas are not rare on the North Slope or within the Arctic Coastal Plain.
- Designated critical habitat for the Polar Bear exists within the action area, but the GMT2 project footprint itself is located approximately 4 miles southwest of the nearest designated critical habitat (USFWS 2018 Figure 9) and will not directly impact it.
- The project does not involve the placement of fill in intertidal waters associated with special aquatic sites.
- No anadromous waters will be impacted by the project. One fish bearing lake, M9925, has a small unnamed beaded drainage stream which will be crossed with a culvert designed for passage of ninespine stickleback (2018 BLM FSEIS). This impact will not be more than minimal.
- The project is not federally funded, so compensatory mitigation is not required under Executive Order 11990.
- Measureable changes in aquatic resource functions would not occur as a result of individual or cumulative impacts.

Based on consideration of the above information, including the 404 (b)(1) guidelines, public interest review factors, avoidance and minimization measures, and compliance with other environmental laws, the Corps has determined that the project would not result in significant resource losses that are specifically identifiable, reasonably likely to occur, and of importance to the human or aquatic environment. Although the project would result in the loss of 78 acres of wetlands, the work would result in minimal loss of aquatic function, with the inclusion of avoidance and minimization measures, including controls to minimize effects, such as best management practices (BMPs) and permit conditions. Based on this information, the Corps has determined that mitigation in the form of avoidance and minimization (including special conditions and BMPs) is sufficient and compensatory mitigation is not required.

APPLICANT REQUESTED MITIGATION

As stated in the regulations at 33 CFR 320.4(r), the Corps may include additional mitigation measures at the applicant's request. The applicant has requested the Corps include, as a special condition to the permit, a project to help restore stream flow at an existing culvert bank located south of the City of Nuiqsut, North Slope Borough, Alaska. The Corps has included the mitigation plan as a special condition of the permit, which is included as Attachment D5.1.

GREATER MOOSES TOOTH TWO (GMT2) DEVELOPMENT PROJECT PERMITTEE RESPONSIBLE WETLANDS MITIGATION PLAN

NATIONAL PETROLEUM RESERVE-ALASKA

Prepared for:
ConocoPhillips Alaska, Inc.
Anchorage, AK

ConocoPhillips

August 2018

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APPENDICES

Appendix

TABLES

ACRONYM LIST

ABR	ABR, Inc.- Environmental Research & Services
ANSRAM	Alaska North Slope Rapid Assessment Method
ASA	Aquatic Site Assessment
ASRC	Arctic Slope Regional Corporation
CPAI	ConocoPhillips Alaska, Inc.
DA	Department of the Army
FCI	Functional Capacity Index
GMT 2	Greater Mooses Tooth 2
HDL	Hattenburg Dilley & Linnell
HUC	Hydrologic Unit Code
NSB	North Slope Borough
NWI	National Wetland Inventory
PRM	Permittee Responsible Mitigation
USACE	U.S. Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
WOUS	Waters of the U.S.

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1.0 INTRODUCTION

ConocoPhillips Alaska, Inc. (CPAI) is seeking a Department of the Army (DA) permit authorization from the U.S. Army Corps of Engineers (USACE) to construct the Greater Mooses Tooth Two (GMT2) development project, consisting of a drill site, access road, pipelines, and ancillary facilities to support development of petroleum reserves within the Greater Mooses Tooth Unit. The proposed work involves the placement of clean fill material on 78.1 acres, 77.9 acres of which are Waters of the U.S. (WOUS). A Vicinity map showing the location of the GMT2 Project is included in Appendix A, Figure 1.

2.0 OBJECTIVES

The overall objective of this Permittee Responsible Mitigation (PRM) plan is to demonstrate how CPAI proposes to mitigate for unavoidable wetlands impacts at GMT2 through permittee responsible wetlands restoration. In addition to the avoidance and minimization measures incorporated into the design of GMT2, the proposed restoration project presented in this PRM plan provides wetlands uplift near the GMT2 project site. The mitigation project will restore important key functions to a riverine wetland system associated with a fresh water access road (Fresh Water Road) in Nuiqsut, Alaska. In addition, the project will provide safe and continuous access to Nuiqsut's fresh water supply reservoir. Safe and continual access to the reservoir is currently jeopardized by recurring flooding and road damage that occurs during breakup.

The current culvert battery crossing associated with the Fresh Water Road is undersized, resulting in ice damming and road over-topping during spring breakup flood events. The gravel road prism over the culverts has been significantly damaged from the over-topping and is contributing to gravel deposition and excess sediment load to the riverine system. The undersized culverts and altered flows contribute to degraded aquatic function and alter the system's hydrologic and sediment transport functions.

The Fresh Water Road restoration project will restore important key riverine wetland function to 35.8 acres (0.30 acres more than currently exists) of lower perennial stream and abutting palustrine wetlands, as well as alleviate ice damming associated with annual breakup discharges. This functional uplift will be achieved through restoring natural flows by: 1) upgrading the crossing to reflect normal flow conditions to restore flood flow alteration function and improve general habitat suitability; 2) removing gravel that has washed downstream to improve sediment removal function and afford vegetation growth; and 3) elevating the road crossing above anticipated spring breakup flood elevations to protect from road washouts during breakup. This restoration project would provide direct benefit to a resident fish bearing stream and abutting wetlands that discharge directly to the Nigliq Channel of the Colville River. These improvements would protect a crucial Nuiqsut transportation corridor providing access to Nuiqsut's fresh water supply. A Restoration Site Overview Map is included in Appendix A, Figure 2.

3.0 SITE SELECTION

The proposed Fresh Water Road restoration site is in the village of Nuiqsut, Alaska, and is identified on the Vicinity Map (Figure 1) and Overview Map (Figure 2) in Appendix A.

The North Slope Borough (NSB) contracted Hattenburg, Dilley, and Linnell (HDL) to complete a Project Analysis Report (PAR) (Appendix B) for the crossing in 2016 (HDL 2016). HDL reported that the crossing appears within the floodplain of the Colville River and that it has undersized culverts which result in the roadway getting over-topped during high spring breakup flows.

The factors considered during the mitigation site selection process include the following:

- Watershed and community needs;
- Onsite alternatives;
- Other restoration alternatives or land preservation opportunities near the watershed; and
- Practicability of accomplishing an ecologically self-sustaining mitigation project.

3.1 Watershed Needs

The GMT2 impacts occur along the drainage divide between the following 10-digit Hydrologic Unit Code (HUC) watersheds:

- 1906020507 - Outlet Fish Creek
- 1906020506 - Ublutuoch River

The Outlet Fish Creek watershed occupies 137,576.89 acres, and the Ublutuoch River watershed occupies 150,954.37 acres. The GMT2 project will impact 52.3 acres of wetlands in the Outlet Fish Creek, and 25.6 acres of wetlands in the Ublutuoch River watersheds, for a total of 77.9 acres of wetlands impacts. These two watersheds contain very little current development and are made up almost entirely of jurisdictional WOUS, including wetlands. The total current development and proposed GMT2 development in these watersheds will be 88.9 acres and 90.1 acres, respectively (Figure 3, Appendix A). This is equivalent to 0.06 percent total anthropogenic impacts in each of the 10-digit HUCs; therefore, these watersheds are not considered impaired.

The proposed restoration project is in the adjacent Colville River Delta-Frontal Harrison Bay watershed (HUC-1906030413). This watershed occupies 303,614.25 acres and contains the village of Nuiqsut and the gravel infrastructure development associated with the village, transportation corridors, and gravel mining. The immediate area around Nuiqsut and the mitigation project site drain to the Nigliq Channel of the Colville River, an important subsistence resource for the area. CPAI has consulted the NSB to discuss the needs of Nuiqsut and the importance of completing this project. The proximity of the mitigation site to Nuiqsut creates an opportunity to provide wetlands and water-related benefits to the community that is nearest to the GMT2 project and to wetland and water resources used by the community. A copy of the letter agreement documenting CPAI's discussions with the NSB is provided as Appendix C to this Mitigation Plan.

3.2 Onsite Alternatives

Mitigation opportunities at the GMT2 project site were considered, but the lack of development in the abutting and adjacent wetlands affords no opportunities for wetlands restoration, or creation onsite or in the same watershed. As shown on Figure 3 (Appendix A), these two watersheds would only have 0.06 percent anthropogenic impacts from development after GMT2 is constructed.

3.3 Other Restoration Alternatives or Land Preservation Opportunities

Other options were explored but nothing was identified that had a similar combination of proximity to the GMT2 project area, actual wetlands functional uplift, positive community impact and community support, and economic practicability. Land preservation opportunities were explored but are very limited, provide no wetlands uplift, are commercially complex, and lack the broad support of a restoration program.

3.4 Practicability of Results Being Ecologically Self-Sustaining

The proposed improvements to the Fresh Water Road will follow acceptable practices of arctic engineering and design. Regular monitoring, coupled with routine maintenance activities and returning the riverine system to normal flows, will result in an ecologically self-sustaining restoration project.

4.0 SITE PROTECTION INSTRUMENT

CPAI has discussed this mitigation project with the NSB. CPAI does not own the land proposed for restoration activities and does not have the ability to establish a perpetual protection instrument. The site is managed by the local government (NSB). The mitigation project does not face threats that are deemed to require site protection beyond the stewardship provided by the NSB.

5.0 BASELINE INFORMATION

5.1 GMT2 Baseline Information

ABR, Inc. - Environmental Research & Services (ABR) performed wetlands habitat mapping for the GMT2 project and submitted that information to CPAI in a July 2017 wetland delineation and desktop mapping verification report (ABR, 2017). The ABR report (Appendix D) contains detailed wetlands mapping and habitat descriptions for the proposed GMT2 impact area, which is included in a larger immediate study area investigated by ABR.

ABR reported that the GMT2 study area contains typical tundra habitats composed of dwarf shrub and emergent vascular plants within saturated and seasonally flooded palustrine wetlands. The study area also comprises two shallow open-water pond systems with poor littoral zones. ABR stated that the pond systems are likely remnants of drained lake basins, which are prevalent on the North Slope.

The ABR report concludes that the GMT2 project will impact 77.8 acres (rounded to the nearest 0.1 acre) of palustrine wetlands and a 0.1-acre pond habitat for a total of 77.9 acres of jurisdictional WOUS impacted. ABR reports that the GMT2 project will also impact 0.2 acres of non-jurisdictional uplands.

CPAI performed an Aquatic Site Assessment (ASA) based on the Arctic Slope Regional Corporation (ASRC) Alaska North Slope Rapid Assessment Method (ANSRAM) for each wetlands class impacted by the GMT2 project to determine the baseline level of functional capacity and the post-project impacts to those watershed functions after GMT2 is constructed. ANSRAM determined that the key functions being provided by the wetlands prior to constructing GMT2 are:

- Flood flow alteration;
- Nutrient and toxicant removal;
- Production of organic matter and its export;
- General habitat suitability; and
- Native plant richness.

The overall baseline Functional Capacity Index (FCI) score for each wetland class is shown below in Table 1.

Table 1. GMT2 Baseline FCI Scores

Wetlands Class	FCI Score	Acres
PEM1F	0.781	4.3
PEM1SS1B	0.682	49.8
PEM1SS1E	0.799	23.7
PUBH	0.814	0.1

0.0 = Low Functional Capacity/ 1.0 = High Functional Capacity

The overall FCI scores determined by ANSRAM for each wetlands type after GMT2 construction are shown below in Table 2. The FCI scores indicate that while permanent gravel will be placed for the construction of GMT2 and result in reduced wetland function, the loss of function in the watershed will be partial rather than total because of the minimization measures incorporated into the GMT2 project, such as culverts to preserve water flow and sufficient gravel to minimize thermokarsting.

Table 2. Post GMT2 FCI Scores

Wetlands Class	FCI Score	Acres
PEM1F	0.618	4.3
PEM1SS1B	0.542	49.8
PEM1SS1E	0.677	23.7
PUBH	0.710	0.1

0.0 = Low Functional Capacity/ 1.0 = High Functional Capacity

Copies of the ANSRAM data sheets showing the individual evaluation metrics and the individual FCI for each function are included in Appendix E.

5.2 Fresh Water Road Restoration Site Baseline Information

A formal wetland delineation has not been completed for the Fresh Water Road restoration site. The wetlands proposed for restoration were delineated from the desktop using United States Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) mapping (USFWS, 2017). NWI mapping was further adapted using current aerial photography and information contained within the 2016 PAR. The extent of the desktop mapping is depicted in Appendix A, Figure 2.

The desktop delineation indicates the Fresh Water Road restoration site currently consists of 35.5 acres of lower perennial riverine habitat (mapped to 20 foot above mean sea level), with palustrine emergent littoral zones and inclusions (R2EM2/UBH). The upstream portion of the system is delineated to the approximate extent of estimated maximum annual breakup flooding elevation presented in the 2016 PAR. The downstream portion of the restoration site terminates at another culvert crossing.

The 2016 PAR identified the restoration site as a culverted crossing over a series of kettle ponds that provides access to the community's water supply located 1.2 miles south of Nuiqsut. HDL reported that a 16-foot wide gravel roadway crosses the unnamed drainage. HDL also reported that the culverts were installed after an existing bridge failed. The crossing consists of three 48-inch diameter by 40-foot long galvanized corrugated steel culverts, armored at the inlets and outlets with sandbags. The crossing primarily drains 9.5 square miles and conveys snowmelt and permafrost thaw. The stream has a mild hydraulic gradient of 0.4% and connects with the main channel of an unnamed stream that is approximately 500 feet downstream of the road crossing. The unnamed stream drains to the Nigliq Channel of the Colville River. HDL reported that the road crossing at the proposed restoration site experiences regular over-topping caused by high spring breakup flows, ice damming, and currently undersized culverts.

This flooding has contributed to road damage which results in excess gravel and sediment deposition downstream of the crossing. This deposition has resulted in channel constriction downstream of the culverts and removal of shoreline vegetation and wetlands habitat. Additional impacts resulting from repeated inundation may be experienced upstream to the limit of reported flood elevations. The upstream portion also discharges from Nuiqsut airport; therefore, flooding could jeopardize the runway during spring breakup.

CPAI performed a baseline desktop ASA for the site using the ASRC ANSRAM to be consistent with the ASA performed for the GMT2 impact site. The ANSRAM determined that the key functions currently being provided by the riverine systems are:

- Nutrient and toxicant removal;
- General fish habitat;
- Native plant richness; and
- Production of organic matter and its export.

ANSRAM determined that several functions were underperforming due to the condition of the culverts and the gravel deposition downstream from annual flood events. The functions that are underperforming and in need of uplift are:

- Sediment removal;
- Erosion and shoreline stabilization;
- General habitat suitability;
- Educational value; and
- Uniqueness and heritage.

ANSRAM determined that the overall baseline FCI score for the system is 0.651.

ANSRAM determined that addressing the issues at the crossing would provide significant uplift to the degraded functions listed above, and that the post-restoration project would result in an overall FCI score of 0.947, which is a ~45 percent increase in function across the system. Additionally, the restoration project would add 0.30 acres to the system by returning the crossing to normal flow patterns and removing gravel deposited downstream.

The ANSRAM data sheets showing the pre- and post-restoration site functional capacity for each measured function are included in Appendix E.

Photographs of the restoration site taken during the summer of 2017 are below:

Photo 1. View along roadway and crossing, looking south.

Photo 2. View along roadway and crossing, looking north.

Photo 3. View looking south at upstream side of culverts.

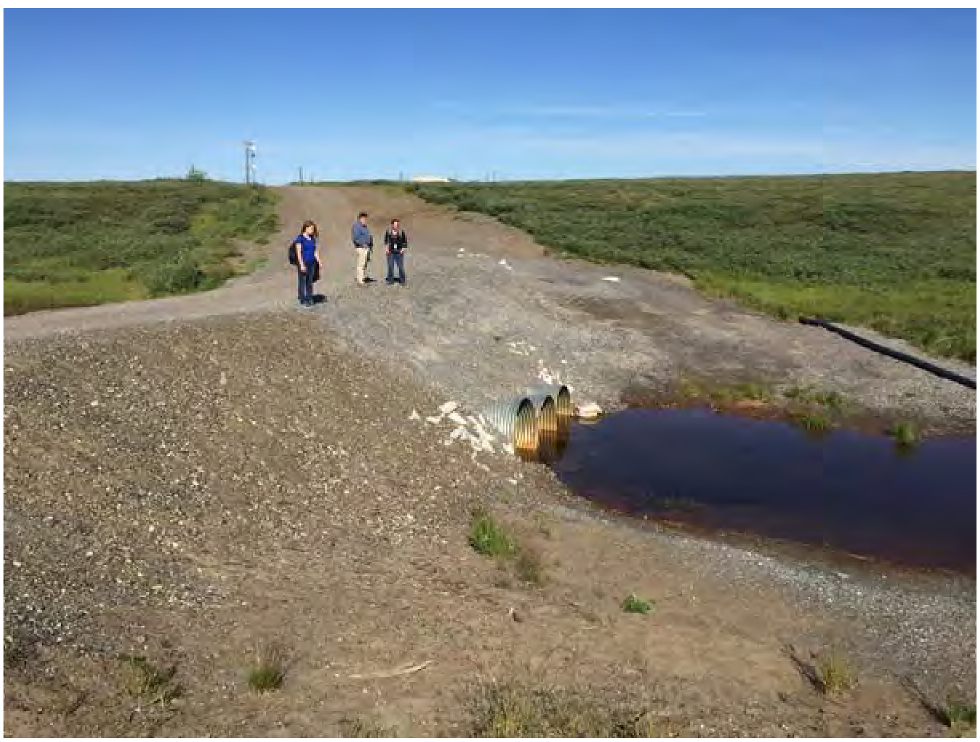

Photo 4. Looking north at downstream side of culverts. The gravel in the stream is from road washouts.

Photo 5. View of upstream side of culverts and sand bag armoring in creek and road embankment.

Photo 6. View downstream from road surface with gravel in stream.

6.0 MITIGATION CREDIT

The Fresh Water Road restoration project would benefit 35.8 acres of lower perennial stream channel and abutting wetlands. Mitigation would be provided by removing the gravel that has been washed downstream and restoring the crossing to natural flow conditions. The crossing restoration will involve widening the stream to its pre-disturbance ordinary high-water width. The restoration project will provide an approximate 0.30-acre increase in wetland surface area over the existing 35.5-acre habitat. The gravel removal will allow shoreline palustrine wetlands to form.

Road integrity will be restored by strengthening the embankments and raising the road grade above anticipated flood elevations, which will reduce the existing effects that the road has on the channel. Upstream channel deformation will likely subside given that excessive ponding from ice damming would be mitigated. Sediment transport function downstream will also be realized once natural flows and channel dimensions are restored at the crossing.

CPAI used the FCI score from ANSRAM to determine a debit from GMT2, using the USACE Credit-Debit Procedure. The debit-credit calculation determined that GMT2 would result in 10.5 debits and that the restoration site would result in 10.7 credits, thus returning slightly more than a 1:1 mitigation ratio. A copy of the calculation is included in Appendix E.

7.0 MITIGATION WORK PLAN

7.1 Fresh Water Road Restoration Work Plan

CPAI proposes to enter into a contractual agreement with the NSB and plans to complete the Fresh Water Road restoration project within the time frame that GMT2 is constructed, which is estimated to be complete by October 2021. The work will include removal of the existing culvert battery and restoring the stream to normal flow patterns. The actual design of the crossing is estimated to be complete by December 31, 2018 and will be submitted to the Corps as an addendum to this PRM plan by March 31, 2019.

The nature of the work and soils in the area lend themselves to construction during multiple seasons. CPAI will mobilize and demobilize materials and equipment for all construction activities. Ice roads will be used during winter activities. CPAI will work closely with the NSB and Nuiqsut for specific construction activity timing.

The excess gravel deposited downstream due to recent flood events will be removed as part of this effort. The gravel, depending on the quality, could be reused in road grade improvements. Gravel that cannot be used will be deposited in an upland location. Vegetation along the shoreline will be allowed to develop naturally where gravel is removed.

8.0 MAINTENANCE PLAN

Land at the Fresh Water Road restoration site is owned and managed by the NSB. The NSB will be responsible for all maintenance at the site after the repair is completed.

9.0 PERFORMANCE STANDARDS

The design will restore normal flows and remove the excess sedimentation downstream of the crossing. Upstream portions of the stream will experience a reduction in flood elevations and ice damming during breakup. This will alleviate the potential for shoreline erosion and ice gouging. Scour below the crossing will be mitigated by restoring normal flow patterns.

Importantly, an improved crossing would also provide year-round community access to the fresh water supply south of the crossing. The threat of flooding to the airport runway will be reduced. Any other use of the road crossing, such as for access to subsistence or recreational activities, will also be improved.

Other design and performance standards will be established by agreement with the NSB.

10.0 MONITORING PLAN

CPAI will confirm the efficacy of the repairs during the first breakup season following completion of those repairs. This confirmation will include documentation that the integrity of the road prism and new crossing are maintained and that normal flows are being experienced. The findings from this monitoring effort will be retained by CPAI and used in the determination of whether adaptive management is necessary.

11.0 LONG-TERM MANAGEMENT

The NSB will be responsible for all long-term management of the crossing.

12.0 ADAPTIVE MANAGEMENT

The NSB will be responsible for any adaptive management at the crossing.

13.0 FINANCIAL ASSURANCE

CPAI will ensure that the project, as explained in this document, is executed. The NSB will be responsible for financial assurance related to future maintenance and monitoring.

14.0 REFERENCES

ABR, Inc.- Environmental Research & Services (ABR). 2017. Wetland Delineation and Desktop Mapping Verification for the Greater Mooses Tooth 2 Development Project, Alternative A-2015. 2017.

Hattenburg Dilley & Linnell (HDL). 2016. Project Analysis Report, Nuiqsut Repair Bridge Crossings. 2016.

United States Fish & Wildlife Service (USFWS). 2017 Nation.al Wetland Inventory Mapping website. 2017. https://www.fws.gov/wetlands/data/Mapper.html.

APPENDICES

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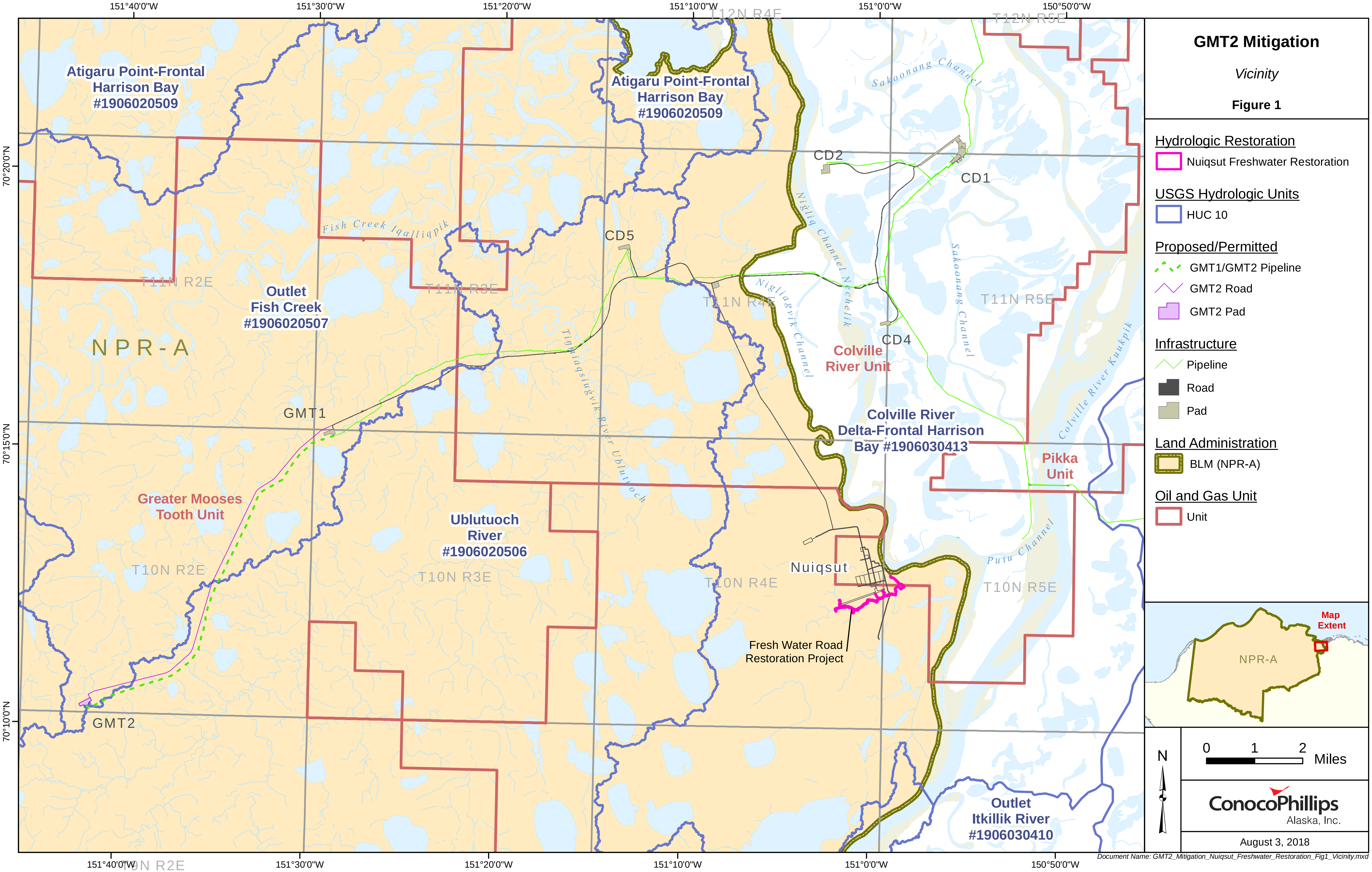
APPENDIX A
FIGURES


GMT2 Mitigation
Vicinity
Figure 1
Hydrologic Restoration
Nuiqsut Freshwater Restoration
USGS Hydrologic Units
HUC 10
Proposed/Permitted
GMT1/GMT2 Pipeline
GMT2 Road
GMT2 Pad
Infrastructure
Pipeline
Road
Pad
Land Administration
BLM (NPR-A)
Oil and Gas Unit
Unit
Map Extent
NPR-A
N
0 1 2 Miles
ConocoPhillips
Alaska, Inc.
August 3, 2018
Document Name: GMT2_Mitigation_Nuiqsut_Freshwater_Restoration_Fig1_Vicinity.mxd
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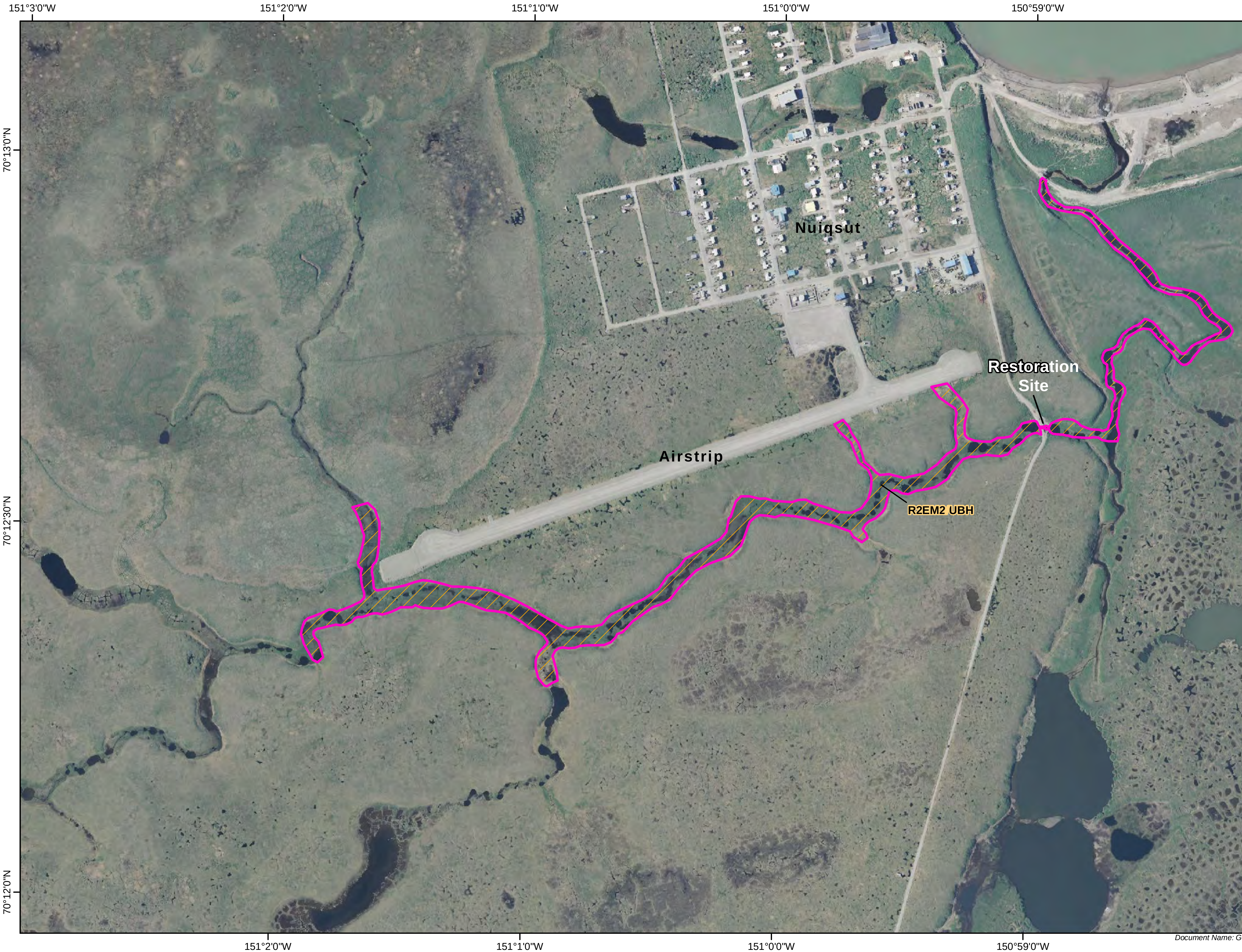
151°30'0"W
151°20'0"W
151°10'0"W
151°0'0"W
150°50'0"W
70°20'0"N
70°15'0"N
70°10'0"N
Atigaru Point-Frontal Harrison Bay #1906020509
Atigaru Point-Frontal Harrison Bay #1906020509
Outlet Fish Creek #1906020507
Ublutuoch River #1906020506
Colville River Delta-Frontal Harrison Bay #1906030413
Outlet Itkillik River #1906030410
N P R - A
Greater Mooses Tooth Unit
Colville River Unit
Pikka Unit
T12N R4E
T12N R5E
T11N R2E
T11N R3E
T11N R4E
T11N R5E
T10N R2E
T10N R3E
T10N R4E
T10N R5E
T9N R2E
CD1
CD2
CD4
CD5
GMT1
GMT2
Nuiqsut
Fresh Water Road Restoration Project
Fish Creek Iqalliqpik
Tiŋmiaqsiuġvik River Ublutuoch
Nigliq Channel Nechelik
Nigliagvik Channel
Sakoonang Channel
Colville River Kuukpik
Putu Channel



GMT2 Mitigation

Nuiqsut Freshwater Road Restoration Site Overview

Figure 2

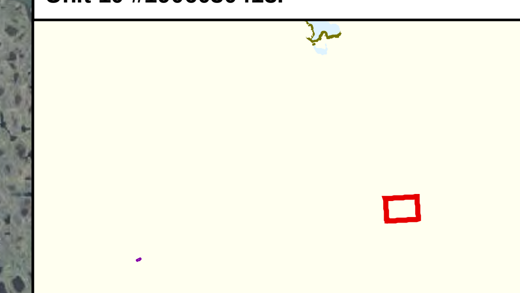
Hydrologic Restoration

Hydrologic Restoration Area

National Wetlands Inventory

NWI Wetland (Adapted)

Note:
The map extent falls within Hydrologic Unit 10 #1906030413.



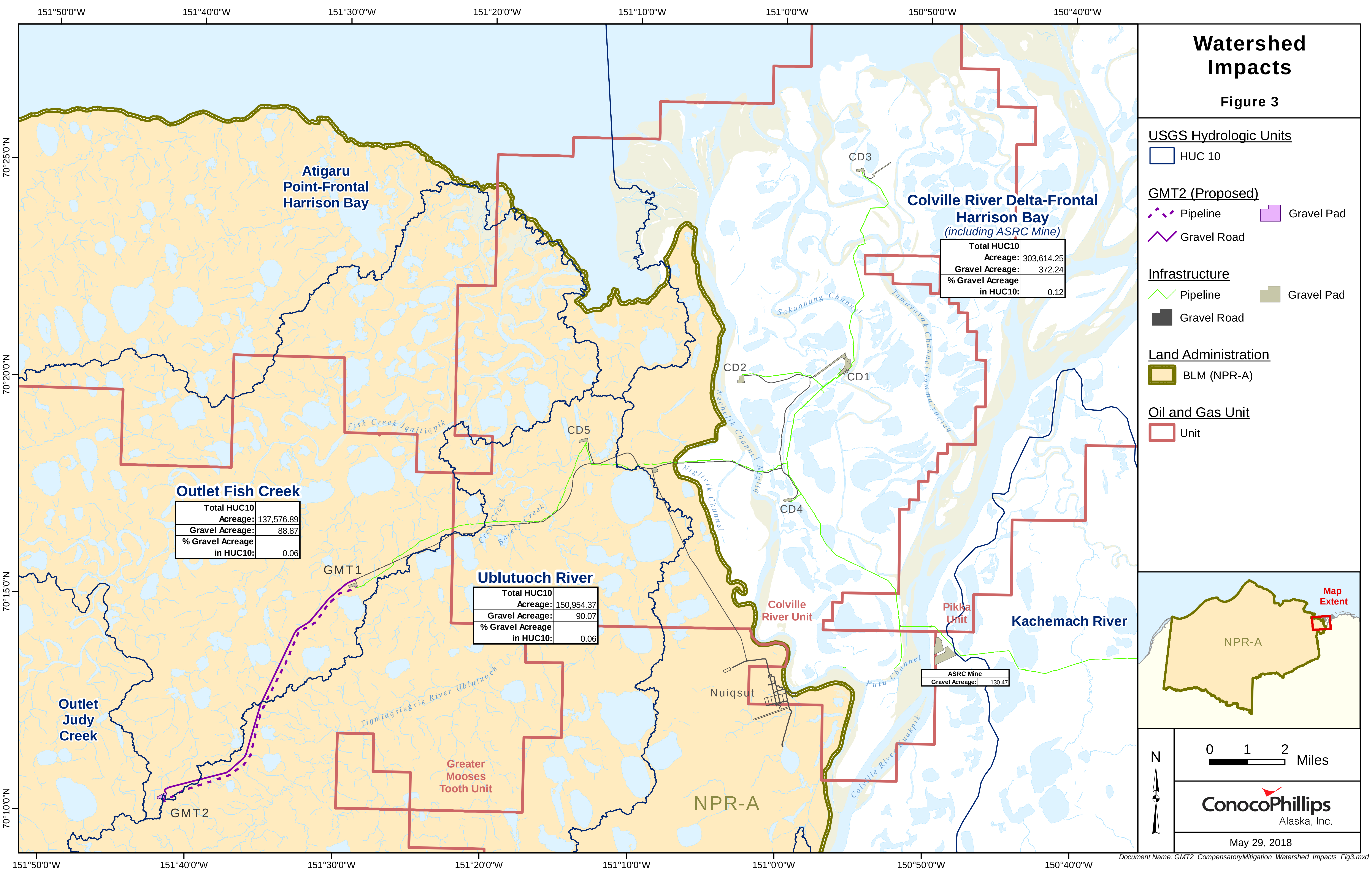
N

0 500 1,000 Feet

ConocoPhillips Alaska, In .

August 3, 2018

Document Name: GMT2_Mitigation_Nuiqsut_Freshwater_Restoration_Site_Fig2_Overview.mxd


Watershed Impacts
Figure 3
USGS Hydrologic Units
HUC 10
GMT2 (Proposed)
Pipeline
Gravel Pad
Gravel Road
Infrastructure
Pipeline
Gravel Pad
Gravel Road
Land Administration
BLM (NPR-A)
Oil and Gas Unit
Unit
Map Extent
NPR-A
N
0 1 2 Miles
ConocoPhillips Alaska, Inc.
May 29, 2018
Document Name: GMT2_CompensatoryMitigation_Watershed_Impacts_Fig3.mxd
Atigaru Point-Frontal Harrison Bay
Colville River Delta-Frontal Harrison Bay (including ASRC Mine)
Total HUC10 Acreage: 303,614.25
Gravel Acreage: 372.24
% Gravel Acreage in HUC10: 0.12
Outlet Fish Creek
Total HUC10 Acreage: 137,576.89
Gravel Acreage: 88.87
% Gravel Acreage in HUC10: 0.06
Ublutuoch River
Total HUC10 Acreage: 150,954.37
Gravel Acreage: 90.07
% Gravel Acreage in HUC10: 0.06
ASRC Mine
Gravel Acreage: 130.47
Outlet Judy Creek
Kachemach River
Colville River Unit
Pikka Unit
Greater Mooses Tooth Unit
NPR-A
CD1
CD2
CD3
CD4
CD5
GMT1
GMT2
Nuiqsut
Fish Creek
Iqalliqpik
Sakoonang Channel
Tamayayak Channel
Tamma'yagiaq
Nechelik Channel
Nigliq
Nigliq Channel
Niglivik Channel
Crea Creek
Barely Creek
Tiŋmiaqsiugvik River
Ublutuoch
Putu Channel
Colville River
Kuukpik
151°50'0"W
151°40'0"W
151°30'0"W
151°20'0"W
151°10'0"W
151°0'0"W
150°50'0"W
150°40'0"W
70°25'0"N
70°20'0"N
70°15'0"N
70°10'0"N

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APPENDIX B
HDL 2016 PROJECT ANALYSIS REPORT

PROJECT ANALYSIS REPORT

Nuiqsut Repair Bridge Crossings

North Slope Borough
Department of Public Works
Capital Improvement
Program Management

February 10, 2016

Prepared by: HATTENBURG DILLEY & LINNELL Engineering Consultants

3335 Arctic Boulevard, Suite 100
Anchorage, Alaska 99503

NUIQSUT REPAIR BRIDGE CROSSINGS

PROJECT ANALYSIS REPORT

CIP No. 68-041

Borough Contract No. 2015-205

Prepared for:

North Slope Borough
Department of Capital Improvement Program Management
Bernadette Fischer, Program Manager

Prepared by:
Scott Hattenburg, PE/Principal
Adam Bruscher, Project Engineer

Hattenburg Dilley and Linnell, LLC
Engineering Consultants
3335 Arctic Boulevard, Suite 100
Anchorage, Alaska 99503
(907) 564-2120

HDL Project: 15-031-02

February 10, 2016

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APPENDICES

EXECUTIVE SUMMARY

The purpose of this study is to provide the North Slope Borough (Borough) with feasible alternatives and costs for the repair and/or replacement of three bridge and culvert crossings in Nuiqsut, Alaska. The three crossings at Sites 1, 2, and 3 have failed or require yearly reconstruction and maintenance.

The Lower Stream Crossing (Site 1) is a temporary culvert crossing approximately 300 feet from the Nigliq Channel. Currently, it provides the only access to the City's boat ramp and material source stockpile. This crossing requires complete reconstruction after the high water and ice jamming events every spring.

The Upper Stream Crossing (Site 2) consists of a 42-foot steel bridge constructed in 1974. This crossing originally provided access to the old airport, and now the village boat ramp and material source stockpile. Reports indicate it failed a couple of years ago. The lower stream crossing at Site 1 was built when the bridge failed.

The Tributary Stream Crossing (Site 3) is a culvert crossing approximately 6,200 feet upstream from the Nigliq Channel that provides the only access to the community's water source. This crossing was installed after a previous bridge failure and has required minimal maintenance with sandbags after seasonal flooding.

Alternatives for each of the crossings were analyzed. Our findings, recommendations and the costs of PAR alternatives are shown **Table EX-1** below.

FINDINGS

1. All three sites are in the flood plain of the Colville River and are subject to overtopping and ice jamming.

2. Little flood information exists for Nuiqsut and the Corps of Engineers has not established a flood datum for Nuiqsut.

3. A flood study and stream monitoring is needed to determine flood recurrence intervals and flood elevations.

4. Debris lines near Site 2 suggest seasonal floodwaters and ice floes overtop the bridge by approximately 2 feet annually and by approximately 8.5 feet during extreme flood events.

5. The Site 3 culverts are undersized and overtop annually but requires only minor sandbag repair after the high water recedes.

6. Debris lines near Site 3, suggests that the roadway overtops by approximately 4.5 feet during extreme high water events.

RECOMMENDATIONS

1. Conduct a flood study and stream monitoring study to determine flood recurrence intervals and flood elevations.

2. Conduct a geotechnical investigation to determine engineering and thermal properties of soils at the sites to allow for proper design.

3. At the Lower Stream Crossing (Site 1), remove the crossing after the Site 2 crossing is restored: **Alternative 1A – Remove Crossing and Salvage Useable Materials.**

4. At the Upper Stream Crossing (Site 2), remove the existing bridge and install three 120-inch culverts: **Alternative 2B – New Culverts, Minor Elevation Change.**

5. At the Tributary Stream Crossing (Site 3), install three new 72-inch culverts to provide all-season access to the water source lake: **Alternative 3B – Install New Circular Culverts, Elevate Roadway 3 Feet.**

Table EX-1 – Capital Cost Summary

Alternative	Capital Cost	Useful Life
1A. Remove Crossing and Salvage Useable Materials	$203,000	N/A
1B. Do Nothing	0	N/A
2A. New Bridge Crossing, Elevate Above Ordinary High Water	3,423,000	30 years
2B. New Culverts, Minor Elevation Change	3,216,000	30 years
2C. Do Nothing	406,000	N/A
3A. Armor Existing Culverts, No Elevation Change	1,502,000	15 years
3B. Install New Circular Culverts, Elevate Roadway 3 Feet	3,352,000	30 years
3C. Install New Arched Culvert, Elevate Roadway 4.5 Feet	3,932,000	30 years
3D. Do Nothing	0	N/A

1.0 INTRODUCTION

Hattenburg Dilley and Linnell, LLC (HDL) was retained by the North Slope Borough (Borough) Department of Capital Improvement Program Management (CIPM) to provide a Project Analysis Report (PAR) for the reconstruction of three drainage channel crossings at Nuiqsut, Alaska. The crossings include two culverts and one bridge crossing on the same unnamed drainage. Breakup flood events damage the structures, causing annual repairs and prevent access to the village water source, boat ramp, and material source stockpile.

1.1 Project Purpose and Objective

The purpose of this project is to provide the Borough with feasible solutions and costs for the reconstruction of the three drainage channel crossings at Nuiqsut.

1.2 Scope

The scope of this PAR includes analyzing the existing site conditions at each of the three sites, developing feasible bridge and culvert crossing alternatives, developing recommendations for repair and/or replacement, and developing a budgetary cost estimate for each alternative. The analysis of the alternatives considers cost, scheduling, phasing of work, material delivery, lead time, impacts on access, and other pertinent criteria determined during the study. HDL worked closely with the Borough and village public works staff to determine the history of failures and operational and maintenance issues.

1.3 Project Location

The project sites are located on the village road system at Nuiqsut, Alaska. Nuiqsut is located 35 miles from the Beaufort Sea coast on the west bank of the Nigliq Channel near the Colville River Delta (CRD). The village is located at 70°13’00” North and 151°00’00” West. The climate is arctic and dominated by extreme temperatures, wind, long daylight hours in the summer and extended periods of darkness during the winter. Temperatures range from -56 to 78°F with the daily minimum temperature below freezing 297 days per year. Annual precipitation is minimal and averages around 5 inches with an annual snowfall of 20 inches.

This study evaluates three crossings - two culvert crossings and one failed bridge crossing located on an unnamed drainage channel. See **Figure 2.**

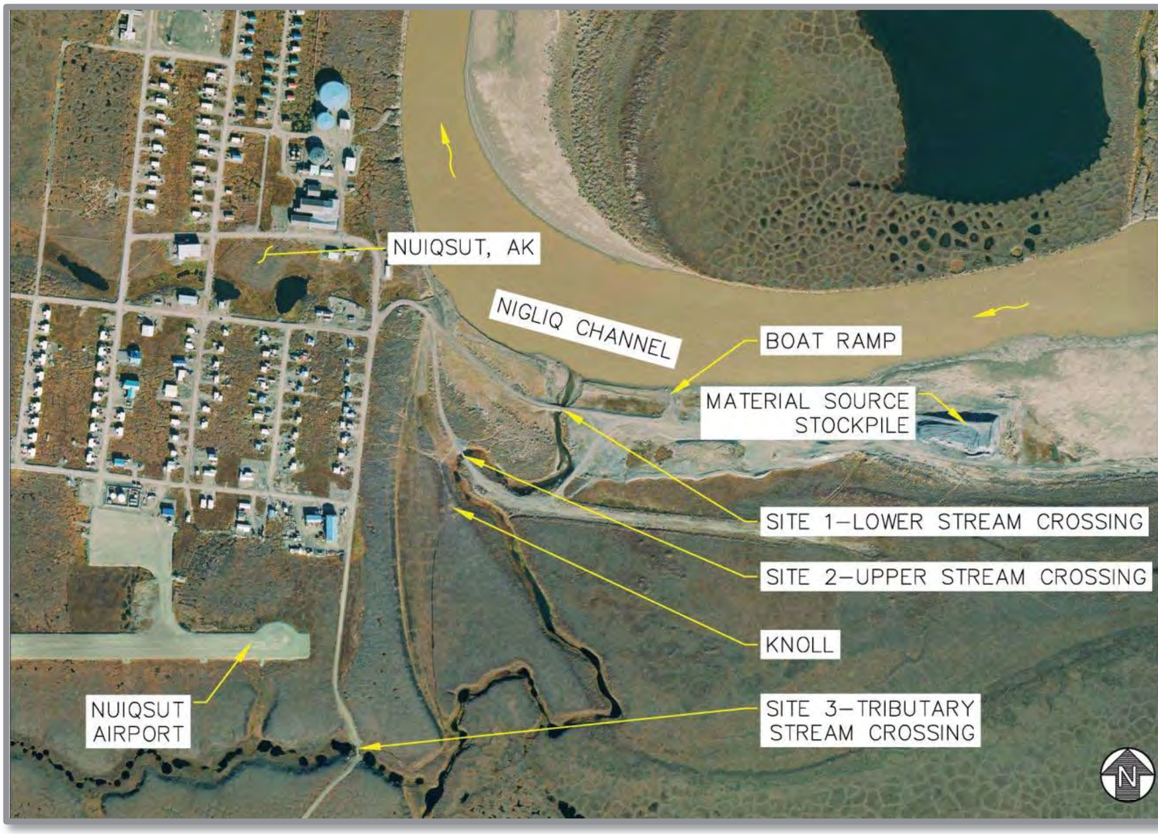


Figure 2: Site Location Map

The Lower Stream Crossing (Site 1) is a temporary culvert crossing approximately 300 feet from the Nigliq Channel. Currently, it provides the only access to the City's boat ramp and material source stockpile. This crossing requires complete reconstruction after the high water and ice jamming events every spring. The Upper Stream Crossing (Site 2) is a bridge constructed in 1974 approximately 1,550 feet upstream from Nigliq Channel.

This crossing originally provided access to the village boat ramp and material source stockpile, but has not been operational for the past couple of years. The lower stream crossing was established upon failure of this structure.

The Tributary Stream Crossing (Site 3) is a culvert crossing approximately 6,200 feet upstream from the Nigliq Channel that provides the only access to the community's water source.

1.4 Background

The Colville River is the largest river basin north of the Brooks Range draining nearly 23,500 square miles. (Baker, 2013 Colville River Delta Spring Breakup Monitoring & Hydrologic Assessment). Spring breakup on the Colville River is dominated by ice jams, glaciering, large ice floes, and high flow rates for an approximate 3 week period each spring. The three crossings are located on an unnamed stream channel adjacent to the Nigliq Channel. See **Figure 2.** The crossings are located in the flood plain of the Colville River.

ConocoPhillips has studied the timing and breakup of the CRD flooding since 2002, including the Nigliq Channel. ConocoPhillips has four stream monitoring stations (MON20, MON22, MON23 and MON28), on the Nigliq Channel downstream of Nuiqsut. Approximately 1.5 miles downstream from Nuiqsut the Nigliq Channel branches into another minor side channel, the Nigliagvik Channel. Peak discharge and water surface elevation in the Nigliq Channel has been monitored at the ice road crossing to CD5 between MON20 and MON23 since 2009. Peak annual discharges and water surface elevations (WSE) are shown in **Table 1**. The WSE is based on the British Petroleum Mean Sea Level (BPMSL) vertical datum. The scope of this study excluded any surveying, ties, or extrapolation to the BPMSL vertical datum.

Table 1: Nigliq Channel Historical Summary of Peak WSE CD5 Road

Year	Peak Indirect Discharge (cfs)	Peak WSE (ft BPMSL)
2014	66,000	9.38
2013	110000	12.42
2012	94,000	8.82
2011	141,000	9.89
2010	134,000	9.65
2009	57,000	7.91

Source Baker, 2013 CRD Spring Breakup Monitoring and Hydrologic Assessment

1.5 Crossing Evaluation

1.5.1 Lower Stream Crossing (Site 1)

The Lower Stream Crossing at Site 1 is a culvert crossing constructed after the upstream bridge failed. See **Figure 3**. The road was rerouted and culverts were installed approximately 1,250 feet downstream from the bridge to provide access to the boat ramp and village material source stockpile. The temporary culvert crossing is two 48-inch corrugated metal pipes (CMP) 42-feet in length. These pipes sit atop another series of five to seven buried steel pipes that are estimated to range in sizes from 18-inch to 24-inch. A 16-foot wide gravel roadway crosses the existing 48-inch diameter culverts. Due to the proximity of the lower stream crossing to the Nigliq Channel (approximately 300-feet) it is subjected to major damage during the spring breakup events and often times has to be reconstructed when the water levels recede.

Currently, it provides the only access to the community boat ramp and material source stockpile. This low profile road is approximately three feet above the surrounding terrain. This crossing is reported to fail almost every spring from overtopping, high flows and ice floes which erode the gravel embankment and scours around the culverts.

Figure 3: Site 1 Culverts

1.5.2 Upper Stream Crossing (Site 2)

The Upper Stream Crossing at Site 2 is a steel bridge constructed in 1974. This crossing originally provided the access to the old airport in the 1970s and then the village boat ramp and material source stockpile until its failure a few years ago. The bridge is a steel girder bridge supported by steel H-piles with abutments retained by timber lagging between piles. The bridge span length is 42 feet, measured from end of girder to end of girder. The bridge has a 14-foot wide overall deck width and decking consists of 2 x 8-inch treated timbers bolted together and attached to the steel girders. Railing consists of 12 x 12-inch timber posts and galvanized guardrail.

Figure 4: Failed Bridge at Site 2

The decking, girders and guardrail have failed. See **Figure 4**. Physical evidence from debris lines indicate that the Colville River spring flood waters overtop the bridge and the bridge elements have failed from the hydraulic pressures and/or impacts from ice floes. The steel pile and timber abutments have survived 40 years with only minor damage and displacement. See **Figure 5**. Steel elements show heavy surficial rust.

Figure 5: Bridge Abutments at Site 2

1.5.3 Tributary Stream Crossing (Site 3)

The Tributary Stream Crossing at Site 3 is a culvert crossing that provides access to the community's water supply - a fresh water lake located 1.2 miles south of the village. The 16-foot wide gravel roadway crosses the unnamed drainage that is estimated to be approximately 250 feet wide and 15 feet deep. The road profile sags approximately 11 feet at the culverts. Culverts were reportedly installed after a previous bridge failed.

The crossing consists of three 48-inch diameter by 40-foot long galvanized corrugated steel culverts. See **Figures 6 and 7**. Physical evidence of a debris line and anecdotal information indicate the roadway overtops yearly at spring breakup. To help protect the structure, the Borough has armored the inlets and outlets with sandbags. According to the Public Works Supervisor for Nuiqsut, the addition of sandbags has greatly extended the life of the structure. The condition of the sandbags is fair. The sandbags are easily accessible to vandalism. This crossing requires minimal maintenance and reconstruction after spring breakup, according to local public works staff.

The crossing appears to be in the floodplain of the Colville River, but primarily drains snowmelt in a basin defined later in this report south and west of Nuiqsut. The overtopping is likely caused by high spring breakup flows and undersized culverts.

Figure 6: Site 3 Crossing Looking South

Figure 7: Site 3 Culverts - Downstream Face

1.6 Flood and Stage Frequency

Since all of the crossings are located within the Colville River floodplain, flood and stage frequency depend heavily on Colville River hydrology. From 1992 to 2014, the measured peak flow ranged from 159,000 – 590,000 cfs, with an average peak discharge of 294,000 cfs. The peak stage varied between 12.20 – 20.69 feet (BPMSL), with an average historical peak of 16.79 feet (BPMSL). The earliest seasonal occurrence of peak flow was May 16, and the latest was June 11.

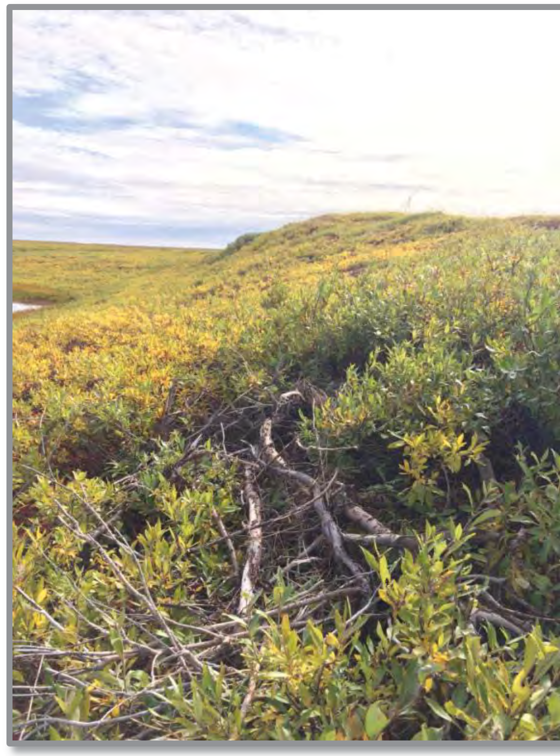


Figure 8: Upper Stream Crossing (Site 2), High Water Debris Line

Colville River data collected for ConocoPhillips has limited applicability to Nuiqsut. Water surface elevations refer to a proprietary vertical datum, BPMSL, which prevented calibration of elevation data collected by HDL and others. Additionally the ConocoPhillips studies did not include a monitoring station immediately in the vicinity of Nuiqsut. Thus, there is no record of peak flow stage and discharge that accounts for isolated seasonal flow events caused by ice jams in the Nigliq Channel at Nuiqsut.

For the crossings in this report, peak flood stage was determined by examining surrounding terrain for evidence of past high water events, such as woody debris deposited at a consistent elevation. See **Figure 8**. We found two locations with evidence of debris from high water events. We estimated that the lower of the two debris lines represented a normal high water event due to the large amount of debris in the area. The relative elevation of this debris line was approximately 2-feet higher than the centerline of the bridge deck. We estimated the higher of the debris lines represented an extreme high water event. This debris line was measured to be approximately 8.5-feet higher than the bridge deck.

For the comparison of alternatives, peak discharges, calculated by USGS regression equations, were used to estimate the preliminary bridge and culvert sizes. Determination of actual peak stage and discharge for design should include installation of stream gages at each of the crossings in question and the conduction of a flood study.

1.7 Drainage and Hydraulics

Sites 1 and 2 are located on an unnamed stream that meanders north from the drinking water supply to its outfall at the Nigliq channel. The drainage area upstream of the crossings is approximately 24.5 square miles. The hydraulic gradient of the channel is extremely mild at approximately 0.07%. The upstream watershed consists of flat, sparsely vegetated tundra with many permafrost lakes and ponds.

Site 3 drains an area of 9.5 square miles, and conveys snowmelt and permafrost thaw that collects in a series of kettle ponds south of the Nuiqsut airport runway. The tributary has a mild hydraulic gradient of 0.4%, and connects with the main channel of the unnamed stream approximately 500 feet downstream of the road crossing.

The hydraulics at each crossing are heavily influenced by the Colville River. As the Colville rises during spring breakup, a backwater effect can be created as culvert outlets become submerged or blocked by ice. The compromise in culvert capacity causes a rise in the headwater elevation, and in some cases, total inundation of the roadway.

Culvert design criteria should comply with the Alaska Highway Drainage Manual, Alaska DOT&PF, June 13, 2006.

Bridge hydraulic design criteria are provided in Sections 10.2 and 10.3 of the Alaska Highway Drainage Manual. The primary design constraint is maintaining a minimum of 3 feet of vertical clearance for passage of ice and debris at the design flow.

1.8 Soil Conditions

The project area is located in the Arctic Coastal Plain. The coastal plain is typically poorly drained and consequently marshy in the summer. Permafrost is known to exist from 800 - 1,000 feet below the ground surface. Soil conditions are unknown at these sites, but are generally assumed to be ice-rich, fine-grained soils with a thawed active layer of 1 to 3 feet in virgin undisturbed tundra, 6 to 10 feet in gravelly material, and deeper in the vicinity of stream channels where thaw bulbs are known to exist.

A geotechnical evaluation has not been performed as part of this contract, but should be performed prior to design and construction. A full geotechnical investigation should be conducted including a subsurface boring program to the depth of expected foundations with subsurface temperature measurements and laboratory testing. At a minimum, one boring should be performed per substructure and one boring per 50 linear feet of wingwall. Borings should include Standard Penetration Testing (SPT) in unfrozen soils and macro-coring, or equivalent sampling in frozen soils to retrieve samples of the frozen soil and ice. The subsurface temperature should be measured using thermistors to a depth of 10 feet below expected foundations. Laboratory testing should include grain size distribution analyses, moisture content, Atterberg limits (if applicable), and salinities. A grain size distribution analysis and proctor test should be performed on the anticipated fill material. In addition, samples of the stream bed materials should be collected to support evaluation of the scour potential.

1.9 Material Source

Gravel and riprap are the two main aggregate materials needed for the project.

1.9.1 Gravel

The Borough's material source stockpile is located approximately 0.5 miles east of the project areas on the south bank of the Nigliq Channel. See **Figure 2**. The stockpile contains approximately 150,000 cubic yards (CY) of sandy gravelly material and is suitable for constructing roadway embankments. The material was extracted 4.5 miles east of the project area on the east bank of the main channel of the Colville River. The Borough indicates the material was delivered to the stockpile in the winter of 2014/2015 for $40 per CY; 70,000 CY of this material is dedicated to the Colville River Access Road project. We understand the remaining 80,000 CY is available for Borough public works needs.

1.9.2 Riprap

There are no known local sources of rock for riprap. Most armor stone on the North Slope comes from Cape Nome or Dutch Harbor via ocean barge. The nearest upland source is Atigun Pass. Atigun Pass riprap would be mined and transported to Prudhoe Bay via the Dalton Highway and then to Nuiqsut via ice roads. The cost is estimated to be about $375 per CY in place - which is less than barged riprap.

1.10 Roadway Design Criteria

Roadway design Criteria are set forth in **Table 2**.

Table 2: Roadway Design Criteria

ELEMENT	VALUE	SOURCE
Construction Classification	Improvement of Existing Road	
Design Functional Classification	Very Low-Volume Local Road / Rural Minor Access Road	AASHTO GDVLVLR 2001
Design Year	2036	
AADT Construction Year (2016) Mid-Design Year (2025) Design Year (2035)	<400 <400 <400	
Design Hourly Volume (DHV)	<400	
Directional Split (%D)	50/50	
(%T)	50%	
Equiv. Single Axle Load (ESAL)	N/A	
Pavement Design Year	N/A	

Design Vehicle	N/A	
Design Speed (Terrain)	25 mph (Level)	
Stopping Sight Distance	250 (Assumed "Higher Risk" & doubled per p.52	AASHTO GDVLVLR 2001, p. 52 & Ex. 8, p.34
Maximum Allowable Grade Minimum Allowable Grade	7% 0.5%	AASHTO PGDHS 2011, Tbl. 5.2, pg. 5-3
Minimum Radius of Curvature	210 ft with Tc=0.4 (wet earth)	AASHTO GDVLVLR 2001, p. 51
Minimum K-Value for Vertical Curves	Crest = 29 Sag = 26	AASHTO GDVLVLR 2001, Ex. 12, pg. 39 AASHTO PGDHS 2011, Tbl. 5.3, pg. 5-4
Number of Roadways	1 lane	
Width of Traveled Way	16 ft	
Width of Shoulder	N/A	
Surface Treatment	N/A	
Side Slope Ratios	Fore: 2H:1V Back: 2H:1V	
Degree of Access Control	N/A	
Median Treatment	N/A	
Illumination:	N/A	
Curb Usage and Type	N/A	
Bicycle/ Pedestrian Provisions	N/A	

1.11 Design Standards and Guidelines

Design standards should comply with the following publications:

- Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400), American Association of State Highway and Transportation Officials (AASHTO), 2001.

- A Policy on Geometric Design of Highways and Streets (PGDHS or "Green Book"), AASHTO, 2001.

- Bridge LRFD Design Specifications, AASHTO, 2014.

- Alaska Highway Drainage Manual, Alaska Department of Transportation and Public Facilities (ADOT&PF).

2.0 ALTERNATIVES

The following feasible alternatives are considered.

Site 1

- Alternative 1A - Remove Crossing and Salvage Useable Materials
- Alternative 1B - Do Nothing

Site 2

- Alternative 2A - New Bridge Crossing, Elevate Above Ordinary High Water
- Alternative 2B - New Culverts, Minor Elevation Change
- Alternative 2C - Do Nothing

Site 3

- Alternative 3A - Armor Existing Culverts, No Elevation Change
- Alternative 3B - Install New Circular Culverts, Elevate Roadway 3 Feet
- Alternative 3C - Install New Arched Culvert, Elevate Roadway 4.5 Feet
- Alternative 3D - Do Nothing

2.1 Alternative 1A – Remove Crossing and Salvage Useable Materials

Alternative 1A consists of removing the lower stream crossing at Site 1 and salvaging the aggregate and two 48-inch culverts. The crossing is within 300 feet of the Nigliq Channel and is mostly affected by high flows in the Nigliq Channel. The crossing is reconstructed every spring. The banks of the stream and streambed would be reshaped and blended to match the existing contours to help facilitate the flow. Removing this crossing would eliminate a maintenance/reconstruction project every spring. Removing the crossing at Site 1 cannot occur until the crossing at Site 2 is reconstructed.

2.2 Alternative 1B - Do Nothing

Alternative 1B is to leave the lower stream crossing at Site 1 in place. If Alternative 1B is selected, the crossing will likely blow out within one year making the road to the boat ramp and material source stockpile impassible.

2.3 Alternative 2A – New Bridge Crossing, Elevate Above Ordinary High Water

This alternative consists of a one lane modular bridge on a steel pile foundation. The proposed superstructure would be a prefabricated modular bridge with an estimated deadload of 34-kips. The bridge would be designed to withstand loading conditions consistent with AASHTO's HL-93 loading condition, which is defined as lane load plus design truck load. In accordance with the Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400) the recommended bridge width is 15 feet. This bridge would be constructed at the previous location and the span would remain unchanged at 42 feet. Prior to any new construction, the existing bridge would be removed and all salvageable materials delivered to the city landfill. The existing piles would be pulled using a vibratory hammer, and new piles driven at the same approximate location.

To allow passage of debris, the bottom chord of the new modular bridge would be elevated to a height of 3-feet above the ordinary high water mark per the recommendation of the Alaska Highway Drainage Manual. The deck height of the new bridge is estimated to be about 8 feet above that of the previous bridge. Based on the debris lines observed in the field, the additional height of this bridge would keep the structure from being impacted during ordinary high water events and spring ice jams, but not extreme flooding. Elevating the new structure would require reconstruction of the approaches.

According to the Alaska Highway Preconstruction Manual, bridge railings must comply with NCHRP 350 test level 2 or 3. To increase bridge rail performance the test level 3 railing should be considered.

Per the AASHTO Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400) the use of guardrails or other traffic barriers are not recommended and deemed impractical for use on roads with very low traffic volumes.

For the purposes of developing a cost estimate, we assumed an active layer of 8 to 10 feet and HP 14 x 117, grade 50, steel H-piles spaced at approximate 6 feet and driven to a depth of 50 feet below the ground surface. It is anticipated that the piles would be driven in the same general location as the existing piling. In permafrost, piles will likely require predrilling.

With an anticipated embankment height of 18 feet, abutments would consist of the H-piles, 8-inch x 8-inch treated timber lagging and horizontal steel rod tiebacks and deadmen to restrain lateral earth pressures. A steel pile cap would support the modular bridge and should be designed to resist the force of ice jams should the ordinary high water mark be exceeded. Riprap armoring would be installed on approach slopes and along the abutment toe to resist erosion and scour. See the concept drawings in **Appendix B**.

This alternative would elevate the bridge above the estimated ordinary high water mark, but could be expected to overtop occasionally and be damaged by extreme flood events on the Colville River. Approach slope armor may be displaced by large ice floes and would require maintenance. Stream gaging and flood study would be needed to estimate the recurrence interval and flood stages for a proper bridge design at Site 2. The roadway from the boat ramp to the village would intentionally not be elevated to allow flood waters and ice floes to pass around the bridge and approaches and avoid having the roadway act as a dam.

2.4 Alternative 2B – New Culverts, Minor Elevation Change

Alternative 2B consists of installing three 120-inch diameter galvanized steel culverts. Sheet piling should be considered under culverts at both ends to prevent piping around the bottom of culverts. Rigid insulation would be installed under culverts to avoid thaw settlements. Prior to any new construction, the existing bridge would be removed and all materials disposed of at the landfill. Existing piles would be pulled or cut off below grade.

A preliminary hydraulic analysis was performed to compare the existing condition to three 10-foot diameter culverts with headwalls. HEC-RAS modeling software was used to develop hydraulic models based on elevations recorded during the site visit. The complexity of the hydraulic processes associated with the ice jams in the Colville River Drainage limits the ability to validate the modeling, but it allows for a general comparison between the existing structure and a proposed structure.

Based on the Alaska Department of Transportation's listed design value for bridges in flood hazard areas, the 100-year peak flow was selected as the design flow. This flow was calculated using USGS regression equations. The model assumed that the bridges or culverts would have a 2-foot blockage due to icing. The results are depicted in **Table 3**.

