U.S. Department of the Interior
Bureau of Land Management

Willow Master Development Plan

Environmental Impact Statement

SUPPLEMENT TO THE DRAFT

Volume 1: Chapters 1 through 5, Glossary, and References

March 2020

Prepared by:
U.S. Department of the Interior
Bureau of Land Management

In Cooperation with:
U.S. Army Corps of Engineers
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Department of Transportation
Native Village of Nuiqsut
Iñupiat Community of the Arctic Slope
City of Nuiqsut
North Slope Borough
State of Alaska

Estimated Total Costs Associated with Developing and Producing this EIS:
$5,005,000

Mission

To sustain the health, diversity, and productivity of the public lands for the future use and enjoyment of present and future generations.

Cover Photo Illustration: Caribou in the Alpine Development on Alaska's North Slope.
Photo by: Wendy Mahan, courtesy of ConocoPhillips.

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The dollar figure represented here is an approximate cost to date. Previously published costs were estimates for the full EIS process.

SUPPLEMENT TO THE DRAFT ENVIRONMENTAL IMPACT STATEMENT WILLOW MASTER DEVELOPMENT PLAN PROJECT

Lead Agency:	U.S. Department of the Interior, Bureau of Land Management (BLM)
Cooperating Agencies:	U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency (EPA), U.S. Department of Transportation (Pipeline and Hazardous Material Administration), State of Alaska, North Slope Borough, Native Village of Nuiqsut, City of Nuiqsut, and the Iñupiat Community of the Arctic Slope.
Proposed Action:	Construct and operate the infrastructure necessary to allow the production and transportation to market of federal oil resources under leaseholds in the northeast area of the National Petroleum Reserve in Alaska (NPR-A), consistent with the Proponent's (ConocoPhillips Alaska, Inc.) federal oil and gas leases and unit obligations.
Abstract:	The Willow Master Development Plan (MDP) Draft Environmental Impact Statement (EIS) was published on August 23, 2019. The Draft EIS analyzed a No Action Alternative (Alternative A), three action alternatives (Alternatives B, C, and D), and two module delivery options (Options 1 and 2), to support a new development proposed by ConocoPhillips Alaska, Inc. on federal oil and gas leases in the northeast area of the NPR-A. This document is a Supplement to the Draft EIS (SDEIS) that addresses additional analysis for three Project components that were added by the Project proponent after publication of the Draft EIS: module delivery Option 3, a constructed freshwater reservoir, and up to three boat ramps for subsistence access. If the MDP is approved, the Proponent may submit applications to build up to five drill sites, a central processing facility, an operations center pad, gravel roads, ice roads and ice pads, 1 or 2 airstrips (varies by alternative), pipelines, and a gravel mine site. The Willow MDP Project would have a peak production in excess of 160,000 barrels of oil per day (with a processing capacity of 200,000 barrels of oil per day) over its 30- or 31-year life (varies by alternative), producing approximately 590 million total barrels of oil, and would help offset declines in production from the North Slope oil fields and contribute to the local, state, and national economies. The EIS describes proposed infrastructure and potential effects on the natural, built, and social environments. The BLM and other state and federal agencies will decide whether to authorize the Willow MDP Project, in whole or in part, based on the analysis contained in the EIS, as well as other state and federal permit review processes.
Review Period:	The review period for the SDEIS is 45 days beginning on the date when EPA publishes a notice of availability for the SDEIS in the *Federal Register*.
Further Information:	Contact Racheal Jones, BLM Alaska Project Manager, at 907-290-0307 or visit the Willow MDP EIS website at https://www.blm.gov/programs/planning-and-nepa/plans-development/alaska/willow-eis.

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Alaska State Office
222 West Seventh Avenue, #13
Anchorage, Alaska 99513-7504
www.blm.gov/alaska

March 2020

Dear Reader:

I am pleased to present the Supplement to the Draft Willow Master Development Plan (MDP) Environmental Impact Statement (SDEIS) for your review. This document supplements the Draft EIS (published on August 23, 2019) with additional analysis for three Project components that were added to the Project by ConocoPhillips Alaska, Inc. (proponent): a different module delivery route (Module Delivery Option 3: Colville River Crossing), a constructed freshwater reservoir (CFWR), and up to three boat ramps for subsistence access. The proposed infrastructure would support a new development proposed by the proponent, on federal oil and gas leases in the northeast area of the National Petroleum Reserve in Alaska (NPR-A). The SDEIS addresses potential effects from the additional proposed infrastructure on the natural, built, and social environments.

The NPR-A is within the North Slope Borough and is predominantly managed by the BLM. The BLM is responsible for land use approvals and EIS compliance with the requirements of the National Environmental Policy Act of 1969 (42 USC 4321 et seq.). The proponent is proposing to construct drill sites, roads, pipelines, and ancillary facilities to support the safe and economic production and transportation to market of oil and gas resources under leaseholds in the NPR-A. The decision to be made is whether BLM will authorize the project, in whole or in part, based on the analysis contained in the EIS.

The SDEIS is intended to fully disclose known or anticipated effects of new project components not previously presented to the public and to offer the opportunity to comment on draft conclusions associated with the new project components. The BLM will evaluate all comments received and address substantive comments in the Final EIS, which is anticipated to be released in the summer of 2020. The most useful comments are specific and address one or more of the following:

- Identification of new information that would have a bearing on the analysis.
- Inaccuracies or discrepancies in information or any errors in our portrayal of the resources and uses of the project area.
- Suggestions for improving implementation of oil and gas development, consistent with the purposes of the NPR-A.
- Identification of new impacts, alternatives, or potential mitigation measures.

Please ensure your comments are as specific as possible. Identify the specific concern or correction you are suggesting, where it appears in the SDEIS, and the modification you feel is necessary or appropriate.

There are three ways to submit comments:

- Electronically at www.blm.gov/alaska/comment123

- By mail:
  BLM Alaska State Office
  (Attn: Racheal Jones, Project Manager)
  222 West 7th Avenue, #13
  Anchorage, AK 99513

- In person:
  BLM Public Information Center,
  222 W. 7th Avenue, Anchorage, Alaska,
  or at the public meetings.

The 45-day public comment period begins with the U.S. Environmental Protection Agency's Notice of Availability published by in the *Federal Register.* The precise dates of the comment period, as well as information about public meetings and subsistence hearings pursuant to Section 810 of the Alaska National Interest Lands Conservation Act, will be posted on our website at www.blm.gov/alaska.

Submitted comments will be publicly available and may be included in the Final EIS. Before including your address, phone number, email address, or other personal identifying information in your comment, be aware that your entire comment, including your personal identifying information, may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so. All submissions from organizations and businesses and from individuals identifying themselves as representatives or officials of organizations and businesses will be available for public inspection in their entirety.

For more information or to learn how to make comments that make a difference on this and all of our plans during public comment periods, visit www.blm.gov/alaska/comment123.

Sincerely,

Chad B. Padgett

Chad Padgett
State Director

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List of Acronyms

6:1	6 horizontal to 1 vertical
ACP	Arctic Coastal Plain
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ASRC	Arctic Slope Regional Corporation
ASTAR	Arctic Strategic Transportation and Resources
BLM	Bureau of Land Management
BMPs	best management practices
BOEM	Bureau of Ocean Energy Management
BT1/2/3/4/5	drill sites, Bear Tooth 1 through 5
CAH	Central Arctic Herd
cfs	cubic feet per second
CFWR	constructed freshwater reservoir
CPAI	ConocoPhillips Alaska, Inc.
CRD	Colville River Delta
CWAT	Community Winter Access Trail
dBA	A-weighted decibel used to characterize airborne noise, referenced to 20 micropascals
DS2P	Kuparuk drill site 2P
EIS	Environmental Impact Statement
GMT-1	Greater Mooses Tooth 1
GMT-2	Greater Mooses Tooth 2
HUC	Hydrologic Unit Code
IAP	Integrated Activity Plan
km	kilometers
Kuukpik	Kuukpik Corporation
LSs	lease stipulations
MDP	Master Development Plan
MG	million gallons
MTI	module transfer island
NEPA	National Environmental Policy Act
NPR-A	National Petroleum Reserve in Alaska
NSB	North Slope Borough
Project	Willow Master Development Plan Project
RFFAs	reasonably foreseeable future actions
RM	river mile
SDEIS	Supplement to the Draft Environmental Impact Statement
SPMT	self-propelled module transporter
SS	suspended sediment
TCH	Teshekpuk Caribou Herd
tpd	tons per day
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
VSMs	vertical support members
WOC	Willow Operations Center
WPF	Willow Processing Facility

1.0 INTRODUCTION

Following publication of the Willow Master Development Plan (MDP) Draft Environmental Impact Statement (EIS), the proponent, ConocoPhillips Alaska, Inc. (CPAI), presented the Bureau of Land Management (BLM) with design updates to the proposed Willow MDP Project (Project). This document supplements the Draft EIS (published on August 23, 2019) with additional analysis for three Project components that have been added by the Project proponent: module delivery Option 3, a constructed freshwater reservoir (CFWR), and up to three boat ramps for **subsistence** access. These are detailed in Chapter 2. Additional Project design updates were provided by the Project proponent; however, the changes are not expected to change the overall analysis or results described in Chapter 3 of the Draft EIS. The Final EIS will incorporate all design changes into the overall Project analyses.

1.1 Regulatory Framework for a Supplement to the Draft Environmental Impact Statement

The Willow MDP EIS is being developed under the framework outlined under the National Environmental Policy Act (NEPA). Per the NEPA process, changes to a proposed project between the Draft EIS and Final EIS may require the lead federal agency to issue a Supplement to the Draft EIS (SDEIS) to inform the public of the proposed changes to the project. Specifically, 40 CFR 1502.9(c) provides that agencies shall prepare supplements to a Draft or Final EIS if there are "substantial changes in the proposed action that are relevant to environmental concerns." Additionally, the Council on Environmental Quality notes a supplement should be prepared when a new alternative not previously considered in a Draft EIS (CEQ 1981) is put forward and it does not fall within the spectrum of alternatives considered in the Draft EIS.

1.2 Rationale for Analysis Contained in the Supplement to the Draft Environmental Impact Statement

Ongoing design refinement and engineering is typical during the NEPA process. This supplemental document evaluates three substantive elements added to the Project description since the Draft EIS. The SDEIS limits the scope of analysis to new Project components that would have new potential effects or would have effects in new areas not previously analyzed in the Draft EIS. Potential environmental effects for Project elements that were already evaluated in the Draft EIS are not reiterated in the SDEIS, even though some effects may be slightly different (in magnitude, duration, or location—not in type of effect) due to CPAI's Project modifications. Other Project changes (e.g., minor changes in gravel pad sizes, changes to the location of Project components and minor shifts in gravel road alignments, changes in ground traffic and air traffic numbers) are not expected to substantively change the overall analysis or results described in Chapter 3 of the Draft EIS. These Project updates and modifications will be detailed in the Final EIS, including the following:

- Production from the neighboring Greater Mooses Tooth 2 (GMT-2), which is currently under construction, may shift from the Alpine processing facility to the Willow Processing Facility (WPF)
- Two additional water sources have been identified to support Project drilling and operations under all action alternatives; water sources vary by alternative
- The Willow Operations Center (WOC), WPF, and airstrip have been relocated approximately 2.5 miles to the northeast under Alternative B
- Refinements have been made to reduce the overall size of the Tiŋmiaqsiuġvik mine site, adjust the layout of the mine cells and ice pads, and draft a reclamation plan
- Refinements have been made to the overall Project footprint (under all action alternatives) that include changes to drill site pads, the WOC pad, the WPF pad, and the airstrip; changes to Project road widths; and the addition of new pads to support Project construction and operations. The refinements marginally decreased the overall Project footprint for some alternatives and marginally increased them for others.

- Updates have been made to total traffic and freshwater use estimates; the updates decreased the estimates for some alternatives and increased them for others
- New Project facilities (e.g., Project-supporting equipment and modules) have been added, to be placed on existing gravel pads in Alpine and Kuparuk
- Updates have been made to the ice road design, including task-specific ice road widths; the updates decreased the widths for some tasks and increased them for others
- Updates have been made to the Project schedule and construction sequencing, however the anticipated life of the Project and Project start date has not changed

Figures in the SDEIS reflect all Project updates. More details on Project updates and modifications are in CPAI's Environmental Evaluation Document, which is available on BLM's ePlanning website: https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=161457.

Because Subsistence is a unique issue and the methods used to analyze it are different than other resources, Chapter 3.16, *Subsistence and Sociocultural Systems*, includes all Project updates in its analysis.

1.3 Development Location (Project Area)

In addition to the location described in the Draft EIS, the newly proposed module delivery option (Option 3) would include use of existing facilities in the Kuparuk River Unit such as the Oliktok Dock and existing Kuparuk gravel road network. Temporary ice roads would be constructed from existing gravel roads across the Colville River to the Project area within the National Petroleum Reserve in Alaska (NPR-A). (See Section 2.3, *Module Delivery Option: Colville River Crossing*.)

2.0 ALTERNATIVES

2.1 Overview of Alternatives and Module Delivery Options

The Draft EIS consisted of a No Action Alternative (Alternative A) and three action alternatives (B, C, and D), which would construct a combination of ice and gravel infrastructure (e.g., roads, pads) to provide access to CPAI's lease holdings and allow for drilling and operations of targeted hydrocarbon resources. Two options were evaluated in the Draft EIS to accommodate sealift delivery of large modules to the Project area (Options 1 and 2 below); any option could be applied to any action alternative. This SDEIS evaluates an additional module delivery option (Option 3), using Oliktok Dock and an ice bridge across the Colville River instead of a constructed gravel module transfer island (MTI).

Currently, four alternatives and three module delivery options are under consideration:

- Alternative A: No Action
- Alternative B: Proponent's Project (Draft EIS Figure 2.4.1)
- Alternative C: Disconnected Infield Roads (Draft EIS Figure 2.4.2)
- Alternative D: Disconnected Access (Draft EIS Figure 2.4.3)
- Option 1: Atigaru Point Module Transfer Island (Draft EIS Figure 2.4.4)
- Option 2: Point Lonely Module Transfer Island (Draft EIS Figure 2.4.5)
- Option 3: Colville River Crossing (Figure 2.3.1)

Figures in the SDEIS reflect all Project changes proposed by CPAI; however, only the CFWR, boat ramps, and Option 3 are analyzed in detail in the SDEIS. All Project changes will be detailed and analyzed in the Final EIS.

2.2 Alternatives B, C, and D

In addition to the Project details for Alternatives B, C, and D provided in the Draft EIS Chapter 2.0, *Alternatives*, and Appendix D, *Alternatives Development*, a CFWR and up to three subsistence boat ramps would be added to all action alternatives.

2.2.1 Constructed Freshwater Reservoir

CPAI's ongoing engineering and planning efforts for the Project have revealed that an additional freshwater source is required to meet planned Project drilling and operations activities. To address the required freshwater needs for the Project, CPAI proposes to develop a CFWR to supply a reliable source of freshwater while minimizing the need for directly withdrawing water from Project area lakes (Figure 2.2.1). The CFWR would be sized to provide for a total estimated winter withdrawal of 55 million gallons (MG); this volume estimate assumes the presence of approximately 6 feet of ice thickness and 5 feet of water at the CFWR bottom for settling. The CFWR would be included under all action alternatives.

The CFWR was designed similarly to an existing freshwater reservoir adjacent to Kuparuk CPF2, a CPAI processing facility located in Kuparuk. The CFWR would include the following:

- An 800-foot-long by 700-foot-wide by 50-foot-deep unlined reservoir pit with 6 horizontal to 1 vertical (6:1) side slopes
- A 1,325-foot-long by 15-foot wide flat bottom and 6- to 10-foot-deep unlined channel connection to Lake M0015 with 6:1 side slopes[1]
- A 7-foot-high perimeter berm bordering the CFWR which would provide pedestrian access around the reservoir for monitoring and maintenance activities, and promote thermal stability of the adjacent permafrost
- A sheet-pile weir with a screen to barricade fish from the CFWR
- A flow-control gate to restrict flow into the CFWR based on monitored water levels in Lake M0015 and the lake's outlet into Willow Creek 3

[1] Dimensions are approximate pending slope stability analysis and additional geotechnical investigations to be completed by CPAI.

The CFWR would be excavated during winter (16.3 total acres) and spoils would be used to construct the perimeter berm (25,000 cubic yards) or would be back hauled to the Project's gravel mine site, where the material would be placed in an excavated mine cell and used as backfill material. The perimeter berm would be capped with approximately 6,000 cubic yards of mined gravel to accommodate equipment access for maintenance of the CFWR and Lake M0015 connection channel.

The CFWR would be accessed by a short gravel road connected to the road to drill site Bear Tooth 3 (BT1/2/3/4/5). Water would be drawn from the reservoir using a submersible pump, screened per Alaska Department of Fish and Game (ADF&G) design guidelines, and likely accessed via a permanent catwalk extending into the CFWR. From the CFWR, raw water would be transported via pipeline to the WPF for emergency fire suppression use and to the WOC (south WOC under Alternative C) for potable water treatment and transport elsewhere in the Project area as needed.

The CFWR would be separated from Lake M0015 and Willow Creek 3 (its inlet and outlet creek). Flow into the CFWR would be controlled using a flow-control gate; this would control water inflow and ensure sufficient outflow from Lake M0015 and into Willow Creek 3. At times of low flow in Willow Creek 3, the flow-control gate can be closed so that water is not diverted into the CFWR. The CFWR would be filled during spring breakup and early summer (i.e., periods of high flow), when a percentage of the flow which contributes to Willow Creek 3 would be diverted to and stored in the reservoir. The estimated annual recharge volume of Lake M0015 and Lake R0064 exceeds the estimated volume of the CFWR and change in water flow is not anticipated to impact the Willow Creek 3 baseline flow.

Table 2.2.1 summarizes the gravel footprint and fill volumes associated with the CFWR. Gravel for the CFWR would originate from the Tiŋmiaqsiuġvik mine site, described in the Draft EIS (Section 2.5.6, *Gravel Mine Site*, and Appendix D Section 4.2.6, *Gravel Mine Site*).

Table 2.2.1. Constructed Freshwater Reservoir Footprint and Gravel Volume Summary

Component	Footprint (acres)	Gravel Fill Volume (cubic yards)
Reservoir excavation	12.9	NA
Water supply channel excavation	3.5	NA
Perimeter berm	3.9	25,000 (native excavated material) 6,000 (gravel)
Total	**20.3**	**25,000 (native excavated material) 6,000 (gravel)**

Note: NA (not applicable)

Pipelines connecting the CFWR to the WPF would be placed on new vertical support members (VSMs) roughly parallel to the water source access road before connecting to VSMs shared with other infield pipelines. The pipeline would maintain a minimum clearance of 7 feet with the surrounding ground surface.

2.2.2 Boat Ramps for Subsistence Users

CPAI proposes to construct up to three boat ramps (number varies by action alternative) for subsistence use as part of its effort to mitigate Project effects on the community of Nuiqsut (Figure 2.2.2). CPAI proposes to construct one boat ramp (all action alternatives) to access the Ublutuoch (Tiŋmiaqsiuġvik) River along the existing gravel road between Alpine CD5 and Greater Mooses Tooth 1 (GMT-1). Two additional boat ramps could be constructed along Judy (Iqalliqpik) Creek and/or Fish (Uvlutuuq) Creek under Alternative B, pending further community input; these boat ramps would be accessed via short roads connected to Project roads near Project bridges. Due to roadless sections contained in Alternatives C and D, these two additional sites would not apply to these alternatives as there would be no gravel road connection to these locations.

Preliminary locations and boat-ramp design have been determined, but CPAI is seeking community feedback on the preferred location(s) that would best serve the needs of the community. The boat ramps would include a short gravel access road and gravel pad with space for vehicles to turn around and provide parking space for approximately 10 trucks with trailers. Early design information estimates approximately 0.4 acre of each boat ramp would be under ordinary high water. The gravel access road would likely have a surface width of 24 feet. Boat ramp footprints are summarized in Table 2.2.2. CPAI estimates 33,000 cubic yards of gravel fill would be required to construct each of the three boat ramps. Gravel for the boat ramps would originate from the Tiŋmiaqsiuġvik mine site, described in the Draft EIS Section 2.5.6, *Gravel Mine Site*, and Appendix D Section 4.2.6, *Gravel Mine Site*.

Table 2.2.2. Boat Ramp Footprint Summary

Boat Ramp Location[a]	Applicable Alternative	Total Footprint[a] (acres)
Ublutuoch (Tiŋmiaqsiuġvik) River	B, C, D	1.8
Judy (Iqalliqpik) Creek	B	2.0
Fish (Uvlutuuq) Creek	B	2.1
Total	**NA**	**5.9**

Note: NA (not applicable).
[a] Includes gravel boat ramp access road, gravel (parking) pad, and boat ramp above and below ordinary high water.

Construction timing for the boat ramp and associated access road would be based on the final selected location(s) of the boat ramp(s), though they would likely be constructed at the same time as the adjacent gravel road. Gravel placement would occur during winter months with gravel seasoning and compaction occurring the following summer. Boat ramp construction would not require pile driving. The need for erosion control would be evaluated during the final design phase, once locations have been finalized based on community input.

The boat ramp would be designed and constructed to avoid impacts on fish and fish habitat, and would be coordinated with BLM and ADF&G.

2.3 Module Delivery Option 3: Colville River Crossing

In response to concerns and comments from stakeholders over the proposed MTI in module delivery Options 1 and 2, CPAI developed a new option to complete sealift module delivery to the Project area, Option 3: Colville River Crossing. Under this option, large sealift modules (weighing between 3,000 and 4,000 tons) would be received at the Oliktok Dock and transported over the existing gravel road network in Kuparuk south to Kuparuk drill site 2P (DS2P) (Figure 2.3.1). From DS2P, the modules would be transported via task-specific ice road across the Colville River (near Ocean Point) to the Project area near the GMT-2 drill site. From GMT-2, the modules would be transported over Project gravel roads (Alternatives B and C) or Project ice roads (Alternative D) to their installation location.

2.3.1 Oliktok Dock and Offshore Barge Lightering Area

Under Option 3, sealift barges would deliver the processing modules to Oliktok Dock using existing, regularly used marine transportation routes. Sealift module delivery would occur during the two open-water (summer) seasons of 2024 and 2026 (Alternatives B and C) or 2025 and 2027 (Alternative D).

To facilitate delivery of the large processing and drill-site modules to Oliktok Dock, lightering barges would be required. Lightering is the process of transferring cargo between vessels to reduce a vessel's draft (i.e., water depth requirement), allowing it to enter shallower waters found in harbors or at docks. The water at Oliktok Dock is approximately 8 feet deep and is too shallow to accommodate fully laden sealift barges; as a result, a portion of each sealift barge load would be transferred onto a lightering barge (with shallower draft requirements) to allow transport to Oliktok Dock.

Both the lightering transfer and barge unloading at Oliktok Dock would require **screeding** operations, which is the redistribution or recontouring of the existing sea floor to provide a level surface for the barges to be grounded on during load transfers.[2] The lightering transfer location would be approximately

[2] Screeding operations are typically accomplished by dragging a metal plate attached to a screeding barge across the bottom of the seafloor to move sediments in a leveling operation. The amount of material moved is typically small and localized; no sediments would be removed from the water and no new fill material would be added. A backhoe or excavator may be used to assist where required; however, the bucket would not be raised above the water surface during operations.

2.3 miles north of Oliktok Dock in 10 feet of water and would require a screeding disturbance area of 9.6 acres. An additional 2.5 acres in front of Oliktok Dock would also require screeding to facilitate unloading of the lightering barges immediately prior to the first barge delivery of each year. Screeding would occur in the summer and would take approximately 1 week to complete with bathymetry measurements occurring afterward to confirm the seafloor surface is acceptable to the barge operator.

In order to complete the sealift module delivery to Oliktok Dock, some improvements and modifications would be required at the dock itself. To accommodate the 25-foot-high side-shell sealift barges anticipated to be used for the Project, CPAI would raise the existing dock surface approximately 6 feet by adding structural components and a gravel ramp. Two new 50-ton bollards would also be installed at the dock face; pile driving would not be required. All modifications to the Oliktok Dock would be within the existing dock footprint and no additional piles or in-water work would be required. All required gravel would be sourced from existing mine sites within the Kuparuk area. Modifications to Oliktok Dock would be completed in the summer of 2023 and would take approximately 4 weeks to complete.

2.3.2 Sealift Module Staging Area

Following delivery of the sealift modules to Oliktok Dock, the modules would be moved to and stored at the existing 12.0-acre gravel pad located 2 miles south of Oliktok Dock (Figure 2.3.1). The staging area pad is currently 3 to 4 feet thick. In the area where the modules would be stored, the pad would be improved with new gravel to bring the minimum pad thickness up to 5 feet. Rig mats would then be installed on the surface to provide further structural support for module storage. All work would be completed within the existing gravel-pad footprint. The sealift modules would be skirted for storage to prevent drifting snow from accumulating under the modules.

2.3.3 Module Transport Ice Road and Colville River Crossing

In January following each sealift, the modules would be transported via the existing gravel road system from the module staging area to DS2P (Figure 2.3.1), where they would be staged on a single-season ice pad near the DS2P access road until construction of the module transport ice roads and Colville River ice bridge are complete.

The location of the Colville River crossing was determined following evaluation of potential crossing areas by CPAI engineering. A variety of engineering factors were considered to determine the potential Colville River crossing location, including determination of the maximum allowable ice road grades for the self-propelled module transporters (SPMTs) and assumptions about SPMT dimensions (assumed to be 27 feet wide by 200 feet long).

The 60-foot-wide, 40.1-mile-long heavy-haul ice road for module transport would be constructed from both the east and west ends at DS2P and GMT-2 (Figure 2.3.1), respectively. The two ice-road segments would meet at the Colville River crossing location near Ocean Point. At the crossing location, an engineered ice bridge would be constructed to provide sufficient load-carrying capacity to support the combined weight of the sealift modules and the SPMTs. The **grounded ice**[3] crossing would be approximately 1 river mile (RM) downstream (south) of Ocean Point, as defined by the U.S. Geological Survey (USGS; see USGS topographic quad map A3 – Harrison Bay). The specific crossing location was selected based on favorable hydrologic, topographic, and bathymetric conditions. The proposed crossing location was also sited so that it is upstream of the influence of saltwater intrusion and tidal backwatering from the Colville River Delta (CRD) and thus is not expected to be used by fish in winter. CPAI will continue to monitor the proposed Colville River crossing location for fish presence over coming winters prior to construction to gain baseline data. CPAI would work with the ADF&G through the permitting

[3] It is anticipated that the grounded ice crossing for the Colville River would be primarily frozen fast to the riverbed; however, there may be some pockets of free water present beneath the ice that are narrower than the length of the SPMT (Figure 2.3.1). The free-water pockets would be spanned by the overall length of the SPMTs and therefore would bear minimal loading.

process if fish presence is found during the winter months when module transport would occur; should it be necessary, CPAI will consult with ADF&G on how fish would be transported around the ice bridge.

The Colville River ice crossing would be approximately 2,800 feet long from the top of the east bank to the top of the west bank (approximately 700 feet long from the edge of water to the edge of water), and 65 feet wide at the surface (Figure 2.3.1). Ramps entering or exiting the river channel may be wider depending on the amount of ice fill required. The total ice thickness of the ramp and crossing would range up to 7.1 feet from the river bottom (natural ice thickness in this area varies and was 0.5 to 6.2 feet thick in April 2019 (additional details on the existing conditions of the crossing location are available in Section 3.8.1.1, *Rivers*).

2.3.4 Other Infrastructure

Option 3 would require a 100-person camp located on a 15-acre single-season ice pad near the DS2P access road to support module moves during the winters of 2025 and 2027 (Alternatives B and C; Alternative D would occur during winter 2026 and winter 2028). Ice road construction crews for the eastern ice-road segment would also be based out of the same camp near DS2P. Ice road crews constructing the western ice road segment would be based out of one of the construction camps used to support other Project construction activity (e.g., at the Kuukpik Pad). The camp proposed in the Draft EIS (Appendix D, *Alternatives Development*) is included as a component of Alternatives B, C, and D; therefore, this camp is not included as a component specific to the Option 3 analysis.

Option 3 would not require the installation of temporary or permanent communications tower to execute, as the Project could use existing communications facilities in the greater Kuparuk area and new communications facilities constructed in the Project area as part of the Project (i.e., under Alternatives B, C, or D).

2.3.5 Access

Module transport from the existing Oliktok Dock to the Project area would occur over existing gravel roads between the dock and DS2P, by ice road (including the Colville River crossing) from near DS2P to GMT-2, and by the proposed Project gravel access road (Alternatives B and C) from GMT-2 to the WPF (or ice road under Alternative D). Note that under Alternative D, Option 3 would require an additional 12.5 miles of 60-foot-wide, heavy-haul ice road between GMT-2 and the WPF for module mobilization in 2026 and 2028 (25.0 miles total).

