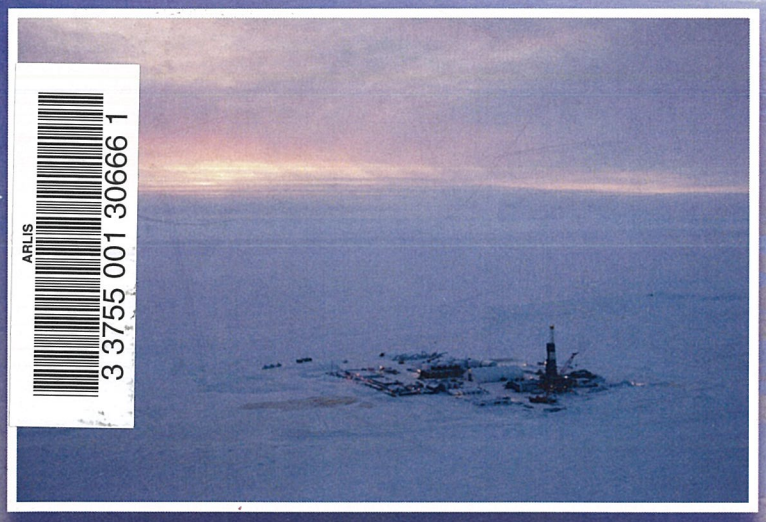

POINT THOMSON PROJECT EIS

Draft Environmental Impact Statement

Executive Summary

November 2011

CHECK FOR 2 CDs
IN Back Pockets.

US Army Corps of Engineers

POINT THOMSON PROJECT EIS

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
REGULATORY DIVISION
P.O. BOX 6898
JBER, ALASKA 99506-0898

REPLY TO
ATTENTION OF:

Regulatory Division
POA-2001-1082-M1

Subject: Point Thomson Project Draft Environmental Impact Statement (EIS)

Dear Reviewer:

The U.S. Army Corps of Engineers (Corps) is pleased to provide you with the Point Thomson Project Draft Environmental Impact Statement (EIS) for your review of the proposed development by Exxon Mobil Corporation and PTE Pipeline LLC (Applicant). This Draft EIS analyzes the environmental impacts that would occur if the Applicant was authorized to construct industrial infrastructure and produce liquid hydrocarbon resources in the area near Point Thomson, Alaska. The Draft EIS compares the Applicant's proposal and three other action alternatives to the human and environmental impacts associated with the No Action Alternative, which involves long-term monitoring of the existing wells and gravel pads.

We invite public comments on all aspects of this Draft EIS. The 45-day public comment period begins with publication of the Notice of Availability in the Federal Register on 18 November 2011. Comments on this Draft EIS must be received by close-of-business on 03 January 2012 to be considered and included in the public record. Paper written comments must also be postmarked by 03 January 2012. Instructions on how to submit comments, and a list of the locations, dates, and times of the open house/public meetings to be held in Alaska are provided at the end of this Executive Summary and on the EIS website at www.pointthomsonprojecteis.com. We would appreciate your comments on improving analyses, making corrections, or considering supplemental work you may recommend. Specific comments are requested so we better respond to them.

After the close of the Draft EIS public comment period, we will prepare a Final EIS in response to comments received. A permit decision will be made after the Final EIS has been published. At that time, we will prepare a Record of Decision to describe, in detail, our decision on the permit application.

The document presented here is the Executive Summary to the Draft EIS. In the back of this document are two compact discs which contain the full Draft EIS and appendices. The Draft EIS is also available for viewing and downloading on the EIS Web site under the "Documents" tab.

Questions can be addressed to Mr. Harry Baij at the letterhead address above, by e-mail at harry.a.baij@usace.army.mil, or by phone at 800-478-2712 (toll free), 907-753-2784 (office), or 907-350-5097 (cell phone). For further information on the Corps' Regulatory Program, visit our Alaska District website at www.poa.usace.army.mil/reg. A Public Notice of Application for Permit for the Point Thomson Project is posted on our website and also included in the Draft EIS as an appendix.

The Draft EIS has been widely distributed for public review and comment. It is also available at public libraries on Alaska's North Slope and elsewhere. We much appreciate the many efforts of several organizations and individuals who participated in production of this Draft EIS. We look forward to receiving your comments.

Sincerely,

H.Baij

Harry A. Baij Jr.
Project Manager

POINT THOMSON PROJECT EIS

Draft Environmental Impact Statement

To the Reader

This Executive Summary is intended to give the reader basic information about the Point Thomson Project while providing enough detail to understand the challenges and trade-offs that must be weighed. Decision makers will be choosing between denying this project and approving development in the Point Thomson area of the North Slope of Alaska. If the project is approved, a plan of development (action alternative) would be chosen.

To aid in the readability of this Executive Summary, the maps corresponding to the alternative descriptions have been grouped together and are located at the end of the alternative section.

This document is intended to provide the factors that differentiate the alternatives from one another. Further detail concerning the alternatives and their potential impacts may be found in the Draft Environmental Impact Statement which is contained on one of the two CDs found at the back of this document. The other CD holds the Appendices.

Lead Agency	U.S. Army Corps of Engineers
Cooperating Agencies	U.S. Environmental Protection Agency U.S. Fish and Wildlife Service State of Alaska, Department of Natural Resources
Project Location	Development site is located approximately 60 miles east of Prudhoe Bay on the North Slope of Alaska.
Direct Comments on this Draft EIS to	**Harry A. Baij, Jr.** *U.S. United States Army Corps of Engineers* *Alaska, Regulatory Division* P.O. Box 6898 JBER, AK 99506-0898 907.753.2784 Harry.A.Baij@usace.army.mil
Filed with EPA:	November 10, 2011
Comment Due Date:	January 3, 2012

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ES 1. | INTRODUCTION

The U.S. Army Corps of Engineers, Alaska District, Regulatory Division (Corps) received a draft permit application from the Exxon Mobil Corporation[1] (Applicant) on October 19, 2009 requesting authorization for the placement of fill material in waters of the United States, in connection with the Applicant's proposed Point Thomson Project. The Corps, as part of its permit review process, developed this Draft Environmental Impact Statement (EIS) in compliance with the National Environmental Policy Act (NEPA).

ES 1.1 | Background

Exploration in the Point Thomson area began in the winter of 1969/1970 with the drilling of the first exploration well. To date 21 exploratory wells have been drilled on and off shore in the general Point Thomson area, and several gravel structures remain in the area from those exploration activities.

In 2002, the U.S. Environmental Protection Agency (EPA) started a NEPA process in response to the Applicant's proposed oil and gas development plans for the Point Thomson area, located on the North Slope of Alaska 60 miles east of Prudhoe Bay on the Beaufort Sea coast (see **Figure ES-1**). At the time, the EPA was the lead federal agency because the development plans called for the potential designation of ocean-dredged material disposal sites, which would have required EPA authorization under Section 102 of the Marine Protection, Research, and Sanctuaries Act (MPRSA). Preparation of the EIS was discontinued before its completion at the request of the Applicant.

In 2006, the Alaska Department of Natural Resources (DNR) began an effort to terminate the Point Thomson Unit and leases, claiming the leaseholders had failed to drill, develop, and produce the Point Thomson Unit and leases in adequate time. Several years of appeals between the State of Alaska and the Point Thomson Unit Operator, Exxon Mobil Corporation, and working interest owners resulted in a court ruling that overturned the State's decision to revoke the Point Thomson Unit. The State of Alaska separately terminated the Point Thomson leases. The State issued a Conditional Interim Decision on January 27, 2009, reinstating two of the leases that were in dispute, pending new development at Point Thomson that would "provide for the drilling and producing from wells by 2014."

The Applicant's current development plan is substantially different from the 2002 plan,

[1] PTE Pipeline LLC was included as the Applicant with Exxon Mobil Corporation in the final permit application submitted to the Corps.

and would not be subject to Section 102 of the MPRSA. However, the current development plan would require authorization from the Corps to fill wetlands and waters of the U.S. under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. Therefore, the Corps is the lead federal agency for this Draft EIS and is conducting its review of the Department of the Army Permit Application concurrently with the NEPA process.

The EPA is a cooperating agency due to its role of oversight of many project-related actions pursuant to the Clean Water Act, the Clean Air Act, the Resource Conservation and Recovery Act, the Safe Drinking Water Act, and the Oil Pollution Act. The U.S. Fish and Wildlife Service (USFWS) is a cooperating agency because of its responsibilities regarding the Endangered Species Act and its interest in activities near the Arctic National Wildlife Refuge (Arctic Refuge), which is managed by the agency. The DNR is also a cooperating agency. It has authority over leases for the state lands where the Point Thomson Project is located and for approving state-required permits.

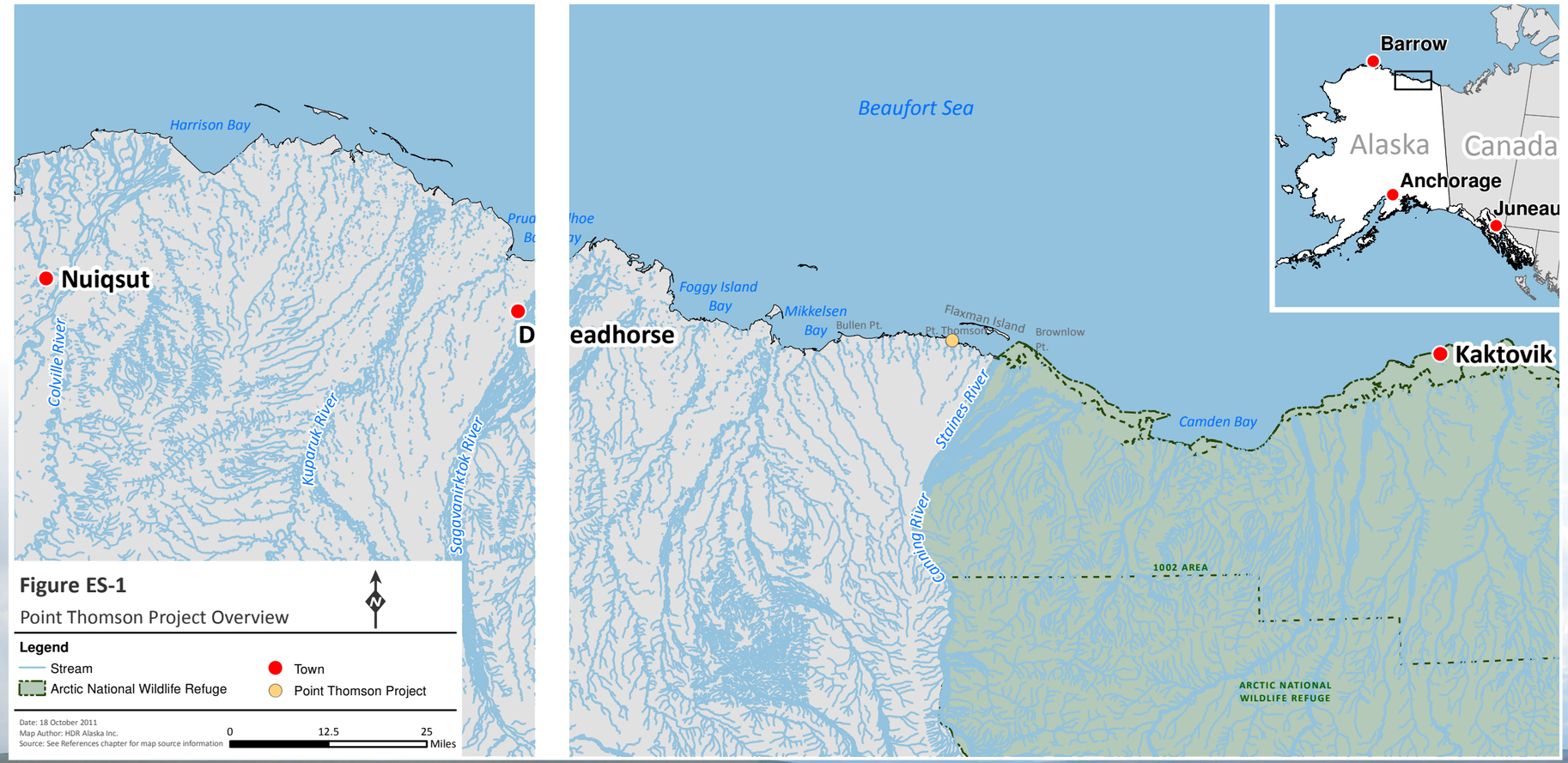
ES 1.2 | Project Overview

The proposed project involves development of hydrocarbon resources (gas condensate and possibly oil) from the Thomson Sand Reservoir in the Point Thomson area (see **Figure ES-1**). The project area is located on the northern edge of Alaska's Arctic Coastal Plain (ACP), 60 miles east of Deadhorse and Prudhoe Bay and 60 miles west of Kaktovik, on the coast of Lion Bay. It is named after a local geographic landform called Point Thomson.