Table 3: Upper Stream Crossing Model Results

	Existing Bridge	Proposed Condition 3 – 120" Culverts
Q_{10} Backwater Elevation (feet below low chord or top of pipe)	-1.3	+1.1
Flow Capacity	700 cfs	1,350 cfs

The results suggest that installing three 120-inch culverts would increase freeboard by 2.4 feet and nearly double the flow capacity.

This Alternative assumes there is no benefit to elevating the crossing because the roadways have flooded. Finished grade over the culverts would approximately match that of the existing bridge approaches with 2 feet of minimum cover over new culverts.

To prevent piping under the culverts, a sheet pile wall would be installed at the inlet and outlet ends to prevent piping under the culvert bottoms. The culverts would be bolted to a steel angle which is in turn secured to the sheet piling. The sheet piling wall shall be cut to accommodate the bottom of the culvert and driven to refusal at the permafrost interface.

The crossing would be armored with 32-inches of Class II riprap from the toe of the slope to the shoulder of the road. This armor toes should be keyed in at the bottoms and ends to prevent edge scour. A riprap apron should extend 15-feet in front of the inlet and outlet ends of the culverts.

Approach slope armor may be displaced by large ice floes and would require some maintenance but less than an elevated bridge. Stream gaging and flood study would be needed to estimate the flood recurrence intervals and stages for design. The roadways and crossings would flood more frequently than the Alternative 2A, the elevated bridge.

2.5 Alternative 2C – Do Nothing

Currently, half of the bridge decking is missing and a wooden barricade with a single warning sign is the only safety measure implemented. Leaving the site as-is is a potential hazard and liability for the Borough and therefore this alternative is not recommended. The bridge and abutments should be removed and the slopes graded to match the existing contours.

2.6 Alternative 3A – Armor Existing Structure, No Elevation Change

During HDL’s site visit in August 2015, it was observed that very little flow was active through the culverts at Site 3. However, a high water debris line was discovered upstream of the crossing. This upstream debris line was measured at approximately 4.5 feet above the crest of the road at the culverts. Downstream of the crossing, a high water debris line was observed approximately 2 feet below the top of the road. Based on the debris lines, there appears to be a significant backwater buildup during peak flows resulting in roadway overtopping and erosion damage. This effect can be mitigated through hydraulic improvements at the crossing. This alternative, however, makes no improvement to the crossing’s hydraulic issues but includes armoring the existing culverts and installing a minimum of 32 inches of Class II riprap. The embankment slopes would be armored and culvert ends armored 15 feet in front of the culvert ends to a width 4 feet on either side of the outside of the culvert. This alternative does not mitigate the backwater buildup during peak flows, but addresses erosion and damage sustained during these periods. Once the waters have receded there may still be a need for minor maintenance.

This alternative would be prone to flooding during breakup and would not provide all season access to the water source lake. This alternative is not recommended if all season access to the water source lake is required.

2.7 Alternative 3B – Install New Circular Culverts, Elevate Roadway 3 Feet

Alternative 3B consists of installing three 72-inch circular culverts at Site 3, raising road grade approximately 3 feet, and armoring slopes and aprons similar to Alternative 2B. Rigid insulation would be installed under culverts to reduce thaw settlements. To prevent piping under the culvert bottoms, a sheet pile wall would be installed at the inlet and outlet ends of the culverts. The culverts shall be bolted to an angle and secured to the sheet piling. The sheet piling would be trimmed to accommodate the shape of the culvert. Slopes and inlet and outlet aprons would be armored with 32-inches of Class II riprap. The aprons would extend 15 feet in front of the culverts.

A hydraulic analysis was performed to compare the existing conditions to the recommendation using HY-8 modeling software. It should be noted that the complexity of the hydraulic process associated with ice jams in the Colville River Drainage limits the ability to validate modeling results; however, a performance comparison between the existing and proposed condition is useful.

Based on the Alaska Department of Transportation's design value for low usage secondary highways, the 10-year peak flow was used as the design flow to analyze the tributary stream crossing. The results are depicted in **Table 4** below. USGS regression equations were used to calculate the flow and it was assumed that the culverts would have a 2-foot blockage due to icing.

Table 4: Tributary Culvert Model Results

	Existing Condition 3 – 48" Culverts	Proposed Condition 3 – 72" Culverts
Q_{10} Backwater Elevation (feet above roadway)	+1.7	-1.9
Overtopping Flow	199 cfs	552 cfs

The results suggest that upgrading to three 72-inch diameter circular culverts would reduce the backwater elevation by several feet and may significantly reduce the probability of overtopping.

The alternative would provide all season access to the water source lake. This alternative is recommended.

2.8 Alternative 3C – Install New Arched Culvert, Elevate Road 4.5 Feet

Alternative 3C consists of installing a single 100-inch by 154-inch arched culvert, rigid insulation, a sheet pile cutoff wall and slope and apron armoring. Similar to Alternatives 3A and 3B, the slopes and aprons would be armored with 32-inches of Class II riprap. The apron would measure approximately 15-feet by 27-feet in front of culvert inlets and outlets. To achieve the recommended minimum culvert cover of 2 feet, the existing roadway grade would have to be raised by 1.2 feet. In order to mitigate overtopping, similar to Alternative 3B (using the Q_{10} backwater information) the roadway should be raised 4.3 feet. Elevating the roadway would enable the road to be useable during spring breakup.

A preliminary hydraulic analysis was performed similar to Alternatives 3A and 3B. Based on the Alaska DOT's design value for low usage secondary highways, the 10-year peak flow was used as the design flow to analyze the tributary stream crossing. The results are depicted in **Table 5** below. USGS regression equations were used to calculate the flow and it was assumed that the culverts would have a 2-foot blockage due to icing.

Table 5: Tributary Culvert Model Results

	Existing Condition 3 – 48" Culverts	Proposed 100" x 154" Arched Culvert
Q_{10} Backwater Elevation (feet above roadway)	+1.7	-0.6
Overtopping Flow	199 cfs	557 cfs

The results suggest upgrading to a single 100-inch by 154-inch arched culvert would reduce the backwater elevation by a couple of feet and would reduce the occurrence of overtopping.

This alternative may be feasible, but its design should take special precautions to insulate the foundation under the arched culvert to prevent frost jacking. Arched culverts are susceptible to failure from frost jacking because of their flat bottom. Recently, a similar multiplate arched culvert in Buckland failed when the bottom jacked, while a circular multiplate structure alongside it performed satisfactorily. It is reported that an ice lense formed underneath, causing the bottom to buckle. For this reason, additional insulation should be added to prevent ice lenses from forming under the arch.

2.9 Alternative 3D – Do Nothing

Alternative 3D leaves the existing crossing as is. With minor spring time repairs this crossing may be useable for years, but will eventually fail due to damage sustained during high water events and ice jamming activities. If the Borough desires all season access to the water source lake, this option is not recommended.

2.10 Other Alternatives Considered

Other alternatives were considered, but deemed not feasible for technical or economic reasons.

2.10.1 Elevate Bridge at Site 2 Above Extreme High Water

Elevating the bridge at Site 2 above the extreme high water event was considered, but deemed not practical or feasible. This alternative would require extremely high, roughly 24.5–foot, abutment walls and extended approaches. Building abutments and approaches of this magnitude would require massive amounts of fill material and gravel, which would be expensive and complicated. Elevating the bridge to this extreme would pose no benefit to the community as the surrounding access roads would be inundated and the bridge would not be of any benefit to the general public. For cost estimate breakdown see **Page 10 of Appendix A.**

2.10.2 Precast Concrete Girders

A bulb-T prestressed concrete bridge was considered for Site 2, but deemed not economically feasible due to the short span. According to a local prestressed concrete manufacturer, a short 50-foot span with a 14 to 16 foot deck width, three 42-inch bulb-T prestressed concrete girders would not be competitive with modular steel bridges of an equivalent size. The concrete would also be more susceptible to ice damage because of the girder depth, and the bulbs lesser lateral strength when compared to a steel bridge.

2.10.3 Elevate the Entire Road to the Boat Ramp Above Extreme High Water

Elevating and armoring the 3200 feet of road to the boat ramp and bridge at Site 2 above extreme high water was considered, but the high cost, estimated to be $20M to $30M for the 28,800 CY of riprap and 92,800 CY of gravel fill was deemed not economically feasible. Elevating the entire road and bridge would hydraulically act as a dam for Colville River flood waters and would be prone to flood damage. The high cost compared to the benefit of providing access to the boat ramp and material source during flood events makes this concept not feasible.

3.0 CONSTRUCTION METHODS

The nature of the work and soils in the area lend itself to construction during multiple seasons. The mobilization/demobilization of materials and equipment on the ice road coupled with winter and summer construction activities will extend construction over the course of one year.

Construction access at Site 3 is governed by the need for access to the village's water source. The 3rd or 4th week of June the city begins pumping water from the lake and pumps continuously until the tanks are full, which is typically around the 1st week of September. The shutdown date varies according to weather. Freezing of the waterline ends the pumping season. During the pumping season, the water system operators require unrestricted access to service pumps and monitor the operation.

3.1 Construction Methods for Culverts

3.1.1 Site 2

The existing bridge should be removed and all salvageable materials shall be delivered to the Borough. The existing piles may be able to be pulled, salvaged, and returned to the City; otherwise, the piling should be cut two feet below grade. In late fall, the sheet pile walls should be installed when the active layer is at its maximum depth. These walls are to be driven through the active layer and to refusal in the permafrost layer below. The sheet pile walls should be left high, about to the spring line of the culverts. Under frozen ground conditions, the Contractor would excavate and install a layer of rigid insulation and install approximately 4-feet of sacrificial fill material to protect the crossing during spring runoff and breakup. After breakup, culverts would be installed and remaining thawed fill placed and compacted under low flow conditions. The sheet piles would be trimmed and attached to culverts using a double rolled angle. Fill slopes should be armored with Class II riprap 32-inches deep over a geotextile fabric with keyed edges. The culvert inlets would be armored with a riprap apron.

3.1.2 Site 3

Due to the average historical high water date of the Colville River on May 31st, and the need for access to the water source lake by the 3rd week in June, winter construction methods will need to be employed. In late fall, the existing culverts and fill would be removed and sheet pile walls installed similar to Site 2. Sheet piles would be cut to an elevation about 6 inches above the invert of the inlet and outlet of the culverts. Then under frozen ground conditions, excavation would occur to the bottom of insulation, insulation installed, then fill brought back up to the bedding depth of the culvert inverts. The culverts, fill, geotextile, and riprap could be placed under frozen ground conditions, if dry granular material could be properly placed and compacted; or the contractor could place temporary riprap to protect during breakup and complete the project under thawed conditions. The sheet piles would be trimmed and attached to culverts using a double rolled angle. Fill slopes should be armored with Class II riprap 32-inches deep over a geotextile fabric with keyed edges. The culvert inlets would be armored with a riprap apron.

3.2 Construction Methods for the Bridge

The removal of the existing bridge structure is needed to construct the bridge. The existing bridge should be removed and all salvageable materials shall be delivered to the Borough. The existing piles should be pulled, salvaged, and returned to the City, or the bridge offset to miss existing piles.

Gravel approaches would be removed to the extent required to drive piles and construct deadmen anchors. New H-piles would be predrilled with an undersized pilot hole and driven to depth. Near-water work should be avoided until spring breakup high flows have receded.

The abutments and wing walls, consisting of piles, treated-timber lagging and deadman anchors, would be constructed during thawing conditions to help ensure proper placement and compaction of fills. The pile caps, elastomeric bearing pads, backwall, bridge structure, and appurtenances would be installed when environmental conditions allow for proper welding and connection installation.

4.0 MAINTENANCE AND OPERATION

Yearly maintenance may be required at Sites 2 and 3 to ensure the longevity of the crossings. Erosion control and bank stabilization will need to be maintained and repaired in a timely manner to protect the structures in place. These structures will be subject to flooding and overtopping during extreme events and will need to be repaired and rearmored, if needed. If normal maintenance is not conducted in a timely fashion the structures may prematurely fail.

It is recommended to inspect culverts on an annual basis and after extreme events. The National Bridge Inspection Standards (NBIS) recommends that bridges should be inspected every two years and that the maximum interval between inspections should not exceed four years.

5.0 ENVIRONMENTAL CONSIDERATIONS AND PERMITTING REQUIREMENTS

HDL conducted preliminary environmental research using the most current available data from state and federal agencies to identify environmental resources in the vicinity of the proposed project. The purpose of the preliminary research was to assist in identifying permitting and regulatory requirements to ensure environmental considerations are adequately addressed in developing any of the "action" alternatives for the proposed project. Environmental categories with resources potentially present in the project area are discussed below.

National Environmental Policy Act (NEPA) Review

The funding source for the proposed project will dictate the type of environmental documentation necessary to satisfy state and federal requirements and/or authorizations.

Should federal funds be used, the federal agency appropriating the funds would likely assume the role of lead federal agency and would be responsible for development of appropriate NEPA documentation. NEPA documentation would outline potential impacts to the natural and man-made environment.

Should the project be entirely state funded, the NSB's primary environmental documentation will be the environmental review conducted for this PAR, which identifies potential environmental impacts and outlines permits and authorizations needed for the project. A NSB or state-funded project triggers the NEPA process when a federal permit is required, such as a U.S. Army Corps of Engineers (USACE) Section 404 permit for impacts to wetlands. This environmental review may be used by the USACE to streamline their NEPA documentation efforts and potentially decrease the amount of time necessary in receiving authorization.

Wetlands & Waters of the U.S.

A review of the U.S. Fish & Wildlife Service (USFWS) National Wetlands Inventory and recent satellite imagery indicates the project area contains wetlands under USACE jurisdiction. It is anticipated that the project will impact wetlands, and will require authorization under a Nationwide Permit and submittal of a Pre-Construction Notification to USACE. Should the project disturb more than 0.50 acre of wetlands, an Individual Permit application would be required.

Construction of the proposed project will involve the discharge of construction storm water into waters of the U.S. Should the project involve more than one acre of disturbed ground, coverage under the Alaska Department of Environmental Conservation's Alaska Pollutant Discharge Elimination Systems (APDES) Construction General Permit for stormwater discharges would be required.

Cultural, Historic, Pre-Historic, & Archaeological Resources

The likelihood of disturbing previously unknown cultural, historic, pre-historic, or archaeological resources within the project areas is low since the areas have been previously disturbed by construction of existing infrastructure. The project will require a Certificate of Traditional Land Use Inventory (TLUI) Clearance from the NSB Department of Inupiat History, Language, and Culture (IHLC).

Should the project receive state or federal funding, consultation with the Alaska Office of History and Archaeology under the Alaska Historic Preservation Act, or State Historic Preservation Officer (SHPO) under Section 106 of the National Historic Preservation Act, would be required.

Fish & Wildlife:

Threatened & Endangered Species

Initial project scoping conducted using USFWS's Information, Planning, and Conservation System tool indicates there is one species, the polar bear (Ursus maritimus), listed as threatened under the Endangered Species Act (ESA) that is known to inhabit the project area. There are no endangered or candidate species or designated critical habitats located in the project area. Consultation with the USFWS under Section 7 of the ESA would be required if federal funding is received for construction.

Migratory Birds

The project is located in areas that have been heavily disturbed; however, shrub and grass-vegetated areas are present. To avoid disturbance to migratory birds, USFWS recommends avoiding clearing from June 1st through August 10th.

Anadromous Fish Streams

A review of the Alaska Department of Fish and Game's (ADF&G) Anadromous Waters Catalog (AWC) indicates the project is located on the Nigliq Channel, a tributary of the Colville River, which is listed as supporting several species of anadromous fishes. Consultation with ADF&G during the design phase of the project is recommended to determine whether fish may be present in the project area and if a Fish Habitat Permit will be required.

Land Ownership

According the Alaska Division of Community and Regional Affairs' Community Map for Nuiqsut, the project would be located on a combination of lands owned by the Borough, City of Nuiqsut, and Kuukpik Corporation. The project will require easements or rights-of-way prior to construction.

Environmental Permitting Summary & Recommendations

Table 6 below summarizes environmental data and permit requirements for development.

Table 6: Recommended Regulatory and Permitting Tasks

NSB Land Management Regulations (LMR)	Development Permit. (fee waived for NSB projects).
Wetlands, Waters of the U.S, & Navigable Waters	Jurisdictional wetlands located within project areas. Section 404 Nationwide Permit/Pre-Construction Notification required. APDES Construction General required if disturbed area is 1 or more acre ($490 fee).

Cultural, Historic, Pre-Historic, & Archaeological Resources	Low potential to encounter historic sites; IHLC's Certificate of TLUI Clearance required (fee waived for NSB projects). Consultation with OHA/SHPO required depending on funding source.
Threatened & Endangered Species	Polar bear listed as Threatened under ESA. Consultation with USFWS required if federally funded.
Migratory Birds	No vegetation clearing between June 1st and August 10th recommended.
Anadromous Fish Streams	No AWC-listed anadromous fish habitat in project area; Nigliq Channel of Colville River is approximately 500 feet downstream of Site 1. Consultation with ADF&G recommended during design.
Land Ownership	Confirm existing or provide easements or rights-of-way for work on NSB, City of Nuiqsut, and Kuukpik Corporation lands.

6.0 ESTIMATE OF PROBABLE COSTS

6.1 Capital Cost

Capital costs for the three sites have been prepared based on the analysis provided herein for each of the sites, details of which are provided in **Appendix A** and summarized in **Table 7**. Capital cost estimates are based on the following general assumptions:

1. Work will be competitively bid.
2. Seasonal ice road between Prudhoe Bay and Nuiqsut will be available and constructed by industry.
3. Materials and equipment will mobilize and demobilize via ice road.
4. A site for material staging and equipment storage will be provided at no cost to the contractor.
5. The Borough stockpiled gravel will be available at no cost.
6. Piling will be predrilled in permafrost.
7. Sheet piling will be driven through the thawed active layer to refusal in the permafrost.

8. Construction shall occur during times of low to no flow.
9. Dewatering will be necessary when working at or below the water levels in the surrounding area.
10. Labor assumed to be at Title 36 wage rates.
11. No crushed aggregate surfacing is required for road surfacing.
12. Alternative 1A work will be performed upon completion of Site 2 work by the same Contractor.

Table 7: Capital Cost Summary

Alternative	Capital Cost	Useful Life
1A. Remove Crossing and Salvage Useable Materials	$203,000	N/A
1B. Do Nothing	0	N/A
2A. New Bridge Crossing, Elevate Above Ordinary High Water	3,423,000	30 years
2B. New Culverts, Minor Elevation Change	3,216,000	30 years
2C. Do Nothing	406,000	N/A
3A. Armor Existing Culverts, No Elevation Change	1,502,000	15 years
3B. Install New Circular Culverts, Elevate Roadway 3 Feet	3,352,000	30 years
3C. Install New Arched Culvert, Elevate Roadway 4.5 Feet	3,932,000	30 years
3D. Do Nothing	0	N/A

6.2 Operation and Maintenance Costs

Operation and maintenance (O&M) costs are expected to include minor riprap restoration annually from ice floes; except after extreme flood events which may cause significant damage. O&M costs can be minimized by keeping embankments sloped and low profile to minimize hydraulic impacts and restoration costs.

7.0 FINDINGS

1. All three sites are in the flood plain of the Colville River and are subject to overtopping and ice jamming.

2. Little flood information exists for Nuiqsut and the Corps of Engineers has not established a flood datum for Nuiqsut.

3. A flood study and stream monitoring is needed to determine flood recurrence intervals and flood elevations.

4. Debris lines near Site 2 suggest seasonal floodwaters and ice floes overtop the bridge by approximately 2 feet annually and by approximately 8.5 feet during extreme flood events.

5. The Site 3 overtops annually but requires only minor sandbag repair after the high water recedes.

6. Debris lines near Site 3 suggest that the roadway overtops by approximately 4.5 feet during extreme high water events.

8.0 RECOMMENDATIONS

1. Conduct a flood study and stream monitoring study to determine flood recurrence intervals and flood elevations.

2. Conduct a geotechnical investigation to determine engineering and thermal properties of soils at the sites to allow for proper design.

3. At the Lower Stream Crossing (Site 1), remove the crossing after the Site 2 crossing is restored: **Alternative 1A – Remove Crossing and Salvage Useable Materials.**

4. At the Upper Stream Crossing (Site 2), remove the existing bridge and install three 120-inch culverts: **Alternative 2B – New Culverts, Minor Elevation Change.**

5. At the Tributary Stream Crossing (Site 3), install three new 72-inch culverts to provide all-season access to the water source lake: **Alternative 3B – Install New Circular Culverts, Elevate Roadway 3 Feet.**

9.0 REFERENCES

1. A Policy on Geometric Design of Highways and Streets, (PGDHS or “Green Book”) AASHTO, 2011.

2. Alaska Highway Drainage Manual, Alaska DOT&PF. June 13, 2006.

3. Baker. 2013 Colville River Delta Spring Breakup Monitoring & Hydrologic Assessment.

4. Big R Bridge. Standard 4 ¼” Steel Deck 30’ to 80’ x 14’ or 16’ Single Lane Bridge – Bridge Detail, December 7, 2015.

5. "Bridges & Structures." Revisions to the National Bridge Inspection Standards (NBIS). N.p., n.d. Web. 07 Dec. 2015.

6. Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400). American Association of State Highway and Transportation Officials (AASHTO), 2001.

7. Green, Ken. NSB CIPM Project Administrator, Personal communication regarding material source stockpile, December 2015.Nukapigak, Thomas. Nuiqsut Public Works Superintendent, Personal Communication, August and November 2015.

8. Roadside Design Guide. AASHTO, 2011.

9. "Village of Nuiqsut | ICAS." ICAS. Web. 16 Sept. 2015.

APPENDIX A

COST ESTIMATE

Nuiqsut Repair Bridge Crossing PAR

2/10/2016

Alternative 1A - Remove Crossing and Salvage Useable Materials

ITEM	QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL PRICE
1	1 L.S.	Temp Erosion and Pollution Control	20,000.00	20,000
2	1 L.S.	Remove 2-48" CMPs	25,000.00	25,000
3	1 L.S.	Remove 5-7 18"-24" Burried Steel Pipes	25,000.00	25,000
4	1 L.S.	Reshaping and Bank Stabilization	45,000.00	45,000
5	1 L.S.	Salvagable Material	15,000.00	15,000
		Subtotal Construction		$130,000

Land Acquisition		0
City Administration	@ 5%	6,500
Design	@ 12%	15,600
Construction Management	@ 15%	19,500
Project Contingency	@ 15%	19,500
3 Years Inflation	@ 3%	12,100
Subtotal		$203,200

Nuiqsut Repair Bridge Crossing PAR
2/10/2016

Alternative 1B - Do Nothing

ITEM	QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL PRICE
		Subtotal Construction		$0

Land Acquisition		0
City Administration	@ 5%	0
Design	@ 12%	0
Construction Management	@ 15%	0
Project Contingency	@ 15%	0
1 Years Inflation	@ 3%	0
Subtotal		$0

Nuiqsut Repair Bridge Crossing PAR

2/10/2016

Alternative 2A - New Bridge Crossing, Elevate Above Ordinary High Water

ITEM	QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL PRICE
1	1 L.S.	Mobilization/Demobilization	286,000.00	286,000
2	1 L.S.	Temp Erosion and Pollution Control	75,000.00	75,000
3	1 L.S.	Construction Surveying	90,000.00	90,000
4	1 L.S.	Remove Piling, Abutments, and Superstrucure	75,000.00	75,000
5	1 L.S.	Modular Bridge (FOB Seattle)	54,600.00	54,600
6	1 L.S.	Modular Bridge Assembly	20,000.00	20,000
7	17 Tons	Barging of Bridge Structure (SEA to PUD)	1,000.00	17,000
8	332,000 Lbs.	HP14x117 Piling, Grade 50 (2840l.f.)	1.00	332,000
9	20 Days	Install H Piles	18,000.00	360,000
10	9,000 Lbs.	Pile Caps, Backwall, and Bearing Plates	1.00	9,000
11	2,700 B.F.	8x8 PT Timber	2.00	5,400
12	432 L.F.	Tie Back Anchors	50.00	21,600
13	12 Each	Deadmen	10,000.00	120,000
14	290 C.Y.	Excavation	50.00	14,500
15	3,960 C.Y.	Gravel Fill	50.00	198,000
16	1,500 S.Y.	Geotextile Fabric	5.00	7,500
17	1,000 C.Y.	Rip Rap	375.00	375,000
18	13 Loads	Trucking (Anc. to Nui.)	10,000.00	130,000

Subtotal Construction		$2,190,600
Land Acquisition		0
City Administration	@ 5%	109,500
Design	@ 12%	262,900
Construction Management	@ 15%	328,600
Project Contingency	@ 15%	328,600
3 Years Inflation	@ 3%	203,100
Subtotal		$3,423,300

Nuiqsut Repair Bridge Crossing PAR

2/10/2016

Alternative 2B - New Culverts, Minor Elevation Change

ITEM	QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL PRICE
1	1 L.S.	Mobilization/Demobilization	268,000.00	268,000
2	1 L.S.	Temp Erosion and Pollution Control	50,000.00	50,000
3	1 L.S.	Construction Surveying	90,000.00	90,000
4	1 L.S.	Remove Piling, Abutments, and Superstrucure	75,000.00	75,000
5	195 L.F.	3 - 120" Φ CMP	1,800.00	351,000
6	6 Each	End Section	4,000.00	24,000
7	55,000 Lbs.	Sheet Piling (1550 S.f.)	1.00	55,000
8	15 Days	Install Sheet Piling	18,000.00	270,000
9	500 Lbs.	8"x4"x9/16" Rolled Angle H.D.G.	6.00	3,000
10	72 L.F.	Tieback Anchors	50.00	3,600
11	4 Each	Deadmen	7,500.00	30,000
12	19,500 B.F.	4" Rigid Insulation	12.00	234,000
13	610 C.Y.	Excavation	50.00	30,500
14	1,600 C.Y.	Gravel Fill	50.00	80,000
15	1,030 C.Y.	Riprap	375.00	386,250
16	1,500 S.Y.	Geotextile Fabric	5.00	7,500
17	10 Loads	Trucking (Anc. to Nui.)	10,000.00	100,000
		Subtotal Construction		$2,057,850

Land Acquisition		0
City Administration	@ 5%	102,900
Design	@ 12%	246,900
Construction Management	@ 15%	308,700
Project Contingency	@ 15%	308,700
3 Years Inflation	@ 3%	190,800
Subtotal		$3,215,850

Nuiqsut Repair Bridge Crossing PAR
2/10/2016

Alternative 2C - Do Nothing (Remove Bridge)

ITEM	QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL PRICE
1	1 L.S.	Mobilization/Demobilization	40,000.00	40,000
2	1 L.S.	Temp Erosion and Pollution Control	75,000.00	75,000
3	1 L.S.	Remove Piling, Abutments, and Superstrucure	75,000.00	75,000
4	1 L.S.	Reshaping and Bank Stabilization	50,000.00	50,000

Subtotal Construction		$240,000
Land Acquisition		0
City Administration	@ 5%	12,000
Design	@ 15%	36,000
Construction Management	@ 20%	48,000
Project Contingency	@ 20%	48,000
3 Years Inflation	@ 3%	22,300
Subtotal		$406,300

Nuiqsut Repair Bridge Crossing PAR

2/10/2016

Alternative 3A - Armor Existing Culverts, No Elevation Change

ITEM	QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL PRICE
1	1 L.S.	Mobilization/Demobilization	250,000.00	250,000
2	1 L.S.	Temp Erosion and Pollution Control	50,000.00	50,000
3	1 L.S.	Slope Grading	85,000.00	85,000
4	1,425 C.Y.	Riprap	375.00	534,400
5	2,420 S.Y.	Geotextile Fabric	5.00	12,100
		Subtotal Construction		$931,500

Land Acquisition		0
City Administration	@ 5%	46,600
Design	@ 12%	111,800
Construction Management	@ 15%	139,700
Project Contingency	@ 20%	186,300
3 Years Inflation	@ 3%	86,400
Subtotal		$1,502,300

Nuiqsut Repair Bridge Crossing PAR

2/10/2016

Alternative 3B - Install New Circular Culverts, Elevate Roadway 3 Feet

ITEM	QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL PRICE
1	1 L.S.	Mobilization/Demobilization	280,000.00	280,000
2	1 L.S.	Temp Erosion and Pollution Control	50,000.00	50,000
3	1 L.S.	Construction Surveying	90,000.00	90,000
4	1 L.S.	Remove Old Culverts	25,000.00	25,000
5	195 L.F.	72" CMP	1,200.00	234,000
6	6 Each	End Sections	3,000.00	18,000
7	34,000 Lbs.	Sheet Piling (1000 S.f)	1.00	34,000
8	15 Days	Install Sheet Piling	18,000.00	270,000
9	500 Lbs.	8"x4"x9/16" Rolled Angle H.D.G.	6.00	3,000
10	72 L.F.	Tieback Anchors	50.00	3,600
11	4 Each	Deadmen	7,500.00	30,000
12	12,400 B.F.	4" Rigid Insulation	12.00	148,800
13	1,280 C.Y.	Excavation	50.00	64,000
14	2,740 C.Y.	Gravel Fill	50.00	137,000
15	1,735 C.Y.	Riprap	375.00	650,625
16	1,390 S.Y.	Geotextile Fabric	5.00	6,950
17	10 Loads	Trucking (Anc. to Nui.)	10,000.00	100,000
		Subtotal Construction		$2,144,975

Land Acquisition		0
City Administration	@ 5%	107,200
Design	@ 12%	257,400
Construction Management	@ 15%	321,700
Project Contingency	@ 15%	321,700
3 Years Inflation	@ 3%	198,900
Subtotal		$3,351,875

Nuiqsut Repair Bridge Crossing PAR

2/10/2016

Alternative 3C - Install New Arched Culvert, Elevate Roadway 4.5 Feet

ITEM	QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL PRICE
1	1 L.S.	Mobilization/Demobilization	328,000.00	328,000
2	1 L.S.	Temp Erosion and Pollution Control	50,000.00	50,000
3	1 L.S.	Construction Surveying	90,000.00	90,000
4	1 L.S.	Remove Old Culverts	25,000.00	25,000
5	72 L.F.	100-inch x 154-inch Pipe Arch Culvert	1,800.00	129,600
6	2 Each	End Sections	4,000.00	8,000
7	40,000 Lbs.	Sheet Piling (1130 S.F.)	1.00	40,000
8	15 Days	Install Sheet Piling	18,000.00	270,000
9	1,000 Lbs.	8"x4"x9/16" Rolled Angle H.D.G.	3.00	3,000
10	72 L.F.	Tieback Anchors	50.00	3,600
11	4 Each	Deadmen	7,500.00	30,000
12	30,800 B.F.	4" Rigid Insulation	12.00	369,600
13	1,500 C.Y.	Excavation	50.00	75,000
14	3,300 C.Y.	Gravel Fill	50.00	165,000
15	2,190 C.Y.	Riprap	375.00	821,250
16	1,660 S.Y.	Geotextile Fabric	5.00	8,300
17	10 Loads	Trucking (Anc. to Nui.)	10,000.00	100,000
		Subtotal Construction		$2,516,350

Land Acquisition		0
City Administration	@ 5%	125,800
Design	@ 12%	302,000
Construction Management	@ 15%	377,500
Project Contingency	@ 15%	377,500
3 Years Inflation	@ 3%	233,300
Subtotal		$3,932,450

Nuiqsut Repair Bridge Crossing PAR
2/10/2016

Alternative 3D - Do Nothing

ITEM	QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL PRICE
		Subtotal Construction		$0

Land Acquisition		0
City Administration	@ 5%	0
Design	@ 12%	0
Construction Management	@ 15%	0
Project Contingency	@ 15%	0
1 Years Inflation	@ 3%	0
Subtotal		$0

Nuiqsut Repair Bridge Crossing PAR

2/10/2016

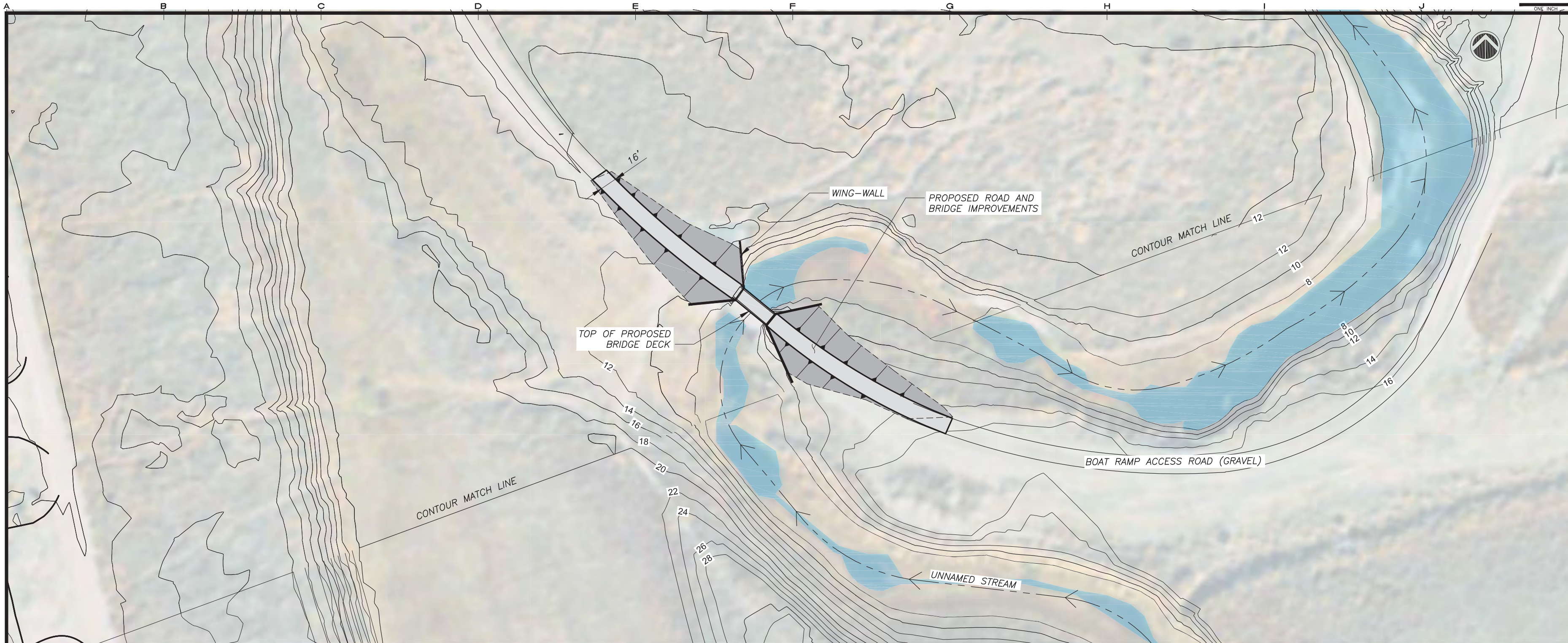
Elevate Bridge at Site 2 Above Extreme High Water - See Section 2.10.1 pg 18

ITEM	QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL PRICE
1	1 L.S.	Mobilization/Demobilization	2,300,000.00	2,300,000
2	92,800 C.Y.	Gravel Fill	50.00	4,640,000
3	28,824 C.Y.	Riprap	375.00	10,809,000
4	42,000 S.Y.	Geotextile Fabric	5.00	210,000

Subtotal Construction		$17,959,000
Land Acquisition		0
City Administration	@ 5%	898,000
Design	@ 12%	2,155,100
Construction Management	@ 15%	2,693,900
Project Contingency	@ 15%	2,693,900
1 Years Inflation	@ 3%	538,800
Subtotal		$26,938,700

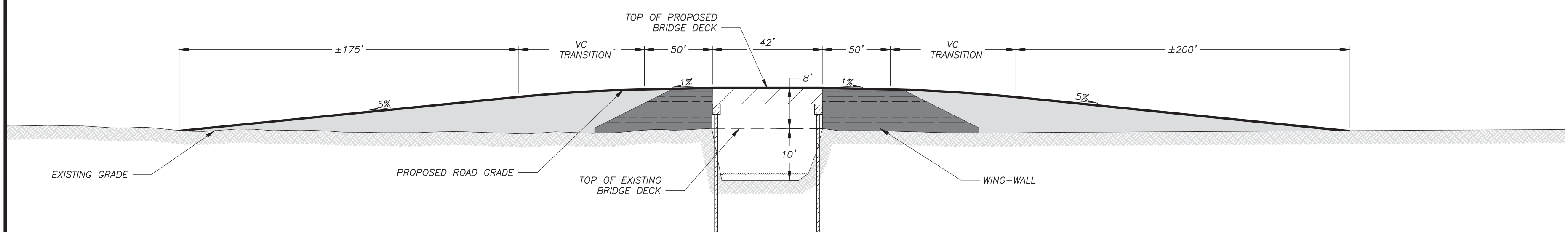
APPENDIX B

CONCEPT DRAWINGS FOR UPPER STREAM CROSSING (SITE 2)



SITE 2-ALTERNATIVE 2A PLAN

1 / 2A.1 SCALE: 1"=50'



SITE 2-ALTERNATIVE 2A SECTION

2 / 2A.1 SCALE: N.T.S

REVISIONS

MARK	DATE	DESCRIPTION
1		
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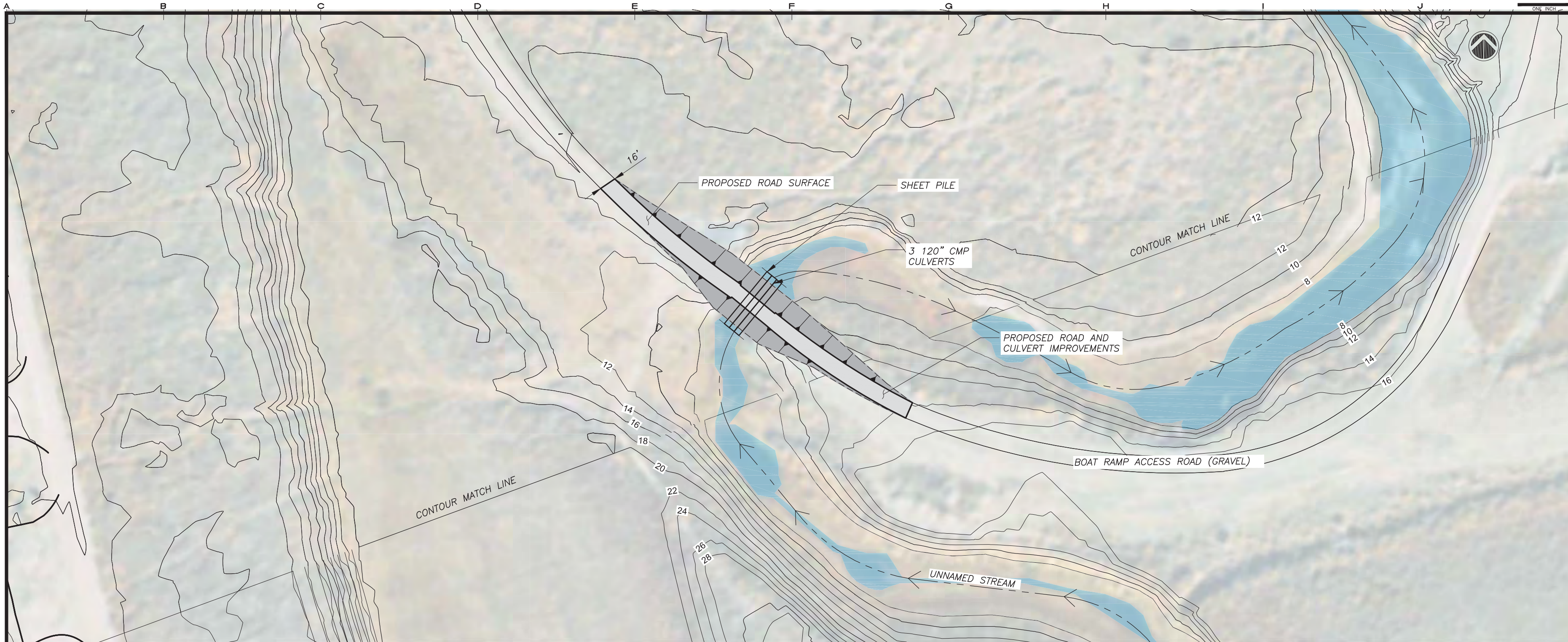
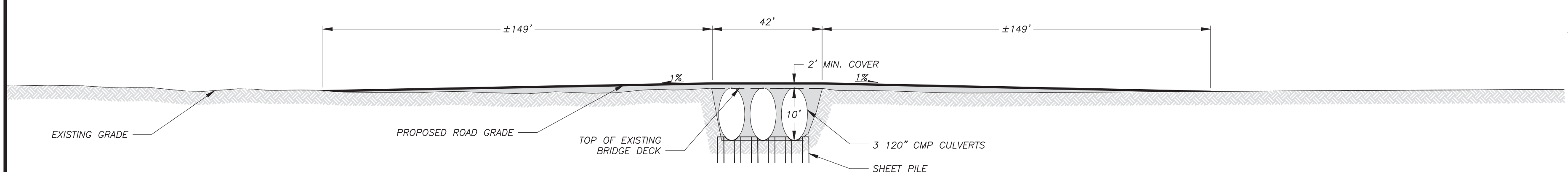
BRIDGE CORSSINGS
NORTH SLOPE BOROUGH
NUIQSUT, ALASKA

SHEET TITLE: SITE 2-ALTERNATIVE 2A
SHEET: 2A.1
DRAWN BY: WJB CHECKED BY: AJB
DATE: 12-17-15 SCALE: 1"=50'
JOB NUMBER: 15-031

H:\jobs\15-031 North Slope Borough PARs 2015 Term (NSB)\02 - NUI Bridge Crossing Repairs\CAD\DRAWINGS\BRIDGE CROSSINGS SITE 2 ALT, 1=1, 12/17/15 at 12:04 by WJB
LAYOUT: f1.2



1 / 2A.1 **SITE 2-ALTERNATIVE 2B PLAN**
SCALE: 1"=50'



2 / 2A.1 **SITE 2-ALTERNATIVE 2B SECTION**
SCALE: N.T.S

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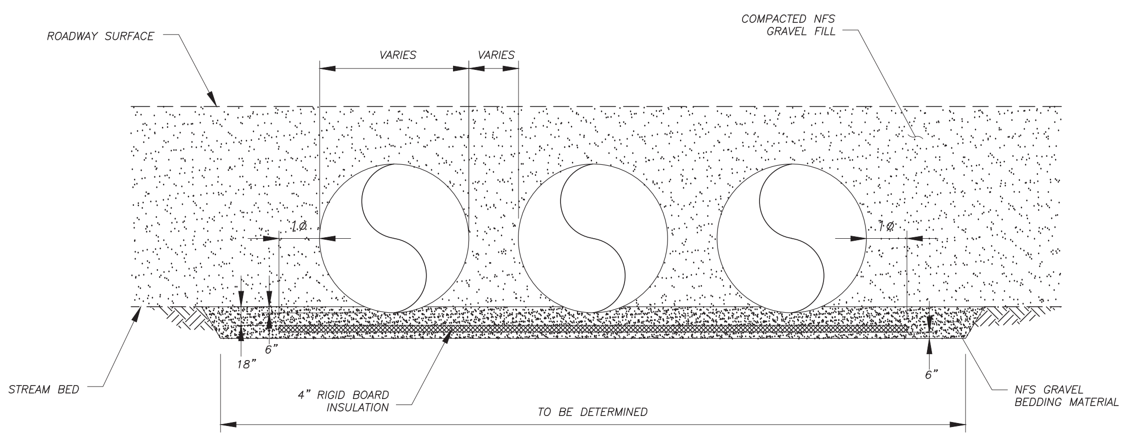
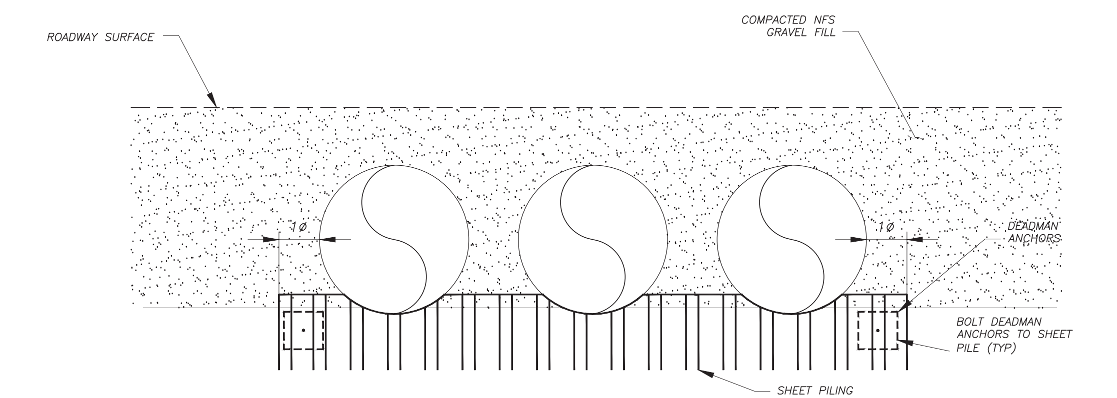
NUIQSUT, ALASKA

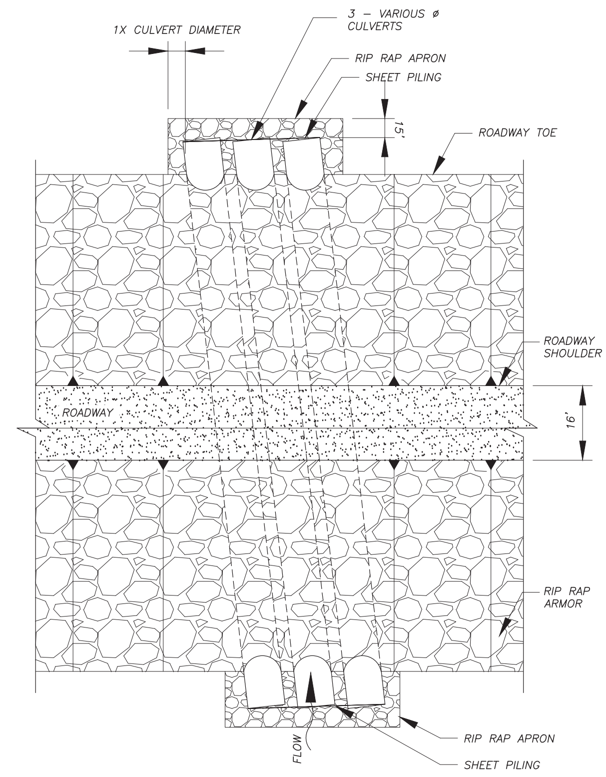
SHEET TITLE: SITE 2- ALTERNATIVE 2B
SHEET: 2B.1
DRAWN BY: WJB | CHECKED BY: AJB
DATE: 12-17-15 | SCALE: 1"=50'
JOB NUMBER: 15-031



1 2B/3B.2 TYPICAL CULVERT DETAIL
SCALE: N.T.S



2 2B/3B.2 TYPICAL SHEET PILE DETAIL
SCALE: N.T.S



3 2B/3B.2 CULVERT LAYOUT PLAN
SCALE: N.T.S

REVISIONS		
MARK	DATE	DESCRIPTION
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BRIDGE CORSSINGS
NORTH SLOPE BOROUGH
NUIQSUT, ALASKA

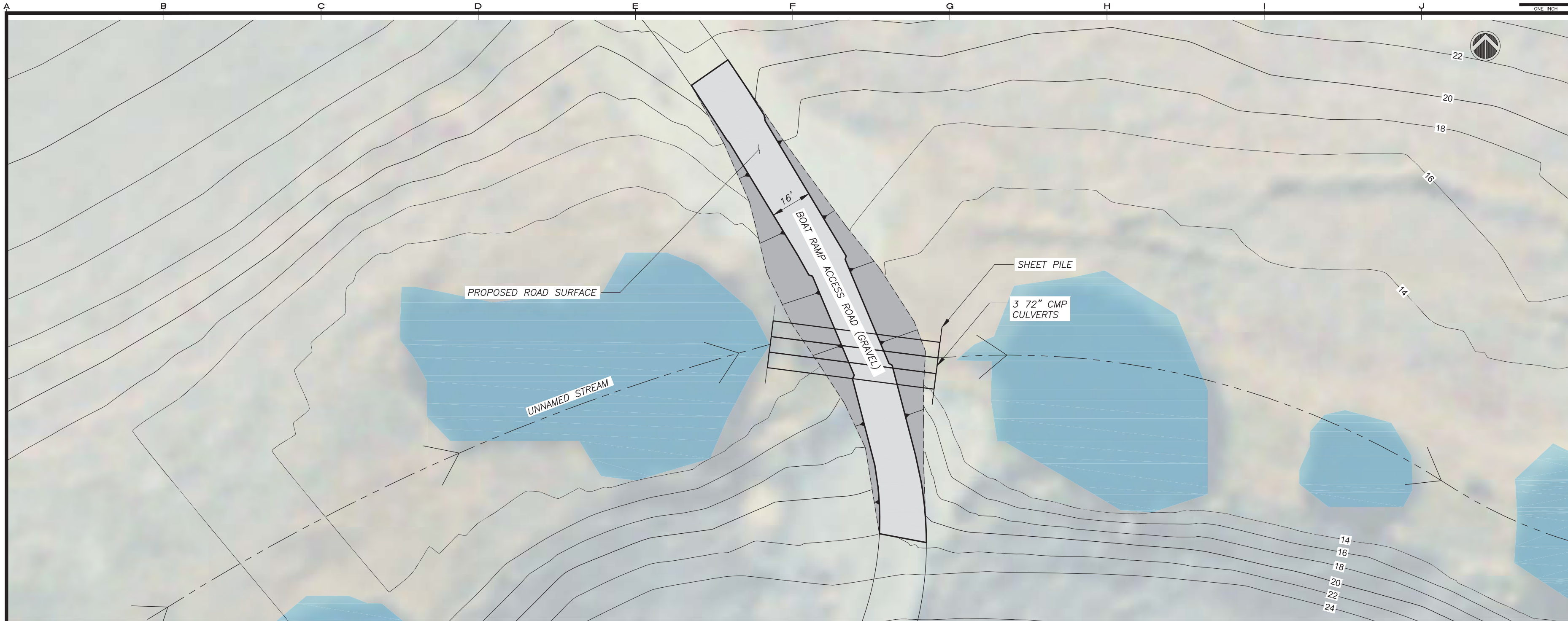
SHEET TITLE: DETAILS

SHEET: 2B.2/3B.2

DRAWN BY: WJB	CHECKED BY: AJB
DATE: 12-17-15	SCALE: 1"=20'
JOB NUMBER: 15-031	

APPENDIX C

CONCEPT DRAWINGS FOR TRIBUTARY STREAM CROSSING (SITE 3)



1 / 3B.1 SITE 3-ALTERNATIVE 3B PLAN
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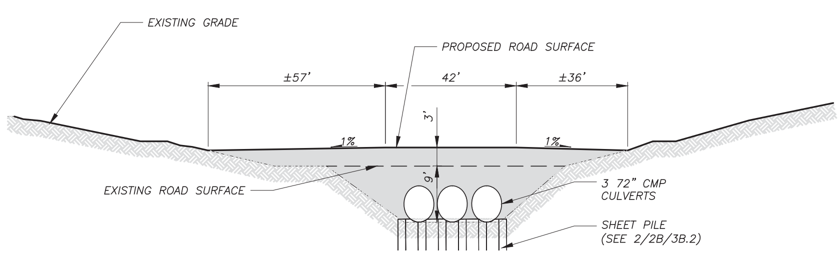

2 / 3B.1 SITE 3-ALTERNATIVE 3B SECTION
SCALE: N.T.S

REVISIONS		
MARK	DATE	DESCRIPTION
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SHEET TITLE: SITE 3– ALTERNATIVE 3B
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CHECKED BY: AJB
DATE: 12–17–15
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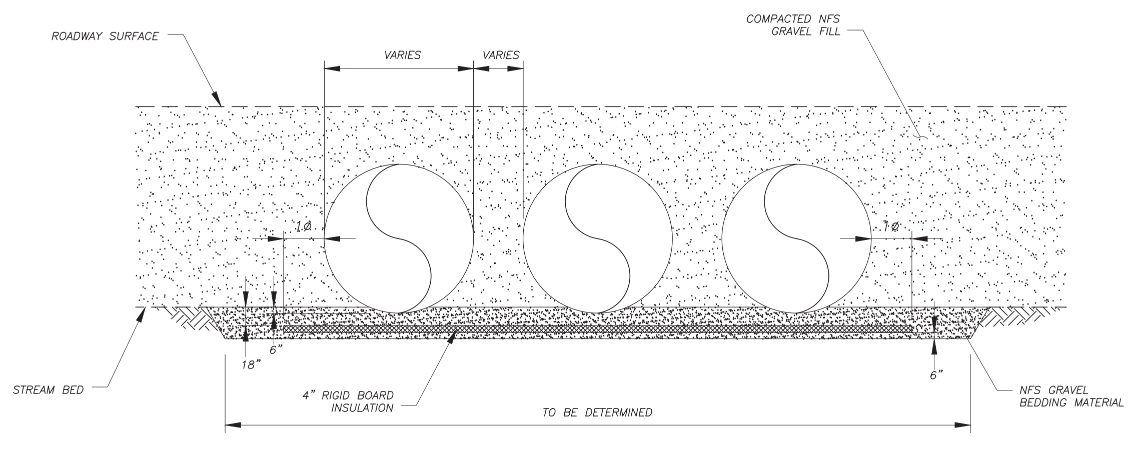
JOB NUMBER: 15–031



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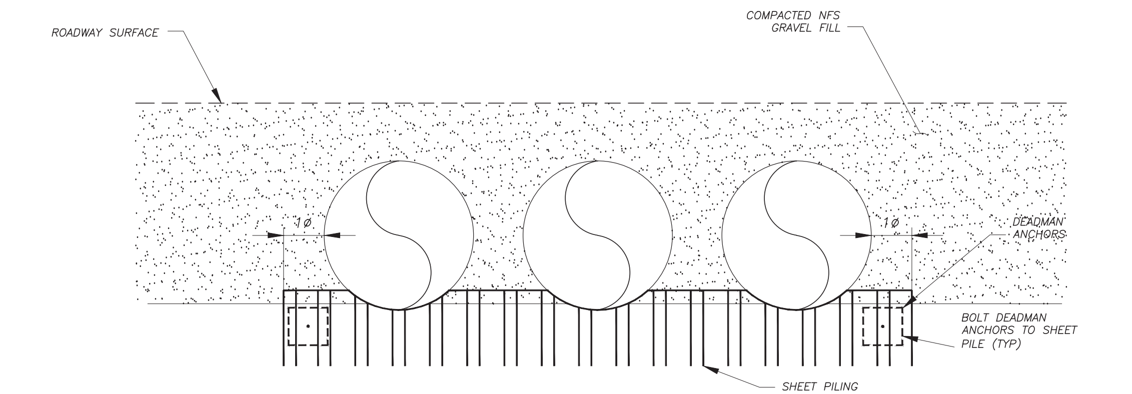

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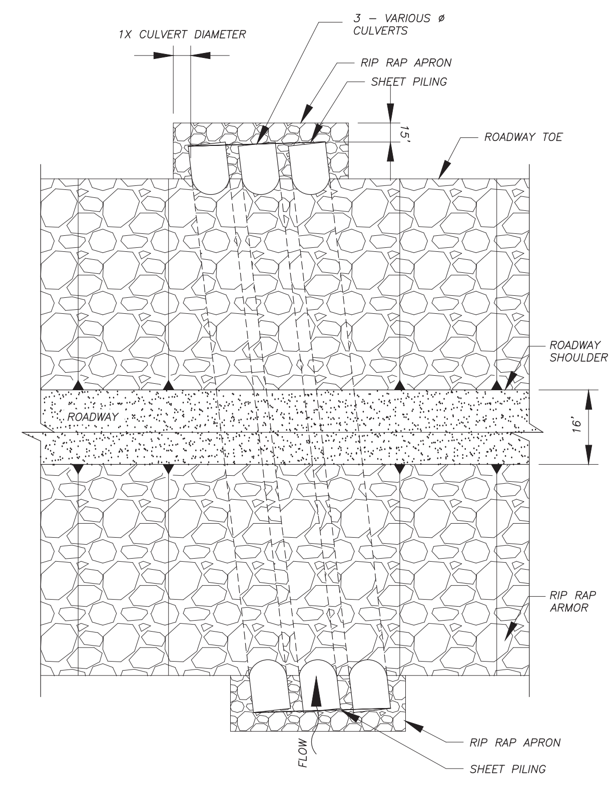

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SCALE: N.T.S

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SHEET TITLE: DETAILS

SHEET: 2B.2/3B.2

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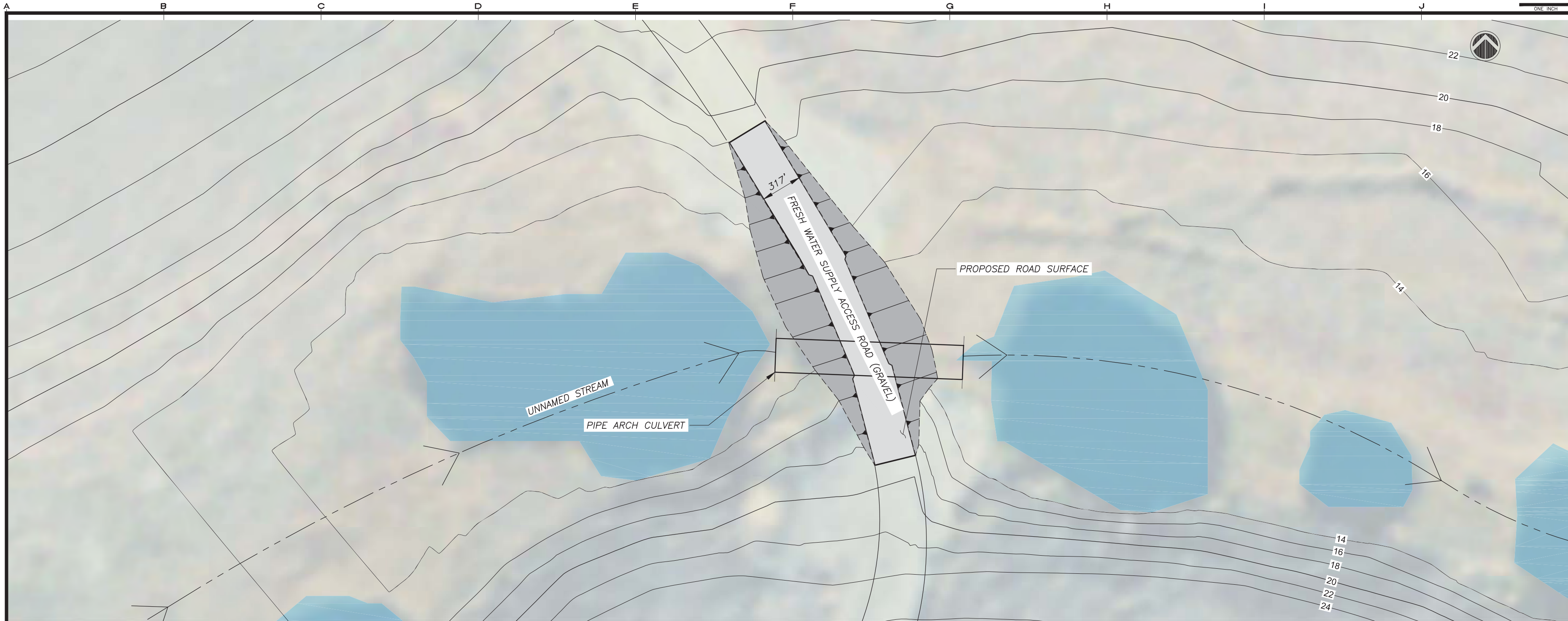
DATE: 12-17-15	SCALE: 1"=20'
JOB NUMBER: 15-031	



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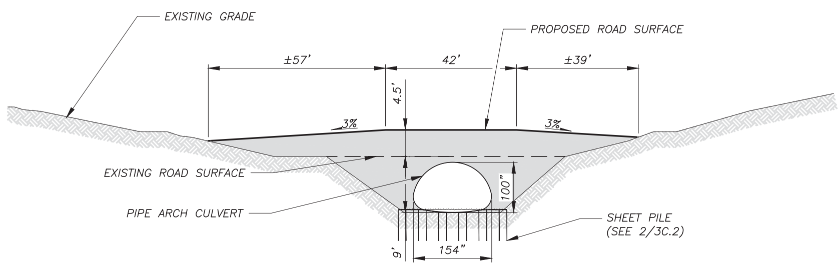

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CHECKED BY: AJB
DATE: 12–17–15
SCALE: 1"=20'
JOB NUMBER: 15–031

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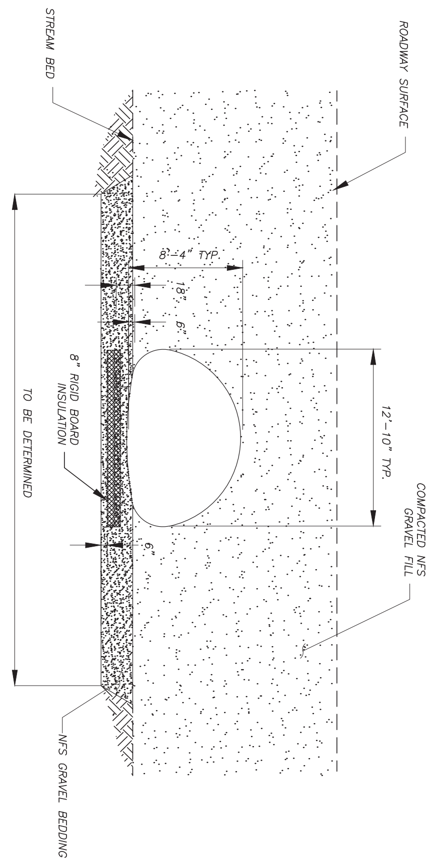

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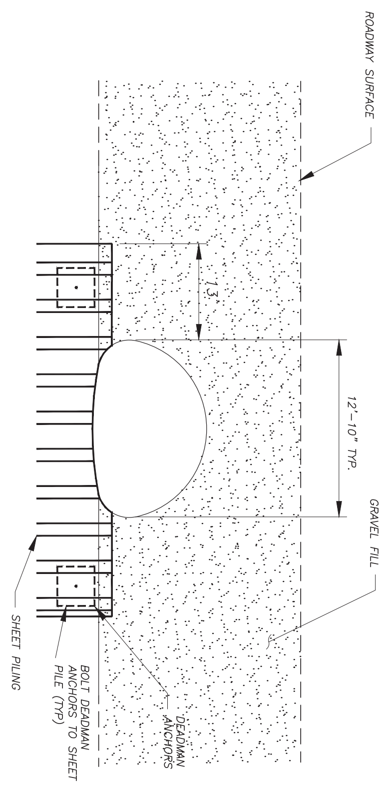

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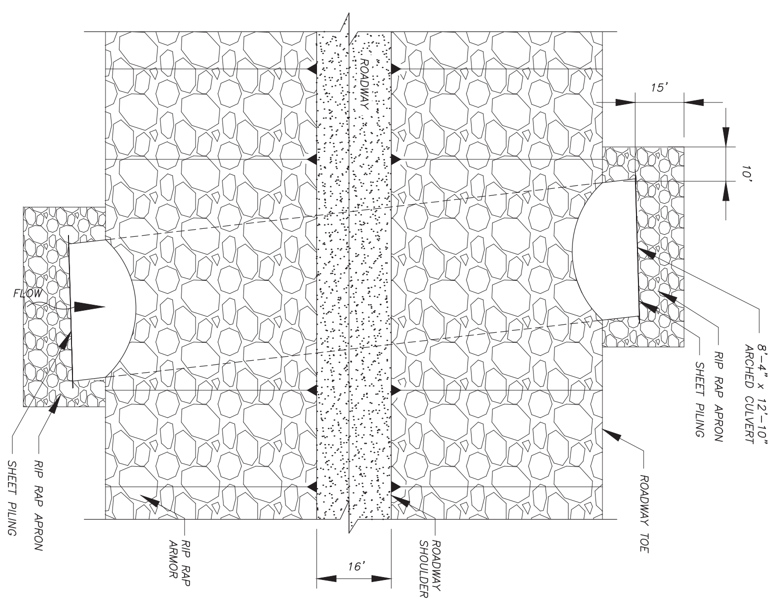

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APPENDIX D

HDL SITE INSPECTION REPORT

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RIGHT-OF-WAY SERVICES

MEMORANDUM

DATE: September 8, 2015

TO: Jack Frantz, North Slope Borough Project Administrator

FROM: Adam Bruscher, Project Engineer

RE: August 20-21, NSB PAR Bridge Crossing Repair - Nuiqsut Site Inspection

On Thursday August 20, 2015, I departed Anchorage with Scott Hattenburg and Kyle Albert of Hattenburg Dilley & Linnell via Alaska Airlines at 7:35 AM and arrived in Prudhoe Bay at 9:17 AM. We departed Prudhoe Bay at 1:30 PM via Ravn Alaska and arrived in Nuiqsut at 1:50 PM. Upon arriving in Nuiqsut we were greeted by Kuukpik Hotel staff and transported to Kuukpikmiut Subsistence Oversight Panel Inc. for our vehicle rental. Upon obtaining the vehicle rental we checked into our rooms at the Kuukpik Hotel.

Temperatures were in the low-40°Fs during the day and mid-30°Fs at night. Conditions were overcast during the site visit.

The purpose for the trip was to investigate and gather the field information necessary to prepare a Project Analysis Report (PAR) for the North Slope Borough (Borough) to repair two temporary culvert crossings and one failed bridge crossing (Figure 1). During our visit to Nuiqsut we also completed an as-built survey of the PAPI pads for the Nuiqsut Airport.

Figure 1: project location map

Upon departing the hotel we spoke with Thomas, the Public Works Supervisor for Nuiqsut. He mentioned that extreme high water events occur during the spring ice breakup and the only visible landmark is the gravel pile located 0.7 miles east of the village and a knoll 0.1 miles east of the village (Figure 1). He also informed us that the backwater from the Colville River causes the water level to rise well above the access road, thus annually washing out the lower stream crossing by the boat launch. The tributary stream crossing south of the airport is armored with sandbags and though it overtops annually, it has not washed out.

For the remainder of the day on August 20th we performed a preliminary investigation of the three stream crossings and as a separate project as-built the newly constructed PAPI pads at the airport.

On August 21st we started our field work at the temporary culvert crossing on the boat ramp access road. We gathered measurements on the existing pipes, roadway dimensions. We setup a level and took field measurements on the top of the roadway, top of pipes and water level at the culverts. We collected a cross section of the stream 100 feet upstream of the bridge, recording relative elevations at 10' intervals.