The 2-mile-long gravel road from the Oliktok Dock to the staging area pad (approximately 2 miles south of the dock) averages about 3 feet thick and would be modified to be at least 5 feet thick to support the summer transport of the modules. This improvement would require an estimated 40,300 cubic yards of gravel and would increase the existing road footprint by less than 0.1 acre. An estimated 12 culverts would be extended within this road segment to accommodate the thicker roadway section. Kuparuk road upgrades, including this portion of the road, have been previously evaluated to support other North Slope projects.

Existing gravel roads between the staging area pad and DS2P would be used during winter conditions and would not require additional gravel thickness to support module transport loading; however, CPAI has identified some curves would need to be widened to accommodate the turning radius of the 200-foot-long SPMTs (Figure 2.3.2). Approximately 5.0 acres of additional gravel fill would be placed to widen the identified curves along the existing Kuparuk gravel road network (Section 2.3.7, *Gravel Requirements*). Culverts would be extended as needed. Improvements to gravel roads and pads associated with Option 3 would be completed in summer.

Ground, air, and sea traffic associated with construction of the ice road and ice bridge, modifications to the existing gravel roads and pads, and transport of the sealift modules to the Project area is summarized in Table 2.3.1. Estimated ground traffic per day and per hour are summarized in Table 2.3.2.

Table 2.3.1. Summary of Option 3 Traffic by Year (number of trips)

Year	Ground[a]	Fixed-Wing to/from Kuparuk[b,c]	Fixed-Wing to/from Alpine[b,c]	Helicopter to/from Alpine[b,d]	Sealift Barges to/from Oliktok Dock[e]	Support Vessels[f]
2023	4,590	6	0	0	0	0
2024	300	4	0	0	8	66
2025	264,990	14	14	8	0	0
2026	300	4	0	0	1	10
2027	264,980	14	14	8	0	0
Total	**535,160**	**42**	**28**	**16**	**9**	**76**

Note: Ground trips are defined as one-way; a single fixed-wing or helicopter flight is defined as a landing and subsequent takeoff; and a single vessel trip is defined as a docking and subsequent departure. Anticipated traffic volumes are based on the Alternative B schedule.
[a] Includes buses, short-haul trucks, passenger trucks, and other miscellaneous vehicles. Ground transportation also includes gravel hauling operations (i.e., B70/maxi dump trucks).
[b] Only includes flights required to support Project development.
[c] Fixed-wing aircraft include C-130, DC-6, Twin Otter/CASA, Cessna, Q400, or similar.
[d] Includes support for ice road construction and agency inspections.
[e] In addition to small module and bulk material barges described for all action alternatives.
[f] Includes crew boats, tugs supporting sealift barges, screeding barge, and other support vessels.

Table 2.3.2. Range of Estimated Ground Traffic per Hour Option 3 (number of trips)

Year	Total Ground Traffic[a]	Daily Summer Traffic[b]	Hourly Summer Traffic[b]	Daily Winter Traffic[c]	Hourly Winter Traffic[c]
2023	4,590	30	1	0	0
2024	300	2	<1	0	0
2025	264,990	0	0	2,008	84
2026	300	2	<1	0	0
2027	264,980	0	0	2,007	84
Total	**535,160**	**NA**	**NA**	**NA**	**NA**

Note: NA (not applicable). Ground trips are defined as one-way. Anticipated traffic volumes are based on the Alternative B schedule.
[a] Includes buses, short-haul trucks, passenger trucks, and other miscellaneous vehicles. Ground transportation also includes gravel hauling operations (i.e., B70/maxi dump trucks).
[b] Assumes ground traffic would occur evenly over entire winter season (by day and hour). Winter season is from approximately December 15 through April 25 (132 days) to account for time to construct ice roads and the usable ice road season (from approximately January 25 through April 25).
[c] Assumes ground traffic would occur evenly over entire summer season. Summer season is from estimated as May 1 through September 30 (153 days).

2.3.6 Water Use

Freshwater would be required for the construction of the Colville River ice bridge, ice roads, and ice pads, as well as for domestic use at construction camps. The water would be supplied from nearby lakes that have been permitted for such use. For ice construction within the banks of the Colville River, some of the water may come from the Colville River. Option 3 water use is summarized in Table 2.3.3.

Table 2.3.3. Summary of Option 3 Water Use by Year (millions of gallons)

Year (Season)	Ice Pads – Freshwater[a]	Ice Roads – Freshwater[b]	Camp Supply – Freshwater[c]	Total Freshwater	Seawater[d]
2023 (Summer)	0	0	1.0	**1.0**	0
2023/2024 (Winter)	0	0	0	**0**	0
2024 (Summer)	0	0	0.5	**0.5**	4.0
2024/2025 (Winter)	10.4	115.0	1.4	**126.8**	0
2025 (Summer)	0	0	0.9	**0.9**	0
2025/2026 (Winter)	0	0	0	**0**	0
2026 (Summer)	0	0	0	**0.3**	4.0
2026/2027 (Winter)	10.4	115.0	1.4	**126.8**	0
2027 (Summer)	0	0	0.9	**0.9**	0
Total	**20.8**	**230.0**	**6.1**	**257.2**	**8.0**

Note: Based on Alternative B Schedule. Alternative D would require an additional 31.1 million gallons of water for ice road construction (for module mobilization); this would be in addition to the water volumes shown in this table for winter 2024/2025 and 2026/2027.
[a] Ice pad construction requires 0.25 million gallons per acre.
[b] Ice road construction requires 2.5 million gallons per mile for 60-foot-wide module transport roads and 15 million gallons at the Colville River crossing location.
[c] Camp supply estimates are based on 100 gallons per person per day.
[d] Seawater includes ballast water.

2.3.7 Gravel Requirements

As described in Sections 2.3.1, *Oliktok Dock and Offshore Barge Lightering Area*; 2.3.2, *Sealift Module Staging Area*; and 2.3.5, *Access*, gravel would be required to raise the height of the existing Oliktok Dock, improve the existing staging pad south of Oliktok Dock, and modify portions of existing gravel roads to accommodate module transport. Gravel would be sourced from an existing gravel mine in the Kuparuk area (e.g., Mine Site C, Mine Site E). This gravel would be mined programmatically along with other mining to support the Project within Kuparuk for the year and would not require dedicated active mining to support the Project. Table 2.3.4 summarizes the gravel volumes required and the anticipated gravel footprint.

Table 2.3.4. Summary of Option 3 Gravel Footprint and Volumes

Component	New Footprint (acres)	Fill Volume (cubic yards)
Upgrades to existing Kuparuk roads from the Oliktok Dock to the staging area pad	0.1	40,300
Upgrades to staging area pad	0.0	43,700
Upgrades to existing road from staging area pad to DS2P	4.9	34,700
Total	**5.0**	**118,700**

Note: DS2P (Kuparuk drill site 2P)

2.3.8 Schedule and Logistics

Gravel haul and placement to modify existing roads and pads would occur during summer 2023 under Alternatives B and C (summer 2024 under Alternative D). During the summer open-water season before sealift module arrival (2024 for Alternatives B and C and 2025 for Alternative D), screeding at the barge lightering location and the area in front of Oliktok Dock would occur around mid-July once the risk of ice encroachment has passed (Figure 2.3.3).

Modules for the WPF and drill sites BT1 through BT3 would be delivered by sealift barges to Oliktok Dock during the summer of 2024 (Alternatives B and C) or 2025 (Alternative D). A second sealift would deliver modules for drill sites BT4 and BT5 in summer 2026 (Alternatives B and C) or 2027 (Alternative D). Modules would be stored on the staging area pad south of Oliktok Dock and mobilized to the WPF during the following winter construction season.

Source: CPAI 2019a
Note: Ice Rd. (ice road); KRU (Kuparuk River Unit); Mod. Move (module move); Module Mob. (module mobilization); WCF (Willow central processing facility). Schedule presented is for Option 3 combined with Alternatives B or C; Alternative D would add 1 year to each activity presented in this schedule figure.

Figure 2.3.3. Option 3 Schedule

The Colville River ice bridge would be in an area currently used by the North Slope Borough (NSB) to construct a portion of the Community Winter Access Trail (CWAT), an annual snow road connecting North Slope communities (e.g., Utqiaġvik, Atqasuk) to the Alaska highway system. CPAI would work with the NSB and local residents to ensure access is provided and conflicts are avoided with CPAI ice roads and CWAT during the winters of 2025 and 2027. Access would be coordinated in a manner similar to current CPAI practices for the annual Alpine Resupply Ice Road. CPAI would establish safety checkpoints at the intersection of the CWAT and CPAI ice road on the west side of the Colville River and on the east side of the river near DS2P to inform drivers of the current status and activity on the ice road, as well as the location of SPMTs along the route. Traffic control measures would be used to control the flow of traffic in areas where SPMTs are operating; these control measures may include temporary traffic signals and/or flagging personnel.

2.3.9 Summary Overview of Option 3

Table 2.3.5 provides a summary of Option 3 components and impacts

Table 2.3.5. Option 3: Colville River Crossing Summary

Component	Impact Value or Description
New gravel footprint (acres)	5.0
Gravel-fill volume (cubic yards)	118,700
Screeding footprint (acres)	Barge lightering area: 9.6 Oliktok Dock: 2.5 Total: 12.1
Ice roads (miles)	80.2
Multi-season ice pads (acres)	0.0
Sealift years[a]	2024 and 2026
Module mobilization years[a]	2025 and 2027
Ground traffic (number of trips)	535,160
Fixed-wing aircraft (number of trips)	To/from Kuparuk: 42 To/from Alpine: 28 Total: 70
Helicopter (number of trips)	16 (to/from Alpine)
Sealift barges (number of trips)	9
Support vessels (number of trips)	76
Total freshwater usage (millions of gallons)	257.2
Total seawater usage (millions of gallons)	8.0
Construction camps	100-person camp to support module offload and transport (each sealift)[b]

[a] Based on Alternative B schedule.
[b] A camp for the ice road crew near the Project area is already included in the action alternatives.

2.4 Alternatives Development

2.4.1 Module Delivery Options via Oliktok Dock Previously Considered

A module delivery alternative using Oliktok Dock and sea ice roads was previously evaluated by BLM; see Component Number 15: MTI in the Draft EIS Appendix D, *Alternatives Development* (Section 3.1.3, *Alternative Components Considered but Eliminated from Further Analysis*; Table D.3.2). This alternative module delivery option was eliminated from further analysis in the Draft EIS due to constraints related to module size and sea ice road limitations across the CRD. Use of the annual Alpine Resupply Ice Road was also considered (Component Number 14: MTI) but was ultimately rejected due to load limits of the Alpine Annual Resupply Ice Road Colville River ice bridge (650 tons) being insufficient to support the modules crossing the river at this location.

The Draft EIS evaluated one additional scenario that would have used the existing Oliktok Dock: Alternative Component Number 23 (Appendix D, Section 3.1.3). Under this scenario, the modules would be delivered to the Oliktok Dock and moved to the Project area via existing gravel roads and approximately 165 miles of ice roads. The ice road routing would travel south to an area near Umiat, where water flows in the Colville River are significantly lower; however, BLM was unable to confirm this route would allow for a fully grounded ice bridge across the river.

Since the alternatives development for the Draft EIS, CPAI has collected additional data regarding flow and ice conditions at Ocean Point (described further in SDEIS Section 3.8, *Water Resources*). CPAI is now confident that transporting sealift modules via an ice road across the Colville River near Ocean Point is feasible and have made this option part of their proposed Project.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Introduction

This SDEIS analyzes the impacts associated with the three new Project components described in Chapter 2.0, *Alternatives*: CFWR, boat ramp(s), and module delivery Option 3 (Colville River Crossing). Environmental effects already analyzed in the Draft EIS (e.g., effects from ground and air traffic) are not repeated in the SDEIS. All Project changes will be analyzed in detail in the Final EIS. For all resources, the NPR-A Integrated Activity Plan (IAP) **lease stipulations** (LSs) or **best management practices** (BMPs) described in the Draft EIS would apply to the three Project components described in the SDEIS; these are not repeated in the SDEIS. There are no additional LSs or BMPs that would apply only to the three Project components described in the SDEIS. Similarly, the three Project components do not change the likelihood or impacts of potential spills, thus spills are not addressed in this chapter of the SDEIS.

3.1.1 Past and Present Actions

Past and present actions in each resource's analysis area are included as part of the existing conditions of the affected environment for all resources analyzed in Chapter 3.0. West of the Colville River, these actions include existing oil and gas infrastructure (e.g., gravel and ice roads, pipelines, processing facilities) in the Alpine and GMT oil fields (Figure 3.1.1), which are regularly serviced by aircraft. East of the Colville River, the Kuparuk oil field includes similar, but more extensive development, with existing mine sites, airstrips, reservoirs, a dock (Oliktok Dock), and seawater treatment facility. The Kuparuk oil field experiences more ground and air traffic than the developments west of the Colville River; ground traffic also travels at higher speeds.

There are several former (decommissioned) U.S. Department of Defense sites with gravel pads, roads, or airstrips near the Beaufort Sea coast. There is no existing marine infrastructure at Atigaru Point or Point Lonely. There is existing marine infrastructure at Oliktok Point and at Oooguruk Island, including a pipeline to the 6-acre constructed gravel island. The shoreline around Oliktok Point has been armored or altered with sheet pile and other revetment (e.g., gravel bags).

Subsistence harvest is a contributing cause of mortality of fish, birds, terrestrial mammals, and marine mammals across the North Slope.

3.1.2 Analysis Methods

The analysis methods have no changes from the Draft EIS for the three Project components described in the SDEIS.

3.2 Climate and Climate Change

The three Project changes (Chapter 2.0, *Alternatives*) are not expected to substantially change the climate change analysis. Key Project components and their associated greenhouse gas contributions are being reanalyzed and the results will be included in the Final EIS.

3.3 Air Quality

The three Project changes (Chapter 2.0, *Alternatives*) are not expected to substantially change the air quality analysis. Key Project components and their associated emissions are being remodeled and the results will be included in the Final EIS.

3.4 Soils, Permafrost, and Gravel Resources

3.4.1 Affected Environment

Though gravel resources are relatively scarce in the NPR-A, especially west and north of the Colville River (BLM 2012), east of the Colville River, there are several existing mine sites, such as Mine Sites E and C in Kuparuk (proposed for use in Option 3) (Figure 3.4.1).

3.4.2 Environmental Consequences

3.4.2.1 Alternatives B, C, and D

3.4.2.1.1 Thawing and Thermokarsting
The CFWR would have 6:1 slopes, which would help reduce the thermal impact of impounded water and stabilize slopes, as the shallow slopes will provide a thermal buffer to reduce the lateral thaw extents into the walls of the excavated reservoir. However, the presence of impounded water would disturb frozen soils and change thermal conditions at the site. This could impact groundwater characteristics immediately adjacent to the excavation and change the movement of groundwater through soils, similar to the effects described in the Draft EIS for gravel mining (Section 3.4.2.3.1, *Thawing and Thermokarsting*). Excavation activities would reduce the amount of available thawed soil as excavation encroaches on frozen materials (BLM 2018, pg. 250). As the rate of excavation slows or ends, the **taliks** and water bearing zones would be re-established as the CFWR fills with water. As the soils of the pit walls are exposed to surface temperatures and allowed to thaw, potential changes to the thermal regime of the area immediately adjacent to the disturbed ground soils and vegetation could occur.

The CFWR is designed similarly to Lake K2014 which is adjacent to Kuparuk CPF2. Though there has been no formal monitoring of the **thaw bulb** or shoreline at Lake K2014, there have been no observations or operational issues regarding stability of the lakeshore or the reservoir that have arisen since it was constructed (CPAI 2019b).

Excavated material from the CFWR would be placed around the CFWR as a 7-foot tall berm. Gravel would be placed on top of the berm to provide a driving surface. Placement of fill can change surface drainage and cause permafrost thawing near the toes of the berm slopes, subsidence, and the accumulation of water, as described in the Draft EIS for gravel mining (Section 3.4.2.3.1) regarding placement of fill for roads and pads. Fill would cover soils and kill existing vegetation, altering the thermal **active layer** indefinitely (USACE 2018, pg. 3-54).

3.4.2.1.2 Gravel Resource Depletion
The Project would permanently decrease gravel sources near the Ublutuoch (Tiŋmiaqsiuġvik) River and further reduce the availability of gravel resources at existing Kuparuk mine site(s) (e.g., Kuparuk Mine Sites C and E).

3.4.2.2 Module Delivery Option 3: Colville River Crossing
Option 3 would affect soils, permafrost, and gravel resources by constructing ice roads (compacting soils and contributing to thaw and **thermokarst**) and extracting gravel (changing landforms and decreasing gravel resources). Both of these effects are described in the Draft EIS Section 3.4.2.3.1 and Section 3.4.2.3.2, *Gravel Resource Depletion*. Option 3 would require 118,700 cubic yards of gravel fill and 666.6 acres of onshore ice infrastructure (e.g., ice roads and ice pads).

3.4.3 Additional Suggested Best Management Practices or Mitigation
The suggested BMPs or mitigation have no changes from the Draft EIS for the three Project components described in the SDEIS.

3.5 Contaminated Sites

3.5.1 Affected Environment
The analysis area for Contaminated Sites (Figure 3.5.1) was expanded to include the area within 0.5 mile of new ground disturbance for Option 3, the CFWR, and the boat ramp(s).

One additional Alaska Department of Environmental Conservation (ADEC) contaminated site identified by the ADEC falls within the expanded analysis area: Oliktok DEW Diesel Tanks SS009a (Haz #2654; Cleanup Complete [ADEC 2019a]). The contaminated site consists of a former tank farm with two

65,000-gallon fuel tanks. The tanks, underlying concrete tank pads, and pipelines have been removed. Soil samples were analyzed for a variety of common hydrocarbon-related contaminants (e.g., benzene, toluene, ethylbenzene, and xylene; gasoline range organics; diesel range organics; residual range organics; and polycyclic aromatic hydrocarbons) during past investigations. No constituents were found above ADEC cleanup levels established for the arctic (18 AAC 75.341(c)(d)); therefore, the site is suitable for unrestricted use and cleanup is complete.

Two additional spills were identified by the ADEC Prevention, Preparedness, and Response Spills Database within the expanded analysis area, but both spills were less than 5 gallons and would have no likely impact on the Project (ADEC 2019b).

3.5.2 Environmental Consequences

The Oliktok DEW Diesel Tanks SS009a site is located 1,400 feet from Option 3 activities and it would be very unlikely that the Project would encounter contamination during construction or operation.

3.5.3 Additional Suggested Best Management Practices or Mitigation

The suggested BMPs or mitigation have no changes from the Draft EIS for the three Project components described in the SDEIS.

3.6 Noise

3.6.1 Affected Environment

In addition to the affected environment described in the Draft EIS, the far eastern analysis area contains the Kuparuk oil field. Kuparuk is larger, has more infrastructure (including more drilling and processing facilities), mine sites, dock facilities, and airstrips, and thus produces more ground and air traffic than the Alpine and GMT oil fields. Thus, the ambient soundscape in the eastern analysis area is likely louder than in NPR-A.

3.6.2 Environmental Consequences

3.6.2.1 Alternatives B, C, and D

The addition of the boat ramps on the Ublutuoch (Tiŋmiaqsiuġvik) River, Judy (Iqalliqpik) Creek, and Fish (Uvlutuuq) Creek would add small skiff traffic to the navigable areas of these streams. This additional noise source would occur in summer, post construction in perpetuity. Noise from skiffs is expected to be 63 A-weighted decibels[4] (dBA) at 1,000 feet from the source and would attenuate to ambient sound levels (35 dBA) at 4.7 miles (NPS 2011). The Ublutuoch (Tiŋmiaqsiuġvik) River boat ramp would be closest to Nuiqsut (8 miles); the estimated sound in Nuiqsut would be 31 dBA. All three boat ramps could be constructed under Alternative B; only the Ublutuoch (Tiŋmiaqsiuġvik) River boat ramp would be constructed under Alternatives C and D because there would not be gravel road access to the other rivers. Though the number of potential users of each boat ramp is unknown, if only one ramp were constructed, use could be concentrated on that river and thus effects could be slightly higher there.

3.6.2.2 Module Delivery Option 3: Colville River Crossing

Option 3 would produce similar types and levels of noise as Option 1 (described in the Draft EIS) except the noise would be farther away from Nuiqsut (Figure 3.6.1) and no impact pile driving, pile removal, or gravel mining would be required. Barges and marine traffic would end at Oliktok Dock, which is 33 miles from Nuiqsut (10 miles further than Atigaru Point).

[4] Airborne sound levels are quantified using A-weighted decibels, where the decibel is a unit of sound pressure referenced to 20 microspascals. A-weighting is a system for weighting measured airborne sound levels to reflect the frequencies that people hear best.

3.6.3 Additional Suggested Best Management Practices or Mitigation
The suggested BMPs or mitigation have no changes from the Draft EIS for the three Project components described in the SDEIS.

3.7 Visual Resources

3.7.1 Affected Environment
The analysis area for **visual resources** was expanded to include the route for Option 3 from Oliktok Dock to the Project area (Figure 3.7.1). The analysis area (also described as the **viewshed**) is 30 miles from Project infrastructure and activity (Draft EIS Section 3.7, *Visual Resources*).

3.7.2 Environmental Consequences

3.7.2.1 Alternatives B, C, and D
The inclusion of the boat ramp(s) and CFWR would not change the effects described in the Draft EIS (Section 3.7.2, *Environmental Consequences*), though the boat ramp(s) would be visible by river users in the immediately adjacent areas.

3.7.2.2 Module Delivery Option 3: Colville River Crossing
Effects to visual resources from Option 3 would be less than those from Options 1 and 2. The use of the existing Oliktok Dock and staging area (approximately 2 miles south of the Oliktok Dock), as well as the use of existing gravel roads from the staging pad to DS2P, would not introduce new delivery infrastructure or light sources as compared to Options 1 and 2 that occur within the NPR-A. There would also be less ground, air, and sea traffic as compared to Options 1 and 2. The 100-person camp for winter ice road construction located near DS2P would be similar to ice road camps associated with Options 1 and 2 and have similar visual impacts (Draft EIS Section 3.7.2.7, *Module Delivery Options*). The construction and use of the ice road west of DS2P to GMT-2 would have similar visual impacts as ice roads associated with Options 1 and 2. There would be approximately 40.1 miles of ice roads associated with Option 3 (9.4 miles within Visual Resource Management [VRM] Class III and 4.4 miles within VRM Class IV within the NPR-A). The ice road would meet VRM objectives for both VRM classes within the NPR-A.

3.7.3 Additional Suggested Best Management Practices or Mitigation
The suggested BMPs or mitigation have no changes from the Draft EIS for the three Project components described in the SDEIS.

3.8 Water Resources

3.8.1 Affected Environment
The analysis area for water resources was expanded to include the watersheds east of the Colville River near Oliktok Point and along the Option 3 ice road. The analysis area also includes the marine area around Oliktok Point (Figure 3.8.1).

3.8.1.1 Rivers
Details of small waterbodies crossed by ice infrastructure are not described here in the SDEIS because exact ice road routes are not yet determined and there are numerous small waterbodies on the North Slope. Almost all of the tributary streams on the east side of the Colville River freeze to the bottom in winter, except for the lower reaches of the Itkillik River and one unnamed stream and lake complex near Ocean Point. These waterbodies have documented unfrozen water in winter (i.e., overwintering fish habitat, detailed below in Section 3.10, *Fish*). The Itkillik River is different than other east side tributaries of the lower Colville River in that it originates in the Brooks Range and thus is longer and drains a larger area than the other tundra rivers. It is one of the largest tributaries of the Colville River on its east side (Figure 3.8.2).

In addition to the Itkillik River, the Colville River is a substantial waterbody, and the ice infrastructure used to cross it would also be substantial, and thus this waterbody is detailed here in the SDEIS. The Colville River drains approximately 30% of the North Slope of Alaska and is summarized in Table 3.8.1.

Table 3.8.1. Summary of the Lower Colville River in the Analysis Area

Characteristic	Colville River
Drainage area	13,860 square miles at Umiat and 20,670 square miles at Nuiqsut
Receiving waters	Harrison Bay
Headwaters	De Long Mountains, Brooks Range
Channel character in Project area	Low gradient; at Ocean Point reach, channel transitions from upstream multiple serpentine meanders to downstream single meandering channel
Tributaries that intersect Project's gravel infrastructure or mine site	None
Primary flood-event driver	Spring breakup
Observed conditions affecting annual peak WSEs and WSE at time of annual peak **discharge**	Snow and ice in channel and on floodplain
Bank erosion	Sloughing and eroding bluff on south (right) bank at Ocean Point (transect 6 in MBI 2019)
Spring breakup monitoring record	24 seasons of **stage** and discharge data, near Nuiqsut (RM 26.5, Monument 1 [MBI 2015]). 17 seasons of stage and discharge data from USGS gaging station 15875000 at Umiat (RM 90). Median observed spring peak discharge 188,000 cfs.
Summer monitoring record	17 seasons of stage and discharge data from USGS gaging station 15875000 at Umiat (USGS 2020). 2 discharge measurements at Ocean Point from September 2019 (MBI 2019).
Water quality record[a]	6 summers of data at USGS gaging station 15875000 at Umiat and 2 transects at Ocean Point sampled September (MBI 2019) and December 2019 (CPAI 2019b).
Existing infrastructure in basin	Nuiqsut, Umiat, Alpine oil field, Nuna development, ASRC mine site

Note: ASRC (Arctic Slope Regional Corporation); cfs (cubic feet per second); RM (river mile); WSE (water surface elevation); USGS (U.S. Geological Survey)
[a] Water quality data are described in Section 3.8.1.2, *Freshwater Water Quality*.

There is no gaging station on the Colville River at Ocean Point (approximately RM 22); the closest gaging stations are at Umiat (RM 90) and at Monument 1 (RM 1), Figure 3.8.2. Though neither of these existing gages measures winter flow at Ocean Point, Umiat is more closely representative of Ocean Point than Monument 1 because Umiat is upstream of the influence of saltwater intrusion and tidal backwatering from the CRD and Monument 1 is not. The average monthly mean discharge at Umiat in winter (December through April) ranged from 84 to 3.1 cubic feet per second (cfs) from 2002 to 2019 as shown in Table 3.8.2 (USGS 2020). (The range of mean monthly discharge for December through April was 132.2 to 0.0 cfs; Table 3.8.2.) Note that the Colville River is more than 2,000 feet wide at Umiat and that by late winter the flow is contained to a very small channel within that width. In other words, the ice across 99% of the channel is frozen to the bottom, but somewhere within that width there is a very small channel with flow.

Downstream from Umiat the probability of having flow in every month of the year increases as the drainage area increases. Similarly, the magnitude of the flow is likely to increase roughly proportional to the drainage area increase. Thus, when the average monthly mean April flow is 3.1 cfs at Umiat, where the drainage area is approximately 13,860 square miles, the average monthly mean April flow may be 1.5 times than that near Nuiqsut (4.7 cfs), where the drainage area is 20,670 square miles. Therefore, flow at Ocean Point is likely higher than flow at Umiat.

Table 3.8.2. Colville River Mean Monthly Discharge (cubic feet per second) at Umiat

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002	ND	ND	ND	ND	ND	ND	ND	ND	21,030	7,221	844	100.1
2003	3.6	0.0	0.0	0.0	690	65,690	24,030	31,800	12,760	10,490	560	72.6
2004	6.9	2.2	0.2	0.0	40,890	24,940	15,310	24,870	12,060	557	142	56.6
2005	20.8	4.2	<0.1	0.0	12,830	72,480	13,920	4,143	6,014	1,169	200	104.5
2006	18.4	0.1	0.0	0.0	22,010	37,120	21,940	33,560	6,229	2,667	325	80.0
2007	27.9	11.7	0.9	0.0	4,179	50,530	12,140	17,820	7,511	874	177	72.6
2008	21.1	0.7	0.0	0.0	17,260	46,530	12,900	10,770	1,867	560	207	72.9
2009	15.0	0.0	0.0	3.0	36,940	45,050	13,890	13,440	13,750	1,775	418	95.2
2010	36.5	13.9	1.7	0.5	17,280	48,760	10,370	15,720	6,213	1,248	454	132.2
2011	35.5	9.7	1.1	0.4	37,790	31,190	13,170	11,330	11,940	1,958	375	93.5
2012	29.2	11.0	1.9	0.5	16,680	41,910	16,970	14,860	27,440	3,678	145	45.9
2013	16.4	3.9	2.0	1.0	6,434	83,970	10,530	10,290	11,750	1,475	509	130.7
2014	25.9	9.3	6.0	6.0	33,290	72,180	29,820	10,130	16,140	1,215	217	89.9
2015	45.2	29.0	16.8	12.0	62,410	17,010	8,243	22,250	11,550	1,504	276	65.5
2016	24.4	10.1	5.7	2.8	47,460	32,660	14,540	27,290	15,310	4,868	405	64.4
2017	16.0	3.8	1.2	1.0	12,070	26,220	13,110	36,370	25,900	6,403	448	86.5
2018	24.9	11.9	7.1	6.0	12,220	47,610	26,970	30,330	23,280	3,122	343	67.1
2019	40.9	30.2	22.6	20.0	36,180	18,370	12,380	38,990	15,500	ND	ND	ND
Average Monthly Mean Discharge	**24.0**	**8.9**	**3.9**	**3.1**	**24,500**	**44,800**	**15,900**	**20,800**	**13,700**	**2,987**	**356**	**84.1**

Note: ND (no data), < (less than). No incomplete data have been used for statistical calculation.
Source: USGS 2020

Available data specific to the Colville River at Ocean Point are summarized in Table 3.8.3. Though the data are limited, Ocean Point has been used as a **rolligon** crossing for a number of years by various users (users are described in Section 3.14, *Land Ownership and Use*) because the area is shallow and has the potential for **bottom-fast ice**.