Activities on the North Slope are shaped by the extreme conditions of the climate. The sun does not rise above the horizon for about two months in the winter, which leads to an average minimum winter temperature in the project area of -24°F. In summer, the continuous sunlight only results in an average maximum temperature of 55°F due to the latitude. The project area is covered with snow for about 8 months of the year; however, snow may fall at any time of the year.

The project area is defined to extend eastward from Deadhorse to the Staines River, and from the lagoon side of Flaxman Island along the Beaufort Sea coast to approximately 8 miles south of the coast line. Most of the Thomson Sand Reservoir is offshore under state coastal waters, while most of the proposed facilities would be located on land. The western boundary of the Arctic Refuge is approximately 2 miles from the easternmost extent of the proposed project. An export pipeline and transportation routes would extend from the Point Thomson facilities to existing facilities to the west.

Since the 1970s, hydrocarbons from the North Slope have contributed a substantial share of U.S. domestic production. Production at Point Thomson would help offset current declines in North Slope production and maintain efficiency of the Trans-Alaska Pipeline System (TAPS). The primary hydrocarbon resource at Point Thomson is natural gas and gas condensate from the Thomson Sand Reservoir; a thin oil rim may also be produced. Evaluating these hydrocarbon resources is part of the proposed action and would include identifying and assessing the location, size, and characteristics of the reservoir and the resources contained therein, as well as determining the commercial viability of producing those resources.



Spring in the project area

Short-term and long-term flow tests would be required to further define the formation fluids and their producing characteristics and to understand how the reservoir properties vary between wells.

There are several unique characteristics associated with the Point Thomson Project. These characteristics were considered by the Corps in the development of this Draft EIS, and in some cases also influenced the Applicant's design, construction, and operational plans for the project.

High-pressure Reservoir / The target reservoir for the Point Thomson Project is several thousand feet deeper and under much higher pressure than the other North Slope hydrocarbon reservoirs. To recover the gas condensate, the project would require specialized, high-pressure drilling and recovery techniques that have not been used on the North Slope. Hydrocarbons would be extracted under pressure and the liquid condensate removed as the pressure drops. The extracted gas would be repressurized and injected back into the reservoir to maintain the overall reservoir pressure. The amount of condensate that would ultimately be recovered would depend on the extent and connectivity of the underground reservoir.

Coastal Location / Because the majority of the Thomson Sand Reservoir is offshore, developing the project facilities offshore would maximize access to the reservoir. The possibility of offshore development was explored as a conceptual alternative during development of this Draft EIS, but was dismissed as a concept because of the added environmental risks in the arctic environment and the availability of technology, in the form of long-reach directional drilling, that would allow the Applicant to access a majority of the reservoir from onshore well pads, thereby avoiding the offshore impacts altogether.

The April 20, 2010 accident on the Deepwater Horizon drilling rig in the Gulf of Mexico, as well as the resulting investigations and findings, provided additional context of concern for this coastal project. The circumstances of the Deepwater Horizon accident were considered during the development of the alternatives and also helped shape the spill analysis within this Draft EIS.

Remote Location / Another unique characteristic of the project is the remote location of Point Thomson, which adds to the challenge of resource development. There are no pipelines or permanent roads leading to the project area to facilitate importing supplies and exporting product. The harsh climate, remote location, and challenges of building on tundra add to the complexity involved in tapping the Point Thomson Reservoir. The Point Thomson Project would be the first permanent oil and gas infrastructure in this remote region of the eastern North Slope, and would require an array of logistical solutions to safely and effectively develop the resource.

Proximity to Arctic Refuge / The Corps recognizes that development of Point Thomson, with its associated export pipeline and transportation infrastructure, would increase the possibility of other hydrocarbon developments near the Arctic Refuge boundary. The proposed development near the Arctic Refuge could spur debate and pressure on Congress to make a decision to either open the 1002 Area to oil and gas drilling or to formally include it in the Wilderness Preservation System. However, opening of the Arctic Refuge to oil and gas development is not considered reasonably foreseeable at this time and is not an issue addressed in this Draft EIS. Reasonably foreseeable future development on the North Slope, including the potential for the proposed project to open the way for further development near the Arctic Refuge, are addressed as part of the cumulative impacts assessment in this Draft EIS.

Future Gas Development / Future development in the project area is expected to include full field development of the Point Thomson Project itself. Full field development is defined in this document as the additional equipment, manpower, and infrastructure that would be needed beyond what is proposed in this Draft EIS to recover and produce additional hydrocarbon resources from the Thomson Sand Reservoir. These additional hydrocarbon resources include the natural gas to be cycled as part of the proposed project. The requirements for full field development cannot be accurately defined until further evaluation of the hydrocarbon resources within the Thomson Sand Reservoir have been completed under the proposed action. The full field development of Point Thomson is considered a reasonably foreseeable future action within the cumulative impacts assessment of this Draft EIS. In the future, this Draft EIS may serve as a foundational NEPA document for further development of the Point Thomson Project. For example, future project evaluations may tier from this document, or may use this document as a basis for a supplemental EIS.

ES 1.3 | Process

The Corps, as the lead federal agency, prepared this Draft EIS to evaluate and describe the environmental effects associated with the development activities as proposed by the Applicant during construction, drilling, and operation of the Point Thomson Project. The Corps is assisted by a team of independent third-party contractors led by HDR Alaska, Inc., working under the sole direction and guidance of the Corps. The EPA, the USFWS, and the DNR, are serving as cooperating agencies.

With the publication of this Draft EIS, the Corps seeks to inform federal, state,

1 The Corps will evaluate the Point Thomson Project to determine if it complies with the Section 404(b)(1) Guidelines (40 CFR 230.10). Steps A through D below describe "tests" that must be performed by the Corps.

A This is the first test in the Section 404(b)(1) Guidelines requires a full evaluation of the alternatives and requires that the Corps identify the least environmentally damaging practicable alternative (LEDPA). The development and evaluation of alternatives, as described in Chapter 2 of this Draft EIS, was structured to facilitate the Corps' determination of the LEDPA. It is important to note that while this specific requirement of the 404(b)(1) Guidelines is focused on protecting aquatic resources, it also requires that the Corps, when identifying the LEDPA, consider "other significant adverse environmental consequences."

B The second test requires the Corps determine that the project complies with certain federal laws concerning water quality, endangered species, and marine sanctuaries.

C The third test requires the Corps determine that the project does not cause or contribute to significant degradation to the waters of the United States.

D The fourth test in the Section 404(b)(1) Guidelines requires the Corps determine that appropriate and practicable steps have been taken that would minimize potential adverse impacts of the discharge on the aquatic ecosystem.

In reaching its decision on these four tests, the Corps will utilize the information contained in this Draft EIS to make factual determinations concerning the Project's impact on the physical, chemical, and biological components of the aquatic environment.

2 Within the Public Interest Review (33 CFR 320.4 (a)) the Corps must determine if the proposed Point Thomson Project is contrary or not contrary to the pubic interest. To do this, the Corps evaluates and balances the benefits and detriments of the project on relevant public interest factors, as disclosed in this Draft EIS. In addition, the Corps fully considers the public comments regarding the project's effects on the public interest factors.

3 The Corps' decision process must determine if the project is in compliance with various related federal laws and regulations. In evaluating a permit application, the Corps will fully consider a number of related federal laws, regulations, and Executive Orders (e.g., the Endangered Species Act, Section 401 of the Clean Water Act, and the National Historic Preservation Act). Most of the laws and regulations within this aspect of the permit process are discussed in this Draft EIS.

and local governments, decision makers, project stakeholders, and the public of the potential impacts associated with the proposed project. The Corps invites interested parties to comment on this Draft EIS.

As stated earlier, the Corps initiated the NEPA process as part of its permit review process. The Corps will evaluate comments received on this Draft EIS and comments received as part of the public notice review. As part of the review and consideration of the Point Thomson Project permit application, the Corps is required to consider the following:

1. **compliance with the Section 404(b)(1) Guidelines**
2. **the Public Interest Review, and**
3. **compliance with relevant federal laws and regulations.**

The Corps will make a decision on whether or not to issue a permit after the Final EIS has been issued. At that time, the Corps will prepare a Record of Decision (ROD) that will describe, in detail, the Corps' evaluation of the permit application. If the permit is granted, the ROD will also include any conditions attached to the Corps approval.

The Corps has structured this Draft EIS to support its public interest review, its determination of compliance with related federal laws, and its evaluations under the 404(b)(1) Guidelines. This Draft EIS helps document the actions that have been taken to avoid and minimize impacts for the NEPA compliance, 404(b)(1) Guidelines compliance, and the Public Interest Review.

NEPA calls for the identification of an environmentally preferred alternative as well as an agency preferred alternative. An environmentally preferred alternative has not been identified at this time. The Corps is accepting comments from the public and agencies regarding their views and supporting rationale in the selection of an environmentally preferred alternative. To maintain neutrality in the 404 permit process, the Corps does not identify an agency preferred alternative in this Draft EIS, nor will they in the Final EIS.

ES 1.4 | Scoping

The Corps developed plans early in the NEPA process to define how the public and agencies would be engaged to maximize their involvement. Scoping activities for the Point Thomson Project EIS were primarily focused on the communities of Kaktovik, Nuiqsut, Barrow, Anchorage, and Fairbanks. Approximately 80 people attended the 5 public scoping meetings in these communities (between January 11, 2010 and February 25, 2010). The Corps identified the villages of Kaktovik, Nuiqsut, and Barrow for scoping meetings because of the proximity to the proposed development area and potential for outreach to potentially impacted parties. Anchorage and Fairbanks were included because of the statewide interest in developing the project and potential indirect effects on these communities. The Corps also held separate scoping meetings for agencies with regulatory jurisdiction over land or development, or with a permitting nexus. Agency meetings were held in Barrow, Anchorage, and Fairbanks. A government-to-government teleconference was held with Tribal representatives from Kaktovik Village, the Native Village of Nuiqsut, the Native Village of Barrow Inupiat Traditional Government, and the Inupiat Community of the Arctic Slope.

During the formal scoping period, more than 300 issue-specific comments were identified in the communication received from the public and agencies. The comments highlighted concerns for what impacts could occur as a result of this project. Comments fell into the following general categories:

- Alternatives
- Environmental consequences
- Subsistence
- Erosion and coastal processes
- Noise and visual impacts
- Threatened and endangered species
- Water quality, hydrology, and drainage
- Cumulative impacts
- Archeological and historical resources
- Land use and ownership
- Transportation
- Environmental justice
- Human health impact
- Wilderness

The proximity of the project to the Arctic Refuge has been noted by the Corps as a concern by the public and agencies. The conflict between oil and gas development on the North Slope and the wilderness experience in and around the Arctic Refuge was at the root of many comments, as was the concern over possible impacts to subsistence traditions.

ES 2. | PROJECT PURPOSE AND NEED

For the purposes of satisfying requirements of NEPA, the Corps understands the purpose of the Applicant's proposed project is to produce liquid hydrocarbons from the Thomson Sand Reservoir and further evaluate and delineate the reservoir and evaluate the Brookian Group sandstones. The need for the proposed project is to provide for increased domestic hydrocarbon production.

The Corps' overall project purpose is used to define alternatives for evaluation in the Draft EIS and to determine the LEDPA under the Section 404(b)(1) guidelines. The Point Thomson Project's overall project purpose, as defined by the Corps, is to produce liquid hydrocarbons from the Thomson Sand Reservoir and further evaluate and delineate the reservoir and evaluate the Brookian Group sandstones.