Figure 2: Temporary culvert crossing, Road to the Boat Launch, two 48-inch CMPs

Next we visited the failed bridge location. We noted the condition of the bridge, what failed, and the sizes and dimension of the structural components of the bridge. We setup a level and took relative elevation measurements on the centerline of the bridge deck, the water surface, channel bottom, and centerline of the road 75 feet East and West of the structure. To better understand the channel hydraulics we recorded a reference cross section roughly 250 feet downstream of the bridge.

Figure 3: Failed 42-foot span Bridge, Road to Boat Launch

The last structure we visited was the tributary stream crossing south of the airport on the road to the water source. We gathered data in a similar fashion to the first culvert crossing and noted the dimensions of the existing pipes and roadway widths. A level was used to determine relative heights for the top of the roadway, culverts, and water surface. A reference cross section was collected 100 feet upstream of the crossing. High water debris lines were located at the edges of the cross-section. The road embankment at this crossing was armored with sandbags that appeared to help protect the structure from erosion.

Figure 4: Temporary culvert crossing – Road to Water Source, three 48-inch diameter CMPs

Upon completing visits to all three structures, we revisited the failed bridge location and investigated surrounding areas to locate the high water debris lines. We found two locations with evidence of debris from high water events. We estimated that the lower of the two debris lines represented a normal high water event due to the large amount of debris in the area. The relative elevation of this debris line was approximately 2 feet higher than the centerline of the bridge deck. We estimated the higher of the debris lines represented an extreme high water event. This debris line was measured to be approximately 8.5 feet higher than the bridge deck.

Figure 5: High water debris line

After documenting the location and relative elevations of the high water lines we gathered our equipment, departed from Nuiqsut at 3:50 PM and arrived in Anchorage at 8:39 PM.

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APPENDIX C
LETTER AGREEMENT BETWEEN CPAI AND NSB

ConocoPhillips
Alaska

Stephen Thatcher
Manager
Western North Slope Development

Post Office Box 100360
Anchorage, Alaska 99510
ATO-1770
Phone 907.263.4464
Stephen.Thatcher@conocophillips.com

March 1, 2018

Harry K. Brower, Jr., Mayor
North Slope Borough
P.O. Box 69
Utqiagvik, Alaska 99723

Re: Nuiqsut Freshwater Lake Road Culvert Replacement

Dear Mayor Brower:

This letter is intended to clarify and document the oral discussions among ConocoPhillips Alaska, Inc., ("CPAI") staff and the North Slope Borough ("NSB") staff about replacing culverts that pass a beaded stream through the road to the Nuiqsut freshwater lake. To confirm that CPAI and NSB share a common understanding of how the proposed project will proceed, we ask that you countersign this letter in the space provided below.

The culvert battery at issue is located about 6,200 feet upstream from the Nigliq Channel and is identified at Site 3 in the NSB's Project Analysis Report (PAR) dated February 10, 2016 and prepared by Hattenburg, Dilley, and Linnell of Anchorage, Alaska. At this location, the gravel road has washed out repeatedly during high water events, resulting in a degraded stream function and fish passage. According to the PAR, this section of roadway overtops during break-up events and the risk of overtopping could be substantially reduced by raising the height of the road and increasing the volume of hydrologic flow beneath it by, for example, replacing the existing culverts with a new flow through design that could be as simple as a larger culvert battery, though detailed engineering would be needed to support final project design. NSB recognizes that an improved stream crossing is desirable.

CPAI has identified improved waterflow at this location as a valuable wetland restoration project that would merit credit as compensatory mitigation under the U.S. Army Corp of Engineers ("USACE") Section 404 permitting program in connection with our GMT2 development. CPAI has had preliminary planning discussions with USACE, Kuukpik Corporation, NSB, and others to develop this project. The next step is to engage an engineering firm to prepare a preliminary design. CPAI is prepared to do this, based on the following key points of mutual agreement:

1. NSB understands that CPAI is proposing to perform a culvert replacement or other project to improve water flow at the road crossing, for the purpose of getting credit from the USACE as compensatory mitigation in connection with a Section 404 permit for the GMT2 project. Implementation of this project depends on getting approvals from USACE and others as necessary to fulfill the purpose of this project.

2. NSB and CPAI expect to enter into good faith discussions in the future with the goal of entering into a binding agreement about project specifications, payment obligations, liabilities, and related issues. The basic proposal is that CPAI would pay for most or all of the project costs, and the NSB would assume ownership, maintenance obligations, and any liability for the new crossing after determining that it meets project specifications. Implementation of the project will depend on reaching timely agreement on the necessary terms and conditions.

3. CPAI plans to engage an engineering firm in March 2018 to prepare a preliminary design and prepare permit application documents. CPAI will bear the full cost of this preliminary design.

4. CPAI also plans to engage an engineering firm to perform hydrology field studies during the summer of 2018 to gather information necessary for final project design. The decision regarding whether or not to execute final project design will be made shortly after receiving the preliminary design and hydrology field studies reports.

5. If CPAI ultimately does not proceed with this project, but the NSB wishes to have the benefit of preliminary design work or summer hydrology studies funded by CPAI, CPAI will allow NSB to purchase the work at cost.

Details on these issues are being discussed primarily by Brad Thomas for CPAI and Bob Shears for NSB.

Please countersign below to confirm that NSB agrees with the basic project structure described in this letter. We will then move forward incrementally to flesh out the full project details, with the goal of ultimately having a concise but comprehensive written agreement between CPAI and NSB.

Yours truly,

Stephen Thatcher

On behalf of NSB, I agree with the key points of understanding set forth above:

3-14-18

Harry K. Brower, Jr., Mayor　　　　Date

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APPENDIX D
ABR GMT2 WETLANDS DELINEATION

WETLAND DELINEATION AND DESK-TOP MAPPING VERIFICATION FOR THE GREATER MOOSE'S TOOTH 2 DEVELOPMENT PROJECT, ALTERNATIVE A—2015

FINAL REPORT

Prepared for

ConocoPhillips Alaska, Inc.
P.O. Box 100360
Anchorage, Alaska 99510-0360

Prepared by

ABR, Inc.—Environmental Research & Services
P.O. Box 240268
Anchorage, AK 99518

July 2017

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APPENDICES

INTRODUCTION

ConocoPhillips Alaska, Inc., (CPAI) is proposing to extend a road and pipeline from the Greater Moose's Tooth 1 (GMT1) project to a new drill site, Greater Moose's Tooth 2 (GMT2) (Figure 1). This report describes the results of an office-based wetland mapping delineation and a brief 1-day field wetland survey to verify the mapping.

STUDY AREA

The extent of the study area described in this report was developed to meet the specific needs of U.S. Army Corps of Engineers (USACE) in identifying the Least Environmentally Damaging Practicable Alternative (LEDPA); supporting the determination of jurisdictional status for a Clean Water Act (CWA) and Section 404 wetland permit for Alternative A. Gravel project components including the road, drill pad and roadway pullouts were buffered by 300 ft and the pipeline alignments were buffered by 150 ft (Figure 1). Location coordinates for the study area center point are -151.588681, 70.209001, NAD 83, UTM Zone 5. The legal description of the wetlands study area is Umiat Meridian:

- TWP 10N, RNG 2E Sections 1, 11, 12, 14, 22, 23, 27, 32, 33, 34
- TWP 11N, RNG 3E Section 31
- TWP 10N, RNG 3E Section 6

METHODS

FIELD SURVEY

On 21 July 2015, a single-day map-verification survey was conducted at 9 sites within the GMT2 mapped area (Figure 2) by Wendy Davis and Erin Johnson (both of ABR). Standard wetland determination forms (USACE 2007a) were completed at each site to confirm both wetland status and classification of the mapped polygons. Using the Ecological Land Survey (ELS) mapping, which was refined to represent wetland types in the study area (see Wetland Mapping and Classification below), the wetland determination plots were preselected within wetland polygons where the underlying aerial photo-signatures did not clearly indicate wetland type boundaries or where landscape changes may have occurred since the original ELS mapping was conducted in 2003. Field plots were also selected to confirm that well-known and distinct photosignatures represented the wetland types currently mapped in the study area.

At each site, routine wetland determinations were performed following the USACE three-parameter approach (Environmental Laboratory 1987, USACE 2007a). To be classified as a wetland, a site must be dominated by hydrophytic plants, have hydric soils, and show evidence of a wetland hydrologic regime. A mobile *Trimble®* *Nomad™* series GPS unit was used to record the wetlands data (using the *WetForm* database) and GPS location for each plot, and provided field access to aerial imagery for the study area. *WetForm* is a commercially developed relational database (Ecotone Corp.) used to enter wetlands site data in the field; it also facilitates the preparation of electronic copies of the 2007 Regional Supplement dataform for each wetland determination plot. Site photos and photos of soils and vegetation were taken at each wetland determination plot. Field wetland determination data forms and photographs are provided in Appendix A.

WETLAND MAPPING AND CLASSIFICATION

The existing, fine-scale ELS maps and associated data for the northeast NPR-A (Jorgenson et al. 2003) were used as the basis for the wetlands mapping. The ELS maps (mapped at a scale of 1:10,000) delineate ecotypes, or local-scale ecosystems, that include information on geomorphology, surface forms, microtopography, and vegetation in the study area. Geomorphology data are represented, in part, by geomorphic (terrain) units that incorporate landform and soil characteristics developed for Alaska by Kreig and Reger (1982) and the Alaska Division of Geological and Geophysical Survey (1983). Geomorphic units incorporate physiography, slope and watershed position, and connections to adjacent waters. For geomorphology, surficial deposits also were emphasized, as they have the most influence on ecological processes. Surface forms (macrotopography) were developed for the North Slope by Jorgenson et al. (2003) based on a system modified by Schoeneberger et al. (1998), and the microtopography classification used follows Washburn's (1973) system for periglacial environments. Vegetation classes were modified from the system developed by Viereck et al. (1992).

For the initial, office-based wetland mapping effort, the ELS ecotypes were crosswalked to Cowardin et al. (1979) wetland types using standard NWI annotation (Dahl et al. 2009). This crosswalk was applied to the ELS data for the northeast NPR-A and the GIS line work was refined as necessary to provide a fine-scale (1:2,000) map for wetlands permitting. A minimum map unit size of 0.1 acre was applied for permanently to seasonally flooded/saturated wetlands and a minimum map unit size of 0.5 acre was applied for saturated to seasonally flooded wetlands and non-wetlands. After the field survey was completed, the wetlands mapping was modified, as needed, to include the new information obtained on-site.

PROPOSED JURISDICTIONAL STATUS

Wetlands and waters within the study area were assessed to determine if they met the definition of a water of the U.S., subject to jurisdiction under Section 404 of the CWA, and/or a navigable water of the U.S., which is subject to jurisdiction under Section 10 of the Rivers and Harbors Act. "Navigable waters of the U.S." are defined as "those waters subject to the ebb and flow of the tide shoreward to the mean high water mark and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. A determination of navigability, once made, applies laterally over the entire surface of the waterbody, and is not extinguished by later actions or events which impede or destroy navigable capacity" (33 CFR 329). "Waters of the U.S." are defined as Traditional Navigable Waters of the U.S. (TNW); tributaries to navigable waters of the U.S. that are relatively permanent (RPW); and other waters of the U.S. that include: intermittent streams that are not relatively permanent, wetlands, lakes, and ponds adjacent to navigable waters or their tributaries (40 CFR 230.3[s]). The CWA definitions are further defined by two Supreme Court decisions; SWANCC and *Rapanos,* which provide guidance on interstate commerce and significant nexus respectively. A significant nexus test is required for some waters of the U.S. that do not meet the criteria for navigability, adjacency, and permanence.

A procedure to define connectivity of waters to TNWs through the classification of waters as tributaries, adjacent wetlands, or significant nexus is described in the *U.S. Army Corps of Engineers Jurisdictional Determination Form Instructional Guidebook* (USACE 2007b). This guidance was used to classify wetlands and waters within the study area and to provide an initial recommendation on the jurisdictional status of the wetlands identified.

RESULTS

FIELD SURVEY

The GMT2 mapped study area contains 5 NWI wetland types and 1 naturally occurring non-wetland (upland) (Figure 2a-e). No new NWI wetland types were identified as a result of the field survey but some map polygons were re-attributed around 2 upland field plots and adjustments were made to the hydrologic regime of some mapped wetland polygons based on the field observations.

WETLAND MAPPING AND CLASSIFICATION

WATERS

One waters wetland type was mapped and verified within the mapped study area (PUBH). Ponds were delineated separately if greater than 0.1 acres surface area and if they were relatively distinct from surrounding wetland complex types. The ponds within the GMT2 mapped study area are predominantly shallow waterbodies with absent or poorly developed lacustrine fringe types. Often they are a part of drained lake basin wetland complexes. During the field survey 2 ponds were documented. The first at GMT2-03 (Figure 2a, Appendix A) was a very small waterbody that was recently drained or dried and that was mapped within the overall surrounding wetland complex. The second, GMT2-05 (Figure 2b, Appendix A) was a larger pond that was delineated separately but also had undergone some drying since originally mapped in 2003.

WETLANDS

Permanently Flooded Emergent Marsh (PEM1H) occurs throughout the GMT2 mapped study area. During the field survey overflight we did not observe any PEM1H types dominated by Arctic pendant grass (*Arctophila fulva*). The emergent marshes are more typically mapped within drained and drying lake basins with complexes of small patches of open water and interspersed with permanently flooded zones with aquatic sedges such as water sedge (*Carex aquatilis*). Semi-permanently Flooded Wet Graminoid Meadow (PEM1F) occurs in similar geomorphic positions to PEM1H and was sampled 1 time during the field survey at GMT2-04 (Figure 2a, Appendix A). At that location it occupied large low center polygons within a drained basin, supporting aquatic sedges such as *C. aquatilis*, round sedge (*C. rotundata*), and tall cottongrass (*Eriophorum angustifolium*).

The majority of the mapped area was dominated by Seasonally Flooded/Saturated Graminoid/Shrub Meadow (PEM1/SS1E) and Saturated Graminoid/Shrub Meadow (PEM1/SS1B). Both types support typical tussock tundra but PEM1/SS1E is differentiated by the presence of 10% or greater cover of open surface water in thermokarst troughs and a mixture of low and high center polygons whereas PEM1/SS1B has very little surface water present and is often characterized by a non-patterned surface on gently convex rolling terrain. PEM1/SS1E supports a variety of dwarf shrubs including diamond willow (*Salix pulchra*), dwarf birch (*Betula nana*), marsh Labrador tea (*Rhododendron tomentosum*), and lingonberry (*Vaccinium vitis-idaea*). The dominant herb is tussock-forming cottongrass (*Eriophorum vaginatum*) but codominants also include obligate wetland sedges such as *C. aquatilis*. PEM1/SS1B has a similar common flora but with less prevalence of obligate wetland plant species.

UPLANDS

The mapped GMT2 study area is undisturbed and no areas of upland fill are present at this time. During the field survey naturally occurring uplands were documented at 2 locations: GMT2-06 (Figure 2b) and GMT2-09 (Figure 2d, Appendix A). Both upland sites were located on very shallow convex banks next to drained lake basins. The plant community in these well-drained areas is more diverse than observed in wet or saturated areas and includes low shrubs such as Richardson's willow (*Salix richardsonii*), *Betula nana*, and *Salix pulchra*. Common dwarf shrubs include *R. tomentosum*, *V. vitis idaea*, least willow (*S. rotundifolia*), and entireleaf mountain-avens (*Dryas integrifolia*). The dominant herb is *E. vaginatum* forming tussocks but in the dryer well drained areas Bigelow's sedge (*Carex bigelowii*) may be recolonizing older tussocks. Soils are well-drained loams to sandy loams with buried organic layers but no hydric soil indicators evident. No primary or secondary hydrology indicators were observed at either location.

PROPOSED JURISDICTIONAL STATUS

The closest TNW to the study area is the Bering Sea located approximately 20 miles to the north east (ADNR 2017). Wetlands in the study area are immediately adjacent to either Fish Creek or the Ublutuoch River, both of which are perennial non-navigable waterways draining directly to the Bering Sea. As described in the Wetlands section (above) wetlands in the area range from permanently flooded surface waters to saturated hydrologic regimes. Wetlands are connected directly to RPWs (Fish Creek and Ublutuoch River) through surface and shallow subsurface hydrologic connections and thus are applicable for jurisdiction under the CWA. No isolated wetlands were observed during the field survey or interpreted during the desk-top mapping exercise.

DIRECT IMPACTS

Direct impacts to wetlands within the gravel footprint for Alternatives A were calculated by NWI class and presented in Table 1. The majority of wetland types directly impacted by Alternative a fall within the dryer PEM1/SS1B and PEM1/SS1E types [(63.7% and 30.4% respectively) Table 1]. The Alternative A route completely avoids all PEM1H (wet marsh wetland types) and 5.5% of the direct impact area is PEM1F (Table 1). This wetland determination identified a small number of naturally occurring uplands in the area, found on raised ridges surrounding lake basins. Direct upland impacts in the Alternative A alignment only account for 0.3% of the total impact area.

Table 1. Wetland and non-wetland acreage for the Greater Moose's Tooth 2 development Alternative A proposed project gravel footprint, NE NPR-A, Alaska. The footprint includes proposed road, drill pad, and road pullouts. Vertical support members were not included in this table but account for less than 0.1 acre.

Wetland Type	Road (acres)	GMT2 Pad (acres)	Road Pullouts (acres)	Total Fill (acres)	Total Fill (% of total)
Waters of the U.S.					
PUBH-Pond (<20acres)	0.1	-	-	0.1	0.1
Wetlands					
PEM1H-Permanently Flooded Emergent Marsh	-	-	-	-	-
PEM1F-Semi-permanently Flooded Emergent Meadow	4.1	0.2	-	4.3	5.5
PEM1/SS1E-Seasonally Flooded Saturated Emergent-Deciduous Shrub Meadow	23.5	0.2	-	23.7	30.4
PEM1/SS1B-Saturated Emergent Deciduous Shrub Meadow	34.9	13.6	1.2	49.7	63.7
Uplands (U)	0.2	-	-	0.2	0.3
TOTAL	**62.8**	**14.0**	**1.2**	**78.0**	**100.0**

[1] Totals are rounded to the nearest 0.1 acre.

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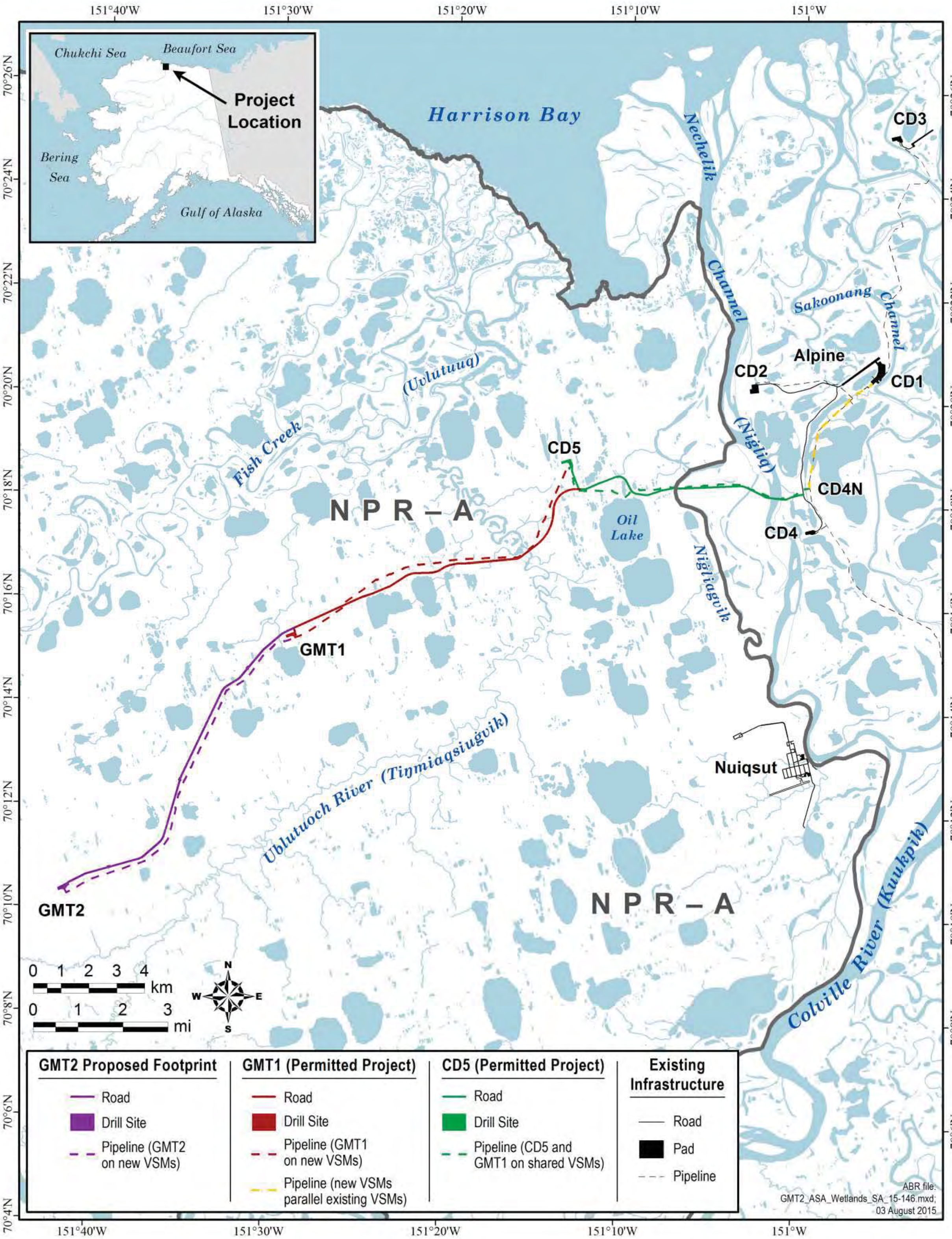

Figure 1. Location and project components for Alternatives of the proposed GMT2 development project

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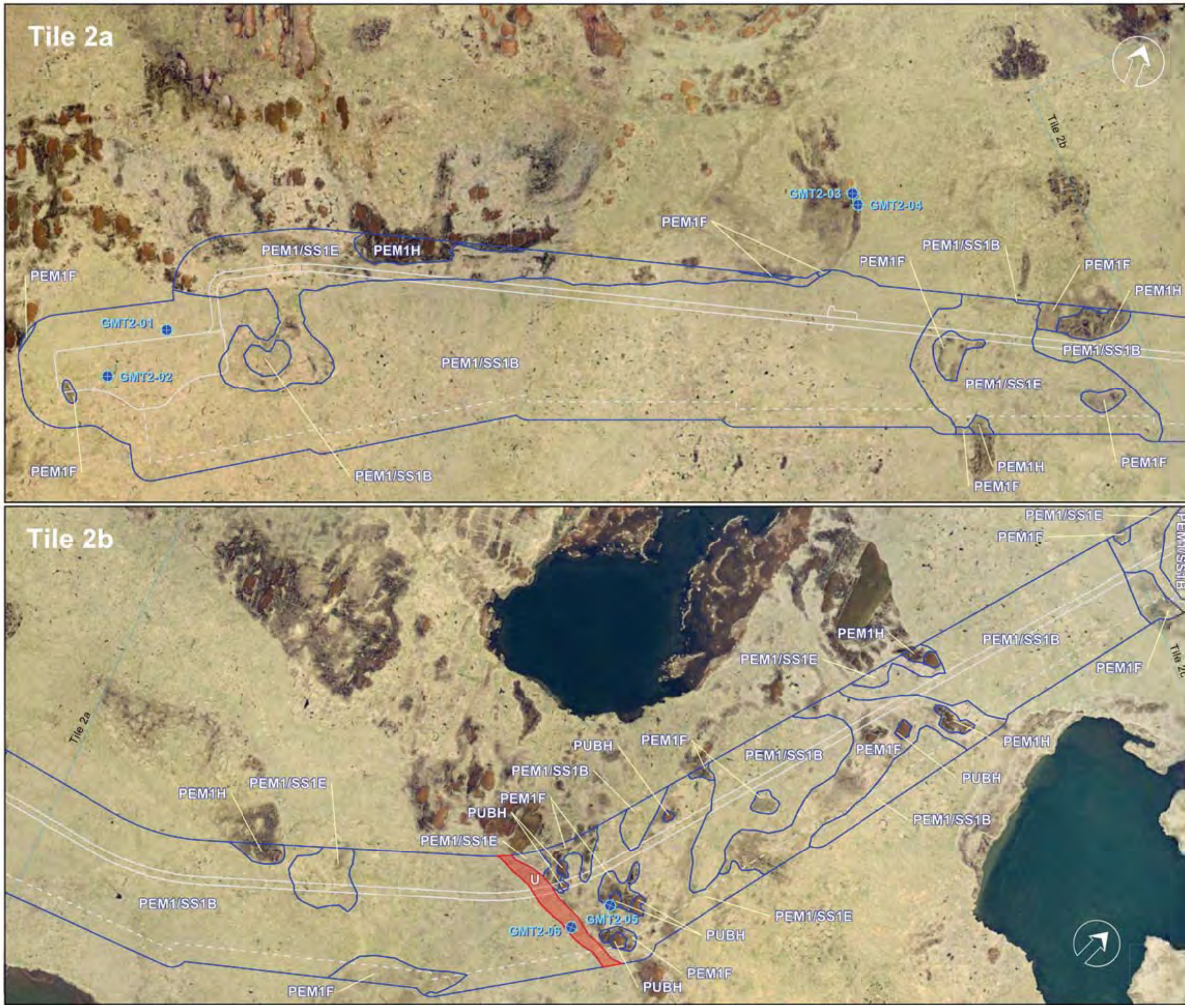


Figure 2a–b. Wetlands and waters for the GMT2 Alternative A study area NE NPR-A, North Slope, Alaska.

Map prepared by:
ABR Inc.–Environmental Research & Services

11 July 2017 | GMT2_ASA_NWI_Tile2ab_17-102.mxd

GMT2 Proposed Footprint

Alt A Drill Site, Road, and Subsistence Access (20170511)
Pipeline (Alt A, 20170511)

Wetland
Upland
Field Verification Point

Waters of the U.S.[1]

PUBH	Pond (<20 acres)

Wetlands[1]

PEM1H	Permanently Flooded Emergent Marsh
PEM1F	Semi-permanently Flooded Emergent Meadow
PEM1/SS1E	Seasonally Flooded Saturated Emergent-Deciduous Shrub Meadow
PEM1/SS1B	Saturated Emergent-Deciduous Shrub Meadow

Uplands

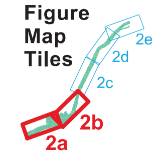
U	Upland

[1] Follows National Wetlands Inventory (NWI) map conventions and Cowardin et al. (1979) classification system.

Approximate scale = 1:10,000

0 500 1,000 Feet
0 100 200 300 Meters

Figure Map Tiles



Orthophoto mosaic from 30 June 1999 and 13–14 July 2001; 2 foot pixel resolution; Alaska State Plane Zone 4, NAD 1983, U.S. feet; Absolute Map Scale applies when printed at 11"x17"

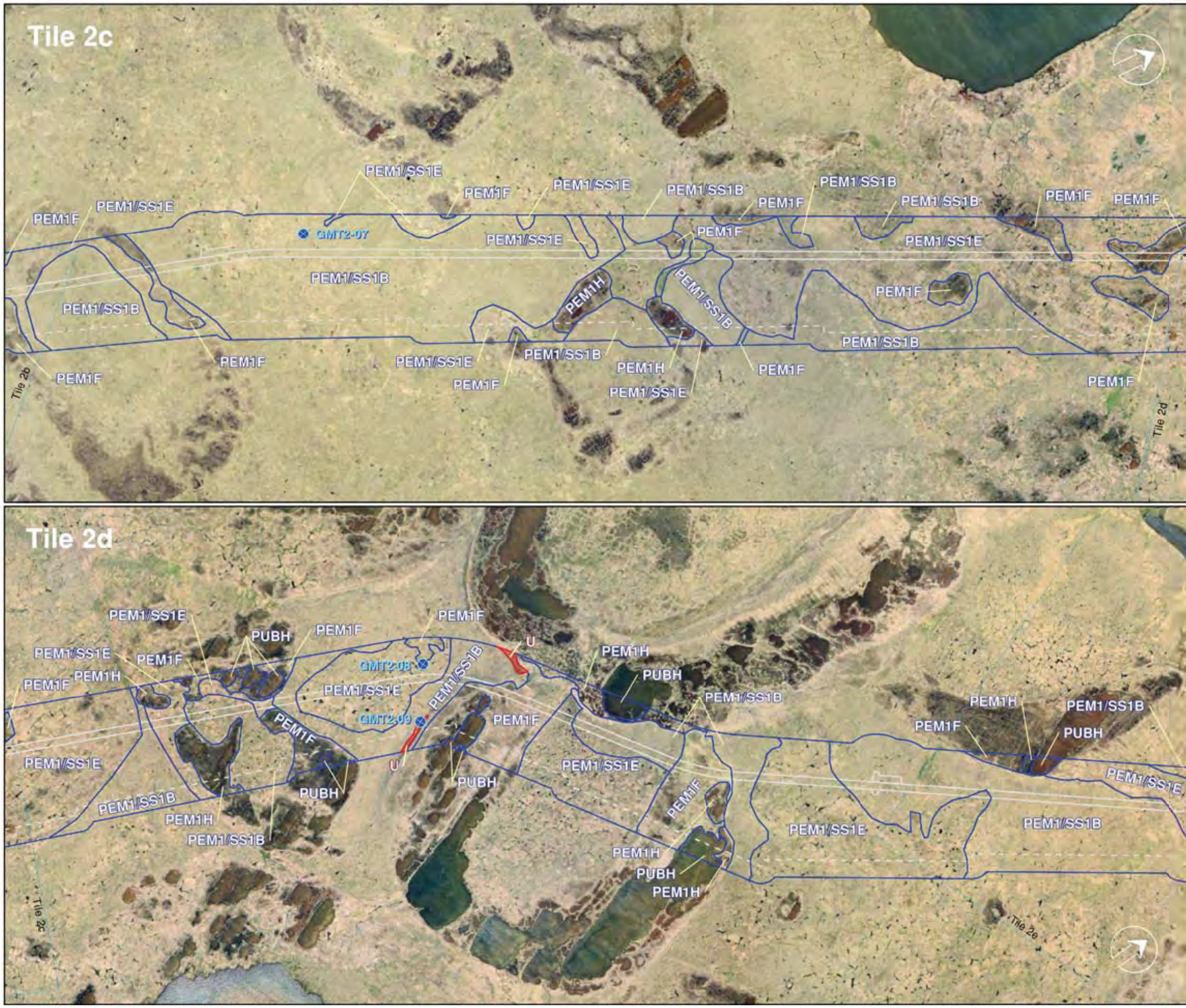


Figure 2c–d. Wetlands and waters for the GMT2 Alternative A study area NE NPR-A, North Slope, Alaska.

Map prepared by:
ABR Inc.–Environmental Research & Services

11 July 2017 | GMT2_ASA_NWI_Tile2cd_17-102.mxd

GMT2 Proposed Footprint

Alt A Drill Site, Road, and Subsistence Access (20170511)
Pipeline (Alt A, 20170511)

Wetland
Upland
Field Verification Point

Waters of the U.S.[1]

PUBH	Pond (<20 acres)

Wetlands[1]

PEM1H	Permanently Flooded Emergent Marsh
PEM1F	Semi-permanently Flooded Emergent Meadow
PEM1/SS1E	Seasonally Flooded Saturated Emergent-Deciduous Shrub Meadow
PEM1/SS1B	Saturated Emergent-Deciduous Shrub Meadow

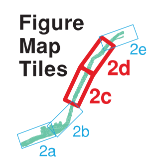
Uplands

U	Upland

[1] Follows National Wetlands Inventory (NWI) map conventions and Cowardin et al. (1979) classification system.

Approximate scale = 1:10,000

0 500 1,000 Feet
0 100 200 300 Meters



Orthophoto mosaic from 30 June 1999 and 13–14 July 2001; 2 foot pixel resolution; Alaska State Plane Zone 4, NAD 1983, U.S. feet; Absolute Map Scale applies when printed at 11"x17"

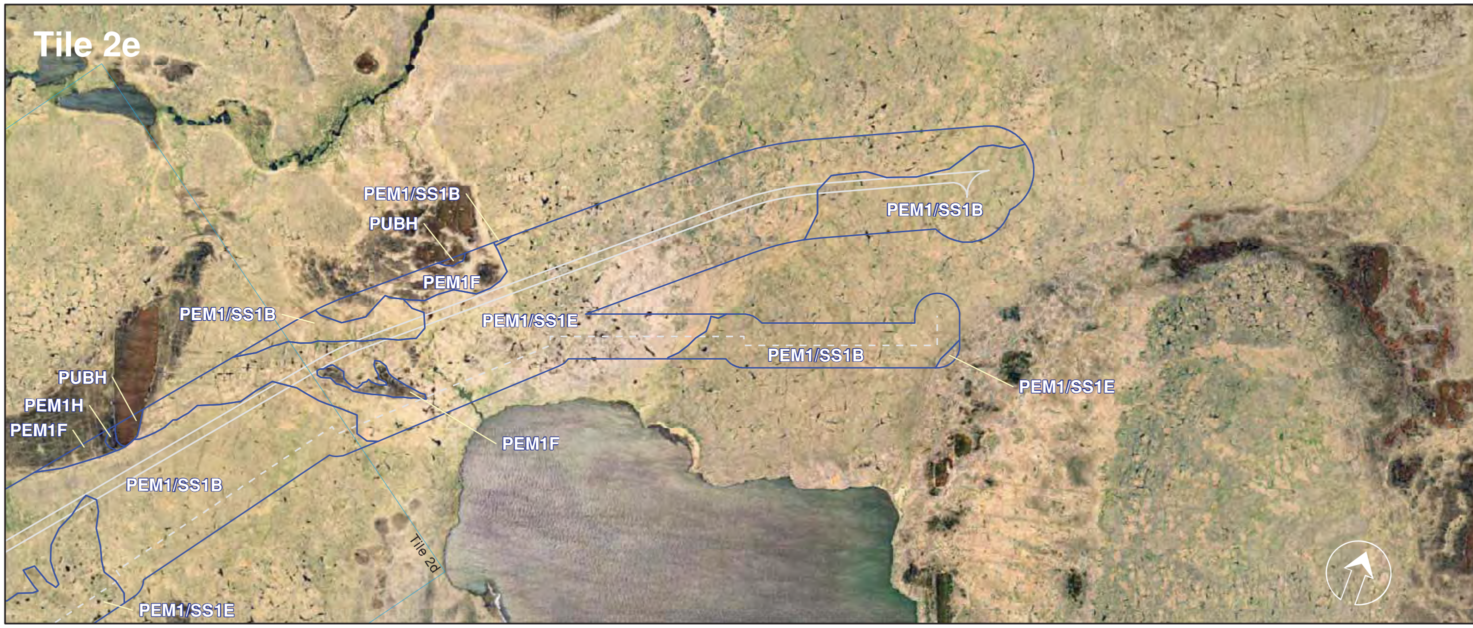


Figure 2e. Wetlands and waters for the GMT2 Alternative A study area NE NPR-A, North Slope, Alaska.

Map prepared by:
ABR Inc.–Environmental Research & Services

11 July 2017	GMT2_ASA_NWI_Tile2e_17-102.mxd

GMT2 Proposed Footprint

- Alt A Drill Site, Road, and Subsistence Access (20170511)
- Pipeline (Alt A, 20170511)
- Wetland
- Upland
- Field Verification Point

Waters of the U.S.[1]

PUBH	Pond (<20 acres)

Wetlands[1]

PEM1H	Permanently Flooded Emergent Marsh
PEM1F	Semi-permanently Flooded Emergent Meadow
PEM1/SS1E	Seasonally Flooded Saturated Emergent-Deciduous Shrub Meadow
PEM1/SS1B	Saturated Emergent-Deciduous Shrub Meadow

Uplands

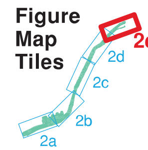
U	Upland

[1] Follows National Wetlands Inventory (NWI) map conventions and Cowardin et al. (1979) classification system.

Approximate scale = 1:10,000

0 500 1,000 Feet
0 100 200 300 Meters

Figure Map Tiles



Orthophoto mosaic from 30 June 1999 and 13–14 July 2001; 2 foot pixel resolution; Alaska State Plane Zone 4, NAD 1983, U.S. feet; Absolute Map Scale applies when printed at 11"x17"

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Appendix A. Wetland Determination Forms

WETLAND DETERMINATION DATA FORM - Alaska Region

Project/Site: GMT2 Borough/City: North Slope Borough Sampling Date: 21-Jul-15

Applicant/Owner: Conoco Phillips Alaska, Inc. (CPAI) Sampling Point: **GMT2-01**

Investigator(s): WAD, EKJ Landform (hillside, terrace, hummocks etc.): Flat

Local relief (concave, convex, none): convex Slope: 0.0 % / 0.0 ° Elevation: 118

Subregion : Northern Alaska Lat.: 70.1739833333334 Long.: -151.69239 Datum: WGS84

Soil Map Unit Name: **NWI classification:** pem1/ss1b

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (●) No ( )	**Is the Sampled Area within a Wetland?** Yes (●) No ( )
Hydric Soil Present?	Yes (●) No ( )	
Wetland Hydrology Present?	Yes (●) No ( )	

Remarks: high center polygons or unpatteerned ground near the GMT2 proposed pad area

VEGETATION - Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.	0	☐	
2.	0	☐	
3.	0	☐	
4.	0	☐	
5.	0	☐	
Total Cover:	0		
50% of Total Cover: 0		20% of Total Cover: 0	

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix pulchra	5	☐	FACW
2. Betula nana	15	☑	FAC
3. Rhododendron tomentosum	10	☑	FACW
4. Vaccinium vitis-idaea	5	☐	FAC
5. Cassiope tetragona	5	☐	FACU
6. Salix reticulata	2	☐	FAC
7.	0	☐	
8.	0	☐	
9.	0	☐	
10.	0	☐	
Total Cover:	42		
50% of Total Cover: 21		20% of Total Cover: 8.4	

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Eriophorum vaginatum	40	☑	FACW
2. Carex bigelowii	2	☐	FAC
3. Eriophorum angustifolium	2	☐	OBL
4. Arctagrostis latifolia	0.1	☐	FACW
5. Saussurea angustifolia	1	☐	FAC
6. Pedicularis sudetica	1	☐	FACW
7.	0	☐	
8.	0	☐	
9.	0	☐	
10.	0	☐	
Total Cover:	46.1		
50% of Total Cover: 23.05		20% of Total Cover: 9.22	

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of dominant Species That Are OBL, FACW, or FAC:	100.0%	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species	2	x 1 =	2
FACW Species	56.1	x 2 =	112.2
FAC Species	25	x 3 =	75
FACU Species	5	x 4 =	20
UPL Species	0	x 5 =	0
Column Totals:	88.1	(A)	209.2 (B)

Prevalence Index = B/A = 2.375

Hydrophytic Vegetation Indicators:

- ☑ Dominance Test is > 50%
- ☑ Prevalence Index is ≤3.0
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length x width)	
% Cover of Wetland Bryophytes (Where applicable)	5
% Bare Ground	0
Total Cover of Bryophytes	15

Hydrophytic Vegetation Present? Yes (●) No ( )

Remarks:

SOIL

Sampling Point: GMT2-01

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix Color (moist)		Matrix %	Redox Features Color (moist)		Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3									Fibric Organic	
3-5									Hemic Organic	
5-9	10YR	3/2	100						Silt Loam	
9-11	10YR	2/2	100						Sapric Organic	

[1] Type: C=Concentration. D=Depletion. RM=Reduced Matrix [2] Location: PL=Pore Lining. RC=Root Channel. M=Matrix

Hydric Soil Indicators:

- ☑ Histosol or Histel (A1)
- ☐ Histic Epipedon (A2)
- ☐ Hydrogen Sulfide (A4)
- ☐ Thick Dark Surface (A12)
- ☐ Alaska Gleyed (A13)
- ☐ Alaska Redox (A14)
- ☐ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3] :

- ☐ Alaska Color Change (TA4)[4]
- ☐ Alaska Alpine swales (TA5)
- ☐ Alaska Redox With 2.5Y Hue
- ☐ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ☐ Other (Explain in Remarks)

[3] One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present.

[4] Give details of color change in Remarks.

Restrictive Layer (if present):
Type: seasonal frost
Depth (inches): 11

Hydric Soil Present? Yes ◉ No ○

Remarks:
considered a histosol assuming saturation if not frozen

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Dry-Season Water Table (C2)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9)
- ☐ Drainage Patterns (B10)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Salt Deposits (C5)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ Microtopographic Relief (D4)
- ☑ FAC-neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ○	No ◉	Depth (inches): 0
Water Table Present?	Yes ○	No ◉	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes ○	No ◉	Depth (inches): 0

Wetland Hydrology Present? Yes ◉ No ○

Recorded Data (stream gauge, monitor well, aerial photo, previous inspection), if available:

Remarks:
Secondary hydrology indicators only.

GMT2-01

pem1/ss1b

Wetland Functional Class: Saturated Graminoid/Shrub Meadow

Wildlife Habitat: Moist Tussock Tundra

Hydric Soil Indicators: Histosol

Wetland Hydrology Indicators: Secondary hydrology indicators only

WETLAND DETERMINATION DATA FORM - Alaska Region

Project/Site: GMT2 | Borough/City: North Slope Borough | Sampling Date: 21-Jul-15

Applicant/Owner: Conoco Phillips Alaska, Inc. (CPAI) | Sampling Point: **GMT2-02**

Investigator(s): WAD, EKJ | Landform (hillside, terrace, hummocks etc.): Flat

Local relief (concave, convex, none): convex | Slope: 0.0 % / 0.0 ° | Elevation: 106

Subregion : Northern Alaska | Lat.: 70.1725616666667 | Long.: -151.69516 | Datum: WGS84

Soil Map Unit Name: | **NWI classification:** **pem1/ss1b**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ◉ No ○ (If no, explain in Remarks.)

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◉ No ○	**Is the Sampled Area within a Wetland?** Yes ◉ No ○
Hydric Soil Present?	Yes ◉ No ○	
Wetland Hydrology Present?	Yes ◉ No ○	

Remarks: lower lying area with innundated pitts and troughs

VEGETATION - Use scientific names of plants. List all species in the plot.

Tree Stratum	**Absolute % Cover**	**Dominant Species?**	**Indicator Status**
1.		☐	
2.		☐	
3.		☐	
4.		☐	
5.		☐	
Total Cover:	0		
Sapling/Shrub Stratum — 50% of Total Cover: 0	20% of Total Cover: 0		
1. Salix pulchra	10	☑	FACW
2. Rhododendron tomentosum	10	☑	FACW
3. Betula nana	15	☑	FAC
4. Cassiope tetragona	5	☐	FACU
5. Vaccinium vitis-idaea	10	☑	FAC
6.	0	☐	
7.	0	☐	
8.	0	☐	
9.	0	☐	
10.	0	☐	
Total Cover:	50		
Herb Stratum — 50% of Total Cover: 25	20% of Total Cover: 10		
1. Eriophorum angustifolium	5	☐	OBL
2. Carex aquatilis	5	☐	OBL
3. Eriophorum vaginatum	40	☑	FACW
4. Saussurea angustifolia	1	☐	FAC
5.	0	☐	
6.	0	☐	
7.	0	☐	
8.	0	☐	
9.	0	☐	
10.	0	☐	
Total Cover:	51		
50% of Total Cover: 25.5	20% of Total Cover: 10.2		

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC:	5	(A)
Total Number of Dominant Species Across All Strata:	5	(B)
Percent of dominant Species That Are OBL, FACW, or FAC:	100.0%	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species	10	x 1 =	10
FACW Species	60	x 2 =	120
FAC Species	26	x 3 =	78
FACU Species	5	x 4 =	20
UPL Species	0	x 5 =	0
Column Totals:	101 (A)		228 (B)

Prevalence Index = B/A = 2.257

Hydrophytic Vegetation Indicators:

- ☑ Dominance Test is > 50%
- ☑ Prevalence Index is ≤3.0
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length x width)	
% Cover of Wetland Bryophytes (Where applicable)	5
% Bare Ground	0
Total Cover of Bryophytes	15

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks:

SOIL

Sampling Point: GMT2-02

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix Color (moist)		Matrix %	Redox Color (moist)		Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3			100						Fibrric Organic	
3-7	10YR	2/3	100						Silty Clay Loam	
7-11			100						Hemic Organic	with mineral content

[1] Type: C=Concentration. D=Depletion. RM=Reduced Matrix [2] Location: PL=Pore Lining. RC=Root Channel. M=Matrix

Hydric Soil Indicators:

- [x] Histosol or Histel (A1)
- [ ] Histic Epipedon (A2)
- [ ] Hydrogen Sulfide (A4)
- [ ] Thick Dark Surface (A12)
- [ ] Alaska Gleyed (A13)
- [ ] Alaska Redox (A14)
- [ ] Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- [ ] Alaska Color Change (TA4)[4]
- [ ] Alaska Alpine swales (TA5)
- [ ] Alaska Redox With 2.5Y Hue
- [ ] Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- [x] Other (Explain in Remarks)

[3] One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present.

[4] Give details of color change in Remarks.

Restrictive Layer (if present):
Type: seasonal frost
Depth (inches): 11

Hydric Soil Present? Yes (●) No ( )

Remarks:
positive alpha alpha reaction,

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one is sufficient)

- [x] Surface Water (A1)
- [ ] High Water Table (A2)
- [x] Saturation (A3)
- [ ] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [ ] Drift deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [ ] Surface Soil Cracks (B6)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [ ] Marl Deposits (B15)
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Dry-Season Water Table (C2)
- [ ] Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- [ ] Water Stained Leaves (B9)
- [ ] Drainage Patterns (B10)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [x] Presence of Reduced Iron (C4)
- [ ] Salt Deposits (C5)
- [ ] Stunted or Stressed Plants (D1)
- [x] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [x] Microtopographic Relief (D4)
- [x] FAC-neutral Test (D5)

Field Observations:

Surface Water Present?	Yes (●)	No ( )	Depth (inches): 1
Water Table Present?	Yes ( )	No (●)	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes (●)	No ( )	Depth (inches): 4

Wetland Hydrology Present? Yes (●) No ( )

Recorded Data (stream gauge, monitor well, aerial photo, previous inspection), if available:

Remarks:
frozen at 11 inches

GMT2-02

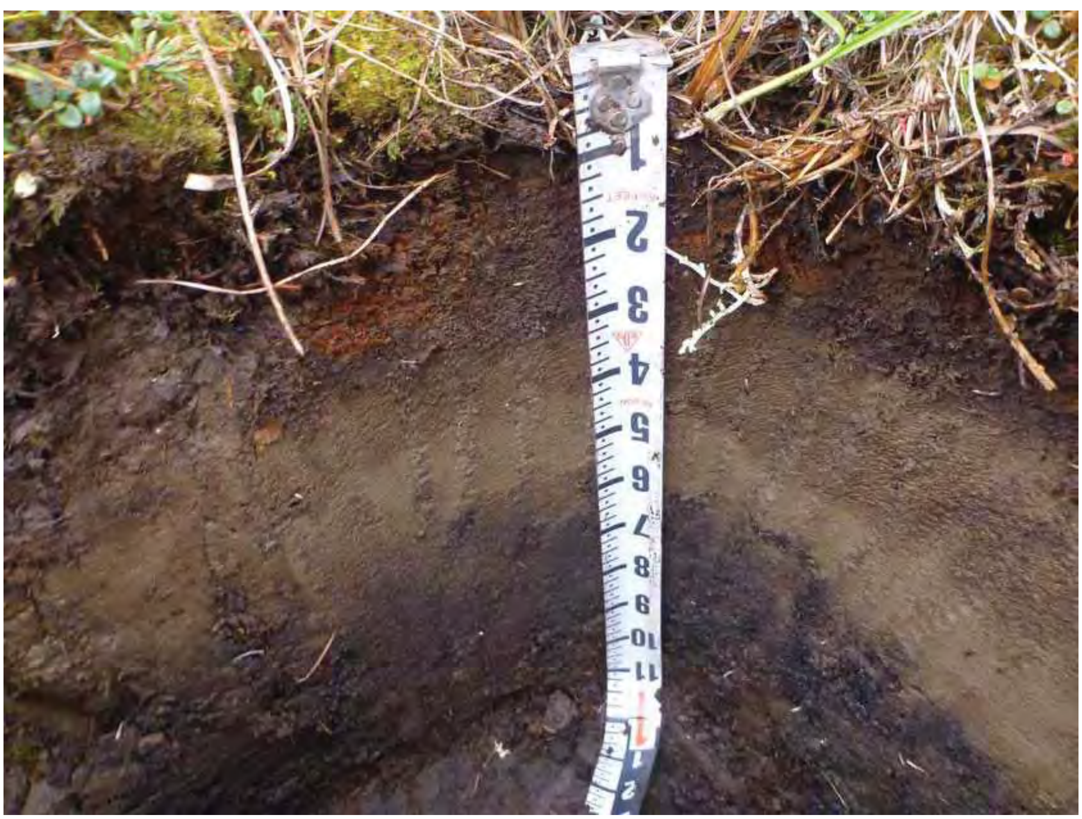
pem1/ss1b

Wetland Functional Class: Seasonally Flooded/Saturated Graminoid/Shrub Meadow

Wildlife Habitat: Moist Sedge/Shrub Tundra

Hydric Soil Indicators: Histosol

Wetland Hydrology Indicators: Saturation and surface water in nearby troughs



WETLAND DETERMINATION DATA FORM - Alaska Region

Project/Site: GMT2 | Borough/City: North Slope Borough | Sampling Date: 21-Jul-15

Applicant/Owner: Conoco Phillips Alaska, Inc. (CPAI) | Sampling Point: **GMT2-03**

Investigator(s): WAD, EKJ | Landform (hillside, terrace, hummocks etc.): drained pund

Local relief (concave, convex, none): concave | Slope: ___ % / ___ ° | Elevation: 89

Subregion : Northern Alaska | Lat.: 70.1827233333333 | Long.: -151.65278 | Datum: ___

Soil Map Unit Name: ___ | **NWI classification:** pusc

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (●) No ( )	**Is the Sampled Area within a Wetland?**	Yes (●) No ( )
Hydric Soil Present?	Yes (●) No ( )		
Wetland Hydrology Present?	Yes (●) No ( )		

Remarks: small dried pond

VEGETATION - Use scientific names of plants. List all species in the plot.

Tree Stratum	**Absolute % Cover**	**Dominant Species?**	**Indicator Status**
1.		☐	
2.		☐	
3.		☐	
4.		☐	
5.		☐	
Total Cover:	0		

Sapling/Shrub Stratum	**Absolute % Cover**	**Dominant Species?**	**Indicator Status**
50% of Total Cover: 0	20% of Total Cover: 0		
1.		☐	
2.		☐	
3.		☐	
4.		☐	
5.		☐	
6.		☐	
7.		☐	
8.		☐	
9.		☐	
10.		☐	
Total Cover:	0		

Herb Stratum	**Absolute % Cover**	**Dominant Species?**	**Indicator Status**
50% of Total Cover: 0	20% of Total Cover: 0		
1. Carex aquatilis	1	☑	OBL
2.	0	☐	
3.	0	☐	
4.	0	☐	
5.	0	☐	
6.	0	☐	
7.	0	☐	
8.	0	☐	
9.	0	☐	
10.	0	☐	
Total Cover:	1		
50% of Total Cover: 0.5	20% of Total Cover: 0.2		

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of dominant Species That Are OBL, FACW, or FAC:	100.0%	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:		
OBL Species	1	x 1 =	1	
FACW Species	0	x 2 =	0	
FAC Species	0	x 3 =	0	
FACU Species	0	x 4 =	0	
UPL Species	0	x 5 =	0	
Column Totals:	1	(A)	1	(B)

Prevalence Index = B/A = 1.000

Hydrophytic Vegetation Indicators:

- ☑ Dominance Test is > 50%
- ☑ Prevalence Index is ≤3.0
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length x width)	
% Cover of Wetland Bryophytes (Where applicable)	
% Bare Ground	
Total Cover of Bryophytes	

Hydrophytic Vegetation Present? Yes (●) No ( )

Remarks:

SOIL

Sampling Point: GMT2-03

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks

[1] Type: C=Concentration. D=Depletion. RM=Reduced Matrix [2] Location: PL=Pore Lining. RC=Root Channel. M=Matrix

Hydric Soil Indicators:

- ☐ Histosol or Histel (A1)
- ☐ Histic Epipedon (A2)
- ☑ Hydrogen Sulfide (A4)
- ☐ Thick Dark Surface (A12)
- ☐ Alaska Gleyed (A13)
- ☐ Alaska Redox (A14)
- ☐ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3] :

- ☐ Alaska Color Change (TA4)[4]
- ☐ Alaska Alpine swales (TA5)
- ☐ Alaska Redox With 2.5Y Hue
- ☐ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ☐ Other (Explain in Remarks)

[3] One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present.

[4] Give details of color change in Remarks.

Restrictive Layer (if present):

Type: unknown

Depth (inches):

Hydric Soil Present? Yes ◉ No ○

Remarks:
no pit

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift deposits (B3)
- ☑ Algal Mat or Crust (B4)
- ☑ Iron Deposits (B5)
- ☑ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Dry-Season Water Table (C2)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9)
- ☑ Drainage Patterns (B10)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Salt Deposits (C5)
- ☐ Stunted or Stressed Plants (D1)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ○	No ◉	Depth (inches):
Water Table Present?	Yes ○	No ◉	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ◉	No ○	Depth (inches):

Wetland Hydrology Present? Yes ◉ No ○

Recorded Data (stream gauge, monitor well, aerial photo, previous inspection), if available:

Remarks:
saturated to surface

GMT2-03

pusc

Wetland Functional Class: Semi-permanently Flooded Wet Graminoid Meadow

Wildlife Habitat: Non-patterned Wet Sedge Meadow

Hydric Soil Indicators: No pit, typically inundated

Wetland Hydrology Indicators: Saturated to surface, surface cracking

WETLAND DETERMINATION DATA FORM - Alaska Region

Project/Site: GMT2 Borough/City: North Slope Borough Sampling Date: 21-Jul-15

Applicant/Owner: Conoco Phillips Alaska, Inc. (CPAI) Sampling Point: **GMT2-04**

Investigator(s): WAD, EKJ Landform (hillside, terrace, hummocks etc.): Flat

Local relief (concave, convex, none): flat Slope: 0.0 % / 0.0 ° Elevation: 75

Subregion : Northern Alaska Lat.: 70.182495 Long.: -151.652286666667 Datum:

Soil Map Unit Name: **NWI classification:** **PEM1F**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (•) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (•) No ( )

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (•) No ( )	**Is the Sampled Area within a Wetland?** Yes (•) No ( )
Hydric Soil Present?	Yes (•) No ( )	
Wetland Hydrology Present?	Yes (•) No ( )	

Remarks: WET SEDGE MEADOW, non patterned.

VEGETATION - Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.		☐	
2.		☐	
3.		☐	
4.		☐	
5.		☐	
Total Cover:	0		

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
50% of Total Cover: 0		20% of Total Cover: 0	
1. Salix pulchra	1	☐	FACW
2. Betula nana	11	☑	FAC
3.	0	☐	
4.	0	☐	
5.	0	☐	
6.	0	☐	
7.	0	☐	
8.	0	☐	
9.	0	☐	
10.	0	☐	
Total Cover:	12		

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
50% of Total Cover: 6		20% of Total Cover: 2.4	
1. Carex aquatilis	15	☑	OBL
2. Eriophorum angustifolium	45	☑	OBL
3. Carex rotundata	3	☐	OBL
4. Pedicularis sudetica	1	☐	FACW
5. Carex saxatilis	5	☐	FACW
6.	0	☐	
7.	0	☐	
8.	0	☐	
9.	0	☐	
10.	0	☐	
Total Cover:	69		
50% of Total Cover: 34.5		20% of Total Cover: 13.8	

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species	63	x 1 =	63
FACW Species	7	x 2 =	14
FAC Species	11	x 3 =	33
FACU Species	0	x 4 =	0
UPL Species	0	x 5 =	0
Column Totals:	81 (A)		110 (B)

Prevalence Index = B/A = 1.358

Hydrophytic Vegetation Indicators:

- ☑ Dominance Test is > 50%
- ☑ Prevalence Index is ≤3.0
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length x width):

% Cover of Wetland Bryophytes (Where applicable): 5

% Bare Ground: 30

Total Cover of Bryophytes: 5

Hydrophytic Vegetation Present? Yes (•) No ( )

Remarks: drepa is weetland moss

SOIL

Sampling Point: GMT2-04

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-15		100					Mucky Peat	hemic org.

[1] Type: C=Concentration. D=Depletion. RM=Reduced Matrix [2] Location: PL=Pore Lining. RC=Root Channel. M=Matrix

Hydric Soil Indicators:

- ☑ Histosol or Histel (A1)
- ☐ Histic Epipedon (A2)
- ☐ Hydrogen Sulfide (A4)
- ☐ Thick Dark Surface (A12)
- ☐ Alaska Gleyed (A13)
- ☐ Alaska Redox (A14)
- ☐ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3] :

- ☐ Alaska Color Change (TA4)[4]
- ☐ Alaska Alpine swales (TA5)
- ☐ Alaska Redox With 2.5Y Hue
- ☐ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ☐ Other (Explain in Remarks)

[3] One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present.

[4] Give details of color change in Remarks.

Restrictive Layer (if present):

Type: seasonal frost

Depth (inches): 15

Hydric Soil Present? Yes ◉ No ○

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one is sufficient)

- ☐ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift deposits (B3)
- ☑ Algal Mat or Crust (B4)
- ☑ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Dry-Season Water Table (C2)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9)
- ☐ Drainage Patterns (B10)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Salt Deposits (C5)
- ☐ Stunted or Stressed Plants (D1)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ○	No ◉	Depth (inches):
Water Table Present?	Yes ◉	No ○	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ◉	No ○	Depth (inches):

Wetland Hydrology Present? Yes ◉ No ○

Recorded Data (stream gauge, monitor well, aerial photo, previous inspection), if available:

Remarks:
meadow likely has surface water in wetter years.

GMT2-04

PEM1F

Wetland Functional Class: Semi-permanently Flooded Wet Graminoid Meadow

Wildlife Habitat: Non-patterned Wet Sedge Tundra

Hydric Soil Indicators: Histosol

Wetland Hydrology Indicators: High water table, saturation, algal matt, iron deposits

WETLAND DETERMINATION DATA FORM - Alaska Region

Project/Site: GMT2 Borough/City: North Slope Borough Sampling Date: 21-Jul-15

Applicant/Owner: Conoco Phillips Alaska, Inc. (CPAI) Sampling Point: **GMT2-05**

Investigator(s): WAD, EKJ Landform (hillside, terrace, hummocks etc.): basin

Local relief (concave, convex, none): concave Slope: % / ° Elevation: 88

Subregion : Northern Alaska Lat.: 70.1899316666667 Long.: -151.59698 Datum:

Soil Map Unit Name: **NWI classification:** **pubh**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (●) No ( )	**Is the Sampled Area within a Wetland?** Yes (●) No ( )
Hydric Soil Present?	Yes (●) No ( )	
Wetland Hydrology Present?	Yes (●) No ( )	

Remarks: small partially drained pond

VEGETATION - Use scientific names of plants. List all species in the plot.

Tree Stratum	**Absolute % Cover**	**Dominant Species?**	**Indicator Status**
1.		☐	
2.		☐	
3.		☐	
4.		☐	
5.		☐	
Total Cover:	0		

Sapling/Shrub Stratum 50% of Total Cover: 0 20% of Total Cover: 0			
1.		☐	
2.		☐	
3.		☐	
4.		☐	
5.		☐	
6.		☐	
7.		☐	
8.		☐	
9.		☐	
10.		☐	
Total Cover:	0		

Herb Stratum 50% of Total Cover: 0 20% of Total Cover: 0			
1. Carex aquatilis	1	☑	OBL
2. Eriophorum angustifolium	1	☑	OBL
3.	0	☐	
4.	0	☐	
5.	0	☐	
6.	0	☐	
7.	0	☐	
8.	0	☐	
9.	0	☐	
10.	0	☐	
Total Cover:	2		

50% of Total Cover: 1 20% of Total Cover: 0.4

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of dominant Species That Are OBL, FACW, or FAC:	100.0%	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species	2	x 1 =	2
FACW Species	0	x 2 =	0
FAC Species	0	x 3 =	0
FACU Species	0	x 4 =	0
UPL Species	0	x 5 =	0
Column Totals:	2 (A)		2 (B)

Prevalence Index = B/A = 1.000

Hydrophytic Vegetation Indicators:

- ☑ Dominance Test is > 50%
- ☑ Prevalence Index is ≤3.0
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length x width)	
% Cover of Wetland Bryophytes (Where applicable)	
% Bare Ground	
Total Cover of Bryophytes	

Hydrophytic Vegetation Present? Yes (●) No ( )

Remarks:

SOIL

Sampling Point: GMT2-05

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks

[1] Type: C=Concentration. D=Depletion. RM=Reduced Matrix [2] Location: PL=Pore Lining. RC=Root Channel. M=Matrix

Hydric Soil Indicators:

- ☐ Histosol or Histel (A1)
- ☐ Histic Epipedon (A2)
- ☐ Hydrogen Sulfide (A4)
- ☐ Thick Dark Surface (A12)
- ☐ Alaska Gleyed (A13)
- ☐ Alaska Redox (A14)
- ☐ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3] :

- ☐ Alaska Color Change (TA4)[4]
- ☐ Alaska Alpine swales (TA5)
- ☐ Alaska Redox With 2.5Y Hue
- ☐ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ☑ Other (Explain in Remarks)

[3] One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present.

[4] Give details of color change in Remarks.

Restrictive Layer (if present):
Type: unknown
Depth (inches):

Hydric Soil Present? Yes ◉ No ○

Remarks:
no pit, innundated pond

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one is sufficient)

- ☑ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift deposits (B3)
- ☑ Algal Mat or Crust (B4)
- ☑ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Dry-Season Water Table (C2)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9)
- ☐ Drainage Patterns (B10)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Salt Deposits (C5)
- ☐ Stunted or Stressed Plants (D1)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ◉	No ○	Depth (inches): 3
Water Table Present?	Yes ◉	No ○	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ◉	No ○	Depth (inches):

Wetland Hydrology Present? Yes ◉ No ○

Recorded Data (stream gauge, monitor well, aerial photo, previous inspection), if available:

Remarks:

GMT2-05

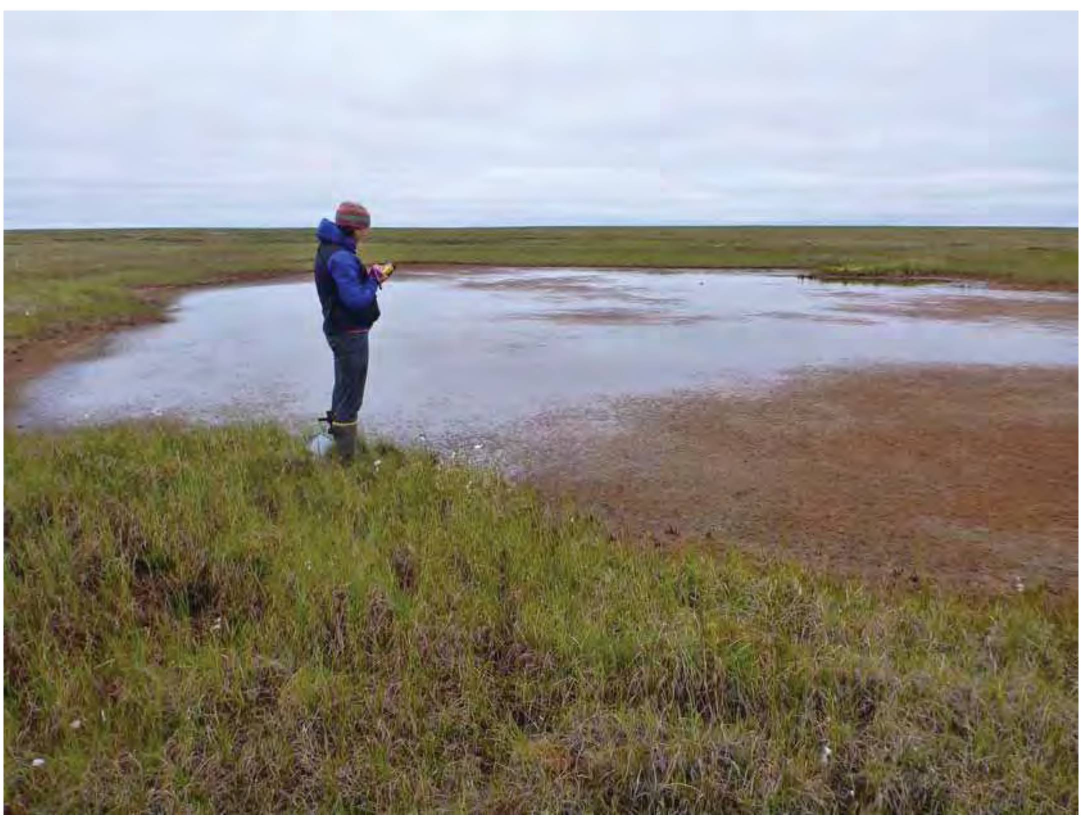
pubh

Wetland Functional Class: Permanently Flooded Pond

Wildlife Habitat: Shallow Open Water with no Islands

Hydric Soil Indicators: No pit, innundated

Wetland Hydrology Indicators: Permanently flooded



WETLAND DETERMINATION DATA FORM - Alaska Region

Project/Site: GMT2 | Borough/City: North Slope Borough | Sampling Date: 21-Jul-15

Applicant/Owner: Conoco Phillips Alaska, Inc. (CPAI) | Sampling Point: **GMT2-06**

Investigator(s): WAD, EKJ | Landform (hillside, terrace, hummocks etc.): small bluuff

Local relief (concave, convex, none): convex | Slope: 3.5 % / 2.0 ° | Elevation: 86

Subregion : Northern Alaska | Lat.: 70.18894 | Long.: -151.597735 | Datum:

Soil Map Unit Name: | **NWI classification:** **Upland**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (●) No ( )	**Is the Sampled Area within a Wetland?** Yes ( ) No (●)
Hydric Soil Present?	Yes ( ) No (●)	
Wetland Hydrology Present?	Yes ( ) No (●)	

Remarks: bluff at the edge of a drained lake basin

VEGETATION - Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.		☐	
2.		☐	
3.		☐	
4.		☐	
5.		☐	
Total Cover:	0		

Sapling/Shrub Stratum 50% of Total Cover: 0 20% of Total Cover: 0

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cassiope tetragona	35	☑	FACU
2. Salix richardsonii	10	☑	FACW
3. Salix pulchra	5	☐	FACW
4. Rhododendron tomentosum	10	☑	FACW
5. Vaccinium vitis-idaea	5	☐	FAC
6. Salix rotundifolia ssp. dodgeana	2	☐	UPL
7. Salix reticulata	5	☐	FAC
8. Dryas integrifolia	2	☐	FACU
9. Betula nana	0	☐	FAC
10.	0	☐	
Total Cover:	74		

Herb Stratum 50% of Total Cover: 37 20% of Total Cover: 14.8

	Absolute % Cover	Dominant Species?	Indicator Status
1. Carex bigelowii	25	☑	FAC
2. Bistorta officinalis	10	☑	FAC
3. Saussurea angustifolia	5	☐	FAC
4. Eriophorum vaginatum	10	☑	FACW
5. Anthoxanthum monticola ssp. alpinum	1	☐	FACU
6. Festuca rubra	1	☐	FAC
7. Poa arctica	1	☐	FAC
8. Pedicularis groenlandica	1	☐	FACW
9.	0	☐	
10.	0	☐	
Total Cover:	54		

50% of Total Cover: 27 20% of Total Cover: 10.8

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC:	5	(A)
Total Number of Dominant Species Across All Strata:	6	(B)
Percent of dominant Species That Are OBL, FACW, or FAC:	83.3%	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	x 1 =	0
FACW Species	36	x 2 =	72
FAC Species	54	x 3 =	162
FACU Species	37	x 4 =	148
UPL Species	1	x 5 =	5
Column Totals:	128 (A)		387 (B)

Prevalence Index = B/A = 3.023

Hydrophytic Vegetation Indicators:

- ☑ Dominance Test is > 50%
- ☑ Prevalence Index is ≤3.0
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length x width)	
% Cover of Wetland Bryophytes (Where applicable)	0
% Bare Ground	0
Total Cover of Bryophytes	20

Hydrophytic Vegetation Present? Yes (●) No ( )

Remarks:

SOIL

Sampling Point: GMT2-06

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix Color (moist)		Matrix %	Redox Features Color (moist)		Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3			100						Mucky Peat	
3-10	10YR	4/3	80	10YR	4/2	20	RM	M	Clay Loam	
10-11	10YR	3/2	100						Silt Loam	
11-13	10YR	3/3	100						Loamy Sand	
13-18	10YR	4/2	100						Loamy Sand	

[1] Type: C=Concentration. D=Depletion. RM=Reduced Matrix [2] Location: PL=Pore Lining. RC=Root Channel. M=Matrix

Hydric Soil Indicators:

- ☐ Histosol or Histel (A1)
- ☐ Histic Epipedon (A2)
- ☐ Hydrogen Sulfide (A4)
- ☐ Thick Dark Surface (A12)
- ☐ Alaska Gleyed (A13)
- ☐ Alaska Redox (A14)
- ☐ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ☐ Alaska Color Change (TA4)[4]
- ☐ Alaska Alpine swales (TA5)
- ☐ Alaska Redox With 2.5Y Hue
- ☐ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ☐ Other (Explain in Remarks)

[3] One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present.