Table 3.8.3. Water Data for Colville River at Ocean Point

Date	Flow or Ice Conditions	Water Temperature (°C)	Salinity	Source
December 10, 2007	Ice not grounded, approximately 2 to 3 feet water depth under ice	NC	NC	Personal communication, Jack Winters ADF&G to DOWL January 16, 2020
April 4, 2019	Grounded ice to 0.7-foot water depth, 0.5 to 6.2 feet ice thickness	NC	NC	CPAI 2019b
September 5, 2019	28,900 cubic feet per second Open channel conditions Average water depth 5.7 feet	9.8 to 10.0	0.1	MBI 2019
December 31, 2019	Ice grounded near both banks Floating ice thickness 2.8 feet Approximately 1.2 to 2.2 feet water under ice Velocity 0.15 to 0.25 feet per second	0.1	0.2	CPAI 2019b

Note: °C (degrees Celsius); ADF&G (Alaska Department of Fish and Game); CPAI (ConocoPhillips Alaska, Inc.); NC (not collected); RFI (request for information). Data collected at similar, but not the same, locations near Ocean Point.

3.8.1.2 Freshwater Water Quality

During spring breakup, and to a lesser extent during summer rainfall-driven high-water events, the Colville River carries suspended sediment (SS) from the foothills of the Brooks Range, and has higher turbidity than any of the smaller rivers originating within the Arctic Coastal Plain (ACP). Most of the annual sediment load is carried between May and October, with approximately 62% flowing to the CRD during 13 days in spring breakup (May and June) (Walker and Hudson 2003). For example, sediment transport at Nuiqsut can range from 467,000 tons per day (tpd) in June to less than 100 tpd during the low-flow period in July (USGS 2016). For the majority of the year, most flowing freshwaters have low SS concentrations and, therefore, low turbidity. From midsummer through freeze-up, SS concentrations decrease to as low as 3 parts per million in the Colville River at Nuiqsut (USGS 2016) with measured turbidity as low as 0.7 nephelometric turbidity unit.

Ocean Point on the Colville River is upstream of the saltwater intrusion influence, which can reach at least 30 miles upstream from Harrison Bay in the winter (Arnborg, Walker et al. 1962). Thus, measurements of winter flow and water surface elevation at Ocean Point are more reliable than locations downstream. Table 3.8.4 shows water quality data for the Colville River at Umiat.

Table 3.8.4. Water Quality Data for the Colville River

Waterbody	Water Temperature (°C)	Turbidity (JTU)[a]	pH Range
Colville River at Umiat	0.2 to 18.3	2	7.2 to 8.0

Source: USGS 2020
Note: °C (degrees Celsius); JTU (Jackson Turbidity Units). Temperature and pH data collected in 1969, 1975, 1978, 2005, and 2007.
[a] Turbidity measurement is from 1975, and thus is not reported in nephelometric turbidity units.

3.8.1.3 Marine Waters

The shelf of the Beaufort Sea in Harrison Bay at the mouth of the Colville River is shallow. The Colville River is the dominant discharge to this bay, discharging warmer freshwater and sediment during spring and summer. Oliktok Point is 10 miles east of the mouth of the East Channel of the Colville River (Figure 3.8.2). From Oliktok Point eastward, a chain of barrier islands form Simpson Lagoon. Simpson Lagoon has a relatively shallow nearshore shelf that provides a mixing environment for turbid, sediment-bearing, freshwater inflows, such as the Colville, Kuparuk, Sagavanirktok, and other smaller rivers. The nearshore areas of the Beaufort Sea are fresher and more turbid compared to the deeper offshore areas, which are clearer, colder, and more saline.

Existing marine infrastructure in the analysis area is at Oliktok Point, where there is a commercial sheet-pile dock, shoreline armoring, and a saltwater treatment plant. In addition, Oooguruk Island, a 6-acre constructed gravel island with a pipeline to shore, is located near the mouth of the Colville River. Screeding occurs with seasonal regularity at Oliktok Dock prior to barge arrival.

3.8.2 Environmental Consequences

3.8.2.1 Alternatives B, C, and D

3.8.2.1.1 Gravel Infrastructure

The CFWR, perimeter berm, access road, and channel connection to Lake M0015 and Willow Creek 3 would add 10.9 more gravel acres of infrastructure to the Project (Table 2.2.1, Figure 2.2.1) that could cause all of the effects described in Draft EIS Section 3.8.2.3.3, *Gravel Infrastructure*:

- Increase turbidity and SS in Lake M0015
- Create dust that could settle in waterbodies, or increase albedo in the dust shadow leading to earlier thaw and ground subsidence
- Alter surface drainage paths and cause impoundments and thermokarst erosion

The boat ramps would add up to 5.9 acres of total gravel fill under Alternative B, including a short access road to each ramp (Table 2.2.2, Figure 2.2.2). The ramps could cause the same effects listed above. In addition, the ramps would be in the 50- or 100-year floodplain of the river to which they provide access. If the gravel boat ramp infrastructure blocks or restricts the flow of surface water during spring breakup, effects described in Draft EIS Section 3.8.2.3.3 could occur. The ramps could: 1) increase the depth and duration of water impoundment, 2) increase thermokarsting, 3) cause a change in flow direction, 4) cause channel instability or a change in alignment, 5) result in erosion of the tundra or a stream channel, or 6) result in deposition of sediment on the tundra or in a stream channel.

3.8.2.1.2 In-Water Structures (Water Intakes, Boat Ramps)

The CFWR would have a water intake that could temporarily increase SS and turbidity during installation, as described in Draft EIS Section 3.8.2.3.4, *In-Water Structures (Bridges, Culverts, Water Intakes)*.

The boat ramps on Judy (Iqalliqpik) Creek and Fish (Uvlutuuq) Creek would be in areas that contain aeolian sand beds, which are highly mobile. Boat ramps in these locations could cause annual scour due to adding an area of hard substrate to an area of soft substrates, and from loading and unloading boats (revving boat motors to load and unload boats from trailers, as well as the tow vehicle's rear tires) and result in routine long term in-water maintenance (Wilson 1996).

Construction of the boat ramp on the Ublutuoch (Tiŋmiaqsiuġvik) River would occur in winter in an area with overwintering fish habitat, which means the ice may not be grounded during construction. If the construction occurs in-water, two potential effects could occur. First, if the river ice surface was used as a work platform, the insulating snow cover would need to be removed, which could super cool the water immediately around the construction site and lead to the formation of slush throughout the entire water column, as observed at the Sagavanirktok River Bridge in 2009 (Morris and Winters 2009). Second, in-water work would increase SS and turbidity in the water column, which could persist for an extended period of time due to the lack of flow (as has been documented on similar winter construction projects in the Kuparuk River, Bill Morris, personal communication to DOWL, January 16, 2020).

3.8.2.1.3 Water Withdrawal

Effects of water withdrawal from freshwater lakes is described in the Draft EIS Section 3.8.2.3.6, *Water Withdrawal*. After the CFWR is excavated, it would be filled with water from Lake M0015 during the first year's breakup (a period of high flow). The volume of water required to fill the CFWR (55 MG) accounts for less than 4% of water volume storage within the Willow Creek 3 basin (which contains both Lakes M0015 and R0064, which are hydraulically connected). The estimated annual recharge volume of the basin exceeds that of the volume of the CFWR. Thus, the Willow 3 peak flood flow, which naturally varies year to year, would be somewhat reduced during the filling of the CFWR. Minimal effects are anticipated to either Lakes M0015 or R0064 or to Willow Creek 3. The CFWR would be refilled as needed annually during breakup; refill would not occur during periods of low flow.

The CFWR would be separated from Lake M0015 and Willow Creek 3 (its inlet and outlet creek). Flow into the CFWR would be controlled using a flow-control gate; this would control water inflow and ensure sufficient outflow from Lake M0015 and into Willow Creek 3. At times of low flow in Willow Creek 3, the flow-control gate can be closed so that water is not diverted into the CFWR.

3.8.2.1.4 Stormwater Runoff

The boat ramps would create stormwater runoff directly into their receiving waterbodies, which could increase contaminants in the channel near the ramps. The boat ramps would be included in the Project's National Pollutant Discharge Elimination System permit.

3.8.2.1.5 Watercraft in Rivers

The boat ramps would increase access and use of the Ublutuoch (Tiŋmiaqsiuġvik) River, Judy (Iqalliqpik) Creek, and Fish (Uvlutuuq) Creek in the areas where they are navigable. Likely use would be by small skiffs (subsistence users). These personal watercraft would increase the potential for gas spills into waterbodies, both up- and downstream of the ramps. Boat wakes could also increase bank erosion both up and downstream of the ramps. The extent and magnitude of erosion would depend on the extent of boat use.

All three boat ramps could be constructed under Alternative B; only the Ublutuoch (Tiŋmiaqsiuġvik) River boat ramp would be constructed under Alternatives C and D because there would not be gravel road access to the other rivers. Though the number of potential users of each boat ramp is unknown, if only one ramp were constructed, use could be concentrated on that river and thus effects could be slightly higher there.

3.8.2.2 Module Delivery Option 3: Colville River Crossing

Approximately 12.1 acres in front of Oliktok Dock and the barge lightering area would be screeded two times during construction for Option 3 (once each in 2025 and 2027), Figure 2.3.1. A temporary increase in turbidity during and immediately after screeding would occur during these two summer seasons.

The gravel fill used for road widening along Oliktok Road would have effects described in Section 3.8.2.3.3, *Gravel Infrastructure*, of the Draft EIS and Section 3.8.2.1.1, *Gravel Infrastructure*, above.

Effects from ice roads and associated freshwater withdrawal are described in Section 3.8.2.3.2, *Ice Infrastructure*, of the Draft EIS. The ice road from DS2P to the Project area would cross the Colville River at Ocean Point. There is little available data regarding winter flow in the Colville River at Ocean Point as described above in Section 3.8.1.1, *Rivers*.

If there was flow in the river when the bottom-fast ice bridge was constructed, the bridge would block or partially block the flow. While it is possible that some of the flow might pass under the bottom-fast ice bridge in the riverbed, it is likely that at least a portion, and probably a majority, of the flow, would be blocked. If some of the surface flow did pass through the riverbed under the bottom-fast ice bridge, the increased velocity of the flow in the riverbed could lead to erosion of the riverbed under the ice bridge, in which case the ice bridge may become ungrounded. In addition, the blocked water would be difficult to manage. The lowest range of winter flows recorded at Umiat are 1.8 to 2.7 cfs (Table 3.8.2), which is equivalent to 808 to 1,212 gallons per minute, respectively. That amount of water would have to be pumped over the ice bridge or directed into a culvert (more on this below). Also, there is a 50% chance that, in any given year, the mean monthly April flow will be greater than described above. During the 17 years of monitoring, the April mean monthly flow at Umiat has been reported as being as high as 20.0 cfs. Between January and March, the next lowest flow months, the mean monthly flow at Umiat varied from 24.0 to 3.1 cfs.

If there is flow at the time of ice bridge construction, the bottom-fast ice bridge would act as an ice dam and effects would be similar to a grounded ice jam: backwatering and out-of-bank flooding upstream of the bridge. If the bridge becomes ungrounded, higher velocities than normal would flow under the bridge and could cause scour downstream, and associated temporary increases in sediment transport and turbidity.

Practically, if there is flow at the time of ice bridge construction, ice will have to be continuously built in order to freeze down the bridge and try to maintain grounding. This provides an opportunity to let the ice bridge rest and recover, which could limit the duration of any given blockage or barrier to flow by providing periods for flow to pass under the bridge. It is anticipated that the ice bridge at the Ocean Point crossing would be needed for 5 weeks. If flows are higher than expected and fully grounding the ice bridge is not practical or it is determined to be a fish passage concern, submerged steel culverts could be installed at a deeper location along the crossing to accommodate flow and fish passage. Culverts would then be pulled when module transit is complete (before spring breakup). Culverts would likely have to span an area at least 300 to 400 feet wide across the 700-foot-wide channel and would have to be designed in size (diameter) and number to provide adequate capacity for the estimated flow. Ice clogging of submerged culverts could occur. Either culverts or pumping water around the ice bridge would be difficult to manage and maintain.

CPAI will be collecting flow and ice data at Ocean Point for several more years before the start of module transport (ice bridge first needed in 2025). Once more data are collected, a plan for water management and fish passage at the ice bridge will be coordinated with BLM and the permitting agencies.

Additionally, building an ice road across the portion of the channel that is dry could cause the riverbed to freeze deeper than it would have. A deeper freeze could cause water that is flowing in the riverbed to be forced to the surface at locations outside the channel(s) that would have confined the surface water flow had the ice road not been constructed.

An ice road and ice bridge across the Colville River could also affect ice jam flooding that occurs downstream in the Colville River. Even if the ice road and bridge is slotted, the added ice may cause ice jam flooding within the CRD or other locations along the river to be worse than it would have been. Ice conditions in the lower Colville River are described in the Nanushuk EIS (USACE 2018, page 3-144 to 3-145 and Figure 3.6.4 therein). Based on that description, ice jams occur regularly at and downstream of Ocean Point all the way to the delta; it appears that ice jam flooding is having a substantial impact on flood elevations within the delta and may control design flood elevations at some locations. It is unknown to what extent the construction of ice bridges is currently exacerbating ice jam flooding conditions.

3.8.3 Additional Suggested Best Management Practices or Mitigation

Additional suggested mitigation measures to reduce impacts created by Option 3 could include the following:

- Continue to collect baseline data regarding discharge, ice conditions, and bank conditions on the Colville River near Ocean Point throughout winters every year until ice bridge construction so that an ice bridge plan can be drafted that would include exact crossing location for bridge and ramps, plans for flow and fish passage management (should they be needed), actions to be taken at the end of ice bridge use (such as slotting or culvert removal, if needed).
- Include erosion mitigation features or options in engineering design of boat ramp(s) to prevent or minimize erosion potential at the boat ramp(s) and along adjacent riverbanks.

3.9 Wetlands and Vegetation

The analysis area for **wetlands** and vegetation was expanded to include the watersheds in which wetlands and vegetation would be directly or indirectly affected by Option 3 (Figure 3.9.1). This added several watersheds east of the Colville River. Watersheds were defined using 10-digit USGS **Hydrologic Unit Codes** (HUCs).

3.9.1 Affected Environment

Wetlands surrounding Option 3 onshore Project infrastructure was mapped using a combination of the U.S. Army Corps of Engineers (USACE) three-parameter method (USACE 1987, 2007) and an ecological unit-based approach, as described in Draft EIS Section 3.9.1, *Affected Environment*. National wetland inventory data (USFWS 2019) were incorporated to supplement the data used in the Draft EIS. Wetland and vegetation types in the analysis area are described in Table 3.9.1 and Figures 3.9.2 and 3.9.3. The wetland types detailed in Table 3.9.1 are not unique and occur throughout the analysis area and the ACP. The extent of wetlands in the field-verified analysis area is summarized in Table 3.9.2. The field-verified portion of the analysis area is 94% wetlands.

Table 3.9.1. Vegetation by Wetland Type in the Analysis Area

Cowardin Code[a]	Wetland Type	Total Acres of Wetland Type in the Analysis Area[b]	Acres of Wetland Type in Field-Verified Portion of Analysis Area[c]
E1UBL	Estuarine Subtidal **Unconsolidated** Bottom	64,514.9	0.0
E2EM1/USP	Estuarine Intertidal **Emergent** Persistent/Unconsolidated Shore Irregularly Flooded	14,258.7	0.0
E2EM1N	Estuarine Intertidal Emergent Persistent Regularly Flooded	9.3	0.0
E2EM1P	Estuarine Intertidal Emergent Persistent Irregularly Flooded	16,112.1	0.0
E2EM2/USP	Estuarine Intertidal Emergent Nonpersistent/Unconsolidated Shore Irregularly Flooded	5,162.3	0.0
E2US/EM1P	Estuarine Intertidal Unconsolidated Shore/Emergent Persistent Irregularly Flooded	11,406.3	0.0
E2US/EM2P	Estuarine Intertidal Unconsolidated Shore/Emergent Nonpersistent Irregularly Flooded	60.9	0.0
E2USN	Estuarine Intertidal Unconsolidated Shore Regularly Flooded	136.3	0.0
E2USP	Emergent Intertidal Unconsolidated Shore Irregularly Flooded	30,802.5	0.0
L1UBH	**Lacustrine** Limnetic Unconsolidated Bottom Permanently Flooded	580,142.9	190.7
L1UBHh	Lacustrine Limnetic Unconsolidated Bottom Permanently Flooded Diked/Impounded	2,682.2	0.0
L2AB2H	Lacustrine Littoral Aquatic Bed Aquatic Moss Permanently Flooded	3.9	0.0
L2EM2/UBF	Lacustrine Littoral Emergent Nonpersistent/Unconsolidated Bottom Semi-Permanently Flooded	153.4	0.0
L2EM2/UBH	Lacustrine Littoral Emergent Nonpersistent/Unconsolidated Bottom Permanently Flooded	3,500.9	0.0
L2EM2F	Lacustrine Littoral Emergent Nonpersistent Semi-Permanently Flooded	1,512.4	0.0
L2EM2H	Lacustrine Littoral Emergent Nonpersistent Permanently Flooded	5,831.0	2.0
L2UB/EM2H	Lacustrine Littoral Unconsolidated Bottom/Emergent Nonpersistent Permanently Flooded	1,229.1	0.1
L2UBF	Lacustrine Littoral Unconsolidated Bottom Semi-Permanently Flooded	34.9	0.0
L2UBH	Lacustrine Littoral Unconsolidated Bottom Permanently Flooded	1,362.4	0.0
L2USA	Lacustrine Littoral Unconsolidated Shore Temporarily Flooded	4,168.4	0.0
L2USC	Lacustrine Littoral Unconsolidated Shore Seasonally Flooded	5,158.8	0.0
M1UBL	Marine Subtidal Unconsolidated Bottom	35,718.1	0.0
M2USN	Marine Intertidal Unconsolidated Shore Regularly Flooded	4.6	0.0
M2USP	Marine Intertidal Unconsolidated Shore Irregularly Flooded	275.0	0.0
PEM1/2F	**Palustrine** Emergent Persistent/Nonpersistent Semi-Permanently Flooded	4,476.4	0.0
PEM1/ML1B	Palustrine Emergent Persistent/Moss-Lichen Moss Seasonally Saturated	300.7	0.0
PEM1/SS1A	Palustrine Emergent Persistent/Scrub-Shrub Broad-Leaved Deciduous Temporarily Flooded	68.1	0.0
PEM1/SS1B	Palustrine Emergent Persistent/Scrub-Shrub Broad-Leaved Deciduous Seasonally Saturated	907,739.0	3,018.0
PEM1/SS1D	Palustrine Emergent Persistent/Scrub-Shrub Broad-Leaved Deciduous Continuously Saturated[d]	2,607.8	2,607.8
PEM1/SS1E	Palustrine Emergent Persistent/Scrub-Shrub Broad-Leaved Deciduous Continuously Seasonally Flooded/Saturated	421,058.3	57.2
PEM1/SS1F	Palustrine Emergent Persistent/Scrub-Shrub Broad-Leaved Deciduous Semi-Permanently Flooded	38,561.6	840.8

Cowardin Code[a]	Wetland Type	Total Acres of Wetland Type in the Analysis Area[b]	Acres of Wetland Type in Field-Verified Portion of Analysis Area[c]
PEM1/UBF	Palustrine Emergent Persistent/Unconsolidated Bottom Semi-Permanently Flooded	41,103.0	0.0
PEM1/UBFh	Palustrine Emergent Persistent/Unconsolidated Bottom Semi-Permanently Flooded Diked/Impounded	5.3	0.0
PEM1/USA	Palustrine Emergent Persistent/Unconsolidated Shore Temporarily Flooded	1,273.2	0.0
PEM1/USC	Palustrine Emergent Persistent/Unconsolidated Shore Seasonally Flooded	677.9	0.0
PEM1/USE	Palustrine Emergent Persistent/Unconsolidated Shore Seasonally Flooded/Saturated	2,927.2	0.0
PEM1B	Palustrine Emergent Persistent Seasonally Saturated	23,878.0	0.0
PEM1C	Palustrine Emergent Persistent Seasonally Flooded	567.1	0.0
PEM1E	Palustrine Emergent Persistent Seasonally Flooded/Saturated	287,089.2	0.0
PEM1F	Palustrine Emergent Persistent Semi-Permanently Flooded	166,688.6	2,176.0
PEM1Fh	Palustrine Emergent Persistent Semi-Permanently Flooded Diked/Impounded	12.8	0.0
PEM1H	Palustrine Persistent Emergent Permanently Flooded[d]	247.5	247.5
PEM2/1F	Palustrine Emergent Nonpersistent/Persistent Semi-Permanently Flooded	5,043.5	0.0
PEM2/UBF	Palustrine Emergent Nonpersistent/Unconsolidated Bottom Semi-Permanently Flooded	64.2	0.0
PEM2/UBH	Palustrine Emergent Nonpersistent/Unconsolidated Bottom Permanently Flooded	781.0	0.0
PEM2F	Palustrine Emergent Nonpersistent Semi-Permanently Flooded	178.7	0.0
PEM2H	Palustrine Emergent Nonpersistent Permanently Flooded	2,406.9	20.0
PSS/EM1A	Palustrine Scrub-Shrub/Emergent Persistent Temporarily Flooded	489.0	0.0
PSS/EM1B	Palustrine Scrub-Shrub/Emergent Persistent Seasonally Saturated	15,971.8	0.0
PSS/EM1E	Palustrine Scrub-Shrub/Emergent Persistent Seasonally Flooded/Saturated	27,603.9	0.0
PSS/EM1F	Palustrine Scrub-Shrub/Emergent Persistent Semi-Permanently Flooded	51.0	0.0
PSS1/EM1A	Palustrine Scrub-Shrub Broad-Leaved Deciduous/Emergent Persistent Temporarily Flooded	1,348.8	0.0
PSS1/EM1B	Palustrine Scrub-Shrub Broad-Leaved Deciduous/Emergent Persistent Seasonally Saturated	9,770.4	0.0
PSS1/EM1C	Palustrine Scrub-Shrub Broad-Leaved Deciduous/Emergent Persistent Seasonally Flooded	167.5	0.0
PSS1/EM1E	Palustrine Scrub-Shrub Broad-Leaved Deciduous/Emergent Persistent Seasonally Flooded/Saturated	11,792.6	0.0
PSS1/EM1F	Palustrine Scrub-Shrub Broad-Leaved Deciduous/Emergent Persistent Semi-Permanently Flooded	751.6	0.0
PSS1/USA	Palustrine Scrub-Shrub Broad-Leaved Deciduous/Unconsolidated Shore Temporarily Flooded	747.6	0.0
PSS1/USB	Palustrine Scrub-Shrub Broad-Leaved Deciduous /Unconsolidated Shore Seasonally Saturated[d]	12.5	12.5
PSS1/USC	Palustrine Scrub-Shrub Broad-Leaved Deciduous /Unconsolidated Shore Seasonally Flooded	13.9	0.0
PSS1A	Palustrine Scrub-Shrub Broad-Leaved Deciduous Temporarily Flooded	4,449.8	0.0
PSS1B	Palustrine Scrub-Shrub Broad-Leaved Deciduous Seasonally Saturated	2,641.0	317.9
PSS1C	Palustrine Scrub-Shrub Broad-Leaved Deciduous Seasonally Flooded	91.7	64.9
PSS1D	Palustrine Shrub-Scrub Broad-Leaved Deciduous Continuously Saturated[d]	117.1	117.1
PSS1E	Palustrine Shrub-Scrub Broad-Leaved Deciduous Seasonally Flooded/Saturated	117.6	0.0
PSS3B	Palustrine Scrub-Shrub Broad-Leaved Evergreen Seasonally Saturated[d]	109.8	109.8
PUB/EM1F	Palustrine Unconsolidated Bottom/Emergent Persistent Semi-Permanently Flooded	9,137.7	0.0
PUB/EM2F	Palustrine Unconsolidated Bottom/Emergent Nonpersistent Semi-Permanently Flooded	45.0	0.0
PUB/EM2H	Palustrine Unconsolidated Bottom/Emergent Nonpersistent Permanently Flooded	734.0	0.0
PUBF	Palustrine Unconsolidated Bottom Semi-Permanently Flooded	155.8	0.0

Cowardin Code[a]	Wetland Type	Total Acres of Wetland Type in the Analysis Area[b]	Acres of Wetland Type in Field-Verified Portion of Analysis Area[c]
PUBFh	Palustrine Unconsolidated Bottom Semi-Permanently Flooded Diked/Impounded	5.9	0.0
PUBFx	Palustrine Unconsolidated Bottom Semi-Permanently Flooded Excavated	2.5	0.0
PUBH	Palustrine Unconsolidated Bottom Permanently Flooded	61,263.0	227.6
PUBHh	Palustrine Unconsolidated Bottom Permanently Flooded Diked/Impounded	42.9	0.0
PUBHx	Palustrine Unconsolidated Bottom Permanently Flooded Excavated	25.6	0.0
PUS/EM1A	Palustrine Unconsolidated Shore/Emergent Persistent Temporarily Flooded	483.1	0.0
PUS/EM1C	Palustrine Unconsolidated Shore/Emergent Persistent Seasonally Flooded	69.3	0.0
PUS/EM1E	Palustrine Unconsolidated Shore/Emergent Persistent Seasonally Flooded/Saturated	309.1	0.0
PUS/SS1A	Palustrine Unconsolidated Shore/Scrub-Shrub Broad-Leaved Deciduous Temporarily Flooded	53.5	0.0
PUSA	Palustrine Unconsolidated Shore Temporarily Flooded	265.6	0.0
PUSC	Palustrine Unconsolidated Shore Seasonally Flooded	165.4	0.0
R1UBV	Riverine Tidal Unconsolidated Bottom Permanent[d]	45.7	19.5
R1USQ	Riverine Tidal Unconsolidated Shore Permanently Flooded[d]	16.2	15.0
R2EM2/UBH	Riverine Low Perennial Emergent Nonpersistent/Unconsolidated Bottom Permanently Flooded	580.8	0.0
R2EM2F	Riverine Low Perennial Emergent Nonpersistent Semi-Permanently Flooded	4.5	0.0
R2UB/EM2H	Riverine Low Perennial Unconsolidated Bottom/Emergent Nonpersistent Permanently Flooded	435.5	0.0
R2UBF	Riverine Low Perennial Unconsolidated Bottom Semi-Permanently Flooded	5,808.8	0.0
R2UBH	Riverine Low Perennial Unconsolidated Bottom Permanently Flooded	19,635.3	19.3
R2USA	Riverine Low Perennial Unconsolidated Shore Temporarily Flooded	1,717.6	0.0
R2USC	Riverine Low Perennial Unconsolidated Shore Seasonally Flooded	14,631.4	11.5
R3UBH	Riverine Upper Perennial Unconsolidated Bottom Permanently Flooded	6,343.9	0.0
R3USA	Riverine Upper Perennial Unconsolidated Shore Temporarily Flooded	186.9	0.0
R3USC	Riverine Upper Perennial Unconsolidated Shore Seasonally Flooded	512.4	0.0
R4SBA	Riverine Intermittent Streambed Temporarily Flooded	22.1	0.0
R4SBC	Riverine Intermittent Streambed Seasonally Flooded	10.7	0.0
R5UBH	Riverine Unknown Perennial Unconsolidated Bed Permanently Flooded	70.1	0.0
U[e]	Upland	122.7	122.7
Upland[e]	Upland	12,345.0	0.0
Us[e]	Upland (fill)[e]	42.9	42.9
Total	**NA**	**2,903,535.8**	**10,240.8**

Note: NA (not applicable). Acres of wetlands in the field-verified portion of the analysis area are included in the total acres of wetlands in the analysis area.
[a] Cowardin 1979, codes defined therein
[b.] Wells, Ives et al. 2018 and USFWS 2019
[c] Wells, Ives et al. 2018
[d] Wetland type uses a higher resolution classification than USFWS (2019) and would only be documented through field verification. The quantity of this type of wetland could be higher in the rest of the analysis area if those areas were field verified.
[e] Cowardin code of "U" was field verified; Cowardin code of "Upland" included all areas in National Wetlands Inventory mapping that were not identified as wetlands; Cowardin code for 'Us' was field verified to distinguish between vegetated uplands and developed uplands.

Table 3.9.2. Extent of Wetlands in the Field-Verified Portion of the Analysis Area (acres)

Wetlands	Uplands	Freshwater WOUS	Saltwater WOUS	Total
9,589.5	165.6	485.6	0.1	**10,240.8**

Note: NA (not applicable); WOUS (Waters of the United States)

There are no plant species listed as threatened or endangered under the Endangered Species Act known to occur in the analysis area. However, there are two plant species identified as sensitive[5] by the BLM: Eurasian junegrass (*Koeleria asiatica*) and Aster pygmaeus (*Symphotrichum pygmaeum*) (ACCS 2020).