ES 3. | ALTERNATIVES

Prior to developing the range of reasonable alternatives, nine alternative concepts (themes) and a number of component options for achieving the purpose of the project were initially considered. These concept themes and component options came from a variety of sources, including cooperating agencies' meetings and public comments. Also influencing the development of these concepts were challenges associated with construction on the North Slope, including extreme cold, seasonal access limitations, whaling season, and the fact that the North Slope is primarily wetlands. The concept themes and component options were initially screened based on their viability, which resulted in several themes and options being eliminated. Viability was defined as whether or not the theme or option was able to meet certain criteria. This included being responsive to the purpose and need, technological feasibility, general assessment of the concept/component's environmental risks, and allowing for full-field development.

The viability analysis resulted in carrying forward six alternatives (which also included several component options) as the full range of alternatives that met the stated purpose and need, and were responsive to the issues identified during the scoping process. The six viable alternatives were further developed and refined, adding more logistic and technological details. Alternatives that were not feasible or were conceptually redundant were eliminated from further consideration. An alternative was determined feasible if it satisfied the project purpose and was technologically feasible. The Corps conducted its feasibility analysis with substantial review and input from the cooperating agencies, as well as technical information requested from the Applicant. The feasibility analysis resulted in one of the six alternatives being eliminated because it wasn't sufficiently different from another of the alternatives. The five remaining alternatives were carried forward and analyzed in this Draft EIS. Through this comprehensive process, the Corps believes that it has captured all of the alternatives and components necessary to determine whether the Applicant's proposed project is the LEDPA.

The five reasonable alternatives assessed in this Draft EIS are:

- **Alternative A**: No Action
- **Alternative B**: Applicant's Proposed Action
- **Alternative C**: Inland Pads with Gravel Access Road
- **Alternative D**: Inland Pads with Seasonal Ice Access Road
- **Alternative E**: Coastal Pads with Seasonal Ice Roads

Maps corresponding to the reasonable alternatives are grouped together starting on page ES-26.

ES 3.1 | ALTERNATIVE A: No Action Alternative

The No Action Alternative is used as a benchmark for comparison of the environmental effects of the action alternatives.

Under the No Action Alternative, the Applicant would suspend project engineering and planning activities for the evaluation of hydrocarbon resources at Point Thomson. The No Action Alternative would result from the Corps not issuing a permit for gravel fill and other construction activities. Without a Corps permit, gravel could not be placed outside of the boundaries of existing pads and the existing pads are not large enough to support further reservoir evaluation; see **Figure ES-2** (on page ES-26). Two existing, drilled-and-capped production wells on the existing Central Pad (PTU-3) would continue to be monitored in accordance with Alaska Oil and Gas Conservation Commission (AOGCC) regulations and prudent operator practices until the time that they are closed or brought into production in a future project. The No Action Alternative would include personnel traveling to and within the project site by helicopter. The Applicant would continue to evaluate project components to determine how the project could be redesigned to make permitting possible, and would endeavor to maintain state oil and gas leases.

Existing capped wells at the Central Pad

ES 3.2 | COMMON COMPONENTS: to All Action Alternatives

While each action alternative is distinct, several components are common due to the use of standard North Slope construction and operational practices. Each of the action alternatives would enable the Applicant to delineate and produce hydrocarbon liquids (condensate and possible oil) from the Thomson Sand Reservoir and delineate other hydrocarbon resources at Point Thomson. All action alternatives would include the following common components associated with the exploration and recovery of hydrocarbon resources: gravel pads to support drilling and production operations; export and infield pipelines; gravel and/or ice roads and airstrips to support transportation needs; and waste disposal and support facilities.

ES 3.2.1 | Common Components: Production Pads

Each alternative has a unique configuration of pads for drilling and production. In general, each alternative incorporates a combination of a Central Well Pad, a Central Processing Facility (CPF), an East Well Pad, and a West Well Pad. The Central Pad is the largest in all the alternatives and would be the primary location for construction, drilling, and operations activities. Each alternative would have five wells capable of either production or injection. Additionally, one disposal well would be drilled at the CPF. Production and injection wells would be drilled using directional drilling techniques to reach the offshore reservoir. The East and West Pads would have wells that would be used initially to delineate and evaluate the reservoir, and to determine whether the rim of oil surrounding the gas reservoir would be viable for production.

ES 3.2.2 | Common Components: Pipelines

Each alternative would include a configuration of infield gathering lines to bring produced fluids from the well pads to the Central Processing Pad for processing. An export pipeline would then transport condensate to a common carrier export pipeline with a connection to TAPS at Prudhoe Bay for shipment to market. Pipelines would be elevated on vertical support members (VSMs) with a minimum 7-foot clearance between the bottom of the pipe and the tundra surface. The 7-foot clearance would allow free passage by wildlife and subsistence hunters on snow machines. Construction of pipelines would occur in the winter from ice roads. Pipeline stream crossings would be accommodated by adjusting the spacing of VSMs. Piping facilities associated with the export pipeline would include pig launchers/receivers, isolation valves, metering equipment, leak detection equipment, data acquisition equipment, and control/safety systems.

ES 3.2.3 | Common Components: Access and Transportation

During construction, personnel, equipment, and supplies would be transported to and within Point Thomson by air, land, and in some alternatives, sea. Each alternative would use a combination of tundra and/or sea ice roads, gravel roads and airstrips.

All alternatives include the construction of a gravel airstrip with an attached helipad. After completion, the gravel airstrip would provide the only year-round fixed-wing aircraft access to the Point Thomson area.

Gravel roads would cross creeks and small tundra streams with culverts or bridges. Bridges would be used to cross the larger drainages. Infield gravel roads would, wherever possible, be located a minimum of 500 feet from elevated pipelines to satisfy caribou migration guidelines. In order to build gravel roads, ice roads would be built along the proposed alignment and most gravel would be laid in the winter.

ES 3.2.4 | Common Components: Support Facilities

All alternatives would have similar support facilities that would include offices, warehouses and workshops, maintenance buildings, temporary and permanent personnel camps, treatment systems for drinking water and wastewater, waste management facilities, communication facilities, electric power generation and distribution facilities, and an emergency response boat launch ramp. Depending on the alternative, these facilities would be located in different locations and may be designed differently. Alternative-specific descriptions are discussed under each alternative.

ES 3.2.4.1 | Gravel Source

The primary source for gravel would be from a new gravel mine site. The location, layout, and size of the new mine would be determined by the gravel requirements of the alternative and from the analysis of core samples prior to construction. In most alternatives, the new gravel mine site would be rehabilitated, including replacement of the overburden and contouring to create stable side walls.

ES 3.2.4.2 | Water Needs and Sources

During construction, freshwater would be required for the construction and maintenance of ice roads and pads, the compaction of gravel for new gravel pads, dust suppression on gravel infrastructure, and camp use. Required freshwater would be supplied from existing, year-round

water sources located between Endicott and the Point Thomson area. Before water withdrawal would occur, permits would be obtained from DNR, Division of Mining, Land and Water. Drilling water needs include camp use and water used to create drilling fluids, or "muds" used to lubricate and cool the drill bit during drilling.

Operations water use would consist largely of camp water and routine maintenance activities such as dust suppression on gravel roads or the construction and maintenance of any operational ice roads. Water needs would fluctuate based on the level of activity in a particular year.

ES 3.2.5 | Common Components: Logistics

Logistics and sequencing varies by alternative, though each follows similar phasing of construction within the project. Construction of each action alternative would begin with mobilization using various modes of transportation for equipment, supplies, and personnel depending on the alternative. The construction phase would include gravel mining, infrastructure installation (roads, pads, airstrips, and pipelines), and facilities transport, installation and commissioning. The operations phase would begin as soon as the first wells are complete and sending condensate to the CPF. In each alternative, production would start while the final wells are being drilled.

The following descriptions of the action alternatives are generally organized and described first in terms of well and production pads, pipelines, access, and transportation, then support facilities and logistics. See **Table ES-1**, at the end of the alternative descriptions, for a detailed comparative summary of the components comprising each of the alternatives.

ES 3.3 | ALTERNATIVE B: Applicant's Proposed Action

Alternative B is the Applicant's Proposed Action and is characterized by three coastal gravel pads (Central, East, and West), two of which are expansions of existing gravel pads (PTU-3 and North Staines River State No. 1); see **Figure ES-3** and **Figure ES-4** (on page ES-28). This alternative would use marine transport for large facility modules.

ES 3.3.1 | Alternative B: Production Pads

The three coastal gravel pads would be connected by a network of gravel roads and infield gathering pipelines. Additional pads would include a small water source pad, a gravel mine stockpile pad, a storage pad, and auxiliary pads at Badami. The Central Pad would be located at the site of the existing PTU-3 gravel pad, and would co-locate the Central Well and the CPF. The East Pad would include and expand the existing North Staines River State No. 1 Pad. The West Pad would be located on an undeveloped site near the coastline west of the Central Pad.

ES 3.3.2 | Alternative B: Pipelines

The 23-mile export pipeline would be constructed from the Central Pad to connect to the existing common carrier pipeline at Badami. The proposed pipeline route from Point Thomson to Badami would be generally located more than a mile inland. Infield gathering pipelines would be constructed to deliver produced hydrocarbons from the East and West Pads to the CPF for processing. The proposed pipeline support design would be T-shaped, with one Horizontal Support Member (HSM) atop one VSM (see **Figure ES-5**).

ES 3.3.3 | Alternative B: Access and Transportation

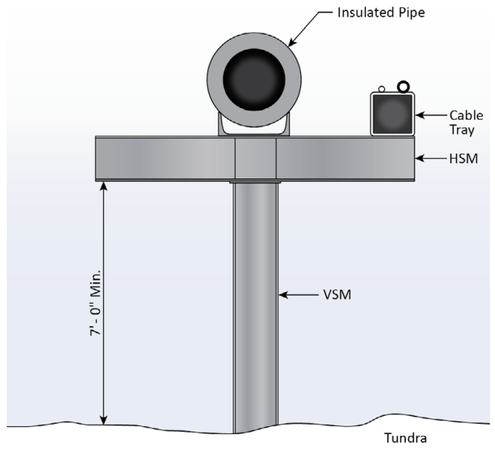
Alternative B would utilize seasonal and infield ice roads, marine transport by coastal and oceangoing (sealift) barges, air transport by helicopters and fixed-wing aircraft, and gravel roads. This alternative includes construction of a sealift facility and a service pier along the coast. Infield gravel roads would be constructed to connect the Central, East, and West Pads, airstrip, gravel mine and stockpile, and freshwater supply sources. During construction, there would be at least two primary seasonal ice roads and infield ice roads between the pads and water sources. During operations, an ice access road to the Point Thomson area would only be used on an as-needed basis which is estimated to be once every five years. A gravel airstrip would be constructed south of the Central Pad, approximately 3 miles inland from the coast.

The Applicant has voluntarily signed a Conflict Avoidance Agreement in which the Applicant agrees to avoid barging during the whaling season (generally from August 24 to September 23), to the greatest extent possible, in order to minimize potential impacts to subsistence hunting. When barging during the whaling season is needed, the Applicant will follow the protocols outlined in the Conflict Avoidance Agreement to avoid or minimize interactions with whaling vessels and whales.

ES 3.3.4 | Alternative B: Support Facilities

Most support facilities would be located at the Central Pad. In addition to the pads common to all action alternatives, Alternative B would require two small gravel pads at Badami. The first pad would be connected to the existing Badami pad by a short gravel road. A second pad to facilitate ice road crossing of the export pipeline would be located south of the

Figure ES-5: T-shaped Pipeline Support Structure



Not to scale

C-1 Mine site reservoir

Badami Main Pad. These pads and connector road would constitute less than 1 acre.

Temporary camps may be located at the East and West Pads during drilling. Ice pads would also be used to support construction works in Alternative B. Mobile construction camps would be located on ice pads until gravel pads become usable.

An injection well for waste disposal would be located on the Central Pad. Materials that could not be injected or burned would be stored until they could be shipped to Deadhorse for disposal.

*ES 3.3.4.1 | **Alternative B:** Gravel Sources*

Most gravel for Alternative B would come from the new gravel mine site located approximately 2 miles south of the Central Pad and just north and east of the proposed airstrip. After the gravel has been mined (two winter seasons); overburden would be replaced and the area contoured.