[4] Give details of color change in Remarks.

Restrictive Layer (if present):
Type: seasonal frost
Depth (inches): 18

Hydric Soil Present? Yes ○ No ◉

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Dry-Season Water Table (C2)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9)
- ☐ Drainage Patterns (B10)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Salt Deposits (C5)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ○	No ◉	Depth (inches):
Water Table Present?	Yes ○	No ◉	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ○	No ◉	Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Recorded Data (stream gauge, monitor well, aerial photo, previous inspection), if available:

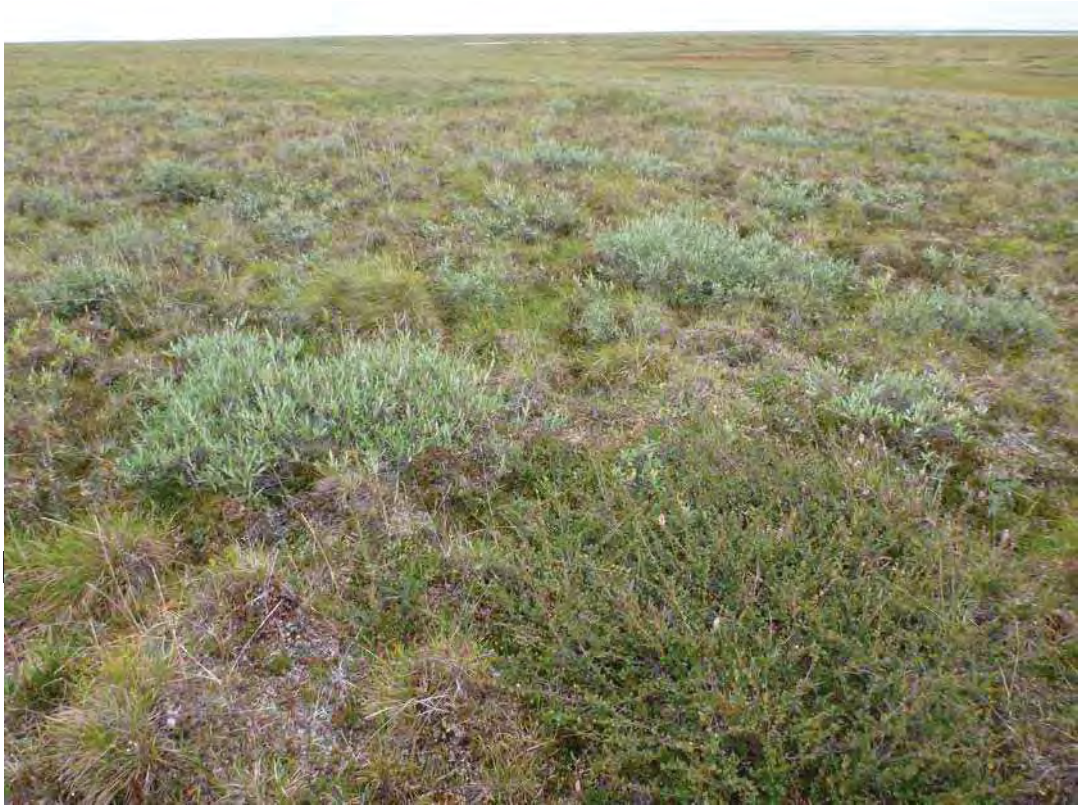
Remarks:
well drained ridge, deep active layer

GMT2-06

Upland

Wetland Functional Class: Upland

Wildlife Habitat: Moist Tussock Tundra



Hydric Soil Indicators: no hydric soil indicators

Wetland Hydrology Indicators: no hydrology indicators

WETLAND DETERMINATION DATA FORM - Alaska Region

Project/Site: GMT2 Borough/City: North Slope Borough Sampling Date: 21-Jul-15

Applicant/Owner: Conoco Phillips Alaska, Inc. (CPAI) Sampling Point: **GMT2-07**

Investigator(s): WAD, EKJ Landform (hillside, terrace, hummocks etc.): Flat

Local relief (concave, convex, none): flat Slope: 0.0 % / 0.0 ° Elevation: 101

Subregion : Northern Alaska Lat.: 70.2107666666667 Long.: -151.584118333333 Datum:

Soil Map Unit Name: **NWI classification:** **pem1/ss1b**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ◉ No ○ (If no, explain in Remarks.)

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◉ No ○	**Is the Sampled Area within a Wetland?** Yes ◉ No ○
Hydric Soil Present?	Yes ◉ No ○	
Wetland Hydrology Present?	Yes ◉ No ○	

Remarks: mosstly non patterned tussock ttundra, very slight slope, no surface dranage features as mapped. This site is borderline wetland

VEGETATION - Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.		☐	
2.		☐	
3.		☐	
4.		☐	
5.		☐	
Total Cover:	0		

Sapling/Shrub Stratum (50% of Total Cover: 0; 20% of Total Cover: 0)	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix pulchra	10	☑	FACW
2. Salix reticulata	5	☐	FAC
3. Betula nana	10	☑	FAC
4. Rhododendron tomentosum	10	☑	FACW
5. Empetrum nigrum	1	☐	FAC
6. Vaccinium vitis-idaea	5	☐	FAC
7.	0	☐	
8.	0	☐	
9.	0	☐	
10.	0	☐	
Total Cover:	41		

Herb Stratum (50% of Total Cover: 20.5; 20% of Total Cover: 8.2)	Absolute % Cover	Dominant Species?	Indicator Status
1. Eriophorum vaginatum	45	☑	FACW
2. Carex bigelowii	5	☐	FAC
3. Bistorta officinalis	3	☐	FAC
4. Eriophorum angustifolium	5	☐	OBL
5.	0	☐	
6.	0	☐	
7.	0	☐	
8.	0	☐	
9.	0	☐	
10.	0	☐	
Total Cover:	58		

50% of Total Cover: 29 20% of Total Cover: 11.6

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species	5	x 1 =	5
FACW Species	65	x 2 =	130
FAC Species	29	x 3 =	87
FACU Species	0	x 4 =	0
UPL Species	0	x 5 =	0
Column Totals:	99 (A)		222 (B)

Prevalence Index = B/A = 2.242

Hydrophytic Vegetation Indicators:

- ☑ Dominance Test is > 50%
- ☑ Prevalence Index is ≤3.0
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length x width)

% Cover of Wetland Bryophytes (Where applicable) 0

% Bare Ground 0

Total Cover of Bryophytes 10

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks:

SOIL

Sampling Point: GMT2-07

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix Color (moist)		Matrix %	Redox Features Color (moist)		Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3			100						Fibric Organic	
3-4			100						Hemic Organic	
4-8	2.5Y	4/2	85	10YR	4/4	15	RM	PL	Silty Clay Loam	
8-11			100						Hemic Organic	

[1] Type: C=Concentration. D=Depletion. RM=Reduced Matrix [2] Location: PL=Pore Lining. RC=Root Channel. M=Matrix

Hydric Soil Indicators:

- ☐ Histosol or Histel (A1)
- ☐ Histic Epipedon (A2)
- ☐ Hydrogen Sulfide (A4)
- ☐ Thick Dark Surface (A12)
- ☐ Alaska Gleyed (A13)
- ☐ Alaska Redox (A14)
- ☐ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3] :

- ☐ Alaska Color Change (TA4)[4]
- ☐ Alaska Alpine swales (TA5)
- ☑ Alaska Redox With 2.5Y Hue
- ☐ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ☐ Other (Explain in Remarks)

[3] One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present.

[4] Give details of color change in Remarks.

Restrictive Layer (if present):

Type: seasonal frost

Depth (inches): 11

Hydric Soil Present? Yes ◉ No ○

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one is sufficient)

- ☑ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Dry-Season Water Table (C2)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9)
- ☐ Drainage Patterns (B10)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Salt Deposits (C5)
- ☐ Stunted or Stressed Plants (D1)
- ☑ Geomorphic Position (D2)
- ☑ Shallow Aquitard (D3)
- ☑ Microtopographic Relief (D4)
- ☐ FAC-neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ◉	No ○	Depth (inches): 1
Water Table Present?	Yes ○	No ◉	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ○	No ◉	Depth (inches):

Wetland Hydrology Present? Yes ◉ No ○

Recorded Data (stream gauge, monitor well, aerial photo, previous inspection), if available:

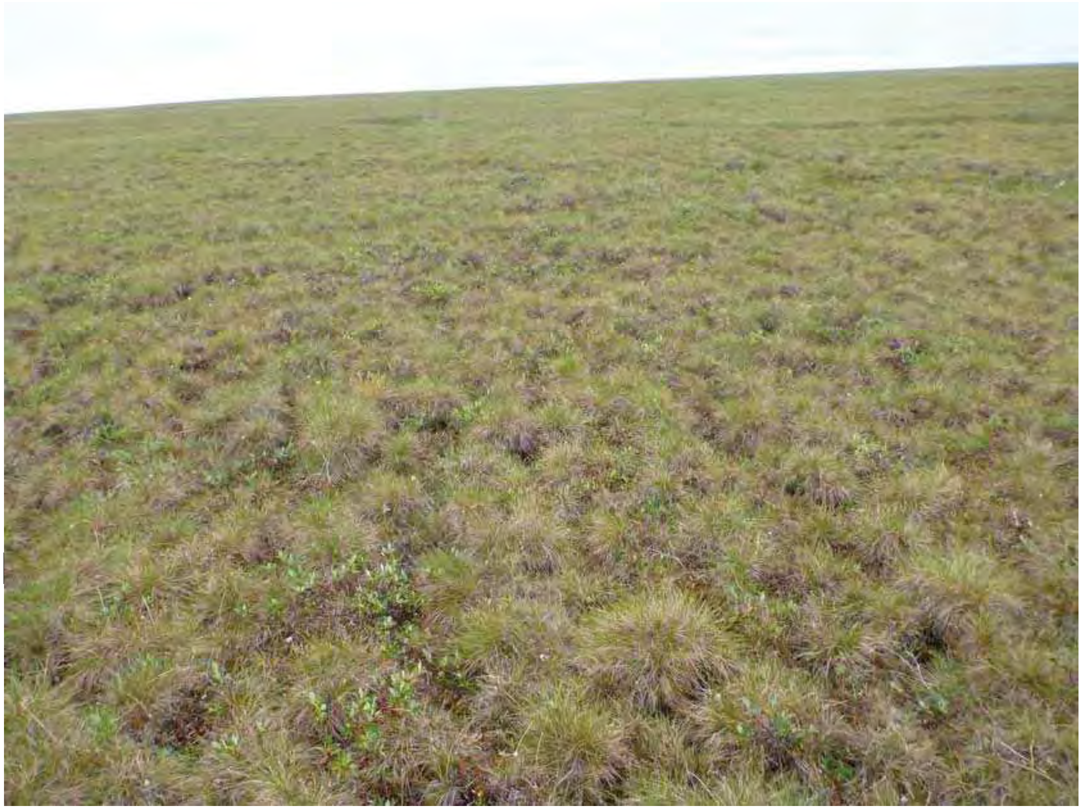
Remarks:
surface water not at soil pit but in troughs within the signature

GMT2-07

pem1/ss1b

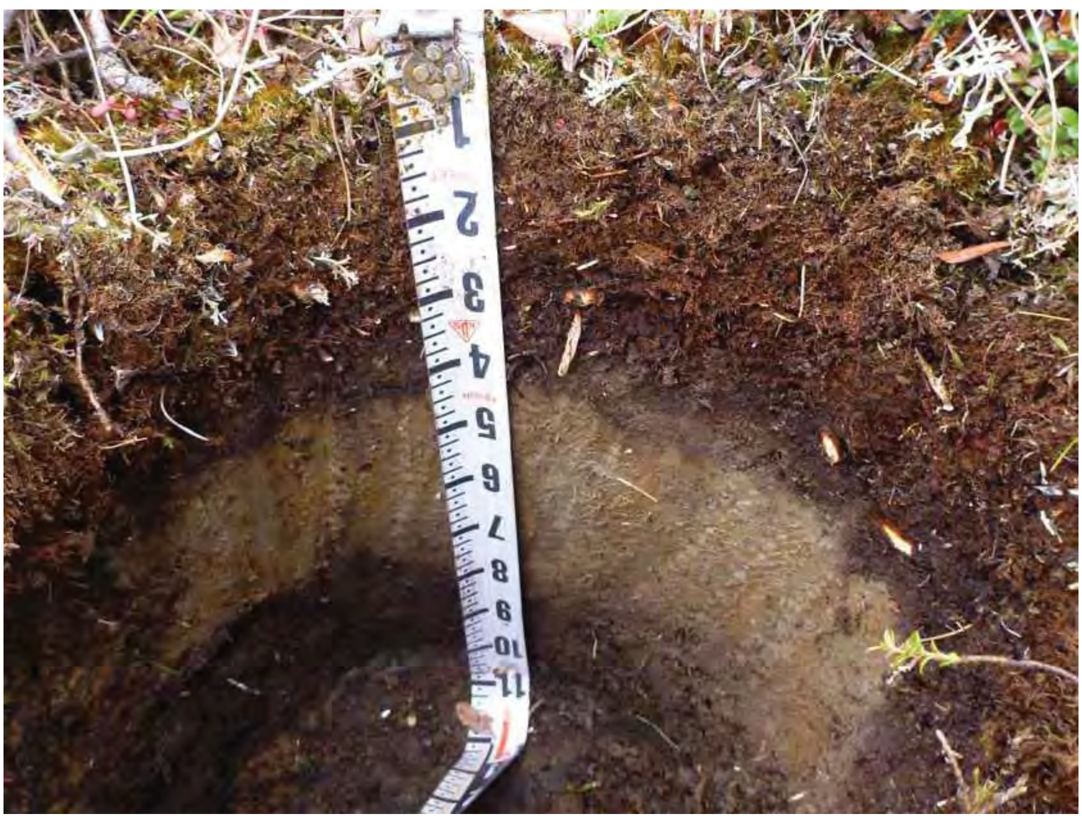
Wetland Functional Class: Saturated Graminoid/Shrub Meadow

Wildlife Habitat: Moist Tussock Tundra



Hydric Soil Indicators: Alaska Redox with 2.5Y Hue

Wetland Hydrology Indicators: Surface water in depressions and secondary hydrology indicators



WETLAND DETERMINATION DATA FORM - Alaska Region

Project/Site: GMT2 Borough/City: North Slope Borough Sampling Date: 21-Jul-15

Applicant/Owner: Conoco Phillips Alaska, Inc. (CPAI) Sampling Point: **GMT2-08**

Investigator(s): WAD, EKJ Landform (hillside, terrace, hummocks etc.): Flat plateau

Local relief (concave, convex, none): flat Slope: 0.0 % / 0.0 ° Elevation: 76

Subregion : Northern Alaska Lat.: 70.2377566666667 Long.: -151.547598333333 Datum:

Soil Map Unit Name: **NWI classification:** **pem1/ss1e**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ◉ No ○ (If no, explain in Remarks.)

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ◉ No ○

Hydric Soil Present? Yes ◉ No ○

Wetland Hydrology Present? Yes ◉ No ○

Is the Sampled Area within a Wetland? Yes ◉ No ○

Remarks: slightly depressed top of small plateau.

VEGETATION - Use scientific names of plants. List all species in the plot.

Tree Stratum	**Absolute % Cover**	**Dominant Species?**	**Indicator Status**
1.		☐	
2.		☐	
3.		☐	
4.		☐	
5.		☐	
Total Cover:	0		

Sapling/Shrub Stratum 50% of Total Cover: 0 20% of Total Cover: 0			
1. Salix pulchra	5	☐	FACW
2. Betula nana	10	☑	FAC
3. Vaccinium vitis-idaea	5	☐	FAC
4. Rhododendron tomentosum	10	☑	FACW
5. Empetrum nigrum	5	☐	FAC
6.	0	☐	
7.	0	☐	
8.	0	☐	
9.	0	☐	
10.	0	☐	
Total Cover:	35		

Herb Stratum 50% of Total Cover: 17.5 20% of Total Cover: 7			
1. Eriophorum vaginatum	40	☑	FACW
2. Pyrola asarifolia	5	☐	FACU
3. Arctagrostis latifolia	1	☐	FACW
4. Carex bigelowii	5	☐	FAC
5. Eriophorum angustifolium	5	☐	OBL
6. Saxifraga hirculus	1	☐	OBL
7. Carex aquatilis	5	☐	OBL
8.	0	☐	
9.	0	☐	
10.	0	☐	
Total Cover:	62		

50% of Total Cover: 31 20% of Total Cover: 12.4

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species	11	x 1 =	11
FACW Species	56	x 2 =	112
FAC Species	25	x 3 =	75
FACU Species	5	x 4 =	20
UPL Species	0	x 5 =	0
Column Totals:	97 (A)		218 (B)

Prevalence Index = B/A = 2.247

Hydrophytic Vegetation Indicators:

- ☑ Dominance Test is > 50%
- ☑ Prevalence Index is ≤3.0
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length x width):

% Cover of Wetland Bryophytes (Where applicable): 5

% Bare Ground: 5

Total Cover of Bryophytes: 10

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks: drepa and unk aquatic mosses as wet bryo.

SOIL

Sampling Point: GMT2-08

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix Color (moist)		Matrix %	Redox Features Color (moist)		Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4			100						Hemic Organics	
4-10	2.5Y	4/1	100						Silty Clay	
10-13	2.5Y	3/2	60	10YR	2/2	40			Hemic Organics	

[1] Type: C=Concentration. D=Depletion. RM=Reduced Matrix [2] Location: PL=Pore Lining. RC=Root Channel. M=Matrix

Hydric Soil Indicators:

- ☐ Histosol or Histel (A1)
- ☐ Histic Epipedon (A2)
- ☐ Hydrogen Sulfide (A4)
- ☐ Thick Dark Surface (A12)
- ☐ Alaska Gleyed (A13)
- ☐ Alaska Redox (A14)
- ☐ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3] :

- ☐ Alaska Color Change (TA4)[4]
- ☐ Alaska Alpine swales (TA5)
- ☐ Alaska Redox With 2.5Y Hue
- ☐ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ☑ Other (Explain in Remarks)

[3] One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present.

[4] Give details of color change in Remarks.

Restrictive Layer (if present):
Type: seasonal frost
Depth (inches): 13

Hydric Soil Present? Yes ◉ No ○

Remarks:
alpha alpha positive

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one is sufficient)

- ☑ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Dry-Season Water Table (C2)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9)
- ☐ Drainage Patterns (B10)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☑ Presence of Reduced Iron (C4)
- ☐ Salt Deposits (C5)
- ☐ Stunted or Stressed Plants (D1)
- ☑ Geomorphic Position (D2)
- ☑ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ◉	No ○	Depth (inches): 2
Water Table Present?	Yes ○	No ◉	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ◉	No ○	Depth (inches): 1

Wetland Hydrology Present? Yes ◉ No ○

Recorded Data (stream gauge, monitor well, aerial photo, previous inspection), if available:

Remarks:
surface water in troughs near pit, assume at least a dry season water table that can't be verified due to frozen soil

GMT2-08

pem1/ss1e

Wetland Functional Class: Seasonally Flooded Saturated Graminoid/Shrub Meadow

Wildlife Habitat: Moist Sedge Shrub Tundra

Hydric Soil Indicators: Positive for alpha alpha dipyridil

Wetland Hydrology Indicators: Surface water in low depressions, saturation

WETLAND DETERMINATION DATA FORM - Alaska Region

Project/Site: GMT2 | Borough/City: North Slope Borough | Sampling Date: 21-Jul-15

Applicant/Owner: Conoco Phillips Alaska, Inc. (CPAI) | Sampling Point: **GMT2-09**

Investigator(s): WAD, EKJ | Landform (hillside, terrace, hummocks etc.): small bluff

Local relief (concave, convex, none): convex | Slope: 5.2 % / 3.0 ° | Elevation: 79

Subregion: Northern Alaska | Lat.: 70.2369183333333 | Long.: -151.54449 | Datum:

Soil Map Unit Name: | **NWI classification:** Upland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	●	
Hydric Soil Present?		●
Wetland Hydrology Present?	●	

Is the Sampled Area within a Wetland? Yes ( ) No (●)

Remarks: bluff or rdge at the edge of drained lake basin. some evidence of disturbance, smashed tussocks.

VEGETATION - Use scientific names of plants. List all species in the plot.

Tree Stratum

#	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.			☐	
2.			☐	
3.			☐	
4.			☐	
5.			☐	
	Total Cover:	0		

Sapling/Shrub Stratum — 50% of Total Cover: 0 — 20% of Total Cover: 0

#	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Salix pulchra	5	☐	FACW
2.	Salix richardsonii	5	☐	FACW
3.	Vaccinium vitis-idaea	10	☑	FAC
4.	Salix rotundifolia ssp. dodgeana	15	☑	UPL
5.	Salix reticulata	5	☐	FAC
6.	Rhododendron tomentosum	10	☑	FACW
7.	Cassiope tetragona	15	☑	FACU
8.		0	☐	
9.		0	☐	
10.		0	☐	
	Total Cover:	65		

Herb Stratum — 50% of Total Cover: 32.5 — 20% of Total Cover: 13

#	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Eriophorum vaginatum	30	☑	FACW
2.	Saussurea angustifolia	5	☐	FAC
3.	Stellaria longipes	0.1	☐	FAC
4.	Pyrola asarifolia	1	☐	FACU
5.	Luzula confusa	1	☐	FAC
6.	Poa arctica	1	☐	FAC
7.	Pedicularis verticillata	1	☐	FAC
8.	Festuca rubra	5	☐	FAC
9.	Papaver macounii	0	☐	FACU
10.		0	☐	
	Total Cover:	44.1		

50% of Total Cover: 22.05 — 20% of Total Cover: 8.82

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of dominant Species That Are OBL, FACW, or FAC: 80.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	x 1 =	0
FACW Species	50	x 2 =	100
FAC Species	43.1	x 3 =	129.3
FACU Species	16	x 4 =	64
UPL Species	0	x 5 =	0
Column Totals:	109.1 (A)		293.3 (B)

Prevalence Index = B/A = 2.688

Hydrophytic Vegetation Indicators:

- ☑ Dominance Test is > 50%
- ☑ Prevalence Index is ≤3.0
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length x width):

% Cover of Wetland Bryophytes (Where applicable): 0

% Bare Ground: 0

Total Cover of Bryophytes: 15

Hydrophytic Vegetation Present? Yes (●) No ( )

Remarks:

SOIL

Sampling Point: GMT2-09

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix Color (moist)		Matrix %	Redox Color (moist)		Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3			100						Peat	
3-7	10YR	3/2	100						Silt Loam	
7-10	10YR	2/1	100						Silt Loam, witth organics	

[1] Type: C=Concentration. D=Depletion. RM=Reduced Matrix [2] Location: PL=Pore Lining. RC=Root Channel. M=Matrix

Hydric Soil Indicators:

- ☐ Histosol or Histel (A1)
- ☐ Histic Epipedon (A2)
- ☐ Hydrogen Sulfide (A4)
- ☐ Thick Dark Surface (A12)
- ☐ Alaska Gleyed (A13)
- ☐ Alaska Redox (A14)
- ☐ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3] :

- ☐ Alaska Color Change (TA4)[4]
- ☐ Alaska Alpine swales (TA5)
- ☐ Alaska Redox With 2.5Y Hue
- ☐ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ☐ Other (Explain in Remarks)

[3] One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present.

[4] Give details of color change in Remarks.

Restrictive Layer (if present):
Type: seasonal frost
Depth (inches): 10

Hydric Soil Present? Yes ○ No ◉

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Marl Deposits (B15)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Dry-Season Water Table (C2)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9)
- ☐ Drainage Patterns (B10)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Salt Deposits (C5)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☑ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):
Water Table Present? Yes ○ No ◉ Depth (inches):
Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ◉ No ○

Recorded Data (stream gauge, monitor well, aerial photo, previous inspection), if available:

Remarks:

GMT2-09

Upland

Wetland Functional Class: Upland

Wildlife Habitat: Moist Tussock Tundra

Hydric Soil Indicators: No hydric soil indicators

Wetland Hydrology Indicators: One secondary indicator (shallow aquitard)

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APPENDIX E
ANSRAM DATASHEETS AND DEBIT-CREDIT CALCULATION

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GMT2 ANSRAM PRE-CONSTRUCTION

Wetland Functions and Values Evaluation Questions	
Unique ID:	GMT2_PRE
HGM Class:	Flats
Cowardin Class:	PEM1F
Size (acres):	4.3
Disturbance Category:	0
A. Exceptional Habitat Designation	**Y or N**
1. Is wetland located within an area considered to be irreplaceable, or does it have unique habitat not found anywhere else on the North Slope (i.e., Teshukpuk Lake Surface Protection Area, Colville River Delta, Beaufort Sea Coastal Marsh)	N
2. Is wetland located within an area considered by any regulatory agency to be an Aquatic Resource of National Importance (ARNI)	N
B. Flood Flow Alteration	**Y or N or N/A**
1. Wetland occurs in the upper portion of its watershed	Y
2. Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events than under normal rainfall	Y
3. Wetland is a closed system	N
4. If flow through, wetland has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris	Y
5. Wetland contains a dense herbaceous layer (>70% cover) or woody vegetation	N
6. Wetland receives floodwater from an adjacent water course at least once every 10 years	Y
7. Floodwaters come as sheet flow rather than channel flow	Y
C. Sediment Removal: If moving waters consider only statements 1 and 2	**Y or N or N/A**
1. Sources of excess sediment are present up gradient of the wetland	N
2. Is wetland influenced by slow-moving water and/or a deepwater habitat	N
3. Is herbaceous vegetation present (>50% cover)	Y
4. Interspersion of vegetation and surface water is moderate in wetland presently or during flooding at least once ever 10 years	Y
5. Sediment deposits are present in wetland (observation or noted in application materials)	Y
D. Nutrient and Toxicant Removal	**Y or N or N/A**
1. Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present up gradient and able to influence the wetland	N/A
2. Wetland is inundated or has indicators that flooding is a seasonal event during the growing season by visual observation, or indicated by other hydrological data source	Y
3. Wetland has at least 30% aerial cover of live vegetation	Y
E. Erosion Control and Shoreline Stabilization	**Y or N or N/A**
1. Wetland has dense, energy absorbing vegetation (>70%) bordering the water course and no evidence of erosion	N/A
2. An herbaceous layer is part of this dense vegetation	N/A
3. Shrubs able to withstand erosive flood events	N/A
F. Production of Organic Matter and its Export	**Y or N or N/A**
1. Wetland has at least 30% aerial cover of herbaceous vegetation	Y
2. Woody plants in wetland are mostly deciduous	Y
3. Interspersion of vegetation and surface water is high in wetland	Y
4. Wetland is inundated or has indicators that flooding is a seasonal event during the growing season	Y
5. Wetland has outlet from which organic matter is flushed	Y
G. General Habitat Suitability	**Y or N or N/A**
1. Is wetland located greater than 300-feet from existing development	Y
2. Undeveloped upland buffers abutting wetland	N/A
3. Wetland part of a larger wetland complex, not fragmented	Y
4. Diversity of plant species is apparent (> or = 5 species with at least 10% cover each)	Y
5. Evidence of wildlife use	Y
6. Wetland has a moderate degree of cowardin class interspersion	Y
H. General Fish Habitat	**Y or N or N/A**
1. Wetland has perennial or intermittent surface-water connection to a fish-bearing water body	N/A
2. Does wetland provide overwintering habitat for fish	N/A
3. Documented presence of fish	N/A
4. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter	N/A
5. Spawning areas are present (aquatic vegetation and/or gravel beds)	N/A
6. Juvenile rest areas	N/A
I. Native Plant Richness	**Y or N or N/A**
1. Dominant and codominant plants are native	Y
2. Wetland contains two or more Cowardin Classes	Y
3. Wetland has two or more strata of vegetation	Y
J. Educational or Scientific Value	**Y or N or N/A**
1. Site has scientific or educational use	N
2. Wetland is in public ownership	Y
3. Accessible trails available	N
4. Is the area a known recreation area	Y
5. Subsistence (berry picking, fishing, hunting)	Y
K. Uniqueness and Heritage	**Y or N or N/A**
1. Wetland contains documented occurrence of a state or federally listed threatened or endangered species	N
2. Wetland contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the U.S. Fish and Wildlife Service	N
3. Wetland has biological, geological, or other features that are determined rare	N
4. Wetland has been determined significant because it provides functions scarce for the area	N
5. Are there known or reported cultural resources in the area	N/A
6. Is the area a known subsistence/recreation/living area	Y
7. Wetland complex contains one or more of the following habitats: a) Tall shrub habitat (>.5ft in height) dominated by Salix spp. b) Aquatic herb habitat dominated by Arctophila fulva. c) Semi-permanently flooded to permanently flooded vegetated portions of drained lake basins d) Anadromous fish overwintering habitat e) Patterned wet sedge meadow and low center polygons f) High center polygon complex g) Riverine coastal mudflats h) Non-patterned wet meadow adjacent to streams and river bluffs.	Y

Wetland Functions and Values Results

Unique ID:	GMT2_PRE
HGM Class:	Flats
Cowardin Class:	PEM1F
Size (acres):	4.3

	Raw Score	Weighted Score
Flood Flow Alteration		
1	1	
2	1	
3	0	
4	1	
5	0	
6	1	
7	1	
	Total	0.714
Sediment Removal		
1	0	
2	0	
3	1	
4	1	
5	1	
	Total	0.600
Nutrient and Toxicant Removal		
1	N/A	
2	1	
3	1	
	Total	1.000
Erosion Control and Shoreline Stabilization		
1	N/A	
2	N/A	
3	N/A	
	Total	N/A
Production of Organic Matter and its Export		
1	1	
2	1	
3	1	
4	1	
5	1	
	Total	1.000
General Habitat Suitability		
1	1	
2	N/A	
3	1	
4	1	
5	1	
6	1	
	Total	1.000
General Fish Habitat		
1	N/A	
2	N/A	
3	N/A	
4	N/A	
5	N/A	
6	N/A	
	Total	N/A
Native Plant Richness		
1	1	
2	1	
3	1	
	Total	1.000
Educational or Scientific Value		
1	0	
2	1	
3	0	
4	1	
5	1	
	Total	0.600
Uniqueness and Heritage		
1	0	
2	0	
3	0	
4	0	
5	N/A	
6	1	
7	1	
	Total	0.333

Disturbance Activities		
Disturbance Category		0
Disturbance Category		Impact Factor
0	=	1
1	=	0.99
2	=	0.95
3	=	0.9
Disturbance Impact Factor		1

Wetland Functions and Values Results (cont.)			
Unique ID	GMT2_PRE		
Exceptional Habitat Designation			0

	Weighted Score	
Flood Flow Alteration	0.714	
Sediment Removal	0.600	
Nutrient and Toxicant Removal	1.000	
Erosion Control and Shoreline Stabilization	N/A	
Production of Organic Matter and its Export	1.000	
General Habitat Suitability	1.000	
General Fish Habitat	N/A	
Native Plant Richness	1.000	
Educational or Scientific Value	0.600	
Uniqueness and Heritage	0.333	
	Total	6.248

Standardization

Total # of functions assessed	8
Standardized Total	0.781

Total (Including Disturbance and Exceptional Habitat)	0.781

Overall Functional Score (Category)

0.76 - 1.00	I	Highest	I
0.51 - 0.75	II		
0.26 - 0.50	III		
0 - 0.25	IV	Lowest	

Notes:

1) Scores for each category component, 0 = no and 1 = yes.
2) Not all functional categories will be applicable to each wetland functional assessment.
   For example, General Fish Habitat is only applicable to wetlands that are fish-bearing waters.
   Functional categories that are not applicable will be treated as NA (not applicable), which means there is no score for
   that component. No score is not the same as 0, which would erroneously reduce the total score.
   Accordingly, the maximum total score will be reduced by 1 point for each functional category that is not applicable.
   For example, if General Fish Habitat does not apply, then the Total # of functions assessed is 9
3) NA = an item that is currently not applicable, but could be applicable at a future time if more data are available.
4) See impacted area assessment worksheet for determination of disturbance activities
   Apply the correct impact factor to the disturbance category.

Wetland Functions and Values Evaluation Questions	
Unique ID:	GMT2_PRE
HGM Class:	Flats
Cowardin Class:	pem1ss1b
Size (acres):	49.8
Disturbance Category:	0
A. Exceptional Habitat Designation	**Y or N**
1. Is wetland located within an area considered to be irreplaceable, or does it have unique habitat not found anywhere else on the North Slope (i.e., Teshukpuk Lake Surface Protection Area, Colville River Delta, Beaufort Sea Coastal Marsh)	N
2. Is wetland located within an area considered by any regulatory agency to be an Aquatic Resource of National Importance (ARNI	N
B. Flood Flow Alteration	**Y or N or N/A**
1. Wetland occurs in the upper portion of its watershed	Y
2. Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events than under normal rainfall	N
3. Wetland is a closed system	N
4. If flow through, wetland has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris	N
5. Wetland contains a dense herbaceous layer (>70% cover) or woody vegetation	Y
6. Wetland receives floodwater from an adjacent water course at least once every 10 years	Y
7. Floodwaters come as sheet flow rather than channel flow	Y
C. Sediment Removal: If moving waters consider only statements 1 and 2	**Y or N or N/A**
1. Sources of excess sediment are present up gradient of the wetland	N
2. Is wetland influenced by slow-moving water and/or a deepwater habitat	N
3. Is herbaceous vegetation present (>50% cover)	Y
4. Interspersion of vegetation and surface water is moderate in wetland presently or during flooding at least once ever 10 years	N
5. Sediment deposits are present in wetland (observation or noted in application materials)	N
D. Nutrient and Toxicant Removal	**Y or N or N/A**
1. Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present up gradient and able to influence the wetland	N/A
2. Wetland is inundated or has indicators that flooding is a seasonal event during the growing season by visual observation, or indicated by other hydrological data source	Y
3. Wetland has at least 30% aerial cover of live vegetation	Y
E. Erosion Control and Shoreline Stabilization	**Y or N or N/A**
1. Wetland has dense, energy absorbing vegetation (>70%) bordering the water course and no evidence of erosion	N/A
2. An herbaceous layer is part of this dense vegetation	N/A
3. Shrubs able to withstand erosive flood events	N/A
F. Production of Organic Matter and its Export	**Y or N or N/A**
1. Wetland has at least 30% aerial cover of herbaceous vegetation	Y
2. Woody plants in wetland are mostly deciduous	Y
3. Interspersion of vegetation and surface water is high in wetland	N/A
4. Wetland is inundated or has indicators that flooding is a seasonal event during the growing season	N
5. Wetland has outlet from which organic matter is flushed	Y
G. General Habitat Suitability	**Y or N or N/A**
1. Is wetland located greater than 300-feet from existing development	Y
2. Undeveloped upland buffers abutting wetland	N/A
3. Wetland part of a larger wetland complex, not fragmented	Y
4. Diversity of plant species is apparent (> or = 5 species with at least 10% cover each	Y
5. Evidence of wildlife use	Y
6. Wetland has a moderate degree of cowardin class interspersion	Y
H. General Fish Habitat	**Y or N or N/A**
1. Wetland has perennial or intermittent surface-water connection to a fish-bearing water body	N/A
2. Does wetland provide overwintering habitat for fish	N/A
3. Documented presence of fish	N/A
4. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter	N/A
5. Spawning areas are present (aquatic vegetation and/or gravel beds)	N/A
6. Juvenile rest areas	N/A
I. Native Plant Richness	**Y or N or N/A**
1. Dominant and codominant plants are native	Y
2. Wetland contains two or more Cowardin Classes	Y
3. Wetland has two or more strata of vegetation	Y
J. Educational or Scientific Value	**Y or N or N/A**
1. Site has scientific or educational use	N
2. Wetland is in public ownership	Y
3. Accessible trails available	N
4. Is the area a known recreation area	Y
5. Subsistence (berry picking, fishing, hunting)	Y
K. Uniqueness and Heritage	**Y or N or N/A**
1. Wetland contains documented occurrence of a state or federally listed threatened or endangered species	N
2. Wetland contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the U.S. Fish and Wildlife Service	N
3. Wetland has biological, geological, or other features that are determined rare	N
4. Wetland has been determined significant because it provides functions scarce for the area	N
5. Are there known or reported cultural resources in the area	N/A
6. Is the area a known subsistence/recreation/living area	Y
7. Wetland complex contains one or more of the following habitats: a) Tall shrub habitat (>.5ft in height) dominated by Salix spp. b) Aquatic herb habitat dominated by Arctophila fulva. c) Semi-permanently flooded to permanently flooded vegetated portions of drained lake basins d) Anadromous fish overwintering habitat e) Patterned wet sedge meadow and low center polygons f) High center polygon complex g) Riverine coastal mudflats h) Non-patterned wet meadow adjacent to streams and river bluffs.	Y

Wetland Functions and Values Results

Unique ID:	GMT2_PRE
HGM Class:	Flats
Cowardin Class:	pem1ss1b
Size (acres):	49.8

	Raw Score	Weighted Score
Flood Flow Alteration		
1	1	
2	0	
3	0	
4	0	
5	1	
6	1	
7	1	
	Total	0.571
Sediment Removal		
1	0	
2	0	
3	1	
4	0	
5	0	
	Total	0.200
Nutrient and Toxicant Removal		
1	N/A	
2	1	
3	1	
	Total	1.000
Erosion Control and Shoreline Stabilization		
1	N/A	
2	N/A	
3	N/A	
	Total	N/A
Production of Organic Matter and its Export		
1	1	
2	1	
3	N/A	
4	0	
5	1	
	Total	0.750
General Habitat Suitability		
1	1	
2	N/A	
3	1	
4	1	
5	1	
6	1	
	Total	1.000
General Fish Habitat		
1	N/A	
2	N/A	
3	N/A	
4	N/A	
5	N/A	
6	N/A	
	Total	N/A
Native Plant Richness		
1	1	
2	1	
3	1	
	Total	1.000
Educational or Scientific Value		
1	0	
2	1	
3	0	
4	1	
5	1	
	Total	0.600
Uniqueness and Heritage		
1	0	
2	0	
3	0	
4	0	
5	N/A	
6	1	
7	1	
	Total	0.333

Disturbance Activities		
Disturbance Category		0
Disturbance Category		Impact Factor
0	=	1
1	=	0.99
2	=	0.95
3	=	0.9
Disturbance Impact Factor		1

Wetland Functions and Values Results (cont.)			
Unique ID	GMT2_PRE		
Exceptional Habitat Designation			0

	Weighted Score		
Flood Flow Alteration	0.571		
Sediment Removal	0.200		
Nutrient and Toxicant Removal	1.000		
Erosion Control and Shoreline Stabilization	N/A		
Production of Organic Matter and its Export	0.750		
General Habitat Suitability	1.000		
General Fish Habitat	N/A		
Native Plant Richness	1.000		
Educational or Scientific Value	0.600		
Uniqueness and Heritage	0.333		
	Total	5.455	
Standardization			
Total # of functions assessed		8	
Standardized Total		0.682	
Total (Including Disturbance and Exceptional Habitat)			0.682

Overall Functional Score (Category)	0.76 - 1.00	I	Highest	II
	0.51 - 0.75	II		
	0.26 - 0.50	III		
	0 - 0.25	IV	Lowest	

Notes:

1) Scores for each category component, 0 = no and 1 = yes.
2) Not all functional categories will be applicable to each wetland functional assessment.
   For example, General Fish Habitat is only applicable to wetlands that are fish-bearing waters.
   Functional categories that are not applicable will be treated as NA (not applicable), which means there is no score for
   that component. No score is not the same as 0, which would erroneously reduce the total score.
   Accordingly, the maximum total score will be reduced by 1 point for each functional category that is not applicable.
   For example, if General Fish Habitat does not apply, then the Total # of functions assessed is 9
3) NA = an item that is currently not applicable, but could be applicable at a future time if more data are available.
4) See impacted area assessment worksheet for determination of disturbance activities
   Apply the correct impact factor to the disturbance category.

Wetland Functions and Values Evaluation Questions	
Unique ID:	GMT2_PRE
HGM Class:	Flats
Cowardin Class:	pem1ss1e
Size (acres):	23.7
Disturbance Category:	0
A. Exceptional Habitat Designation	**Y or N**
1. Is wetland located within an area considered to be irreplaceable, or does it have unique habitat not found anywhere else on the North Slope (i.e., Teshukpuk Lake Surface Protection Area, Colville River Delta, Beaufort Sea Coastal Marsh)	N
2. Is wetland located within an area considered by any regulatory agency to be an Aquatic Resource of National Importance (ARNI	N
B. Flood Flow Alteration	**Y or N or N/A**
1. Wetland occurs in the upper portion of its watershed	Y
2. Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events than under normal rainfall	Y
3. Wetland is a closed system	N
4. If flow through, wetland has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris	Y
5. Wetland contains a dense herbaceous layer (>70% cover) or woody vegetation	Y
6. Wetland receives floodwater from an adjacent water course at least once every 10 years	Y
7. Floodwaters come as sheet flow rather than channel flow	Y
C. Sediment Removal: If moving waters consider only statements 1 and 2	**Y or N or N/A**
1. Sources of excess sediment are present up gradient of the wetland	N
2. Is wetland influenced by slow-moving water and/or a deepwater habitat	N
3. Is herbaceous vegetation present (>50% cover)	Y
4. Interspersion of vegetation and surface water is moderate in wetland presently or during flooding at least once ever 10 years	Y
5. Sediment deposits are present in wetland (observation or noted in application materials)	Y
D. Nutrient and Toxicant Removal	**Y or N or N/A**
1. Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present up gradient and able to influence the wetland	N/A
2. Wetland is inundated or has indicators that flooding is a seasonal event during the growing season by visual observation, or indicated by other hydrological data source	Y
3. Wetland has at least 30% aerial cover of live vegetation	Y
E. Erosion Control and Shoreline Stabilization	**Y or N or N/A**
1. Wetland has dense, energy absorbing vegetation (>70%) bordering the water course and no evidence of erosion	N/A
2. An herbaceous layer is part of this dense vegetation	N/A
3. Shrubs able to withstand erosive flood events	N/A
F. Production of Organic Matter and its Export	**Y or N or N/A**
1. Wetland has at least 30% aerial cover of herbaceous vegetation	Y
2. Woody plants in wetland are mostly deciduous	Y
3. Interspersion of vegetation and surface water is high in wetland	Y
4. Wetland is inundated or has indicators that flooding is a seasonal event during the growing season	Y
5. Wetland has outlet from which organic matter is flushed	Y
G. General Habitat Suitability	**Y or N or N/A**
1. Is wetland located greater than 300-feet from existing development	Y
2. Undeveloped upland buffers abutting wetland	N/A
3. Wetland part of a larger wetland complex, not fragmented	Y
4. Diversity of plant species is apparent (> or = 5 species with at least 10% cover each	Y
5. Evidence of wildlife use	Y
6. Wetland has a moderate degree of cowardin class interspersion	Y
H. General Fish Habitat	**Y or N or N/A**
1. Wetland has perennial or intermittent surface-water connection to a fish-bearing water body	N/A
2. Does wetland provide overwintering habitat for fish	N/A
3. Documented presence of fish	N/A
4. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter	N/A
5. Spawning areas are present (aquatic vegetation and/or gravel beds)	N/A
6. Juvenile rest areas	N/A
I. Native Plant Richness	**Y or N or N/A**
1. Dominant and codominant plants are native	Y
2. Wetland contains two or more Cowardin Classes	Y
3. Wetland has two or more strata of vegetation	Y
J. Educational or Scientific Value	**Y or N or N/A**
1. Site has scientific or educational use	N
2. Wetland is in public ownership	Y
3. Accessible trails available	N
4. Is the area a known recreation area	Y
5. Subsistence (berry picking, fishing, hunting)	Y
K. Uniqueness and Heritage	**Y or N or N/A**
1. Wetland contains documented occurrence of a state or federally listed threatened or endangered species	N
2. Wetland contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the U.S. Fish and Wildlife Service	N
3. Wetland has biological, geological, or other features that are determined rare	N
4. Wetland has been determined significant because it provides functions scarce for the area	N
5. Are there known or reported cultural resources in the area	N/A
6. Is the area a known subsistence/recreation/living area	Y
7. Wetland complex contains one or more of the following habitats: a) Tall shrub habitat (>.5ft in height) dominated by Salix spp. b) Aquatic herb habitat dominated by Arctophila fulva. c) Semi-permanently flooded to permanently flooded vegetated portions of drained lake basins d) Anadromous fish overwintering habitat e) Patterned wet sedge meadow and low center polygons f) High center polygon complex g) Riverine coastal mudflats h) Non-patterned wet meadow adjacent to streams and river bluffs.	Y

Wetland Functions and Values Results	
Unique ID:	GMT2_PRE
HGM Class:	Flats
Cowardin Class:	pem1ss1e
Size (acres):	23.7

	Raw Score	Weighted Score
Flood Flow Alteration		
1	1	
2	1	
3	0	
4	1	
5	1	
6	1	
7	1	
	Total	0.857
Sediment Removal		
1	0	
2	0	
3	1	
4	1	
5	1	
	Total	0.600
Nutrient and Toxicant Removal		
1	N/A	
2	1	
3	1	
	Total	1.000
Erosion Control and Shoreline Stabilization		
1	N/A	
2	N/A	
3	N/A	
	Total	N/A
Production of Organic Matter and its Export		
1	1	
2	1	
3	1	
4	1	
5	1	
	Total	1.000
General Habitat Suitability		
1	1	
2	N/A	
3	1	
4	1	
5	1	
6	1	
	Total	1.000
General Fish Habitat		
1	N/A	
2	N/A	
3	N/A	
4	N/A	
5	N/A	
6	N/A	
	Total	N/A
Native Plant Richness		
1	1	
2	1	
3	1	
	Total	1.000
Educational or Scientific Value		
1	0	
2	1	
3	0	
4	1	
5	1	
	Total	0.600
Uniqueness and Heritage		
1	0	
2	0	
3	0	
4	0	
5	N/A	
6	1	
7	1	
	Total	0.333

Disturbance Activities		
Disturbance Category		0
Disturbance Category		Impact Factor
0	=	1
1	=	0.99
2	=	0.95
3	=	0.9
Disturbance Impact Factor		1

Wetland Functions and Values Results (cont.)			
Unique ID	GMT2_PRE		
Exceptional Habitat Designation			0
	Weighted Score		
Flood Flow Alteration	0.857		
Sediment Removal	0.600		
Nutrient and Toxicant Removal	1.000		
Erosion Control and Shoreline Stabilization	N/A		
Production of Organic Matter and its Export	1.000		
General Habitat Suitability	1.000		
General Fish Habitat	N/A		
Native Plant Richness	1.000		
Educational or Scientific Value	0.600		
Uniqueness and Heritage	0.333		
	Total	6.390	
Standardization			
Total # of functions assessed		8	
Standardized Total		0.799	
Total (Including Disturbance and Exceptional Habitat)			0.799

Overall Functional Score (Category)				
	0.76 - 1.00	I	Highest	I
	0.51 - 0.75	II		
	0.26 - 0.50	III		
	0 - 0.25	IV	Lowest	

Notes:

1) Scores for each category component, 0 = no and 1 = yes.
2) Not all functional categories will be applicable to each wetland functional assessment.
   For example, General Fish Habitat is only applicable to wetlands that are fish-bearing waters.
   Functional categories that are not applicable will be treated as NA (not applicable), which means there is no score for that component. No score is not the same as 0, which would erroneously reduce the total score.
   Accordingly, the maximum total score will be reduced by 1 point for each functional category that is not applicable.
   For example, if General Fish Habitat does not apply, then the Total # of functions assessed is 9
3) NA = an item that is currently not applicable, but could be applicable at a future time if more data are available.
4) See impacted area assessment worksheet for determination of disturbance activities
   Apply the correct impact factor to the disturbance category.

Wetland Functions and Values Evaluation Questions	
Unique ID:	GMT2_PRE
HGM Class:	Depressional
Cowardin Class:	pubh
Size (acres):	0.1
Disturbance Category:	0
A. Exceptional Habitat Designation	**Y or N**
1. Is wetland located within an area considered to be irreplaceable, or does it have unique habitat not found anywhere else on the North Slope (i.e., Teshukpuk Lake Surface Protection Area, Colville River Delta, Beaufort Sea Coastal Marsh)	N
2. Is wetland located within an area considered by any regulatory agency to be an Aquatic Resource of National Importance (ARNI	N
B. Flood Flow Alteration	**Y or N or N/A**
1. Wetland occurs in the upper portion of its watershed	Y
2. Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events than under normal rainfall	Y
3. Wetland is a closed system	Y
4. If flow through, wetland has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris	N/A
5. Wetland contains a dense herbaceous layer (>70% cover) or woody vegetation	N/A
6. Wetland receives floodwater from an adjacent water course at least once every 10 years	Y
7. Floodwaters come as sheet flow rather than channel flow	Y
C. Sediment Removal: If moving waters consider only statements 1 and 2	**Y or N or N/A**
1. Sources of excess sediment are present up gradient of the wetland	N
2. Is wetland influenced by slow-moving water and/or a deepwater habitat	Y
3. Is herbaceous vegetation present (>50% cover)	N/A
4. Interspersion of vegetation and surface water is moderate in wetland presently or during flooding at least once ever 10 years	N/A
5. Sediment deposits are present in wetland (observation or noted in application materials)	Y
D. Nutrient and Toxicant Removal	**Y or N or N/A**
1. Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present up gradient and able to influence the wetland	N/A
2. Wetland is inundated or has indicators that flooding is a seasonal event during the growing season by visual observation, or indicated by other hydrological data source	Y
3. Wetland has at least 30% aerial cover of live vegetation	N/A
E. Erosion Control and Shoreline Stabilization	**Y or N or N/A**
1. Wetland has dense, energy absorbing vegetation (>70%) bordering the water course and no evidence of erosion	N/A
2. An herbaceous layer is part of this dense vegetation	N/A
3. Shrubs able to withstand erosive flood events	N/A
F. Production of Organic Matter and its Export	**Y or N or N/A**
1. Wetland has at least 30% aerial cover of herbaceous vegetation	N/A
2. Woody plants in wetland are mostly deciduous	N/A
3. Interspersion of vegetation and surface water is high in wetland	N/A
4. Wetland is inundated or has indicators that flooding is a seasonal event during the growing season	N/A
5. Wetland has outlet from which organic matter is flushed	N/A
G. General Habitat Suitability	**Y or N or N/A**
1. Is wetland located greater than 300-feet from existing development	Y
2. Undeveloped upland buffers abutting wetland	N/A
3. Wetland part of a larger wetland complex, not fragmented	Y
4. Diversity of plant species is apparent (> or = 5 species with at least 10% cover each	N/A
5. Evidence of wildlife use	Y
6. Wetland has a moderate degree of cowardin class interspersion	N/A
H. General Fish Habitat	**Y or N or N/A**
1. Wetland has perennial or intermittent surface-water connection to a fish-bearing water body	N/A
2. Does wetland provide overwintering habitat for fish	N/A
3. Documented presence of fish	N/A
4. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter	N/A
5. Spawning areas are present (aquatic vegetation and/or gravel beds)	N/A
6. Juvenile rest areas	N/A
I. Native Plant Richness	**Y or N or N/A**
1. Dominant and codominant plants are native	Y
2. Wetland contains two or more Cowardin Classes	N/A
3. Wetland has two or more strata of vegetation	N/A
J. Educational or Scientific Value	**Y or N or N/A**
1. Site has scientific or educational use	N
2. Wetland is in public ownership	Y
3. Accessible trails available	N
4. Is the area a known recreation area	Y
5. Subsistence (berry picking, fishing, hunting)	Y
K. Uniqueness and Heritage	**Y or N or N/A**
1. Wetland contains documented occurrence of a state or federally listed threatened or endangered species	N
2. Wetland contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the U.S. Fish and Wildlife Service	Y
3. Wetland has biological, geological, or other features that are determined rare	N
4. Wetland has been determined significant because it provides functions scarce for the area	N
5. Are there known or reported cultural resources in the area	N
6. Is the area a known subsistence/recreation/living area	Y
7. Wetland complex contains one or more of the following habitats: a) Tall shrub habitat (>.5ft in height) dominated by Salix spp. b) Aquatic herb habitat dominated by Arctophila fulva. c) Semi-permanently flooded to permanently flooded vegetated portions of drained lake basins d) Anadromous fish overwintering habitat e) Patterned wet sedge meadow and low center polygons f) High center polygon complex g) Riverine coastal mudflats h) Non-patterned wet meadow adjacent to streams and river bluffs.	Y

Wetland Functions and Values Results	
Unique ID:	GMT2_PRE
HGM Class:	Depressional
Cowardin Class:	pubh
Size (acres):	0.1

	Raw Score	Weighted Score
Flood Flow Alteration		
1	1	
2	1	
3	1	
4	N/A	
5	N/A	
6	1	
7	1	
	Total	1.000
Sediment Removal		
1	0	
2	1	
3	N/A	
4	N/A	
5	1	
	Total	0.667
Nutrient and Toxicant Removal		
1	N/A	
2	1	
3	N/A	
	Total	1.000
Erosion Control and Shoreline Stabilization		
1	N/A	
2	N/A	
3	N/A	
	Total	N/A
Production of Organic Matter and its Export		
1	N/A	
2	N/A	
3	N/A	
4	N/A	
5	N/A	
	Total	N/A
General Habitat Suitability		
1	1	
2	N/A	
3	1	
4	N/A	
5	1	
6	N/A	
	Total	1.000
General Fish Habitat		
1	N/A	
2	N/A	
3	N/A	
4	N/A	
5	N/A	
6	N/A	
	Total	N/A
Native Plant Richness		
1	1	
2	N/A	
3	N/A	
	Total	1.000
Educational or Scientific Value		
1	0	
2	1	
3	0	
4	1	
5	1	
	Total	0.600
Uniqueness and Heritage		
1	0	
2	1	
3	0	
4	0	
5	0	
6	1	
7	1	
	Total	0.429

Disturbance Activities		
Disturbance Category		0
Disturbance Category		Impact Factor
0	=	1
1	=	0.99
2	=	0.95
3	=	0.9
Disturbance Impact Factor		1

Wetland Functions and Values Results (cont.)		
Unique ID	GMT2_PRE	
Exceptional Habitat Designation		0

	Weighted Score	
Flood Flow Alteration	1.000	
Sediment Removal	0.667	
Nutrient and Toxicant Removal	1.000	
Erosion Control and Shoreline Stabilization	N/A	
Production of Organic Matter and its Export	N/A	
General Habitat Suitability	1.000	
General Fish Habitat	N/A	
Native Plant Richness	1.000	
Educational or Scientific Value	0.600	
Uniqueness and Heritage	0.429	
	Total	5.695

Standardization

Total # of functions assessed	7
Standardized Total	0.814

Total (Including Disturbance and Exceptional Habitat)	0.814

Overall Functional Score (Category)				
	0.76 - 1.00	I	Highest	I
	0.51 - 0.75	II		
	0.26 - 0.50	III		
	0 - 0.25	IV	Lowest	

Notes:
1) Scores for each category component, 0 = no and 1 = yes.
2) Not all functional categories will be applicable to each wetland functional assessment.
For example, General Fish Habitat is only applicable to wetlands that are fish-bearing waters.
Functional categories that are not applicable will be treated as NA (not applicable), which means there is no score for that component. No score is not the same as 0, which would erroneously reduce the total score.
Accordingly, the maximum total score will be reduced by 1 point for each functional category that is not applicable.
For example, if General Fish Habitat does not apply, then the Total # of functions assessed is 9
3) NA = an item that is currently not applicable, but could be applicable at a future time if more data are available.
4) See impacted area assessment worksheet for determination of disturbance activities
Apply the correct impact factor to the disturbance category.

GMT2 ANSRAM POST-CONSTRUCTION

Wetland Functions and Values Evaluation Questions	
Unique ID:	GMT2_Post
HGM Class:	Flats
Cowardin Class:	PEM1F
Size (acres):	4.3
Disturbance Category:	2
A. Exceptional Habitat Designation	**Y or N**
1. Is wetland located within an area considered to be irreplaceable, or does it have unique habitat not found anywhere else on the North Slope (i.e., Teshukpuk Lake Surface Protection Area, Colville River Delta, Beaufort Sea Coastal Marsh)	N
2. Is wetland located within an area considered by any regulatory agency to be an Aquatic Resource of National Importance (ARNI	N
B. Flood Flow Alteration	**Y or N or N/A**
1. Wetland occurs in the upper portion of its watershed	Y
2. Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events than under normal rainfall	N
3. Wetland is a closed system	N
4. If flow through, wetland has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris	Y
5. Wetland contains a dense herbaceous layer (>70% cover) or woody vegetation	N
6. Wetland receives floodwater from an adjacent water course at least once every 10 years	Y
7. Floodwaters come as sheet flow rather than channel flow	Y
C. Sediment Removal: If moving waters consider only statements 1 and 2	**Y or N or N/A**
1. Sources of excess sediment are present up gradient of the wetland	N
2. Is wetland influenced by slow-moving water and/or a deepwater habitat	N
3. Is herbaceous vegetation present (>50% cover)	N
4. Interspersion of vegetation and surface water is moderate in wetland presently or during flooding at least once ever 10 years	Y
5. Sediment deposits are present in wetland (observation or noted in application materials)	Y
D. Nutrient and Toxicant Removal	**Y or N or N/A**
1. Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present up gradient and able to influence the wetland	N/A
2. Wetland is inundated or has indicators that flooding is a seasonal event during the growing season by visual observation, or indicated by other hydrological data source	Y
3. Wetland has at least 30% aerial cover of live vegetation	N
E. Erosion Control and Shoreline Stabilization	**Y or N or N/A**
1. Wetland has dense, energy absorbing vegetation (>70%) bordering the water course and no evidence of erosion	N/A
2. An herbaceous layer is part of this dense vegetation	N/A
3. Shrubs able to withstand erosive flood events	N/A
F. Production of Organic Matter and its Export	**Y or N or N/A**
1. Wetland has at least 30% aerial cover of herbaceous vegetation	N
2. Woody plants in wetland are mostly deciduous	Y
3. Interspersion of vegetation and surface water is high in wetland	Y
4. Wetland is inundated or has indicators that flooding is a seasonal event during the growing season	Y
5. Wetland has outlet from which organic matter is flushed	Y
G. General Habitat Suitability	**Y or N or N/A**
1. Is wetland located greater than 300-feet from existing development	N
2. Undeveloped upland buffers abutting wetland	N/A
3. Wetland part of a larger wetland complex, not fragmented	N
4. Diversity of plant species is apparent (> or = 5 species with at least 10% cover each	Y
5. Evidence of wildlife use	Y
6. Wetland has a moderate degree of cowardin class interspersion	Y
H. General Fish Habitat	**Y or N or N/A**
1. Wetland has perennial or intermittent surface-water connection to a fish-bearing water body	N/A
2. Does wetland provide overwintering habitat for fish	N/A
3. Documented presence of fish	N/A
4. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter	N/A
5. Spawning areas are present (aquatic vegetation and/or gravel beds)	N/A
6. Juvenile rest areas	N/A
I. Native Plant Richness	**Y or N or N/A**
1. Dominant and codominant plants are native	Y
2. Wetland contains two or more Cowardin Classes	Y
3. Wetland has two or more strata of vegetation	Y
J. Educational or Scientific Value	**Y or N or N/A**
1. Site has scientific or educational use	Y
2. Wetland is in public ownership	Y
3. Accessible trails available	Y
4. Is the area a known recreation area	Y
5. Subsistence (berry picking, fishing, hunting)	Y
K. Uniqueness and Heritage	**Y or N or N/A**
1. Wetland contains documented occurrence of a state or federally listed threatened or endangered species	N
2. Wetland contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the U.S. Fish and Wildlife Service	N
3. Wetland has biological, geological, or other features that are determined rare	N
4. Wetland has been determined significant because it provides functions scarce for the area	N
5. Are there known or reported cultural resources in the area	N/A
6. Is the area a known subsistence/recreation/living area	Y
7. Wetland complex contains one or more of the following habitats: a) Tall shrub habitat (>.5ft in height) dominated by Salix spp. b) Aquatic herb habitat dominated by Arctophila fulva. c) Semi-permanently flooded to permanently flooded vegetated portions of drained lake basins d) Anadromous fish overwintering habitat e) Patterned wet sedge meadow and low center polygons f) High center polygon complex g) Riverine coastal mudflats h) Non-patterned wet meadow adjacent to streams and river bluffs.	Y

Wetland Functions and Values Results

Unique ID:	GMT2_Post
HGM Class:	Flats
Cowardin Class:	PEM1F
Size (acres):	4.3

	Raw Score	Weighted Score
Flood Flow Alteration		
1	1	
2	0	
3	0	
4	1	
5	0	
6	1	
7	1	
	Total	0.571
Sediment Removal		
1	0	
2	0	
3	0	
4	1	
5	1	
	Total	0.400
Nutrient and Toxicant Removal		
1	N/A	
2	1	
3	0	
	Total	0.500
Erosion Control and Shoreline Stabilization		
1	N/A	
2	N/A	
3	N/A	
	Total	N/A
Production of Organic Matter and its Export		
1	0	
2	1	
3	1	
4	1	
5	1	
	Total	0.800
General Habitat Suitability		
1	0	
2	N/A	
3	0	
4	1	
5	1	
6	1	
	Total	0.600
General Fish Habitat		
1	N/A	
2	N/A	
3	N/A	
4	N/A	
5	N/A	
6	N/A	
	Total	N/A
Native Plant Richness		
1	1	
2	1	
3	1	
	Total	1.000
Educational or Scientific Value		
1	1	
2	1	
3	1	
4	1	
5	1	
	Total	1.000
Uniqueness and Heritage		
1	0	
2	0	
3	0	
4	0	
5	N/A	
6	1	
7	1	
	Total	0.333

Disturbance Activities		
Disturbance Category		2
Disturbance Category		Impact Factor
0	=	1
1	=	0.99
2	=	0.95
3	=	0.9
Disturbance Impact Factor		0.95

Wetland Functions and Values Results (cont.)			
Unique ID	GMT2_Post		
Exceptional Habitat Designation			0

	Weighted Score		
Flood Flow Alteration	0.571		
Sediment Removal	0.400		
Nutrient and Toxicant Removal	0.500		
Erosion Control and Shoreline Stabilization	N/A		
Production of Organic Matter and its Export	0.800		
General Habitat Suitability	0.600		
General Fish Habitat	N/A		
Native Plant Richness	1.000		
Educational or Scientific Value	1.000		
Uniqueness and Heritage	0.333		
	Total	5.205	
Standardization			
Total # of functions assessed		8	
Standardized Total		0.651	
Total (Including Disturbance and Exceptional Habitat)			0.618

Overall Functional Score (Category)				
	0.76 - 1.00	I	Highest	II
	0.51 - 0.75	II		
	0.26 - 0.50	III		
	0 - 0.25	IV	Lowest	

Notes:

1) Scores for each category component, 0 = no and 1 = yes.
2) Not all functional categories will be applicable to each wetland functional assessment.
   For example, General Fish Habitat is only applicable to wetlands that are fish-bearing waters.
   Functional categories that are not applicable will be treated as NA (not applicable), which means there is no score for that component. No score is not the same as 0, which would erroneously reduce the total score.
   Accordingly, the maximum total score will be reduced by 1 point for each functional category that is not applicable.
   For example, if General Fish Habitat does not apply, then the Total # of functions assessed is 9
3) NA = an item that is currently not applicable, but could be applicable at a future time if more data are available.
4) See impacted area assessment worksheet for determination of disturbance activities
   Apply the correct impact factor to the disturbance category.