The analysis area east of the Colville River contains substantially more development than west of the river; it includes a network of gravel roads and pads, mine sites, reservoirs, an industrial dock, and facilities to support oil-field development and production. The mechanism for **invasive species** introduction or transport remains limited as equipment (e.g., heavy equipment, trucks) is primarily stationed on the North Slope and remains there and fill material is sourced from local or regional mine sites. However, introductions have occurred in the analysis area, as is demonstrated by the presence of common dandelion (*Taraxacum officinale*) and foxtail barley (*Hordeum jubatum*) along the Tarn Road near DS2P (Figure 3.9.1) (McEachen and Maher 2016), the nearest location of invasive species reported (ACCS 2020).

3.9.2 Environmental Consequences

3.9.2.1 Alternatives B, C, and D

3.9.2.1.1 Direct Loss of Wetlands

The boat ramps and the CFWR would permanently remove wetlands by placement of gravel fill or excavation. Direct effects to wetlands from fill or excavation are described in the Draft EIS Section 3.9.2.3.1, *Direct Loss and Alteration of Wetlands*. Table 3.9.3 summarizes direct wetland impacts by Cowardin type. As described in the Draft EIS Section 3.9.2.3.1, wetland conditions in watersheds with less than 5% cover by impervious surfaces are good (i.e., close to reference conditions, which were defined as the average condition of the three least impaired wetlands; Hicks and Larson 1997). For the SDEIS analysis, impervious cover was used as a proxy for gravel fill since both impervious cover and gravel fill decrease the infiltration rate of precipitation and increase surface runoff in a watershed. The additional direct fill would result in a slight increase of total fill for the Project but would not measurably increase the proportion of proposed fill in any of the 10-digit HUCs in which the fill would occur (i.e., fill would occur in no more than 0.2% of any of the HUCs).

Table 3.9.3. Acres of Fill and Excavation for the Boat Ramps and Constructed Freshwater Reservoir by Wetland Type

Cowardin Code	Wetland Loss from Boat Ramps[a]	Wetland Loss from Constrcted Freshwater Reservoir
L1UBH	0.0	1.5
PEM1/SS1B	1.6	0.0
PEM1/SS1E	0.2	0.0
PEM1F	0.0	10.4
PSS1/EM1B	0.1	0.0
PSS1/EM1E	0.1	0.0
PSS1/USB	0.3	0.0
PSS1B	0.0	2.8
PSS1C	0.1	0.0
PSS1D	0.0	0.0
R2UBF	0.3	0.0
PSS3B	0.0	5.7

[5] BLM designates native wildlife, fish, or plant species occurring on BLM lands when they become at-risk species. Once designated, BLM works cooperatively with other federal and state agencies and nongovernmental organizations to proactively conserve these species and ensure that activities on public lands do not contribute to the need for their listing under the Endangered Species Act.

Cowardin Code	Wetland Loss from Boat Ramps[a]	Wetland Loss from Constrcted Freshwater Reservoir
R2UBH	0.0	0.0
R2USC	0.2	0.0
Uplands	3.0	0.0
Total	**5.9**	**20.4**
Total in Wetlands[b]	**2.9**	**20.4**

Note: Cowardin codes defined in Table 3.9.1.
[a] Values reflect the Alternative B scenario where three boat ramps would be constructed; Alternatives C and D would only construct one boat ramp.
[b] Fill not in wetlands would be in uplands or freshwater.

3.9.2.1.2 Direct Vegetation Damage and Soil Compaction

Direct vegetation damage and soil compaction have no changes from the Draft EIS for the three Project components described in the SDEIS.

3.9.2.1.3 Indirect Change in Wetland Composition

The boat ramps and CFWR would have gravel infrastructure that would contribute to the effects of dust, gravel spray, thermokasrsting, and impoundments described in the Draft EIS Section 3.9.2.3.3, *Indirect Change in Wetland Composition*. The quantity of effects from these Project components is summarized in Table 3.9.4.

Table 3.9.4. Acres of Indirect Effects from Dust, Gravel Spray, Thermokarsting, or Impoundments from the Boat Ramps and Constructed Freshwater Reservoir by Wetland Type

Cowardin Code	Boat Ramps[a]	Constructed Freshwater Reservoir
L1UBH	0.0	4.2
PEM1/SS1B	4.2	0.4
PEM1/SS1E	5.7	0.0
PEM1F	2.2	13.6
PSS1/EM1B	2.0	0.0
PEM1/EM1E	2.9	0.0
PSS1/USB	1.9	0.0
PSS1B	0.0	14.2
PSS1C	1.5	0.0
R2UBF	5.9	0.0
PSS3B	0.0	1.2
R2UBH	4.2	0.0
R2USC	0.9	0.0
Uplands	12.7	0.0
Total	**44.1**	**33.6**
Total in Wetlands[b]	**31.4**	**33.6**

Note: Cowardin codes defined in Table 3.9.1. Dust shadow is calculated from all gravel infrastructure. Numbers may differ slightly with other reported values in the environmental impact statement due to rounding.
[a] Values reflect the Alternative B scenario where three boat ramps would be constructed; Alternatives C and D would only construct one boat ramp.
[b] Fill not in wetlands would be in uplands or freshwater.

Because the CFWR is not expected to substantially change water levels in Lake M0015 or Willow Creek 3 (as described above in Section 3.8.2.1.3, *Water Withdrawal*), water diversion to the CFWR is not expected to indirectly affect adjacent wetlands or reduce the amount of water available to the wetland community.

The boat ramps would increase mechanisms for invasive species introduction or dispersal to the Project area by increasing access for people to travel to areas previously less accessible. Established invasive species could alter existing wetland types and functions.

3.9.2.2 Module Delivery Option 3: Colville River Crossing

3.9.2.2.1 Direct Loss of Wetlands

Option 3 would permanently remove wetlands by placing 5 acres of gravel fill. Direct effects to wetlands from fill are described in the Draft EIS Section 3.9.2.3.1, *Direct Loss and Alteration of Wetlands*. Table 3.9.5 summarizes direct wetland impacts by Cowardin type.

As described above in Section 3.9.2.1.1, *Direct Loss and Alteration of Wetlands*, wetland conditions in watersheds with less than 5% cover by impervious surfaces are good (i.e., close to reference conditions, which were defined as the average condition of the three least impaired wetlands; Hicks and Larson 1997). The fill for Option 3 would occur over five 10-digit HUCs that range in size from 77,254 acres to 234,392 acres. Thus, the amount of fill for Option 3 is negligible when compared to the size of the HUCs in which the fill would occur. The fill would not measurably increase the proportion of proposed fill in any of the 10-digit HUCs.

Table 3.9.5. Acres of Fill for Module Delivery Option 3 (Colville River Crossing) by Cowardin Code

Cowardin Code	Option 3: Colville River Crossing (acres)
PEM1/SS1B	2.5
PEM1/SS1E	2.1
PEM1/UBF	<0.0
PEM1E	0.3
PEM1F	<0.0
Total	**4.9**[a]
Total in Wetlands[b]	**4.9**[a]

Note: < (less than). Cowardin codes defined in Table 3.9.1.
[a] The SDEIS reports the total fill as 5.0 acres, it is reported as 4.9 acres here due to rounding.
[b] Fill not in wetlands would be in uplands or freshwater.

3.9.2.2.2 Direct Vegetation Damage

Option 3 would construct ice infrastructure that could damage vegetation. Effects of vegetation damage are described in the Draft EIS Section 3.9.2.3.2, *Direct Vegetation Damage and Soil Compaction*. Approximately 666.6 acres of vegetation damage could occur from ice infrastructure for Option 3 (Table 3.9.6). Damage would occur over less than 0.1% of any of the five 10-digit HUCs in which the effect would occur. No multi-season ice pads would be needed.

Table 3.9.6. Vegetation Damage from Ice Infrastructure for Module Delivery Option 3 (Colville River Crossing) by Ice Infrastructure Type

Ice Infrastructure	Option 3: Colville River Crossing
Single-season ice pads (acres)	83.4
Multi-season ice pads (acres)	0.0
Ice roads (miles)	80.2
Ice roads (acres)	583.2
Total acres	**666.6**

Note: The total acres indirectly impacted by ice infrastructure were assumed to be equal to wetland acres, since uplands comprise less than 1% of the analysis area.

3.9.2.2.3 Indirect Change in Wetland Composition

Option 3 would add 5 acres of gravel fill to existing Kuparuk roads that would contribute to the effects of dust and gravel spray described in the Draft EIS Section 3.9.2.3.3, *Indirect Change in Wetland Composition*. The quantity of effects from these Project components is summarized in Table 3.9.7. Because the gravel fill would occur adjacent to existing gravel roads with existing dust shadows, the effect would be minor.

Table 3.9.7. Acres of Indirect Dust Shadow from Module Delivery Option 3 (Colville River Crossing) by Cowardin Code

Cowardin Code	Option 3: Colville River Crossing (acres)
PEM1/SS1B	3.4
PEM1/SS1E	2.0
PEM1/USE	0.1
PEM1E	0.2
PEM1F	<0.1
Upland	0.1
Total	**5.8**
Total in Wetlands[a]	**5.7**

Note: < (less than). Cowardin codes defined in Table 3.9.1. Dust shadow calculations do not include the existing dust shadow from Kuparuk roads, but rather the new area in which the existing dust shadow would be expanded.
[a] Fill not in wetlands would be in uplands or freshwater.

3.9.3 Additional Suggested Best Management Practices or Mitigation

Provide wash stations to clean and inspect vehicles before are allowed west of the Colville River; clean tires and wheel wells so they are free from soils, seeds, and plant parts.

3.10 Fish

3.10.1 Affected Environment

The analysis area for fish was expanded to include aquatic habitats adjacent to and downstream of the boat ramps, CFWR, and Option 3 access roads (gravel road upgrades and ice roads), as well as the nearshore marine waters off Oliktok Point (Figure 3.10.1). The main freshwater drainage added to the analysis area is the Colville River (due to the Option 3 ice bridge at Ocean Point). Existing conditions in the Colville River and the marine area near Oliktok Point are described above in Section 3.8, *Water Resources*. Marine and **anadromous** fish species that use the Oliktok Point area are listed in Table E.10.1 of Appendix E.10 in the Draft EIS. Studies in the summer of 1983 (Moulton and Fawcett 1984), documented a higher abundance of broad whitefish, humpback whitefish, Arctic cisco, least cisco, Dolly Varden, Arctic cod, Arctic flounder, and fourhorn sculpin west of the Oliktok Point than east of it.

The Colville River at Ocean Point is anadromous (used for spawning, rearing and migration, Figure 3.10.1). Overwintering habitat depicted in this figure was derived from Morris (2003), and likely overestimates overwintering habitat in some areas. Channel conditions and thus aquatic habitat at Ocean Point are distinctly different than both upstream and downstream reaches in that the active channel at Ocean Point is narrow, banks are more steeply incised, and few if any channel braids occur in winter. Ocean Point is also believed to be the approximate upstream extent of saltwater influence from the CRD. Subsequently, there is also a change in documented winter fish use of the Colville River upstream of Ocean Point.

Arctic cisco (qaaqtak or *Coregonus autumnalis*) move in to the CRD each fall or winter under the ice as saltwater moves up the delta channels (Moulton, Seavey et al. 2010). Residents of Nuiqsut fish for the species throughout the delta during early winter, primarily in the Nigliq channel (within the extent of the saltwater intrusion). Because saltwater does not typically extend far upstream from the CRD (the documented extent of saltwater intrusion is at least 30 miles upstream from Harrison Bay in the winter (Arnborg, Walker et al. 1962)), Arctic cisco are unlikely to be in the vicinity of Ocean Point during winter. Burbot (Tittaaliq or *Lota lota*) fishing during winter, though only quantified in 2006, is focused in the mainstem of the Colville River east of the Putu Channel divergence (Moulton and Pausanna 2006). Summer and late fall fishing for broad whitefish (*Coregonus nasus*) is focused in the Nigliq Channel and in the mainstem of the Colville River upstream to just below its confluence with the Itkillik River (Moulton and Pausanna 2006). The distribution of fishing efforts suggests that these targeted fish species are not common further upstream (to Ocean Point). Studies of seasonal movements of radio-tagged broad whitefish (Morris 2000, 2003) found that fish that moved into the Colville River in fall or winter did not move upstream from Ocean Point, and most wintered in a side channel of the Colville River at Ocean

Point or downstream in reaches around the confluence with the Itkillik River. It is likely that burbot are not moving through Ocean Point during winter, though they are the most likely species to do so when the opportunity is there (i.e., flows are sufficient). Most species aside from burbot are not feeding in the winter and tend to be fairly sedentary once they have reached overwintering locations.

Several streams on the east side of the Colville River in the analysis area are anadromous (Kalubik Creek, Miluveach River, Kachemach River, Itkillik River, and one unnamed stream and lake complex near Ocean Point), but none contain known overwintering habitat except for near their connections to the Colville River (e.g., the Itkillik River) (Figure 3.10.1). The Itkillik River is different than other east side tributaries of the lower Colville River in that it originates in the Brooks Range and thus is longer and drains a larger area than the other tundra rivers. It is one of the largest tributaries of the Colville River on its east side and contains some overwintering habitat near its confluence with the Colville River.

The Ublutuoch (Tiŋmiaqsiuġvik) River contains overwintering fish habitat at the proposed boat ramp location (Figures 3.10.1 and 3.10.2). Maximum water depths in the reach (approximately 3 river miles) upstream of the boat ramp were over 23 feet in 1999 and ranged from less than 1 foot to 23.6 feet (Moulton 2004). Overwintering habitat on the North Slope is typically in water 7 to 8 feet deep.

Lake M0015 supports both sensitive and resident fish (Figure 3.10.2).

3.10.2 Environmental Consequences

3.10.2.1 Alternatives B, C, and D

3.10.2.1.1 Habitat Loss and Alteration

The boat ramps (and their access roads) would permanently alter 0.4 acre of aquatic habitat for each boat ramp (i.e., the portion of each boat ramp that would be beneath ordinary high water) for a total of 1.2 acres for all three boat ramps.

The CFWR perimeter berm and boat ramps (including the boat ramp access roads) would create dust from vehicle traffic that could deposit on adjacent waterbodies, as described in the Draft EIS Section 3.10.2.3.1, *Habitat Loss, Alteration, or Creation*. Approximately 4.2 acres of dust shadow over waterbodies would be added from the CFWR perimeter berm and 11 acres from the boat ramps (three boat ramps would be constructed under Alternative B; Alternatives C and D would only construct one boat ramp and effects would be less).

Because the CFWR is not expected to substantially change water levels in Lake M0015 or Willow Creek 3 (as described above in Section 3.8.2.1.3, *Water Withdrawal*), water diversion to the CFWR is expected to have effects described for withdrawal in the Draft EIS Section 3.10.2.3.1.

If the reservoir is decommissioned at the end of the Project, the 50-foot-deep CFWR would provide new overwintering fish habitat. Lake M0015 currently supports both sensitive and resident fish (Figure 3.10.2).

Construction of the boat ramp on the Ublutuoch (Tiŋmiaqsiuġvik) River would occur in overwintering fish habitat in winter. If the construction occurs in-water, two potential effects could occur. First, if the river ice surface is used as a work platform, the insulating snow cover would need to be removed, which could super cool the water immediately around the construction site and lead to the formation of slush throughout the entire water column, as observed at the Sagavanirktok River Bridge in 2009 (Morris and Winters 2009). Second, in-water work would increase SS and turbidity in the water column, which could persist for an extended period of time due to the lack of flow (as has been documented on similar winter construction projects in the Kuparuk River, Bill Morris, personal communication to DOWL, January 16, 2020). The Ublutuoch (Tiŋmiaqsiuġvik) River contains a substantial amount of overwintering habitat, thus it is anticipated that effects would be localized to the immediate area (from the boat ramp to a riffle immediately downstream of the existing bridge over the river on the GMT road, Figure 3.10.1) and fish would move to other available overwintering habitat.

The boat ramps on Judy (Iqalliqpik) Creek and Fish (Uvlutuuq) Creek would be in areas that contain aeolian sand beds, which are highly mobile. Boat ramps in these locations could cause annual scour from loading and unloading boats (revving boat motors to load and unload boats from trailers, as well as the tow vehicle's rear tires) and result in routine long-term in-water maintenance. Boat wakes could also cause bank erosion in the navigable area of the streams where the boat ramps are located. The extent and magnitude of erosion would be influenced by a number of factors as described above in Sections 3.8.2.1.2, *In-Water Structures (Water Intakes, Boat Ramps)*, and 3.8.2.1.5, *Watercraft in Rivers*. Erosion could alter fish habitat by altering banks and adding sediment to the stream. Because Judy (Iqalliqpik) Creek and Fish (Uvlutuuq) Creek are migration habitat (not high-quality rearing or spawning habitat), and because there is a large amount of this type of habitat in the area, the effects on fish are not expected to be measurable.

The boat ramps would increase access and use of the Ublutuoch (Tiŋmiaqsiuġvik) River, Judy (Iqalliqpik) Creek, and Fish (Uvlutuuq) Creek in the areas where they are navigable. Likely use would be by small skiffs (subsistence users). Use of personal watercraft would increase the potential for gas spills into waterbodies, both up and downstream of the ramps. The boat ramps would also create stormwater runoff directly into their receiving waterbodies, which could increase contaminants in the channel near the ramps. When the amount of available high-quality fish habitat is considered with the extent of expected use of the boat ramps and associated potential spills, the effects to fish would be relatively small.

All three boat ramps could be constructed under Alternative B; only the Ublutuoch (Tiŋmiaqsiuġvik) River boat ramp would be constructed under Alternatives C and D because there would not be gravel road access to the other rivers. Though the number of potential users of each boat ramp is unknown, if only one ramp were constructed, use could be concentrated on that river and thus effects could be slightly higher there.

3.10.2.1.2 Disturbance and Displacement

Construction of the Ublutuoch (Tiŋmiaqsiuġvik) River boat ramp in winter could disturb or displace fish in overwintering fish habitat near the boat ramp if in-water construction occurs. Noise and human activity from in-water construction could disturb or displace fish; because of the limited amount of overwintering fish habitat available (Figure 3.10.1), fish may not be able to find alternative habitat during the in-water work.

Skiffs using the boat ramps in summer and fall could disturb or displace fish along the navigable reaches of the boat-accessible rivers. As described above in Section 3.10.2.1.1, *Habitat Loss and Alteration*, if only one boat ramp were constructed, use could be concentrated on that river and thus effects could be slightly higher there.

3.10.2.1.3 Injury and Mortality

There are no changes to injury and mortality compared to the Draft EIS for the Project components described in the SDEIS.

3.10.2.2 Module Delivery Option 3: Colville River Crossing

Option 3 would require 5.0 acres of gravel fill along existing Kuparuk gravel roads (Table 3.10.1), which would expand the existing dust shadow along the road and affect small areas that are currently outside the dust shadow. Effects of gravel fill and dust deposition are described in the Draft EIS Section 3.10.2.3.1, *Habitat Loss, Alteration, or Creation*.

Option 3 would require 12.1 acres of screeding at Oliktok Dock and the barge lightering area (Figure 2.3.1). Screeding, as described in Draft EIS Section 3.10.2.6, *Module Delivery Options*, would do the following:

- Temporarily alter benthic marine habitat by recontouring sediments prior to barge landings.
- Create in-water noise that would disturb or displace fish (cause behavioral avoidance).
- Injure or cause mortality to bottom-dwelling fish within the screeding footprint. Screeding would occur two times and would not affect fish at the population level.

Barge traffic to and from Oliktok Point would disturb and locally displace nearshore marine fish due to noise, as described in the Draft EIS Section 3.10.2.6, *Module Delivery Options*. Barges would have to travel farther to get to Oliktok Dock than to the MTI locations in Options 1 or 2. However, because support vessels would originate from Oliktok Dock, Option 3 would substantially reduce the miles of support vessel traffic and the number of trips needed (Table 3.10.1)

Option 3 would require 666.6 acres of ice roads and ice pads over 2 years (2025 and 2027). Ice roads and pads can also alter fish habitat by temporarily blocking passage or eroding streambeds or stream banks, as described in the Draft EIS Section 3.10.2.3.1 (*Habitat Loss, Alteration, and Creation*). Ice infrastructure for Option 3 would require 257.2 million gallons of freshwater. Lakes in the area from DS2P to the Itkillik River are generally shallower and contain only **resistant fish** species or no fish. Thus, though numerous lakes may be used for water withdrawal, effects to fish are not expected.

Because most of the streams that would be crossed by the Option 3 ice road east of the Colville River freeze to the bottom in the winter, effects to fish would be minimal. However, the Itkillik River has overwintering habitat near its confluence with the Colville River. Thus, there is potential for isolated overwintering habitat that would need to be avoided during final alignment of the ice road.

As described above in Section 3.10.1, *Affected Environment*, fish are not anticipated to be present at Ocean Point during the winter because the river ice can be naturally grounded and little flow exists. CPAI will monitor ice conditions and fish presence at the crossing location over the next several winters prior to ice bridge construction in 2025 and 2027. If there are indications that fish may be present in winter, CPAI would work with ADF&G through the permitting process to determine if and how fish need to be moved around the ice bridge. If fish had to be transported around the bridge, it would cause stress (disturbance) during capture and transport. It is anticipated that the ice bridge at the Ocean Point crossing would be needed for 5 weeks.

Table 3.10.1. Effects to Fish and Fish Habitat from Module Delivery Option 3 (Colville River Crossing)

Project Component	Effect to Fish or Fish Habitat	Option 3: Colville River Crossing
Gravel fill in marine area	Habitat and EFH loss Temporary habitat alteration from sedimentation or turbidity Disturbance or displacement from noise during gravel recontouring in summer	None in marine area
Gravel fill onshore	Habitat alteration from dust shadow Disturbance or displacement during construction	No overlap of fill or dust shadow with waterbodies
Pile and sheet pile removal	Disturbance or displacement from noise	None
Screeding	Temporary habitat alteration Disturbance or displacement from noise or human activity Injury or mortality of benthic species	12.1 acres, 2 occurrences 164 to 179 dB rms at 3.28 feet Minimal injury of fish entrained in screeded material
Freshwater ice roads	Habitat alteration from water withdrawal (water quality or quantity changes) Habitat alteration from temporarily blocked passage	257.2 million gallons of freshwater 80.2 miles of onshore ice road 666.6 acres of onshore ice roads and ice pads Approximately 2,000-foot-long ice bridge across the Colville River with 700 feet spanning the active winter channel; Additional 850 feet (total) of ice ramps
Barge and support vessel traffic	Disturbance or displacement from noise and human activity	Temporary disturbance along nearshore barge route ~600 more miles of barge traffic than Option 1, ~1,200 more miles than Option 2[a] ~350 miles of support vessel traffic (>22,400 fewer miles of support vessel traffic than Option 1, ~44,800 fewer miles than Option 2)[a] 145 to 175 dB rms at 3.28 feet from the source

Note: ~ (approximately); > (greater than); dB (decibels); rms (root-mean-square). All sound levels are detailed in Draft EIS

Appendix E.13, *Marine Mammals Technical Appendix*.

[a] All module delivery options would have the same number of barge trips, but the distance traveled would vary by option. Atigaru Point is approximately 50 miles from Point Lonely and Oliktok Dock is approximately 50 miles from Atigaru Point. Six round-trip barge trips over 50 miles is 600 miles. Barges would travel from southern Alaska. Support vessels would originate at Oliktok Dock; for Option 3 support vessels would travel 2.3 miles one way to the barge lightering area and 76 total trips would be needed. For Options 1 and 2: 224 round-trip support vessel trips over 50 miles is 22,400 miles.

3.10.3 Additional Suggested Best Management Practices or Mitigation

Additional suggested mitigation measures to reduce impacts created by Option 3 could include the following:

- Identify overwintering fish habitat along the Itkillik River and other tributaries to the Colville River along the Option 3 ice road route and avoid crossing these areas with the module delivery ice road.
- Collect baseline data regarding winter fish presence along the Colville River near Ocean Point throughout winters every year until the grounded ice bridge crossing is no longer required for the Project.

3.11 Birds

3.11.1 Affected Environment

The analysis area for birds was expanded to include the area within a 3.7-mile (6-kilometer [km]) radius of Project actions needed for the boat ramps, CFWR, and Option 3 access roads (gravel road upgrades and ice roads), as well as the nearshore marine waters off Oliktok Point (Figure 3.11.1).

The main freshwater drainage added to the analysis area is the Colville River (due to the Option 3 ice bridge at Ocean Point). Existing conditions of the Colville River and the marine area near Oliktok Point are described above in Section 3.8, *Water Resources*.

3.11.1.1 Bird Species

There is a greater abundance of brant (Murphy and Anderson 1993; Stickney, Attanas et al. 2015; Stickney and Ritchie 1996), long-tailed ducks (Fischer, Tiplady et al. 2002; Flint, Reed et al. 2003; Lysne, Mallek et al. 2004a), and eiders (spectacled, king, common, and Steller's; Attanas and Shook 2020; Flint et al. 2003; Fischer, Tiplady et al. 2002; Morgan and Attanas 2016) near Oliktok Point, than in the Project area (Fischer and Larned 2004).

3.11.1.1.1 Special Status Species

Special status species that may be present in the action area are described in the Draft EIS Section 3.11.1.1.1, *Special Status Species*, and Appendix E.11, *Birds Technical Appendix*. Densities of yellow-billed loon (a common breeder in the analysis area) and spectacled eider (a possible breeder in the analysis area) in the updated analysis area are depicted in Figures 3.11.2 through 3.11.4. The density of **pre-breeding** spectacled eiders is lower at Oliktok than at Point Lonely or Atigaru Point (Figure 3.11.2), and likely the number of nests is lower too. Spectacled eider are known to nest along Oliktok Road. As described in the Draft EIS Appendix E.11, *Birds Technical Appendix* (Section 1.1.1, *Special Status Species*), the analysis area west of the Colville River has spectacled eider densities of 0.03 and 0.08 birds per square mile (Johnson, Parrett et al. 2018, 2019). The Kuparuk oil field (included in the analysis area east of the Colville River) has an average density of 0.17 birds per square mile (Attanas and Shook 2020). Fischer and Larned (2004) recorded fewer spectacled eiders and unidentified eiders in the nearshore zone at Oliktok Point than at Atigaru or Point Lonely based on 3 years of aerial survey data (Fischer and Larned 2004, Figure 3, Table 5), but the general movement of adults and juveniles from east to west indicates the entire coast is used. The nearshore zone from the Saganavirktok River to Point Barrow was identified as an important area for spectacled eiders based on satellite telemetry (Sexson, Pearce et al. 2014).

Two other special status species, yellow-billed and red-throated loons, also make extensive use of nearshore waters in the western Beaufort Sea (Lysne, Mallek et al. 2004b). Higher proportions of both species of loon were recorded in the Jones/Return Islands Survey segment where Oliktok Dock is located, than in Harrison Bay (including Atigaru Point and Point Lonely).

3.11.1.2 Bird Habitats

Table 3.11.1 summarizes habitats in the analysis area. Acres of some habitat types changed since the Draft EIS, but no additional habitat types were added.