*ES 3.3.4.2 | **Alternative B:** Water Needs and Sources*

Freshwater would be required for the construction of ice roads and pads, camp operations, and drilling and would be trucked from permitted water sources. Freshwater for camp use during construction, drilling, and operations would be transported from the existing C-1 mine site reservoir by truck. The C-1 mine site reservoir would continue to be the primary water source during operations.

ES 3.3.5 | Alternative B: Logistics

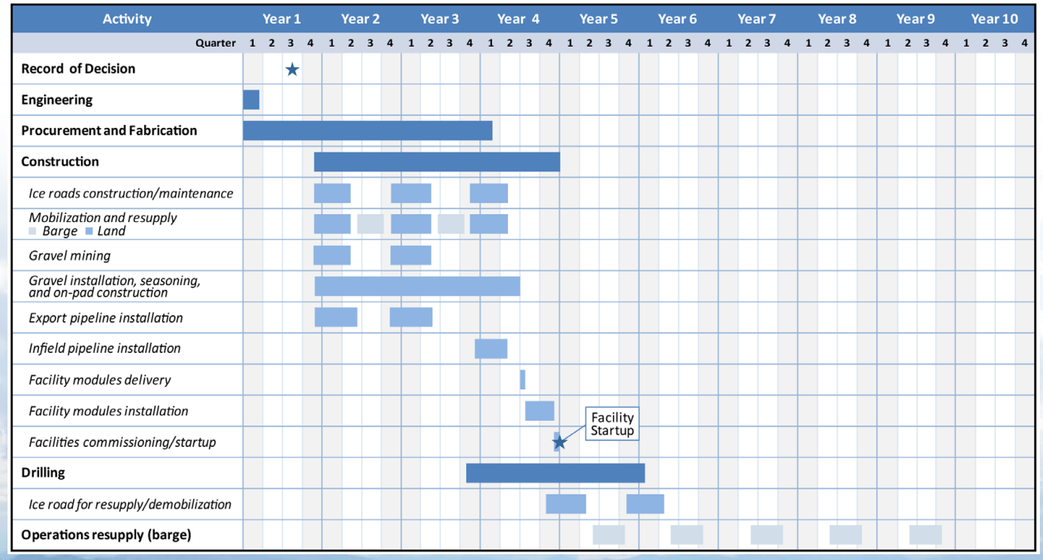
Under this alternative, ice roads would be constructed between the Endicott Spur Road and Point Thomson to facilitate the construction of the export pipeline and movement of pioneer camp modules, equipment, and supplies. Once constructed, the sealift facility and service pier would be used for importing and exporting supplies and the gravel airstrip would provide year-round access.

Aerial view of tundra polygons

Helicopters from Deadhorse would provide access for personnel when other modes were not available. Air travel would be dependant on weather which can change very quickly on the North Slope. Busing on the ice roads would transport personnel from late January to mid-April during years that an ice road would be built.

Construction, drilling and operation phases would overlap. See **Figure ES-6** for a step plan of activities. Startup of production would occur at the end of Year 4 with drilling continuing into Year 6.

Figure ES-6: Alternative B–Logistics Plan



ES 3.4 | ALTERNATIVE C: Inland Pads with Gravel Access Road

Alternative C was developed to minimize impacts to coastal resources to the extent possible by locating project components inland from the coastline and reducing coastal access to the Point Thomson site. The alternative is composed of four gravel pads (a Central Processing Pad 2 miles inland, East and West Pads both one-half mile inland, and a Central Well Pad at the existing PTU-3 pad) and a gravel access road between Point Thomson and the Endicott Spur Road in lieu of constructing a coastal barge facility at Point Thomson (see **Figure ES-7** and **Figure ES-8,** on page ES-32). The gravel access road would allow year-round access to Point Thomson and would remove direct marine transport; however, it would not be built in time to facilitate construction and drilling. This alternative also attempts to minimize

impacts to hydraulic connectivity by moving linear facilities further inland and orienting infield gravel roads in a north-south alignment, the area's predominant hydraulic gradient.

ES 3.4.1 | Alternative C: Production Pads

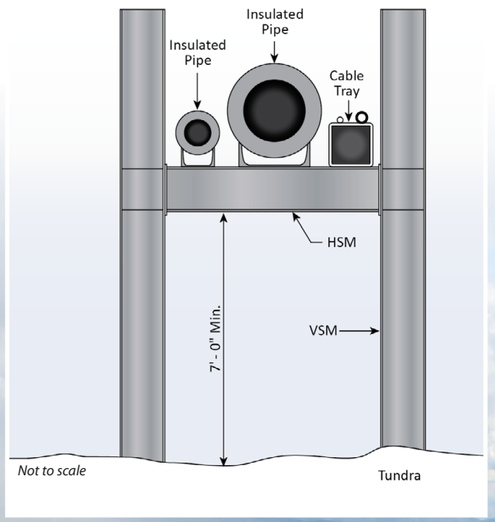
The four gravel pads would be connected by a network of gravel roads and infield gathering pipelines. Additional pads would include a small water source pad and a gravel mine stockpile pad. The Central Processing Pad would be located 2 miles inland, southwest of the Central Well Pad. The Central Well Pad would be located near the coast and would be an expansion of the existing PTU-3 gravel pad. The Central Well Pad would contain the drilling and well infrastructure and an emergency boat launch. The East Pad would be located approximately 4.5 miles east of the Central Processing Pad and about one-half mile inland from the coastline and the North Staines River State No. 1 Pad. The West Pad would be located a little more that 3 miles west of the Central Processing Pad, and about one-half mile inland. The East, West, and Central Processing Pads would be located on previously undeveloped sites.

ES 3.4.2 | Alternative C: Pipelines

A 51-mile export pipeline would be constructed from the Central Pad to connect to the existing Endicott common carrier pipeline. The proposed pipeline route from Point Thomson to Endicott would be 500 feet south of and parallel to the gravel access road. Infield gathering pipelines would be constructed to deliver produced hydrocarbons from the Central Well, East, and West Pads to the CPF for processing. The support members for the production pipeline and injection flow line for Alternative C would be H-shaped (see **Figure ES-9**), with two parallel VSMs and an HSM spanning the distance between them. Similar to T-shaped pipeline support structures, the H-shaped support structures would have a minimum 7-foot clearance to allow caribou passage. An injection pipeline would run between the CPF and the Central Well Pad using the same VSMs as the gathering line.

The infield water pipeline to convey freshwater for operations would be constructed aboveground on timber supports to raise the pipes 12 inches off the ground. The total height would be approximately 24 inches tall. The water line would generally following the infield road from the C-1 mine reservoir to the Central Processing Pad. It would not go to the well pads.

Figure ES-9: H-shaped Pipeline Support Structure



ES 3.4.3 | Alternative C: Access and Transportation

Alternative C relies on ice roads, gravel roads, and aircraft. The existing coastal barging access would cease and no barge facilities would be constructed at Point Thomson. Within Point Thomson, the infield gravel road network would be the primary way for personnel, materials, and equipment to travel. Modules/equipment would be staged in Deadhorse awaiting ice road opening. While Alternative C does not include barge transportation to Point Thomson, modules would be transported from their fabrication site to Prudhoe Bay via sealift barge. Prudhoe Bay infrastructure would need to be evaluated and may require upgrades to accommodate the landing of sealift barges. Studies would have to be completed to determine the maximum size modules that the roads and bridges in the Deadhorse area could support. Either the modules would have to be designed to meet the road/bridge specifications or the roads and bridges would need to be upgraded, depending on the results of the studies.

A gravel access road would be constructed to provide access to and from Point Thomson during operations. This road would be located inland between 3 and 8 miles south of the coastline, beginning at the Endicott Spur Road south of the Badami common carrier pipeline, and continue eastward to Point Thomson. The gravel access road would generally be located approximately 500 feet to the north of the export pipeline. A tundra ice road would be built to support the construction of the gravel road. Another tundra ice road would be constructed for VSM and export pipeline construction. A third tundra ice road would be built parallel to the pipeline ice road. This ice road would be used for transporting materials, supplies, and modules to and from Point Thomson. Perpendicular ice roads would be built between the pipeline and transport ice roads so that trucks would be able to maneuver around slow moving modules. Other ice roads would be built for construction as well as on an as-needed basis during operations.

Winter sunset over the tundra

A gravel airstrip would be constructed in the location of the abandoned West Staines gravel airstrip, which would also be incorporated into the new gravel access road alignment. The new airstrip would accommodate a C-130 cargo plane.

Infield gravel roads would be constructed to connect the Central, East, and West Pads to the CPF, airstrip, gravel mine and stockpile, and freshwater supply sources. Infield gravel roads would be oriented north-south and located a minimum of 500 feet from elevated pipelines, where possible.

ES 3.4.4 | Alternative C: Support Facilities

There would be about 3 years of construction activities occurring before the gravel access road would be ready for use. Until that time, supplies, including the annual fuel supply, would need to be delivered to Point Thomson by ice road for construction and drilling. Because of the lack of summer access to Point Thomson, fuel and other supplies would have to be brought in while the ice access roads are available and stockpiled at the Central Processing Pad.

An injection well for waste disposal would be located on the Central Processing Pad. Materials that could not be injected or burned would be stored until they could be shipped to Deadhorse for disposal.

Alternative C would require additional gravel storage pads, including gravel storage pads at each mine site along the gravel access road, a gravel pad at the C-1 mine site reservoir, and a new gravel pad at Deadhorse for module storage. Ice pads would also be used to support construction works. Mobile construction camps would be located on ice pads until gravel pads became usable.

ES 3.4.4.1 | Alternative C: Gravel Sources

Gravel for pads would come from the new gravel mine site located near the proposed Central Processing Pad. Construction of the gravel access road would require up to 5 additional gravel mines, sited approximately every 10 miles along the proposed road corridor.

ES 3.4.4.2 | Alternative C: Water Needs and Sources

During construction, freshwater would be transported from the C-1 mine site reservoir by truck and stored in onsite tanks. Once construction is complete, water would be delivered to the Central Processing Pad via an elevated pipeline. Water needed at the well pads would be delivered by truck and stored in onsite tanks.

ES 3.4.5 | Alternative C: Logistics

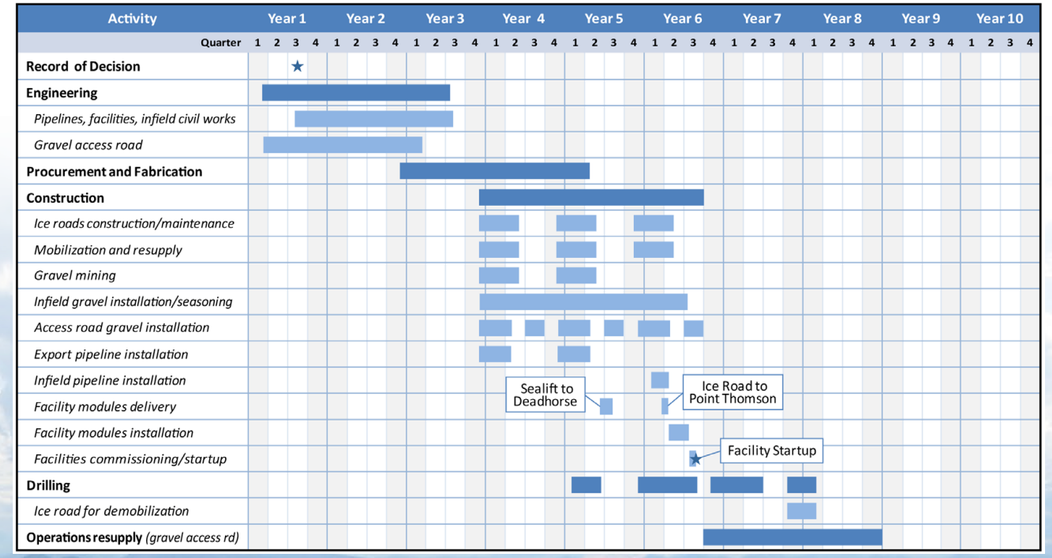
The key logistics feature of Alternative C would be the first 3 years of engineering design and procurement of materials that would occur after the ROD.