Wetland Functions and Values Evaluation Questions	
Unique ID:	GMT2_Post
HGM Class:	Flats
Cowardin Class:	pem1ss1b
Size (acres):	49.8
Disturbance Category:	2
A. Exceptional Habitat Designation	**Y or N**
1. Is wetland located within an area considered to be irreplaceable, or does it have unique habitat not found anywhere else on the North Slope (i.e., Teshukpuk Lake Surface Protection Area, Colville River Delta, Beaufort Sea Coastal Marsh)	N
2. Is wetland located within an area considered by any regulatory agency to be an Aquatic Resource of National Importance (ARNI	N
B. Flood Flow Alteration	**Y or N or N/A**
1. Wetland occurs in the upper portion of its watershed	Y
2. Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events than under normal rainfall	N
3. Wetland is a closed system	N
4. If flow through, wetland has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris	N
5. Wetland contains a dense herbaceous layer (>70% cover) or woody vegetation	N
6. Wetland receives floodwater from an adjacent water course at least once every 10 years	Y
7. Floodwaters come as sheet flow rather than channel flow	Y
C. Sediment Removal: If moving waters consider only statements 1 and 2	**Y or N or N/A**
1. Sources of excess sediment are present up gradient of the wetland	N
2. Is wetland influenced by slow-moving water and/or a deepwater habitat	N
3. Is herbaceous vegetation present (>50% cover)	Y
4. Interspersion of vegetation and surface water is moderate in wetland presently or during flooding at least once ever 10 years	N
5. Sediment deposits are present in wetland (observation or noted in application materials)	N
D. Nutrient and Toxicant Removal	**Y or N or N/A**
1. Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present up gradient and able to influence the wetland	N/A
2. Wetland is inundated or has indicators that flooding is a seasonal event during the growing season by visual observation, or indicated by other hydrological data source	Y
3. Wetland has at least 30% aerial cover of live vegetation	N
E. Erosion Control and Shoreline Stabilization	**Y or N or N/A**
1. Wetland has dense, energy absorbing vegetation (>70%) bordering the water course and no evidence of erosion	N/A
2. An herbaceous layer is part of this dense vegetation	N/A
3. Shrubs able to withstand erosive flood events	N/A
F. Production of Organic Matter and its Export	**Y or N or N/A**
1. Wetland has at least 30% aerial cover of herbaceous vegetation	N
2. Woody plants in wetland are mostly deciduous	Y
3. Interspersion of vegetation and surface water is high in wetland	N/A
4. Wetland is inundated or has indicators that flooding is a seasonal event during the growing season	N
5. Wetland has outlet from which organic matter is flushed	Y
G. General Habitat Suitability	**Y or N or N/A**
1. Is wetland located greater than 300-feet from existing development	N
2. Undeveloped upland buffers abutting wetland	N/A
3. Wetland part of a larger wetland complex, not fragmented	N
4. Diversity of plant species is apparent (> or = 5 species with at least 10% cover each	Y
5. Evidence of wildlife use	Y
6. Wetland has a moderate degree of cowardin class interspersion	Y
H. General Fish Habitat	**Y or N or N/A**
1. Wetland has perennial or intermittent surface-water connection to a fish-bearing water body	N/A
2. Does wetland provide overwintering habitat for fish	N/A
3. Documented presence of fish	N/A
4. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter	N/A
5. Spawning areas are present (aquatic vegetation and/or gravel beds)	N/A
6. Juvenile rest areas	N/A
I. Native Plant Richness	**Y or N or N/A**
1. Dominant and codominant plants are native	Y
2. Wetland contains two or more Cowardin Classes	Y
3. Wetland has two or more strata of vegetation	Y
J. Educational or Scientific Value	**Y or N or N/A**
1. Site has scientific or educational use	Y
2. Wetland is in public ownership	Y
3. Accessible trails available	Y
4. Is the area a known recreation area	Y
5. Subsistence (berry picking, fishing, hunting)	Y
K. Uniqueness and Heritage	**Y or N or N/A**
1. Wetland contains documented occurrence of a state or federally listed threatened or endangered species	N
2. Wetland contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the U.S. Fish and Wildlife Service	N
3. Wetland has biological, geological, or other features that are determined rare	N
4. Wetland has been determined significant because it provides functions scarce for the area	N
5. Are there known or reported cultural resources in the area	N/A
6. Is the area a known subsistence/recreation/living area	Y
7. Wetland complex contains one or more of the following habitats: a) Tall shrub habitat (>.5ft in height) dominated by Salix spp. b) Aquatic herb habitat dominated by Arctophila fulva. c) Semi-permanently flooded to permanently flooded vegetated portions of drained lake basins d) Anadromous fish overwintering habitat e) Patterned wet sedge meadow and low center polygons f) High center polygon complex g) Riverine coastal mudflats h) Non-patterned wet meadow adjacent to streams and river bluffs.	Y

Wetland Functions and Values Results

Unique ID:	GMT2_Post
HGM Class:	Flats
Cowardin Class:	pem1ss1b
Size (acres):	49.8

	Raw Score	Weighted Score
Flood Flow Alteration		
1	1	
2	0	
3	0	
4	0	
5	0	
6	1	
7	1	
	Total	0.429
Sediment Removal		
1	0	
2	0	
3	1	
4	0	
5	0	
	Total	0.200
Nutrient and Toxicant Removal		
1	N/A	
2	1	
3	0	
	Total	0.500
Erosion Control and Shoreline Stabilization		
1	N/A	
2	N/A	
3	N/A	
	Total	N/A
Production of Organic Matter and its Export		
1	0	
2	1	
3	N/A	
4	0	
5	1	
	Total	0.500
General Habitat Suitability		
1	0	
2	N/A	
3	0	
4	1	
5	1	
6	1	
	Total	0.600
General Fish Habitat		
1	N/A	
2	N/A	
3	N/A	
4	N/A	
5	N/A	
6	N/A	
	Total	N/A
Native Plant Richness		
1	1	
2	1	
3	1	
	Total	1.000
Educational or Scientific Value		
1	1	
2	1	
3	1	
4	1	
5	1	
	Total	1.000
Uniqueness and Heritage		
1	0	
2	0	
3	0	
4	0	
5	N/A	
6	1	
7	1	
	Total	0.333

Disturbance Activities		
Disturbance Category		2
Disturbance Category		Impact Factor
0	=	1
1	=	0.99
2	=	0.95
3	=	0.9
Disturbance Impact Factor		0.95

Wetland Functions and Values Results (cont.)			
Unique ID	**GMT2_Post**		
Exceptional Habitat Designation			0

	Weighted Score		
Flood Flow Alteration	0.429		
Sediment Removal	0.200		
Nutrient and Toxicant Removal	0.500		
Erosion Control and Shoreline Stabilization	N/A		
Production of Organic Matter and its Export	0.500		
General Habitat Suitability	0.600		
General Fish Habitat	N/A		
Native Plant Richness	1.000		
Educational or Scientific Value	1.000		
Uniqueness and Heritage	0.333		
	Total	4.562	
Standardization			
Total # of functions assessed		8	
Standardized Total		0.570	
Total (Including Disturbance and Exceptional Habitat)			0.542

Overall Functional Score (Category)	0.76 - 1.00	I	Highest	II
	0.51 - 0.75	II		
	0.26 - 0.50	III		
	0 - 0.25	IV	Lowest	

Notes:

1) Scores for each category component, 0 = no and 1 = yes.
2) Not all functional categories will be applicable to each wetland functional assessment.
   For example, General Fish Habitat is only applicable to wetlands that are fish-bearing waters.
   Functional categories that are not applicable will be treated as NA (not applicable), which means there is no score for that component. No score is not the same as 0, which would erroneously reduce the total score.
   Accordingly, the maximum total score will be reduced by 1 point for each functional category that is not applicable.
   For example, if General Fish Habitat does not apply, then the Total # of functions assessed is 9
3) NA = an item that is currently not applicable, but could be applicable at a future time if more data are available.
4) See impacted area assessment worksheet for determination of disturbance activities
   Apply the correct impact factor to the disturbance category.

Wetland Functions and Values Evaluation Questions	
Unique ID:	GMT2_Post
HGM Class:	Flats
Cowardin Class:	pem1ss1e
Size (acres):	23.7
Disturbance Category:	2
A. Exceptional Habitat Designation	**Y or N**
1. Is wetland located within an area considered to be irreplaceable, or does it have unique habitat not found anywhere else on the North Slope (i.e., Teshukpuk Lake Surface Protection Area, Colville River Delta, Beaufort Sea Coastal Marsh)	N
2. Is wetland located within an area considered by any regulatory agency to be an Aquatic Resource of National Importance (ARNI	N
B. Flood Flow Alteration	**Y or N or N/A**
1. Wetland occurs in the upper portion of its watershed	Y
2. Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events than under normal rainfall	N
3. Wetland is a closed system	N
4. If flow through, wetland has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris	Y
5. Wetland contains a dense herbaceous layer (>70% cover) or woody vegetation	N
6. Wetland receives floodwater from an adjacent water course at least once every 10 years	Y
7. Floodwaters come as sheet flow rather than channel flow	Y
C. Sediment Removal: If moving waters consider only statements 1 and 2	**Y or N or N/A**
1. Sources of excess sediment are present up gradient of the wetland	N
2. Is wetland influenced by slow-moving water and/or a deepwater habitat	N
3. Is herbaceous vegetation present (>50% cover)	N
4. Interspersion of vegetation and surface water is moderate in wetland presently or during flooding at least once ever 10 years	Y
5. Sediment deposits are present in wetland (observation or noted in application materials)	Y
D. Nutrient and Toxicant Removal	**Y or N or N/A**
1. Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present up gradient and able to influence the wetland	N/A
2. Wetland is inundated or has indicators that flooding is a seasonal event during the growing season by visual observation, or indicated by other hydrological data source	Y
3. Wetland has at least 30% aerial cover of live vegetation	Y
E. Erosion Control and Shoreline Stabilization	**Y or N or N/A**
1. Wetland has dense, energy absorbing vegetation (>70%) bordering the water course and no evidence of erosion	N/A
2. An herbaceous layer is part of this dense vegetation	N/A
3. Shrubs able to withstand erosive flood events	N/A
F. Production of Organic Matter and its Export	**Y or N or N/A**
1. Wetland has at least 30% aerial cover of herbaceous vegetation	N
2. Woody plants in wetland are mostly deciduous	Y
3. Interspersion of vegetation and surface water is high in wetland	Y
4. Wetland is inundated or has indicators that flooding is a seasonal event during the growing season	Y
5. Wetland has outlet from which organic matter is flushed	Y
G. General Habitat Suitability	**Y or N or N/A**
1. Is wetland located greater than 300-feet from existing development	N
2. Undeveloped upland buffers abutting wetland	N/A
3. Wetland part of a larger wetland complex, not fragmented	N
4. Diversity of plant species is apparent (> or = 5 species with at least 10% cover each	Y
5. Evidence of wildlife use	Y
6. Wetland has a moderate degree of cowardin class interspersion	Y
H. General Fish Habitat	**Y or N or N/A**
1. Wetland has perennial or intermittent surface-water connection to a fish-bearing water body	N/A
2. Does wetland provide overwintering habitat for fish	N/A
3. Documented presence of fish	N/A
4. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter	N/A
5. Spawning areas are present (aquatic vegetation and/or gravel beds)	N/A
6. Juvenile rest areas	N/A
I. Native Plant Richness	**Y or N or N/A**
1. Dominant and codominant plants are native	Y
2. Wetland contains two or more Cowardin Classes	Y
3. Wetland has two or more strata of vegetation	Y
J. Educational or Scientific Value	**Y or N or N/A**
1. Site has scientific or educational use	Y
2. Wetland is in public ownership	Y
3. Accessible trails available	Y
4. Is the area a known recreation area	Y
5. Subsistence (berry picking, fishing, hunting)	Y
K. Uniqueness and Heritage	**Y or N or N/A**
1. Wetland contains documented occurrence of a state or federally listed threatened or endangered species	N
2. Wetland contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the U.S. Fish and Wildlife Service	N
3. Wetland has biological, geological, or other features that are determined rare	N
4. Wetland has been determined significant because it provides functions scarce for the area	N
5. Are there known or reported cultural resources in the area	N/A
6. Is the area a known subsistence/recreation/living area	Y
7. Wetland complex contains one or more of the following habitats: a) Tall shrub habitat (>.5ft in height) dominated by Salix spp. b) Aquatic herb habitat dominated by Arctophila fulva. c) Semi-permanently flooded to permanently flooded vegetated portions of drained lake basins d) Anadromous fish overwintering habitat e) Patterned wet sedge meadow and low center polygons f) High center polygon complex g) Riverine coastal mudflats h) Non-patterned wet meadow adjacent to streams and river bluffs.	Y

Wetland Functions and Values Results	
Unique ID:	GMT2_Post
HGM Class:	Flats
Cowardin Class:	pem1ss1e
Size (acres):	23.7

	Raw Score	Weighted Score
Flood Flow Alteration		
1	1	
2	0	
3	0	
4	1	
5	0	
6	1	
7	1	
	Total	0.571
Sediment Removal		
1	0	
2	0	
3	0	
4	1	
5	1	
	Total	0.400
Nutrient and Toxicant Removal		
1	N/A	
2	1	
3	1	
	Total	1.000
Erosion Control and Shoreline Stabilization		
1	N/A	
2	N/A	
3	N/A	
	Total	N/A
Production of Organic Matter and its Export		
1	0	
2	1	
3	1	
4	1	
5	1	
	Total	0.800
General Habitat Suitability		
1	0	
2	N/A	
3	0	
4	1	
5	1	
6	1	
	Total	0.600
General Fish Habitat		
1	N/A	
2	N/A	
3	N/A	
4	N/A	
5	N/A	
6	N/A	
	Total	N/A
Native Plant Richness		
1	1	
2	1	
3	1	
	Total	1.000
Educational or Scientific Value		
1	1	
2	1	
3	1	
4	1	
5	1	
	Total	1.000
Uniqueness and Heritage		
1	0	
2	0	
3	0	
4	0	
5	N/A	
6	1	
7	1	
	Total	0.333

Disturbance Activities		
Disturbance Category		2
Disturbance Category		Impact Factor
0	=	1
1	=	0.99
2	=	0.95
3	=	0.9
Disturbance Impact Factor		0.95

Wetland Functions and Values Results (cont.)			
Unique ID	GMT2_Post		
Exceptional Habitat Designation			0

	Weighted Score		
Flood Flow Alteration	0.571		
Sediment Removal	0.400		
Nutrient and Toxicant Removal	1.000		
Erosion Control and Shoreline Stabilization	N/A		
Production of Organic Matter and its Export	0.800		
General Habitat Suitability	0.600		
General Fish Habitat	N/A		
Native Plant Richness	1.000		
Educational or Scientific Value	1.000		
Uniqueness and Heritage	0.333		
	Total	5.705	
Standardization			
Total # of functions assessed		8	
Standardized Total		0.713	
Total (Including Disturbance and Exceptional Habitat)			0.677

Overall Functional Score (Category)	0.76 - 1.00	I	Highest	II
	0.51 - 0.75	II		
	0.26 - 0.50	III		
	0 - 0.25	IV	Lowest	

Notes:

1) Scores for each category component, 0 = no and 1 = yes.
2) Not all functional categories will be applicable to each wetland functional assessment.
   For example, General Fish Habitat is only applicable to wetlands that are fish-bearing waters.
   Functional categories that are not applicable will be treated as NA (not applicable), which means there is no score for that component. No score is not the same as 0, which would erroneously reduce the total score.
   Accordingly, the maximum total score will be reduced by 1 point for each functional category that is not applicable.
   For example, if General Fish Habitat does not apply, then the Total # of functions assessed is 9
3) NA = an item that is currently not applicable, but could be applicable at a future time if more data are available.
4) See impacted area assessment worksheet for determination of disturbance activities
   Apply the correct impact factor to the disturbance category.

Wetland Functions and Values Evaluation Questions	
Unique ID:	GMT2_Post
HGM Class:	Depressional
Cowardin Class:	pubh
Size (acres):	0.1
Disturbance Category:	2
A. Exceptional Habitat Designation	**Y or N**
1. Is wetland located within an area considered to be irreplaceable, or does it have unique habitat not found anywhere else on the North Slope (i.e., Teshukpuk Lake Surface Protection Area, Colville River Delta, Beaufort Sea Coastal Marsh)	N
2. Is wetland located within an area considered by any regulatory agency to be an Aquatic Resource of National Importance (ARNI	N
B. Flood Flow Alteration	**Y or N or N/A**
1. Wetland occurs in the upper portion of its watershed	Y
2. Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events than under normal rainfall	N
3. Wetland is a closed system	Y
4. If flow through, wetland has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris	N/A
5. Wetland contains a dense herbaceous layer (>70% cover) or woody vegetation	N/A
6. Wetland receives floodwater from an adjacent water course at least once every 10 years	Y
7. Floodwaters come as sheet flow rather than channel flow	Y
C. Sediment Removal: If moving waters consider only statements 1 and 2	**Y or N or N/A**
1. Sources of excess sediment are present up gradient of the wetland	N
2. Is wetland influenced by slow-moving water and/or a deepwater habitat	Y
3. Is herbaceous vegetation present (>50% cover)	N/A
4. Interspersion of vegetation and surface water is moderate in wetland presently or during flooding at least once ever 10 years	N/A
5. Sediment deposits are present in wetland (observation or noted in application materials)	Y
D. Nutrient and Toxicant Removal	**Y or N or N/A**
1. Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present up gradient and able to influence the wetland	N/A
2. Wetland is inundated or has indicators that flooding is a seasonal event during the growing season by visual observation, or indicated by other hydrological data source	Y
3. Wetland has at least 30% aerial cover of live vegetation	N/A
E. Erosion Control and Shoreline Stabilization	**Y or N or N/A**
1. Wetland has dense, energy absorbing vegetation (>70%) bordering the water course and no evidence of erosion	N/A
2. An herbaceous layer is part of this dense vegetation	N/A
3. Shrubs able to withstand erosive flood events	N/A
F. Production of Organic Matter and its Export	**Y or N or N/A**
1. Wetland has at least 30% aerial cover of herbaceous vegetation	N/A
2. Woody plants in wetland are mostly deciduous	N/A
3. Interspersion of vegetation and surface water is high in wetland	N/A
4. Wetland is inundated or has indicators that flooding is a seasonal event during the growing season	N/A
5. Wetland has outlet from which organic matter is flushed	N/A
G. General Habitat Suitability	**Y or N or N/A**
1. Is wetland located greater than 300-feet from existing development	N
2. Undeveloped upland buffers abutting wetland	N/A
3. Wetland part of a larger wetland complex, not fragmented	N
4. Diversity of plant species is apparent (> or = 5 species with at least 10% cover each	N/A
5. Evidence of wildlife use	Y
6. Wetland has a moderate degree of cowardin class interspersion	N/A
H. General Fish Habitat	**Y or N or N/A**
1. Wetland has perennial or intermittent surface-water connection to a fish-bearing water body	N/A
2. Does wetland provide overwintering habitat for fish	N/A
3. Documented presence of fish	N/A
4. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter	N/A
5. Spawning areas are present (aquatic vegetation and/or gravel beds)	N/A
6. Juvenile rest areas	N/A
I. Native Plant Richness	**Y or N or N/A**
1. Dominant and codominant plants are native	Y
2. Wetland contains two or more Cowardin Classes	N/A
3. Wetland has two or more strata of vegetation	N/A
J. Educational or Scientific Value	**Y or N or N/A**
1. Site has scientific or educational use	Y
2. Wetland is in public ownership	Y
3. Accessible trails available	Y
4. Is the area a known recreation area	Y
5. Subsistence (berry picking, fishing, hunting)	Y
K. Uniqueness and Heritage	**Y or N or N/A**
1. Wetland contains documented occurrence of a state or federally listed threatened or endangered species	N
2. Wetland contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the U.S. Fish and Wildlife Service	Y
3. Wetland has biological, geological, or other features that are determined rare	N
4. Wetland has been determined significant because it provides functions scarce for the area	N
5. Are there known or reported cultural resources in the area	N
6. Is the area a known subsistence/recreation/living area	Y
7. Wetland complex contains one or more of the following habitats: a) Tall shrub habitat (>.5ft in height) dominated by Salix spp. b) Aquatic herb habitat dominated by Arctophila fulva. c) Semi-permanently flooded to permanently flooded vegetated portions of drained lake basins d) Anadromous fish overwintering habitat e) Patterned wet sedge meadow and low center polygons f) High center polygon complex g) Riverine coastal mudflats h) Non-patterned wet meadow adjacent to streams and river bluffs.	Y

Wetland Functions and Values Results		
Unique ID:		GMT2_Post
HGM Class:		Depressional
Cowardin Class:		pubh
Size (acres):		0.1

	Raw Score	Weighted Score
Flood Flow Alteration		
1	1	
2	0	
3	1	
4	N/A	
5	N/A	
6	1	
7	1	
	Total	0.800
Sediment Removal		
1	0	
2	1	
3	N/A	
4	N/A	
5	1	
	Total	0.667
Nutrient and Toxicant Removal		
1	N/A	
2	1	
3	N/A	
	Total	1.000
Erosion Control and Shoreline Stabilization		
1	N/A	
2	N/A	
3	N/A	
	Total	N/A
Production of Organic Matter and its Export		
1	N/A	
2	N/A	
3	N/A	
4	N/A	
5	N/A	
	Total	N/A
General Habitat Suitability		
1	0	
2	N/A	
3	0	
4	N/A	
5	1	
6	N/A	
	Total	0.333
General Fish Habitat		
1	N/A	
2	N/A	
3	N/A	
4	N/A	
5	N/A	
6	N/A	
	Total	N/A
Native Plant Richness		
1	1	
2	N/A	
3	N/A	
	Total	1.000
Educational or Scientific Value		
1	1	
2	1	
3	1	
4	1	
5	1	
	Total	1.000
Uniqueness and Heritage		
1	0	
2	1	
3	0	
4	0	
5	0	
6	1	
7	1	
	Total	0.429

Disturbance Activities		
Disturbance Category		2
Disturbance Category		Impact Factor
0	=	1
1	=	0.99
2	=	0.95
3	=	0.9
Disturbance Impact Factor		0.95

Wetland Functions and Values Results (cont.)			
Unique ID	**GMT2_Post**		
Exceptional Habitat Designation			0

	Weighted Score		
Flood Flow Alteration	0.800		
Sediment Removal	0.667		
Nutrient and Toxicant Removal	1.000		
Erosion Control and Shoreline Stabilization	N/A		
Production of Organic Matter and its Export	N/A		
General Habitat Suitability	0.333		
General Fish Habitat	N/A		
Native Plant Richness	1.000		
Educational or Scientific Value	1.000		
Uniqueness and Heritage	0.429		
	Total	5.229	
Standardization			
Total # of functions assessed		7	
Standardized Total		0.747	
Total (Including Disturbance and Exceptional Habitat)			0.710

Overall Functional Score (Category)	0.76 - 1.00	I	Highest	II
	0.51 - 0.75	II		
	0.26 - 0.50	III		
	0 - 0.25	IV	Lowest	

Notes:

1) Scores for each category component, 0 = no and 1 = yes.
2) Not all functional categories will be applicable to each wetland functional assessment.
   For example, General Fish Habitat is only applicable to wetlands that are fish-bearing waters.
   Functional categories that are not applicable will be treated as NA (not applicable), which means there is no score for that component. No score is not the same as 0, which would erroneously reduce the total score.
   Accordingly, the maximum total score will be reduced by 1 point for each functional category that is not applicable.
   For example, if General Fish Habitat does not apply, then the Total # of functions assessed is 9
3) NA = an item that is currently not applicable, but could be applicable at a future time if more data are available.
4) See impacted area assessment worksheet for determination of disturbance activities
   Apply the correct impact factor to the disturbance category.

RIVERINE ANSRAM PRE-CONSTRUCTION

Wetland Functions and Values Evaluation Questions	
Unique ID:	Riverine-Pre
HGM Class:	Riverine
Cowardin Class:	r2
Size (acres):	35.3
Disturbance Category:	3
A. Exceptional Habitat Designation	**Y or N**
1. Is wetland located within an area considered to be irreplaceable, or does it have unique habitat not found anywhere else on the North Slope (i.e., Teshukpuk Lake Surface Protection Area, Colville River Delta, Beaufort Sea Coastal Marsh)	N
2. Is wetland located within an area considered by any regulatory agency to be an Aquatic Resource of National Importance (ARNI	N
B. Flood Flow Alteration	**Y or N or N/A**
1. Wetland occurs in the upper portion of its watershed	N
2. Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events than under normal rainfall	N
3. Wetland is a closed system	N/A
4. If flow through, wetland has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris	Y
5. Wetland contains a dense herbaceous layer (>70% cover) or woody vegetation	Y
6. Wetland receives floodwater from an adjacent water course at least once every 10 years	Y
7. Floodwaters come as sheet flow rather than channel flow	N
C. Sediment Removal: If moving waters consider only statements 1 and 2	**Y or N or N/A**
1. Sources of excess sediment are present up gradient of the wetland	Y
2. Is wetland influenced by slow-moving water and/or a deepwater habitat	N
3. Is herbaceous vegetation present (>50% cover)	N/A
4. Interspersion of vegetation and surface water is moderate in wetland presently or during flooding at least once ever 10 years	N/A
5. Sediment deposits are present in wetland (observation or noted in application materials)	N/A
D. Nutrient and Toxicant Removal	**Y or N or N/A**
1. Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present up gradient and able to influence the wetland	N/A
2. Wetland is inundated or has indicators that flooding is a seasonal event during the growing season by visual observation, or indicated by other hydrological data source	Y
3. Wetland has at least 30% aerial cover of live vegetation	Y
E. Erosion Control and Shoreline Stabilization	**Y or N or N/A**
1. Wetland has dense, energy absorbing vegetation (>70%) bordering the water course and no evidence of erosion	N
2. An herbaceous layer is part of this dense vegetation	Y
3. Shrubs able to withstand erosive flood events	Y
F. Production of Organic Matter and its Export	**Y or N or N/A**
1. Wetland has at least 30% aerial cover of herbaceous vegetation	Y
2. Woody plants in wetland are mostly deciduous	Y
3. Interspersion of vegetation and surface water is high in wetland	Y
4. Wetland is inundated or has indicators that flooding is a seasonal event during the growing season	Y
5. Wetland has outlet from which organic matter is flushed	N
G. General Habitat Suitability	**Y or N or N/A**
1. Is wetland located greater than 300-feet from existing development	N
2. Undeveloped upland buffers abutting wetland	N
3. Wetland part of a larger wetland complex, not fragmented	N
4. Diversity of plant species is apparent (> or = 5 species with at least 10% cover each	Y
5. Evidence of wildlife use	Y
6. Wetland has a moderate degree of cowardin class interspersion	Y
H. General Fish Habitat	**Y or N or N/A**
1. Wetland has perennial or intermittent surface-water connection to a fish-bearing water body	Y
2. Does wetland provide overwintering habitat for fish	N/A
3. Documented presence of fish	Y
4. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter	Y
5. Spawning areas are present (aquatic vegetation and/or gravel beds)	Y
6. Juvenile rest areas	Y
I. Native Plant Richness	**Y or N or N/A**
1. Dominant and codominant plants are native	Y
2. Wetland contains two or more Cowardin Classes	Y
3. Wetland has two or more strata of vegetation	Y
J. Educational or Scientific Value	**Y or N or N/A**
1. Site has scientific or educational use	N
2. Wetland is in public ownership	N
3. Accessible trails available	Y
4. Is the area a known recreation area	Y
5. Subsistence (berry picking, fishing, hunting)	Y
K. Uniqueness and Heritage	**Y or N or N/A**
1. Wetland contains documented occurrence of a state or federally listed threatened or endangered species	Y
2. Wetland contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the U.S. Fish and Wildlife Service	Y
3. Wetland has biological, geological, or other features that are determined rare	N
4. Wetland has been determined significant because it provides functions scarce for the area	N
5. Are there known or reported cultural resources in the area	N/A
6. Is the area a known subsistence/recreation/living area	Y
7. Wetland complex contains one or more of the following habitats:	
a) Tall shrub habitat (>.5ft in height) dominated by Salix spp.	
b) Aquatic herb habitat dominated by Arctophila fulva.	
c) Semi-permanently flooded to permanently flooded vegetated portions of drained lake basins	
d) Anadromous fish overwintering habitat	
e) Patterned wet sedge meadow and low center polygons	
f) High center polygon complex	
g) Riverine coastal mudflats	
h) Non-patterned wet meadow adjacent to streams and river bluffs.	Y

Wetland Functions and Values Results	
Unique ID:	Riverine-Pre
HGM Class:	Riverine
Cowardin Class:	r2
Size (acres):	35.3

	Raw Score	Weighted Score
Flood Flow Alteration		
1	0	
2	0	
3	N/A	
4	1	
5	1	
6	1	
7	0	
	Total	0.500
Sediment Removal		
1	1	
2	0	
3	N/A	
4	N/A	
5	N/A	
	Total	0.500
Nutrient and Toxicant Removal		
1	N/A	
2	1	
3	1	
	Total	1.000
Erosion Control and Shoreline Stabilization		
1	0	
2	1	
3	1	
	Total	0.667
Production of Organic Matter and its Export		
1	1	
2	1	
3	1	
4	1	
5	0	
	Total	0.800
General Habitat Suitability		
1	0	
2	0	
3	0	
4	1	
5	1	
6	1	
	Total	0.500
General Fish Habitat		
1	1	
2	N/A	
3	1	
4	1	
5	1	
6	1	
	Total	1.000
Native Plant Richness		
1	1	
2	1	
3	1	
	Total	1.000
Educational or Scientific Value		
1	0	
2	0	
3	1	
4	1	
5	1	
	Total	0.600
Uniqueness and Heritage		
1	1	
2	1	
3	0	
4	0	
5	N/A	
6	1	
7	1	
	Total	0.667

Disturbance Activities		
Disturbance Category		3
Disturbance Category		Impact Factor
0	=	1
1	=	0.99
2	=	0.95
3	=	0.9
Disturbance Impact Factor		0.9

Wetland Functions and Values Results (cont.)				
Unique ID	Riverine-Pre			
Exceptional Habitat Designation			0	

	Weighted Score			
Flood Flow Alteration	0.500			
Sediment Removal	0.500			
Nutrient and Toxicant Removal	1.000			
Erosion Control and Shoreline Stabilization	0.667			
Production of Organic Matter and its Export	0.800			
General Habitat Suitability	0.500			
General Fish Habitat	1.000			
Native Plant Richness	1.000			
Educational or Scientific Value	0.600			
Uniqueness and Heritage	0.667			
	Total	7.233		
Standardization				
Total # of functions assessed		10		
Standardized Total		0.723		
Total (Including Disturbance and Exceptional Habitat)			0.651	
Overall Functional Score (Category)	0.76 - 1.00	I	Highest	II
	0.51 - 0.75	II		
	0.26 - 0.50	III		
	0 - 0.25	IV	Lowest	

Notes:

1) Scores for each category component, 0 = no and 1 = yes.
2) Not all functional categories will be applicable to each wetland functional assessment.
For example, General Fish Habitat is only applicable to wetlands that are fish-bearing waters.
Functional categories that are not applicable will be treated as NA (not applicable), which means there is no score for that component. No score is not the same as 0, which would erroneously reduce the total score.
Accordingly, the maximum total score will be reduced by 1 point for each functional category that is not applicable.
For example, if General Fish Habitat does not apply, then the Total # of functions assessed is 9
3) NA = an item that is currently not applicable, but could be applicable at a future time if more data are available.
4) See impacted area assessment worksheet for determination of disturbance activities
Apply the correct impact factor to the disturbance category.

RIVERINE ANSRAM POST-CONSTRUCTION

Wetland Functions and Values Evaluation Questions	
Unique ID:	Riverine_Post
HGM Class:	Riverine
Cowardin Class:	r2
Size (acres):	35.8
Disturbance Category:	0
A. Exceptional Habitat Designation	**Y or N**
1. Is wetland located within an area considered to be irreplaceable, or does it have unique habitat not found anywhere else on the North Slope (i.e., Teshukpuk Lake Surface Protection Area, Colville River Delta, Beaufort Sea Coastal Marsh)	N
2. Is wetland located within an area considered by any regulatory agency to be an Aquatic Resource of National Importance (ARNI	N
B. Flood Flow Alteration	**Y or N or N/A**
1. Wetland occurs in the upper portion of its watershed	Y
2. Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events than under normal rainfall	Y
3. Wetland is a closed system	N/A
4. If flow through, wetland has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris	Y
5. Wetland contains a dense herbaceous layer (>70% cover) or woody vegetation	Y
6. Wetland receives floodwater from an adjacent water course at least once every 10 years	Y
7. Floodwaters come as sheet flow rather than channel flow	Y
C. Sediment Removal: If moving waters consider only statements 1 and 2	**Y or N or N/A**
1. Sources of excess sediment are present up gradient of the wetland	Y
2. Is wetland influenced by slow-moving water and/or a deepwater habitat	Y
3. Is herbaceous vegetation present (>50% cover)	N/A
4. Interspersion of vegetation and surface water is moderate in wetland presently or during flooding at least once ever 10 years	N/A
5. Sediment deposits are present in wetland (observation or noted in application materials)	N/A
D. Nutrient and Toxicant Removal	**Y or N or N/A**
1. Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present up gradient and able to influence the wetland	N/A
2. Wetland is inundated or has indicators that flooding is a seasonal event during the growing season by visual observation, or indicated by other hydrological data source	Y
3. Wetland has at least 30% aerial cover of live vegetation	Y
E. Erosion Control and Shoreline Stabilization	**Y or N or N/A**
1. Wetland has dense, energy absorbing vegetation (>70%) bordering the water course and no evidence of erosion	Y
2. An herbaceous layer is part of this dense vegetation	Y
3. Shrubs able to withstand erosive flood events	Y
F. Production of Organic Matter and its Export	**Y or N or N/A**
1. Wetland has at least 30% aerial cover of herbaceous vegetation	Y
2. Woody plants in wetland are mostly deciduous	Y
3. Interspersion of vegetation and surface water is high in wetland	Y
4. Wetland is inundated or has indicators that flooding is a seasonal event during the growing season	Y
5. Wetland has outlet from which organic matter is flushed	Y
G. General Habitat Suitability	**Y or N or N/A**
1. Is wetland located greater than 300-feet from existing development	Y
2. Undeveloped upland buffers abutting wetland	N
3. Wetland part of a larger wetland complex, not fragmented	Y
4. Diversity of plant species is apparent (> or = 5 species with at least 10% cover each	Y
5. Evidence of wildlife use	Y
6. Wetland has a moderate degree of cowardin class interspersion	Y
H. General Fish Habitat	**Y or N or N/A**
1. Wetland has perennial or intermittent surface-water connection to a fish-bearing water body	Y
2. Does wetland provide overwintering habitat for fish	N/A
3. Documented presence of fish	Y
4. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter	Y
5. Spawning areas are present (aquatic vegetation and/or gravel beds)	Y
6. Juvenile rest areas	Y
I. Native Plant Richness	**Y or N or N/A**
1. Dominant and codominant plants are native	Y
2. Wetland contains two or more Cowardin Classes	Y
3. Wetland has two or more strata of vegetation	Y
J. Educational or Scientific Value	**Y or N or N/A**
1. Site has scientific or educational use	Y
2. Wetland is in public ownership	N
3. Accessible trails available	Y
4. Is the area a known recreation area	Y
5. Subsistence (berry picking, fishing, hunting)	Y
K. Uniqueness and Heritage	**Y or N or N/A**
1. Wetland contains documented occurrence of a state or federally listed threatened or endangered species	Y
2. Wetland contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the U.S. Fish and Wildlife Service	Y
3. Wetland has biological, geological, or other features that are determined rare	N
4. Wetland has been determined significant because it provides functions scarce for the area	Y
5. Are there known or reported cultural resources in the area	N/A
6. Is the area a known subsistence/recreation/living area	Y
7. Wetland complex contains one or more of the following habitats: a) Tall shrub habitat (>.5ft in height) dominated by Salix spp. b) Aquatic herb habitat dominatedby Arctophila fulva. c) Semi-permanently flooded to permanently flooded vegetated portions of drained lake basins d) Anadromous fish overwintering habitat e) Patterned wet sedge meadow and low center polygons f) High center polygon complex g) Riverine coastal mudflats h) Non-patterned wet meadow adjacent to streams and river bluffs.	Y

Wetland Functions and Values Results	
Unique ID:	Riverine_Post
HGM Class:	Riverine
Cowardin Class:	r2
Size (acres):	35.8

	Raw Score	Weighted Score
Flood Flow Alteration		
1	1	
2	1	
3	N/A	
4	1	
5	1	
6	1	
7	1	
	Total	1.000
Sediment Removal		
1	1	
2	1	
3	N/A	
4	N/A	
5	N/A	
	Total	1.000
Nutrient and Toxicant Removal		
1	N/A	
2	1	
3	1	
	Total	1.000
Erosion Control and Shoreline Stabilization		
1	1	
2	1	
3	1	
	Total	1.000
Production of Organic Matter and its Export		
1	1	
2	1	
3	1	
4	1	
5	1	
	Total	1.000
General Habitat Suitability		
1	1	
2	0	
3	1	
4	1	
5	1	
6	1	
	Total	0.833
General Fish Habitat		
1	1	
2	N/A	
3	1	
4	1	
5	1	
6	1	
	Total	1.000
Native Plant Richness		
1	1	
2	1	
3	1	
	Total	1.000
Educational or Scientific Value		
1	1	
2	0	
3	1	
4	1	
5	1	
	Total	0.800
Uniqueness and Heritage		
1	1	
2	1	
3	0	
4	1	
5	N/A	
6	1	
7	1	
	Total	0.833

Disturbance Activities		
Disturbance Category		0
Disturbance Category		Impact Factor
0	=	1
1	=	0.99
2	=	0.95
3	=	0.9
Disturbance Impact Factor		1

Wetland Functions and Values Results (cont.)			
Unique ID	**Riverine_Post**		
Exceptional Habitat Designation			0

	Weighted Score		
Flood Flow Alteration	1.000		
Sediment Removal	1.000		
Nutrient and Toxicant Removal	1.000		
Erosion Control and Shoreline Stabilization	1.000		
Production of Organic Matter and its Export	1.000		
General Habitat Suitability	0.833		
General Fish Habitat	1.000		
Native Plant Richness	1.000		
Educational or Scientific Value	0.800		
Uniqueness and Heritage	0.833		
	Total	9.467	
Standardization			
Total # of functions assessed		10	
Standardized Total		0.947	
Total (Including Disturbance and Exceptional Habitat)			0.947

Overall Functional Score (Category)				
	0.76 - 1.00	I	Highest	I
	0.51 - 0.75	II		
	0.26 - 0.50	III		
	0 - 0.25	IV	Lowest	

Notes:

1) Scores for each category component, 0 = no and 1 = yes.
2) Not all functional categories will be applicable to each wetland functional assessment.
   For example, General Fish Habitat is only applicable to wetlands that are fish-bearing waters.
   Functional categories that are not applicable will be treated as NA (not applicable), which means there is no score for
   that component. No score is not the same as 0, which would erroneously reduce the total score.
   Accordingly, the maximum total score will be reduced by 1 point for each functional category that is not applicable.
   For example, if General Fish Habitat does not apply, then the Total # of functions assessed is 9
3) NA = an item that is currently not applicable, but could be applicable at a future time if more data are available.
4) See impacted area assessment worksheet for determination of disturbance activities
   Apply the correct impact factor to the disturbance category.

GMT2 DEBIT-CREDIT CALCULATION

GMT2 Debit Credit Calculation

Debit Credit Calculation-GMT2

Credit Calculation (Nuigsut Stream PRM Restoration)

WAA1_Crossing		Acres		
		35.8		
fci pre=	0.65	[redacted]		
fci post	0.95			
fci delta	0.30			
t=				
es=				
paf=	0.00			
		pa=	0	
		adj Delta	0.30	
risk	1.00			
time lag	1.00			
			credit	**10.7**

Debit Calculation

pem1f	
Impact Acres	4.3
fci pre	0.78
fci post	0.62
Fci Delta	0.16
Total Debit	0.69

pem1ss1b	
Impact Acres	49.8
fci pre	0.68
fci post	0.54
Fci Delta	0.14
Total Debit	6.97

pem1ss1e	
Impact Acres	23.7
fci pre	0.80
fci post	0.68
Fci Delta	0.12
Total Debit	2.8

pubh	
Impact Acres	0.1
fci pre	0.81
fci post	0.71
fci delta	0.10
Total Debit	0.01

Total Acres	**77.9**
Total Debits	**10.5**

	Inputs	
	Outputs	
t=	Threat	
es=	Environmental Significance	
paf=	Preservation adjustment factor	(t+es)
pa=	Preservation Adjusted	(paf x fci Delta)
adj Delta=	pa adjusted for time lag and risk	
fci=	Functional Capcity index	
fci delta	pre fci - post fci	
WAA=	Wetlands Assessment Area	
credit=	adj delta x acres	
Debit=	fci delta x impact acres	

Debit/Credit Balance	
Impact Acres	77.9
Total Debits	10.5
total acres Req.	35.8
total credit	10.7

ATTACHMENT D6

ATTACHMENT D.6
Special Permit Conditions and Rationales.

The following special conditions will be included in the Department of the Army (DA) permit to ensure the project is not contrary to the public interest [33 CFR 320.4(r)], and to ensure the project complies with the 404 (b)(1) Guidelines [40 CFR 230.1O(d)], or at the permittee's request.

Pre-construction Meeting.

1. The permittee shall convene a pre-construction meeting, with their contractor representatives present, a minimum of 15-days prior to the discharge of fill material into waters of the US authorized under this DA permit. The permittee shall invite the USACE, and appropriate federal, state, and borough resource or regulatory agencies within 10-days of the meeting date. The permittee shall provide copies of this DA permit and all attachments to all contractor representatives who shall make the permit copies available in the field during construction activities.

Rationale: To ensure clarification of all permit requirements with the permittee and their contractors. 33 CFR 325

Applicant Requested Compensatory Mitigation.

2. As provided in 33 CFR 320.4 (r)(2), additional mitigation may be added to Department of the Army permit conditions at the applicant's request. Per your request, the Nuiqsut Freshwater Road Restoration Site mitigation plan, as submitted by letter dated 3 August 2018, is included as a special condition of the DA permit. Prior to construction, the final design of the project will be submitted for review and approval via standard mail to U.S. Army Corps of Engineers, Regulatory Division, P.O Box 6898 JBER, Alaska 99506-0898, or electronically to regpagemaster@usace.army.mil (not to exceed 10 MB). No work shall take place until you have received approval from this office.

Fill Discharges.

3.a. The Permittee shall use only clean fill material for this project. The fill material shall be free from items such as trash, debris, automotive parts, asphalt, construction materials, concrete blocks with exposed reinforcement bars, and soils contaminated with any toxic substance, in toxic amounts in accordance with Section 307 of the Clean Water Act.

Rationale. Discharges of pollutants, other than the clean mineral fill material, is not authorized and would cause additional adverse impacts to the aquatic environment. 40 CFR 230 and 33 CFR 325

3.b. All authorized fill area boundaries shall be surveyed and be clearly delineated (staked, flagged, or posted) prior to the discharge. No fill material, supplies, or construction materials shall be stockpiled on wetlands outside of the authorized fill areas. Transportation vehicles and equipment shall not be operated outside of the authorized fill areas, except as authorized by the State of Alaska and/or North Slope Borough to construct and operate on winter ice pads and/or roads or for tundra travel with specially designed and approved low tundra impact vehicles. Road and fill pad surfaces and slopes shall be maintained without discharging fill material outside of permitted fill embankments into waters of the US.

Rationale: This condition is required to avoid adverse impacts to adjacent wetlands as a result of the permitted project (33 CFR 320.4(b)(1), 33 CFR 320.4(r)(1), and 40 CFR 230.41).

3.c. Snow and ice clearing operations must prevent vegetation, soil, or debris from being discharged into waters of the US outside of all authorized fill areas.

Rationale. Rationale: This condition is required to avoid adverse impacts to adjacent wetlands as a result of the permitted project (33 CFR 320.4(b)(1), 33 CFR 320.4(r)(1), and 40 CFR 230.41).

3.d. All authorized discharges, except those to place, adjust, or relocate culverts, shall be completed during frozen winter conditions during the State of Alaska and/or North Slope Borough approved winter tundra construction/travel season. Discharges necessary to install additional culverts, correct culvert positions, and adjust culvert settings may occur outside of the approved winter tundra construction/travel season, except in circumstances which are contrary to the Terms and Conditions of the USFWS' September 21, 2018 Biological Opinion (below).

Rationale. The discharge of fill materials and related construction activities during the winter season and on ice roads and pads greatly reduces the adverse impacts to the aquatic resources, fish and wildlife resources, and the general environment. 40 CFR 230 and 33 CFR 325

3.e. All fill slopes shall be immediately stabilized to prevent erosional impacts to the aquatic environment. Active sloughing of fill material, increased water turbidity, accumulation of sediment in waters and wetlands, and erosion on slopes or around culverts shall be indicators fill slope stabilization is not adequate.

Rationale. This condition is required to ensure that areas outside of the permitted area are protected from sediment caused by erosion, slumping, or lateral displacement of surrounding bottom deposits until the site is permanently stabilized (33 CFR 320.4(b), 40 CFR 230.20(b), 40 CFR 230.21, and 40 CFR 230.72(a)).

3.f. If placement of the access road fill material is not completed within any winter season, sufficient openings shall be provided in the roadbed to maintain natural drainage flows and overland cross-drainage. Road opening widths shall be of sufficient size to prevent scour of the adjacent tundra wetlands.

Rationale. This condition is required to minimize impacts to adjacent wetlands and other waters of the U.S. as a result of the permitted project (33 CFR 320.4(b) and (l) and 40 CFR 230.41).This condition is included to protect water quality and fish and wildlife habitats. 40 CFR 230, 33 CFR 320

3.g As-Built Certification: Within 60 days of completion of the work authorized by this permit, the Permittee shall submit as-built drawings of the authorized work and a completed "As-Built Certification By Professional Engineer" form to the U.S. Army Corps of Engineers, Regulatory Division, P.O Box 6898 JBER, Alaska 99506-0898, or electronically to regpagemaster@usace.army.mil (not to exceed 10 MB). The as-built drawings shall be signed and sealed by a registered professional engineer and include the following:

a) A plan view drawing of the location of the authorized work footprint, as shown on the permit drawings, with transparent overlay of the work as constructed in the same scale as the permit drawings on 8½-inch by 1inch sheets or PDF. The plan view drawing should show all "earth disturbance," including wetland impacts and water management structures.

b) A list of any deviations between the work authorized by this permit and the work as constructed. In the event that the completed work deviates, in any manner, from the authorized work, describe on the attached “As-Built Certification By Professional Engineer” form the deviations between the work authorized by this permit and the work as constructed. Clearly indicate on the as-built drawings any deviations that have been listed. Please note that the depiction and/or description of any deviations on the drawings and/or “As-Built Certification By Professional Engineer” form does not constitute approval of any deviations by the Corps.

c) Include the Department of the Army permit number on all sheets submitted.

Threatened and Endangered Species (Terms and Conditions for Endangered Species Act Compliance)

Biological Opinion: This permit does not authorize the Permittee to take an endangered species, in particular the Polar Bear, Spectacled Eider, and Alaska-breeding Steller’s Eider. In order to legally take a listed species, the Permittee must have separate authorization under the Endangered Species Act (ESA) (e.g., an ESA Section 10 permit, or a BO under ESA Section 7, with “incidental take” provisions with which you must comply).

The enclosed Biological Opinion (BO) contains mandatory terms and conditions to implement the reasonable and prudent measures that are associated with “incidental take” that is also specified in the BO. Authorization under this permit is conditional upon compliance with all of the mandatory terms and conditions associated with incidental take of the enclosed BO, which terms and conditions are incorporated by reference in this permit. Failure to comply with the terms and conditions associated with incidental take of the BO, where a take of the listed species occurs and would constitute an unauthorized take, would also constitute noncompliance with this permit. The United States Fish and Wildlife Service is the appropriate authority to determine compliance with the terms and conditions of its BO, and with the ESA.

Hydrology.

5.a. Existing (natural) drainage patterns shall be maintained throughout all construction and operation periods by the installation of culverts in all authorized fill areas in sufficient number and size to prevent ponding, dewatering, water diversion between watersheds, or concentrating runoff flows. Important field surveying, planning, and design work must ensure the placement of culverts along the access road are not effected by hydrologic changes due to project construction.

Rationale. This condition is included to protect important watersheds for water quality, vegetation and soils, and fish and wildlife habitats. 40 CFR 230, 33 CFR 320.

5.b. The permittee shall prepare and submit a culvert monitoring report to the USACE, for the 3 summer seasons following fill placement authorized in this DA permit. The reports shall be submitted prior to July 30 of each year. The report shall include photographs of all road and pad areas to demonstrate the hydrologic conditions at spring break-up time and post break-up (summer conditions). The report shall include an evaluation of all areas where additional culverts are necessary to retain existing drainage patterns and where culvert maintenance, repair, upgrade, setting adjustments, or replacement are necessary. The culvert/drainage corrective work shall be completed by freeze-up within the same summer season the drainage problems are identified. Evidence of ponding, drying, erosion, or stream channel changes adjacent to authorized fill areas are indicators of necessary corrective action. Culverts shall be marked to facilitate snow removal operations to prevent excessive deposition of snow into creeks and drainage areas. Culverts shall be maintained to adequately convey surface waters throughout the life of the project (access road use).

Rationale. This condition is included to ensure water flow through the culvert is adequate for all flows at all times without causing erosional changes to the channel, including up and downstream reaches of the crossing; retain the substrate, banks, and vegetation; and provide for fish passage. The hydrologic regime protects water quantity and quality, vegetation, soils, and fish and wildlife habitats. 40 CFR 230, 33 CFR 320.

5.c. Design of the culverted road crossing at the Lake M9925 outfall stream crossing shall be coordinated with the BLM, ADFG, and USACE to insure adequate fish passage. Final detailed design figures shall be provided to the to the U.S. Army Corps of Engineers, Regulatory Division, P.O Box 6898 JBER, Alaska 99506-0898, or electronically to regpagemaster@usace.army.mil (not to exceed 10 MB).

Rationale. This condition is included to insure adequate and continued fish passage, particularly for ninespine stickleback. Retaining the hydrologic regime also protects water quality, vegetation, and soils. 40 CFR 230, 33 CFR 320

Gravel, Dust, and Snow.

6. a. The permittee shall comply with the latest version of the Alpine Facilities Erosion Control Plan-Greater Mooses Tooth, Revised.

6.b. The permittee shall ensure pollution to aquatic resources from road gravel spray and fine airborne fill particle dust discharges are minimized to the maximum extent practicable. Dust abatement practices, during dust prone weather and/or seasonal conditions, must be performed for the life of the project (use of the road). Compliance with this condition shall be determined by visible dust and gravel presence on tundra wetland areas adjacent to the authorized fill areas.

Rationale. This condition is included to protect water quality and fish and wildlife habitats from secondary impacts. 40 CFR 230, 33 CFR 320.

Cease to Maintain or Abandon.

7. Should the permittee decide to cease to maintain, use, or to abandon the authorized fill and pipeline, VSMs authorized under this DA permit, the USACE shall be notified by written communication and in compliance with General Condition 2 of this DA permit. Cease to maintain, use, and abandon are defined as non-use of the facilities, or portions thereof, for a period of 5 consecutive years. If any authorized fill areas or pipeline sections are determined to be unmaintained, used, or abandoned, a fill and/or structure removal and site rehabilitation plan (Rehab Plan) shall be submitted to the USACE within 120 days of abandonment. The plan shall include, at a minimum: goals and objectives, site treatments, performance standards, reporting, remedial work plans, and monitoring to ensure performance standards are met. The plan shall include an objective of restoring fish and wildlife habitat.

Rationale: This condition is necessary to make a determination following General Condition 2 and 4 of this permit and 33 CFR 325 (Appendix A).

THE STATE of ALASKA
GOVERNOR BILL WALKER

Department of Environmental Conservation

DIVISION OF WATER
Wastewater Discharge Authorization Program

555 Cordova Street
Anchorage, Alaska 99501-2617
Main: 907.269.6285
Fax: 907.334.2415
www.dec.alaska.gov/water/wwdp

September 11, 2018

ConocoPhillips Alaska, Inc (CPAI)
Attention: Mr. Brad Thomas
P.O. Box 100360
Anchorage, AK 99510

Re: CPAI, Greater Moose's Tooth Two (GMT2)
POA-2015-486, Colville River

Dear Mr. Thomas:

In accordance with Section 401 of the Federal Clean Water Act of 1977 and provisions of the Alaska Water Quality Standards, the Department of Environmental Conservation (DEC) is re-issuing the enclosed Certificate of Reasonable Assurance for placement of dredged and/or fill material in waters of the U.S., including wetlands and streams, associated with the development of the Greater Moose's Tooth Two, northwest of Nuiqsut, Alaska.

DEC regulations provide that any person who disagrees with this decision may request an informal review by the Division Director in accordance with 18 AAC 15.185 or an adjudicatory hearing in accordance with 18 AAC 15.195 – 18 AAC 15.340. An informal review request must be delivered to the Director, Division of Water, 555 Cordova Street, Anchorage, AK 99501, within 20 days of the permit decision. Visit http://dec.alaska.gov/commish/ReviewGuidance.htm for information on Administrative Appeals of Department decisions.

An adjudicatory hearing request must be delivered to the Commissioner of the Department of Environmental Conservation, 410 Willoughby Avenue, Suite 303, PO Box 111800, Juneau, AK 99811-1800, within 30 days of the permit decision. If a hearing is not requested within 30 days, the right to appeal is waived.

By copy of this letter we are advising the U.S. Army Corps of Engineers of our actions and enclosing a copy of the certification for their use.

Sincerely,

James Rypkema
Program Manager, Storm Water and Wetlands

Enclosure: 401 Certificate of Reasonable Assurance

cc: (with encl.)
Steve Moore, USACE, Anchorage
Jack Winters, ADF&G
USFWS Field Office Fairbanks
Matt LaCroix, EPA Operations, Anchorage

STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
CERTIFICATE OF REASONABLE ASSURANCE

In accordance with Section 401 of the Federal Clean Water Act (CWA) and the Alaska Water Quality Standards (18 AAC 70), a Certificate of Reasonable Assurance, is reissued to ConocoPhillips Alaska, Inc. (CPAI), Attention: Mr. Brad Thomas, at P.O. Box 100360, Anchorage, AK 99510, for placement of dredged and/or fill material in waters of the U.S. including wetlands and streams in association with the development of the Greater Moose's Tooth Two, northwest of Nuiqsut, Alaska.

The entirety of the project is located on the Arctic Coastal Plain of Alaska in the National Petroleum Reserve–Alaska near the Beaufort Sea and west of the Colville River, approximately 12 miles northwest of Nuiqsut, Alaska. The applicant's stated purpose is to construct a road-accessible drill site, associated pipelines, and ancillary facilities to safely develop, produce, and transport hydrocarbons from the GMT2 reservoir to the existing Alpine Central Processing Facility (ACF) at Colville Delta 1 (CD1) and eventually to market at a reasonable rate of financial return. The project would produce 3-phase hydrocarbons (oil, gas, and water) which would be carried by pipeline to the ACF at CD1 for processing. Sales-quality crude oil produced at the ACF would be transported from CD1 via the existing Alpine Sales Oil Pipeline and Kuparuk Pipeline to the Trans-Alaska Pipeline System (TAPS) for shipment to market.

CPAI proposes the placement of 674,300 cubic yards (cy) of clean fill material into 78.1 acres, of which 77.9 acres are WOUS, including wetlands (see Table 1 below), to construct:

- An 8.2-mile gravel access road (62.8 acres total; 62.6 acres in WOUS);
- A drill pad with 48-well capacity at GMT2 (14.0 acres in WOUS);
- Three vehicle pullout pads (0.4 acre each in WOUS) for safety and subsistence activity access; and
- Vertical Support Members (VSM) for 8.6-mile pipeline from GMT1 to GMT2 (total fill footprint of 0.1 acre in WOUS).

The GMT2 Development Project would produce oil, gas, and water that would be carried from the GMT2 drill site to Greater Moose's Tooth One (GMT1) via new pipelines. From GMT1, produced fluids would be transported via the permitted GMT1 pipeline to the Colville River Delta 5 (CD5) pad. From CD5, produced fluids from GMT2 would be transported via a new pipeline placed on existing VSMs to the ACF at CD1 for processing. Sales-quality crude processed at the ACF would be transported from CD1 via the existing Alpine Sales Oil Pipeline and Kuparuk Pipeline to the Trans Alaska Pipeline System for shipment to market. Miscible injectant (MI), injection water, and lean gas would be delivered by both proposed and existing/permitted pipelines to the GMT2 dill site from CD1/ACF. The proposed drill site would be operated and maintained by Alpine staff and supported using CD1/ACF infrastructure.

Construction of the GMT2 Development Project facilities would occur over either two or three ice road seasons. The schedule would likely be selected in mid-2018, although may be modified as detailed design progresses. However, the identified work would generally occur in the indicated seasons and sequence.

A state issued water quality certification is required under Section 401 because the proposed activity will be authorized by a U.S. Army Corps of Engineers permit (POA-2015-486) and a discharge of pollutants to waters of the U.S. located in the State of Alaska may result from the proposed activity. Public notice of the application for this certification was given as required by 18 AAC 15.180 in the Corps Public Notice POA-2015-486 posted from March 23, 2018 to May 7, 2018.

The proposed activity is located within:

- Sections 1, 11, 12, 14, 22, 23, 27, 32-34 of Township (T) 10 North (N), Range (R) 2 East (E), Umiat Meridian (UM);
- Section 6 of T. 10 N., R. 3 E., UM;
- Sections 24-28, 31-33 of T. 11 N., R. 3 E., UM;
- Sections 12-19 of T. 11 N., R. 4 E., UM;
- Sections 5-7 of T. 11 N., R. 5 E., UM;
- U.S. Geological Survey Quadrangle Maps Harrison Bay A-2 and Harrison Bay A-3, 70.1730° North, -150.6934° West (GMT2 Drill Pad).

The geographic start of the proposed project is the existing GMT1 drill site gravel pad: Latitude 70.256952° and Longitude -151.479496°; the end of the proposed project is the proposed GMT 2 drill site gravel pad: Latitude 70.1730° and Longitude -150.6934°.

The Department of Environmental Conservation (DEC) reviewed the application and certifies that there is reasonable assurance that the proposed activity, as well as any discharge which may result, will comply with applicable provisions of Section 401 of the CWA and the Alaska Water Quality Standards, 18 AAC 70, provided that the following additional measures are adhered to.

1. Reasonable precautions and controls must be used to prevent incidental and accidental discharge of petroleum products or other hazardous substances. Fuel storage and handling activities for equipment must be sited and conducted so there is no petroleum contamination of the ground, subsurface, or surface waterbodies.

2. During construction, spill response equipment and supplies such as sorbent pads shall be available and used immediately to contain and cleanup oil, fuel, hydraulic fluid, antifreeze, or other pollutant spills. Any spill amount must be reported in accordance with Discharge Notification and Reporting Requirements (AS 46.03.755 and 18 AAC 75 Article 3). The applicant must contact by telephone the DEC Area Response Team for Northern Alaska at (907) 451-2121 during work hours or 1-800-478-9300 after hours. Also, the applicant must contact by telephone the National Response Center at 1-800-424-8802.

3. Construction equipment shall not be operated below the ordinary high water mark if equipment is leaking fuel, oil, hydraulic fluid, or any other hazardous material. Equipment shall be inspected on a daily basis for leaks. If leaks are found, the equipment shall not be used and pulled from service until the leak is repaired.

4. All work areas, material access routes, and surrounding wetlands involved in the construction project shall be clearly delineated and marked in such a way that equipment operators do not operate outside of the marked areas.

5. Natural drainage patterns shall be maintained, to the extent practicable, without introducing ponding or drying.

6. Excavated or fill material, including overburden, shall be placed so that it is stable, meaning after placement the material does not show signs of excessive erosion. Indicators of excess erosion include: gullying, head cutting, caving, block slippage, material sloughing, etc. The material must be contained with siltation best management practices (BMPs) to preclude reentry into any waters of the U.S., which includes wetlands.

7. Include the following BMPs to handle storm water and total storm water volume discharges as they apply to the site:

   a. Divert storm water from off-site around the site so that it does not flow onto the project site and cause erosion of exposed soils;

   b. Slow down or contain storm water that may collect and concentrate within a site and cause erosion of exposed soils;

   c. Place velocity dissipation devices (e.g., check dams, sediment traps, or riprap) along the length of any conveyance channel to provide a non-erosive flow velocity. Also place velocity dissipation devices where discharges from the conveyance channel or structure join a water course to prevent erosion and to protect the channel embankment, outlet, adjacent stream bank slopes, and downstream waters.

8. Fill material must be clean sand, gravel or rock, free from petroleum products and toxic contaminants in toxic amounts.

9. Any disturbed ground and exposed soil not covered with fill must be stabilized and re-vegetated with endemic species, grasses, or other suitable vegetation in an appropriate manner to minimize erosion and sedimentation, so that a durable vegetative cover is established in a timely manner.

This certification expires five (5) years after the date the certification is signed. If your project is not completed by then and work under U.S Army Corps of Engineers Permit will continue, you must submit an application for renewal of this certification no later than 30 days before the expiration date (18 AAC 15.100).

Date: September 11, 2018

James Rypkema

James Rypkema, Program Manager
Storm Water and Wetlands

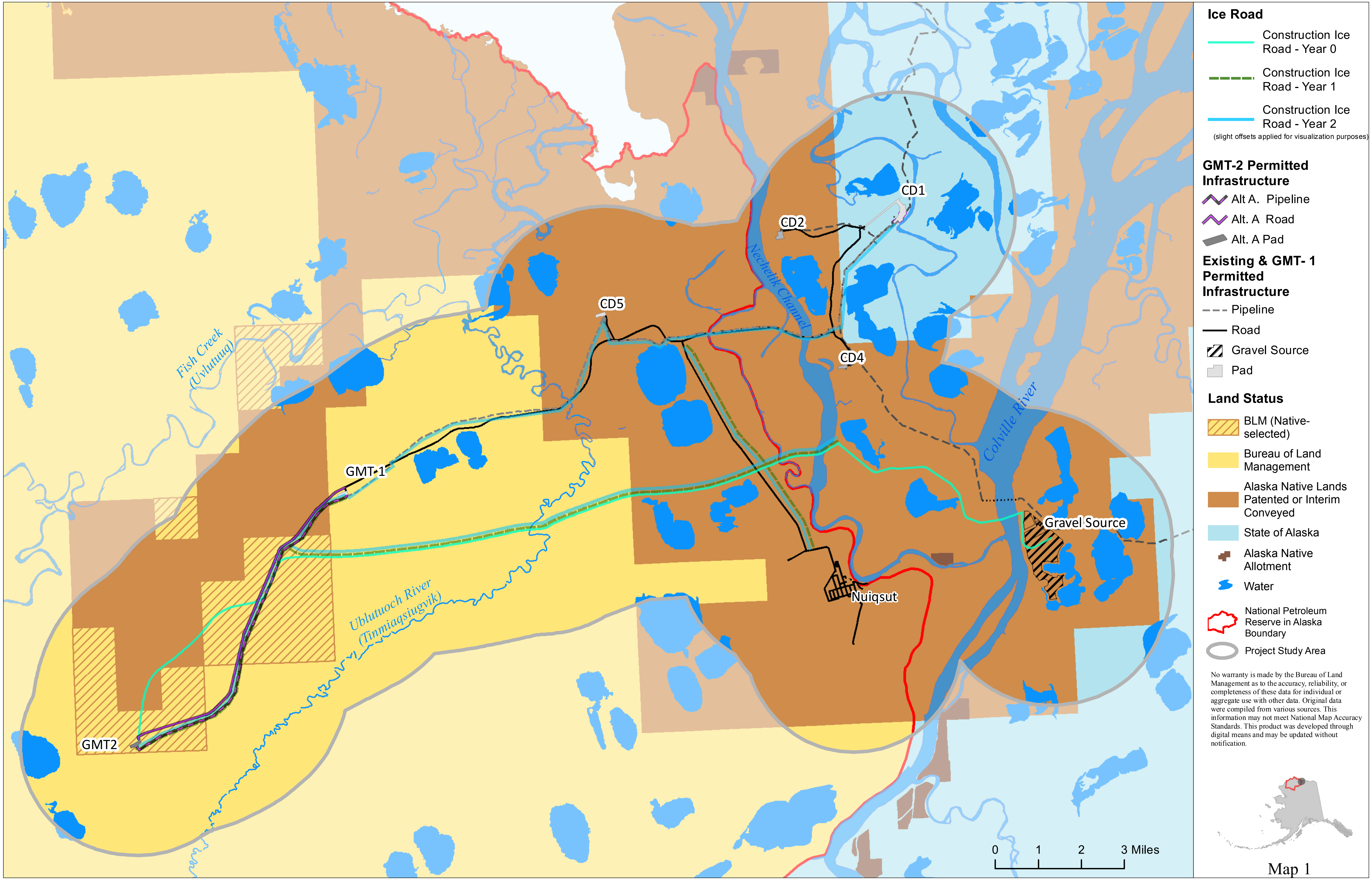
APPENDIX E

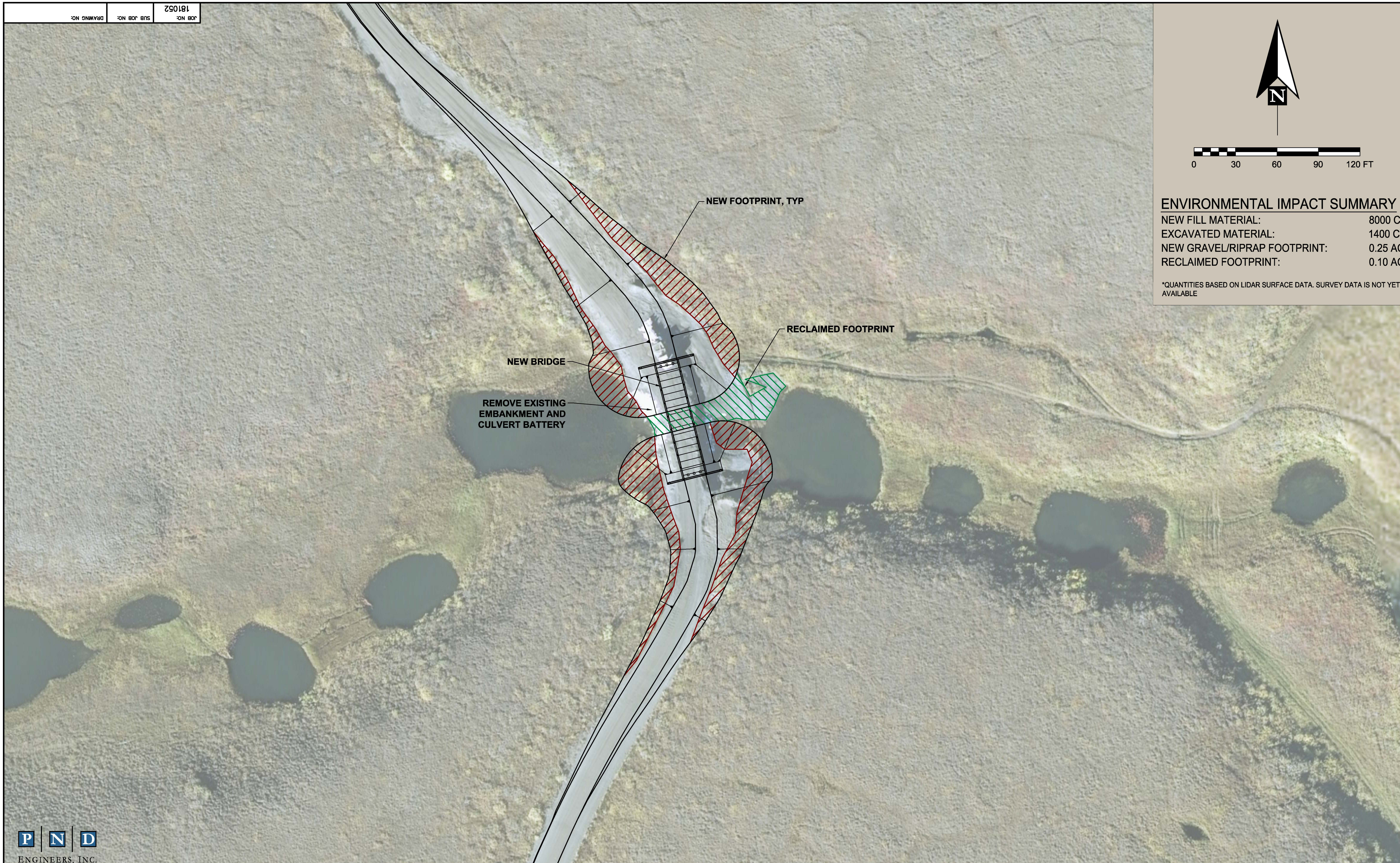
MAPS

Greater Mooses Tooth 2 Oil and Gas Development Project

Joint Record of Decision and Permit Evaluation
Bureau of Land Management
U.S. Army Corps of Engineers

October 2018


Ice Road
Construction Ice Road - Year 0
Construction Ice Road - Year 1
Construction Ice Road - Year 2
(slight offsets applied for visualization purposes)
GMT-2 Permitted Infrastructure
Alt A. Pipeline
Alt. A Road
Alt. A Pad
Existing & GMT- 1 Permitted Infrastructure
Pipeline
Road
Gravel Source
Pad
Land Status
BLM (Native-selected)
Bureau of Land Management
Alaska Native Lands Patented or Interim Conveyed
State of Alaska
Alaska Native Allotment
Water
National Petroleum Reserve in Alaska Boundary
Project Study Area
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.
CD1
CD2
CD4
CD5
GMT-1
GMT2
Nuiqsut
Gravel Source
Nechelik Channel
Colville River
Fish Creek (Uvlutuuq)
Ublutuoch River (Tinmiaqsiugvik)
0 1 2 3 Miles
Map 1



ENVIRONMENTAL IMPACT SUMMARY

NEW FILL MATERIAL:	8000 CY
EXCAVATED MATERIAL:	1400 CY
NEW GRAVEL/RIPRAP FOOTPRINT:	0.25 AC
RECLAIMED FOOTPRINT:	0.10 AC

*QUANTITIES BASED ON LIDAR SURFACE DATA. SURVEY DATA IS NOT YET AVAILABLE

JOB NO: 181052 SUB JOB NO: DRAWING NO:

REFERENCE DWG NO/SHT NO:

REV	DATE	REVISIONS	BY	CHK	JOB ENGR	PROJ ENGR	CUST APP

ECM NO:

CC NO: –

CADD FILE NO. – –

SCALE: – DATE: 8/31/18

ConocoPhillips
Alaska, Inc.