Table 3.11.1. Descriptions and Use of Bird Habitats in the Analysis Area

Habitat[a]	Description	No. of Species Using	Acres in Analysis Area
Dune Complex	Mosaic of swale and ridge features on inactive sand dunes, supporting wet to flooded sedge and moist shrub types in swales and moist to dry dwarf and low shrub types on ridges	1	1,838.6
Riverine Complex	Mosaic of moist to wet sedge and shrub types, water, and barrens along flooded streams and associated floodplains	3	983.4
Salt-Killed Tundra	Coastal low-lying areas where saltwater from storm surges has killed the original vegetation and is being colonized by salt-tolerant vegetation	3	181.6
River or Stream	Permanently flooded channels large enough to be mapped as separate units	4	7,528.5
Tapped Lake with Low-Water Connection	Same as above except connected to adjoining surface waters even at low water	5	2,215.7
Tidal Flat Barrens	Nearly flat, barren mud or sand periodically inundated by tidal waters; may include small areas of partially vegetated mud or sand	6	32.6
Human Modified	Area with vegetation, soil, or water significantly disturbed by human activity	7	459.7
Tapped Lake with High-Water Connection	Lakes that were breached and drained by a migrating river channel and by permafrost thaw. Tapped lakes subject to river stages and discharge, connected only during flood or high-water events.	9	4,547.7
Brackish Water	Coastal ponds and lakes that are flooded periodically by saltwater during storm surges	10	148.7
Deep Open Water without Islands	Waterbody lacking emergent vegetation with a depth of at least 6.6 feet (2 meters)	11	25,216.0
Shallow Open Water without Islands	Waterbodies lacking emergent vegetation with depths less than 6.6 feet (2 meters)	11	4,330.2
Barren	Area without vegetation and not normally inundated	12	9,610.4
Deep Open Water with Islands or Polygonized Margins	Waterbodies with depths of at least 6.6 feet (2 meters) with islands or with polygonized wetlands forming a complex shoreline	14	20,250.7
Shallow Open Water with Islands or Polygonized Margins	Waterbodies lacking emergent vegetation with depths less than 6.6 feet (2 meters) with islands or with **polygonized wetlands** forming a complex shoreline (Draft EIS, Chapter 3.9, *Wetlands and Vegetation*).	14	3,802.4
Grass Marsh	Ponds and lake margins with the emergent grass *Arctophila fulva* (pendant grass). Shallow water depths (less than 3.3 feet [1 meter]). Tends to have abundant invertebrates, good escape cover for birds, and high importance to many waterbirds.	15	1,654.0
Moist Tussock Tundra	Gentle slopes and ridges of coastal deposits and terraces, pingos, and the uplifted centers of older drained lake basins. Vegetation dominated by tussock-forming plants, most commonly *Eriophorum vaginatum*. Associated with high-centered polygons of low or high relief.	18	86,398.9
Salt Marsh	Complex assemblage of small brackish ponds, halophytic sedges and willows, and barren patches on stable mudflats usually associated with river deltas	21	1,107.6
Young Basin Wetland Complex	Complex ice-poor, drained lake thaw basins characterized by a complex mosaic of vegetation classes that, in general, have surface water with a high percentage of Fresh Sedge Marsh and Fresh Grass Marsh	21	1,040.6
Open Nearshore Water	Shallow estuaries, lagoons, and embayments along the Beaufort Sea coast	22	181.1
Deep Polygon Complex	Area permanently flooded with water more than 1.6 feet (≤0.5 meter) deep, frequently with emergent sedge in margins, deep polygon centers, and well-developed polygon rims	25	1,309.4

Habitat[a]	Description	No. of Species Using	Acres in Analysis Area
Sedge Marsh	Permanently flooded waterbodies dominated by the emergent sedge *Carex aquatilis*. Typically, emergent sedges occur in water <1.6 feet (≤0.5 meter) deep.	25	7,237.9
Tall, Low, or Dwarf Shrub	Both open and closed stands of low (≤4.9 feet [1.5 meters] high) and tall (>4.9 feet [1.5 meters] high) willows along riverbanks and Dryas Tundra on upland ridges and stabilized sand dunes	25	22,725.8
Old Basin Wetland Complex	Complex ice-rich habitat in older drained lake basins with well-developed low- and high-centered polygons resulting from ice-wedge development and aggradation of segregated ice.	27	20,099.4
Moist Sedge-Shrub Meadow	High-centered, low-relief polygons and mixed high- and low-centered polygons on gentle slopes of lowland, riverine, drained basin, and deposits formed by the movement of soil and other material. Soils saturated at intermediate depths (>0.5 feet [>0.15 meter]) but generally free of surface water during summer.	36	53,797.2
Nonpatterned Wet Meadow	Analogous to sedge meadow or shrub meadow. Lowland areas, typically flooded in spring, but lacking polygons or other terrain relief features.	39	17,996.2
Patterned Wet Meadow	Lowland areas with low-centered polygons that are flooded in spring, centers flooded or with water remaining close to the surface throughout the growing season. Vegetation growth typically is more robust in polygon troughs than in centers.	44	55,788.1
Unmapped	Unknown	–	824,350.3
Total	–	**–**	**1,174,832.7**

Source: See sources for Table E.11.1 in the Draft EIS Appendix E.11, *Birds Technical Appendix*.
Note: As described in Draft EIS Section 3.11.1.2, *Bird Habitats*, habitats were ranked by the number of species using them to portray areas with the highest potential for avian occurrence. Actual scores ranged from 1 (one species used the habitat) to 44 (44 species used the habitat). Shading denotes high-use habitats (at least 20 species use the habitat). See Draft EIS Appendix E.11, Table E.11.1 for more details on habitat values.
[a] More information on these habitat types is provided in the Draft EIS, Chapter 3.9, *Wetlands and Vegetation*.

3.11.2 Environmental Consequences

3.11.2.1 Alternatives B, C, and D

3.11.2.1.1 Habitat Loss and Alteration

The perimeter berm of the CFWR would permanently remove 3.9 acres of bird habitat, and the reservoir and channel connection to Lake M0015 would permanently alter 16.3 acres of bird habitat. Most of habitat loss and alteration would be in Nonpatterned Wet Meadow and Moist Sedge-Shrub Meadow (Table 3.11.2). Habitats altered would result in lower quality habitat than existing wetlands, which are used by a high number of avian species. The reservoir would become water habitat and result in a loss of habitat for tundra-nesting birds and a gain in habitat for waterbirds. However, because the reservoir would be screened for fish, it would not provide food for piscivorous birds.

The CFWR could displace less than 5.3 nests, primarily of ground-nesting shorebirds and passerines, based on average densities from breeding bird plots (Johnson, Burgess et al. 2005).

The boat ramps (and their access roads) would cause approximately 5.8 acres of habitat loss for all ramps (Table 3.11.2). Three boat ramps would be constructed under Alternative B; Alternatives C and D would construct one boat ramp and effects would be less.

The CFWR perimeter berm and boat ramps (including the boat ramp access roads) would create dust and gravel spray that could alter adjacent habitats, as described in the Draft EIS Section 3.11.2.3.1, *Habitat Loss or Alteration*. As detailed in Table 3.11.3, 33.5 acres of dust shadow would be added from the CFWR and 41.1 acres from the boat ramps (under Alternative B, 3 boat ramps would be constructed; Alternatives C and D would construct only 1 boat ramp and effects would be less).

Because the CFWR is not expected to substantially change water levels in Lake M0015 or Willow Creek 3 (as described above in Section 3.8.2.1.3, *Water Withdrawal*), water diversion to from CFWR is expected to have effects described for withdrawal in the Draft EIS Section 3.11.2.3.1.

Table 3.11.2. Acres of Bird Habitats Permanently Lost by the Boat Ramps and Constructed Freshwater Reservoir

Habitat	Habitat Use (1 to 44 species)[a]	Habitat Loss: Boat Ramps[b]	Habitat Loss[c]: Constructed Freshwater Reservoir	Habitat Alteration[c]: Constructed Freshwater Reservoir
Dune Complex	1	0.3	0.0	0.0
Deep Open Water without Islands	11	0.0	1.5	0.0
Barren	12	0.2	0.0	0.0
Moist Tussock Tundra	18	1.1	0.0	0.0
Tall, Low, or Dwarf Shrub	25	3.5	1.6	1.2
Moist Sedge-Shrub Meadow	36	0.7	4.6	1.1
Nonpatterned Wet Meadow	39	0.0	7.0	1.3
Patterned Wet Meadow	44	<0.0	1.7	0.3
Total high-use acres (>20 species)	–	**4.2**	**14.9**	**3.9**
Total acres	–	**5.8**	**16.4**	**3.9**

Note: – (not applicable). Acres of habitat lost is presented for bird habitats only; thus, the total gravel footprint may differ from total direct habitat loss, as some areas in the gravel footprint may not be bird habitat.
[a] As described in Draft EIS Section 3.11.1.2, *Bird Habitats*, habitats were ranked by the number of species using them to portray areas with the highest potential for avian occurrence. Actual scores ranged from 1 (one species used the habitat) to 44 (44 species used the habitat). Shading denotes high-use habitats (at least 20 species use the habitat). See Draft EIS Appendix E.11, *Birds Technical Appendix*, Table E.11.1 for more details on habitat values.
[b] Values reflect the Alternative B scenario where three boat ramps would be constructed; Alternatives C and D would only construct one boat ramp.
[c] Habitat loss would be from perimeter berm; habitat alteration would be from reservoir and channel connection to Lake M0015.

Table 3.11.3. Acres of Bird Habitats Altered by Dust, Gravel Spray, Thermokarsting, or Impoundments by the Boat Ramps and Constructed Freshwater Reservoir

Habitat	Habitat Use (1 to 44 species)[a]	Boat Ramps[b]	Constructed Freshwater Reservoir	Total
Dune Complex	1	3.2	0.0	**3.2**
River or Stream	4	6.2	0.0	**6.2**
Deep Open Water without Islands	11	0.0	4.2	**4.2**
Shallow Open Water without Islands	11	0.8	0.0	**0.8**
Barren	12	3.7	0.0	**3.7**
Moist Tussock Tundra	18	0.5	0.3	**0.8**
Tall, Low, or Dwarf Shrub	25	16.9	14.2	**31.1**
Moist Sedge-Shrub Meadow	36	5.9	1.2	**7.1**
Nonpatterned Wet Meadow	39	3.1	9.3	**12.4**
Patterned Wet Meadow	44	0.8	4.3	**5.1**
Total high-use acres (>20 species)	–	**26.7**	**29.0**	**55.7**
Total acres	–	**41.1**	**33.5**	**74.6**

Note: – (not applicable)
[a] As described in Draft EIS Section 3.11.1.2, *Bird Habitats*, habitats were ranked by the number of species using them to portray areas with the highest potential for avian occurrence. Actual scores ranged from 1 (one species used the habitat) to 44 (44 species used the habitat). Shading denotes high-use habitats (at least 20 species use the habitat). See Draft EIS Appendix E.11, *Birds Technical Information*, Table E.11.1 for more details on habitat values.
[b] Values reflect the Alternative B scenario where three boat ramps would be constructed; Alternatives C and D would only construct one boat ramp.

3.11.2.1.2 Disturbance and Displacement

Construction of the CFWR and the boat ramps would result in human activity, machinery, and noise that could disturb or displace birds near the construction areas, mainly during the winter construction season. The boat ramps would result in increased human activity, vehicle traffic, boat traffic, and noise during the summer season in perpetuity. This infrastructure would add 115 acres of disturbance to the Project (based on the U.S. Fish and Wildlife Service [USFWS]-established a 656-foot [200-meter] zone around **nesting** spectacled eiders) (Table 3.11.4), as described in the Draft EIS Section 3.11.2.3.2, *Disturbance or Displacement*.

All three boat ramps could be constructed under Alternative B; only the Ublutuoch (Tiŋmiaqsiuġvik) River boat ramp would be constructed under Alternatives C and D because there would not be gravel road access to the other rivers. Though the number of potential users of each boat ramp is unknown, if only one ramp were constructed, use could be concentrated on that river and thus effects could be slightly higher there.

Increased subsistence access via boat ramps could also displace or disturb birds and change their local distribution or local abundance.

Table 3.11.4. Acres of Bird Disturbance and Displacement by Habitat Type within 656 feet (200 meters) of Gravel Infrastructure and Summer Activity

Habitat	Habitat Use (1 to 44 species)[a]	Boat Ramps[b]	Constructed Freshwater Reservoir	Total
Dune Complex	1	4.3	0.0	**4.3**
River or Stream	4	8.3	0.0	**8.3**
Deep Open Water without Islands	11	0.0	15.9	**15.9**
Shallow Open Water without Islands	11	0.8	0.4	**1.2**
Barren	12	7.9	0.0	**7.9**
Deep Open Water with Islands or Polygonized Margins	14	0.5	0.0	**0.5**
Moist Tussock Tundra	18	4.8	4.6	**9.4**
Tall, Low, or Dwarf Shrub	25	18.4	18.6	**37.0**
Moist Sedge-Shrub Meadow	36	3.0	2.5	**5.5**
Nonpatterned Wet Meadow	39	4.3	12.6	**16.9**
Patterned Wet Meadow	44	4.7	3.4	**8.1**
Total high-use acres (by >20 species)	–	**30.4**	**37.1**	**67.5**
Total acres	–	**57.0**	**58.0**	**115.0**

Note: – (not applicable). Disturbance zone estimated as 656 feet (200 meters) beyond the perimeter of gravel infrastructure and pipelines (summer terrestrial disturbance), where disturbance would alter behavior or displace birds, as indicated by the USFWS disturbance and displacement buffer for spectacled eiders (USFWS 2015).

[a] As described in Draft EIS Section 3.11.1.2, *Bird Habitats*, habitats were ranked by the number of species using them to portray areas with the highest potential for avian occurrence. Actual scores ranged from 1 (one species used the habitat) to 44 (44 species used the habitat). Shading denotes high-use habitats (at least 20 species use the habitat). See Draft EIS, Appendix E.11, *Birds Technical Information*, Table E.11.1 for more details on habitat values.

[b] Values reflect the Alternative B scenario where three boat ramps would be constructed; Alternatives C and D would only construct one boat ramp. Values are for boat ramps only, not entire area where boats could be used.

3.11.2.1.3 Injury and Mortality

Increased subsistence access via boat ramps could result in increased harvest of birds, leading to increases in mortality for waterfowl (primarily goose) in areas accessible by boat (lakes and wetlands along Ublutuoch [Tiŋmiaqsiuġvik] River, Judy [Iqalliqpik] Creek, and Fish [Uvlutuuq] Creek).

3.11.2.1.4 Special Status Species

Table 3.11.5 summarizes habitat loss and alteration, as well as disturbance in spectacled eider preferred habitats from the boat ramps and the CFWR. The boat ramp on Judy (Iqalliqpik) Creek would be within 500 feet of two lakes that are habitat for yellow-billed loon (Figure 3.11.4).

Table 3.11.5. Acres of Spectacled Eider Preferred Habitat Affected by the Boat Ramps and Constructed Freshwater Reservoir

Effect	Boat Ramps[a]	Constructed Freshwater Reservoir	Constructed Freshwater Reservoir Berm	Total
Direct habitat loss[b]	0.0	0.0	0.0	**0.0**
Direct habitat alteration[b]	<0.1	10.2	1.6	**11.8**
Indirect habitat alteration (dust shadow)	0.0	0.0	0.0	**0.0**
Disturbance zone[c]	0.5	0.0	0.0	**0.5**

Note: Preferred habitats are described in Draft EIS Appendix E.11, *Birds Technical Information*, Table E.11.3.
[a] Values reflect the Alternative B scenario where three boat ramps would be constructed; Alternatives C and D would only construct one boat ramp.
[b] Habitat loss from constructed freshwater reservoir would be from perimeter berm, habitat alteration would be from reservoir and channel connection to Lake M0015.
[c] Disturbance zone estimated as 656 feet (200 meters) beyond the perimeter of gravel or summer activities, where disturbance would alter behavior or displace birds, as indicated by the USFWS disturbance and displacement buffer for spectacled eiders (USFWS 2015). Acres of disturbance is presented for bird habitats only; thus, the total disturbance may not be proportional to the total direct habitat loss, as some areas in the behavioral disturbance footprint may not be bird habitat.

3.11.2.2 Module Delivery Option 3: Colville River Crossing

Screeding at Oliktok Dock and the lightering area would temporarily alter habitats by increasing turbidity and temporarily decreasing availability of benthic foods in the area immediately surrounding the screeding footprint (Table 3.11.6), as described in the Draft EIS Section 3.11.2.6.1, *Option 1: Proponent's Module Transfer Island*. In addition, birds along the nearshore barge route (foraging long-tailed duck, scoter, eider, loon, and goose) could be temporarily disturbed or displaced due to slow-moving vessels. Barge disturbance or displacements is also described in the Draft EIS Section 3.11.2.6.1.

Some improvements would need to be made to Oliktok Dock to facilitate module transfer. This work would occur in summer and be within the existing footprint of the dock; all work would be on shore, no in-water work and no pile driving are proposed.

Screeding, barging, and Oliktok Dock improvements for Option 3 could disturb or displace more waterbirds and seabirds of some species and fewer of others when compared with the area west of Oliktok Point (Options 1 and 2). Oliktok Point is heavily used by long-tailed duck, other sea ducks, goose, loon, and marine birds, particularly during post-breeding. Common eiders also use the area during nesting. Though more birds of some species could be affected, the types and magnitude of effects would be less than from Options 1 and 2 because no pile driving or in-water work is required at Oliktok Dock and the screeding area is 2.4 acres smaller. Differences in species-specific effects are due to different species densities at Oliktok Point versus Atigaru Point or Point Lonely.

Flint et al. (2003) and Fischer et al (2002) found no changes in distribution and foraging of long-tailed ducks between industrial and non-industrial shorelines in the Beaufort Sea. Thus, though there could be short-term reactions by birds to disturbance from screeding, barging, and boat traffic, those activities would likely not result in avoidance, or changes in distribution or activity of birds.

Additional construction that would occur in summer from Oliktok Dock to DSP2 would be road upgrades (2 miles from Oliktok Point to an existing staging pad), expanding the existing module staging pad, and moving sealift modules to the existing staging pad. Construction for the onshore components of Option 3 would result in human activity, machinery, traffic, and noise that could disturb or displace birds near the construction areas, as described in the Draft EIS Section 3.11.2.3.2, *Disturbance or Displacement*. Because this work would occur in summer, more birds would be present and effects would be greater than for winter construction. Brant use Oliktok Point during nesting and post-breeding (Stickney and Ritchie 1996) and are susceptible to disturbance during **brood-rearing** and **fall-staging** (Murphy and Anderson 1993; Ward and Stehn 1989). They rely on salt-affected coastal marshes and meadows on the ACP (which are not abundant) for feeding during post-breeding (Stickney and Ritchie 1996). Brant are easily disturbed by low-flying aircraft, boats, and people on foot (Murphy and Anderson 1993; Ward and Stehn 1989). During the years in which these activities occur in the summer, they would disturb brant when they are growing and putting on weight for migration. Because most of the summer activities would occur on or near existing roads and pads in an area that is already industrial, disturbance of birds would not differ substantially from existing levels of disturbance.

Option 3 would have less habitat loss from gravel fill: approximately 5.0 acres of fill would be required to widen some curves along existing Kuparuk gravel roads. Habitat loss would be less for Option 3 than the other module delivery options, and the loss that would occur would be in areas that have already been impacted by the dust shadow from the existing road.

No new communications towers would be needed for Option 3, so there would be less risk for collision than other module delivery options.

Ice roads can alter bird habitats by compressing vegetation, withdrawing water from lakes, delaying snowmelt, and causing impoundments, as described in the Draft EIS Section 3.11.2.3.1, *Habitat Loss or Alteration*. Table 3.11.6 summarizes ice infrastructure needed for Option 3. Ice road construction for Option 3 would also result in human activity, machinery, traffic, and noise that could disturb or displace birds near the construction areas, as described in the Draft EIS Section 3.11.2.3.2, *Disturbance or Displacement*. The Option 3 ice road may encounter more wintering birds at Ocean Point than other locations, but winter birds are mobile and small in numbers when compared with summer populations. Overall, Option 3 winter activities would have minimal impacts on birds because fewer birds are present during winter than in summer.

Option 3 could have up to 30 vehicles per day during summer (2023) and approximately 2,000 vehicles per day (84 vehicles per hour) during winter for 2 years (2025 and 2027) (Table 2.3.2), which could increase the likelihood of injury or mortality due to a vehicle strike. There would be minimal air traffic at Alpine and Kuparuk associated with Option 3 (Table 2.3.1).

Table 3.11.6. Effects to Birds from Module Delivery Option 3 (Colville River Crossing)

Project Component	Effect to Birds	Option 3: Colville River Crossing
Gravel fill in marine area	Open nearshore water and benthic habitat loss Temporary habitat alteration from sedimentation or turbidity Disturbance or displacement from noise	None
Gravel fill onshore	Habitat loss Habitat alteration from dust shadow Disturbance or displacement during construction	5.0 acres filled along existing Kuparuk roads 5.8 acres of dust shadow beyond existing dust shadow 5.6 acres of disturbance[a]
Pile and sheet pile removal	Disturbance or displacement from noise	None
Screeding	Temporary habitat alteration (increased turbidity, and decreased benthic forage) Disturbance or displacement from noise or human activity	12.1 acres, 2 occurrences 164 to 179 dB rms at 3.28 feet
Freshwater ice roads	Habitat alteration from water withdrawal (water quality or quantity changes) Habitat alteration from vegetation compaction	257.2 million gallons of water 80.2 miles of onshore ice road 666.6 acres of onshore ice roads and ice pads Approximately 2,000-foot-long ice bridge across the Colville River with 700 feet spanning the active winter channel Additional 850 feet (total) of ice ramps
Onshore traffic[b]	Disturbance or displacement Injury or mortality from vehicle strikes	Summer ground traffic (for 3 years): <1 vehicle/hour Winter ground traffic (2025 and 2027): up to 84 vehicles/hour Air traffic (2025 and 2027, from Alpine and Kuparuk): 28 fixed-wing aircraft trips each year and 8 helicopter trips
Barge and support vessel traffic[b]	Temporary disturbance or displacement from noise and human activity	Temporary disturbance along nearshore barge route ~600 more miles of barge traffic than Option 1, ~1,200 more miles than Option 2[c] ~350 miles of support vessel traffic (>22,400 fewer miles of support vessel traffic than Option 1, ~44,800 fewer miles than Option 2)[c] 145 to 175 dB rms at 3.28 feet from the source
120-foot-tall communication tower	Injury or mortality from collision with tower or guywires	None

Note: ~ (approximately); (>) greater than; dB (decibels); rms (root-mean-square). All sound levels are detailed in Draft EIS Appendix E.13, *Marine Mammals Technical Appendix*.
[a] Disturbance is calculated using the USFWS 656-foot (200-meter) zone around nesting spectacled eiders (during June 1 to 31 July), as described in the Draft EIS Section 3.11.2.3.2, *Disturbance or Displacement*. This zone encompasses all effective disturbance distances summarized for related species and families of birds nesting in the analysis area (Livezey, Fernandez et al. 2016) and is used here to estimate the area affected by human activity, noise, traffic, and machinery in summer.
[b] Traffic is detailed in Tables 2.3.1 and 2.3.2.
[c] All module delivery options would have the same number of barge trips, but distance traveled would vary by option. Atigaru Point is approximately 50 miles from Point Lonely and Oliktok Point is approximately 50 miles from Atigaru Point. Six round-trip barge trips over 50 miles is 600 miles. Barges would travel from southern Alaska. Support vessels would originate at Oliktok Point; for Option 3 support vessels would travel 2.3 miles one way to the lightering area and 76 total trips would be needed. For Options 1 and 2: 224 round-trip support vessel trips over 50 miles is 22,400 miles.

3.11.2.2.1 Special Status Species

Effects described above for habitat loss and alteration, as well as disturbance and displacement from summer activities, would affect spectacled eiders and other special status species.

3.11.3 Additional Suggested Best Management Practices or Mitigation

Construct upgrades to Kuparuk roads before or after the nesting season (June 1 through July 31) if possible, to avoid impacts to tundra-nesting birds, and loss of eggs, nestlings, or both.

3.12 Terrestrial Mammals

3.12.1 Affected Environment

The analysis area for caribou was expanded to include the area within 3.7 miles (6 km) of construction or operation of the boat ramps, CFWR, and Option 3 access roads (gravel road upgrades and ice roads) (Figure 3.12.1). The expanded analysis area now includes the area east of the Colville River to Oliktok Point and Kuparuk, which is within the range of the Central Arctic Herd (CAH; Figure 3.12.2) (Arthur and Del Vecchio 2009; Murphy and Lawhead 2000; Nicholson, Arthur et al. 2016).

The area east of the Colville River to Oliktok Point contains the Kuparuk oil field as well as the Mustang, Nuna, and Oooguruk developments. Kuparuk has extensive existing infrastructure, including gravel roads, pipelines, processing facilities, mine sites, airstrips, reservoirs, a dock (Oliktok Dock), and seawater treatment facility. The Kuparuk oil field experiences more ground and air traffic than the existing developments west of the Colville River; ground traffic also travels at higher speeds.

The CAH herd size was estimated at approximately 5,000 animals when it was first described as a separate herd in the mid-1970s. The herd grew dramatically until the early 1990s, when it experienced a dip in numbers before increasing again to peak at an estimated 68,442 animals in July 2010. The herd then declined to an estimated 22,630 in July 2016, but has recovered modestly to 30,069 as of the July 2019 census (ADF&G 2017; Lenart 2015, 2017, 2019). The decline after 2010 was thought to be due to high adult mortality as well as emigration of some CAH caribou to the Porcupine Herd or Teshekpuk Caribou Herd (TCH), which the CAH often intermixes with in their winter range (ADF&G 2017).

Most CAH caribou migrate onto the ACP during May, shortly before the calving season (Nicholson, Arthur et al. 2016). The CAH calves from late May to mid-June in two general areas of the ACP: approximately half the herd calves between the Colville and Kuparuk rivers, with highest densities occurring south and southwest of the Kuparuk oil field; the other half of the herd calves east of the Prudhoe Bay oil field, between the Sagavanirktok and Canning rivers in areas with limited development (Figure 3.12.3) (Arthur and Del Vecchio 2009; Cameron, Smith et al. 2005; Lenart 2015). Calving on the CRD is rare (Lenart 2015; Murphy and Lawhead 2000; Prichard, Macander et al. 2017) and few CAH females calve west of the Colville River (Lenart 2015).

After calving, CAH caribou remain on the ACP during summer, repeatedly moving between inland foraging areas and coastal mosquito-relief habitat in response to weather-mediated fluctuations in insect activity levels (Figure 3.12.3) (Lawhead 1988; Murphy and Lawhead 2000; White, Thomson et al. 1975). Over the last decade, portions of the herd have occasionally moved east nearly to the Canada border during July and then spread out across the eastern coastal plain in late summer, while others remained in the vicinity of the oil fields west of the Sagavanirktok River (Arthur and Del Vecchio 2009; Lenart 2015; Prichard, Macander et al. 2017). Most CAH caribou remain east of the CRD during the summer insect season, although movements onto and west of the CRD by large numbers of CAH caribou occur periodically (likely following periods of west winds), judging from telemetry data and aerial survey observations. One notable such movement occurred in July 2001, when approximately 6,000 CAH caribou moved west across the CRD into the NPR-A (Lawhead and Prichard 2002). The CAH typically winters in or near the central Brooks Range, often mixing with Porcupine Herd animals on the winter range (Arthur and Del Vecchio 2009; Lenart 2015; Nicholson, Arthur et al. 2016).

3.12.1.1 Terrestrial Mammal Habitat

In addition to the habitat types described in Table E.12.2 of the Draft EIS Appendix E.12, *Terrestrial Mammals Technical Appendix*, three other habitats occur in the expanded analysis area; these are summarized in Table 3.12.1. Use of these habitats by terrestrial mammals is described in Table 3.12.2.

The distribution of these habitats in the analysis area is shown in Figure 3.12.1, and described more in Section 3.12.2.1.1, Habitat Loss and Alteration, below.

Table 3.12.1. Terrestrial Mammal Habitat Types

Habitat[a]	Description	Species Use[a]
Tidal Flat Barrens	Nearly flat, barren mud or sand periodically inundated by tidal waters; may include small areas of partially vegetated mud or sand	1
Sedge Marsh	Permanently flooded waterbodies dominated by the emergent sedge *Carex aquatilis*. Typically, emergent sedges occur in water <1.6 feet (≤0.5 meter) deep.	6
Salt Marsh	Complex assemblage of small brackish ponds, halophytic sedges and willows, and barren patches on stable mudflats usually associated with river deltas	10

Note: Habitat use is depicted in Figure 3.12.1. Shading depicts high habitat use (by nine or more species). Habitats described in other sections of the Draft EIS and the SDEIS are not used by terrestrial mammals and thus not included in the table.
[a] Indicates the number of species that typically use the habitat.

Table 3.12.2. Habitat Use by Terrestrial Mammals

Habitat Type	Caribou	Muskox	Moose	Grizzly (brown) Bear	Foxes (2 species)	Arctic Ground Squirrel	Collared Lemming	Brown Lemming	Singing Vole	Snowshoe Hare	Root Vole	Weasels (2 species)	Shrews (2 species)	No. Species Using Habitat
Tidal Flat Barrens	IR	–	–	–	–	–	–	–	–	–	–	–	–	1
Sedge Marsh	–	–	–	–	–	–	–	U	–	–	U	U	U	6
Salt Marsh	IR	–	–	F	F	–	–	U	–	–	U	U	U	9

Note: – (not used); F (foraging); IR (insect relief); No. (number); U (general use). Shading indicates high habitat use (nine or more species use the habitat).

3.12.2 Environmental Consequences

3.12.2.1 Alternatives B, C, and D

3.12.2.1.1 Habitat Loss and Alteration

The CFWR (reservoir, perimeter berm, and channel connection to Lake M0015) would cause 18.8 acres of habitat loss and the boat ramps (and their access roads) would cause approximately 5.8 acres of habitat loss (Table 3.12.3).

The CFWR perimeter berm and boat ramps (including their access roads) would create dust and gravel spray that could alter adjacent habitats (Table 3.12.4), as described in the Draft EIS Section 3.12.2.3.1, *Habitat Loss or Alteration*. Approximately 84.7 acres of dust shadow would be added from the CFWR and 29.3 acres from the three boat ramps under Alternative B (Alternatives C and D would only construct one boat ramp at the Ublutuoch [Tiŋmiaqsiuġvik] River and effects would be less).