- Construction would begin late in Year 3. The gravel access road would not be available for use until late in Year 6. Prior to that time all supplies and personnel would be transported to Point Thomson via air (helicopter or fixed-wing) or over ice road.
- During the first construction season (Year 3/Year 4), the primary means of transporting personnel would be by helicopter from Deadhorse, supplemented by crew busses on the ice access road from late January to mid-April. After the gravel airstrip was completed in late Year 4, personnel transfer would take place primarily by fixed-wing aircraft from Anchorage or Fairbanks for the remainder of construction.
- All sealift modules and some truckable modules would have to be delivered to Deadhorse during open water season of Year 5, staged for 6 to 9 months, and then transported during the following ice road season in Year 6.
- See **Figure ES-10** for a step plan of activities. Startup of production would occur in Year 6 with drilling continuing into Year 8.
- Before the opening of the gravel access road, enough fuel and supplies would have to be trucked in during the ice road use window to last throughout the rest of the year.

ES 3.5 | ALTERNATIVE D: Inland Pads with Seasonal Ice Access Road

Alternative D was developed to minimize impacts to coastal resources to the extent possible by locating project components inland from the coastline and reducing coastal access to the Point Thomson site. The alternative is composed of the same four gravel pads as described in Alternative C, but the tundra ice road would run east from the Endicott Spur Road to the northern end of the Point Thomson Project area (see **Figure ES-11** and **Figure ES-12,** on page ES-36). The alternative also attempts to minimize impacts to hydraulic connectivity, as in Alternative C, by aligning most infield gravel roads in a north-south orientation.

Figure ES-10: Alternative C–Logistics Plan



ES 3.5.1 | Alternative D: Production Pads

Alternative D would locate drilling and production facilities onto four gravel pads, similar to Alternative C. The well pads would be connected by a network of gravel roads and infield gathering pipelines. The Central Well Pad would be located near the coast at the site of the existing PTU-3 gravel pad, while the Central Processing Pad would be located approximately 2 miles inland. Because of the seasonal nature of ice road-only access to Point Thomson, additional storage would be needed through operations as compared with other alternatives. The East Pad would be located a little over 3 miles east of the Central Processing Pad and about one-half mile inland from the coastline and the existing North Staines River State No. 1 Pad. The West Pad would be located about 5 miles west of the Central Processing Pad and about one-half mile inland. Both the East and West Pads would be located on undeveloped sites.

ES 3.5.2 | Alternative D: Pipelines

The infield gathering pipelines, production lines, injection flow lines and their supports would be the same as in Alternative C. Infield gathering pipelines would be constructed to deliver produced hydrocarbons from the Central, East, and West Pads to the CPF for processing. The 23-mile export pipeline would be constructed from the Central Pad to connect to the existing common carrier pipeline at Badami. The proposed pipeline route from Point Thomson to Badami would generally be located more than 4 miles inland.

ES 3.5.3 | Alternative D: Access and Transportation

Alternative D would utilize infield ice roads, marine transport by sealift barges to Prudhoe Bay, air transport by helicopters and fixed-wing aircraft, and infield gravel roads. Large modules would be brought to Point Thomson by ice road from the Endicott Spur. The ice road and aircraft would be the primary way to transport materials, equipment, and personnel to and from Point Thomson. Within Point Thomson the infield gravel road network would be used for transport. While Alternative D does not include barge transportation to Point Thomson, modules would be transported from their fabrication site to Prudhoe Bay via sealift barge. Prudhoe Bay infrastructure would need to be evaluated to ensure that roads and bridges would be able to support Point Thomson modules, or modules would need to be sized to be able to travel over existing roads and bridges.

Tundra ice roads would be the primary access to Point Thomson during construction, drilling, and operations. During construction, up to three seasonal tundra ice roads may be constructed in one winter from the Endicott Spur to Point Thomson. The Applicant may construct a sea ice road instead of or in addition to the tundra ice road to maximize the ice road season during any or all years of construction. After completion of construction, a single ice access road would be built annually between the Endicott Spur Road and Point Thomson for annual resupply of fuel and consumables, as well as personnel transport.

A gravel airstrip would be constructed south of the Central Pad, approximately 3 miles inland from the coast, located northeast of the former West Staines gravel airstrip. A tundra ice airstrip would be built as needed in years prior to the gravel airstrip being available.

Infield gravel roads would be constructed to connect the Central, East, and West Pads, airstrip, gravel mine and stockpile, and freshwater supply sources. The infield gravel roads would be aligned in a north-south orientation to minimize impedance of water flow. Infield gravel roads would, wherever possible, be located a minimum of 500 feet from elevated pipelines.

ES 3.5.4 | Alternative D: Support Facilities

Like Alternative C, Alternative D would have limited access to Point Thomson. Supplies would have to be delivered by air or annual ice road. Fuel and other supplies would have to be stockpiled at the Central Processing Pad because of the lack of summer access. Unlike Alternative C, the access limitation would last the life of the project.

In addition to those pads common to all action alternatives, Alternative D would require a gravel storage area at the existing C-1 storage pad, a water source access pad, as well as auxiliary pads at Badami and a module staging pad at Deadhorse. Ice pads would also be used to support construction works in Alternative D. Mobile construction camps would be located on ice pads until gravel pads became usable.

Additional pads would include infield nondrilling or production pads, including a small water source pad, a gravel mine stockpile pad, and the C-1 storage pad.

An injection well for waste disposal would be located on the Central Processing Pad. Materials that could not be injected or burned would be stored until it could be shipped to Deadhorse for disposal.

Central Pad activity, open water season 2010

ES 3.5.4.1 | Alternative D: Gravel Source

Most gravel for Alternative D would come from the new gravel mine site located approximately 2 miles south of the Central Pad, near the proposed Central Processing Pad. The gravel mine for Alternative D would be larger than in Alternative B. After completion of mining activity, the gravel mine site would be rehabilitated and used as a freshwater reservoir.

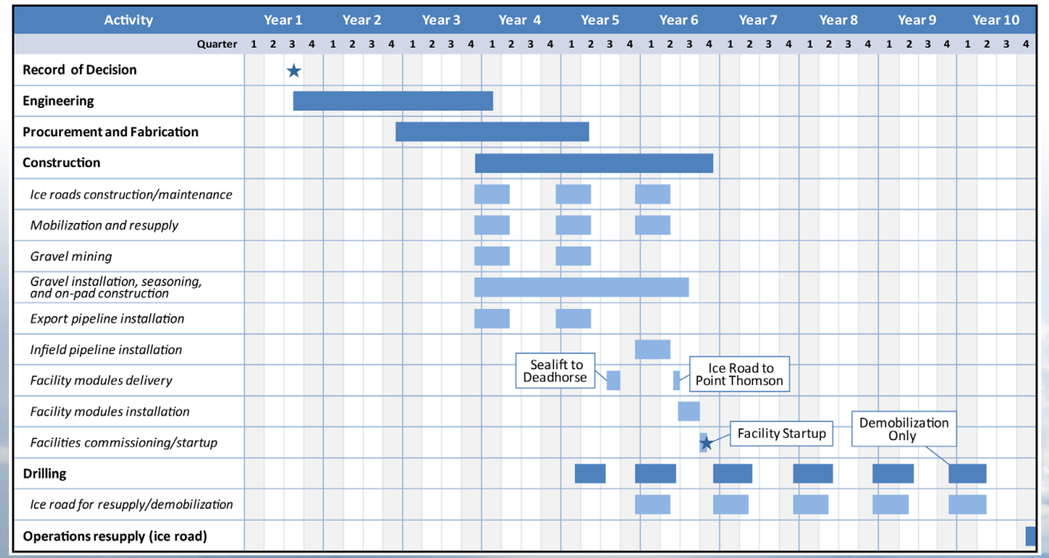
ES 3.5.4.2 | Alternative D: Water Needs & Resources

Freshwater for camp use during construction would be transported by truck from the C-1 mine site reservoir. Freshwater for operations would be transported by an insulated water line that would be buried within the gravel of the road between the new mine site reservoir and the Central Processing Pad. Water tanks for drilling activities on the well pads would be refilled by truck from either permitted surface water or the new mine reservoir. After completion of mining activity, the gravel mine site would be rehabilitated, and used as the primary reservoir. To recharge the reservoir, an inlet structure would be constructed to divert water from an adjacent stream during peak discharges. The C-1 mine site reservoir could serve as a secondary water source.

ES 3.5.5 | Alternative D: Logistics

The logistics for Alternative D would be similar to those described in Alternative C, though Alternative D would use an annual ice access road to resupply its drilling and operations activities each year. Construction would begin at the end of Year 3, startup of production would occur towards the end of Year 6 and drilling would continue into Year 9 with the rig being demobilized via ice road in early Year 10. See **Figure ES-13** for the step plan of activities.

Figure ES-13 Alternative D–Logistics Plan



ES 3.6 | ALTERNATIVE E: Coastal Pads with Seasonal Ice Road

Alternative E was developed to reduce impacts to wetlands and surrounding water resources by minimizing the development footprint. To achieve this, this alternative would reduce the amount of gravel fill needed for some of the project components (see **Figure ES-14** and **Figure ES-15,** on page ES-40). During drilling, the gravel well pad footprints would be expanded by multiyear ice pads to support all the necessary equipment. Over the long term during operations, the ice pad footprint would be removed and only the gravel fill would remain. The gravel footprint would also be reduced by the use of ice roads in much of the infield road system.

ES 3.6.1 | Alternative E: Production Pads

Similar to Alternative B, Alternative E would locate the drilling and production facilities onto a three-pad configuration that would consist of an enlarged Central Pad (Central Well/Central Processing Pad) and two other ice-gravel combination pads (the East and West Pads). The Central Pad would be located on an expanded version of the PTU-3 gravel pad. The gravel footprint of the East and West Pads would allow for adequate pad space for operations and would be supplemented with a multiseason ice pad extension during the drilling phase. The Central Pad would be larger under this alternative to provide more storage and additional support space to compensate for the smaller gravel footprint of and limited access to the East and West Pads. The East Pad would encompass the existing North Staines River No. 1 Pad, while the West Pad would be located on an undeveloped site near the coastline at the same location as Alternative B. Access to the East and West Pads would either be by ice road in the winter or helicopter year-round.

ES 3.6.2 | Alternative E: Pipelines

The 22-mile export pipeline would be similar to Alternative B. The pipeline route would be generally located between 1 and 2 miles from the coastline. An ice road would be built and used to construct the export pipeline. Infield pipelines would be constructed to deliver the produced hydrocarbons from the East and West Pads to the CPF.

An infield water pipeline to supply freshwater during operations would be constructed on VSMs between the C-1 mine site reservoir and the operations camp.

ES 3.6.3 | Alternative E: Access and Transportation

All modes of transport would be used for this alternative. Barges would bring modules and equipment. Supplies would be transported either by barge or over ice roads. Personnel would be flown in and out of Point Thomson and would travel between pads by helicopter when ice roads are not available. The only infield gravel road would run south from the Central Pad to the airstrip, the C-1 storage pad, and C-1 mine site reservoir.

Ice roads are essential to Alternative E. As stated above, the only gravel road would be an infield road running south from the Central Pad. All other

roads would be seasonal ice roads. Road access to the East and West Pads would be by seasonal ice roads throughout the life of the project.
For construction, tundra ice access roads and/or a sea ice access road would be constructed seasonally to bring supplies and equipment and to facilitate the building of the export pipeline. During operations, an ice access road to Point Thomson would only be constructed on an as-needed basis which is estimated to be once every five years.

Under Alternative E, as in Alternative B, both coastal and sealift barging would be used to transport supplies and modules. Equipment barged to Point Thomson and meant for the East or West Pad would be stored at the Central Pad until infield ice roads could be built.

Alternative E would include a shorter gravel airstrip than the other alternatives. The shorter airstrip would prevent the use of a C-130 cargo plane, which could limit the ability of the project to bring in large equipment by air. The airstrip would be constructed south of the Central Pad, approximately 2 miles inland from the coast. A seasonal full length sea ice airstrip would be constructed initially until the gravel airstrip is useable. The Central, East and West Pads would also include a helipad and associated support systems, because access to the East and West pads during the summer would primarily be by helicopter, though occasionally by tundra-safe, low ground-pressure vehicles.