DRAWN: R CRANDY DESIGN: E PERRY CHECKED: D THEIMAN

REDRAWN FROM: – APPROVAL: –

– MODULE: UNIT:

NUIQSUT CULVERT BATTERY REPLACEMENT PROJECT
SPILL-THROUGH BRIDGE IMPACT SUMMARY

JOB NO: 181052 SUB JOB NO: DRAWING NO. CED-XXXX-XXX PART: 001 OF 1 REV:

APPENDIX F

U.S. FISH AND WILDLIFE SERVICE
Biological Opinion

Greater Mooses Tooth 2 Oil and Gas Development Project

Joint Record of Decision and Permit Evaluation
Bureau of Land Management
U.S. Army Corps of Engineers

October 2018

United States Department of the Interior
U.S. FISH AND WILDLIFE SERVICE
Fairbanks Fish and Wildlife Field Office
101 12th Avenue, Room 110
Fairbanks, Alaska 99701
September 21, 2018

Ted Murphy
Acting State Director
Bureau of Land Management
222 W 7th Avenue #13
Anchorage, Alaska 99513

Ryan Winn
North Section Chief
U.S. Army Corps of Engineers
Alaska District Regulatory Division
P.O. Box 6898
JBER, Alaska 99506-0898

Dear Mr. Murphy and Mr. Winn,

This document transmits the U.S. Fish and Wildlife Service's (Service) final Biological Opinion (BO) on a proposal by the Bureau of Land Management (BLM), in partnership with the U.S. Army Corp of Engineers (USACE), to issue permits to ConocoPhillips Alaska, Inc. (CPAI) for construction and operation of the Greater Moose's Tooth 2 Development (GMT2) on lands managed by BLM within the National Petroleum Reserve – Alaska (NPRA).

This BO describes the effects of this action on threatened spectacled eiders (*Somateria fischeri*), Alaska-breeding Steller's eiders (*Polysticta stelleri*), polar bears (*Ursus maritimus*), and designated polar bear critical habitat, pursuant to section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 et seq.). We used information provided in the draft environmental impact statement (DEIS), BLM's Biological Assessment (BA), previous BOs, communications with BLM and USACE, other Service documents, and published and unpublished literature to develop this BO.

Section 7(a)(2) of the ESA states that Federal agencies must ensure that their activities are not likely to:

- Jeopardize the continued existence of any listed species, or
- Result in the destruction or adverse modification of designated critical habitat.

The Service has determined the proposed action may affect, but is not likely to adversely affect Alaska-breeding Steller's eiders, but is likely to adversely affect spectacled eiders, polar bears, and designated polar bear critical habitat.

Following review of the status and environmental baseline of spectacled eiders and polar bears, an analysis of potential effects and cumulative effects of the proposed action to these listed entities, the Service has concluded the proposed action is not likely to jeopardize the continued existence of spectacled eiders or polar bears, and is not likely to destroy or adversely modify polar bear critical habitat. If you have comments or concerns regarding this BO, please contact Ted Swem, Consultation Branch Chief, Fairbanks Fish and Wildlife Field Office at (907) 456-0441.

Sincerely,

Sarah Conn
Field Supervisor
Fairbanks Fish and Wildlife Service

Biological Opinion on the Effects of Greater Moose's Tooth 2 Oil and Gas Development in the National Petroleum Reserve-Alaska on the Spectacled Eider, Alaska-breeding Steller's Eider, Polar Bear, and Polar Bear Critical Habitat

Consultation with:

U.S. Bureau of Land Management
Arctic District Office
Fairbanks, Alaska

and

U.S. Army Corps of Engineers
Alaska District
Anchorage, Alaska

Prepared by:
U.S. Fish and Wildlife Service
Fairbanks Fish and Wildlife Field Office
101 12th Ave, Room 110
Fairbanks, Alaska 99701

September 21, 2018

TABLE OF CONTENTS

INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion (BO) on the potential effects of a proposal by the U.S. Bureau of Land Management (BLM) and the U.S. Army Corps of Engineers (USACE) to issue permits to ConocoPhillips Alaska, Inc. (CPAI) for construction and operation of a satellite oil production development, Greater Moose's Tooth-2 (GMT-2), in the Greater Moose's Tooth Unit (GMTU) in the National Petroleum Reserve-Alaska (NPR-A).

This BO evaluates the potential effects of the proposed action upon spectacled eiders (*Somateria fischeri*), Alaska-breeding Steller's eiders (*Polysticta stelleri*), polar bears (*Ursus maritimus*), and polar bear critical habitat, pursuant to section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq*.). We used information provided in the Biological Assessment (BA; BLM 2018a), the Draft Supplemental Environmental Impact Statement (DSEIS; BLM 2018b), previous BOs, communications with BLM, other Service documents, and published and unpublished literature to develop this BO. It is important to note that our evaluation focuses exclusively on the potential effects of the Preferred Alternative, and further consultation may be required if the action that is ultimately authorized deviates from the Preferred Alternative in a manner that increases the impacts to listed species or designated critical habitat.

Section 7(a)(2) of the ESA requires that all Federal agencies must ensure that their actions are not likely to:

- Jeopardize the continued existence of any listed species; or
- Result in the destruction or adverse modification of designated critical habitat.

The Service has determined that the proposed action may affect, but is not likely to adversely affect, Alaska-breeding Steller's eiders, but is likely to adversely affect spectacled eiders, polar bears, and designated polar bear critical habitat. Following a more comprehensive review of the status and environmental baseline of spectacled eiders, polar bears, and polar bear critical habitat, and an analysis of potential effects and cumulative effects of the proposed action to these listed entities, the Service has concluded the proposed action is not likely to jeopardize the continued existence of spectacled eiders or polar bears, and is not likely to destroy or adversely affect polar bear critical habitat.

Project and Consultation History

Planning efforts for GMT-2 began more than a decade ago. As proposed, GMT-2 (Figure 1) would be a satellite development, connected by permanent gravel road and pipeline to GMT-1 and a series of five nearby satellite developments within the Alpine development complex in the Colville River Unit (CRU), individually identified as Colville Delta 1 to 5 (hereafter CD1, CD2, CD3, CD4, and CD5). The satellite oil development at GMT-2 was previously described and evaluated as part of the Alpine Satellites Development in an environmental impact statement (BLM 2004a), a biological assessment (Johnson et al. 2004), and a biological opinion (USFWS 2004). Following the issuance of the Alpine Satellite Development Plan EIS and Record of Decision (BLM 2004a and 2004b), subsequent exploration established that the two satellites in NPR-A, which were originally identified as CD-6 and CD-7, were not in the CRU, but were within a separate unit, which was subsequently classified as the GMTU. CPAI requested that the

BLM designate and approve the proposed GMTU so CPAI could perform exploration and development operations in an efficient and logical manner under a unit plan of development. CD-6 and CD-7 were then renamed GMT-1 and GMT-2, respectively.

In 2013, the BLM adopted its Record of Decision (ROD) for the NPR-A Integrated Activity Plan/Environmental Impact Statement (IAP/EIS) (BLM 2013). The IAP ROD (BLM 2013) allocates lands available and unavailable for oil and gas leasing, exploration, and development and includes best management practices (BMPs) and lease stipulations that minimize impacts of these activities. The IAP/EIS (BLM 2012) included a development scenario, and on February 5, 2013, the Service issued the *Biological Opinion for the National Petroleum Reserve – Alaska Integrated Activity Plan, 2013* (IAP BO, USFWS 2013) for potential effects to listed species resulting from implementation of the IAP. We concluded that the scenario, including the BMPs and lease stipulations, was not likely to jeopardize the continued existence of Alaska-breeding Steller's eiders, spectacled eiders, or polar bears. We also provided the BLM with an Incidental Take Statement for Alaska-breeding Steller's eiders and spectacled eiders.

The current GMT-2 drill pad location (BLM 2018b) has changed from previously identified locations described in BLM 2004, 2012, and 2014. The currently proposed GMT-2 pad location now occurs outside the Colville River Special Area to minimize potential impacts to peregrine falcons. The proposed location is 0.9 mile north of the 2012/2014 location and 0.11 mile north of the Colville River Special Area boundary. The current and previous proposed pad locations are shown on Map 2.1-1 of the DSEIS (BLM 2018b).

Potential impacts of the Proposed Action were evaluated in the context of the status and environmental baseline of the species to provide an aggregative analysis of impacts to listed species. Our analysis includes potential direct and indirect effects, cumulative effects, and effects of interrelated and interdependent actions on listed species in the Action Area, including effects of BMPs and lease stipulations that would govern management of GMT-2. Although this consultation and BO do not tier to the existing IAP or associated BO, we view the proposed action and the associated impact analyses in the context of the IAP under which the proposed action would be authorized and managed, and incorporate the IAP/EIS (BLM 2012) and IAP BO (USFWS 2013) as references in their entirety.

The process for authorizing take (incidental or intentional) for marine mammals such as polar bears differs from that used to authorize incidental take of other threatened and endangered species. Although we have enumerated the extent of anticipated incidental take of polar bears, the Service is not authorizing incidental take of polar bears under the ESA in this BO. Consistent with the ESA and regulations at 50 CFR §402.14(i) Appendix (A), incidental take statements for marine mammals are not included in formal consultations until regulations, authorizations, or permits under the Marine Mammal Protection Act (MMPA) and/or its 2007 amendments are in effect. Once incidental take of polar bears is authorized under the MMPA, incidental take that results from actions conducted in compliance with all requirements and stipulations set forth in the MMPA authorization will also be considered to be authorized under the ESA. To date, CPAI has consistently obtained authorization under the MMPA for incidental take of polar bears for their oilfield facilities and activities on the North Slope, and we assume this practice will continue in the future.

Alaska-breeding Steller's Eiders

Alaska-breeding Steller's eiders breed almost exclusively on the Arctic Coastal Plain (ACP), and nesting is concentrated in tundra wetlands near Utqiaġvik, Alaska (USFWS 2013). Steller's eiders occur at very low densities elsewhere on the ACP (Larned et al. 2012a). Only three sightings of Steller's eiders have occurred near the Action Area recently and only one Steller's eider has been observed within the Action Area during extensive aerial surveys for eiders on the North Slope (USFWS Arctic Coastal Plain Aerial Breeding Pair Survey Geodatabase, 1992-2016). The species has not been found breeding in northeast NPR-A or on the Colville River Delta in > 20 years. Therefore, we conclude that the probability of Steller's eiders occurring in the Action Area is so low as to be discountable, and concur with the BLM's determination in the BA (page 28) that this project is not likely to adversely affect Steller's eiders. Thus, further consultation for this species under section 7 of the Act is unnecessary.

Yellow-billed Loons

The Service was petitioned to list the yellow-billed loon (*Gavia adamsii*) under the ESA on April 5, 2004, but on October 1, 2014 we determined the species does not meet the definition of an endangered or threatened species under the ESA and listing pursuant to the ESA is not warranted (79 FR 59195). Thus, we do not consider this species further in this BO.

Pacific Walrus

The Service was petitioned to list the Pacific walrus (*Odobenus rosmarus divergens*) under the ESA on February 8, 2008 but on October 4, 2017 we determined the species does not meet the definition of an endangered or threatened species under the ESA and listing pursuant to the ESA is not warranted. Thus, we do not consider this species further in this BO.

DESCRIPTION OF THE ACTION AREA

Regulations implementing the ESA (50 CFR §402.02) define an "Action Area" as "area[s] to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." Potential impacts of GMT-2 on threatened species would occur at different geographic scales (e.g., disturbance from aircraft would occur over a larger area than disturbance from ground passenger vehicles). BLM (2018a) depicts the Action Area as the 2.5-mi (4.0 km) zone around the proposed GMT-2 drill site and all proposed support infrastructure including GMT-1, CD-5, Alpine, the Arctic Slope Regional Corporation (ASRC) mine, and Nuiqsut, gravel and ice roads, personnel camps, and material sites. The total area for this action is $\approx$ 625 km^2 (Figure 1). We expect this zone encompasses all potential effects of the Proposed Action on threatened species and designated critical habitat, and thus use it as the Action Area.

DESCRIPTION OF THE PROPOSED ACTION

Location

The preferred alternative for the GMT-2 Project is described and analyzed in this document. The proposed GMT-2 pad is in Section 32, Township 10N, Range 2E (T10N, R2E) Umiat Meridian (UM). The pipeline corridor crosses through Section 3, T10N, R3E UM; and Sections 1, 11, 12, 14, 22, 23, 27, 32, 33, and 34, T10N, R2E UM.

The Arctic Slope Regional Corporation (ASRC) Mine site is 4.5 miles east of Nuiqsut and east of the east channel of the Colville River within T10N, R5E, Sections 10, 11, 14, and 15 UM, at latitude 70.225° N and longitude 150.803° W. The Kuukpik 10-acre pad at the junction of the CD-5 road and Nuiqsut Spur Road may also serve as a camp during construction.

Road, Drill Pad and Support Facilities

The GMT-2 Project is approximately 17 miles southwest of the Alpine Central Facilities. The preferred alternative includes an 8.2-mile long, all-season road with about 46 culverts between GMT-2 and GMT-1. The gravel footprint of the GMT-2 pad is 0.057 km^2 (14 acres), the road is 0.25 km^2 (62.8 acres), and subsistence pullouts (3) for vehicles are 0.002 km^2 (0.4 acres each), for a total of 0.32 km^2 (78 acres) of gravel surface (Table 1). The pad will include a 210 ft. communication tower without guywires.

The GMT-2 pad would accommodate up to 48 wells; drilling would occur over 7.5 years, and oil would be expected to enter the pipeline to Alpine sometime in 2022. Electric power for GMT-2 operations would be provided by the CD-1/Alpine Central Processing Facility power system. Power cables would be suspended from the pipeline horizontal support members via a messenger cable. The drilling rig would be 222 ft. tall. The drill rig and drill camp would use a temporary power connection, fueled by ultra-low sulfur diesel until the permanent GMT-2 drill site power supply system is in place. No processing other than heating of production fluids would occur on the pad. A fiber optic cable providing communication support between GMT-1 and GMT-2 would be suspended from horizontal support members via the same messenger cable as the powerlines. The predicted lifespan of GMT-2 is currently 32 years, including 3 years of construction, 30 years of oil production, and 1 year with both construction and operation occurring.

Pipelines

The GMT-2 Project would produce oil, gas, and water that would be carried from the GMT-2 pad by pipelines going to the Alpine Central Processing Facility at CD-1 for processing. Sales quality crude oil processed at the Alpine Central Processing Facility would be transported from CD-1 via the existing Alpine Oil Pipeline and Kuparuk Pipeline to the Trans-Alaska Pipeline System for shipment to market.

Miscible injectant and injection water (for enhanced oil recovery) would be delivered by pipeline to the GMT-2 pad from CD-1/Alpine Central Processing Facility. Lean gas for artificial lift would also be transported from CD-1/Alpine Central Processing Facility. The production crude and water injection pipelines would be designed to allow pipeline inspection and maintenance (e.g., pigging) between GMT-2 pad and CD-1/Alpine Central Processing Facility.

Pipelines would be supported on common vertical support members (VSMs) placed approximately 55 feet apart. Fiber optic and power cables would also be suspended from the VSMs via messenger cable attached to the horizontal support members. Pipelines (including suspended cables) would be a minimum of 7 ft. above ground and set within 1000 ft. of the gravel road.

The 8.6-mile long 3-phase GMT-2 to GMT-1 pipeline segment would require approximately 800 new VSMs, and would connect the new site to current infrastructure (Figure 1). The proposed

GMT-2 to GMT-1 pipeline is located south and east of the proposed access road (Figure 1). No valves or vertical loops will be installed between GMT-2 and GMT-1 because there are no major stream crossings. No new pipelines would be required from GMT-1 to CD-5, where fluids would travel via existing pipelines. The GMT-1 to CD-1/Alpine Central Processing Facility Pipeline Segments required as part of the GMT-2 Project would be placed on new or existing VSMs within the existing right-of-way from GMT-1 to CD-1/Alpine Central Processing Facility.

Upgrades to the current infrastructure would include a new 20-inch fluids pipeline placed on existing VSMs from CD-5 to CD-4N, from CD-4N to CD-2, and from CD-2 to CD-1. From CD-4N to CD-2 and from CD-2 to CD-1, a new 6-inch Miscible Injectant (MI) pipeline would be added to existing VSMs. A power cable suspended in a new messenger cable below HSMs would be added from GMT-2 to CD-1, where the Alpine Central Processing Facility (ACF) is located.

Table 1. Estimated gravel use for the GMT-2 project.

Facility	Footprint km^2 (acres)[a]	Fill Quantity (cubic yards)[a]	Notes/dimensions[a]
GMT-2 Drill site Pad	0.057 (14)	152,000	
All-season Access Road, GMT-1 to GMT-2	0.25 (62.8)	510,000	8.2 miles long; 32 ft. crown width & minimum 5 ft. depth
Subsistence Road Pullouts	0.005 (1.2)	9,300	3 pullouts, 0.4 acres each
Bridges	0	0	None
Total Gravel for GMT-2	0.32 (78.0)	671,300	Pads and roads
Pipelines	0.0004 (0.1[b])		8.6 miles, 3 phase from GMT-2 to GMT-1 on ~800 new VSMs; 9.8 miles, crude oil from CD-5 to CD-1 on existing VSMs; 3.3 miles miscible injection pipeline from CD-4/CD-5
Gravel Source	0.03 (23)	671,300	ASRC Mine

[a] Values are approximate and may change during final design, does not include 0.1 acre from pipeline VSMs between GMT-1 and GMT-2.
[b] VSM footprint.

Ice Roads

Ice roads are likely to be in place and in use from about February 1 through April 20 of each year (80 days). Ice roads cross the Tiŋmiaqsiuġvik setback during all three winters (Figure 1). The first winter ice road (25.6 miles) would support gravel transfer and road and pad construction; the second and third winter ice roads (27 miles and 43.9 miles respectively) would support pipeline installation and facility construction. Pipeline construction ice roads would be 80 ft. wide, gravel haul ice roads would be 50 ft. wide, and the remaining ice roads would be 35 ft. wide.

Gravel Source

Gravel excavation (1 season), transport, road and pad construction would utilize ice roads built during the first winter (2018/2019). Gravel conditioning and grading are planned during summer 2019. Winter (2019/2020 and 2020/2021) ice roads would support pipeline installation, tie-in work, and facility construction. Pipeline construction, power and communication cables, and facility installation would be completed during spring and summer of 2021.

The ASRC commercial gravel mine site would supply gravel for GMT-2 (Figure 1). The ASRC mine Phase 3 (POA-1996-869-M4), previously permitted January 30, 2014, is separate from this action, and currently identified as POA-1996-869-M11. The mine is approximately 4.5 miles northeast of Nuiqsut, and is outside of the NPR-A. The volume of gravel needed for the proposed project is 671,300 cubic yards [cy], requiring the excavation of 23 acres at the mine site.

Vehicle Transport
Personnel, equipment, and materials would be transported overland on snow trails, ice roads, and on the gravel GMT-1 – GMT-2 Access Road, once it is constructed. A summary of estimated required vehicle traffic trips is provided in Table 2.5-3 of the BLM's March 2018 DSEIS (BLM 2018b).

Vehicle traffic would be greatest during 2018/2019, 2019/2020, and 2020/2021. Ice road construction would occur from mid-November through December. Construction of the gravel road, gravel drill pad, and installation of a portion of the pipeline scope would occur from February through April. Gravel conditioning would occur in August and September.

In 2021, traffic would occur on ice roads and the gravel GMT-1 – GMT-2 Access Road. Vehicles would support pipeline and facilities construction and drilling. Completion of the pipeline installation would occur from February through April via ice road. Facility construction will occur February through December. After April 2021, all vehicle traffic would occur on the GMT-1 – GMT-2 Access Road. Drilling would begin in May 2021.

Once drilling begins, vehicle traffic would decline and would be limited to the GMT-1 – GMT-2 Access Road. Vehicle traffic associated with routine operations would begin after production begins in December, 2022 and would continue until decommissioning is complete.

Aerial Transport
Aerial transport to/from Alpine would occur year round during all phases of the project. Construction activities (3 years) would include increases in air traffic predominately for crew and material/equipment transport to CD-1/APF. Baseline flights (those that would occur regardless of the GMT-2 project; (90 flights/year) currently accommodate drilling and operations at Alpine. During the first year of construction at GMT-2, 402 helicopter and 125 fixed-wing flights (one-way) would be required above baseline levels. During the second year of construction, 409 helicopter and 145 fixed-wing flights beyond baseline levels would be needed. During drilling and operations (third year and beyond), helicopter flights would decline to 90 flights/year beyond baseline levels; fixed-wing flights would remain at 145 flights/year until construction concludes during the third year, after which no additional fixed-wing flights would be anticipated. All fixed-wing traffic will be supported from Alpine. The greatest number of flights (90 – 409 flights/year, ~ 95% of flights above baseline), primarily helicopter support for special studies and ice road cleanup, would occur during summer, including the breeding season for eiders (May – August) (Figure 2).

Applicant-Requested Mitigation

Three existing 48-inch diameter culverts, located at the intersection of Fresh Water Road (south of Nuiqsut) and an unnamed tributary to Nigliq channel, would be removed and replaced with an open cell or free-span structure. Approximately 1,400 cubic yards of gravel would be extracted from within 0.10 acre of channel beneath and in the immediate vicinity of the existing road crossing. Up to 0.25 acre of open water, roadway shoulder, and abutting wetland could be permanently filled as a result of minor road grade raising and re-alignment.

Interrelated and Interdependent Actions

For this BO, the Service considered activities that would be interrelated and interdependent to the proposed action as well as accidental events that may occur as a result of the proposed action. Interrelated actions are those actions that are part of a larger action and depend on the larger action for their jurisdiction. Interdependent actions are those actions that have no independent utility apart from the action being considered in the BO. Interrelated and interdependent activities that may occur in or near the GMT-2 Area in conjunction with the proposed action include additional mineral exploration/development on Native lands, additional telecommunications infrastructure, increased research activity, offshore oil exploration/development, onshore support facilities, additional staging areas, access roads, and accidental oil spills originating from barges, tank farms, and supply trucks/vessels.

Minimization Measures

1. To the extent possible, permanent facilities would be located in elevated and drier habitats to avoid impacts to preferred tundra bird nesting habitats. Over 90% of the gravel footprint is in Moist Tussock Tundra and Moist Sedge-Shrub Meadow;
2. Gravel extraction and major construction would occur during winter to reduce vegetation and wildlife impacts;
3. Power and communication lines would be supported under pipelines to reduce bird collision risk, maintaining 7-foot (2.1 m) clearance above tundra;
4. Lighting would be shielded and directed downward to reduce attraction and disorientation to birds (except as required by FAA and OSHA);
5. The volume of water withdrawn from water source lakes would be restricted (depending on depth and fish presence) and recharge and effects on water quality and aquatic species would be monitored;
6. Culverts would maintain fish passage and cross drainage;
7. Ice roads crossing streams would be slotted at end of the season to maintain connectivity;
8. A waste management program that controls food availability would reduce attraction of predators and scavengers;
9. Employee training, specifically for proper food disposal and prohibitions on feeding wildlife, would minimize wildlife interactions;
10. The best available technology would be used to reduce nesting, denning, or perching of predators and scavengers at facilities. Inspections of drill rigs and infrastructure as frequently as is practicable during March through July would ensure that any nesting materials placed by ravens are removed;
11. The Wildlife Avoidance and Interaction Plan would be implemented to reduce attraction of and negative interactions with wildlife;
12. The Polar Bear Avoidance and Interaction Plan would be followed, to reduce and report encounters with polar bears;

13. Active spill prevention and response plans would be maintained (Oil Discharge Prevention and Contingency Plans and Spill Prevention Control and Countermeasures Plans);
14. All communication towers would be located on production pads and would not have guy wires; and
15. The GMT-2 Project would follow the Alpine Facilities Erosion Control Plan, updated to include GMT-2. Temporary erosion protection would be placed before breakup following the first construction season to provide protection from a flood event. The temporary protection would be replaced with permanent erosion protection once the gravel has been allowed to season (settle and drain). The Alpine Storm Water Pollution Prevention Plan (SWPPP) would be amended to cover management of pad drainage. The Alpine Erosion Control plan also includes snow removal and dust control plans. Snow removal plans include the use of snow blowing equipment to minimize gravel spray to the tundra and placing cleared snow in designated areas. The dust control plan includes watering gravel roads to minimize dust impacts on the tundra and maintain the integrity of the roads.

Crude and Refined Oil Spills

While spills of crude and refined oil products are not part of the Proposed Action, they may occur as a result of activities authorized and described in the Proposed Action. Therefore, we provide a brief review of the potential types of spills that could occur. Spills could occur from pipelines, storage tanks, production facilities and infrastructure, drilling rigs, and heavy equipment or vehicles. Impacts from spills could vary based on the material spilled, the size of the spill, and what time of year the spill occurred. The GMT-2 EIS (BLM 2018b) categorizes materials that could be spilled as process water, crude oil, non-crude oil, and other hazardous substances.

> *Process water is produced water mixed with crude oil and saltwater or brine. Salt in the seawater and brine can negatively affect plant growth and survival at relatively low concentrations when spilled on tundra. These effects can be persistent, because salts are not broken down by chemical or biological processes in the soil. Spills of process water can change the salinity in freshwater bodies, which may be toxic to sensitive species.*
>
> *Crude oil is oil separated from the produced water. Crude oil spilled on the tundra can cause damage to plants by coating the surface of leaves or causing hydrophobic soil conditions, reducing the supply of water to plant roots. Non-crude oil includes diesel, gasoline, hydraulic fluid, transmission oil, waste oil, and other refined petroleum products. Refined petroleum products, particularly diesel and gasoline, are generally more toxic to plants, microbes, and animals (including humans) than crude oil.*
>
> *Other hazardous substances that may be onsite include methanol, glycols, corrosion inhibitor, scale inhibitor, drag reducing agents, biocides, and drilling muds. Methanol and glycols are toxic to animals, and are completely soluble in water. Other hazardous substances have different toxicities and behave differently when spilled. Drilling muds are complex mixtures that may contain bentonite clay, saline substances, or mineral oil. Drilling muds and fluids can affect tundra by changing soil salinity and alkalinity, as well as smothering plants due to burial (Alaska Department of Environmental*

> *Conservation Tundra Treatment Guidelines 2010). Other hazardous substances have different toxicities and behave differently when spilled* (BLM 2018b).

The total number of spills reported within the Alpine Oil Field for the entire operating period, from 1998 through March 2017 is 252 spills, with a total volume of ~15,975 gallons, of which 48 percent was non-crude oil and 35 percent was process water (BLM 2018b). The BA (BLM 2018b) states:

> *Spills related to construction activities are anticipated to be relatively small in volume, primarily related to vehicle and construction equipment fueling and maintenance. A tanker truck accident or fuel storage tank failure are the most likely source of a large construction spill. Construction related spills are anticipated to be non-crude oil products. Spills that could occur during drill and operation could result in larger volume spills than construction activities. Spills from pipelines, bulk storage tanks, production facilities and infrastructure, blowouts, and heavy equipment and vehicles could occur. Pipelines include a 20-inch produced fluids pipeline (crude oil, gas, and water), a 14-inch injection water pipeline (seawater or produced water), a 6-inch gas pipeline, and a 6-inch miscible injectant pipeline. Bulk storage tanks for diesel and wastewater may be used during drilling and operations, and other hazardous substances may be present and stored onsite…..A review of the spill history at Alpine shows the majority of the spills are less than 10 gallons, and occur in February and March. Most of the spills have occurred on a pad area, or containment and resulted in minor impacts with low intensity, short duration, and limited extent (GMT-1 SIES, BLM, 2014*).

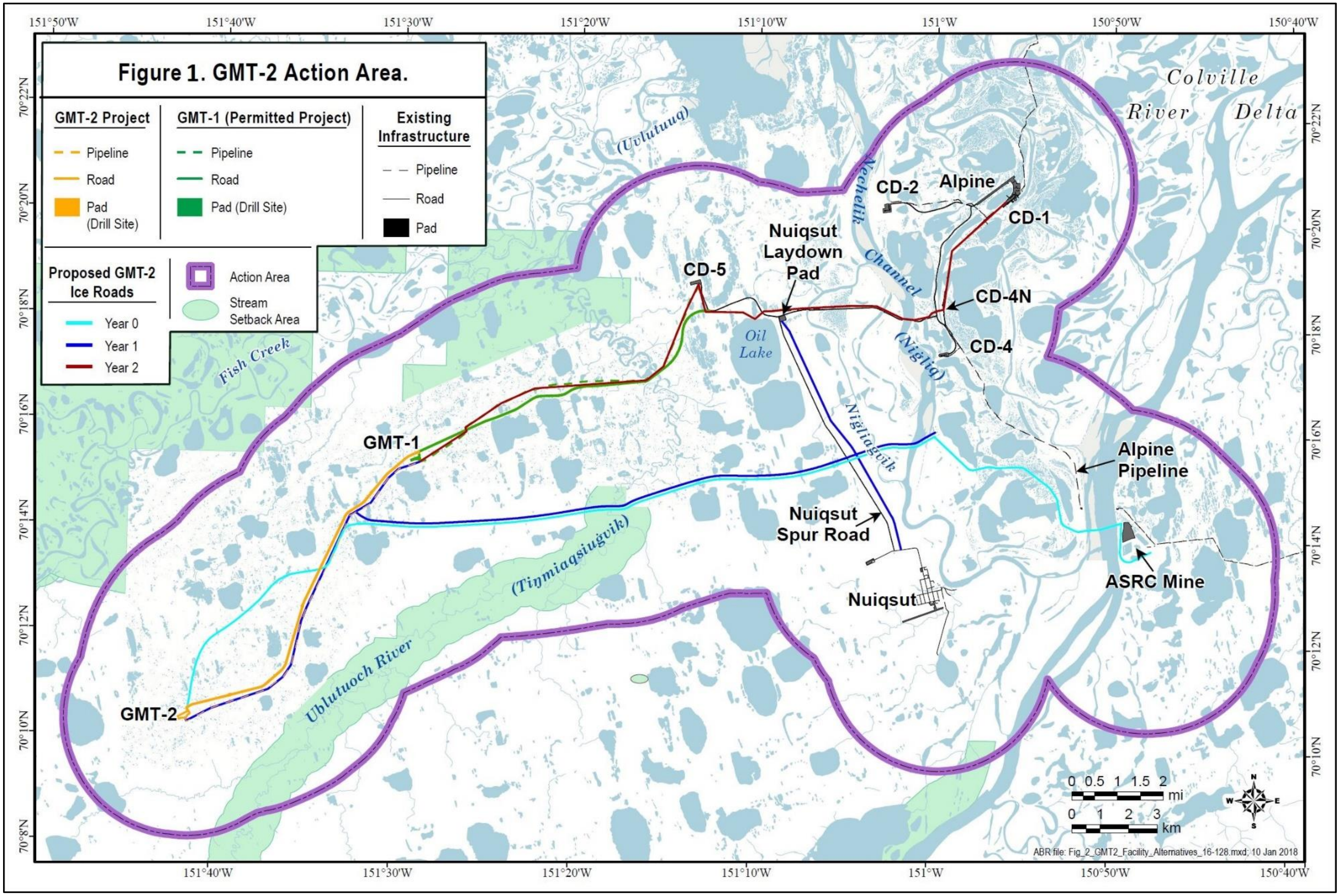


Figure 1. GMT-2 Preferred Alternative Action Area (2.5 mi zone around the facilities, ice roads, and material source). From BLM (2018a).

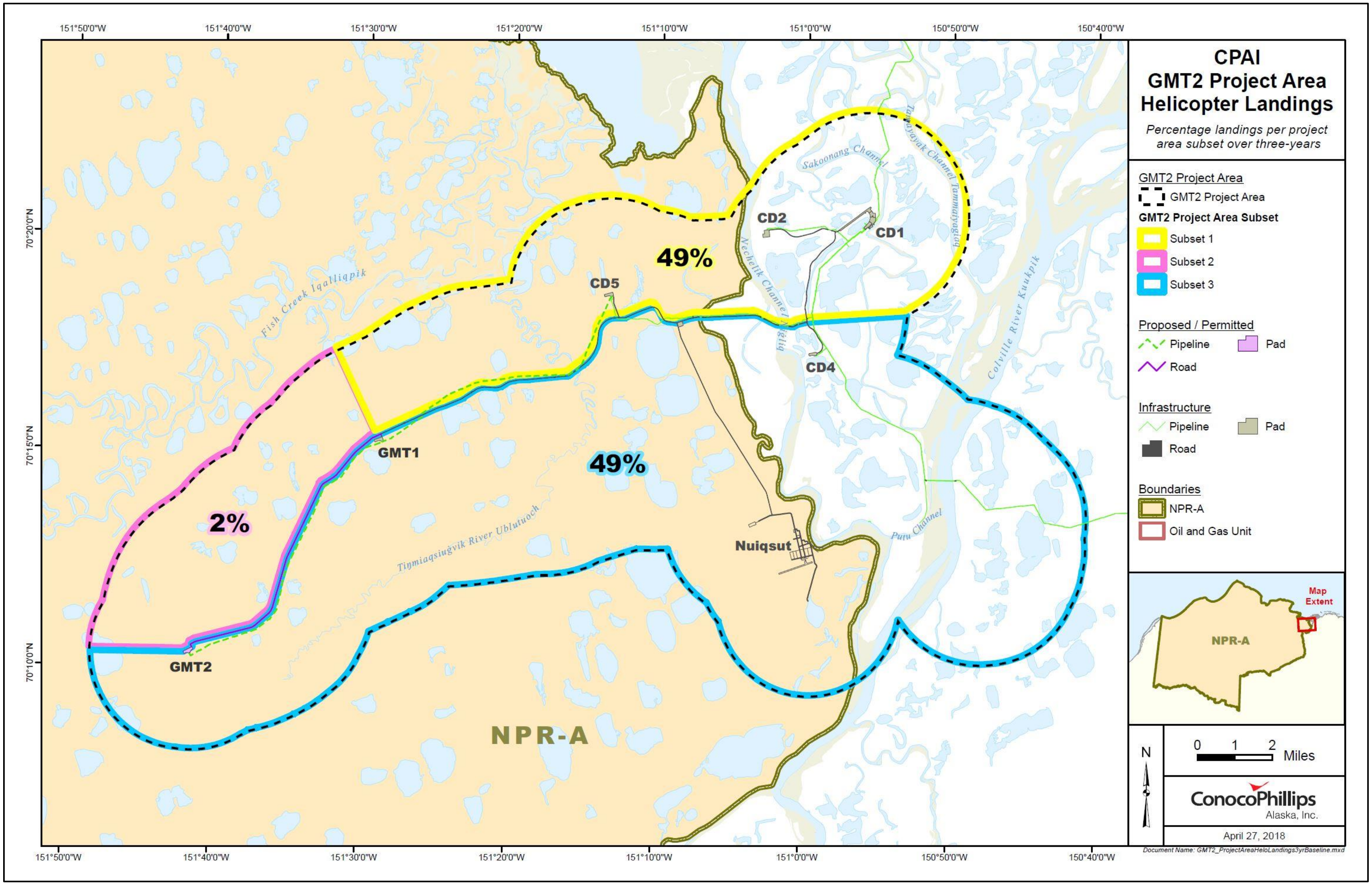


Figure 2. Locations of helicopter takeoffs/landings within the GMT-2 Action Area. Provided by BLM (2018).

STATUS OF THE SPECIES AND CRITICAL HABITAT

This section presents biological and ecological information relevant to the status of listed species and designated critical habitat, including information on species' life history, abundance, distribution, habitat associations, and other factors relevant to survival and recovery.

Spectacled Eiders

Status and Distribution

The spectacled eider was listed throughout its range as threatened on May 10, 1993 (58 FR 27474) based on indications of steep declines in the two Alaska-breeding populations. Historically, spectacled eiders nested in Alaska discontinuously from the Nushagak Peninsula north to Utqiaġvik, and east nearly to Canada's Yukon Territory (Phillips 1922-1926, Bent 1925, Bailey 1948, Dau and Kistchinski 1977, Derksen et al. 1981, Garner and Reynolds 1986, Johnson and Herter 1989). Currently, this species comprises three primary breeding populations, which nest on Alaska's North Slope (or Arctic Coastal Plain), the Yukon-Kuskokwim Delta (Y-K Delta), and in northern Russia (Figure 3). The Y-K Delta population declined 96% between the 1970s and early 1990s (Stehn et al. 1993, Ely et al. 1994), which was the primary impetus for listing the species.

After breeding, spectacled eiders migrate to several discrete molting areas (Figure 3), with birds from the different populations and genders favoring different molting areas (Petersen et al. 1999). All three spectacled eider populations overwinter in openings in pack ice of the central Bering Sea, south of St. Lawrence Island (Petersen et al. 1999; Figure 3), where they remain until March or April (Lovvorn et al. 2003).

Breeding- North Slope Population

Spectacled eiders arrive on the ACP breeding grounds in late May to early June. Breeding density varies across the North Slope. Numbers of breeding pairs peak in mid-June and decline 4 – 5 days later when males begin to depart from the breeding grounds (Smith et al. 1994, Anderson and Cooper 1994, Anderson et al. 1995, Bart and Earnst 2005). In general, on the Arctic Coastal Plain spectacled eiders breed near large shallow productive thaw lakes, often with convoluted shorelines and/or small islands (Larned and Balogh 1997, Anderson et al. 1999). Nest sites are often located within 3 feet of a lakeshore (Johnson et al. 1996). Mean clutch size reported from studies on the Colville River Delta was 4.3 (Bart and Earnst 2005). Spectacled eider clutch size near Utqiaġvik has averaged 4.1 to 4.7 (Safine 2011, Safine 2012). Incubation lasts 20 – 25 days (Kondratev and Zadorina 1992, Harwood and Moran 1993, Moran and Harwood 1994, Moran 1995), and hatching occurs from mid- to late July (Warnock and Troy 1992). On the nesting grounds, spectacled eiders feed on mollusks, insect larvae, small freshwater crustaceans, and plants and seeds (Kondratev and Zadorina 1992) in shallow freshwater or brackish ponds, or on flooded tundra. Young fledge approximately 50 to 55 days after hatching, and females with broods move from freshwater to marine habitats just prior to or after fledging (Safine 2011).

Nest success is highly variable and greatly influenced by predators. In arctic Russia, apparent nest success was estimated as <2% in 1994 and 27% in 1995; predation was believed to be the cause of high failure rates, with foxes, gulls and jaegers the suspected predators (Pearce et al. 1998). Apparent nest success in 1991 and 1993 – 1995 in the Kuparuk and Prudhoe Bay oil fields on the ACP varied from 25 – 40% (Warnock and Troy 1992, Anderson et al. 1998). Nest survival probability for spectacled eiders in an area near Utqiaġvik, where arctic fox control was conducted, was 72% in 2011 (95% CI, 27 – 92%; Safine 2012).

Post-breeding- North Slope

Males generally depart breeding areas when females begin incubation in late June (Anderson and Cooper 1994, Bart and Earnst 2005). Use of the Beaufort Sea by departing males is variable. Some appear to move directly to the Chukchi Sea over land, while the majority moved rapidly (average travel of 1.75 days) over nearshore waters of the Beaufort Sea from the breeding grounds to the Chukchi Sea (TERA 2002). Males seem to prefer large river deltas such as the Colville River containing open water in early summer when much of the Beaufort Sea is still frozen. About half of adult males tracked in northern and western Alaska using satellite telemetry migrated to northern Russia to molt (Matt Sexson, USGS, unpublished data).
This study also suggested that male eiders follow coast lines before migrating across the northern Bering and Chukchi seas en route to northern Russia (Matt Sexson, USGS unpublished data).

Females generally depart the breeding grounds after males; more of the Beaufort Sea is ice-free at this time, allowing more extensive and prolonged use of marine waters (Peterson et al. 1999, TERA 2002). Females spent an average of two weeks in the Beaufort Sea (range 6 – 30 days) mostly in its western portion (TERA 2002). Females also appeared to migrate through the Beaufort Sea an average of 10 km further offshore than males (Peterson et al. 1999). Telemetry data indicate that molt migration of failed/non-breeding females from the Colville River Delta through the Beaufort Sea is relatively rapid (two weeks) compared to two to three months spent by failed/non-breeding females in the Chukchi Sea (Matt Sexson, USGS unpublished data).

Molt

Avian molt is energetically demanding, especially for species such as spectacled eiders that complete molt in a few weeks. Spectacled eiders use four molting areas from July to late October (Figure 3; Larned et al. 1995, Peterson et al. 1999). Females generally use molting areas nearest their breeding grounds. Males do not show strong molting site fidelity; males from all three breeding areas molt in Ledyard Bay, Mechigmenskiy Bay, and the Indigirka/Kolyma River Delta. Males reach molting areas first, beginning in late June, and remain through mid-October. Failed/non-breeding females arrive at molting areas in late July, while successfully-breeding females and young of the year reach molting areas in late August or September and remain through October.

Winter

After molting, spectacled eiders migrate offshore in the Chukchi and Bering Seas to a single wintering area in openings in pack ice of the central Bering Sea south/southwest of St. Lawrence Island (Figure 3). Hundreds of thousands of spectacled eiders (Petersen et al. 1999) rest and feed by diving up to 70 m to eat benthic bivalves, mollusks, and crustaceans (Lovvorn et al 2003, Cottam 1939, Petersen et al. 1998, Petersen and Douglas 2004). Sampling over several decades suggests that the benthic community in the overwintering area has shifted from larger to smaller species of clams (Lovvorn et al. 2003, Richman and Lovvorn 2003).

Figure 3. Distribution of spectacled eiders. Molting areas (green) are used July through October. Wintering area (yellow) are used October through April. The full extent of molting and wintering areas is not yet known and may extend beyond the boundaries shown.

Late Winter/Spring

Spectacled and other eiders likely make extensive use of the eastern Chukchi spring lead system between departure from the wintering area in March and April and arrival on the North Slope in mid-May or early June. Limited spring aerial observations in the eastern Chukchi have documented dozens to several hundred common eiders (*Somateria mollissima*) and spectacled eiders in spring leads and several miles offshore in relatively small openings in rotting sea ice (W. Larned, USFWS; J. Lovvorn, University of Wyoming, pers. comm.). Woodby and Divoky (1982) documented large numbers of king eiders (*S. spectabilis*) and common eiders using the eastern Chukchi lead system, advancing in pulses during days of favorable following winds, and concluded that an open lead is probably requisite for spring eider passage in this region. Preliminary results from an ongoing satellite telemetry study conducted by the USGS Alaska Science Center suggest that spectacled eiders also use this lead system during spring migration (USGS unpublished data).

Adequate foraging opportunities and nutrition during spring migration are critical to spectacled eider productivity. Like most sea ducks, female spectacled eiders do not feed substantially on the breeding grounds, but produce and incubate their eggs while living primarily off body reserves (Korschgen 1977, Drent and Daan 1980, Parker and Holm 1990). Clutch size, a measure of reproductive potential, was positively correlated with body condition and reserves obtained prior to arrival at breeding areas (Coulson 1984, Raveling 1979, Parker and Holm 1990). Body reserves must be maintained from winter or acquired during the 4-8 weeks (Lovvorn et al. 2003) of spring staging, and Petersen and Flint (2002) suggest common eider productivity on the western Beaufort Sea coast is influenced by conditions encountered in May to early June during spring migration through the Chukchi Sea (including Ledyard Bay). Common eider female body mass has been found to increase 20% during the 4-6 weeks prior to egg laying (Gorman and Milne 1971, Milne 1976, Korschgen 1977, Parker and Holm 1990). For spectacled eiders, average female body weight in late March in the Bering Sea was 1,550 ± 35 g (n = 12), and slightly (but not significantly) greater upon arrival at breeding sites (1,623 ± 46 g, n = 11; Lovvorn et al. 2003), indicating that spectacled eiders maintain or enhance their physiological condition during spring staging.

<u>Abundance and Trends</u>

The first range-wide estimate of spectacled eiders was 363,000 birds (333,526 – 392,532 95% CI), obtained by aerial surveys of the wintering area in the Bering Sea in late winter 1996 – 1997 (Petersen et al. 1999). Winter/spring surveys using aerial photo census techniques were repeated in 2009 and 2010. The minimum global population estimate from these surveys was 369,122 (90% CI, ± 4,932; Larned et al. 2012b), suggesting range-wide population stability over the interval.

Population indices for North Slope-breeding spectacled eiders are unavailable prior to 1992. However, Warnock and Troy (1992) documented an 80% decline in spectacled eider abundance from 1981 to 1991 in the Prudhoe Bay area. Since 1992, the Service has conducted annual aerial surveys for breeding spectacled eiders on the ACP. The average annual population estimate (adjusted for detection) for 2007–2016 is 4,236 (95% CI = 3,178 – 5,294) breeding pairs, with a ten-year average growth rate of 0.997 (95% CI = 0.954 – 1.043; Wilson et al. 2017).

Prior to 1972, an estimated 47,700 – 70,000 pairs of spectacled eiders nested on the Y-K Delta in average to good years (Dau and Kistchinski 1977). From the early 1970s to the early 1990s, the population declined steeply from 48,000 to 2,000 (Stehn et al. 1993). Ely et al. (1994) documented a 79% decline in eider nests between 1969 and 1992 for areas near the Kashunuk River. Furthermore, aerial and ground survey data indicated that spectacled eider numbers declined 9 – 14% per year from 1985 – 1992 (Stehn et al. 1993). Fischer and Stehn (2013) used combined annual ground-based and aerial survey data to estimate the number of nests and eggs of spectacled eiders on the coastal area of the YK-Delta in 2012 and evaluate long-term trends in the YK-Delta breeding population from 1985 to 2012. In a given year, the estimated number of nests reflects the minimum number of breeding pairs in the population and does not include non-nesting individuals or nests that were destroyed or abandoned (Fischer and Stehn 2013). The total number of spectacled eider nests on the YK-Delta in 2012 was estimated at 8,062 (SE 1110). The average population growth rate based on these surveys was 1.058 (90% CI = 1.005 – 1.113) in 2003 – 2012 and 0.999 (90% CI = 0.986 – 1.012) in 1985 – 2012 (Fischer and Stehn 2013). Log-linear regression based solely on the longterm YK-Delta aerial survey data indicate positive population growth rates of 1.073 (90% CI =1.046 – 1.100) in 2001 – 2010 and 1.070 (90% CI = 1.058 – 1.081) in 1988 – 2010 (Platte and Stehn 2011).

Critical habitat

There is no designated critical habitat for spectacled eiders on lands administered by BLM in the NPR-A or elsewhere on Alaska's North Slope.

Spectacled Eider Recovery Criteria

The Spectacled Eider Recovery Plan (USFWS 1996) presents research and management priorities with the objective of recovery and delisting so that protection under the ESA is no longer required. Although the cause or causes of the spectacled eider population decline is not known, factors that affect adult survival are likely to be the most influential on population growth rate. These include lead poisoning from ingested spent shotgun pellets, which may have contributed to the rapid decline observed in the Y-K Delta (Franson et al. 1995, Grand et al. 1998), and other factors such as habitat loss, increased nest predation, overharvest, and disturbance and collisions with human built structures (factors discussed in the Environmental Baseline). Exposure to other contaminants, including petroleum-related compounds, organochlorine compounds, and elements, may also have contributed to population declines or constrained recovery. Under the Recovery Plan, the species will be considered recovered when each of the three recognized populations (Y-K Delta, North Slope of Alaska, and Arctic Russia): 1) is stable or increasing over 10 or more years and the minimum estimated population size is at least 6,000 breeding pairs; or 2) number at least 10,000 breeding pairs over 3 or more years, or 3) number at least 25,000 breeding pairs in one year.

Polar bear

Status and distribution

Due to threats to sea ice habitat, on May 15, 2008 the Service listed the polar bear as threatened under the ESA (73 FR 28212) throughout its range. In the U.S., the polar bear is also protected under the Marine Mammal Protection Act (MMPA) and the Convention on International Trade in Endangered Species of Wildlife Fauna and Flora (CITES) of 1973.

Polar bears are widely distributed throughout the Arctic where the sea is ice-covered for large portions of the year. Polar bears throughout their range are subdivided into 19 recognized populations or stocks (Figure 4). The U.S. contains portions of two subpopulations: the Chukchi Sea (CS) (also called the Alaska-Chukotka subpopulation in the U.S.–Russia Bilateral Agreement) and the Southern Beaufort Sea (SB) subpopulation.

Population size estimates and trends

The most current population estimate for polar bears is approximately 26,000 individuals (95 % CI = 22,000-31,000; Wiig et al. 2015). Regarding population trends, the International Union for Conservation of Nature and Natural Resources, Species Survival Commission (IUCN/SSC) Polar Bear Specialist Group (PBSG) ranked three of the 19 subpopulations as "declining" and nine as "data deficient." They ranked six as "stable" and just one as "increasing" (PBSG 2015, USFWS 2017).

Species biology and life history

Polar bears are the largest living bear species (DeMaster and Stirling 1981) with a longer neck and proportionally smaller head than other ursids. They are sexually dimorphic; females weigh 400 to 700 pounds (lbs) and males up to 1,440 lbs (USFWS 2017).

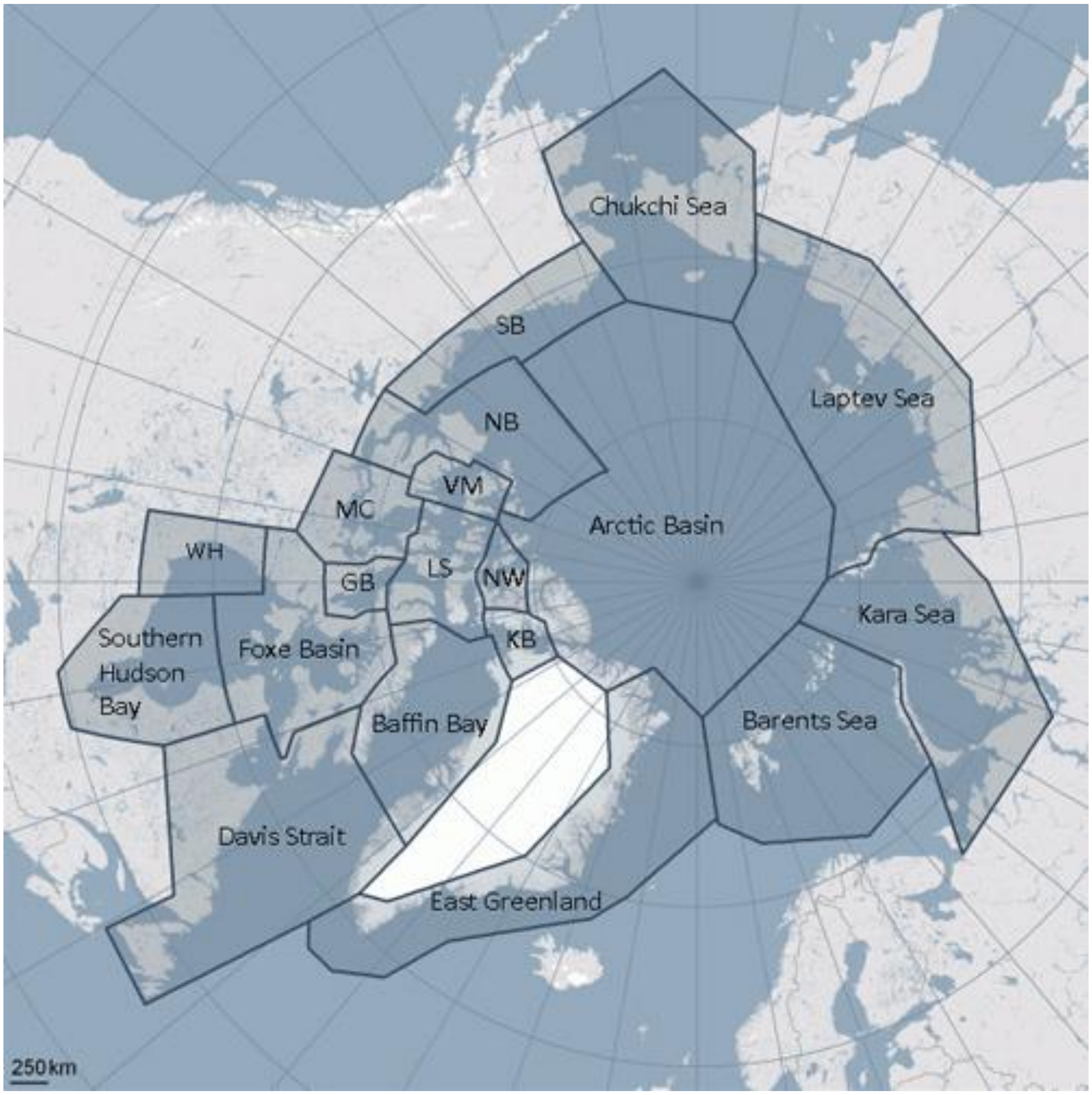


Figure 4. Global distribution of polar bear subpopulations as defined by the Polar Bear Specialist Group (Obbard et al. 2010; http://pbsg.npolar.no/en/status/population-map.html). Subpopulations include the Southern Beaufort Sea (SB), Chukchi Sea, Laptev Sea, Kara Sea, Barents Sea, East Greenland, Northern Beaufort (NB), Kane Basin (KB), Norwegian Bay (NW), Lancaster Sound (LS), Gulf of Boothia (GB), McClintock Channel (MC), Viscount Melville (VM), Baffin Bay, Davis Strait, Foxe Basin, Western Hudson Bay (WH), and Southern Hudson Bay.

Breeding and reproduction- Polar bears are a K-selected species, characterized by late sexual maturity, small litter sizes, and extended maternal investment in raising young. All of these factors contribute to the species' low reproductive rate (Amstrup 2003). Females generally mature and breed for the first time at 4 or 5 years and give birth at 5 or 6 years of age. Litters of two cubs are most common, but 3-cub litters are seen on occasion across the Arctic (Amstrup 2003). The minimum reproductive interval for adult females is three years. Cubs stay with their mothers until weaning, which occurs most commonly in early spring when cubs are 2 1/2 years old. Female bears are available to breed again after their cubs are weaned (USFWS 2017).

Survival- Polar bears are long-lived and are not generally susceptible to disease or parasites. Due to extended maternal care of young and low reproductive rates, polar bears require high adult survival rates, particularly females, to maintain population levels (Eberhardt 1985; Amstrup and Durner 1995). Survival rates are generally age dependent, with cubs-of-the-year having the lowest rates and prime-age adults (prime reproductive years are between approximately 5 and 20 years of age) having survival rates that can exceed 90 percent (Regehr et al. 2007a). Survival rates exceeding 90 percent for adult females are essential to sustain polar bear populations (Amstrup and Durner 1995).

Changes in body condition have been shown to affect bear survival and reproduction, which could, in turn, have population-level effects (Regehr et al. 2010; Rode et al. 2010). Survival of polar bear cubs-of-the-year has been directly linked to their weight and the weight of their mothers, with lower weights resulting in reduced survival (Derocher and Stirling 1996; Stirling et al. 1999). Changes in body condition indices were documented in the Western Hudson Bay subpopulation before a statistically significant decline in that subpopulation was documented (Regehr et al. 2007b). Thus, changes in these indices may signal that reductions in survival and abundance are imminent (USFWS 2017).

Feeding- Polar bears are top predators in the Arctic marine ecosystem. They prey heavily on ice-seals, principally ringed seals (*Phoca hispida*), and to a lesser extent, bearded seals (*Erignathus barbatus*). Areas near ice edges, leads, or polynyas where ocean depth is minimal are the most productive hunting grounds (Durner et al. 2004). Bears occasionally take larger animals, such as walruses (*Odobenus rosmarus*) and belugas (*Delphinapterus leucas*) (Kiliaan and Stirling 1978).

Bowhead whale carcasses, leftover after subsistence harvest, have been available to polar bears as a food source on the North Slope since the early 1970s (Koski et al. 2005). The use of whale carcasses as a food source likely varies among individuals and years. Stable isotope analysis of polar bears in 2003 and 2004 suggested that bowhead whale carcasses comprised 11%-26% (95% CI) of the diets of sampled polar bears in 2003, and 0%-14% (95% CI) in 2004 (Bentzen et al. 2007).

<u>Threats to the polar bear</u>

Because the polar bear depends on sea ice for its survival, loss of sea ice due to climate change is its largest threat worldwide, although polar bear subpopulations face different combinations of human-induced threats (73 FR 28212, Obbard et al. 2010). The largest direct human-caused loss of polar bears is from subsistence hunting, but for most subpopulations where subsistence hunting of polar bears occurs, it is a regulated and/or monitored activity (Obbard et al. 2010). A thorough account of subsistence hunting, sport harvest, poaching, defense-of-life removals, and the management systems controlling these direct removal activities can be found in USFWS

(2017). Other threats include accumulation of persistent organic pollutants in polar bear tissue, tourism, human-bear conflict, and increased development in the Arctic (Obbard et al. 2010).

Climate change- As stated in the Polar Bear Conservation Management Plan (PBCMP) (USFWS 2016), polar bears evolved over thousands of years to life in a sea ice-dominated ecosystem and depend on sea ice for essential life functions. Climate-induced habitat degradation and loss are negatively affecting some polar bear stocks, and unabated global warming is expected to reduce the worldwide polar bear population (Obbard et al. 2010). Patterns of increased temperatures, earlier spring thaw, later fall freeze-up, increased rain-on-snow events (which may cause dens to collapse), and potential reductions in snowfall are also occurring. Loss of sea ice habitat due to climate change is identified as the primary threat to polar bears (Schliebe et al. 2006, 73 FR 28212, Obbard et al. 2010).

The sea ice ecosystem supports ringed seals and other marine mammals that comprise the polar bear's prey base (Stirling and Archibald 1977; Smith 1980; Smith 1985; Iverson et al. 2006). Sea ice cover is shown to be strongly, negatively correlated with surface temperature, which is increasing at about 3 times the global average in the Arctic (Comiso 2012). Declines in sea ice area more pronounced in summer than winter (NSIDC, 2011a, b). The mean linear rate of decline for August sea ice extent is 29,000 square miles per year, or 10.4 percent per decade since 1979 relative to the 1981 to 2010 average (NSIDC 2018). Thus, average Arctic sea ice extent in August is approximately 40% less now than 40 years ago. Positive feedback systems (i.e., sea-ice albedo) and naturally occurring events, such as warm water intrusion into the Arctic and changing atmospheric wind patterns, can cause fragmentation of sea ice, reduction in the extent and area of sea ice in all seasons, retraction of sea ice away from productive continental shelf areas throughout the polar basin, reduction of the amount of heavier and more stable multi-year ice, and declining thickness and quality of shore-fast ice (Parkinson et al. 1999, Rothrock et al. 1999, Comiso 2003, Fowler et al. 2004, Lindsay and Zhang 2005, Holland et al. 2006, Comiso 2006, Serreze et al. 2007, Stroeve et al. 2008).

Loss of access to prey- The decline of sea ice habitat due to changing climate is affecting the ability of polar bears to forage in several ways. Sea ice provides a platform for hunting and feeding, seeking mates and breeding, denning, resting, and for long-distance movement. Polar bears depend on sea ice to hunt seals, and temporal and spatial availability of sea ice is predicted to decline. Once sea ice concentration drops below 50 percent, polar bears have been documented to abandon sea ice for land, where access to their primary prey is almost entirely absent, or they may retreat northward with more consolidated pack ice over the polar basin, which is likely less productive foraging habitat (Whiteman et al. 2015). In either case, polar bears are likely to have reduced access to prey resources (Whiteman et al. 2015). Ware et al. (2017) found that polar bears are increasingly occurring on ice over less-productive waters in summer. Although polar bears occasionally capture ringed seals in open water (Furnell and Oolooyuk 1980), typically ice seals in open water are inaccessible to polar bears (Harwood and Stirling 1992). Thus, species experts do not believe that polar bears will readily adapt to the loss of sea ice by adopting other hunting methods, such as hunting seals in ice-free water (Stirling and Derocher 1993; Derocher et al. 2004).

Effects of climate change on polar bear prey species- Ice seals, principally ringed seals, and to a lesser extent bearded seals, are the primary prey of polar bears, although other food sources are occasionally exploited (USFWS 2017). Climate change and the loss of Arctic sea ice are expected to affect ice seal populations significantly, and in response in 2012 the National Marine Fisheries Service (NMFS) listed the Arctic subspecies of ringed seal (*Phoca hispida hispida*) and the Beringia distinct population segment (DPS) of the bearded seal (*Erignathus barbatus nauticus*) as threatened species under the Act (77 FR 76706; 77 FR 76740).

Ice seal population dynamics reflect a complex mix of biotic and abiotic factors (Pilfold et al. 2015), making it difficult to accurately assess the effects of changes in sea ice. However, several mechanisms by which a warming environment have affected ice seals, or plausibly should be expected to, have been identified. An adequate snow layer providing insulation around birth lairs is crucial for thermoregulation and survival of young pups (Stirling and Smith 2004). Pups in lairs with thin snow roofs are also more vulnerable to predation than pups in lairs with thick roofs (Hammill and Smith 1991; Ferguson et al. 2005), and when lack of snow cover has forced birthing to occur in the open, nearly 100% of pups died from predation (Smith and Lydersen 1991; Smith et al. 1991). Rain-on-snow events during the late winter are increasing in frequency and can damage or eliminate snow-covered pupping lairs (ACIA 2005). Exposed pups are then vulnerable to hypothermia and predation by polar bears and arctic foxes (*Alopex lagopus*) (Stirling and Smith 2004). Pupping habitat on landfast ice (McLaren 1958; Burns 1970) and drifting pack ice (Wiig et al. 1999; Lydersen et al. 2004) can also be affected by earlier warming and break-up in the spring, which shortens the length of time pups have to grow and mature (Kelly 2001; Smith and Harwood 2001).

Although the rate and extent of population-level response of ice seals to changes in sea ice conditions remain unclear, effects to ice seal populations will certainly affect polar bear populations. Polar bear populations fluctuate with prey abundance (Stirling and Lunn 1997), and regional declines in ringed and bearded seal numbers and productivity have been linked to marked declines in the associated polar bear subpopulations (Stirling and Øritsland 1995; Stirling 2002).

Redistribution of polar bears in response to changes in sea ice- Several studies have shown that changes in sea ice, including the timing of melt in spring and freeze-up in fall, correlate with changes in the distribution of polar bears and their body condition or other indices of fitness. In Western Hudson Bay, sea ice break-up now occurs approximately 2.5 weeks earlier than it did 30 years ago because of increasing spring temperatures (Stirling et al. 1999; Stirling and Parkinson 2006), which is also correlated with when female bears come ashore and when they are able to return to the ice (Cherry et al. 2013). Similarly, changes in summer sea ice conditions have resulted in an increase in the time spent on shore during summer and the proportion of the population on shore in the Southern Beaufort Sea and Chukchi Sea subpopulations (Rode et al. 2015; Atwood et al. 2016). Rode et al. (2015) also found that changes in sea ice likely explain shifts in summer distribution of the Chukchi Sea subpopulation, from use of both Alaskan and Russian coastal areas before reductions in sea ice, to almost exclusive use of coastal areas in Russia after reductions in sea ice.