Table 3.12.3. Acres of Terrestrial Mammal Habitats Directly Lost or Altered by the Boat Ramps and Constructed Freshwater Reservoir

Habitat	Habitat Usee (1 to 13)[a]	Acres in the Analysis Area	Boat Ramps[b]	Constructed Freshwater Reservoir	Total
Unmapped[c]	Unknown	780,524.1	0.0	0.0	**0.0**
Barren	1	9,300.5	0.2	0.0	**0.2**
Salt-killed Tundra	1	110.0	0.0	0.0	**0.0**
Tidal Flat Barrens	1	32.1	0.0	0.0	**0.0**
Human Modified	3[d]	444.5	0.0	0.0	**0.0**
Nonpatterned Wet Meadow	6	16,783.0	0.0	8.3	**8.3**
Sedge Marsh	6	7,043.1	0.0	0.0	**0.0**
Dune Complex	7	1,771.7	0.3	0.0	**0.3**
Riverine Complex	8	983.4	0.0	0.0	**0.0**
Salt Marsh	9	960.7	0.0	0.0	**0.0**
Young Basin Wetland Complex	9	722.4	0.0	0.0	**0.0**
Moist Tussock Tundra	10	81,415.6	1.1	0.0	**1.1**
Old Basin Wetland Complex	10	19,010.8	0.0	0.0	**0.0**
Patterned Wet Meadow	10	53,760.9	<0.1	2.0	**2.0**
Tall, Low, or Dwarf Shrub	11	22,232.7	3.5	2.8	**6.3**
Moist Sedge-Shrub Meadow	13	50,721.0	0.7	5.7	**6.4**
Total high-use habitat acres	–	**228,824.1**	**5.3**	**10.5**	**15.8**
Total acres	–	**1,045,816.5**	**5.8**	**18.8**	**24.6**

Note: – (not applicable). Shading denotes high-use habitats (use by nine or more species).
[a] As described in Draft EIS Appendix E.12, *Terrestrial Mammals Technical Appendix*, Section 1.2, *Habitats*, habitats were ranked by the number of species using them to portray areas with the highest potential for species occurrence. See Draft EIS Appendix E.12, Tables E.12.2 and E.12.3 for more details on habitat use.
[b] Values reflect the Alternative B scenario where three boat ramps would be constructed; Alternatives C and D would only construct one boat ramp.
[c] Some unmapped areas may not be used by terrestrial mammals, for example waterbodies.
[d] Seasonal use of areas with fewer insects (possible positive effect). Attraction to roads may also increase risk of collisions with vehicles (possible negative effect).

Table 3.12.4. Acres of Terrestrial Mammal Habitats Altered by Dust, Gravel Spray, Thermokarsting, or Impoundments by the Boat Ramps and Constructed Freshwater Reservoir

Habitat	Habitat Use (1 to 13)[a]	Boat Ramps[b]	Constructed Freshwater Reservoir	Total
Barren	1	0.0	4.1	**4.1**
Nonpatterned Wet Meadow	6	9.3	14.6	**23.9**
Dune Complex	7	0.0	3.2	**3.2**
Moist Tussock Tundra	10	0.3	1.8	**2.1**
Patterned Wet Meadow	10	4.3	5.6	**9.9**
Tall, Low, or Dwarf Shrub	11	14.2	37.6	**51.8**
Moist Sedge-Shrub Meadow	13	1.2	17.8	**19.0**
Total high-use habitat acres	–	**20.0**	**62.8**	**82.8**
Total acres	–	**29.3**	**84.7**	**114.0**

Note: – (not applicable). Table depicts area potentially altered by dust generated from vehicles or wind on gravel fill (328-foot [100-meter] radius from gravel infrastructure). Shading denotes high-use habitats (use by nine or more species).
[a] As described in Draft EIS Appendix E.12, *Terrestrial Mammals Technical* Appendix, Section E.1.2, *Habitats*, habitats were ranked by the number of species using them to portray areas with the highest potential for species occurrence. See Draft EIS Tables E.12.2 and E.12.3 for more details on habitat use.
[b] Values reflect the Alternative B scenario where three boat ramps would be constructed; Alternatives C and D would only construct one boat ramp.

3.12.2.1.2 Disturbance and Displacement

Construction of the CFWR and the boat ramps would result in human activity, machinery, and noise that could disturb or displace caribou near the construction areas, mainly during the winter construction season. The boat ramps would result in increased human activity, vehicle traffic, boat traffic, and noise during the summer season in perpetuity. This infrastructure would disturb or displace caribou over an additional 10,052.6 acres under Alternative B, based on a disturbance area of 2.5 miles (4 km) from new gravel infrastructure as described in the Draft EIS Section 3.12.2.3.2, *Disturbance or Displacement*. (There would be approximately 9,872.5 acres of disturbance for all three boat ramps and 180.1 for the CFWR.) Because Alternatives C and D would only construct one boat ramp (on the Ublutuoch [Tiŋmiaqsiuġvik] River), disturbance would be less. The disturbance zone for the boat ramps and CFWR would be located in areas where the average caribou density during the calving season is at the low end of the range (less than 0.19 to 0.34 total caribou per square km respectively) from 2002 through 2019 based on aerial surveys (Figures 3.12.4 through 3.12.7). Table 3.12.5 summarizes the percent of the TCH seasonal range within the disturbance zone.

Table 3.12.5. Percent of the Teshekpuk Caribou Herd Seasonal Range within 2.5 Miles of New Gravel Infrastructure for the Boat Ramps and Constructed Freshwater Reservoir

Percentage of Seasonal Range	Boat Ramps[a]	Constructed Freshwater Reservoir
Spring migration	0.01	<0.01
Calving	0.01	<0.01
Calving (maternal females only)	<0.01	<0.01
Post-calving	<0.01	<0.01
Mosquito season	<0.01	<0.01
Oestrid fly season	0.01	<0.01
Late summer	0.01	<0.01
Fall migration	0.02	<0.01
Winter	0.01	<0.01

Source: ABR Inc. 2020
Note: Percentages based on the proportion of use distribution calculated using kernel density estimation for each season.
[a] Values reflect the Alternative B scenario where three boat ramps would be constructed; Alternatives C and D would only construct one boat ramp.

All three boat ramps could be constructed under Alternative B; only the Ublutuoch (Tiŋmiaqsiuġvik) River boat ramp would be constructed under Alternatives C and D because there would not be gravel road access to the other rivers. Though the number of potential users of each boat ramp is unknown, if only one ramp were constructed, use could be concentrated on that river and thus effects could be slightly higher there.

Increased subsistence access via boat ramps would likely result in changes in distribution of subsistence activities, including skiff traffic and caribou hunting, which could displace or disturb caribou near these rivers in the summer and fall in perpetuity and may alter caribou distribution and movements. Caribou density in the boat ramp areas in the summer is low (caribou are closer to Teshekpuk Lake or coastal insect relief areas). Caribou use of the boat ramp areas increases during late summer and fall migration.

3.12.2.1.3 Injury and Mortality

Increased subsistence access via boat ramps could result in increased harvest of caribou, or changes in the location of harvest, leading to increases in mortality in areas accessible by boat along the Ublutuoch (Tiŋmiaqsiuġvik) River, Judy (Iqalliqpik) Creek, and Fish (Uvlutuuq) Creek.

3.12.2.1.4 Attraction to Human Facilities

During oestrid fly harassment, caribou may be attracted to gravel infrastructure (where vegetation and thus insects are fewer) as fly-relief habitat (Curatolo and Murphy 1986; Johnson and Lawhead 1989; Lawhead, Byrne et al. 1993; Noel, Pollard et al. 1998). As described in the Draft EIS Section 3.12.2.3.4, *Attraction to Human Activities and Facilities*, at such times, groups of caribou would likely seek relief (and/or travel) on the elevated Project gravel roads and pads. The CFWR and the boat ramps would add 9.9 acres of gravel infrastructure to the Project.

3.12.2.2 Module Delivery Option 3: Colville River Crossing

Option 3 would place 5.0 acres of gravel fill along existing Kuparuk roads (Figure 2.3.2). Though this would fill some habitats used by caribou, caribou also use gravel infrastructure as described in the Draft EIS Section 3.12.2.3.4, *Attraction to Human Activities and Facilities*. The fill would be along existing gravel roads with existing dust shadows; the fill would extend the dust shadow incrementally in several locations for a total 5.7 acres of additional dust shadow. Effects of habitat alteration from dust and gravel spray are described in the Draft EIS Section 3.12.2.3.1, *Habitat Loss or Alteration*.

Habitat alteration could also occur from the 666.6 acres of ice infrastructure that would compress vegetation (Table 3.12.6). Effects of ice infrastructure habitat alteration on caribou is described in the Draft EIS Section 3.12.2.3.1, *Habitat Loss or Alteration*.

Ice roads and associated traffic can disturb or displace caribou, as described in the Draft EIS Section 3.12.2.3.2, *Disturbance or Displacement*. Option 3 would have 80.2 miles of ice road (Table 3.12.6). Option 3 would produce ground traffic throughout the year over 5 years of construction. Summer traffic would occur for 3 years and produce less than 1 vehicle per hour (Table 2.3.2). Winter traffic would occur for 2 years (2025 and 2027) and produce up to 84 vehicles per hour (Table 2.3.2). Air traffic would also occur in 2025 and 2027 to or from Alpine and Kuparuk, there would be 28 fixed-wing aircraft trips each year and 8 helicopter trips (Table 2.3.1). Additional traffic on existing roads in summer could potentially result in additional delays or deflections of CAH caribou movements, primarily during mid-summer. Roads with traffic levels above 15 vehicles per hour have been reported to have lower caribou crossing success (Murphy and Curatolo 1987). Additional traffic could also result in additional vehicle-wildlife collisions, although this is expected to be rare. CAH caribou have been reported to use the area within 1 km of roads at a lower density during the mosquito seasons (Johnson, Golden et al. 2019), but they also cross roads frequently during that season (Prichard, Lawhead et al. 2019).

Construction for the onshore components of Option 3 would result in human activity, machinery, traffic, and noise in both summer and winter that could disturb or displace caribou near the construction areas, as described in the Draft EIS Section 3.12.2.3.2, *Disturbance or Displacement*. Because few CAH caribou are present during winter, ice road construction and the associated personnel camp would have minimal impacts on that herd, but could affect TCH caribou. Summer activities onshore for Option 3 would include Oliktok Dock upgrades, curve widening activity along the existing Kuparuk road network (Figure 2.3.2), modifying an existing pad where the sealift modules would be staged, and moving sealift modules to the existing staging pad. Because these activities would occur on or near existing roads and pads in an area that is already industrial, there would be minimal disturbance to CAH caribou. Summer construction would not affect TCH caribou because they are further west near Teshekpuk Lake in summer (i.e., not present in the Oliktok Point or Kuparuk area).

Table 3.12.6. Summary of Module Delivery Option 3 (Colville River Crossing) Components that Contribute to Effects to Caribou

Component	Option 3: Colville River Crossing
Habitat loss (Gravel fill) (acres)	5.0
Habitat alteration (dust shadow) (acres)	5.7
Habitat alteration (vegetation compaction from ice infrastructure) (acres)	666.6
Disturbance (within 2.5 miles of new gravel infrastructure) (acres)	35.8
Miles of onshore ice road	80.2 miles (total) 40.1 miles constructed twice (2025 and 2027)
Ground traffic[a] (number of trips)	535,160
Fixed-Wing air traffic[b] (number of trips)	Alpine: 28 Kuparuk: 42 Total: 70
Helicopters traffic (number of trips)	Alpine: 16

Note: Ground trips are defined as one way; a single fixed-wing or helicopter flight is defined as a landing and subsequent takeoff; and a single vessel trip is defined as a docking and subsequent departure. Anticipated traffic volumes are based on the Alternative B schedule.
[a] Includes buses, short-haul trucks, passenger trucks, and other miscellaneous vehicles. Ground transportation also includes gravel hauling operations (i.e., B70/maxi dump trucks).
[b] Fixed-wing aircraft include C-130, DC-6, Twin Otter/CASA, Cessna, Q400, or similar.

3.12.3 Additional Suggested Best Management Practices or Mitigation

The suggested BMPs or mitigation have no changes from the Draft EIS for the three Project components described in the SDEIS.

3.13 Marine Mammals

3.13.1 Affected Environment

The analysis area for marine mammals is described in the Draft EIS Section 3.13, *Marine Mammals*. The analysis area was expanded to include the onshore activities for Option 3 (Figure 3.13.1). This includes existing gravel roads from Oliktok Dock to DS2P and areas east of the Project area and east of the Colville River to Oliktok Point. The area east of the Colville River to Kuparuk contains the Kuparuk oil field as well as the Nuna and Oooguruk developments. Kuparuk has extensive existing infrastructure (e.g., gravel and ice roads, pipelines, processing facilities). The area has existing mine sites, airstrips, reservoirs, a dock (Oliktok Dock), and seawater treatment facility. The Kuparuk oil field experiences more ground and air traffic than the developments west of the Colville River; ground traffic also travels at higher speeds.

Existing marine infrastructure in the analysis area occurs at Oliktok Point, where there is a commercial sheet-pile dock, shoreline armoring, and a saltwater treatment plant. In addition, Oooguruk Island, a 6-acre constructed gravel island with a pipeline to shore, is located near the mouth of the Colville River. Screeding occurs with seasonal regularity at Oliktok Dock prior to barge arrival.

There are approximately 2,807.8 acres of mapped potential terrestrial denning habitat in the entire analysis area for marine mammals.

3.13.2 Environmental Consequences

3.13.2.1 Alternatives B, C, and D

3.13.2.1.1 Habitat Loss and Alteration

Approximately 0.3 acres would be removed from the boat ramps on the Ublutuoch (Tiŋmiaqsiuġvik) River, Judy (Iqalliqpik) Creek, and Fish (Uvlutuuq) Creek (Table 3.13.1). Approximately 26.2 acres of foraging habitat for polar bears would be permanently lost as a result of gravel infrastructure and reservoir.

There would be no construction or operational impacts to other marine mammals from the CFWR or boat ramps, because they are located inland.

Table 3.13.1. Project Components from the Constructed Freshwater Reservoir and Boat Ramps that May Affect Marine Mammals

Impact	Boat Ramps[a]	Constructed Freshwater Reservoir	Total
Acres of gravel fill	5.9	3.9	**9.8**
Acres of excavation	0.0	16.4	**16.4**
Acres of fill in polar bear potential terrestrial denning habitat	0.3	0.0	**0.3**
Acres of fill in polar bear **critical habitat**	1.6	0.0	**1.6**
Acres of disturbance (area within 1-mile of human activity, USFWS buffer)	6,815.2	2,654.6	**9,469.8**

Note: NA (not applicable); USFWS (U.S. Fish and Wildlife Service).
[a] Values reflect the Alternative B scenario where three boat ramps would be constructed; Alternatives C and D would only construct one boat ramp.

3.13.2.1.2 Disturbance and Displacement

Construction and operational activities from the CFWR and boat ramps may result in disturbance or displacement of polar bears from noise or from the physical presence of equipment or personnel. These types of effects are described in the Draft EIS Section 3.13.2.3.2, *Disturbance or Displacement*. Denning females are more sensitive to disturbance; using the disturbance buffer of 1 mile commonly used by USFWS for identified polar bear dens, 9,469.8 acres would potentially be disturbed from the CFWR and the boat ramps. The nearest known polar bear maternal dens are approximately 6.1 miles from the proposed boat ramps (in this case, the boat ramp on the Ublutuoch [Tiŋmiaqsiuġvik] River), although this is not necessarily indicative that polar bears would den in the same area again (Durner, Fischbach et al. 2010; USGS unpublished data) (Table 3.13.1). Because construction of these facilities would have a short duration and occur over a small area of denning habitat relative to the entire North Slope, polar bears are expected to find alternate similar habitat. Implementation of BMPs and pre-construction surveys to identify dens would lessen (not eliminate) impacts from disturbance and displacement. The timing of construction would influence the level of potential disturbance: starting construction in late November or December could result in a polar bear not selecting a site for denning, but disturbance would occur prior to giving birth.

Indirect disturbance of polar bears could occur due to skiff traffic on the navigable reaches of the Ublutuoch (Tiŋmiaqsiuġvik) River, Judy (Iqalliqpik) Creek, and Fish (Uvlutuuq) Creek in summer and fall. All three boat ramps could be constructed under Alternative B; only the Ublutuoch (Tiŋmiaqsiuġvik) River boat ramp would be constructed under Alternatives C and D because there would not be gravel road access to the other rivers. Though the number of potential users of each boat ramp is unknown, if only one ramp were constructed, use could be concentrated on that river and thus effects could be slightly higher there.

There would be no impacts to seals, as all facilities are located inland.

3.13.2.1.3 Injury and Mortality

There are no changes to injury and mortality compared to the Draft EIS for the three Project components described in the SDEIS.

3.13.2.1.4 Special Status Species

All the effects described above for Alternatives B, C, and D would apply to polar bears. There would be no impacts to seals, as all facilities are located inland.

3.13.2.2 Module Delivery Option 3: Colville River Crossing

Because Option 3 would not use an MTI, but would use the existing commercial dock at Oliktok Point, the amount of in-water work and the amount of gravel fill is substantially reduced from Options 1 or 2. The only in-water work would be screeding at Oliktok Dock and the lightering area, which would temporarily alter habitats by increasing turbidity in the area immediately surrounding the screeding footprint (Table 3.13.2), as described in the Draft EIS Section 3.13.2.6.1, *Option 1: Proponent's Module Transfer Island*. Because fewer seals use the area near Oliktok Point than near Atigaru Point (as evidenced by Nuiqsut seal hunters' preferred hunting grounds, which are to the west of the Colville River Delta [SRB&A 2010b]), effects would be lesser than those from Option 1. In addition, marine mammals (primarily seals) in the screeding area and along the nearshore barge route could be temporarily disturbed or displaced due to noise and slow-moving vessels. Barge disturbance or displacement is also described in the Draft EIS Section 3.13.2.6.1. Because there is existing marine infrastructure at Oliktok Point, screeding and barging in this area could result in a less novel response from marine mammals than in areas with no human development or activity.

Some improvements would need to be made to Oliktok Dock to facilitate module delivery. This work would occur in summer and be within the existing footprint of the dock; all work would be onshore, no in-water work and no pile driving are proposed. Airborne sound and the presence of construction machinery could temporarily disturb seals and polar bears during the 4-week construction window.

Onshore, sealift modules would be transported from Oliktok Dock to south to DS2P on existing gravel roads in Kuparuk. Several curves along the road would need to be widened to accommodate module transport. Polar bear potential terrestrial denning habitat is not mapped in the Oliktok or Kuparuk area, thus acres of this type of habitat lost from road improvements for Option 3 cannot be quantified. All 5.0 acres of road improvements would result in a loss of foraging habitat for polar bears. The nearest known polar bear maternal den is approximately 2.8 miles from the proposed gravel fill (near Oliktok Point), although this is not necessarily indicative that polar bears would den in the same area again (Durner et al. 2010; USGS unpublished data) (Table 3.13.3, Figure 3.13.2).

Ice infrastructure would cover 666.6 acres total (333.3 acres each in 2025 and 2027), which could alter polar bear foraging habitat during winter construction. Ice infrastructure would cross mapped potential terrestrial denning habitat for polar bears (Figure 3.13.1). Specifically, the crossing of the Colville River at Ocean Point is located in polar bear potential terrestrial denning habitat. The nearest known polar bear maternal den is approximately 10.3 miles from the Option 3 ice road route (across the Colville River from Nuiqsut), although this is not necessarily indicative that polar bears would den in the same area again (Durner et al. 2010; USGS unpublished data) (Table 3.13.2, Figure 3.13.2). The altered habitat from the construction of single season ice roads and pads would recover almost immediately after the winter season is complete and the ice melts. Multi-season ice pads could take longer to recover depending on the degree of soil saturation as detailed in the Draft EIS Section 3.9, *Wetlands and Vegetation*.

Construction and use of ice roads and pads would result in noise and traffic that could disturb or displace polar bears. In addition to ground traffic, air traffic to or from Alpine and Kuparuk would be needed for Option 3. All traffic associated with Option 3 is detailed in Tables 2.3.1 and 2.3.2. Disturbance and displacement effects from ice infrastructure and from traffic are described in the Draft EIS Section 3.13.2.3.2, *Disturbance or Displacement*. Because all ice roads and pads would be inland, there would be no impacts to seals.

Option 3 would require a 100-person camp located on a 15-acre single-season ice pad near the DS2P access road to support module moves during the winters of 2025 and 2027 (Alternatives B and C; Alternative D would occur during the winters of 2026 and 2028). Polar bears may be attracted to human facilities, as described in the Draft EIS Section 3.13.2.3.3, *Injury or Mortality,* which could increase human-bear interactions and increase the risk of injury or mortality of bears.

Table 3.13.2. Effects to Marine Mammals from Module Delivery Option 3 (Colville River Crossing)

Project Component	Effect to Marine Mammals	Option 3: Colville River Crossing
Gravel fill in marine area	Open nearshore water and benthic habitat loss Temporary habitat alteration from sedimentation or turbidity Disturbance or displacement from noise	None
Gravel fill onshore	Polar bears: Habitat loss Habitat alteration from dust shadow Disturbance or displacement during construction from airborne noise or human activity[a]	5.0 acres filled along existing Kuparuk roads 5.8 acres of dust shadow beyond existing dust shadow 62 dBA at 1,000 feet
Pile and sheet pile installation and removal	Disturbance or displacement from noise	None
Screeding	Polar bears and seals: Temporary habitat alteration (increased turbidity, and decreased benthic forage) Disturbance or displacement from underwater noise or human activity[a]	12.1 acres, 2 occurrences 164 to 179 dB rms at 3.28 feet (distance to 120 dB rms underwater threshold is 131 to 707 feet for seals and polar bears)
Oliktok Dock Improvements	Polar bears and seals: Disturbance or displacement from construction airborne noise or human activity[a]	62 dBA at 1,000 feet
Ice Infrastructure	Polar bears: Habitat alteration from water withdrawal (water quality or quantity changes) Habitat alteration from vegetation compaction Disturbance or displacement from construction airborne noise or human activity[a]	257.2 million gallons of water 80.2 miles of onshore ice road 666.6 acres of onshore ice roads and ice pads Approximately 2,000-foot-long ice bridge across the Colville River with 700 feet spanning the active winter channel Additional 850 feet (total) of ice ramps 62 dBA at 1,000 feet
Onshore traffic[b]	Polar bears: Disturbance or displacement from airborne noise or human activity[a] Injury or mortality from vehicle strikes	Summer ground traffic (for 3 years): <1 vehicle/hour Winter ground traffic (2025 and 2027): up to 84 vehicles/hour Air traffic (2025 and 2027, from Alpine and Kuparuk): 28 fixed-wing aircraft trips each year and 8 helicopter trips
Barge and support vessel traffic[b]	All marine mammals: Temporary disturbance or displacement from underwater noise and human activity[a] Injury or mortality from vessel strikes	Temporary disturbance along nearshore barge route ~600 more miles of barge traffic than Option 1, ~1,200 more miles than Option 2 [c] ~350 miles of support vessel traffic (>22,400 fewer miles of support vessel traffic than Option 1, ~44,800 fewer miles than Option 2) [c] 145 to 175 dB rms at 3.28 feet from the source (distance to 120 dB rms underwater threshold is 7,067 feet for all marine mammals)[d]

Note: ~ (approximately); > (greater than); dB (decibels); rms (root-mean-square). All sound levels are detailed in Draft EIS Appendix E.13, *Marine Mammals Technical Appendix*.

[a] Total acres of disturbance are provided in Table 3.13.3. Offshore polar bear disturbance from screeding is calculated using the NMFS underwater disturbance threshold of 120 dB rms, assuming transmission loss of 15 log(R) for polar bears and seals. Disturbance area is not quantified for barge route since route is estimated.

[b] Traffic is detailed in Tables 2.3.1 and 2.3.2. Onshore disturbance calculations are provided with ice infrastructure calculations.

[c] All module delivery options would have the same number of barge trips, but distance traveled would vary by option. Atigaru Point is approximately 50 miles from Point Lonely and Oliktok Point is approximately 50 miles from Atigaru Point. Six round-trip barge trips over 50 miles is 600 miles. Barges would travel from southern Alaska. Support vessels would originate at Oliktok Point; for Option 3 support vessels would travel 2.3 miles one way to the lightering area and 76 total trips would be needed. For Options 1 and 2: 224 round-trip support vessel trips over 50 miles is 22,400 miles.

[d] Disturbance from vessels is calculated using the NMFS underwater disturbance threshold of 120 dB rms assuming transmission loss of 15 log(R) for all marine mammals.

Table 3.13.3. Project Components from Option 3 (Colville River Crossing) that may Affect Marine Mammals

Impact	Option 3: Colville River Crossing
Acres of ice infrastructure[b]	666.6
Acres of multi-season ice pad	0.0
Acres of gravel fill	5.0
Acres of fill in polar bear potential terrestrial denning habitat	0.0
Acres of fill in polar bear critical habitat	1.3
Acres of ice infrastructure in polar bear critical habitat	0.0
Acres of onshore polar bear disturbance (area within 1 mile of human activity, USFWS buffer)	53,251.2 Ice road 55,613.3 Existing gravel road[d]
Acres of offshore polar bear disturbance (within 0.5 mile of in-water work, USFWS buffer) [c]	1,277.4
Nearest known historical polar bear den to gravel infrastructure (miles) [e]	2.8
Nearest known historical polar bear den to ice infrastructure (miles) [e]	10.3
Barge trips	9
Support vessel trips	76

Note: NA (not applicable); USFWS (U.S. Fish and Wildlife Service)
[a] Acres of ice infrastructure includes ice roads and ice pads.
[b] Potential terrestrial denning habitat not mapped for much of ice road route.
[c] Disturbance area is not quantified for barge route since route is estimated.
[d] The Project would add to existing disturbance on existing gravel road.
[e] Polar bears may den in similar drainages year after year, but a historical den location does not indicate that polar bears would be more likely to den in that same location in the future.

3.13.2.2.1 Special Status Species

All the effects described above for Option 3 would apply to polar bears: foraging habitat loss; habitat alteration from screeding and ice infrastructure; disturbance or displacement from barging, construction, and ground and air traffic; and injury or mortality from attraction to human facilities. Habitat loss would be permanent, all other effects would last several years to several weeks (2 non-consecutive summer seasons of barging and screeding; 4 weeks of dock construction over a single summer; 2 non-consecutive winters with ice road and ice pad construction; and 5 total years of ground and air traffic). Impacts to bearded and ringed seals could occur from barging, screeding, improvements to Oliktok Dock, and air traffic described above for Option 3.

3.13.3 Additional Suggested Best Management Practices or Mitigation

The suggested BMPs or mitigation have no changes from the Draft EIS for the three Project components described in the SDEIS.

3.14 Land Ownership and Use

3.14.1 Affected Environment

The analysis area for Land Ownership (Figure 3.14.1) was expanded to the east to include a portion of the existing Kuparuk gravel road network, as well as Kuparuk Mine Sites C and E. The rest of the analysis area remains the same as described in the Draft EIS.

One additional existing land use occurs in the analysis area that was not described in the Draft EIS: marine shipping at Oliktok Dock.

The land within the analysis area is wildlife habitat and used for subsistence. Within the NPR-A, the BLM has authorized several research permits, **special recreation permits**, the NSB CWAT, and winter cross-country rights-of-way. Areas of industrial use (oil and gas exploration and development) occur in the Alpine, GMT, and Kuparuk oil fields. Nuiqsut is primarily residential, with some institutional and commercial uses.

Table 3.14.1 describes surface land management in the updated analysis area.

Table 3.14.1. Surface Land Management in the Analysis Area for Land Ownership and Use

Land Manager	Acreage	Percent of Total
Bureau of Land Management	1,201,311.0	48.8%
U.S. Department of Defense	591.2	0.0%
Private	157.9	0.0%
Alaska Native allotment	4,233.5	0.2%
Alaska Native lands patented or interim conveyed[a]	145,159.7	5.9%
Alaska Native lands (selected)	31,819.4	1.3%
State of Alaska	636,266.3	25.8%
Local government	1,227.4	0.0%
Undetermined (waterbodies)	443,437.5	18.0%
Total	**2,464,203.9**	**100.0%**

[a] Also referred to as Alaska Native Claims Settlement Act lands.

3.14.2 Environmental Consequences

The three components will increase the overall acres to be developed and may potentially change rezoning requirements.

Land affected by the added components is managed by the BLM, State of Alaska, and Kuukpik. No private lands, NSB lands, or Native allotments would be affected. The closest added Project component near a Native allotment would be the ice road required under Option 3. The road would be located within approximately 0.25 mile of a Native allotment.

The subsistence boat ramps (Figure 2.2.2) would require BLM approval of deviations from specific LSs and BMPs related to setbacks, buffers, and special use areas within NPR-A. The boat ramps would be located near the gravel road crossings of the Ublutuoch (Tiŋmiaqsiuġvik) River (along the existing gravel road between Alpine CD5 and GMT-1), and Judy (Iqalliqpik) Creek and Fish (Uvlutuuq) Creek. All three boat ramps could be constructed under Alternative B; Alternatives C and D would only construct the Ublutuoch (Tiŋmiaqsiuġvik) River boat ramp (due to lack of a gravel road connection to the other streams). Each boat ramp would add a 3.7-acre gravel footprint to the Project.