ES 3.6.4 | Alternative E: Support Facilities

Most support facilities would be located at the Central Pad, and would include stockpiling areas to accommodate materials transported by barge in the summer.
An injection well for waste disposal would be located on the Central Pad. Materials that could not be injected or burned would be stored until it could be shipped to Deadhorse for disposal.

Development of other gravel pads would include a gravel storage pad, the existing C-1 storage, and a water source access pad. Two small gravel pads would also be required at Badami.

ES 3.6.4.1 | Alternative E: Gravel Sources

Gravel for Alternative E would come from the new gravel mine site located approximately 2 miles south of the Central Pad and just north and east of the proposed airstrip. After completion of mining activity, overburden would be placed back in the mine and contoured.

ES 3.6.4.2 | Alternative E: Water Needs and Sources

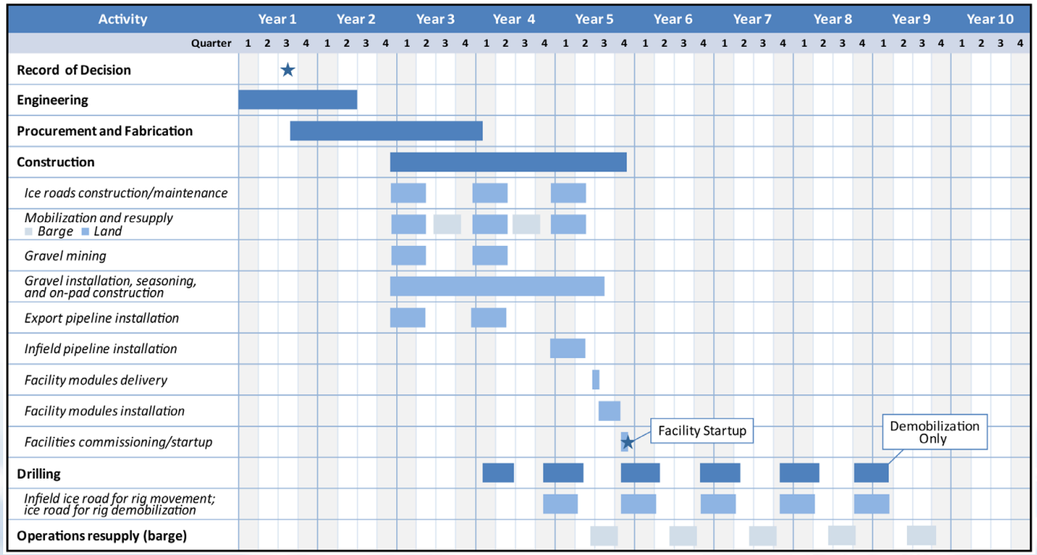
Freshwater for camp use during construction, drilling, and operations would be transported from the C-1 mine site reservoir by truck, and the C-1 mine site reservoir would be the primary water source for all activities during operations. The rehabilitated Point Thomson gravel mine would be available as a secondary water source.

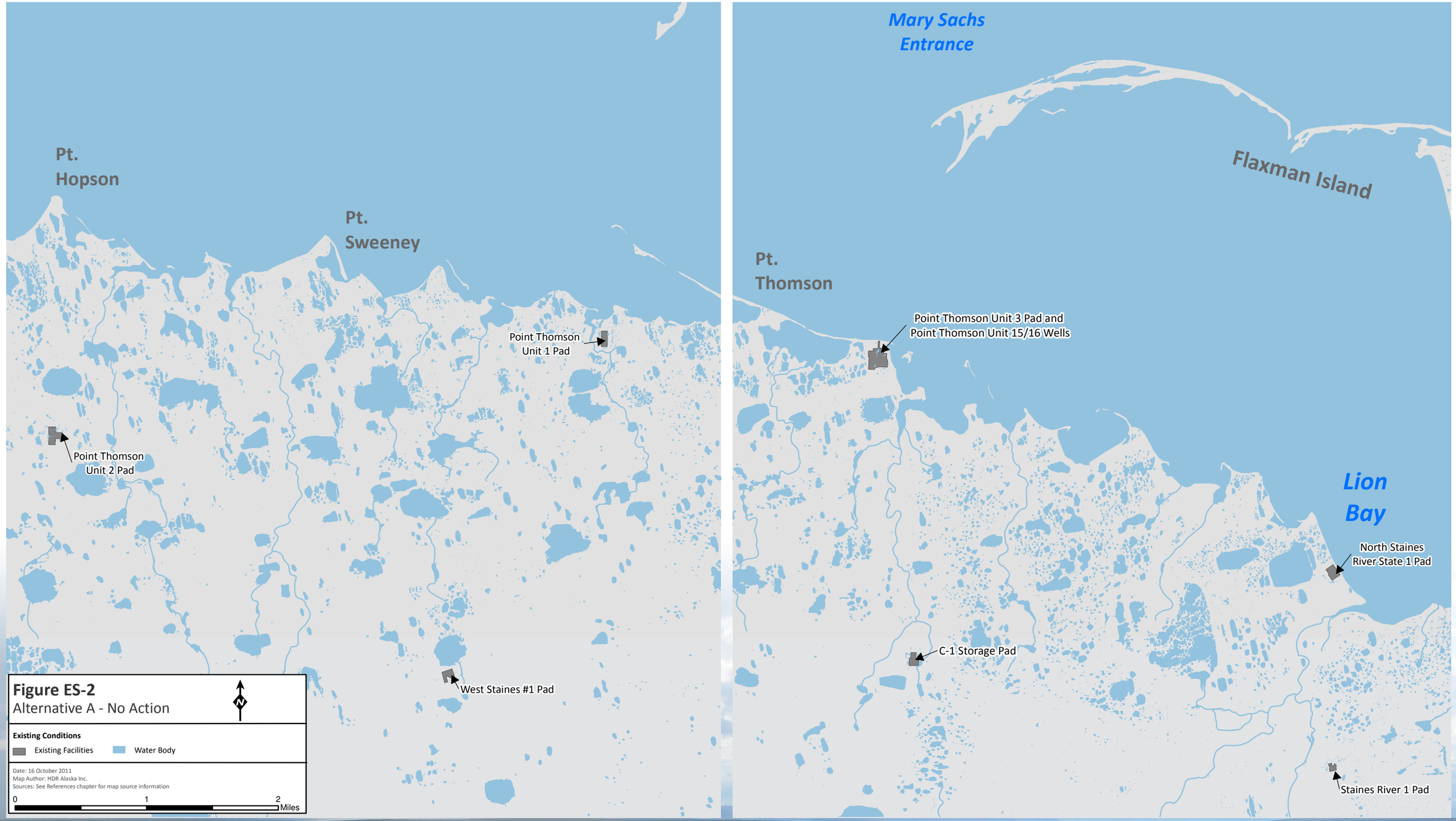
ES 3.6.5 | Alternative E: Logistics

Logistics of Alternative E would be similar to those described in Alternative B. After the ROD, engineering would occur for a year prior to the start of construction at the end of Year 2. Additional logistical challenges would be posed by the use of infield ice infrastructure. Because of the lack of access to the East and West Pads throughout much of the year, additional storage and safety modules would need to be constructed.

Startup of production would occur at the end of Year 5 with drilling continuing into Year 8 due to the difficulty of moving the drill rig between pads only during ice road availability. The drill rig would be demobilized at the beginning of Year 9. See **Figure ES-16** for the step plan of activities.

Figure ES-16: Alternative E–Logistics Plan




Pt.
Hopson
Pt.
Sweeney
Point Thomson
Unit 1 Pad
Point Thomson
Unit 2 Pad
West Staines #1 Pad
Mary Sachs
Entrance
Flaxman Island
Pt.
Thomson
Point Thomson Unit 3 Pad and
Point Thomson Unit 15/16 Wells
Lion
Bay
North Staines
River State 1 Pad
C-1 Storage Pad
Staines River 1 Pad
Figure ES-2
Alternative A - No Action
N
Existing Conditions
Existing Facilities
Water Body
Date: 16 October 2011
Map Author: HDR Alaska Inc.
Sources: See References chapter for map source information
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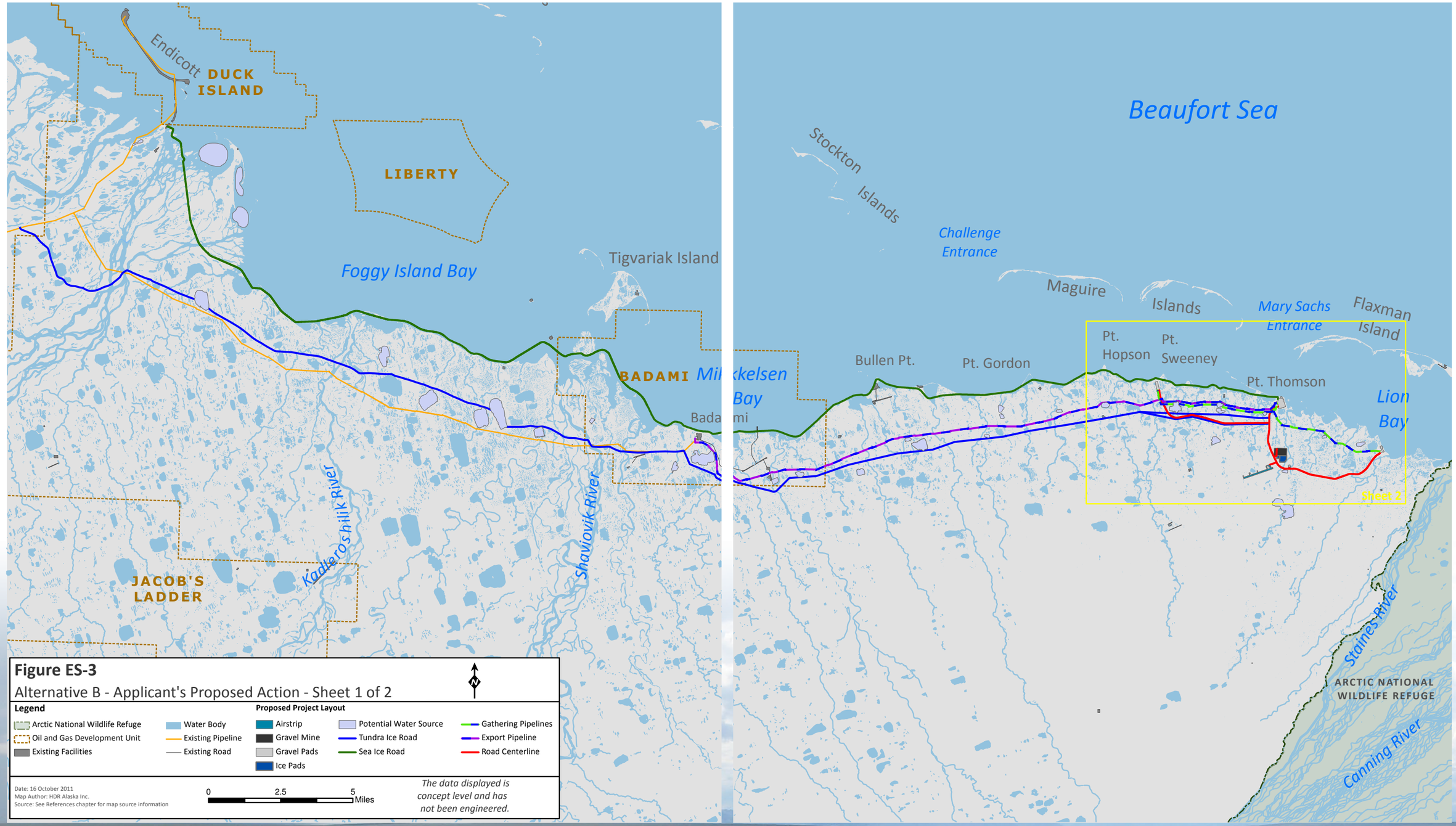
1
2
Miles