Changes in the distribution of polar bears in response to changes in sea ice may increase exposure to some threats. If bears spend more time on land during the open water period, there is potential for increased disease transmission (Kirk et al. 2010; Prop et al. 2015; Wiig et al. 2015), particularly where bears concentrate at dwindling food resources (e.g., remains of subsistence-harvested whales at Barter Island, Cross Island, and Point Barrow). Aggregations could also increase the number of individuals exposed in the event of oil spills (BOEM 2014). Increased use of onshore habitat by polar bears has also led to an increase in the number of human-polar bear conflicts (Dyck 2006; Towns et al. 2009). In two studies from northern Canada, researchers found that the majority of polar bears killed in defense of human life occurred during the open water season (Stenhouse et al. 1988; Dyck 2006). Thus, as more bears come on shore during summer, remain on shore longer, and become increasingly food-stressed, the risk of human conflict increases along with a probable increase in defense-of-life kills.

Demographic response- Reduced access to preferred prey (i.e., ice seals; Thiemann et al. 2008) is likely to have demographic effects on polar bears. For example, in the Southern Beaufort Sea subpopulation, the period when sea ice is over the continental shelf has decreased significantly over the past decade, resulting in reduced body mass and productivity (Rode et al. 2010; Rode et al. 2014) and likely reduced population size (Bromaghin et al. 2015).

Changes in movements and seasonal distributions caused by climate change have been shown to affect polar bear nutrition and body condition (Stirling and Derocher 2012). Declining reproductive rates, subadult survival, and body mass have occurred because of longer fasting periods on land resulting from progressively earlier ice break-ups (Stirling et al. 1999; Derocher et al. 2004). Rode et al. (2010) suggested that declining sea ice has resulted in reduced body size and reproductive rates in the Southern Beaufort Sea subpopulation, and Regehr et al. (2007b) found that reduced sea ice habitat correlated with a reduction in the number of yearlings produced per female. In the Western Hudson Bay subpopulation, sea ice related declines in vital rates led to reduced abundance and declining population trends (Regehr et al. 2007b).

To date, however, researchers have documented demographic effects of sea ice loss in only a few of the 19 polar bear subpopulations (Regehr et al. 2007a; Rode et al. 2012). Rode et al. (2014) found that even though sea ice loss during summer had been substantial in the Chukchi Sea, polar bears in that subpopulation had not yet exhibited concomitant declines in body mass or productivity.

Reduced denning success- Climate change could negatively influence polar bear denning (Derocher et al. 2004). Insufficient snow would prevent den construction or result in use of poor sites where the roof could collapse (Derocher et al. 2004). Changes in the amount and timing of snowfall could also impact the thermal properties of dens, and because cubs are born helpless and remain in the den for three months before emergence, major changes in the thermal properties of dens could negatively impact cub survival (Derocher et al. 2004). Unusual rain events are projected to increase throughout the Arctic in winter (Liston and Hiemstra 2011), and increased rain in late winter and early spring could cause den collapse (Stirling and Smith 2004). The proportion of bears denning on ice has decreased for some subpopulations (Atwood et al. 2016) and not others, but the consequences of these shifts to cub survival are unknown.

While polar bears can successfully den on sea ice (Amstrup and Gardner 1994; Fishbach et al. 2007), for most subpopulations, maternity dens are located on land (Derocher et al. 2004). Female polar bears can repeatedly return to specific denning areas on land (Harington 1968; Ramsay and Stirling 1990; Amstrup and Gardner 1994). For bears to access preferred denning areas on land, pack ice must drift close enough or must freeze sufficiently early to allow pregnant females to walk or swim to the area by late October or early November (Derocher et al. 2004). As distance increases between the pack ice edge and coastal denning areas, it will become increasingly difficult for females to access terrestrial denning locations unless they are already on or near land. Distance between the ice edge and shore is one factor thought to limit denning in western Alaska in the Chukchi Sea subpopulation (Rode et al. 2015). Increased travel distances could negatively affect denning success and ultimately population size of polar bears (Aars et al. 2006).

Under most climate-change scenarios, the distance between the edge of the pack ice and land will increase during summer. Derocher et al. (2004) predicted that under future climate change scenarios, pregnant female polar bears will be unable to access many of the most important denning areas in the north coast of the central Beaufort Sea. Bergen et al. (2007) found that between 1979 and 2006, the minimum distance polar bears traveled to denning habitats in northeast Alaska increased by an average rate of 3.7-5.0 miles (6-8 km) per year, have nearly doubled since 1992, and would likely increase threefold by 2060.

Shipping and transportation- A decline in Arctic sea ice has increased the navigability of Arctic waters, with previously ice-covered sea routes now opening in summer, allowing access for commercial shipping, natural resource development, and tourism. Potential effects include fracturing of sea ice, disturbance of polar bears and their prey, increased human-polar bear encounters, introduction of waste/ litter and toxic pollutants into the environment, and increased risk of oil spills (PBRS 2015; USFWS 2017). Although shipping is expected to increase in Arctic waters in response to declining sea ice, the PBCMP concluded that trans-Arctic shipping poses minimal risk to polar bears in the long-term (USFWS 2017). Arctic nations are increasingly working cooperatively to track changes in shipping and manage possible increases in environmental impacts (USFWS 2017).

Oil and gas development- Polar bears overlap with both active and planned oil and gas operations throughout their range. Impacts on polar bears from industrial activities, such as oil and gas development, may include: disturbance from increasing human-bear interactions, resulting in direct displacement of polar bears, preclusion of polar bear use of preferred habitat (most notably, denning habitat); and/or displacement of primary prey. At the time of listing, the greatest level of oil and gas activity occurring within polar bear habitat was in the United States (Alaska). The Service determined that direct impacts on polar bears from oil and gas exploration, development, and production activities had been minimal and did not threaten the species overall. This conclusion was based primarily on: 1) the relatively limited and localized nature of the development activities; 2) existing mitigation measures that were in place; and 3) the availability of suitable alternative habitat for polar bears (USFWS 2017).

Although oil and gas exploration, development and production throughout the Arctic has declined since the time of the listing, offshore oil and gas activities may increase due a decline in summer sea ice (USFWS 2016. 2017). Plans are also underway for new oil and gas development and infrastructure in polar bear habitat (e.g., natural gas pipeline from Mackenzie Delta to southern Canada and exploration offshore from Greenland, Russia, and Alaska (Beaufort Sea). In the United States, potential effects on polar bears are mitigated through: 1) development of activity-specific human-bear interaction plans (to avoid disturbance), 2) safety and deterrence training for industry staff, 3) bear monitoring and reporting requirements, and 4) implementation of project-specific protection measures (e.g., 1 mile buffers around den sites). In 2015, the Department of the Interior released additional proposed regulations for future, offshore exploratory drilling activities in the U.S. Arctic (USDOI 2015). These regulations are intended to improve operational standards from mobilization to transport, drilling, and emergency response in a manner that the entire exploration operation can be conducted in a safe manner (USFWS 2017).

Contaminants- In the final rule listing the polar bear as a threatened species, the Service identified three categories of contaminants in the Arctic that present the greatest potential threats to polar bears and other marine mammals: persistent organic pollutants (POPs), heavy metals, and petroleum hydrocarbons (73 FR 28288-28291). In the PBCMP (USFWS 2017, p. 74), the Service concluded that contaminant concentrations were not thought to have population level effects on most polar bear populations, but noted that contaminants may become a threat in the future, especially in subpopulations experiencing declines related to nutritional stress brought on by sea ice loss and environmental changes.

Petroleum hydrocarbons/oil spills- Oil spills could potentially affect polar bears through: 1) affecting their ability to thermoregulate if their fur is oiled, 2) lethal or sublethal effects of ingestion of oil from grooming or eating contaminated prey, 3) habitat loss or decreased availability of preferred habitat; and 4) impacts to the abundance or health of prey. At the time of listing, no major oil spills had occurred in the marine environment within the range of polar bears and the Service had determined that the probability of a large oil spill occurring in polar bear habitat was low. We also noted that, in Alaska: 1) previous operations in the Beaufort and Chukchi seas have been conducted safely, and effects on wildlife and the environment have been minimized; 2) regulations exist to require pollution prevention and control; and 3) plans are reviewed by both leasing and wildlife agencies to ensure appropriate species-specific protective measures for polar bears are included. However, we also noted that increased oil and gas development coupled with increased shipping elevated the potential for spills, and if a large spill were to occur, it could have significant impacts to polar bears and their prey, depending on the size, location, and timing of the spill.

Persistent Organic Pollutants (POPs)- Persistent organic pollutants are organic chemicals resistant to biodegradation, and can affect apex predators such as polar bears that have low reproductive rates and high lipid levels because POPs tend to bioaccumulate and biomagnify in fatty tissues. While the levels of some contaminants, such as PCBs, generally seem to be decreasing in polar bears, others, such as hexachlorocyclohexanes, were relatively high, and newer compounds, such as polybrominated diphenyl ethers and perflouro-octane sulfonates, posed a potential future risk to polar bears. The effects of these contaminants at the population level are relatively unknown (USFWS 2017).

Metals- The most toxic or abundant elements in marine mammals are mercury, cadmium, selenium, and lead. Of these, mercury is of greatest concern because of its potential toxicity at relatively low concentrations and its tendency to bioaccumulate and biomagnify in the food web (73 FR 28291). In the final rule to list the polar bear (73 RF 28212) the Service noted that although mercury found in marine mammals often exceed levels that have caused effects in terrestrial mammals, most marine mammals appear to have evolved mechanisms that allow tolerance of higher concentrations of mercury (AMAP 2005). Although population-level effects are still widely un-documented for most polar bear subpopulations, increasing exposure to contaminants may become a more significant threat in the future, especially for declining polar bear subpopulations and/or bears experiencing nutritional stress (USFWS 2017).

Ecotourism- Polar bear viewing and photography are popular forms of tourism that occur primarily in Churchill, Canada; Svalbard, Norway; and the north coast of Alaska (the communities of Kaktovik and Barrow). In the final listing rule for the polar bear, the Service noted that, while it is unlikely that properly regulated tourism will have a negative effect on polar bear subpopulations, increasing levels of public viewing and photography in polar bear habitat might lead to increased human-polar bear interactions. Tourism can also result in inadvertent displacement of polar bears from preferred habitats or alter natural behaviors (Lentfer 1990; Dyck and Baydack 2004, Eckhardt 2005). Conversely, tourism can have the positive effect of increasing the worldwide constituency of people with an interest in polar bears and their conservation (USFWS 2017).

Polar bear critical habitat

The polar bear was listed as a threatened species throughout its range, but the regulatory authority to designate critical habitat (50 CFR 424.12(h)) is limited to areas of U.S. jurisdiction, which in the case of the polar bear includes Alaska and adjacent territorial and U.S. waters. The Service designated 484,734 square kilometers of critical habitat for the polar bear in 2010 (75 FR 76086).

<u>Description of Polar Bear Critical Habitat</u>- Designation of critical habitat requires, within the geographical area occupied by the polar bear, identification of the physical or biological features (PBFs) essential to the conservation of the species that may require special management or protection. We identified the following three PBFs essential to the conservation of the polar bear:

1) Sea-ice habitat used for feeding, breeding, denning, and movement, which is further defined as sea-ice over waters 300 m or less in depth that occurs over the continental shelf with adequate prey resources (primarily ringed and bearded seals) to support polar bears.
2) Terrestrial denning habitat, which includes topographic features, such as coastal bluffs and river banks, with suitable macrohabitat characteristics. Suitable macrohabitat characteristics are:
    a) Steep, stable slopes (range 15.5–50.0°), with heights ranging from 1.3 to 34 m, and with water or relatively level ground below the slope and relatively flat terrain above the slope;
    b) Unobstructed, undisturbed access between den sites and the coast;

c) Sea-ice in proximity to terrestrial denning habitat prior to the onset of denning during the fall to provide access to terrestrial den sites; and
d) The absence of disturbance from humans and human activities that might attract other polar bears.

3) Barrier island habitat used for denning, refuge from human disturbance, and movements along the coast to access maternal den and optimal feeding habitat, including all barrier islands along the Alaska coast and their associated spits, within the range of the polar bear in the United States, and the water, ice, and terrestrial habitat within 1.6 km of these islands.

Considering the three PBFs, and the quantity and spatial arrangement of them necessary to support conservation of the polar bear, we designated the following three critical habitat units, each of which contains at least one of the PBFs:

Unit 1, Sea Ice Habitat- Sea ice habitat covers approximately 464,924 km^2 of primarily marine habitat extending from the mean high tide line of the Alaska coast seaward to the 300 m depth contour, and spans west to the international date line, north to the Exclusive Economic Zone, east to the US–Canada border, and south to the southern limit of the known distribution of the Chukchi Sea polar bear subpopulation. Sea ice is used by polar bears for the majority of their life cycle for activities such as hunting seals, breeding, denning, and traveling.

Unit 2, Terrestrial Denning Habitat- Terrestrial denning habitat occurs within approximately 14,652 km^2 of land along the northern coast of Alaska from the Canadian border west to near Point Barrow. It encompasses approximately 95% of the known historical terrestrial den sites from the Southern Beaufort Sea subpopulation (Durner et al. 2009). The inland extent of denning distinctly varies between two longitudinal zones, with 95% of known dens between the Alaska/Canada border and Kavik River occurring within 32 km of the mainland coast, and 95% of dens between the Kavik River and Utqiaġvik occurring within 8 km of the mainland coast. The inland boundary of the Terrestrial Denning Unit reflects this difference in the distribution of known den sites, with the boundary drawn at 32 km inland between the Alaska/Canada border and the Kavik River and 8 km inland between the Kavik River and Utqiaġvik.

Unit 3, Barrier Island Habitat- Barrier island habitat covers approximately 10,575 km^2 of barrier islands and the associated complex of spits, water, ice, and terrestrial habitats within 1.6 km of barrier islands. There is significant overlap between this unit and the Terrestrial Denning and Sea Ice units. Similar to the Sea Ice Unit, the Barrier Island Unit extends from near the Alaska/Canada Border to near Hooper Bay in southwestern Alaska but only occurs where barrier islands exist.

Exclusions within Designated Polar Bear Critical Habitat- Within the Terrestrial Denning and Barrier Island units, critical habitat does not include manmade structures (e.g., houses, gravel roads, airport runways and facilities, pipelines, well heads, generator plants, construction camps, sewage treatment plants, hotels, docks, seawalls, and the land on which they were constructed) that existed on the effective date of the rule. The two communities of Barrow and Kaktovik were also excluded.

ENVIRONMENTAL BASELINE

Regulations implementing the ESA (50 CFR §402.02) define the environmental baseline to include the past and present impacts of all Federal, State, or private actions and other human actions in the Action Area. Also included are anticipated impacts of all proposed Federal projects in the Action Area that have undergone section 7 consultation and the impacts of State and private actions concurrent with the consultation in progress.

Spectacled Eiders

Spectacled eiders use portions of the Action Area during spring and summer to breed, nest, and raise broods. This BO utilized multiple datasets to assess eider density and trend in the GMT-2 Action Area. Available datasets include both smaller-scale regional studies funded or conducted by industry to inform management of proposed projects (Seiser and Johnson 2018a, Seiser and Johnson 2018b, Johnson et al. 2018) and larger-scale aerial surveys of the ACP conducted by the Service to monitor populations (Wilson et al. 2017).

Long-term studies have been conducted by ABR Inc. on behalf of CPAI and the BLM in the Colville Study Area (CSA), the Kuparuk Study Area (KSA), and NPR-A Study Area (NPR-ASA), and portions of these study areas overlap with the Action Area (Figure 6). Aerial surveys were conducted in the CSA for 25 years (1993 − 1998, 2000 − 2017) and in the NPR-ASA for 14 years (1999 − 2006 and 2008 − 2014). Ground-based eider nest searches were conducted in the CSA (Alpine, CD-2, CD-3, CD-4, CD-5, and Alaska Clean Seas spill-response sites) in 1993 – 2007 and 2009 − 2017 and in the NPR-ASA in 1999 − 2004, 2009, and 2013 − 2014 (Seiser and Johnson 2018a, Seiser and Johnson 2018b, Johnson et al. 2015; Johnson pers. comm. 2018). These studies provide recent site-specific density and trend data in the GMT-2 Action Area. We summarize this information below.

The average indicated density for pre-nesting spectacled eiders over a 25-year study period is 0.11 individuals/km^2 (Johnson et al. 2018). The CSA is further partitioned into CD North and CD South, with greater densities in CD North (Figure 7).

> *All observations of pre-nesting Spectacled Eiders in the [CSA] in 2017 were of small groups of 1–3 birds. The CD North subarea contained 85% of the Spectacled Eiders observed, whereas the CD South subarea contained 9%. The density of pre-nesting Spectacled Eiders in the CD North subarea during 2017 (0.27 indicated birds/km²) was twice the density recorded on the much larger Colville Delta study area (0.13 indicated birds/km²). The distribution of pre-nesting Spectacled Eiders in 2017 was typical of previous years, when densities were highest north of Alpine and low south and northeast of Alpine* (Johnson et al. 2018).

Compared with 14 previous years of pre-nesting surveys, the density of spectacled eiders in the NPR-ASA was near average in 2014 with the density being only 21 percent of the density on the CSA (Johnson et al. 2015). Over the entire NPR-ASA spectacled eider densities were 0.02 observed eiders/km^2 and 0.03 indicated eiders/km^2 in 2014 (Johnson et al. 2015). Spectacled eiders were observed only in two subareas (Alpine West and Fish Creek Delta, Figure 6) in the NPR-ASA in 2014, with the highest density in Alpine West (0.14 indicated birds/km^2) (Johnson et al. 2015). The mean density distribution also shows high densities have occurred in Alpine West near the Colville River, as well as near the coast and Fish and Judy creeks in the western portions of the NPR-ASA (Johnson et al. 2015).

In 2017, ground-based nest searches for eiders were conducted in select areas of the CSA and NPR-ASA (Seiser and Johnson 2018a). These ground-based nest searches have been conducted for the past 9 years in preparation for planned tundra activity during the nesting season (Seiser and Johnson 2018a). In 2017, only 9 qualifying Alaska Clean Seas sites and 3 water-source lakes were searched for eider nests; nest searches along the CD-3 – CD-2 ice road, and CD-3 drill pad and airstrip were not conducted (Seiser and Johnson 2018a). The majority of the area where the ground-based nest searches took place in 2017 is more than 5 miles from the proposed GMT-2 pad and road. During the 2017 nest survey, no spectacled eider nests were found within the select areas of the CSA and NPR-ASA (Seiser and Johnson 2018a).

In 2017, ground-based nest searches for eiders were also conducted in potential nesting habitat within 200 m of each side of the GMT-1 ice road, ice pads, water-source access points, and hydrotest locations between the CD-4 road and the GMT-1 pad (Figures 1 and 2 in Seizer and Johnson 2018b). No spectacled eider nests were found during these 2017 nest surveys (Seiser and Johnson 2018b).

Finally, in 2017, ground-based searches for eiders were conducted near DS-1E, DS-2C, DS-2F, DS-2T northern basin complex (2T [N]), DS-2T southern basin complex (2T [S]), and Mine Site E (Figure 1 in Morgan and Attanas 2018) of the KSA. These areas were searched because nesting spectacled Eiders have been observed frequently and repeatedly since ground-based nest searches began in 1993 in the area (Morgan and Attanas 2018). Eight spectacled Eider nests were located in 2017 (Morgan and Attanas 2018); all were more than five miles from the Action Area.

Population growth rates in both the CSA and NPR-ASA were slightly positive but not statistically significant (Johnson et al. 2018 and Johnson et al. 2015, respectively).

Pre-nesting spectacled eiders used 18 of 24 available habitats during 24 years of aerial surveys on the CSA. Seven habitats were preferred (i.e., use was significantly greater than availability, $P \leq 0.05$) by pre-nesting spectacled eiders: three primarily coastal salt-affected habitats (Brackish Water, Salt Marsh, and Salt-killed Tundra), three aquatic habitats (Deep Open Water with Islands or Polygonized Margins, Shallow Open Water with Islands or Polygonized Margins, and Grass Marsh), and one terrestrial habitat (Deep Polygon Complex) (Johnson et al. 2018). Deep Polygon Complex, which consists of a mosaic of small, deep, polygon ponds with relatively narrow vegetated rims and sometimes with islets, is notable because of its disproportionate use; it was used by 28 percent of the spectacled eider groups yet comprised only 2.7 percent of the CSA (Johnson et al. 2018). Six habitats were avoided (i.e., use significantly less than availability), including Open Nearshore Water, Tidal Flat Barrens, River or Stream, Moist Sedge-Shrub Meadow, Tall, Low, or Dwarf Shrub, and Barrens. All other habitats were used in proportion to their availability (Johnson et al. 2018), indicating no preference for or avoidance of these habitats.

Pre-nesting spectacled eiders used 13 of 26 available habitats in the NPR-ASA during 14 years of aerial surveys (Johnson et al. 2015), preferring five habitats, four of which also were preferred in the CSA: Brackish Water, Salt Marsh, Shallow Open Water with Islands or Polygonized Margins, and Grass Marsh (Johnson et al. 2015). Two terrestrial habitats (Moist Sedge-Shrub Meadow and Moist Tussock Tundra) were significantly avoided, which is notable because these comprise the majority of area within the NPR-ASA (Johnson et al. 2015). The habitat selection information for both the CSA and NPR-ASA is relevant because the permanent gravel footprint of GMT-2 would occur in habitat types that were either avoided or were not selected for by spectacled eiders (depending on study area and habitat type) in the pre-nesting period.

Annual aerial surveys to monitor the distribution, abundance, and growth rate of 29 waterbird species breeding on the ACP have been conducted by the Service since 1986 (Wilson et al. 2017). In addition to the ABR Inc. surveys summarized in previous paragraphs, these aerial surveys provide larger-scale regional context for local distribution and density estimates and are more robust in evaluating population trend. Prior to 2007, two historical surveys with slightly different timing and coverage (i.e., the original Arctic Coastal Plain [Original ACP] Survey [1986-2006; Brackney and King 1993, Mallek et al. 2006], and the North Slope Eider [NSE] survey [1992-2006; Larned et al. 2006]) were conducted. In 2007, the Original ACP and NSE surveys were merged (Stehn et al. 2013), and the re-designed survey (hereafter, "ACP Survey;" Larned et al. 2007, Larned et al. 2012, Stehn et al. 2013, Stehn 2014) has been flown annually since 2007.

The most recently synthesized aerial survey results (USFWS 2015b, covering survey years 2012 – 2015) provide a means to evaluate the relative density of spectacled eiders across the ACP and provide an additional means to assess density within the Action Area. Using GIS, the range in observed density across the ACP was subdivided into five categories or contours, each of which contains a range in density and was defined by the lower and upper limits and median of the range within that contour. The GMT-2 Action Area occurs within the two lowest density contours: 0 – 0.034 eiders/km^2 (407 km^2 [65%] of the Action Area) and 0.035 – 0.101 eiders/km^2 (218 km^2 [35%] of the Action Area). Thus, consistent with ABR's surveys, our aerial surveys show that spectacled eiders occur at very low density (up to ~1 spectacled eider per 30 km^2) or low density (up to ~1 spectacled eider per 10 km^2) within the GMT-2 Action Area. The ACP survey data also allow assessment of trend, which was essentially stable over the interval 2007-2016 (growth rate 0.997; 95% CI 0.954-1.043; Wilson et al. 2017).

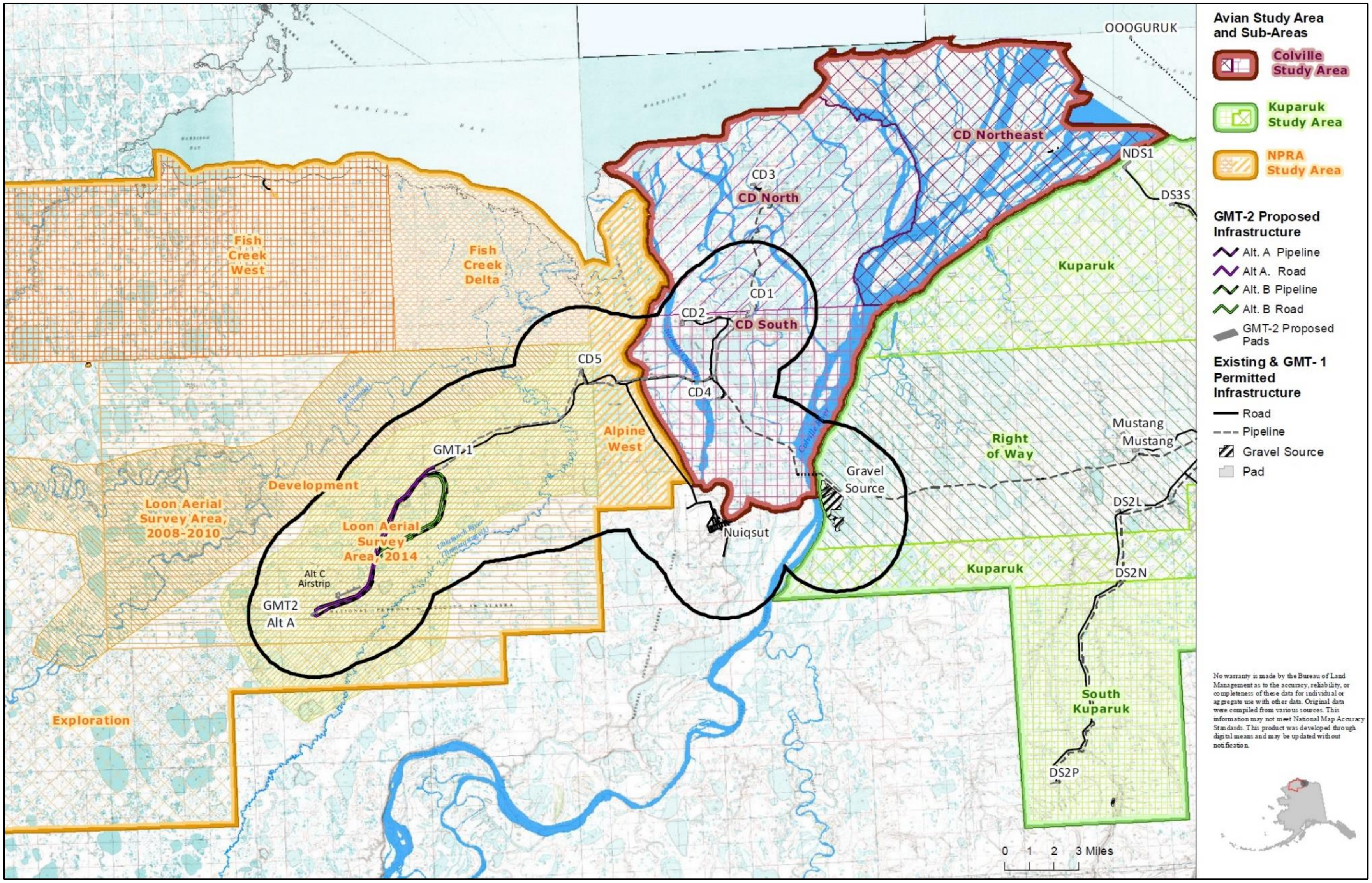


Figure 4. Avian studies in proximity to the GMT-2 Action Area.

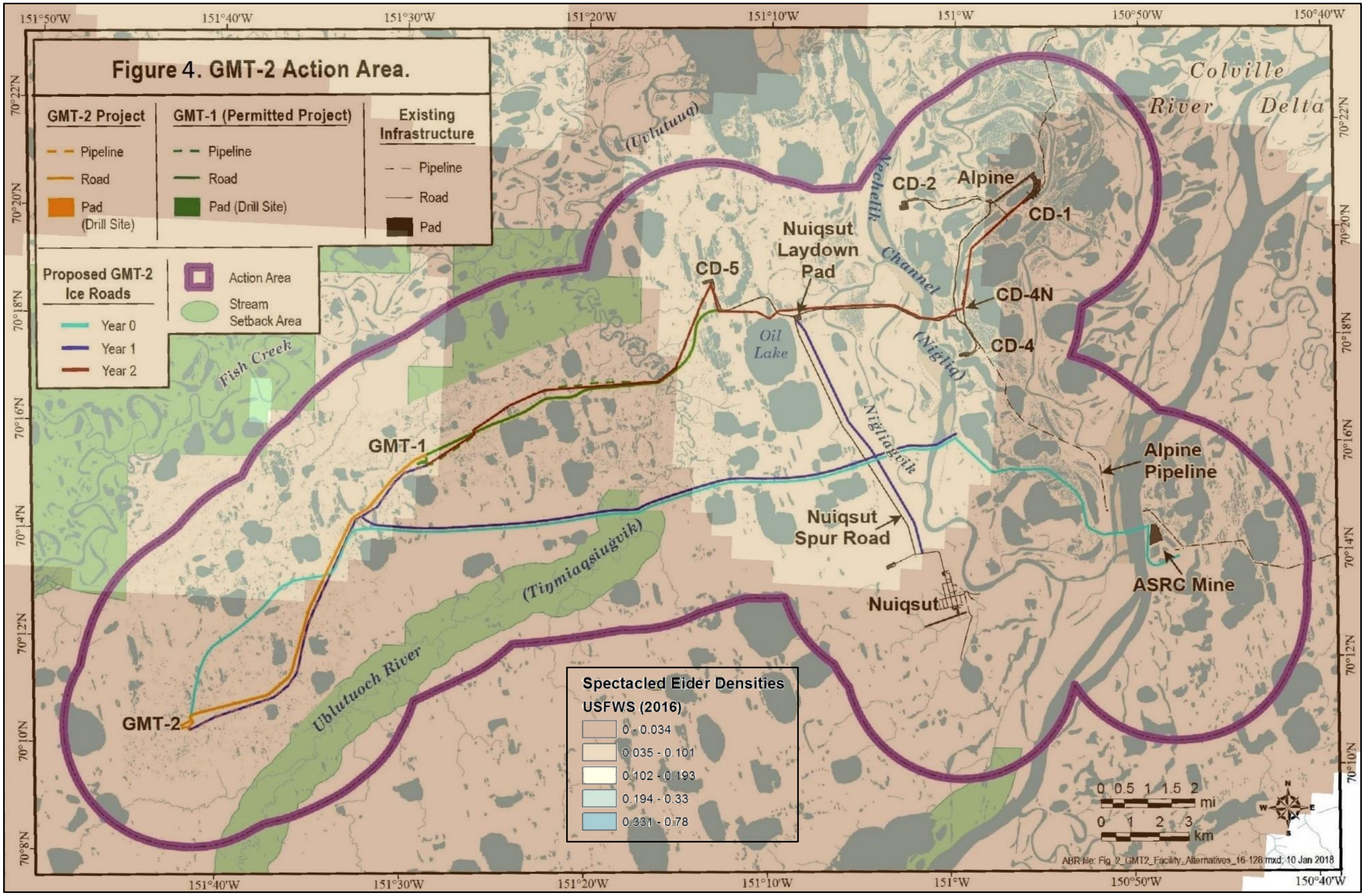


Figure 6. Spectacled eider densities in relation to GMT-2 Preferred Alternative Action Area. Source data USFWS 2016 unpublished.

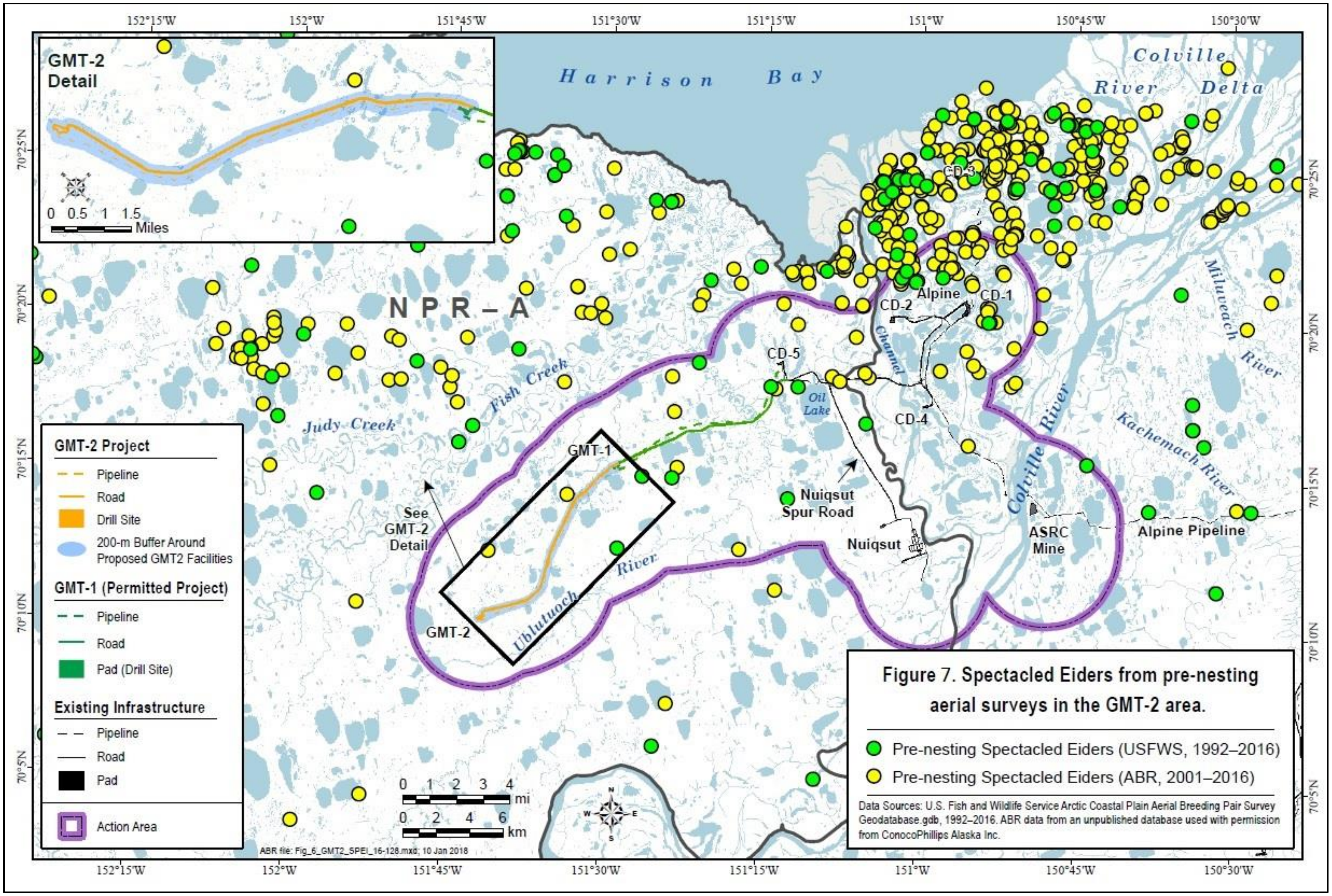


Figure 7. Locations of spectacled eiders from pre-nesting aerial surveys and ground-based nest surveys conducted in the area of GMT-2. From BLM (2018a).

Possible Threats in the Action Area

Factors which may have contributed to the current status of spectacled eiders in the action area include but are not limited to, long-term habitat loss through development and disturbance, environmental contaminants, increased predator populations, collisions with structures, research, climate change, and subsistence harvest. These impacts are occurring throughout much of the species' range, including within the action area.

Habitat loss through development and disturbance- Nesting habitat loss on the North Slope has been limited, and is not believed to have caused population declines or constrained population recovery. However, loss of nesting habitat likely has affected spectacled eiders at the individual level and local scale in some areas.

Development within the Action Area includes the Alpine airstrip, drill pads, roads, pipelines and associated infrastructure; GMT-1 pad, road, pipeline; the ASRC mine site; and the community of Nuiqsut, the dumpsite, spur road and airstrip.

Environmental contaminants- Deposition of lead shot in tundra wetlands and shallow marine habitat where eiders forage poses a threat to listed eiders. The toxic effects of ingestion of lead poisoning may vary among individuals, but include lethal and sublethal effects (Hoffman 1990). Ingestion of spent lead shot reduced survival rates of spectacled eiders on the Y-K Delta (Franson et al. 1995, Flint et al. 1997, Flint and Grand 1997, Grand et al. 1998, Flint and Herzog 1999). Ingestion of lead shot by listed eiders could occur during the breeding season, particularly for breeding hens and young birds foraging in shallow tundra ponds. Exposure may decline during incubation, when hens largely forgo foraging, but the need to forage resumes after hatching, and both hens and ducklings may encounter and ingest lead shot. Waterfowl hunting with lead shot is prohibited throughout Alaska, and for hunting all birds on the North Slope. However, its sale and use continues in villages, and lead deposited in wetlands previously will presumably be present in the environment and ingested by waterfowl for some unknown period into the future.

Other contaminants, including petroleum hydrocarbons from local sources or globally distributed heavy metals, may also affect listed eiders. For example, spectacled eiders wintering near St. Lawrence Island exhibited high concentrations of metals as well as subtle biochemical changes (Trust et al. 2000). Additionally, spectacled eiders breeding and staging on the Colville River Delta may have been exposed to petroleum hydrocarbons, heavy metals, and other contaminants from nearby industrial development. However, risk of contaminant exposure and potential affects to listed eiders in the Action Area are unknown.

Increased Predator Populations- Predator and scavenger populations have likely increased near villages and industrial infrastructure on the ACP in recent decades (Eberhardt et al. 1983, Day 1998, Powell and Backensto 2009). Reduced fox trapping, anthropogenic food sources in villages, and an increase in availability of nesting/denning sites at human-built structures may have resulted in increased numbers of arctic foxes (*Alopex lagopus*), common ravens (*Corvus corax*), and glaucous gulls (*Larus hyperboreus*) in developed areas of the ACP (Day 1998). For example, ravens are highly efficient egg predators (Day 1998), and have been observed depredating Steller's eider nests near Utqiaġvik (Quakenbush et al. 2004). Ravens also appear to have expanded their breeding range on the ACP by using manmade structures for nest sites (Day 1998). Therefore, as the scale of development increases, the number of artificial nest sites and sources of anthropogenic food will also increase, and the reproductive success of spectacled eiders could decrease.

Collisions with structures- Migratory birds suffer considerable mortality from collisions with man-made structures (Manville 2004) including light poles, buildings, drill rigs, guyed towers or poles, and overhead powerlines. Birds are particularly at risk of collision when visibility is impaired by darkness or inclement weather (Weir 1976). There is also evidence that lights on structures increase collision risk (Reed et al. 1985, Russell 2005, numerous authors cited by Manville 2000). Anderson and Murphy (1988) monitored bird behavior and strikes to a 12.5 km power line in the Lisburn area (the southern portion of the Prudhoe Bay oil fields) during 1986 and 1987. They documented lethal wire collisions in 18 species of birds, including at least one eider. Results indicated that strike rate was related to flight behavior, in particular the height of flight above ground (or water) level. Johnson and Richardson (1982) in their study of migratory bird behavior along the Beaufort Sea coast reported that 88% of eiders flew below an estimated altitude of 10 m (32 ft) and well over half flew below 5 m (16 ft). Thus, structures as low as < 10 m in height pose a collision risk to migrating eiders.

Although several factors confound accurate collision estimates for listed eiders, including: 1) temporal changes in eider density and distribution, 2) lack of understanding how feature configurations contribute to avian collisions, and 3) how variations in weather and lighting conditions effect probability of collisions; an unknown level of collision risk remains over the life of man-made structures. However, some design considerations may reduce or eliminate collision risk for listed eiders, including shielded lighting to limit outward-radiating light and minimize potential attraction and/or disorienting effects to eiders, and avoidance of the use of guyed towers or overhead lines).

Research- Field-based scientific research has increased on the ACP in response to interest in climate change and its effects on Arctic ecosystems. While some activities have no impact on spectacled eiders (e.g., remote sensing tools are used or field work occurs outside the nesting season), aerial surveys, on-tundra activities, or remote aircraft landings may disturb listed eiders. Many of these activities are considered in intra-Service consultations, or under a programmatic consultation with the BLM for summer activities in the NPR-A. We are aware of no current or planned research activities within the action area that would affect listed eiders, however.

Climate Change- The environmental baseline includes consideration of ongoing and projected changes in climate. This BO includes consideration of ongoing and projected changes in climate using terms as defined by the Intergovernmental Panel on Climate Change (IPCC). “Climate” refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2014, pp. 119 – 120). The term “climate change” thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2014, p. 120). Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2014, pp. 49 – 52).

High latitude regions, such as Alaska's North Slope, are thought to be especially sensitive to effects of climate change (Quinlan et al. 2005, Schindler and Smol 2006, Smol et al. 2005). While climate change will likely affect individual organisms and communities, it is difficult to predict with certainty how these effects will manifest. Biological, climatological, and hydrologic components of the ecosystem are interlinked and operate on varied spatial, temporal, and organizational scales with feedback between components (Hinzman et al. 2005).

There are a wide variety of changes occurring across the circumpolar Arctic. Arctic landscapes are dominated by freshwater wetlands (Quinlan et al. 2005), which listed eiders depend on for forage and brood rearing. As permafrost thaws, some water bodies are draining (Smith et al. 2005, Oechel et al. 1995), or drying due to increased evaporation and evapotranspiration during prolonged ice-free periods (Schindler and Smol 2006, and Smol and Douglas 2007). In addition, productivity of some lakes and ponds is increasing in correlation with elevated nutrient inputs from thawing soil (Quinlan et al. 2005, Smol et al. 2005, Hinzman et al. 2005, and Chapin et al. 1995) and other changes in water chemistry or temperature are altering algal and invertebrate communities, which form the basis of the Arctic food web (Smol et al. 2005, Quinlan et al. 2005).

With reduced summer sea ice coverage, the frequency and magnitude of coastal storm surges has increased. During these events, coastal lakes and low lying wetlands are often breached, altering soil/water chemistry as well as floral and faunal communities (USGS 2006). When coupled with softer, semi-thawed permafrost, reductions in sea ice have significantly increased coastal erosion rates (USGS 2006), which may reduce available coastal tundra habitat over time.

Changes in precipitation patterns, air and soil temperatures, and water chemistry are also affecting terrestrial communities (Hinzman et al. 2005, Prowse et al. 2006, Chapin et al. 1995), and the range of some boreal vegetation species is expanding northward (Callaghan et al. 2004). Climate-induced shifts in distributions of predators, parasites, and disease vectors may also have significant effects on listed and un-listed species. Climate change may also cause mismatched phenology among listed eider migration, development of tundra wetland invertebrate stocks, fluctuation of small mammal populations, and corresponding abundance of predators (Callaghan et al. 2004).

While the impacts of climate change are on-going and the ultimate effects on spectacled eiders within the action area are unclear, species with small populations are more vulnerable to the impacts of environmental change (Crick 2004). Some species may adapt and thrive under changing environmental conditions, while others decline or suffer reduced biological fitness.

Subsistence harvest- Prior to the listing of spectacled eiders under the ESA, some level of subsistence harvest of this species occurred across the North Slope (Braund et al. 1993). Hunting for spectacled eiders was closed in 1991 by Alaska State regulations and Service policy, and outreach efforts have been conducted by the North Slope Borough, BLM, and Service to encourage compliance. Harvest surveys and other information indicate that spectacled eiders continue to be taken during subsistence hunting on the North Slope, although estimates of the number taken are imprecise, and numerous unquantifiable biases compromise the reliability of estimates. Continued efforts to eliminate shooting are being implemented in North Slope villages. Intra-service consultation on the promulgation of the Migratory Bird Subsistence Hunting Regulations is conducted annually.

Polar Bears

Typically, most polar bears occur in the active ice zone, far offshore, hunting throughout the year. Bears also spend a limited time on land to feed or move to other areas, although melting sea ice may result in increased numbers of polar bears moving from the offshore ice onto land. During fall and winter months, polar bears use the terrestrial environment to establish maternal den sites (pregnant females), and/or exploit food resources (e.g., whale carcasses). Polar bears may also abandon melting sea ice and/or use the terrestrial environment to transit to other areas. The available information indicates that polar bears occur near the Action Area with some regularity, although most sightings occurred north of the Action Area, closer to the Beaufort Sea coast, and most likely correspond to transient individuals (males and non-denning females) and are not indicative of use of the area for denning (Figure 8).

Female polar bears in the Southern Beaufort Sea subpopulation establish maternal dens on pack ice or onshore, although the distribution of dens appears to be changing over time. Fishbach et al. (2007) found that the proportion denning on pack ice (as opposed to onshore) decreased from 62% from 1985–1994 to 37% in 1998–2004, and those denning on sea ice shifted from west to east. They attributed both trends to deteriorating sea ice conditions in the western Beaufort Sea (Fishbach et al. 2007).

Potential polar bear denning habitat is generally definable by the physical features that facilitate the capture of sufficient snow to allow den excavation (Durner et al. 2003). In terrestrial habitats, these conditions are typically found along the shores of rivers, lakes and the coast. Orientation of these landforms, wind speed and direction, and snow amount and timing also influence the suitability of denning habitat (Liston 2012). The two dominant wind directions associated with storm events that deposit the most snow (storms with wind speeds above approximately 5 m/s, assuming snow is available to be transported) on the North Slope of the Arctic coast are northeast to east (45.0 to 90.0 degrees) and west southwest to southwest (247.5 to 270.0 degrees; Liston 2012). Suitable denning habitat within the Action Area primarily occurs along the Ublutuoch River (Tiŋmiaqsiuġvik) and Niġliq and Niġliagvik channels of the Colville River (Figures 8 and 9).

Only two dens have been found near the Action Area, one within the Action Area in 1917 and one ~ 1.8 km outside the Action Area in 2007 (Figure 8), possibly because most dens in this region occur closer to the coast (≥ 95% of records of polar bear dens [n=19] between the Kavik River and Utqiaġvik were within 4.5 km of the coast [Durner et al. 2009]). Additionally, suitable denning habitat within the Action Area is sparse, and polar bears generally den at a low density across the landscape (Harington 1968, Lentfer and Hensel 1980, Amstrup and Gardner 1994).

We also expect transient (non-denning) polar bears to pass through the Action Area only infrequently, as they generally remain close to the coast. While no systematic polar bear surveys have been conducted in the Alpine Satellites Development project area, the majority of opportunistic sightings (since 1917) occured north and northeast of the GMT-2 Action Area and much closer to the coast (Figure 9).

Southern Beaufort Sea Subpopulation

Polar bears in the Action Area are considered to belong to Southern Beaufort Sea (SBS) subpopulation (Figure 5). Radio-telemetry data and other marking data suggest that the SBS subpopulation ranges between Icy Cape, Alaska and Pearce Point, Northwest Territories, Canada. The SBS subpopulation had an estimated population size of approximately 900 bears in 2010 (Bromaghin et al. 2015), which is a significant reduction from previous estimates of approximately 1,800 in 1986 (Amstrup et al. 1986) and 1,526 in 2006 (Regehr et al. 2006). In addition, analyses of over 20 years of data on size and body condition of bears in this subpopulation demonstrated declines for most sex and age classes and significant negative relationships between annual sea ice availability and body condition (Rode et al. 2010). This suggests the SBS subpopulation is currently declining due to sea ice loss (USFWS 2016a).

Threats and Possible Stressors in the Action Area

As stated in the section, *Threats to the Polar Bear,* the primary threat to polar bears throughout their range is the projected future loss of sea ice resulting from climate change. Although significant changes in summer sea ice have already occurred in the past few years, the prognosis for continued change and how those changes will affect polar bear populations is not yet known. Other factors that may affect polar bears in the Action Area are also discussed.

Subsistence Harvest- The Inuvialuit-Inupiat Polar Bear Management Agreement, a Native-to-Native agreement, between the Inupiat from Alaska and the Inuvialuit in Canada was created for the SBS subpopulation of polar bears in 1988. Polar bears harvested from the communities of Utqiaġvik, Nuiqsut, Kaktovik, Wainwright, and Atqasuk are currently considered part of the SBS subpopulation and thus are subject to the terms of the Inuvialuit-Inupiat Polar Bear Management Agreement. The agreement establishes quotas and recommendations concerning protection of denning females, family groups, and methods of harvest. In 1988, the Inuvialuit-Inupiat Council (Council) established a sustainable harvest quota of 80 bears for the SBS subpopulation. Since 1980, Native subsistence harvest of polar bears from the SBS has remained relatively consistent at an average of 36 per year.

Polar Bear Research- Currently, several ongoing polar bear research programs take place along the ACP. The goal of these programs is to gain information on the ecology and population dynamics of polar bears to help inform management decisions, especially in light of climate change. These activities may cause short-term adverse effects to individual polar bears targeted in survey and capture efforts and may incidentally disturb those nearby. In rare cases, research efforts may lead to injury or death of individual polar bears. Polar bear research is authorized through permits issued under the MMPA. These permits include estimates of the maximum number of bears likely to be harassed, subjected to biopsy darting, captured, etc., and include a condition that halts a study if a specified number of deaths, usually four to five, occurs during the life of the permit, which typically lasts five years.

Incidental Take Regulations- Incidental Take Regulations (ITRs) for the Beaufort and Chukchi seas have been issued under the MMPA for oil and gas activities in and adjacent to the Beaufort and Chukchi seas since the early 1990s. Oil and gas companies can obtain LOAs under the ITRs, and these LOAs include reporting requirements. Under the Beaufort Sea ITRs, the oil and gas industry observed an average 306 polar bears annually (range 170 – 420 in 2006 – 2009). About 81% of observed bears showed no change in behavior, 4% fled from the source of disturbance, and the remaining 15% were subject to intentional hazing or other deterrence actions (described below). Because few oil and gas activities have occurred in the Chukchi Sea and adjacent area, few polar bear sightings have been reported by industry. The current Chukchi Sea ITRs expire in 2018, and the Service will likely re-issue these regulations.

Deterrence Activities and Intentional Take Authorization- Polar bear deterrence activities associated with Industry and non-Industry activities take place in the Action Area. The Service previously consulted on a Final Rule regarding passive and preventative deterrence measures any person can use when working in polar bear habitat (75 FR 61631). These passive deterrence measures are expected to cause only short-term changes in behavior, such as bears departing the area. However, intentional take LOAs also allow trained individuals to use other mechanisms (e.g., non-lethal projectiles) to deter polar bears from human structures and activities. Industry-related intentional take authorizations are described further in Section 6 (Effects of the Action) of this document.

Climate Change- For a more complete discussion of effects of climate change in the arctic, see the section, *Climate Change* for spectacled eiders. In addition to the loss of sea ice, climate change may affect polar bears and their habitat in a variety of other ways. For example, increasing temperatures in the arctic are likely to result in increased frequency of rain-on-snow events, which will affect the insulation and structure of dens, potentially reducing the production of cubs (and ice seals, which are the primary prey of polar bears). However, uncertainty regarding the frequency of these events and their effects on productivity makes predicting their impact impossible.

<u>Summary</u>
The primary factor affecting the status of polar bears in the Action Area is the loss of sea ice. In addition, polar bears are taken by subsistence hunters annually, but this harvest is managed through international agreements to ensure sustainability. Other stressors are not thought to significantly affect polar bear populations; however, all stressors could become more significant in combination with expected loss of sea ice. While polar bears may be present in the Action Area, we expect them to occur infrequently, with the greatest likelihood of occurrence in the northern portions of Action Area, which is nearest to the coast.

Polar Bear Critical Habitat
In this section, we discuss the condition of the critical habitat in the Action Area and the factors responsible for that condition, and the value of the critical habitat in the Action Area for the conservation/recovery of the listed species. We consider the Action Area as the 4.0-km zone around the proposed GMT-2 drill site and all associated support facilities, and we continue to consider this zone to encompass all potential effects of the Proposed Action on threatened species and designated critical habitat. Only ~ 16% (~ 103 km^2) of the Action Area is within the Terrestrial Denning Unit of polar bear critical habitat (Figure 8), and therefore we focus on the area of overlap between critical habitat and the Action Area and only mention the surrounding environment when it is relevant or provides useful context. Within critical habitat, the primary factors affecting the condition of critical habitat are climate change, which is affecting polar bear

habitat broadly throughout the Arctic, and oil and gas development and the associated infrastructure and human activities, which is relevant to conditions within critical habitat at the local scale.

The primary factor affecting the condition of polar bear habitat is the decline of sea ice due to changing climate, caused by increasing concentrations of greenhouse gasses. This generalization applies to the species' habitat as a whole as well as to designated critical habitat, which occurs exclusively within Alaska. Most of the identified mechanisms by which climate change will affect polar bear habitat pertain to marine habitats, including sea ice and barrier islands, although the PBCMP (USFWS 2016) summarizes mechanisms by which denning (including in the terrestrial environment) could be affected by climate change. These include insufficient snowfall and/or increased warming or rainfall in winter, all of which could impact the fitness or survival of cubs by weakening the structural stability of dens or decreasing their insulation qualities (see Derocher et al. 2004). At this time, however, we have no reason to believe that climate change has affected the limited extent of suitable denning habitat within the Action Area.

In addition to climate change, the condition of critical habitat within the Action Area has been affected by the presence of industrial oil development and the associated human activities. Within critical habitat in the Action Area, permanent human-built structures include Alpine, CD-2, CD-5, and the permanent gravel road that connects GMT-1 with the Alpine oil development complex to the east and the village of Nuiqsut to the south (Figure 8).

When evaluating the baseline condition of PCEs in the Action Area, we considered actions that are ongoing or were consulted on previously. They include research on polar bears by USGS and the Service, summer activities and research in NPR-A, contaminated site remediation and restoration, and development projects in and adjacent to Nuiqsut. We have previously evaluated the effects of some oil and gas activities in the Action Area in consultations on other actions, such as the LOAs issued pursuant to these ITRs. All of these previously consulted upon activities had only short-term, localized effects to critical habitat, and none approach the level of adverse modification.

Although previous actions within critical habitat in the Action Area have not physically altered the physical and biological features (PBFs) of terrestrial denning habitat, human activities related to the proposed action may conceivably disturb polar bears and thereby dissuade use of critical habitat. However, potential impacts of human activities to denning are limited by the following factors:

> ITRs that authorize (under the Marine Mammal Protection Act) the nonlethal, incidental, unintentional take of small numbers of polar bears during oil and gas industry activities in the Beaufort Sea and adjacent northern coast of Alaska include several requirements that serve to reduce potential disturbance of denning polar bears. LOAs, which are the applicant- and project-specific mechanism of authorizing incidental take under provisions of the ITRs, require:

- Efforts to locate occupied polar bear dens within and near areas of operation, utilizing appropriate tools, such as forward-looking infrared (FLIR) imagery and/or polar bear scent-trained dogs. All observed or suspected polar bear dens must be reported to the Service prior to the initiation of activities.

- Operators must observe a 1.6 km operational exclusion zone around all known polar bears during the denning season (November–April, or until the female and cubs leave the area). Should previously unknown occupied dens be discovered within 1.6 km of activities, work must cease and the Service contacted for guidance. The Service will evaluate these instances on a case-by-case basis to determine the appropriate action. Potential actions may range from cessation or modification of work to conducting additional monitoring, and the holder of the authorization must comply with any additional measures specified.

Human activities at developed sites within the Action Area take place nearly continuously and throughout the year. Therefore, parturient female polar bears prospecting for potential denning sites in or near the Action Area, and that are sensitive to human presence and disturbance, would presumably be able to identify and avoid areas of disturbance. Nearby, particularly north of the Action Area, is extensive denning habitat that lacks industrial or village development and remains available for denning.

Assessing the value of critical habitat within the Action Area to the conservation of polar bears is inherently subjective, but history of use of the area provides a reasonable index of value. Information on the history of denning nearby is available from several sources, including radio telemetry data, results from den searches, and observations reported by employees of the oil industry in the Alpine oil development complex in the Colville Delta and at CD-5 and GMT-1. The available information indicates that polar bears occur near the Action Area with some regularity (Figure 9). However, most recent sightings occurred north of the Action Area, closer to the Beaufort Sea coast, and most consist of sightings of polar bears, the majority of which likely correspond to transient individuals (males and non-denning females) and are not indicative of use of the area for denning. We are aware of no records of denning within critical habitat in the Action Area, although four dens have been found nearby, one within the Action Area in 1917, another ~ 4 km outside the Action Area in 1949, a third ~ 2.8 km outside the Action Area in 1997, and the fourth ~ 2.1 km outside the Action Area in 2007 (Figure 9). A small portion of critical habitat within the Action Area contains the macrohabitat features suitable for denning, primarily ~ 3.0 km to the southwest of CD-5, along banks of the Ublutuoch River (Tinmiaqsiuġvik), and ~ 3.0 km to the east of CD-5, along banks of the Nigliaġvik Channel (Figure 8).

The value of critical habitat within the Action Area may change over time in response to climate change. Fischbach et al. (2007), examining distribution of maternal dens in the Beaufort Sea region, found that the proportion denning on pack ice (as opposed to onshore) decreased from 62% from 1985 – 1994 to 37% in 1998 – 2004, and those denning on sea ice shifted from west to east. They attributed both trends to deteriorating sea ice conditions in the western Beaufort Sea (Fischbach et al. 2007). Derocher et al. (2004) reported that the number of dens on the southernmost islands in Svalbard strongly correlated with the date that sea ice arrived in autumn, and proposed that continued deterioration of sea ice may prevent pregnant females from accessing important denning habitat on islands or coasts, including on the North Slope of Alaska.

Thus, the value (or use) of critical habitat inside the Action Area may increase as conditions elsewhere deteriorate, or the value may decrease as sea ice in the polar basin in early winter retreats northward, preventing pregnant females from accessing the Beaufort Sea coast in Alaska (Derocher et al. 2004).

In summary, the value of polar bear critical habitat within the GMT-2 Action Area is limited by several factors, including the minimal degree of overlap between critical habitat and the Action Area (16% of the Action Area); the small proportion of the landscape within the area of overlap that contains the macrohabitat features of denning habitat; and information suggesting that use of the Action Area by polar bears, particularly for denning, is very minimal. Further, although there is significant human presence within critical habitat in the Action Area, the degree to which infrastructure and human activities intersect with potential denning habitat is minimal, and human activities there are highly managed to reduce disturbance of polar bears and protect an occupied den, should one occur there. We conclude that the value of critical habitat within the Action Area is minimal, and that human presence and activities within the area of overlap have affected, although not substantially, the overall condition of critical habitat within the Action Area.

EFFECTS OF THE ACTION

Regulations implementing the ESA (50 CFR §402.02) define the "Effects of the Action" as the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action. This section of the BO analyzes direct effects, indirect effects, and interdependent and interrelated effects of the proposed Action on listed species and critical habitat.

Spectacled Eiders

This section includes an analysis of the direct and indirect effects of the proposed action on spectacled eiders and/or habitat and its interrelated and interdependent activities. We evaluated the following possible mechanisms by which GMT-2 could potentially affect spectacled eiders:

- Habitat loss with associated disturbance
- Collisions with structures
- Increased predator populations
- Exposure to spills and contaminants
- Increased subsistence activities

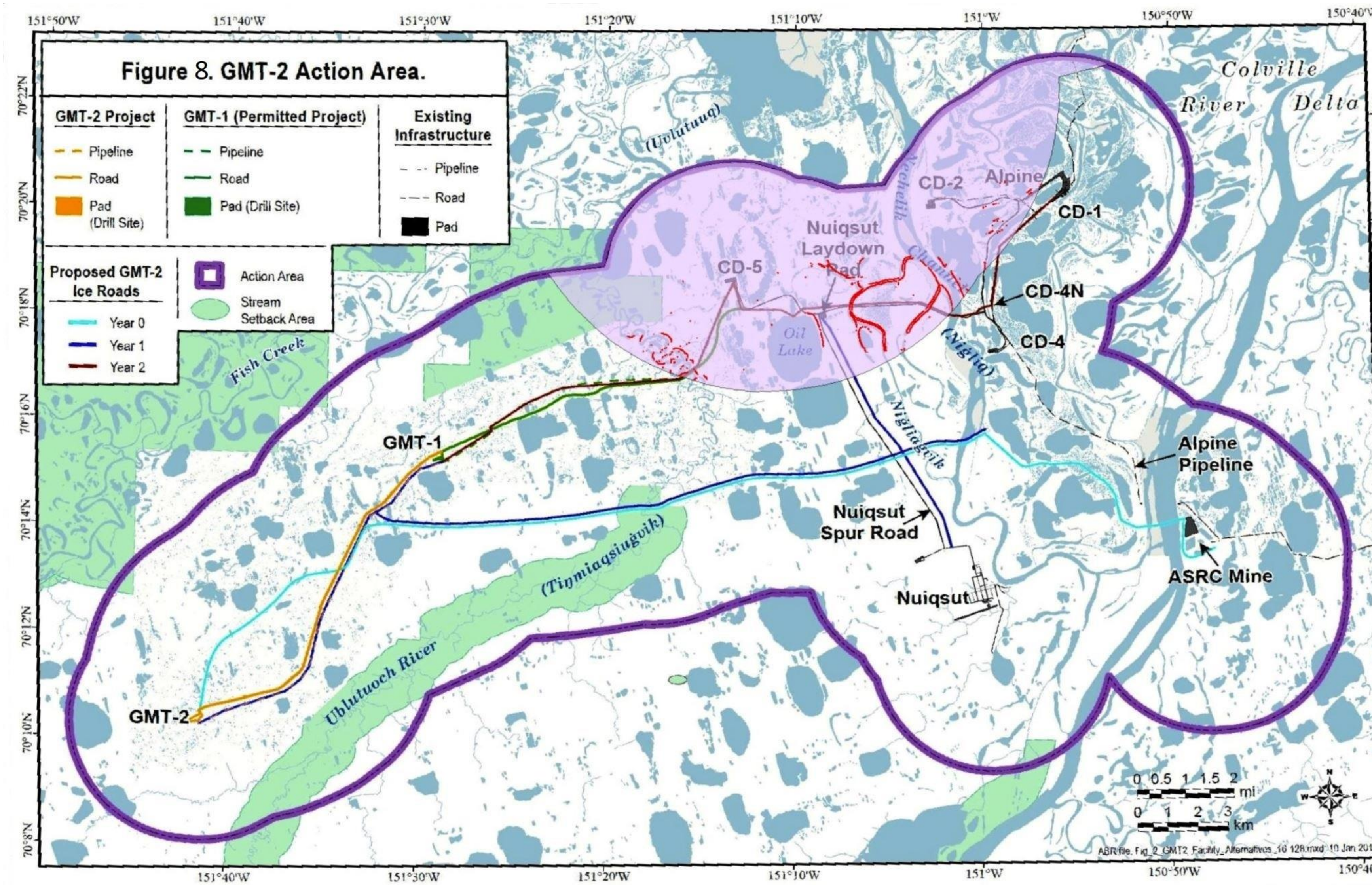


Figure 9. Potential terrestrial polar bear denning microhabitat features (redlined) within designated critical habitat (shaded area) contained by the GMT-2 Action Area. From BLM (2018a).

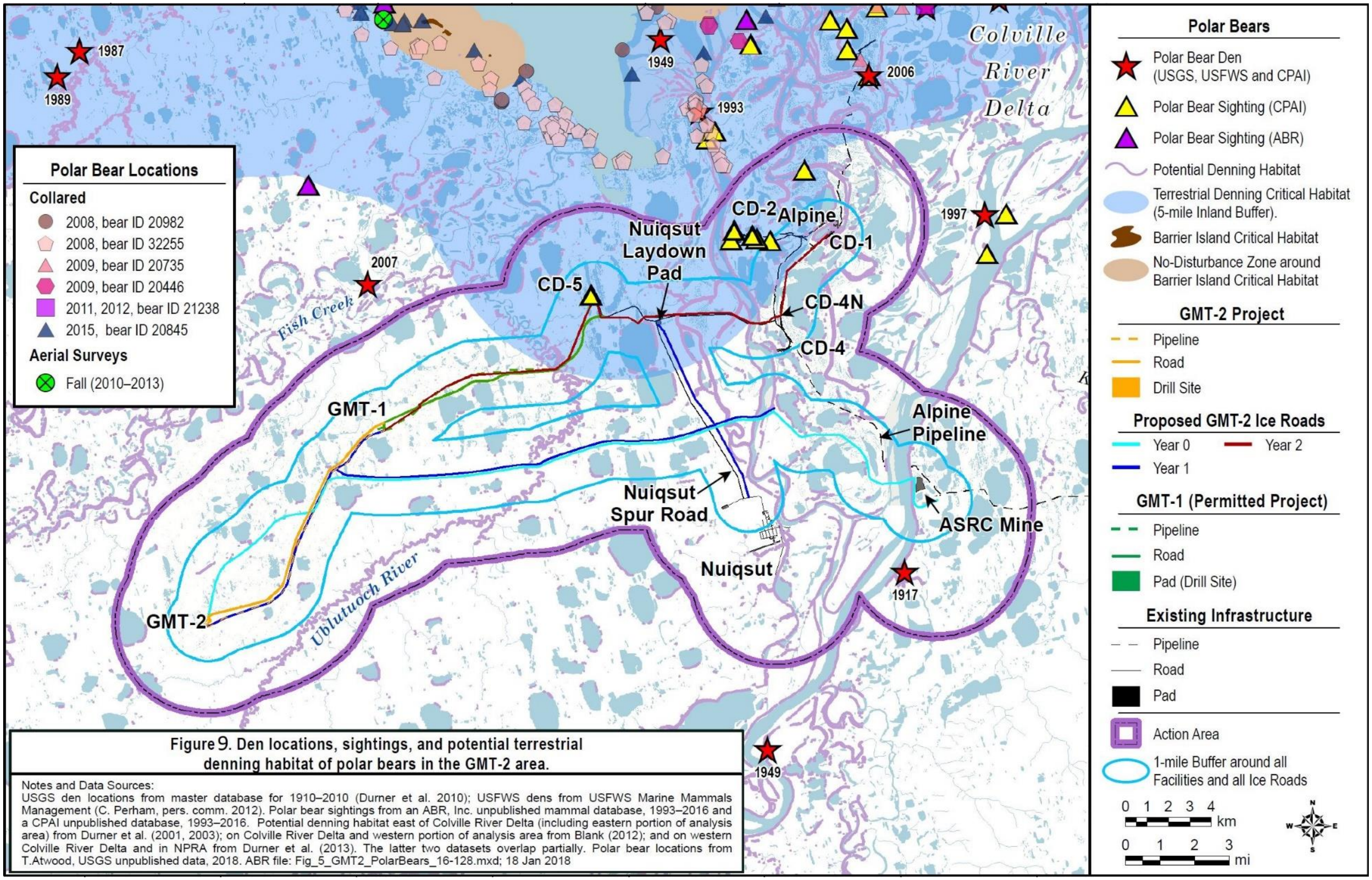


Figure 10. Polar bear den locations, and sightings within and near the GMT-2 Action Area. From BLM (2018a).