The boat ramps would require one more deviation from LS E-2 and BMPs E-11, K-1, and K-2, due to gravel infrastructure near fish-bearing waterbodies (including one or more of the waterbodies protected in LS E-2 and BMPs K-1 and K-2). Because the intent of a boat ramp is to access a waterbody, it is not possible to avoid encroachment within 500 feet of the waterbody. The ramps at the Ublutuoch (Tiŋmiaqsiuġvik) River and Judy (Iqalliqpik) Creek would likely also cross the standard disturbance setback of 1 mile around recorded yellow-billed loon nest sites and 500 meters (1,625 feet) around the shoreline of nest lakes (Figure 3.11.4).

The boat ramp on Fish (Uvlutuuq) Creek (Alternative B only) would be within the Teshekpuk Lake Special Area (Figure 3.14.1). The boat ramp on the Ublutuoch (Tiŋmiaqsiuġvik) River would be on Native land.

3.14.2.1 Module Delivery Option 3: Colville River Crossing

Option 3 would deliver sealift modules to the existing Oliktok Dock and transport the modules over the existing gravel road network from the dock to DS2P, followed by transport via ice road to the Project area. The existing industrial use of the dock and gravel road would not change. The ice road route to the Project area would cross State of Alaska lands east of the Colville River and enter NPR-A near Ocean Point (Figure 3.14.1). The ice road would cross the Colville River Special Area for two winter seasons. The route has existing snow road use by NSB for their CWAT and by five other permitted commercial operators for transporting people and cargo. The Project would add additional commercial use to a portion of the route for two seasons.

Option 3 would add approximately 5.0 total acres of new gravel footprint along the existing Kuparuk gravel road network, on lands that are owned or managed by the State of Alaska. The gravel for these road improvements would be acquired from existing operational Kuparuk mines (e.g., Mine Site C, Mine Site E).

3.14.3 Additional Suggested Best Management Practices or Mitigation

Additional suggested mitigation measures to reduce impacts created by Option 3 could include the following:

- Develop a coordination plan with other stakeholders who are permitted to use the snow road (i.e., CWAT) by BLM to prevent access conflicts during sealift module movement across the Colville River.

3.15 Economics

3.15.1 Affected Environment

There is no change to the analysis area or affected environment from the Draft EIS due to the inclusion of the three new Project components in the SDEIS.

3.15.2 Environmental Consequences

Construction of the CFWR, boat ramp(s), and features associated with Option 3 would change the overall number and timing of construction employment by a small (likely insubstantial) amount. The exact amount is difficult to break out from the entire Project construction. All Project activities will be addressed in the Final EIS.

Monitoring and maintenance activities related to the CFWR and boat ramp(s) may result in a slight increase in operations activity, including employment. The exact amount is difficult to break out from the entire Project construction. All Project activities will be addressed in the Final EIS.

3.15.3 Additional Suggested Best Management Practices or Mitigation

The suggested BMPs or mitigation have no changes from the Draft EIS for the three Project components described in the SDEIS.

3.16 Subsistence and Sociocultural Systems

3.16.1 Affected Environment

The **direct effects analysis area** was expanded to include overland areas to the south and southeast of Nuiqsut; coastal boating areas to the east of the CRD near Oliktok Point; and riverine boating areas along the Colville River near Ocean Point and the lower Itkillik River (Figure 3.16.1). For the SDEIS, the direct effects and alternatives analysis areas includes all updates to Project footprints (i.e., more than just Option 3, boat ramps, and CFWR). While some minor changes resulted from changes to the existing alternative (B, C, and D) and module delivery option (Options 1 and 2) footprints, a majority of changes to the direct effects analysis area are a result of the addition of Option 3 (use of Oliktok Dock and the Colville River crossing near Ocean Point).

3.16.1.1 Overview of Subsistence Uses

3.16.1.1.1 Nuiqsut

An overview of Nuiqsut subsistence use is detailed in the Draft EIS Section 3.16.1.3.1, *Nuiqsut*. Changes to that overview due to changes in the direct effects analysis area are described below.

Approximately 40% of Nuiqsut **subsistence use areas** occur within the updated direct effects analysis area (Table 3.16.1; Figure B.1 in Appendix B, *Subsistence Technical Appendix*). The primary resources harvested by residents within these areas include caribou, wolf, wolverine, moose, goose, and seal (Table 3.16.2). A small number of respondents have reported use areas for eiders, broad whitefish, and burbot within the direct effects area. Caribou, wolf, wolverine, and goose are the primary resources harvested by Nuiqsut throughout the direct effects analysis area, particularly around the Project area and module delivery option ice roads. In addition, seal and eider hunting occur offshore near the module delivery options. Residents of Nuiqsut commonly harvest fish (particularly broad whitefish) downstream from the

Project in Fish (Uvlutuuq) Creek; in addition, residents conduct much of their fishing for broad whitefish, Arctic cisco, Arctic grayling, and burbot downstream from the direct effects area where it crosses the Colville River. Residents commonly hunt for moose along the Colville River, including at Ocean Point. Other activities such as vegetation harvesting also occur on the Colville River. Across 9 years of the Nuiqsut Caribou Subsistence Monitoring Project, the direct effects analysis area held between 13% and 26% of reported caribou harvests (Table 3.16.3). Use of the direct effects analysis area occurs year-round, peaking in winter for resources such as wolf and wolverine; spring for goose and eider; summer for caribou, seal, and fish; and fall for moose (Figure B.1 in Appendix B). Snow machines and all-terrain vehicles are the primary methods of travel to the direct effects area, although residents also access areas associated with the module delivery options (marine and coastal areas, in addition to the Colville River), by boat (Figure B.8 in Appendix B). Of the resources harvested within the direct effects area, caribou, white-fronted goose, and bearded seal are considered resources of major importance in Nuiqsut based on an analysis of selected variables (Table B.9 in Appendix B of the Draft EIS).

Table 3.16.1. Nuiqsut Use Areas within the Direct Effects Analysis Area Subsistence and Sociocultural Systems

Source	Resource Type	Time Period	Total Number of Use Areas	Number (%) of Use Areas in Direct Effects Area
SRB&A 2010b	All Resources	1995–2006	758	304 (40%)
SRB&A 2010a, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018	Caribou	2008–2016	1,692	884 (52%)

Table 3.16.2. Percent of Nuiqsut Harvesters Using the Direct Effects Analysis Area for Different Resources, by Resource, 1995 through 2006

Resource	Total Number of Respondents	Number of Respondents in Direct Effects Area	Percent of Nuiqsut Respondents
Caribou	32	30	94%
Wolverine	24	24	100%
Wolf	23	23	100%
Goose	33	23	70%
Bearded seal	27	15	56%
Ringed seal	23	10	43%
Eiders	28	14	50%
Broad whitefish	26	5	19%
Arctic char	26	4	15%
Moose	31	29	94%
Burbot	30	1	3%
All resources	**33**	**32**	**97%**

Source: SRB&A 2010b

Table 3.16.3. Nuiqsut Caribou Harvests Within the Direct Effects Analysis Area, 2008 through 2016

Study Year	Percent of Caribou Harvests Within Direct Effects Analysis Area
Year 1	20%
Year 2	17%
Year 3	16%
Year 4	26%
Year 5	22%
Year 6	13%
Year 7	21%
Year 8	14%
Year 9	18%

Source: SRB&A 2018

3.16.1.1.2 Utqiaġvik

An overview of Utqiaġvik subsistence use is detailed in the Draft EIS Section 3.16.1.3.2, *Utqiaġvik*. Changes to that overview due to changes in the direct effects analysis area are described below.

A relatively small percentage of Utqiaġvik use areas (3%) occur within the 2.5-mile direct effects area (Table 3.16.4). The primary resources harvested by residents within these areas are moose, wolf, wolverine, and caribou (44%, 29%, 29%, and 26% of harvesters, respectively), with a small number of harvesters also reporting use areas for seal and goose (Table 3.16.5). Caribou, wolf, and wolverine are harvested throughout the Project area, whereas seal is harvested near the module delivery options. Moose are hunted by some Utqiaġvik residents where the direct effects area crosses the Colville River near Ocean Point. Use of the direct effects area by Utqiaġvik harvesters peaks during the winter months of March through April, with a smaller peak in July and August (Figure B.21 in Appendix B). Travel is primarily by snow machine, with some coastal boat hunting and riverine boat hunting along the Colville River (Figure B.22 in Appendix B). Of the resources harvested within the direct effects area, caribou and bearded seal are resources of major importance to Utqiaġvik, goose and moose are of moderate importance, and wolf and wolverine are of minor importance (Table B.17 in Appendix B of the Draft EIS).

Table 3.16.4. Utqiaġvik Use Areas within the Direct Effects Analysis Area

Resource Category	Time Period	Total Number of Use Areas	Number (%) of Use Areas in Direct Effects Area
All resources	1995–2006	2,029	50 (3%)

Source: SRB&A 2010b

Table 3.16.5. Percent of Utqiaġvik Harvesters Using the Direct Effects Analysis Area for Different Resources, 1995 through 2006

Resource	Total Number of Respondents for Resource	Number of Respondents in Direct Effects Area	Percent of Utqiaġvik Resource Respondents
Wolverine	31	9	29%
Wolf	31	9	29%
Caribou	73	19	26%
Moose	9	4	44%
Bearded seal	63	1	2%
Ringed seal	48	1	2%
Goose	71	1	1%
All resources	**75**	**23**	**31%**

Source: SRB&A 2010b

3.16.2 Environmental Consequences

3.16.2.1 Alternatives B, C, and D

Figures 3.16.6 through 3.16.13 in the Draft EIS show Nuiqsut and Utqiaġvik subsistence use areas by resource and the alternatives analysis area, which is defined as the area surrounding the action alternatives and mine site. Minor changes to the alternative footprints resulted in changes to the alternatives-specific analyses. Tables 3.16.6 and 3.16.7 show resource harvests and use within the alternatives analysis area. Because the data are identical across the action alternatives, they are shown in a single column. These data are based on an analysis of available information from subsistence mapping studies in Nuiqsut and Utqiaġvik and are useful for understanding the likelihood and magnitude of direct impacts on subsistence uses. In these mapping studies, a sample of active harvesters in each community identified harvest areas and/or harvesting locations by resource on a map.

Table 3.16.6. Number and Percent of Nuiqsut and Utqiaġvik Harvesters Using the Alternatives Analysis Area by Resource Category

Resource Category	Number (Percent) of Nuiqsut Harvester Respondents Reporting Use Areas in Alternatives Analysis Area	Number (Percent) of Utqiaġvik Harvester Respondents Reporting Use Areas in Alternatives Analysis Area
Caribou	27 (84%)	5 (7%)
Wolverine	21 (88%)	7 (23%)
Wolf	20 (87%)	7 (23%)
Goose	12 (36%)	0 (0%)
Moose	2 (6%)	0 (0%)
Eiders	1 (4%)	0 (0%)
All resources	**29 (88%)**	**8 (11%)**

Source: SRB&A 2010a

Table 3.16.7. Number and Percent of Nuiqsut Caribou Harvesters and Harvests Using the Alternatives Analysis Area by Study Year

Study Year	Number (Percent) of Nuiqsut Caribou Harvester Respondent Reporting Use Areas in Alternatives Analysis Area	Percent of Reported Caribou Harvests Occurring in Alternatives Analysis Area
Year 1	22 (61%)	6%
Year 2	23 (43%)	6%
Year 3	31 (54%)	7%
Year 4	26 (45%)	18%
Year 5	25 (44%)	13%
Year 6	18 (32%)	7%
Year 7	31 (52%)	14%
Year 8	22 (38%)	6%
Year 9	18 (29%)	9%

Source: SRB&A 2018

3.16.2.1.1 Resource Abundance

There are no changes to resource abundance compared to the Draft EIS for the three Project components described in the SDEIS.

3.16.2.1.2 Resource Availability

Impacts to resource availability are detailed in the Draft EIS Section 3.16.2.3.2, *Resource Availability*. In addition to Project roads, under Alternative B, CPAI would construct a boat ramp specifically for subsistence use on the Ublutuoch (Tiŋmiaqsiuġvik) River, Judy (Iqalliqpik) Creek, and Fish (Uvlutuuq) Creek. Increased traffic along these drainages as a result of increased access for subsistence hunters could displace or disturb caribou and alter caribou movement and distribution (see Section 3.12.2.1.2, *Disturbance and Displacement*). Use of these rivers for hunting, in combination with traffic along Project roads to the east, could decrease the availability of caribou within areas directly west of the community of Nuiqsut where residents frequently hunt during the fall months. However, these impacts to resource availability may be offset by the increased access introduced by Project roads and boat ramps (see Section 3.16.2.1.3). Alternatives C and D would construct a single subsistence boat ramp on Ublutuoch (Tiŋmiaqsiuġvik) River; boat ramps would not be constructed on Fish (Uvlutuuq) and Judy (Iqalliqpik) creeks. Thus, potential impacts to resource availability resulting from increased subsistence access would be lower than under Alternative B.

3.16.2.1.3 Harvester Access

Harvester access is detailed in the Draft EIS Section 3.16.2.3.3, *Harvester Access*. Updates to that description for the three Project components described in the SDEIS are included below.

Boats are used in the direct effects area, but primarily in the marine area and along the Colville River where module transport ice roads are proposed (see Draft EIS, Section 3.16.2.6, *Module Delivery Options*). Boat hunting occurs along Fish Creek, but generally downriver from the action alternatives on the Iqalliqpik Channel.

Boat ramps constructed under Alternative B (Ublutuoch [Tiŋmiaqsiuġvik] River, Judy [Iqalliqpik] Creek, and Fish [Uvlutuuq] Creek) would be accessible from existing Project roads with the addition of short access roads. Travel by boat to the proposed boat ramp location on the Ublutuoch (Tiŋmiaqsiuġvik) River from Fish (Iqalliqpik) Creek has occurred during some years, although on a limited basis (SRB&A 2010b, 2019). If it is possible for individuals to navigate to Fish (Iqalliqpik) Creek via the Ublutuoch (Tiŋmiaqsiuġvik) River using boats, the boat ramps could have substantial benefits to some users. Use of Fish (Iqalliqpik) Creek for subsistence purposes has declined in recent years with residents citing fuel costs and difficult travel and navigation conditions (e.g., shallower waters near the mouth of Fish [Iqalliqpik] Creek) for the decline in use. A boat ramp on the Ublutuoch (Tiŋmiaqsiuġvik) River could facilitate access to this traditionally important subsistence harvesting area. Of the three proposed boat ramps, residents would be most likely to use the Ublutuoch [Tiŋmiaqsiuġvik] River boat ramp, as it is closest to the community and would provide more immediate access to the lower, most heavily used portions of Fish (Iqalliqpik) Creek where most traditional camps are located. The boat ramps on Judy (Iqalliqpik) Creek, and Fish (Uvlutuuq) Creek are located in areas that are not commonly accessed by boat, according to available subsistence use area data (SRB&A 2010b, 2019). However, these boat ramps could provide a benefit to the community, particularly in the event that the Project reduces the availability of certain resources, such as caribou, near the community. Accessing the upriver areas of Fish (Uvlutuuq) and Judy (Iqalliqpik) creeks would allow residents to access areas that are currently not frequently used due to the long boat ride from the community, high costs associated with such travel, and reported difficulties in recent years navigating into the mouth of Fish (Iqalliqpik) Creek by boat. Access to these areas may result in a shift in the community’s boat hunting areas, but could also provide access to new areas with greater concentrations of caribou in areas that are considered less affected by development (e.g., to the west of the current Prudhoe Bay, Kuparuk, Alpine development complex).

Alternatives C and D would construct a subsistence boat ramp on Ublutuoch (Tiŋmiaqsiuġvik) River, but not on Fish (Uvlutuuq) and Judy (Iqalliqpik) creeks.

3.16.2.1.4 Other Subsistence and Sociocultural Impacts

There are no changes to other subsistence and sociocultural impacts compared to the Draft EIS for the three Project components described in the SDEIS.

3.16.2.2 Module Delivery Option 3: Colville River Crossing

Figures 3.16.1 through 3.16.13 show Nuiqsut and Utqiaġvik subsistence use areas by resource and the Option 3 analysis area, which is defined as the area surrounding the Oliktok Dock and Option 3 ice road. Tables 3.16.8 and 3.16.9 show resource harvests and use within the Option 3 analysis area for Nuiqsut and Utqiaġvik. A majority of Nuiqsut harvesters (97%) use the Option 3 analysis area for resource harvesting activities, compared to 16% of Utqiaġvik harvesters (Table 3.16.8). As shown on the Figures 3.16.1 through 3.16.9, Nuiqsut residents use the area surrounding the ice road crossing for overland and riverine hunting of caribou, overland hunting of wolf and wolverine, hunting of goose (primarily where the ice road crosses the Colville River), riverine moose hunting, and fishing. Nuiqsut residents use the area surrounding Oliktok Dock for offshore hunting of seals and eiders (Figure 3.16.6 and 3.16.7), and coastal hunting of caribou, with some limited moose, wolf, and wolverine hunting in that area as well. The Option 3 analysis area has accounted for between 6% and 12% of the total reported caribou harvest during individual study years (Table 3.16.9). Utqiaġvik harvesters report some use of the ice road crossing area for overland and riverine caribou hunting, overland wolf and wolverine hunting, and riverine moose hunting (Figures 3.16.10 through 3.16.13).

Table 3.16.8. Number and Percentage of Nuiqsut and Utqiaġvik Harvesters, Option 3 Analysis Area, 1995 through 2007

Resource Category	Nuiqsut: Ocean Point Crossing	Utqiaġvik: Ocean Point Crossing
Caribou	29 (91%)	8 (11%)
Wolverine	23 (96%)	5 (16%)
Wolf	22 (96%)	5 (16%)
Goose	15 (45%)	–
Eiders	13 (46%)	–
Broad whitefish	4 (15%)	–
Moose	29 (94%)	4 (44%)
Bearded seal	11 (41%)	–
Ringed seal	8 (35%)	–
All resources	**32 (97%)**	**12 (16%)**

Source: SRB&A 2010b
Note: – (community did not have any use areas overlapping the analysis area for this resource)

Table 3.16.9. Number and Percentage of Nuiqsut Caribou Harvesters and Harvests, Option 3 Analysis Area, 2008 through 2016

Study Year	Total Number of Active Harvester Respondents	Ocean Point Crossing Active Harvester Respondents	Ocean Point Crossing Caribou Harvests
Year 1	36	34 (94%)	12%
Year 2	53	47 (89%)	9%
Year 3	57	52 (91%)	8%
Year 4	58	51 (88%)	8%
Year 5	57	48 (84%)	7%
Year 6	57	44 (77%)	6%
Year 7	60	50 (83%)	8%
Year 8	58	48 (83%)	7%
Year 9	63	47 (75%)	8%

Source: SRB&A 2018

The effects of Option 3 would be the same as described for Option 1, with the differences described below.

Option 3 would not construct an MTI and would instead rely on existing infrastructure at Oliktok Dock for module delivery. The areas offshore from Oliktok Dock are used by Nuiqsut residents for seal and eider hunting, and the coastal area from the Colville River Delta to Oliktok Point is used to hunt caribou, often while traveling to and from Oliktok Dock for other purposes. The Oliktok Dock portion of Option 3 could affect a greater percentage of bearded seal (41%), ringed seal (35%), and eider harvesters (46%) (Table 3.16.8). However, Option 3 would have fewer overall impacts to these marine and coastal uses, as activities at Oliktok Point would be additive to existing impacts, rather than introducing impacts into areas that were previously unaffected by development; Option 3 would also not require the construction of a gravel island. Use of Oliktok Dock would also reduce barge and vessel activity through core Nuiqsut seal and eider subsistence harvesting areas in Harrison Bay, and reduce the intensity of marine traffic as substantially fewer support vessels would be required (76 versus 224 under Options 1 and 2, SDEIS Table 2.3.1 and Draft EIS Table 2.8.2). Because fewer seals use the Oliktok Point area, and because there is existing marine infrastructure and activity at Oliktok Point, screeding and barging activities under Option 3 would likely cause less displacement and disturbance of marine mammals than other module delivery options (see Section 3.13.2.2, *Module Delivery Option 3: Colville River Crossing*). The location of the module transport staging area at Oliktok Point would also move infrastructure and activities out of Utqiaġvik's marine subsistence harvesting area.

Modules would be transported along existing road routes from Oliktok Dock to Kuparuk DS2P, and then from DS2P to GMT-2 along an ice road constructed for the Project. Some modifications to the Oliktok Road would be required to ensure an adequate turning radius; however, this area is not regularly used by contemporary Nuiqsut subsistence users. The ice road route under Option 3 would cross through areas somewhat more heavily used by the community of Nuiqsut than those under Options 1 and 2. In particular, the ice road would cross through areas heavily used in the winter for hunting of furbearers (96% of wolf and wolverine harvesters) and caribou (91% of harvesters) along the Itkillik River, Colville River near Ocean Point, and to the south and west of the community. Ice roads and associated traffic could disturb or displace wintering TCH caribou, resulting in reduced resource availability for winter hunters (see Section 3.12.2.2, *Module Delivery Option 3: Colville River Crossing*). The Option 3 analysis area accounts for between 6% and 12% of the total caribou harvest during individual study years, compared to between 4% and 11% under Option 1. The road also crosses through areas of moderate overlapping use for waterfowl, in areas used by 45% of goose harvesters; thus, if the ice road season extends into April, then early spring goose hunting could be directly affected. Option 3 would affect a slightly smaller percentage of goose harvesters than Option 1 and would also result in less habitat disturbance (see Section 3.11.2.2, *Module Delivery Option 3: Colville River Crossing*). While the area where the ice road crosses the Colville River is heavily used by Nuiqsut moose hunters (94%), these activities occur in the fall when the ice road would not be present. The crossing is located far enough upstream from the CRD that fish are not anticipated to be present in winter (see above Section 2.3.3, *Module Transport Ice Road and Colville River Crossing*, and Section 3.10.2.2, *Module Delivery Option 3: Colville River Crossing*); winter fishing activities are generally focused downstream from Ocean Point. Construction of the ice road under Option 3 would result in the community of Nuiqsut being completely encircled to the north, west, south, and east by gravel or ice roads. Thus, during module transport years, individuals on snow machines would likely have to cross over roads in order to travel any distances greater than 15 or 20 miles from the community. Option 3 would require one less winter ice road season (two winters) compared to Options 1 and 2 (three winters); in addition, substantially less ground traffic would be required under Option 3 (approximately one-quarter of that predicted under Option 1, SDEIS Table 2.3.1 and Draft EIS Table 2.8.2), and therefore the ice road and associated traffic are less likely to deflect or disturb subsistence resources and less likely to deter subsistence harvesters from crossing. Option 3 would also require substantially less fixed wing and helicopter traffic than Option 1, reducing disturbances to wildlife resources and hunters (SDEIS Table 2.3.1 and Draft EIS Table 2.8.2).

With the exception of moose hunting areas, Option 3 would move most activity and infrastructure associated with module delivery further into the periphery of Utqiaġvik's subsistence use area. While Option 3 overlaps with moose hunting areas for 44% of moose harvesters, these moose hunting activities generally occur during the summer and fall months when ice roads would not be present. Because the ice road would be located farther east, impacts on resource availability resulting from disturbances to migrating caribou would be less likely for Utqiaġvik. Overall, Option 3 would be less likely to have direct impacts to Utqiaġvik harvesters than Options 1 and 2.

3.16.3 Additional Suggested Best Management Practices or Mitigation

The suggested BMPs or mitigation have no changes from the Draft EIS for the three Project components described in the SDEIS.

3.17 Environmental Justice

3.17.1 Affected Environment

The communities of Utqiaġvik, Anaktuvuk Pass, Atqasuk, Wainwright, and Point Lay were added to the analysis due to the overlap of Project effects with potential reasonably foreseeable future actions (RFFAs) in the cumulative effects analysis. These minority and low-income populations are described in detail in the NPR-A IAP DEIS (BLM 2019), page 3-270 and Appendix V.

3.17.2 Environmental Consequences

Construction activity for the CFWR, boat ramp(s), features (e.g., ice roads) associated with Option 3, and not constructing an MTI (as included under Options 1 and 2), would change the overall number and timing of construction employment and could potentially provide additional employment opportunities and other economic benefits (e.g., increased revenue) for the community of Nuiqsut. Any increase in the number of jobs would also increase **household** income and dividends for Arctic Slope Regional

Corporation (ASRC) and Kuukpik Corporation (Kuukpik) shareholders if these corporations have subsidiaries working on Project construction.

Module delivery Option 3 would not include an MTI and would eliminate or reduce many of the subsistence impacts associated with Options 1 and 2, including the construction of new offshore marine infrastructure, the overall volume of ground and air traffic, and the number of years of activity.

The addition of boat ramp(s) to the Project would increase overall subsistence access to local rivers for residents of Nuiqsut.

The addition of the CFWR and boat ramps would not change the environmental justice determinations as the described in the Draft EIS for the action alternatives: the effects on subsistence, sociocultural systems, and public health may be highly adverse and would be disproportionately borne by the Nuiqsut population. For the module transfer options, effects of Option 3 would be substantially less for Nuiqsut than for Option 1, because no marine infrastructure would be built, and the majority of the activity would be outside of the community’s core subsistence use area. Option 3 would not be highly adverse or disproportionately borne by the Nuiqsut population.

3.17.3 Additional Suggested Best Management Practices or Mitigation

The suggested BMPs or mitigation have no changes from the Draft EIS for the three Project components described in the SDEIS.

3.18 Public Health

3.18.1 Affected Environment

The analysis area for public health remains unchanged from the Draft EIS.

3.18.2 Environmental Consequences

3.18.2.1 Health Effects Category 1: Social Determinants of Health

Employment: Construction activities for the CFWR, boat ramp(s), and features (e.g., ice roads) associated with Option 3 would change the overall number and timing of construction employment and could potentially provide additional employment opportunities for the community of Nuiqsut. Any increase in the number of jobs would also increase household income and dividends for ASRC and Kuukpik shareholders if these corporations have subsidiaries working on Project construction.

3.18.2.2 Health Effects Categories 2 Through 8

There are no changes to health effects categories 2 through 8 compared to the Draft EIS for the three Project components described in the SDEIS.

3.18.3 Additional Suggested Best Management Practices or Mitigation

The suggested BMPs or mitigation have no changes from the Draft EIS for the three Project components described in the SDEIS.

3.19 Cumulative Effects

3.19.1 Background and Methodology

There are no changes to background and methodology compared to the Draft EIS for the three Project components described in the SDEIS.

3.19.2 Past, Present, and Reasonably Foreseeable Future Actions

Past and present actions are described in Section 3.1, *Introduction and Analysis Methods*, and in Figure 3.1.1. RFFAs considered in the cumulative impacts analysis were updated to include the area near Option 3 (Colville River Crossing). These are presented in detail in Table 3.1.1 and in Figure 3.19.1. Impacts of RFFAs that are the farthest from BT3 (the center of the Project) would overlap with impacts from the

Project in three primary areas: overall subsistence uses, caribou movement, and greenhouse gas emissions contributions to climate change.

Past and present actions that were considered were mainly oil and gas exploration and development actions on the North Slope that have environmental impacts within the analysis area of the resources analyzed in this cumulative effects analysis. RFFAs include oil and gas exploration, pipeline development, and transportation projects that are likely to affect resources in similar ways as the Project. Exploration activities by a variety of entities occur throughout the North Slope. The location and frequency of exploration activity changes from year to year, though trends may arise across some years. In recent years, exploration activity in the NPR-A and areas south and east of Nuiqsut (outside of the NPR-A) have seen increased exploration as additional recoverable resources have been discovered in these less developed areas. This trend is likely to continue over the coming years and may increase if changes in the NPR-A IAP (currently underway and listed as an RFFA in Table 3.19.1) open more areas of the NPR-A to oil and gas activity.

For the EIS, exploration activity is grouped as one RFFA due to the disparate and constantly changing details about activities by a wide variety of applicants and the uncertainty related to any one applicant’s exploration plans beyond the currently permitted activity. Exploration activities typically include construction and use of ice roads and pads (and sometimes ice airstrips), heavy equipment operation, traffic, water withdrawal, exploration well drilling, and seismic surveys. These activities have historically occurred across the North Slope and will continue to do so with concentrated activity likely to occur within the NPR-A and in areas south and east of Nuiqsut (outside of the NPR-A).