Endicott
DUCK ISLAND
LIBERTY
Foggy Island Bay
Tigvariak Island
BADAMI
Badami
Kadleroshilik River
Shaviovik River
JACOB'S LADDER
Beaufort Sea
Stockton Islands
Challenge Entrance
Maguire Islands
Mary Sachs Entrance
Flaxman Island
Bullen Pt.
Pt. Gordon
Pt. Hopson
Pt. Sweeney
Pt. Thomson
Lion Bay
Sheet 2
Staines River
ARCTIC NATIONAL WILDLIFE REFUGE
Canning River
Figure ES-3
Alternative B - Applicant's Proposed Action - Sheet 1 of 2
N
Legend
Arctic National Wildlife Refuge
Oil and Gas Development Unit
Existing Facilities
Water Body
Existing Pipeline
Existing Road
Proposed Project Layout
Airstrip
Gravel Mine
Gravel Pads
Ice Pads
Potential Water Source
Tundra Ice Road
Sea Ice Road
Gathering Pipelines
Export Pipeline
Road Centerline
Date: 16 October 2011
Map Author: HDR Alaska Inc.
Source: See References chapter for map source information
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2.5
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Miles
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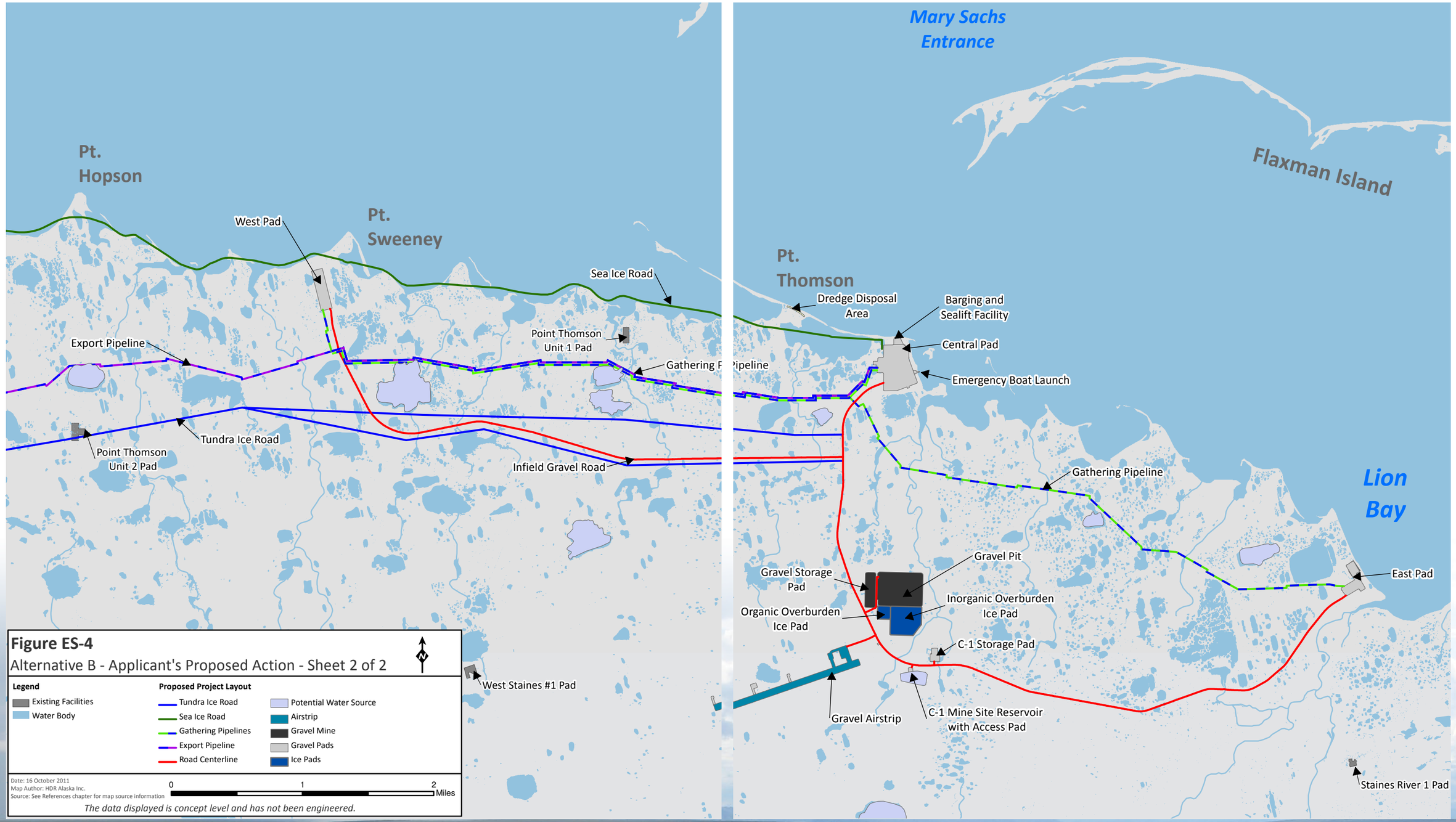
Pt.
Hopson
Pt.
Sweeney
West Pad
Sea Ice Road
Export Pipeline
Point Thomson
Unit 1 Pad
Gathering P
Tundra Ice Road
Point Thomson
Unit 2 Pad
Infield Gravel Road
West Staines #1 Pad
Mary Sachs
Entrance
Flaxman Island
Pt.
Thomson
Dredge Disposal
Area
Barging and
Sealift Facility
Central Pad
Emergency Boat Launch
ipeline
Gathering Pipeline
Lion
Bay
Gravel Pit
Gravel Storage
Pad
East Pad
Inorganic Overburden
Ice Pad
Organic Overburden
Ice Pad
C-1 Storage Pad
Gravel Airstrip
C-1 Mine Site Reservoir
with Access Pad
Staines River 1 Pad
Figure ES-4
Alternative B - Applicant's Proposed Action - Sheet 2 of 2
N
Legend
Existing Facilities
Water Body
Proposed Project Layout
Tundra Ice Road
Sea Ice Road
Gathering Pipelines
Export Pipeline
Road Centerline
Potential Water Source
Airstrip
Gravel Mine
Gravel Pads
Ice Pads
Date: 16 October 2011
Map Author: HDR Alaska Inc.
Source: See References chapter for map source information
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2
Miles
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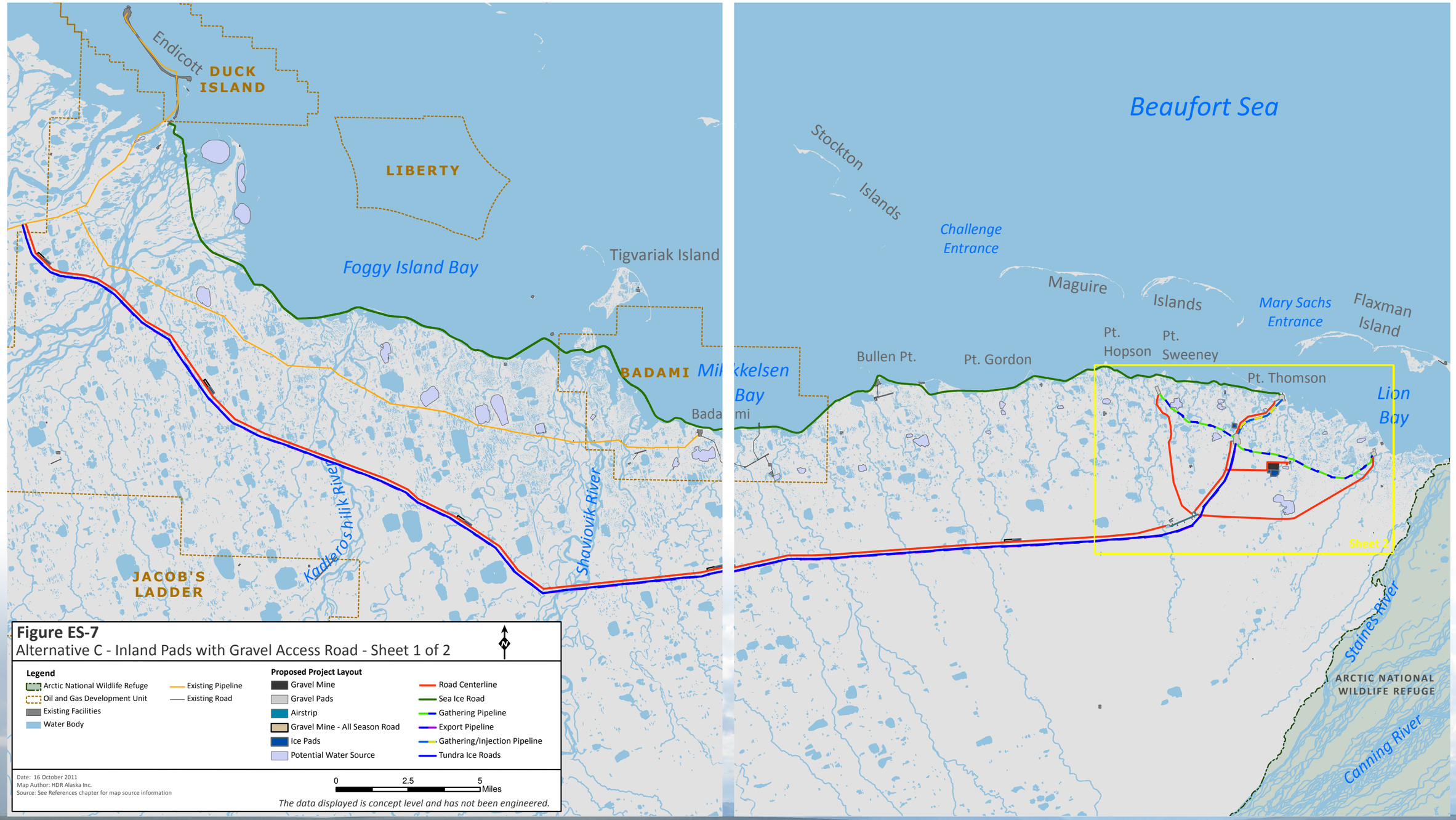
Endicott
DUCK ISLAND
LIBERTY
Foggy Island Bay
Tigvariak Island
BADAMI
Bada
Kadleroshilik River
Shaviovik River
JACOB'S LADDER
Beaufort Sea
Stockton Islands
Challenge Entrance
Maguire Islands
Mary Sachs Entrance
Flaxman Island
Bullen Pt.
Pt. Gordon
Pt. Hopson
Pt. Sweeney
Pt. Thomson
Lion Bay
Sheet 2
Staines River
ARCTIC NATIONAL WILDLIFE REFUGE
Canning River
Figure ES-7
Alternative C - Inland Pads with Gravel Access Road - Sheet 1 of 2
N
Legend
Arctic National Wildlife Refuge
Oil and Gas Development Unit
Existing Facilities
Water Body
Existing Pipeline
Existing Road
Proposed Project Layout
Gravel Mine
Gravel Pads
Airstrip
Gravel Mine - All Season Road
Ice Pads
Potential Water Source
Road Centerline
Sea Ice Road
Gathering Pipeline
Export Pipeline
Gathering/Injection Pipeline
Tundra Ice Roads
Date: 16 October 2011
Map Author: HDR Alaska Inc.
Source: See References chapter for map source information
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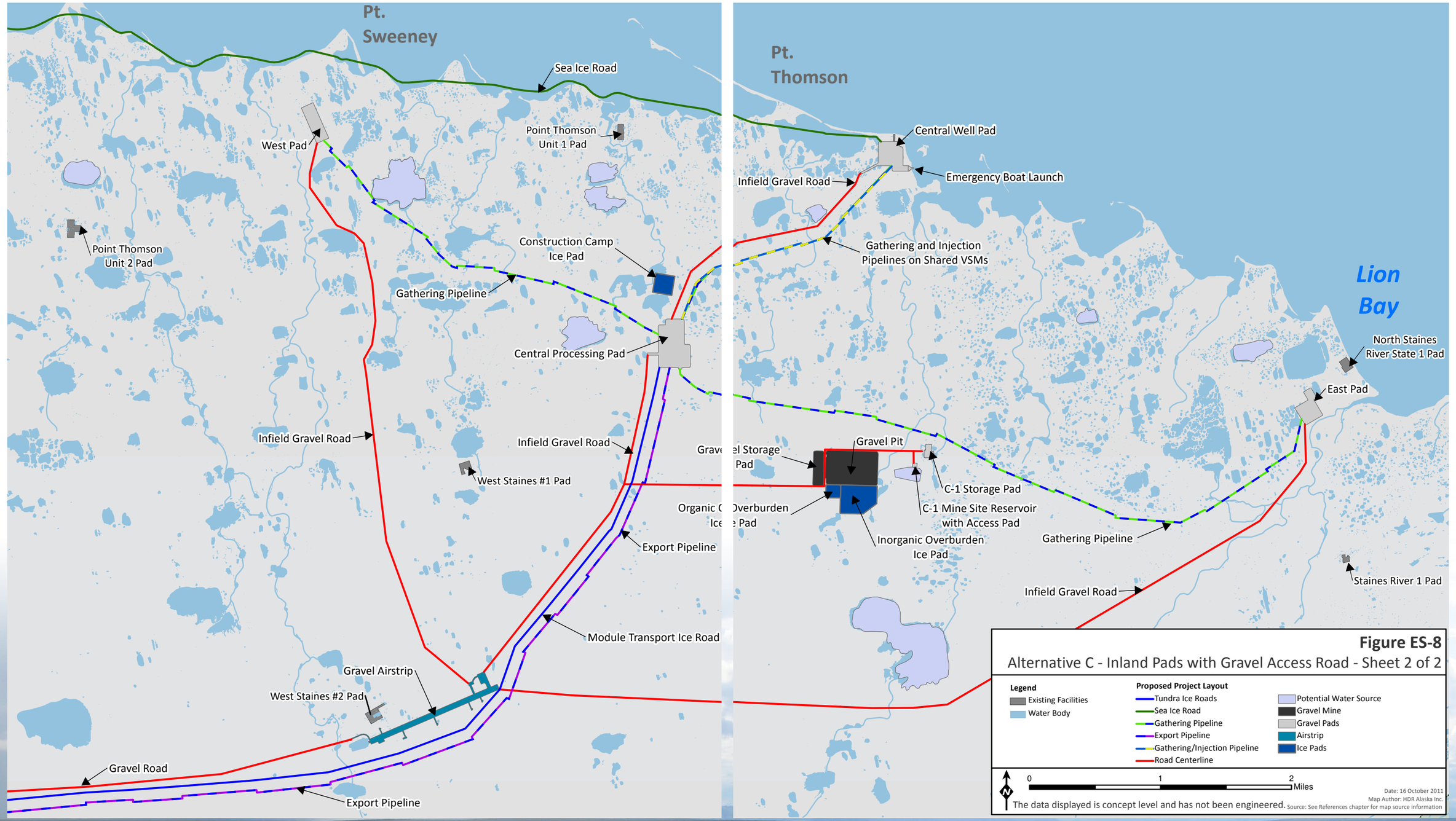