Habitat loss with associated disturbance
The construction and operation of oil and gas facilities at GMT-2 could affect the reproduction of spectacled eiders directly through the alteration of habitat, which could render it unsuitable for nesting or brood rearing, and indirectly if disturbance from human presence and activities at facilities prevents nesting or affects breeding success in nearby habitat. We evaluate the potential for alteration of habitat and disturbance to affect spectacled eiders, below.

Gravel extraction and fill **-** The BLM estimated that permanent gravel pads and roads would occupy 0.32 km^2 of area in the Action Area, and we conclude the placement of gravel fill will permanently render this habitat unsuitable for nesting and brood rearing by spectacled eiders. We estimate the magnitude of this effect below.

*Ice roads and pads***-** We would not anticipate significant long-term habitat loss from ice road or snow trail operations associated with winter gravel extraction and transport. Research indicates damage from ice roads occurs on higher, drier sites with little or no damage in wet or moist tundra areas (Pullman et al. 2003) when ice roads are used. Jorgenson (1999) found impacts were limited to isolated patches of scuffed high microsites and crushed tussocks. Similarly, Yokel and VerHoef (2014), found disturbance from seismic and ice road activity was greatest in drier, shrubby habitat than in moist habitat. McKendrick (2003) studied several riparian willow areas and found although some branches were damaged, the affected plants survived. Because spectacled eiders prefer to nest in low moist tundra areas (Anderson and Cooper 1994, Anderson et al. 2009), we conclude the limited damage in higher drier tundra habitat from ice roads would not adversely affect spectacled eiders.

*Disturbance***-** We anticipate that disturbance of spectacled eiders would occur within a “zone of influence” surrounding new development from on-pad activities and traffic on roads. Three mechanisms through which disturbance could affect breeding potential or success are:

1. Flushing hens from nests, exposing eggs or small young to inclement weather and predators, or causing nest abandonment;

2. Disturbing hens with ducklings, potentially causing broods to fragment and decreasing survival of ducklings; and

3. Displacing adults and/or broods from preferred habitats during pre-nesting, nesting, brood rearing, and migration.

Empirical support documenting the indirect effects of disturbance on spectacled eider breeding performance is limited, but some information exists. In the Alpine development complex, the locations of pre-nesting spectacled eiders within oil fields did not differ before and after construction (Johnson et al. 2006), and pre-nesting spectacled eiders (observed in groups or pairs) averaged 239 m from structures whereas nests averaged 442 m from structures (Anderson et al. 2007). This suggests that pre-nesting pairs were not particularly sensitive to nearby infrastructure, whereas hens appeared to avoid nearby infrastructure when identifying nest sites and laying eggs. Therefore, habitat near facilities may have lower nesting value than habitat farther from sources of disturbance. Female waterfowl may also damage eggs when they are flushed from nests (Major 1989), and may abandon nests entirely, particularly if disturbance occurs early in the incubation period (Livezy 1980, Götmark and Ählund 1984). However, the effects of disturbance and displacement would likely vary with the number, duration, frequency, intensity and timing of activities, and these factors would vary among facilities and the activities associated with them. Additionally, individual eiders would likely respond to disturbance differently, depending on individual tolerance and previous experience. Based on this extremely cursory review of species- and location-specific information, and observations from other waterfowl species, we can identify processes by which the distribution or success of nests could be affected by industrial activities. However, estimating impacts is complicated by uncertainty regarding the actual magnitude of impact, the potential for habituation over time, and whether spectacled eiders displaced from nesting habitat by disturbance would forego nesting, nest elsewhere with lower success, or merely move elsewhere with no change in breeding performance.

Based on the concepts and mechanisms described above, disturbance from aircraft could potentially adversely impact spectacled eiders. The project description predicts that 125 to 145 fixed-wing aircraft flights (above current baseline levels) to and from the Alpine airstrip would be needed during construction of GMT-2, and we assume additional fixed-wing aircraft traffic will be needed to support production and maintenance into the future. Potential impacts of aircraft disturbance to nesting spectacled eiders are poorly understood but observations in the Kuparuk Oilfield indicate that spectacled eiders generally respond similarly to other waterfowl (ABR, unpublished), and spectacled eiders occasionally nest near the Deadhorse and Utqiaġvik airports, indicating at least some individuals tolerate or become habituated to aircraft traffic at established airstrips. As with other forms of disturbance, tolerance likely varies among individuals, and some individuals could be disturbed or displaced with unknown physiological and reproductive consequences. However, we expect impacts to be minimal, as the ongoing regular air traffic at Alpine has presumably allowed less-sensitive individuals to habituate and more-sensitive individuals to nest farther from the airstrip to create separation from disturbance. Therefore, we conclude increased air traffic at Alpine needed to support GMT-2 will have insignificant effects to spectacled eiders.

Helicopters would also be used in support of GMT-2, and the project description includes an estimated ~400 takeoffs/landings per year during construction, declining to ~90 flights/year after construction ends. Unlike fixed-wing aircraft, Industry helicopter operations often occur off established infrastructure on undeveloped tundra.

Helicopter traffic in NPR-A is substantial and increasing each year, with >10,000 takeoff/landings in 2018. Given 1) the volume of air traffic, 2) the potential for impacts to listed species, 3) the difficulty in ascribing flights to specific projects (e.g., GMT-2), and 4) the difficulty of accurately predicting aircraft activity years in advance; we now separately conduct section 7 consultation on helicopter traffic in NPR-A each year with the BLM. The flights associated with GMT-2 are not additive to, but are a subset of, the flights being considered in this “annual summer programmatic” consultation. This approach allows annual estimation of helicopter traffic, which has increased substantially in recent years, and has resulted in improvements in categorizing activities and estimating impacts. Therefore, we will address helicopter traffic associated with individual oil and gas development projects, including GMT-2, in the summer programmatic consultation, and these effects are not considered further in this consultation.

The greatest potential for human presence and activities to disturb spectacled eiders is within the zone of influence immediately adjacent to permanent facilities in nesting and brood-rearing habitat. For example, construction of gravel pads and roads, production facilities, pipelines, and human activities associated with operation and maintenance of this infrastructure are all potential sources of disturbance. However, because gravel mining, material hauling, pad, road, and pipeline construction, and pipeline maintenance would occur during winter, when spectacled eiders are not present, disturbance to nesting eiders from these sources would be discountable. Nonetheless, on-going disturbance associated with human activities at GMT-2 infrastructure would occur year-round, including during breeding, nesting, and brood-rearing periods for spectacled eiders.

Estimate of effects- To estimate the number of spectacled eider nests that could be affected by habitat loss and disturbance, we multiplied the area over which impacts could occur by the estimated density of spectacled eiders within that area. We considered the affected area to include permanent gravel fill (0.32 km^2; BLM 2018b) plus an adjacent zone of influence in which human activities at nearby facilities could plausibly prevent nesting or reduce breeding success. We assumed that disturbance could affect the likelihood of nesting or nesting success within 200 m (~650 ft) of facilities (pads and roads) where human activities will take place during the nesting season (8.03 km^2; BLM 2018b). Thus, we estimated the total affected area to be 8.35 km^2.

We used observations from a systematic aerial survey of Alaska's Arctic Coastal Plain (USFWS 2015b) to characterize spectacled eider density within the affected area. Because these aerial surveys provide an *index* of the population, we made adjustments to convert the index to a density estimate. First, because the index of density varies within the affected area, we approximated mean density by weighting the values proportionately, deriving an average estimate for the affected area of 0.04 "indicated" spectacled eiders[1]/km^2. Then, we adjusted for imperfect detection by assuming ~75% of spectacled eiders are seen during aerial surveys[2], which converted the population index to an estimate of density of 0.53 spectacled eiders/ km^2. Last, assuming one potential nest for every two adults, we divided the estimate of spectacled eider density by two to convert the estimate to the number of pairs or nests/ km^2. Applying this process, we estimate an average of 0.027 pairs or nests/km^2 per year in the affected area.

Multiplying the affected area (8.35 km^2) by the estimated density of pairs or nests (0.027/km^2), we estimate the proposed action could result in a potential loss of production of 0.23 nests/year, totaling ~7.2 nests (rounded to 7) across the 32-year life of the project. Admittedly, this estimate is extremely imprecise, is predicated upon several untested assumptions, and is subject to several

[1] In these aerial survey indices, "Indicated birds" represents the number of singles*2 + the number of pairs*2 + the number of flocked individuals (Stehn et al 2013) and detection is assumed to be 1.0.
[2] A detection rate of 75% is an approximate average of three independent rates for single, paired, and flocked spectacled eiders, which were 0.71, 0.78 for pairs, and 0.81 for small flocks (Wilson et al. 2017; J. Fischer, pers. comm.).

unquantifiable biases[3]. Nonetheless, we believe it is consistent with the (low) density of spectacled eiders in the Action Area and reasonably approximates potential loss of production from habitat loss and disturbance during nesting.

Summary- We conclude that habitat loss would result from permanent gravel fill for the construction of pads and roads, and indirect effects caused by disturbance and displacement could result when human activities occur during the breeding season. Impacts of ice pad and ice road construction, and the incremental increase to fixed-wing aircraft traffic at the Alpine airstrip to support GMT-2, would have insignificant impacts to spectacled eider reproduction. While recognizing potential impacts of helicopter traffic associated with GMT-2, those impacts are addressed elsewhere in annual consultation with BLM. Using the process described above, we roughly estimate that the Proposed Action will result in the loss of production of ~7 spectacled eider nests across the 32-year life of the project. Because the most recent population estimate for North Slope-breeding spectacled eiders is 14,814 (13,501–16,128, 90% CI; Stehn et al. 2013), we would not anticipate population level effects from the loss of ~7 nests over the next 32 years.

Collisions with structures

Migratory birds are killed in significant numbers by collisions with human-built structures, including communication towers, buildings (particularly those with windows or glass exteriors), power lines, marine vessels, vehicles, wind turbines, and others (APLIC 2012, Manville 2009, Loss 2014). Structures associated with the oil and gas industry on Alaska's North Slope that pose a collision risk for birds include offshore and onshore buildings, drill rigs, flare stacks, power lines, communication towers, marine vessels transporting materials, and possibly pipe racks. Lethal collisions involving spectacled eiders or other closely-related species (which presumably, by virtue of their greater numbers, serve as indicators of risk to less-numerous species such as spectacled and Steller's eiders) have occurred on the North Slope at buildings, power lines, and possibly other structures, although several biases (e.g., scavengers removing carcasses before they are found) likely cause underestimation of the frequency of collisions and the types of structures at which they occur.

Spectacled eiders are potentially at risk of encountering and colliding with human-built structures on the North Slope: 1) during spring migration, as they move west to east, and disperse to prospect for and colonize suitable breeding habitat; 2) during the breeding season, as they move locally within nesting and brood-rearing habitat; and 3) after breeding, as a succession of males, unsuccessful hens, and successful hens with broods, leave the coastal plain, returning to the marine environment for the non-breeding season. Darkness at night appears to increase collision risk for species that fly or migrate at night (Weir 1976), presumably by making unlit objects such as power lines less visible, and by creating a need for artificial lighting of some structures, which compounds susceptibility by attracting or disorienting flying birds (Reed et al. 1985, Russell 2005, Manville 2009). For spectacled eiders, spring migration in May and June, and local movements during the June-July breeding season, take place during the arctic summer with continuous daylight. In late summer and fall, however, when successfully-nesting hens and

[3] Several assumptions are inherent in this process, each of which we believe make this a conservative, or more-protective, estimate. These are that all pairs within the zone of influence will fail to produce young (i.e., no pairs within the zone of influence will nest successfully, and none will move elsewhere to avoid disturbance and then nest successfully) and that all failures can be ascribed to the effects of the action.

broods migrate from the coastal plain, collision risk escalates with returning twilight and darkness and the accompanying increase in artificially-lit structures.

When considering collision risk to spectacled eiders migrating on the North Slope, two relevant factors warrant mention. First, although some migration may take place overland on the coastal plain, available information suggests that most migrants move along the Beaufort Sea coast or over offshore waters. In spring, as eiders, including spectacled eiders, move east into the region, they are thought to follow open water leads in pack ice (Woodby and Divoky 1982, Johnson and Richardson 1982, Oppel et al. 2009, M. Sexson, USGS, pers. comm.). During post-breeding migration in summer and fall, satellite telemetry studies on the eastern ACP indicated male spectacled eiders departed early in summer and generally remained close to shore, sometimes crossing overland, whereas most females, which departed later, moved north into the Beaufort Sea before moving westward (Petersen et al 1999; TERA 2002). Thus, it is reasonable to conclude that most spectacled eider migration occurs along the coast and offshore, taking place several miles north of the structures at GMT-2. Second, during spring spectacled eiders migrate to their breeding areas on the North Slope from the west, progressing eastward from the Bering, Chukchi, and western Beaufort seas, and in fall, they return to the west. Telemetry data, although limited, do not show individuals moving farther east after nesting, and prior to returning to the west where they molt and winter (Petersen et al 1999; TERA 2002; Sexson 2015). Therefore, presumably the only spectacled eiders that move as far east as GMT-2 are those that nest near or to the east of GMT-2, which aerial surveys show includes only ~13% of the population that nests on the North Slope (USFWS unpubl. data).

Therefore, to evaluate collision risk to spectacled eiders posed by GMT-2 structures, we considered the generalizations drawn above, documented instances of collisions of spectacled eiders and other sea ducks on the North Slope, the project description, and the BMPs that serve to reduce risk. In addition to the drilling rig and communication tower, up to 48 permanent well houses on the GMT-2 pad would also pose collision risk. Several factors will serve to ameliorate collision risk, however. As noted above, all structures at GMT-2 would be well inland (> 27 km) from the migratory routes used by most spectacled eiders. Also, only ~13% of spectacled eiders nesting on the North Slope are likely to range as far east as the Action Area, significantly reducing exposure. The drilling rig would be present for 7.5 years (2022-2029) but would then be removed. Furthermore, the communication tower would not be supported by guy wires, substantially reducing the profile and associated collision risk. BMP E10 requires that lights on tall structures to be shielded and directed downward, reducing potential attraction and disorientation resulting in collision from outward radiating light. Very importantly, no overhead power lines are proposed, completely alleviating one considerable form of risk. Finally, because spectacled eiders occur at low density in the Action Area, the risk of locally-nesting or -fledging individuals encountering structures at GMT-2 is very minimal. Collectively, we believe these factors significantly reduce collision risk at GMT-2. Although we have no means to objectively estimate the number of spectacled eiders that would collide with structures at GMT-2, based on our subjective assessment we conclude that between 0 and 5 spectacled eiders would be injured or killed over the 32-year life of the project.

Increased predator populations

As discussed in the *Environmental Baseline* for spectacled eiders, abundance of predators and scavengers has increased near industrial infrastructure on the ACP. In particular, ravens have expanded their breeding range northward onto the ACP by using human-built structures for nesting and perching. Therefore, as the number of structures and anthropogenic attractants associated with development increase, the distribution and survival of predators may change, with potential individual- or population-level impacts to nesting spectacled eiders.

We expect structures associated with GMT-2 would increase the number of potential nesting and perching sites for ravens, and possible access to anthropogenic food sources may also attract predators to the action area. However, BMP E-9 prohibits feeding of wildlife and requires CPAI to utilize the best available technology to prevent facilities from providing nesting, denning, or shelter sites for ravens, raptors, or foxes. Further, BMP E-9 requires monitoring and annual reporting, which will allow managers to assess whether ravens and foxes nest or den in association with GMT-2 infrastructure. Therefore, based on results of monitoring efforts, management actions specific to GMT-2 or the GMT/Alpine industrial complex as a whole can be implemented as needed.

Based upon the low density of spectacled eiders in the Action Area, and the requirements of BMP E-9 and our ability to track and address predator response to GMT-2 as needed, we anticipate that impacts to predator populations caused by GMT2 will not adversely affect spectacled eiders.

Exposure to spills and contaminants

We evaluated the effects of oil and other toxic substance spills on spectacled eiders in the IAP BO (USFWS 2013, pp. 77, 98) and concluded that adverse effects to spectacled eiders are unlikely to occur due to the low probability of large spills occurring and because spectacled eiders are unlikely to contact small spills. BMPs, lease stipulations, and development setbacks from the coast reduce the likelihood of a significant quantity of oil spilled in NPR-A reaching concentrations of spectacled eiders in marine waters. Because the deviations the BLM may grant could affect potential effects of spills to aquatic habitats, we discuss their potential impacts in section titled: 6.1.3 *Effects of Best Management Practices and Lease Stipulations*.

Increased subsistence activities

The harvest of spectacled eiders for subsistence or sport purposes is prohibited, although harvest survey date indicate that some harvest likely continues to occur. As a result, the potential impacts of subsistence harvest is consulted upon annually in the Intra-Service Biological Opinion for Hunting Regulations for the Spring/Summer Harvest, and allows the representation and participation of subsistence users and for integration of local, regional, and statewide perspectives on practices and impacts. We acknowledge that allowing use of the continually-expanding infrastructure associated with the Alpine and GMT industrial complex to access subsistence areas could conceivably result in an increase in impacts to spectacled eiders. Nonetheless, we believe this possibility is disountable, particularly considering the low density of spectacled eiders in the Action Area. Furthermore, we believe evaluating and addressing potential effects of subsistence practices are better accomplished in consultation on the regulations for subsistence harvest. Therefore, the small potential for impacts is not further addressed in this BO.

Effects of Best Management Practices and Lease Stipulations

GMT-2 is subject to the lease stipulations set forth in the 2008 IAP ROD, and subject to BMPs set forth in the 2013 IAP ROD. As discussed in the IAP BO (USFWS 2013), the BLM would require adherence to almost all lease stipulations and BMPs, several of which benefit spectacled eiders. However, in order for the Proposed Action to be developed, the BLM would have to grant deviations to stipulation E-2 and BMP E-7(c). BMP E-7(c) pertains to spatial separation between roads and pipelines, and the requested deviation would not impact spectacled eiders. Stipulation E-2 pertains to the spatial separation between permanent oil and gas facilities (including pipelines) and fish-bearing water bodies and aquatic habitats. A deviation to stipulation E-2 could slightly increase the risk of oil reaching the marine environment, should a large spill occur. In spring and autumn, spectacled eiders congregate in ice-free marine waters such as those offshore of river deltas, and an increased risk of oil reaching the marine environment could increase risk to spectacled eiders.

Based on the large spill scenario analysis in the IAP/EIS (BLM 2012), large oil spills are unlikely to occur for GMT-2. Oil spills from pipelines are not likely to be large or spread widely given spill prevention measures in the Oil Discharge Prevention and Contingency Plans and Spill Prevention Control and Countermeasures Plans. Prevention measures include hydrostatic testing prior to operation, shut-off valves, pressure monitoring, regular inspection and maintenance with in-line pigs, FLIR monitoring, and emergency response procedures (including booms to protect streams and drainages). Because of the myriad prevention measures used, large spills occur so infrequently (once in 39 years of North Slope operations) that they are not reasonably certain to occur. Thus, the low probability of a large oil spill occurring from a pipeline makes it highly unlikely spectacled eiders would be affected by granting of the deviation to stipulation E-2.

Polar Bears

Based on the GMT-2 Project, we determined that the following factors might cause adverse effects to polar bears:

- Oil spills
- Disturbance
- Human-polar bear interactions

In the sections below, we describe how these factors could affect polar bears and estimate the number of polar bears potentially affected by them.

Oil Spills

In the IAP BO (USFWS 2013, p. 99), we concluded that given the low probability of a large oil spill combined with the infrequent occurrences of polar bears in NPR-A, it is highly unlikely that polar bears would be affected by oil spills in NPR-A should spills occur. Likewise, we do not expect polar bears would be affected by spills within the GMT-2 Action Area should spills occur. We continue the discussion of the impacts of oil spills as it pertains to the proposed deviations to BMPs in section 6.3.4 *Effects of Best Management Practices and Lease Stipulations.*

Disturbance

Several activities that would occur at GMT-2 could disturb polar bears. Possible sources of disturbance could include aircraft, drilling activities, activity at facilities, pipeline construction and maintenance, and gravel and ice road construction and associated vehicle traffic. These disturbances could affect denning and non-denning polar bears.

Denning Bears- Few if any polar bear dens are likely to be affected by GMT-2 construction and operation activities because the Action Area is inland from the coast where polar bears occur infrequently, and because gravel and ice roads cross relatively small areas of suitable habitat for denning. Based on historical denning information in the Action Area and along the ACP, polar bears are unlikely to den in the GMT-2 Action Area. Durner et al. (2009, p. 5) determined 95 percent of all historical confirmed and probable dens have occurred within 4.5 km (2.8 mi) of the Beaufort Sea coast in the region of the Action Area. Necessary topographic, macrohabitat, and microhabitat features that are essential for polar bear denning include steep, stable slopes (range 15.5–50.0°), with heights ranging from 1.3 to 34 m (4.3 to 111.6 ft.), and with water or relatively level ground below the slope and relatively flat terrain above the slope. The remaining 5 percent of polar bear dens may be located farther from the coast where topographic, macrohabitat, and microhabitat features exist, but the probability of a den decreases with distance from the coast. The GMT-2 Action Area is largely outside 4.5 km (2.8 mi), and all new road and pad constructions are > 14 km (9 mi) from the coast.

The highest potential for disturbance to denning polar bears in the GMT-2 Action Area would be during winter construction seasons 2018/2019, 2019/2020 and 2020/2021 when noise and activity levels would be greatest. During operations, co-occurrence of infrastructure and suitable denning habitat within critical habitat (16% of GMT-2, which has higher probability of den sites) has been assessed at 3.5 ha for GMT-1(ABR 2014), and is essentially the same for GMT-2. While no new co-occurrence of infrastructure will occur, GMT-2 construction and operations will add to traffic along this route and extend the period of high activity and disturbance until the operation phase. A maternal polar bear searching for a den location near the road will be subject to continuous traffic along her route, and will either tolerate the noise, or move to a quieter location prior to denning. The Service finds it unlikely that disturbance from the GMT-2 Action Area would impact denning polar bear because: based on historical denning information in the Action Area and along the ACP; polar bears are unlikely to den in the GMT-2 Action Area; and maternal polar bears would have to tolerate the construction and operation activities of the GMT-2 Action Area while passing through to den in suitable habitat. As a safeguard, the BLM and Service will require CPAI to adhere to minimization measures as described in the IAP BO (USFWS 2013, Appendix A) and explained in sections captioned *6.3.4 Effects of Best Management Practices and Lease Stipulations* and *6.3.5 Minimization measures pursuant to the Marine Mammal Protection Act* below.

Aircraft overflights have the potential to disturb denning polar bears, but typically these events are occasional and short in duration. Amstrup (1993) studied the response of denning bears to research aircraft flying 50 to 500 m above the ground and recorded 40 cases of potential disruption of denning by research aircraft (44 dens were located in this study). Two bears left their dens temporarily, but disturbance did not appear to affect cub survival (Amstrup 1993). Thus, flights over dens are not expected to cause disturbance to the degree that reproductive performance is likely to be affected. Additionally, the chance of aircraft flying directly over a polar bear den is low because dens occur at very low density across the landscape. Further, aircraft associated with GMT-2 will likely fly at elevations higher than those evaluated in the Amstrup (1993) study, as minimum flight elevations over polar bears or areas of concern and flight restrictions around known polar bear dens will be required in LOAs/minimization measures (e.g., BMP F), as appropriate, to reduce the likelihood that bears are disturbed by aircraft. Aircraft overflights during the denning season are rare, and the chance of encountering denning bears is extremely low, but if this does occur we expect the effect of aerial disturbance on denning bears to be minimal.

Table 2. Winter helicopter Flights in the Action Area (5% of all helicopter flights).

Project Phase	**Winter Helicopter Flights within GMT-2 Action Area**
Construction (First Year)	20
Construction (Second Year)	20
Drilling and Operations (annual no. of flights)	5
Drilling and Operations (total flights for the 30 year phase)	150
Project Life Total Flights (32 years)	195

Non-denning Bears- Transient (non-denning) polar bears tend to move along the coast during the late summer–fall open water season and congregate on barrier islands where whale carcasses or other food is available (Miller et al. 2006, Schliebe et al. 2008). It is unlikely that polar bears would be encountered within the GMT-2 Action Area with any frequency given its inland location. To illustrate, seven polar bear sightings have been recorded around Alpine CD-1 and CD-2 (approximately one third the distance from the coast of GMT-2) between 2005 and 2016, 7 sightings were recorded near CD-3, and 3 sightings have been recorded at CD-5 (BLM 2018a). Thus, we expect very few polar bears would enter the GMT-2 Action Area given the distance from the coast. However, if polar bears pass through the Action Area, human-polar bear interactions possibly leading to deterrence actions may occur. We expect the likelihood of interactions to increase with decreasing distance from the coast. In the IAP BO (USFWS 2013, pp. 82-89) we estimated that about 15% of polar bear interactions in NPR-A would result in deterrence actions and that in most cases, the actions would cause only minor, temporary behavioral changes (e.g., causing the bear to flee). We describe these potential deterrence actions below.

Human-Polar Bear Interactions

Information regarding human-polar bear interactions occurring at oil and gas developments across the North Slope indicates that the Proposed Action could result in deterrence actions. CPAI maintains records of polar bear observations throughout its North Slope operations. Most records (100 of 127, or 79%) are from Kuparuk. Small numbers are from the Colville River delta (19 records, 15%) and NE NPR-A (3 records, 2%) between 1995 and 2016 (Appendix D: BLM 2018a) and most of these are within 8 km (5 miles) of the coast. The 22 records from the Colville and NE NPR-A comprise 28 individuals (excluding identifiable multiple observations of the same individuals); records of polar bear sightings by CPAI and others in the GMT-2 area are shown in Figure 5 of BLM 2018a. Of these 22 encounters, 4 (18%) involved hazing, deliberate efforts to persuade bears to move away from people or facilities. In each case a single bear was involved, for a total of 4 polar bears hazed. In most cases, hazing involved more than 1 type of deterrent, therefore the sum of all deterrent types exceeded the total number of hazings: 4 hazings involved vehicles, 3 involved noise (horns, sirens, etc.), 3 involved spotlights, and 3 involved firearms (all with non-lethal rounds, typically cracker shells or similar noise-making rounds). None of the deterrence actions for CPAI resulted in a severe injury or death of a polar bear.

Thus, we expect that most deterrence actions would not involve the use of projectiles and therefore are likely to cause only minor, temporary behavioral changes (e.g., forcing a bear to leave the area). Potential effects of deterrence actions to individual bears likely vary with a bear's physiological and reproductive condition, and the number, type, and duration of deterrence actions used. In the unlikely event that bears are deterred using more aggressive methods (e.g., projectiles such as bean bags and rubber bullets), those bears may be injured (e.g., sustain pain and bruising).

Very rarely, these deterrence actions may be fatal if the projectiles are used incorrectly[4]. In the IAP BO (USFWS 2013, p. 89), we estimated that up to five deterrence actions using projectiles may occur annually as a result of the Proposed Action, with no more than five fatalities to polar bears occurring during the 50-year life of the full development scenario. However, predicting the number of deterrence actions for individual projects such as GMT-2 is difficult. Regardless, given the distance from the coast, we expect the use of projectiles would occur fewer than once annually, with up to two injuries and no fatalities over the life of the project.

Effects of Best Management Practices and Stipulations

GMT-2 is subject to the lease stipulations set forth in the 2008 IAP ROD, and subject to BMPs set forth in the 2013 IAP ROD. As discussed in the IAP BO (USFWS 2013), the BLM would require adherence to almost all of the IAP ROD's (BLM 2013) BMPs and lease stipulations. In order for the project to be implemented, the BLM would have to grant deviations to stipulation E-2 and BMP E-7(c). While granting a deviation to E-7(c) would not impact polar bears, deviation to E-2 could slightly increase the risk of oil reaching the marine environment, should a large spill occur. Polar bears contacting spilled oil could suffer injuries or die.

Based on the large spill scenario analysis in the IAP/EIS (BLM 2012), large oil spills are unlikely to occur for GMT-2. Oil spills from pipelines are not likely to be large or spread widely given spill prevention measures in the Oil Discharge Prevention and Contingency Plans and Spill Prevention Control and Countermeasures Plans. Prevention measures include hydrostatic testing prior to operation, shut-off valves, pressure monitoring, regular inspection and maintenance with in-line pigs, FLIR monitoring, and emergency response procedures (including booms to protect streams and drainages). Large spills occur so infrequently (once in 39 years of North Slope operations) that they are not reasonably certain to occur. Thus, the low probability of a large oil spill occurring from a pipeline makes it highly unlikely polar bears would be affected by the deviations.

Minimization measures pursuant to the Marine Mammal Protection Act

The Service has issued ITRs for the Beaufort Sea and adjacent areas under the MMPA for oil and gas activities since the early 1990s. Oil and gas companies can obtain LOAs under the ITRs, and these LOAs require adherence to an approved polar bear interaction plan. CPAI has obtained an LOA pursuant to the Beaufort Sea ITRs that authorizes incidental take of polar bears for its

[4] One deterrence action in 2011 associated with BP Exploration, Alaska resulted in an unintended fatality of a polar bear.

oilfields and activities on the North Slope. The Service also issues LOAs for intentional take of polar bears that authorize specific methods of deterring polar bears, and like LOAs for incidental take, intentional take LOAs require adherence to an approved interaction plan. CPAI has obtained LOAs for their various oilfield projects to date. These LOAs will expire before the end of the development lifespan of this project, but we assume that CPAI will obtain new LOAs in the future. Based on the record of the oil and gas industry as a whole and CPAI in particular, we expect that potential impacts of GMT-2 on polar bears will be minimized through adherence to their approved interaction plan.

Polar Bear Critical Habitat
We identify the following factors that could potentially cause adverse effects to polar bear critical habitat:

Alteration of the physical and biological features (BPFs) of critical habitat, resulting from the construction of permanent facilities and gravel roads;

- Oil spills;
- Disturbance; and
- Human-polar bear interactions.

We identify no interrelated or interdependent actions that require additional consideration.

Alteration of the Physical or Biological Features of Critical Habitat
Permanent alteration of the landscape, which could potentially affect the BPFs of critical habitat, has been assessed for the GMT-1 drill site and the associated permanent gravel road. The GMT-2 drill site is not within designated critical habitat or habitat containing the macrohabitat features associated with denning habitat, and therefore will not alter the PBFs. Infrastructure associated with GMT-2 intersects with suitable denning habitat where the gravel road connecting GMT-1 to CD-5 (and the larger Alpine development complex) crosses the Ublutuoch River just inside the boundary of designated critical habitat. However, the road crosses the Ublutuoch River on a raised bridge, and the macrohabitat features that define potential denning habitat remain unchanged. Considering these factors, we conclude that GMT-2 and the associated infrastructure will not affect the PBFs of polar bear critical habitat.

Oil Spills
The BLM, in managing the NPR-A as a whole, periodically revises their Integrated Activity Plans (IAPs) to reflect evolving management priorities, changes in industry interest and resource assessments, advances in technology, and other factors. The IAPs contain reasonable development scenarios for the reserve as a whole, and entail large scale impact evaluations that include assessment of the likelihood of spills of varying sizes occurring, and the likelihood that spills, if they occur, reach lakes, rivers, or the marine environment. We consult with the BLM on their IAPs, allowing periodic impact evaluations that reflect updated development scenarios and the corresponding lease stipulations and Best Management Practices, which are designed to minimize impacts. In 2013, we consulted with the BLM on their then-current IAP (USFWS 2013, p. 99) and concluded that given the low probability of a large oil spill combined with the infrequent occurrences of polar bears in NPR-A, it is highly unlikely that polar bears would be affected by oil spills in NPR-A should spills occur. Further, we concluded that spills of oil or

other contaminants could cause minor and temporary effects to polar bear critical habitat, but effects would be limited to localized areas and would not prevent polar bears from deriving the intended conservation benefit from designated critical habitat as a whole (USFWS 2013, p. 100). We believe this conclusion remains valid.

More specifically to GMT-2, based on the estimates of likelihood of large spills provided in the DSEIS (BLM 2018b), spills large enough to affect the BPFs of critical habitat are unlikely to result from GMT-2. Further, the limited spatial overlap between suitable denning habitat within critical habitat in the Action Area, and infrastructure from which oil could conceivably be spilled, makes it even more unlikely that oil sufficient to affect the BPFs of critical habitat would be spilled. Considering the low likelihood of large spills occurring within the Action Area, and the likelihood that suitable denning habitat would be affected if a large spill were to occur, we conclude that oil spills from GMT-2 are extremely unlikely to affect the value of terrestrial denning habitat to polar bears.

<u>Disturbance</u>
Several activities that would occur at GMT-2 could disturb polar bears, and disturbance is relevant if it prevents polar bears from accessing or using critical habitat. Potential sources of disturbance could include drilling activities, activity at facilities, pipeline construction and maintenance, gravel and ice road construction and associated vehicle traffic, and air traffic. Disturbance could conceivably affect the fecundity of females that are disturbed while searching for a den site or could potentially affect the outcome of a den established near a source of disturbance.

The effect of disturbance at established dens diminishes with distance and is thought to be negligible beyond 1.6 km (76 FR 47010). Therefore, we assume the potential for disturbance at dens is limited to locations where infrastructure and human activity would occur within 1.6 km of suitable denning habitat. The GMT-2 drill site is not within designated critical habitat or near suitable denning habitat, so the potential for disturbance at dens is limited to areas where ice roads, gravel roads, and pipelines will occur within 1.6 km of suitable denning habitat. During construction, the ice road passing through critical habitat is aligned closely to the permanent road; therefore, any added disturbance from the ice road is negligible above the estimated 3.5 ha for the permanent road. Review of historical information suggests an absence of denning in the area of overlap between designated critical habitat and the Action Area. Furthermore, the Action Area is further inland than most polar bears dens occur (> 95% of records of polar bear dens [n=19] between the Kavik River and Utqiaġvik were within 4.5 km of the coast [Durner et al. 2009]). Therefore, it is very unlikely that polar bears will attempt to establish dens near infrastructure from GMT-2.

Other factors likely further reduce the likelihood that disturbance from GMT-2 will affect denning polar bears. Female polar bears prospecting for den sites near the road connecting GMT-1 with CD5 would likely encounter traffic and disturbance while prospecting for den sites. Projected traffic rates along the all-season road include > 70,000 vehicle trips per winter during construction (through April 2020), > 6000 vehicle trips during the final ice road year (through April 2021), and ~ 700 vehicle trips per year thereafter. Thus, prospecting females are likely to be exposed to disturbance, allowing less-tolerant individuals to move away from the road prior to establishing dens and giving birth to cubs. Additionally, considerable suitable denning habitat containing no oil and gas infrastructure or regular sources of human disturbance occurs near the Action Area, especially to the north where denning occurs more frequently (Durner et al. 2009).

The potential that disturbance will indirectly reduce the value of polar bear critical habitat would be significantly reduced by other existing regulatory programs that directly address the disturbance of polar bears. The Marine Mammal Protection Act (MMPA) allows for incidental, non-intentional take from harassment of small numbers of marine mammals during specific activities. Section 101(a)(5) of the MMPA gives the Service authority to administer an incidental take program that allows polar bear managers to work cooperatively with parties requesting authorization for take. Using the issuance of Incidental Harassment Authorizations (if take is limited to nonlethal harassment) or promulgation of Incidental Take Regulations (ITRs), the Service can provide authorization for take under specific conditions. Conditions associated with this authority that serve to limit impacts to polar bears include:

- No more than small numbers of polar bears can be taken;
- No greater than a negligible impact on the species can result;
- An unmitigatable adverse impact on the availability of the species for subsistence use by Alaska Natives must not result;
- Means of effecting the least practicable adverse impact upon the species, its habitat, and its availability for subsistence harvest must be employed; and
- Monitoring and reporting of impacts are required.

Since 1991, affiliates of the oil and gas industry have requested, and we have issued regulations for, incidental take authorization for onshore and offshore oil and gas exploration, development, and production activities in Alaska in polar bear habitat. Regulations have been issued separately, on staggered 5-year schedules, for the Chukchi and Beaufort sea regions. This geographic separation of the regulations corresponds to the two subpopulations that occur in Alaska. As a result, we periodically re-evaluate for the Chukchi and Beaufort sea regions whether or not the thresholds of small numbers, negligible effects, and adverse impacts to subsistence harvest are exceeded. Mitigation measures applied to ensure least practicable impacts include requirement of site-specific plans of operation and site-specific polar bear interaction plans. In combination, these plans reduce attraction to bears (e.g., through garbage disposal procedures, snow management procedures) and provide training and other measures to eliminate the potential for injurious or lethal take of bears in defense of human life in the event that encounters occur. Other mitigation measures may be required on a case-by-case basis, such as use of infra-red thermal technology or trained dogs to determine presence or absence of dens in suitable denning habitat; measures to protect pregnant polar bears during denning activities (den selection, birthing, and maturation of cubs); and limiting industrial activities near barrier islands, which are used for denning, feeding, resting, and seasonal movements. This incidental-take program and the associated mitigation measures have effectively limited human-bear interactions and disturbance to bears, ensuring that, at least to date, industry effects have had a negligible impact on polar bears.

In addition to disturbance from ground-level activities at facilities or along the road, air traffic associated with GMT-2 could potentially disturb polar bears, affecting the success or likelihood of denning in the Action Area. An estimated 5% of all air traffic above baseline would occur within the Action Area during the winter months, section *3.6 Aerial Transport.* Flights would maintain altitudes of > 1,000 feet (weather and safe operating conditions permitting), except during takeoff and landing. Flights would originate at (and presumably return to) Deadhorse, Kuparuk, Nuiqsut, or Alpine, where considerable background air traffic, including takeoffs and landings, currently occurs. Incidental take under the USFWS LOA (16-13) requires CPAI to run a detection survey each year prior to activities occurring in polar bear denning habitat during the denning period (November to mid-April). Therefore, we conclude that additional new flights required for GMT-2 will not significantly alter denning conditions for denning in the Action Area, and conclude that air traffic associated with GMT-2 will have a negligible effect on polar bear denning within critical habitat.

Additionally, Section 7(a)(2) of the ESA requires Federal agencies, including the Service, to ensure that their actions are not likely to jeopardize the continued existence of any species listed under the ESA or destroy or adversely modify designated critical habitat. Authorizing take of polar bears under Section 101(a)(5) of the MMPA, as described above, qualifies as a Federal action requiring consultation. Thus, every five years, on an alternating schedule, we consult on the issuance of regulations for oil and gas exploration, development, and production activities in Alaska in polar bear habitat in the onshore and offshore environments of the Chukchi and Beaufort seas. Although the standards of the MMPA (authorized impacts cannot be reasonably likely to adversely affect the species) are more protective than those of the ESA (the action agency must ensure their actions are not likely to jeopardize the species or destroy or adversely modify critical habitat), the section 7 consultation process provides an additional layer of protection for the polar bear and its habitat. Specifically, biological opinions issued through section 7 consultation on the incidental take regulations and “letters of authorization” issued to individual operators require periodic re-evaluation of impacts to polar bears and their habitat, and include a requirement that consultation is re-initiated if required monitoring and reporting indicate that impacts to polar bears or their habitat exceed those predicted and evaluated during consultation.

In summary, two separate regulatory programs, authorized under different statutes, evaluate the effects of oil and gas activities upon polar bears in the Chukchi and Beaufort sea regions. Oil and gas operators are required to document and report human-bear interactions and other impacts, and the regulatory programs are re-evaluated every five years in order to ensure impacts are adequately managed. Further, consistent with the requirements and protective standards of the MMPA, for the incidental take program to continue it must be ensured that no more than negligible effects to polar bears and their habitat occur.

Human-Polar Bear Interactions

Information regarding human-polar bear interactions occurring at oil and gas industry facilities across the North Slope are provided in section *6.3.3 Human-Polar Bear Interactions*. In keeping with the purpose and benefits of deterrence actions in general, deterrence actions at industrial infrastructure in or near denning habitat would presumably dissuade polar bears from establishing a den nearby, reducing the potential for disturbance or conflict after a den is established. Thus, although deterrence actions in denning habitat may alter behavior or disrupt movements in the short term, or in rare cases could result in non-lethal injury (e.g., bruising), we believe the net effect of deterrence actions to the denning success of the individuals involved would be positive. Overall, human-polar bear interactions, as mitigated by the existing deterrence program, would contribute positively to maintaining the conservation benefit of polar bear critical habitat.

CUMULATIVE EFFECTS

Regulations implementing the ESA (50 CFR §402.02) define "cumulative effects" as the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the Action Area. Within the GMT-2 Action Area, future oil and gas development, scientific research, and community growth will likely occur. However, these activities would require Federal permits (e.g., from the BLM and USACE) and separate consultation and therefore are not considered cumulative impacts under the ESA.

The new road and ice roads may affect access to areas used by subsistence hunters, which could conceivably impact harvest of spectacled eiders. Promulgation of regulations that govern the subsistence harvest of migratory birds is a Federal action that requires separate consultation under the ESA and therefore is not considered a cumulative impact under the ESA.

CONCLUSION

Section 7(a)(2) of the ESA requires Federal agencies to ensure their activities are not likely to: (1) jeopardize the continued existence of any listed species, or (2) result in the destruction or adverse modification of designated critical habitat. Regulations that implement section 7(a)(2) of the ESA define "jeopardize the continued existence of" as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, number, or distribution of that species" (50 CFR 402.02).

This BO evaluates the potential impacts of the proposed Action on spectacled eiders, polar bears, and polar bear critical habitat in the GMT-2 Action Area. To reach a conclusion, impacts of the proposed Action are not considered in isolation, but are placed in the context of the current status of the species and critical habitat, the environmental baseline, and cumulative effects (as defined by the ESA). After considering these aggregate effects on the species, the Service's biological opinion is that the proposed Action is not likely to jeopardize the continued existence of any of these species, nor is it likely to destroy or adversely modify polar bear critical habitat.

In evaluating the impacts of the Action to listed species, the Service identified a number of adverse effects that may occur. These are discussed more fully in the section, *Effects of the Proposed Action*, and are summarized below. Incidental take has been authorized for activities that may adversely affect listed eiders. Impacts to polar bears were assessed to ensure the Action is in compliance with section 7(a)(2). However, while we estimate the take that may occur, no incidental take for polar bears has been authorized in this BO as the take of marine mammals may only be authorized under the ESA after it is authorized under the MMPA.

The analysis set forth in this BO is based on our assessment of the likely effects of the activities in the BLM's description of the Proposed Action. Additional section 7 consultation may be required in the future, however, as specific exploration and development projects are proposed. Additional consultation would be required in accordance with 50 CFR § 402.16; for example, if proposed projects so differ from the activities in the Proposed Action that the likely effects of the proposed projects to listed species or critical habitat exceed those considered in this BO. Any additional consultations would require careful consideration of all information available at that time, including up-to-date evaluations of the status of listed species and critical habitat, the environmental baseline and project-specific considerations such as the specific location, nature, and extent of proposed activities. We wish to provide clear notification that additional consultations could result in different conclusions than the ones set forth in this BO, depending on these project-specific considerations.

Summary for Spectacled Eiders

We identified loss of nesting habitat (with the associated disturbance) and collisions as the factors most likely to adversely affect spectacled eiders.

Some habitat could be completely and permanently lost when structures or fill render the habitat unusable. Additionally, the capability of immediately adjacent habitat to support eiders may be completely or partially compromised by nearby structures and the associated human activity, which could disturb nesting eiders or prevent them from nesting or rearing broods nearby. The extent of the area affected by disturbance remains unknown, and it is also unknown whether eiders are simply displaced from this habitat (possibly with reduced productivity) or continue to use it but possibly at reduced fitness. We have determined habitat loss and disturbance within the adjacent 200 m zone of influence around GMT-2 facilities may adversely affect listed eiders, causing functional loss of 8.35 km^2 of nesting habitat. We estimate this would result in the production loss of 7 spectacled eider nests over the 32-year life of the project. We also estimate that between zero and 5 spectacled eiders would be injured or killed by colliding with structures at GMT-2 over the life of the project.

The Service determined that while some impacts of the Proposed Action will likely cause adverse effects on individuals, these effects, when taken together, are not likely to cause population-level impact in spectacled or Steller's eiders. We anticipate that BLM's IAP/EIS stipulations and BMPs would minimize potential effects of exploration and development, including predator attraction, disturbance, habitat loss/alteration, exposure to oil spills or other contaminants, and collisions. Therefore, the Service concludes that the effects of all the Proposed Action, considered together with, cumulative effects and in the context of the status of the species, environmental baseline, and cumulative effects, *are not reasonably likely to jeopardize the continued existence of spectacled eiders by reducing appreciably the likelihood of survival and recovery of the species in the wild by reducing their reproduction, numbers, or distribution*.

Summary for Polar Bears

Polar bears could be adversely affected by the Proposed Action through disturbance, and human-polar bear interactions. These effects are summarized below.

We anticipate most polar bears would not experience more than short-term disturbance resulting from the Proposed Action. Non-denning (mobile) bears may be affected by human presence and activities such that they change their behavior and move away from the source of disturbance, or in rare cases may be attracted to the area where activity is occurring. The majority of polar bear disturbances would result only in short-term behavior changes that have a minimal effect on polar bears.

Small spills of oil and other chemicals are expected to occur. However, it is highly unlikely that polar bears will be significantly affected because the vast majority of spills will likely be of a very low volume and would occur on development pads. Moreover, the density of polar bears is low in the Action Area so it is unlikely that polar bears will encounter spilled substances that result from the Proposed Action. Further, human activities associated with spill response would likely cause sufficient disturbance to displace polar bears from the spill site before they contact the spill. Very rarely an oil or chemical spill may be unattended, and one or more polar bears may access these chemicals and suffer injury or death. Even in the unlikely event that one or more large spills occur from an uncontrolled well blowout or leak from a pipeline crossing a river, the scarcity of polar bears in the Action Area suggests very few polar bears would be exposed. Given the low probability of a large oil spill combined with the low density of bears in the Action Area, we expect a very small number of polar bears to contact spills. Therefore, at most, we expect a small number of individual-level impacts to polar bears, and population-level effects are not likely to occur.

Some human-polar bear interactions may require deterrence actions. Predicting the number of deterrence actions for individual projects such as GMT-2 is difficult. However, we anticipate the use of projectiles would occur fewer than once annually and up to two times for the 32-year life of the GMT-2 development with no deterrence action resulting in deaths.

We anticipate that stipulations and BMPs set forth in the BLM's IAP/EIS directly benefit polar bears by:

- reducing access to anthropogenic sources of food (e.g., trash);
- requiring designs to reduce surprise encounters with bears;
- requiring workers to be educated on bear avoidance strategies;
- preventing environmental contamination; and
- protecting potential denning habitat from impacts and disturbance.

These BMPs complement protective measures included in LOAs issued under the MMPA by the USFWS.

In summary, we expect few, if any, polar bears would die as a result of disturbance, human-polar bear interactions, or small oil spills. The anticipated level of impact is not likely to cause population-level declines. All anticipated effects of the Proposed Action would likely impact only a limited number of individuals and only a small proportion of the worldwide population. Therefore, the Service concludes the effects of the Proposed Action, considered together with cumulative effects and in the context of the status of the species, environmental baseline, and cumulative effects, *are <u>not</u> reasonably likely to jeopardize the continued existence of polar bears by reducing appreciably the likelihood of survival and recovery of the species in the wild by reducing their reproduction, numbers, or distribution.*

Summary for Polar Bear Critical habitat

Three units of critical habitat in Alaska exist to support the conservation of polar bears; these units are sea ice habitat, terrestrial denning habitat, and barrier island habitat. As summarized above in the Status of Critical Habitat, the condition of designated critical habitat is declining and is expected to continue to decline in response to Arctic warming (IPCC 2014; Overland and

Wang 2007, 2013). To date, the primary changes in the status of critical habitat have been decreases in the extent and quality of sea ice (USFWS 2016a, p. 65). Secondarily, increased human activities, including oil and gas exploration, development, and production, have occurred both offshore and onshore in critical habitat. However, these activities are tightly regulated and impacts to polar bears and their habitat have been negligible to date (75 FR 76118-76119). Thus, the ability of critical habitat to support polar bear conservation is declining and is expected to continue to decline, but to date the effects are primarily to sea ice and are attributable to global-scale climate change, whereas as impacts onshore, and those caused by local-scale factors, have thus far only negligibly affected polar bears and their habitat.

In the Environmental Baseline section above, we evaluated the value of critical habitat within the Action Area, considering how past and ongoing human and natural factors have affected it. We conclude the value of polar bear critical habitat within the GMT-2 Action Area is limited by several factors, including its small area (only 16% of the Action Area); the limited extent of the macrohabitat features of denning habitat within critical habitat in the Action Area; and indications that use of the Action Area by polar bears, particularly for denning, is very minimal. Additionally, although activities occur within critical habitat in the Action Area, the actual area in which infrastructure and human activities overlap is minimal. Further, human activities there are highly managed to reduce disturbance of polar bears and protect dens, in the unexpected event that a den were to occur there. We conclude that the value of critical habitat within the Action Area is minimal, and that climate change and human activities within the area of overlap have affected, but not substantially, the condition and value of critical habitat within the Action Area.

In the Effects of the Action section above, we identified the following factors that could potentially cause adverse effects to polar bear critical habitat:

- Alteration of the physical and biological features (BPFs) of critical habitat, resulting from the construction of permanent facilities and gravel roads;
- Oil spills;
- Disturbance; and
- Human-polar bear interactions.

After evaluating these factors, we conclude that the value of terrestrial denning habitat will not be impacted by alteration of the BPFs, and that appreciable impacts from oil spills are extremely unlikely to occur. Further, polar bear interactions with humans associated with GMT-2 may alter behavior or disrupt movements in the short term, or may require deterrence actions to avoid potentially harmful situations. However, we believe the tightly managed deterrence program would ensure human-polar bear interactions do not reduce the conservation benefit of polar bear critical habitat.

Finally, although disturbance of polar bear dens or females prospecting for den sites could potentially affect denning, we find this potential is minimized by these factors:

1) The spatial overlap between suitable denning habitat and infrastructure where disturbance could occur is very limited in extent. Assuming potential disturbance at dens is limited to areas where suitable denning habitat occurs within 1 mi (1.6 km) of infrastructure (76 FR

47010), this will be limited to 0.72 km^2 during construction. The area of this overlap would drop to 0.66km^2 when construction is complete and operations begin in 2022.

2) Polar bears generally avoid denning where oil and gas exploration, development and production occur (75 FR 76115). Due to the availability and proximity of terrestrial denning habitat that lacks industrial infrastructure and human activity, the potential for polar bears to establish dens near sources of disturbance is likely further reduced; and
3) The existing MMPA incidental take regulatory program has been very successful in ensuring that impacts to polar bears of oil and gas exploration, development, and production have been negligible. This program entails measures to detect and protect pregnant polar bears and dens, monitoring and reporting requirements, and periodic re-evaluations to ensure requirements under the MMPA and ESA are met (CPAI currently has the following LOAs under the MMPA, which apply at least in part to GMT1: LOA 16-13; LOA 17-09; LOA 17-10; LOA 17-12).

We are aware of no cumulative effects within the Action Area that will materially affect the value of critical habitat.

In summary, after reviewing the current status of polar bear critical habitat, the environmental baseline for the Action Area, the effects of GMT-2, and cumulative effects, it is the Service's biological opinion that the development and operation of GMT-2 is not likely to destroy or adversely modify designated critical habitat.

ESTIMATED INCIDENTAL TAKE

Biological opinions often have an accompanying Incidental Take Statement. Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. "Harm" is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. "Harass" is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, but not for the purpose of, carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Estimated Incidental Take for Spectacled Eiders

Habitat Loss and Disturbance

Using the methods described in the *Effects of the Action* section, we estimate the following incidental take for the 32-year life of the project:

- Seven nests.

Collisions

Using methods described the *Effects of the Action* section for spectacled eiders, we estimate the following incidental take for the 32-year life of the project:

- Between 0 and 5 spectacled eiders may collide with structures associated with GMT-2 over the life of the project, resulting in injury or death.

Estimated Incidental Take for Polar Bears

Using methods described the *Effects of the Action* section for polar bears, we estimate the following incidental take for the 32-year life of the project:

- Up to two deterrence actions that cause injury (e.g., pain and bruising), but that do not cause severe injury or death, during the 32-year life of development.

The process for authorizing take (incidental or intentional) for marine mammals such as polar bears differs from the process of authorizing incidental take of other threatened and endangered species. Although we have enumerated the extent of anticipated incidental take of polar bears, the Service is not authorizing incidental take of polar bears under the ESA in this BO. Consistent with the ESA and regulations at 50 CFR §402.14(i) Appendix (A), incidental take statements for marine mammals are not included in formal consultations until regulations, authorizations, or permits under the MMPA are in effect. Because such take must first be authorized under the MMPA, incidental take under the ESA that results from actions conducted in compliance with all requirements and stipulations set forth in the MMPA authorization will be considered by the Service to also be authorized under the ESA. CPAI has obtained authorization under the MMPA for take of polar bears for their various oilfield projects on the North Slope to date. These LOAs will expire before the end of the development lifespan of this project, but we assume that CPAI will continue to receive LOAs in the future.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

Reasonable and Prudent Measures (RPMs) and their implementing Terms and Conditions (T&Cs) aim to minimize the incidental take anticipated to result from the Proposed Action. As described above, activities resulting from GMT-2 may lead to the incidental take of spectacled eiders through habitat loss, disturbance, predation, and collisions. The Service expected that adherence to the lease stipulations and BMPs included in the IAP ROD (BLM 2013) would effectively minimize incidental take of spectacled eiders, and thus did not include RPMs and T&Cs in the IAP BO (USFWS 2013). However, the Action Area for GMT-2 includes areas outside of NPR-A where these BMPs do not apply. Thus, we are including RPMs and T&Cs for spectacled eiders in this amended BO to minimize incidental take within the entire Action Area. The RPMs and T&Cs are based on the BMPs applied to management within NPR-A but have been adapted to focus on minimizing incidental take of spectacled eiders within the entire Action Area.

Disturbance

RPM 1. Minimize ground-level activity (by vehicle or on foot) within 200 meters of occupied spectacled eider nests.

Predation

RPM 2. Minimize the use of GMT-2 facilities as nesting, denning, or shelter sites for avian and nest predators.

Collisions

RPM 3. Minimize the likelihood that collisions would occur as a result of GMT-2 infrastructure.

TERMS AND CONDITIONS

Disturbance

RPM 1. *Minimize ground-level activity (by vehicle or on foot) within 200 meters of occupied spectacled eider nests.*

T&C 1a. Ground-level activity (by vehicle or on foot) within 200 meters of occupied spectacled eider nests, from June 1 through July 31, will be restricted to existing thoroughfares, such as pads and roads. Construction of permanent facilities, placement of fill, alteration of habitat, and introduction of high noise levels within 200 meters of occupied spectacled eider nests will be prohibited.

T&C 1b. In instances where summer (June 1 through July 31) support/construction activity must occur off existing thoroughfares, Service-approved nest surveys must be conducted during mid-June prior to the approval of the activity. Collected data will be used to evaluate whether the action could occur based on employment of a 200-meter buffer around nests or if the activity would be delayed until after mid-August once ducklings are mobile and have left the nest site. Also, in cases in which oil spill response training is proposed to be conducted within 200 meters of shore in riverine, marine, or inter-tidal areas, the BLM and USACE will work with the Service to schedule the training at a time that is not a sensitive nesting/brood-rearing period or require that nest surveys be conducted in the training area prior to the rendering a decision on approving the training. The protocol and timing of nest surveys for spectacled eiders will be determined in cooperation with the Service, and must be approved by the Service. Surveys should be supervised by biologists who have previous experience with spectacled eider nest surveys.

These T&Cs are based on the BLM's BMP E-18.

Predation

RPM 2. *Minimize the use of GMT-2 facilities as nesting, denning, or shelter sites for avian and nest predators.*

T&C 2a. Areas of operation shall be left clean of all debris.
This T&C is based on the BLM's BMP A-1.

T&C 2b. CPAI shall prepare and implement a comprehensive waste management plan for all activities occurring within the GMT-2 Action Area. The plan shall be submitted to the authorized officers for approval, in consultation with federal, State, and North Slope Borough regulatory and resource agencies, as appropriate (based on agency legal authority and jurisdictional responsibility), as part of a plan of operations or other similar permit application. Management decisions affecting waste generation shall be addressed in the following order of priority: (1) prevention and reduction, (2) recycling, (3) treatment, and (4) disposal. The plan shall consider and take into account the following requirements:

1. Methods to avoid attracting wildlife to food and garbage. The plan shall identify precautions that are to be taken to avoid attracting wildlife to food and garbage.
2. Disposal of putrescible waste. Requirements prohibit the burial of garbage. Lessees and permitted users shall have a written procedure to ensure that the handling and disposal of putrescible waste will be accomplished in a manner that prevents the attraction of wildlife. All putrescible waste shall be incinerated, backhauled, or composted in a manner approved by the authorized officer. All solid waste, including incinerator ash, shall be disposed of in an approved waste-disposal facility in accordance with Environmental Protection Agency and Alaska Department of Environmental Conservation regulations and procedures. The burial of human waste is prohibited except as authorized by the authorized officer.

These T&Cs are based on the BLM's BMPs A-2a and A-2b.

T&C 2c. CPAI shall utilize best available technology to prevent facilities from providing nesting, denning, or shelter sites for ravens, raptors, and foxes. The lessee shall provide the authorized officer with an annual report on the use of oil and gas facilities by ravens, raptors, and foxes as nesting, denning, and shelter sites. Additionally, feeding of wildlife is prohibited and will be subject to non-compliance regulations.
This T&C is based on BLM's BMP E-9.

Collisions

RPM 3. *Minimize the likelihood that collisions would occur as a result of GMT-2 infrastructure.*

T&C 3a. Illumination of all structures between August 1 and October 31 shall be designed to direct artificial exterior lighting inward and downward, rather than upward and outward, unless otherwise required by the Federal Aviation Administration.
This T&C is based on BLM's BMP E-10.

T&C 3b. To reduce the possibility of spectacled eiders colliding with above-ground utility lines (power and communication), such lines shall either be buried in access roads or suspended on vertical support members except in rare cases which are to be few in number and limited in extent. Exceptions are limited to the following situations, and must be reported to the USFWS when exceptions are authorized:

1. Overhead power or communication lines may be allowed when located entirely within the boundaries of a facility pad;
2. Overhead power or communication lines may be allowed when engineering constraints at the specific and limited location make it infeasible to bury or connect the lines to a vertical support member; or
3. Overhead power or communication lines may be allowed in situations when human safety would be compromised by other methods.

This T&C is based on BLM's BMP E-11c.

T&C 3c. To reduce the likelihood of spectacled eiders colliding with communication towers, towers should be located, to the extent practicable, on existing pads and as close as possible to buildings or other structures, and on the east or west side of buildings or other structures if possible. Support wires associated with communication towers, radio antennas, and other similar facilities, should be avoided to the extent practicable. If support wires are necessary, they should be clearly marked along their entire length to improve visibility to low-flying birds. Such markings shall be developed through consultation with the Service.
This T&C is based on BLM's BMP E-11d.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. BLM and USACE are encouraged to:

1. Continue to work with the Service and other Federal and State agencies in implementing recovery actions identified in the Steller's and spectacled eider recovery plans. Research to determine important habitats, migration routes, and wintering areas of spectacled and Steller's eiders is an important step toward minimizing conflicts with current and future North Slope oil/gas activities.
2. Continue to monitor threatened eiders and BLM special status species in the Action Area and surrounding region in which oil and gas development is likely to occur. Results will allow the Service, BLM, and USACE to better evaluate abundance, distribution, and population trends of listed eiders and other special status species. These efforts will enhance the likelihood that future oil and gas development within NPR-A and the Colville River delta will not jeopardize listed eiders or lead to listing additional species.
3. Develop an outreach program that aims to eliminate use of lead shot and accidental shootings of spectacled and Alaska-breeding Steller's eiders within the Action Area.

The Service requests notification of the implementation of any conservation recommendations by the BLM and USACE to keep the Service informed of actions minimizing or avoiding adverse effects or benefiting candidate or listed species or their habitats.

Thank you for your cooperation in the development of this BO. If you have any comments or require additional information, please contact Ted Swem, Consultation Branch Chief, at ted_swem@fws.gov, (907) 456-0441, or Fairbanks Fish and Wildlife Field Office, 101 12th Ave., Fairbanks, Alaska, 99701.

RE-INITIATION NOTICE

This concludes formal consultation on the Action described. As provided in 50 CFR 402.16, re-initiation of formal consultation is required where discretionary BLM or USACE involvement or control over the action has been retained (or is authorized by law) and:

1) If the amount or extent of incidental take is exceeded;
    a. Habitat loss and associated disturbance:
        - Seven spectacled eider nests during the 32-year development lifespan
    b. Collisions:
        - Five spectacled eiders injured or killed in collisions with infrastructure.
2) If new information reveals the Proposed Action may affect listed species in a manner or to an extent not considered in this opinion that includes but is not limited to the following:
    a. More than to two deterrence events that lead to injury (e.g., pain and bruising) during the 32-year life of development, but that do not cause severe injury or death;
    b. Any human-caused incidents that lead to the death of a polar bear; or
    c. Any human-caused incidents that cause the premature abandonment of polar bear dens.
3) If a new species is listed or critical habitat designated that may be affected by the Action.

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Appendix A: Deviations Requested by CPAI

(Text provided by BLM 2018b)

In a letter dated October 30, 2017, CPAI formally requested that BLM grant deviations to two stipulations/BMPs (DSEIS Appendix I).

Deviation Request for Lease Stipulation E-2 (Facilities Within 500 Feet of Water Bodies)

CPAI first seeks a deviation from Lease Stipulation E-2 (2008), which prohibits permanent oil and gas facilities, including roads and pipelines, within 500 feet of fish bearing water bodies and aquatic habitats. A map illustrating all rivers, streams, and lakes within 500 feet of the Alternative A facilities is included as Attachment 2 for reference. As shown on that map, the road route for Alternative A comes within 500 of one named lake (M9925).

The objective of Lease Stipulation E-2 is to protect fish-bearing waterbodies, water quality, and aquatic habitats. In the 2013 IAP, Stipulation E-2 was clarified to apply only to fish-bearing waterbodies. The terms of Lease Stipulation E-2 in both the 2008 and 2013 versions expressly provide: "Essential pipeline and road crossings will be permitted on a case-by-case basis."

The GMT2 project area, like much of the North Slope, contains abundant lakes, rivers, streams, creeks, and ponds. These water bodies are prevalent because the area is underlain by permafrost, which generally prohibits drainage. Additionally, this area is classified as wetlands, attesting to presence of numerous water bodies. The 2004 Alpine Satellite Development Plan EIS (Sections 3.2.1.1 and 3.2.2.1) states:

- "The tundra covered Arctic Coastal Plain . . . is generally characterized by periglacial features associated with flat topography, poor drainage, and underlying permafrost. Thaw-lakes and polygonal surface patterns on inter-lake ice wedges are the dominant terrain features."
- "Abundant thaw-lakes and marshy thaw-lake basins, generally only a few feet deep, cover 25 to 30 percent of the landscape."
- "Lakes and ponds are the most prevalent features of the Plan Area. "

Because of the abundance of water bodies in the area, it is not technically possible, let alone technically feasible, to locate all facilities farther than 500 feet from the highest high-water mark of all active floodplains. CPAI selected the proposed locations for pads, roads, and pipelines by balancing engineering, habitat, economics, hydrology, and other environmental factors, such as avoiding bird nest locations, to the extent possible. Maintaining a distance of 500 feet from every water body, while also minimizing gravel footprint, is not practicable in this environment.

Even where facilities need to be placed closer than 500 feet from a water body, the objective of Lease Stipulation E-2, protection of water quality, would still be satisfied. Standard practices such as pipeline inspections and other spill prevention efforts will protect water bodies from potential spills to the extent possible. Secondary containment for tanks, tank inspection procedures, and refueling practices minimize the chance of a potential tank spill leaving a pad and entering a water body. Spill response equipment will be staged near sensitive areas and agency approved spill plans will be in place.

BLM granted approval an exception from this requirement in 2004, based on technical infeasibility of total compliance due to the hydrology and number of water bodies in the area as well as implementation of other measures that would protect water bodies (e.g., use of secondary containment).[5] BLM reaffirmed this decision, speaking terms of a "deviation" rather than an exception, for the GMT1 development at page 7 of the GMT1 ROD, issued in 2015. CPAI now requests confirmation that the 2004 exception remains in effect to allow the location of facilities closer than 500 feet from water bodies where necessary based on other environmental and engineering factors.

Deviation Request for BMP E-7c (500 Feet Between Pipelines and Roads)

CPAl's second request is for a deviation from BMP E-7c., which requires a minimum distance of 500 feet between pipelines and roads. Four stretches of the proposed road and pipeline routes locate the pipeline within 500 feet of the gravel road. These are 3,990 feet of road and pipeline near lake M9925, 3,909 feet near lake M9923, 4,803 feet near lake Z06005, and 1,195 feet near lake R0062. These particular distances and locations may change subject to potential pipeline route modifications.

The objective of BMP E-7c is to minimize disruption of caribou movement and subsistence use. The standard is for pipelines and roads to be designed to allow the free movement of caribou and the safe, unimpeded passage of the public while participating in subsistence activities. The BMP also states: "Separating roads from pipelines may not be feasible within narrow land corridors between lakes and where pipelines and roads converge on a drill pad. Where it is not feasible to separate pipelines and roads, alternative pipeline routes, designs and possible burial within the road will be considered by the authorizing officer. "

Separating the pipeline from the gravel road by more than 500 feet, while also staying 500 feet away from nearby lakes, is not feasible at the four locations. Location 2 is also narrowed by the need to keep the road out of the Fish Creek setback. The nearest the road comes to the pipeline at location 1 is approximately 359 feet, at location 2,337 feet, at location 3,269 feet, and at location 4,458 feet.

Even where pipelines and roads would be placed closer than 500 feet, the objective of BMP E-7c, that the pipelines and roads would be designed to allow the free movement of caribou and the safe, unimpeded passage of the public while participating in subsistence activities, will still be satisfied. The pipeline height will be a minimum of 7 feet allowing unimpeded passage, and road pullouts have been proposed to support subsistence activities and provide a safe place for subsistence hunters to rendezvous while hunting or traveling to camp and cabin sites.

For the reasons set forth above, CPAI requests a deviation from ROP E-7c as necessary to allow certain stretches of road and pipeline to be less than 500 feet apart.

[5] In the 2004 Alpine Satellite Development Plan ROD, this Lease Stipulation is referred to on page 3 as "Stipulation 41."