Table 3.19.1. Reasonably Foreseeable Future Actions that may Interact with the Project

Type	Project	Entity	Description	Unit/ Location	Distance to BT3[a] (miles)
Oil and Gas Exploration and Development	Outer Continental Shelf Leasing Program	BOEM	Revisions to leasing plan in Chukchi and Beaufort Seas, could open more areas to offshore leasing. Under 43 USC 1331-1656b, a new plan is under development.	Offshore	Varies
Oil and Gas Exploration and Development	Nanushuk	Oil Search Alaska	New oil and gas development east of the Colville River. USACE ROD May 2019; construction began in late 2019 and will continue for several years	Pikka Unit	35
Oil and Gas Development	Nuna DS2	ConocoPhillips Alaska Inc.	Nuna DS1 gravel infrastructure was constructed 2015 and is included as a present project; a second drill site (DS2) is permitted may be constructed in the future	Kuparuk River Unit	46
Oil and Gas Exploration and Development	Placer	Arctic Slope Regional Corporation	New 7-acre gravel pad and 7-mile gravel road with pipeline originating from near the Mustang Pad	Placer Unit	45
Oil and Gas Exploration and Development	Mustang	Brooks Range Petroleum Company	Exploration wells and gravel infrastructure; project suspended ~2014 due to funding issues; may be active again at any point	Southern Miluveach Unit	45
Oil and Gas Exploration	Miscellaneous Seismic Exploration	Multiple	Seismic exploration is ongoing throughout the region; conducted by multiple firms for different operators	Multiple	Varies
Oil and Gas Exploration and Development	Liberty	Hilcorp Alaska	Proposed manmade island located northeast of Deadhorse. BOEM published ROD on October 26, 2018.	Liberty	108
Oil and Gas Exploration and Development	Greater Willow 1 and 2	ConocoPhillips Alaska Inc.	Potential expansion areas to be included in the Willow Master Development Plan	Bear Tooth Unit	8
Oil and Gas Development	Kuparuk Seawater Treatment Plant Upgrades	ConocoPhillips Alaska Inc.	Planned upgrades to the existing treatment plant at Oliktok Point	Kuparuk River Unit	61
Oil and Gas Development	Kuparuk Operational Projects	ConocoPhillips Alaska Inc.	Routine operational projects with small footprints	Kuparuk River Unit	50+

Type	Project	Entity	Description	Unit/ Location	Distance to BT3[a] (miles)
Oil and Gas Development	Alpine Infrastructure Upgrades	ConocoPhillips Alaska Inc.	Proposed expansion of the Alpine airstrip apron, expansion of gas infrastructure on CD-1 pad, additional gravel pads for staging, and other routine operational projects with small footprints	Colville River Unit	33
Oil and Gas Development	Oliktok Road Upgrades	ConocoPhillips Alaska Inc.	Up to 48 acres of road widening from 3N to Kuparuk CPF1, 2G, and 2M, as well access road from 3M to 3I, permitted in 2017	Kuparuk River Unit	50
Oil and Gas Development	K-Pad expansion	Kuukpik Corporation	5-acre expansion to existing pad near the Nuiqsut Spur Road	Colville River Unit	27.5
Oil and Gas Development	Alaska LNG	State of Alaska	Natural gas line from North Slope to Nikiski; includes compression and liquification facilities	North Slope	89
Oil and Gas Development	Alaska Stand Alone Pipeline	State of Alaska	Natural gas pipeline for in-state distribution that would follow the Trans-Alaska Pipeline System from the gas conditioning facility in Prudhoe Bay south to a connection with the existing ENSTAR natural gas pipeline system in the Matanuska-Susitna Borough	North Slope	89
Oil and Gas Exploration and Development	Arctic National Wildlife Refuge Oil and Gas Leasing Program	BLM	Oil and gas leasing program for the Arctic National Wildlife Refuge in Area 1002	Arctic National Wildlife Refuge	140
Mining	Miscellaneous Mine Site Expansions	Multiple	Opening of new cells at existing mine sites on the North Slope, such as Mine Sites E and F, and ASRC Mine Site	Multiple	Varies (32 miles closest)
Transportation	Colville River Access Road	Nuiqsut/North Slope Borough	Proposed gravel road connecting water source lake to Colville River; road permitted in 2016	Nuiqsut	28
Transportation	Arctic Strategic Transportation and Resources (ASTAR) Project	State of Alaska/ North Slope Borough	Planning level effort to identify North Slope community needs; includes potential roads (seasonal ice, snow, or all-season gravel) that may connect communities to the Dalton Highway	North Slope	Unknown
Transportation	Community Winter Access Trail	North Slope Borough	Overland snow trails to connect Atqasuk and Utqiaġvik to the Dalton Highway	Multiple	Varies
Oil and Gas Exploration and Development	NPR-A Integrated Activity Plan Revisions	BLM	Revisions to the IAP for NPR-A, including potentially opening areas to oil and gas leasing and development	NPR-A	0

Note: BLM (Bureau of Land Management); BOEM (Bureau of Ocean and Energy Management); BT3 (drill site Bear Tooth 3); DS (drill site); IAP (Integrated Activity Plan); LNG (liquified natural gas); NPR-A (National Petroleum Reserve in Alaska); ROD (record of decision); USACE (U.S. Army Corps of Engineers). A reasonably foreseeable future project is defined as a project for which there is an existing proposal, a project currently in the NEPA process, or a project to which a commitment of resources (such as funding) has been made. For the SDEIS, we assume all present projects will also occur in the future; present projects are not listed in the table.

[a] BT3 is the center of the Project; distances are measured from BT3 to closest point of other projects.

3.19.3 Cumulative Impacts to Resources

3.19.3.1 No Changes from Draft Environmental Impact Statement

The inclusion of the CFWR, boat ramp(s), and use of Option 3 would not substantially change the cumulative impacts analyzed in the Draft EIS for the following resources:

- Climate and climate change
- Air quality
- Soils, permafrost, and gravel resources
- Contaminated sites
- Noise
- Visual resources

- Water resources
- Wetlands and vegetation
- Land ownership and use
- Economics

3.19.3.2 Cumulative Impacts to Biological Resources

Because the acres of wetland and vegetation that would be affected by the three project components described in the SDEIS are relatively small (they add a nominal amount to the total acres described in the Draft EIS cumulative effects analysis, Section 3.19.9, *Cumulative Impacts to Biological Resources*), there are no changes to the cumulative effects analysis for this resource. As described in the Draft EIS Section 3.9.2.3.1, *Direct Loss and Alteration of Wetlands*, wetland conditions in watersheds with less than 5% cover by impervious surfaces are good (i.e., close to reference conditions, which were defined as the average condition of the three least impaired wetlands; Hicks and Larson 1997). For the EIS analysis, impervious cover was used as a proxy for gravel fill since both impervious cover and gravel fill decrease the infiltration rate of precipitation and increase surface runoff in a watershed. The additional acres of gravel fill from the three project components described in the SDEIS would not increase the total wetlands fill in any given watershed to 5% or more.

Project boat ramps and increased gravel infrastructure expected from RFFAs would increase subsistence access and likely subsistence harvest of fish, birds, and terrestrial mammals.

Many of the RFFAs are in the range of the CAH, a caribou herd that has been exposed to oil and gas infrastructure for approximately 40 years. Development that displaces caribou from calving areas, hinders caribou movements among seasonal ranges, or increases hunter access is likely to have the biggest impact on caribou. The additional projects would result in additional disturbance and displacement during some seasons, but the potential demographics impacts from these projects would depend on the location and type of development. Continued development within the summer range of the CAH would create additional habitat loss from gravel placement, disturbance and displacement during some seasons, and additional deflections and delays during caribou mid-summer movements. Johnson et al. (2019) estimated that CAH caribou density was lower in 12%, 15%, and 17% of important habitat during the calving, post-calving, and mosquito season respectively as a result of partial avoidance of areas near infrastructure. The additional activity and traffic associated with Option 3 would be additive to these potential impacts, though limited in duration to three summers and two winters. Murphy, Russell et al. (2000) found that changes in activity budgets of caribou from exposure to development were likely to have demographic impacts only at higher levels of exposure than currently exist. Nellemann and Cameron (1998) found that caribou density during calving declined with increasing road density. Colocating pipelines near existing infrastructure, avoiding development in calving areas, and using BMPs for development design would minimize impacts on caribou. Although the CAH has limited use of the Project area, the additional development would increase the total exposure to development for the herd.

The main RFFAs that could affect the TCH are the NPR-A IAP revisions, the Arctic Strategic Transportation and Resources (ASTAR) project, and future expansions of the Willow MDP Project. Revisions to the BLM's NPR-A IAP that are currently underway may change the boundaries or restrictions associated with existing special areas, such as the Teshekpuk Lake Special Area. If areas are removed from special area designation, they would no longer have special protections for biological resources such as birds and caribou. One of the alternatives the BLM is considering would open all of the land near Teshekpuk Lake to leasing; if leasing and development occurred in the high-density calving area of the TCH, additional effects to the TCH and to birds could occur. Development within the high-density calving area would likely result in displacement of maternal caribou during calving. The demographic impacts of this displacement are difficult to predict, but could result in higher calf mortality or reduced calf and adult body condition if alternative calving areas have higher predatory densities or lower forage quality. The development of the Project area would result in less undeveloped area available for alternative calving areas. The relative value for calving habitat was mapped by Wilson et al. (2012), although in recent years the TCH calving distribution has apparently expanded to areas to the west of Teshekpuk Lake (Parrett 2015; Prichard, Klimstra et al. 2019).

The revisions to the NPR-A IAP could also allow 30 to 190 miles of new roads (and 30 to 190 miles of new pipelines), including a community road connecting Nuiqsut and Utqiagvik that would be routed north of Teshekpuk Lake. The ASTAR project could include additional road construction through seasonal ranges of the TCH and CAH. New roads could directly kill some caribou due to vehicle collisions, delay or alter caribou migratory movements (Panzacchi, Moorter et al. 2013; Wilson, Parrett et al. 2016), or increase access for local or non-local hunters. These changes in addition to the use of Project roads and boat ramps by hunters could alter the distribution of hunting activity and the location and levels of harvest. Changes to hunter access could impact all game species of birds and mammals although this could be mitigated through hunting regulations or road use limitations. Roads near calving areas would likely result in displacement of calving caribou unless they are closed during the calving season. Road construction north of Teshekpuk Lake could potentially interfere with the use of narrow corridors of land that are used to access mosquito-relief habitat (Yokel, Prichard et al. 2011). The addition of roads that could be used for hunting could alter the use of the Project roads by subsistence hunters.

Seismic activity associated with new oil and gas leasing could disturb wintering caribou of the TCH and other species wintering or denning on the ACP. Seismic trains and camps could cause some long-term damage to forage vegetation in some areas and cause snow compaction that could delay the timing of snowmelt and increase mortality and limit movements of small mammals. The impact of seismic activity on forage plants would be in addition to direct loss of forage from gravel roads and pads.

Climate change will continue to affect fish, birds, and wildlife throughout the area and could alter the rate or degree of potential cumulative impacts. Climate change, as described in Section 3.2, *Climate and Climate Change*, could have both positive and negative impacts on birds and terrestrial mammals. The impacts of climate change are likely to vary by species, but in general, climate change will introduce significant uncertainty in predicting demographic trends of species in the area and will make the predicted impacts of development more difficult to accurately assess. Climate change appears to be resulting in a northward expansion of some mammal species, such as moose, beaver, and snowshoe hare (Tape, Christie et al. 2016; Tape, Gustine et al. 2016; Tape, Jones et al. 2018). Increasing numbers of red foxes due to warming could cause a decline in arctic foxes. Some species with low reproductive output in the Arctic, such as grizzly bears, may benefit from increased productivity and a more diverse prey base. Warming could also result in a spread of pathogens (Kutz, Bollinger et al. 2015).

Climate change in the Arctic is predicted to have multiple, sometimes counteracting, effects on caribou (Albon, Irvine et al. 2017; Mallory and Boyce 2017; Martin, Jenkins et al. 2009). Climate change may have been a factor in a 56% decline in populations of migratory caribou and wild reindeer across the Arctic over the last two decades (Russell, Gunn et al. 2019). A longer snow-free season can increase access to forage (Cebrian, Kielland et al. 2008; Tveraa, Stien et al. 2013), but increasing mid-summer temperatures could result in more severe insect harassment (Weladji, Holand et al. 2003), and increase the incidence of parasites and the rate of annual decline in forage quality (Gustine, Barboza et al. 2017). If mosquitos emerge closer to calving, it could result in a higher rate of separation of calves, poorer body quality of maternal caribou, and higher calf mortality. Earlier river breakup could alter the timing or difficulty of caribou migrations (Leblond, St-Laurent et al. 2016; Sharma, Couturier et al. 2009).

During the winter, changes in precipitation could increase energetic demands for cratering through snow to access forage (Fancy and White 1985). Increasing frequency of rain-on-snow events could greatly decrease access to winter forage and change the winter distribution of the TCH (Albon, Irvine et al. 2017; Bieniek, Bhatt et al. 2018; Hansen, Aanes et al. 2011; Loe, Hansen et al. 2016), which could alter the use of the Project area during winter in unpredictable ways, and increase mortality (Forbes, Kumpula et al. 2016). Changes in timing of snowmelt and vegetation growth could mean that the timing of calving and the emergence of highly nutritious forage would no longer overlap (Post and Forchhammer 2008). Gustine, Barboza et al. (2017) found no evidence of a spring nourishment mismatch for caribou in Alaska, but suggested that one may occur in fall with increased warming.

Over the longer term, changes in vegetation composition could lower forage quality (Fauchald, Park et al. 2017). Increased moose densities (Tape, Gustine et al. 2016) could increase predator densities and alter predator distributions. Increases in wildfire could lead to lower lichen availability on the winter range

(Joly, Chapin et al. 2010). Calving grounds tend to shift depending on the timing of snowmelt (Carroll, Parrett et al. 2005; Dau 2007; Griffith, Douglas et al. 2002), therefore, climate change could alter the location of calving grounds, and additional development could interact with climate change by limiting the availability of alternative calving areas as conditions change. Impacts on caribou body condition resulting from climate change may also make caribou more susceptible to potential impacts from developments.

As described in the Draft EIS Section 3.13, *Marine Mammals*, the Project would contribute an incremental increase in habitat loss and alteration; disturbance and displacement due to Project noise and human activity; and mortality and injury associated with construction, vessel strikes, and human safety concerns. Placement of gravel fill would contribute a small incremental loss and alteration of potential denning habitat of polar bears on the ACP.

The Project would add vessel traffic to the Beaufort Sea, at a time when traffic is expected to continue to increase due to changing climate and reduced sea ice extents. Project vessel traffic in combination with increased shipping and vessel traffic could increase the likelihood of vessel strikes of marine mammals. The revisions to the NPR-A IAP could also increase vessel traffic, and potential revisions by BOEM to its outer continental shelf leasing plans could result in additional offshore oil and gas development through issuance of offshore leases in areas of the Beaufort and Chukchi seas currently closed to leasing. These activities, in combination with the Willow Project, could have cumulative impacts (vessel strikes, disturbance, and displacement) on marine mammals across the Beaufort Sea, including bowhead whales.

Warming global temperatures, and associated reductions in extent and duration of sea ice (Durner, Douglas et al. 2009) that are predicted to occur in the future may have implications for polar bears and their ice-dependent marine prey. The effects of continuing climate change pose challenges to the future well-being of marine mammals and may lead to population declines and range contraction for some ice-dependent marine species. However, the ability of federal agencies to influence the processes thought to be responsible for climate change (such as greenhouse gas emissions) is extremely limited at present, absent an effective worldwide response to the problem.

As sea ice cover diminishes with warming climate, polar bears may spend more time on land and fast more, which would reduce access to prey and negatively affect energy levels, respectively (Molnár, Derocher et al. 2010). It may also mean a higher likelihood of bears encountering human infrastructure and activities on land. The impacts of onshore development would likely affect polar bears through disturbance in coastal barrier-island and denning habitats, especially during construction, but those would be mitigated through the Incidental Take Regulations and Letters of Authorization issued by USFWS (which stipulate mitigation and minimization measures).

Increased subsistence harvest due to increased onshore subsistence access could kill more polar bears, or displace them to other habitats to avoid harvest.

3.19.3.3 Cumulative Impacts to the Social Environment (Land Use, Economics, and Public Health)

Project boat ramps and increased gravel infrastructure expected from RFFAs would increase subsistence access for Nuiqsut residents and likely subsistence harvest of fish, birds, terrestrial mammals, and marine mammals. This would add to the positive effects to community health of past, present, and RFFAs described in the Draft EIS Section 3.19.10, *Cumulative Impacts to the Social Environment (Land Use, Economics, and Public Health)*.

In addition, if oil and gas development continues westward into the core calving area for the TCH, or if it reduces access to key insect relief habitats, and the herd experiences a decline in productivity and abundance, subsistence users of the herd (including those from Nuiqsut, Utqiaġvik, Anaktuvuk Pass, Atqasuk, and Wainwright) could be affected. This could have impacts on public health (health effects category 4: food, nutrition, and subsistence activities) across the North Slope, since subsistence resources are often shared among communities. Such a scenario could occur if the BLM selects Alternative D in the

NPR-A IAP Draft EIS. Alternative D would open areas surrounding Teshekpuk Lake to oil and gas leasing and infrastructure development. Under this scenario, any impacts related to the health and abundance of the TCH would likely extend to subsistence users of the herd.

The revisions to the NPR-A IAP could also increase vessel traffic, and potential revisions by BOEM to its outer continental shelf leasing plans could result in additional offshore oil and gas development through issuance of offshore leases in areas of the Beaufort and Chukchi seas currently closed to leasing. These activities, in combination with the Willow Project, could have cumulative impacts on the availability of marine mammals for the North Slope communities of Nuiqsut, Utqiaġvik, Point Lay, and Wainwright. This could have impacts on public health (health effects category 4: food, nutrition, and subsistence activities) across the North Slope, since subsistence resources are often shared among communities.

3.19.3.4 Cumulative Impacts to Subsistence and Sociocultural Systems

Project boat ramps and increased gravel infrastructure expected from RFFAs would increase subsistence access and likely subsistence harvest of fish, birds, terrestrial mammals, and marine mammals. This would add to the cumulative effects described in the Draft EIS Section 3.19.11, *Cumulative Impacts to Subsistence and Sociocultural Systems*.

Increased development infrastructure on the North Slope would continue to cause alteration and degradation of habitats for key subsistence resources including caribou, furbearers, fish, and goose. Over time, these changes could affect the health and abundance of different subsistence resources on the North Slope. If development continues westward into the core calving area for the TCH, or if it reduces access to key insect relief habitats, then the herd could experience an overall decline in productivity and abundance. Such a scenario could occur if the BLM selects Alternative D in the NPR-A IAP Draft EIS. Alternative D would open areas surrounding Teshekpuk Lake to oil and gas leasing and infrastructure development. Under this scenario, impacts related to the health and abundance of the TCH would likely extend to subsistence users of the herd including those from Nuiqsut, Utqiaġvik, Anaktuvuk Pass, Atqasuk, and Wainwright.

The revisions to the NPR-A IAP could also increase vessel traffic, and potential revisions by BOEM to its outer continental shelf leasing plans could result in additional offshore oil and gas development through issuance of offshore leases in areas of the Beaufort and Chukchi seas currently closed to leasing. These activities, in combination with the Willow Project, could have cumulative impacts on the availability of marine mammals for the North Slope communities of Nuiqsut, Utqiaġvik, Point, Lay, and Wainwright. In particular, bowhead whales are a resource of high importance to the coastal communities of the North Slope, and residents could experience reduced harvest success if increased offshore activity causes deflections or behavioral changes in whales.

In addition to the additive effects of increasing oil and gas infrastructure in the region, increased activity, including oil and gas exploration and seismic activity, air traffic, vessel traffic, scientific research, recreation, and sport hunting and fishing activities, would also contribute to subsistence impacts on Nuiqsut and Utqiaġvik by increasing the frequency of noise and air traffic disturbances, vessel disturbances, and interactions with non-local researchers, workers, and recreationists. Increased noise disturbances would contribute to existing impacts on subsistence resource availability.

3.19.3.5 Cumulative Impacts to Environmental Justice

Project boat ramps and increased gravel infrastructure expected from RFFAs would increase subsistence access for Nuiqsut residents and likely subsistence harvest of fish, birds, terrestrial mammals, and marine mammals. This would add to the positive effects of past, present, and RFFAs described in the Draft EIS Section 3.19.12, *Cumulative Impacts to Environmental Justice*.

In addition, if oil and gas development continues westward into the core calving area for the TCH, or if it reduces access to key insect relief habitats, and the herd experiences a decline in productivity and abundance, subsistence users of the herd (including those from Nuiqsut, Utqiaġvik, Anaktuvuk Pass, Atqasuk, and Wainwright) could be affected. This could have impacts on public health across the North

Slope, since subsistence resources are often shared among communities. Such a scenario could occur if the BLM selects Alternative D in the NPR-A IAP Draft EIS. Alternative D would open areas surrounding Teshekpuk Lake to oil and gas leasing and infrastructure development. Under this scenario, impacts related to the health and abundance of the TCH would likely extend to subsistence users of the herd.

The revisions to the NPR-A IAP could also increase vessel traffic, and potential revisions by BOEM to its outer continental shelf leasing plans could result in additional offshore oil and gas development through issuance of offshore leases in areas of the Beaufort and Chukchi seas currently closed to leasing. These activities, in combination with the Willow Project, could have cumulative impacts on the availability of marine mammals for the North Slope communities of Nuiqsut, Utqiaġvik, Point Lay, and Wainwright. In particular, bowhead whales are a resource of high importance to the coastal communities of the North Slope, and residents could experience reduced harvest success if increased offshore activity causes deflections or behavioral changes in whales.

The effects on subsistence, sociocultural systems, and public health may be highly adverse and would be disproportionately borne by populations from Nuiqsut, Utqiaġvik, Anaktuvuk Pass, Atqasuk, Point Lay, and Wainwright.

4.0 SPILL RISK ASSESSMENT

The inclusion of the boat ramp(s), CFWR, and Option 3 would not change the likelihood of spills occurring during Project construction or operations but could result in spills occurring in different areas (e.g., Oliktok Dock). The anticipated magnitude and duration of potential spills identified in the Draft EIS would not change based on these new Project elements or module delivery option.

4.1 Boat Ramps

CPAI would construct up to three boat ramps along the Ublutuoch (Tiŋmiaqsiuġvik) River, Judy (Iqalliqpik) Creek, and Fish (Uvlutuuq) Creek (number and location vary by alternative; Figure 2.2.2) for local residents in an effort to help mitigate Project-related impacts to subsistence activities (Section 2.2.2, *Boat Ramps for Subsistence Users*).

Boat ramp construction would occur during winter when the waterways would be frozen. As with any construction activity, the potential for spills or leaks would be present, though they are not expected to occur. Consistent with BMP A-5 (BLM 2013), refueling of equipment within 500 feet of the waterway’s active floodplain would be prohibited.

Once constructed, boat ramp users could contribute contaminants (e.g., fuels, lubricants) to the waterways through their use of the rivers accessed by the boat ramps. These releases would likely be very small (less than 10 gallons) and could occur along the navigable reaches of the river(s) accessed from the boat ramps. These small releases would be short in duration and would quickly dissipate in the moving waterbodies.

4.2 Option 3: Colville River Crossing

Under module delivery Option 3, a grounded ice bridge would be constructed across the Colville River near Ocean Point (Figure 2.3.1) for the transport of large sealift modules. As with any construction activity, the potential for spills or leaks would be present during the construction of the ice bridge and the SPMT crossing, though they are not anticipated to occur. Consistent with BLM BMP A-5 (BLM 2013), refueling of equipment within 500 feet of the waterway’s active floodplain would be prohibited.

Should an accidental release or spill occur, it would likely be a small spill and may be contained to the surface of ice infrastructure where it could be removed. Due to the time of year and location of the activity, in spills or releases would not likely reach liquid water and they are not expected to travel downstream in the Colville River.

5.0 MITIGATION

CPAI would construct up to three boat ramp(s) to support subsistence use and to help mitigate Project impacts to subsistence (Table 5.1.1; Figure 2.2.2). The boat ramp(s) would not be used by CPAI to support the Project under planned operations; it is possible CPAI could use the boat ramp(s) to respond to emergency incidents such as spills or other accidental releases.

Table 5.1.1. Summary of Proposed Project Boat Ramps by Alternative

Boat Ramp Location	Alternative
Ublutuoch (Tiŋmiaqsiuġvik) River	B, C, D
Judy (Iqalliqpik) Creek	B
Fish (Uvlutuuq) Creek	B

All action alternatives (B, C, and D) include a boat ramp at the Ublutuoch (Tiŋmiaqsiuġvik) River, which would be located along the existing gravel road between Alpine CD5 and GMT-1. Alternative B would also include two additional boat ramps at Judy (Iqalliqpik) Creek and Fish (Uvlutuuq) Creek; Alternatives C and D would not include boat ramps at these locations due to the disconnected road access under these alternatives, which would prevent Nuiqsut subsistence users from reaching these rivers.

GLOSSARY TERMS

Active layer – The top layer of ground subject to annual thawing and freezing in areas underlain by permafrost.

Albedo – A measure of how a surface reflects incoming radiation; a surface with a higher albedo reflects more radiation than a surface with lower albedo.

Anadromous – Fish species that begin their life cycle in freshwater, migrate to saltwater, and return to freshwater to spawn (e.g., Pacific salmon).

Benthic – The area at the bottom of a body of water (such as an ocean or lake) that includes the sediment surface and some subsurface layers.

Best management practice – Mitigation developed through the BLM planning process or NEPA process that is not attached to an oil and gas lease but is required, implemented, and enforced at the operational level for all authorized (not just oil and gas) activities in the planning area. Best management practices are developed with various mechanisms in place to ensure compliance.

Bottom-fast ice – Ice that is attached to the waterbody or sea floor and is relatively uniform in composition and immobile during winter (also known as grounded, bedfast, ground-fast, fast ice).

Brood-rearing – After hatch, the season when young birds grow and develop flight capability and are cared for by one or both parents; this life stage spans June (for some early nesting passerines and goose) through August.

Critical habitat – Geographic areas that contain features essential to the conservation of an endangered or threatened species and may require special management and protection. Critical habitat is federally designated.

Direct effects analysis area – All subsistence use areas within 2.5 miles of Project infrastructure.

Discharge – The rate at which a given volume of water passes a given location within a specific period of time (e.g., cubic feet per second or gallons per minute).

Dust shadow – The area of deposition by airborne dust around gravel infrastructure.

Emergent – Of or denoting a plant which is taller than the surrounding vegetation.

Fall-staging – Season when birds are feeding to build fat reserves for migratory flights and when many species gather in flocks before migration; for most North Slope species, fall-staging occurs in August and September, although shorebirds may start forming flocks in July.

Grounded Ice – See **Bottom-fast Ice.**

Household – One or more individuals living in one housing unit, whether or not they are related.

Hydrologic Unit Codes – A USGS-based system of organizing watersheds using a sequence of numbers or letters to identify a watershed. As the numbers used to describe a watershed increase, the size of the watershed decreases.

Invasive species – Species nonnative to a given ecosystem and whose introduction is likely to cause economic or environmental harm or harm to human health (EO 13112).

Lacustrine – Produced or originating from within a lake.

Lease stipulation – Mitigation developed through BLM planning process or NEPA process that is specifically attached to a lease.

Nesting – Season when birds are building nests and incubating eggs, which for most birds on Alaska's North Slope spans May through July.

Palustrine – Produced or originating from or within a marsh.

Permafrost – Ground with subfreezing temperatures for at least 2 consecutive years.

Pre-breeding – Equivalent to pre-nesting. Period immediately prior to nesting when nesting habitats are becoming available after snowmelt or flooding, and birds are dispersing into nesting areas, generally in late May for early nesting species and in early June for most species on the ACP.

Resistant fish - Fish that are resistant to the potential changes in water quality, such as reduced dissolved oxygen and increased dissolved solids, as per BMP B-2, as well as Alaska Department of Natural Resources and ADF&G permit stipulations. These species are ninespine stickleback and Alaska blackfish.

Rolligon – A type of wheeled, low-impact off-road vehicle frequently used on the North Slope for tundra or snow travel; it can be configured to suit a variety of industrial and construction needs.

Screeding – A process which recontours sediment on the marine floor but does not remove sediment from the water. The activity often entails dragging a metal plate such as a screed bar across the sediment, thereby smoothing the high spots and filling the relatively lower areas. The amount of material moved is generally small and localized and the result is a flat seafloor within the work area. Screeding is necessary to temporarily ground the sealift barges during module offloading; a flat seafloor provides stability and prevents damage to the barge hulls during grounding.

Special Recreation Permits – Permits issued by BLM to businesses, organizations, and individuals to allow the use of specific public land and related waters for commercial, competitive, and organized group use. The permits allow BLM to track commercial and competitive use of public lands and provide resource protection measures to ensure the future enjoyment of those resources by the public.

Stage – The vertical height of the water above an established but usually arbitrary point. Sometimes zero stage corresponds to the riverbed but more often to just an arbitrary point.

Subsistence – A traditional way of life in which wild renewable resources are obtained, processed, and distributed for household and community consumption according to prescribed social and cultural systems and values.

Subsistence use areas – The geographic extent of a resident’s or community’s use of the environment to conduct traditional subsistence activities.

Talik – A layer of year-round unfrozen ground that lies in permafrost areas and often forms beneath lakes and rivers too deep to completely freeze during winter.

Thaw bulb – A layer of year-round unfrozen ground that lies in permafrost areas and often forms beneath lakes and rivers too deep to completely freeze during the winter.

Thermokarst – A land surface with karst-like features and hollows produced by melting of ice-rich soil or permafrost.

Unconsolidated – Sediment that is loosely arranged or unstratified, or whose particles are not cemented together.

Viewshed – The total landscape seen from a point, or from all or a logical part of a travel route, use area, or waterbody.

Visual resources – Visible features and objects, natural and human-made, moving and stationary, which comprise the character of the landscape observed from a given location or key observation point.

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