Figure ES-8

Alternative C - Inland Pads with Gravel Access Road - Sheet 2 of 2

Legend

- Existing Facilities
- Water Body

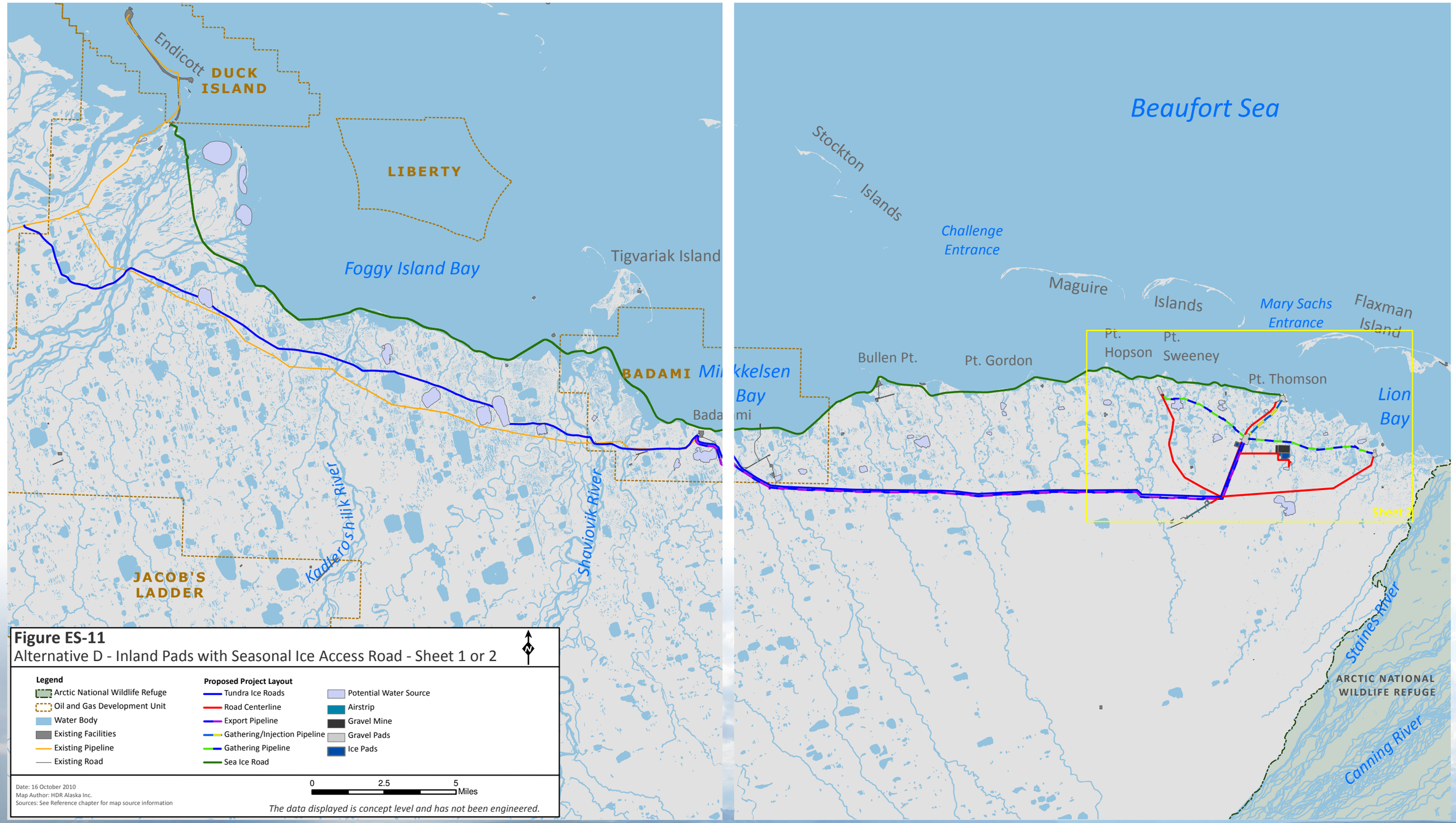
Proposed Project Layout

- Tundra Ice Roads
- Sea Ice Road
- Gathering Pipeline
- Export Pipeline
- Gathering/Injection Pipeline
- Road Centerline
- Potential Water Source
- Gravel Mine
- Gravel Pads
- Airstrip
- Ice Pads

0 1 2 Miles

Date: 16 October 2011
Map Author: HDR Alaska Inc.

The data displayed is concept level and has not been engineered. Source: See References chapter for map source information


Endicott
DUCK ISLAND
LIBERTY
Foggy Island Bay
Tigvariak Island
BADAMI
Bada
Kadleroshilik River
Shaviovik River
JACOB'S LADDER
Beaufort Sea
Stockton Islands
Challenge Entrance
Maguire Islands
Mary Sachs Entrance
Flaxman Island
Bullen Pt.
Pt. Gordon
Pt. Hopson
Pt. Sweeney
Pt. Thomson
Lion Bay
Sheet 2
Staines River
ARCTIC NATIONAL WILDLIFE REFUGE
Canning River
Figure ES-11
Alternative D - Inland Pads with Seasonal Ice Access Road - Sheet 1 or 2
Legend
Arctic National Wildlife Refuge
Oil and Gas Development Unit
Water Body
Existing Facilities
Existing Pipeline
Existing Road
Proposed Project Layout
Tundra Ice Roads
Road Centerline
Export Pipeline
Gathering/Injection Pipeline
Gathering Pipeline
Sea Ice Road
Potential Water Source
Airstrip
Gravel Mine
Gravel Pads
Ice Pads
Date: 16 October 2010
Map Author: HDR Alaska Inc.
Sources: See Reference chapter for map source information
0 2.5 5 Miles
The data displayed is concept level and has not been engineered.

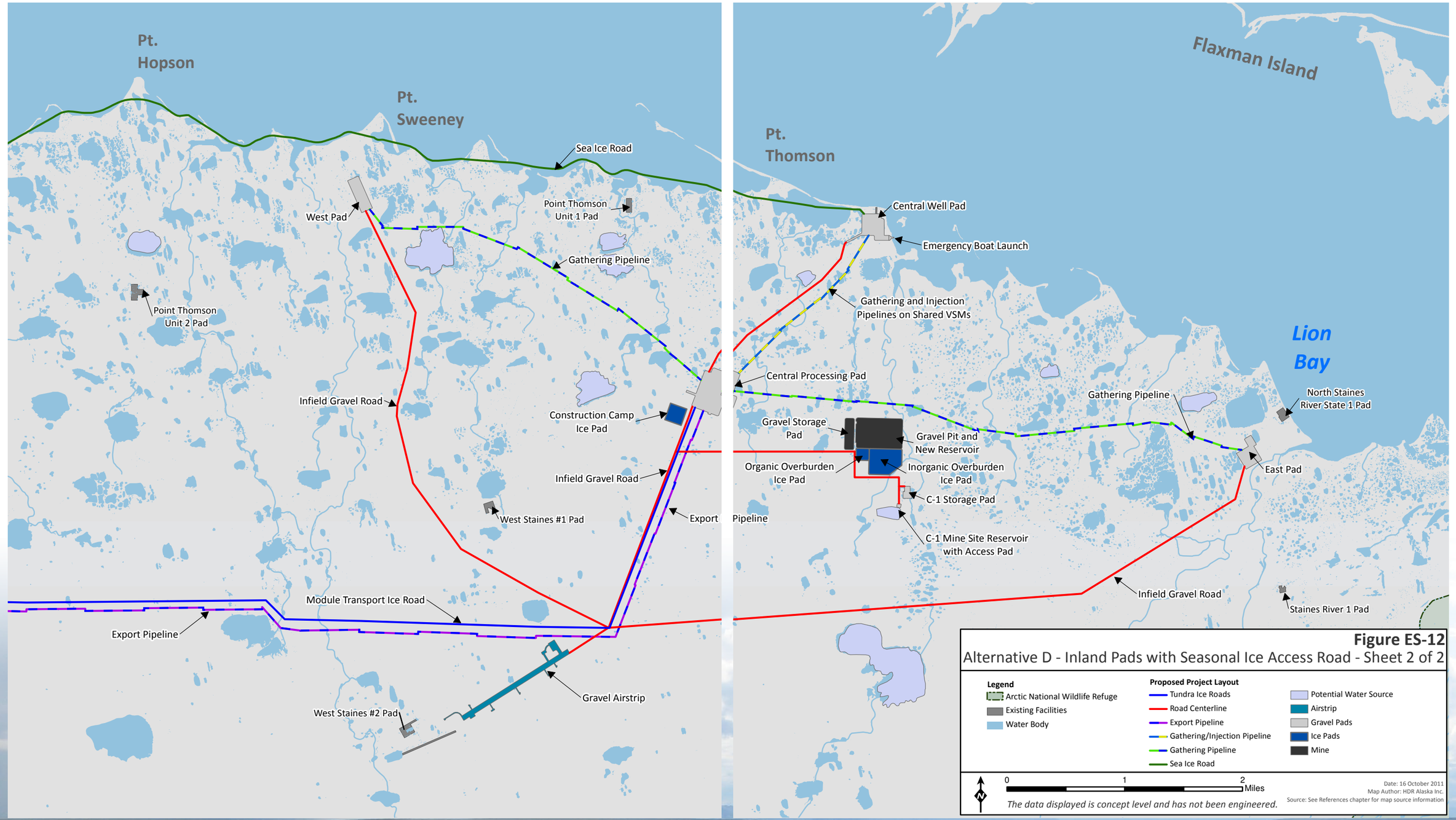


Figure ES-12
Alternative D - Inland Pads with Seasonal Ice Access Road - Sheet 2 of 2

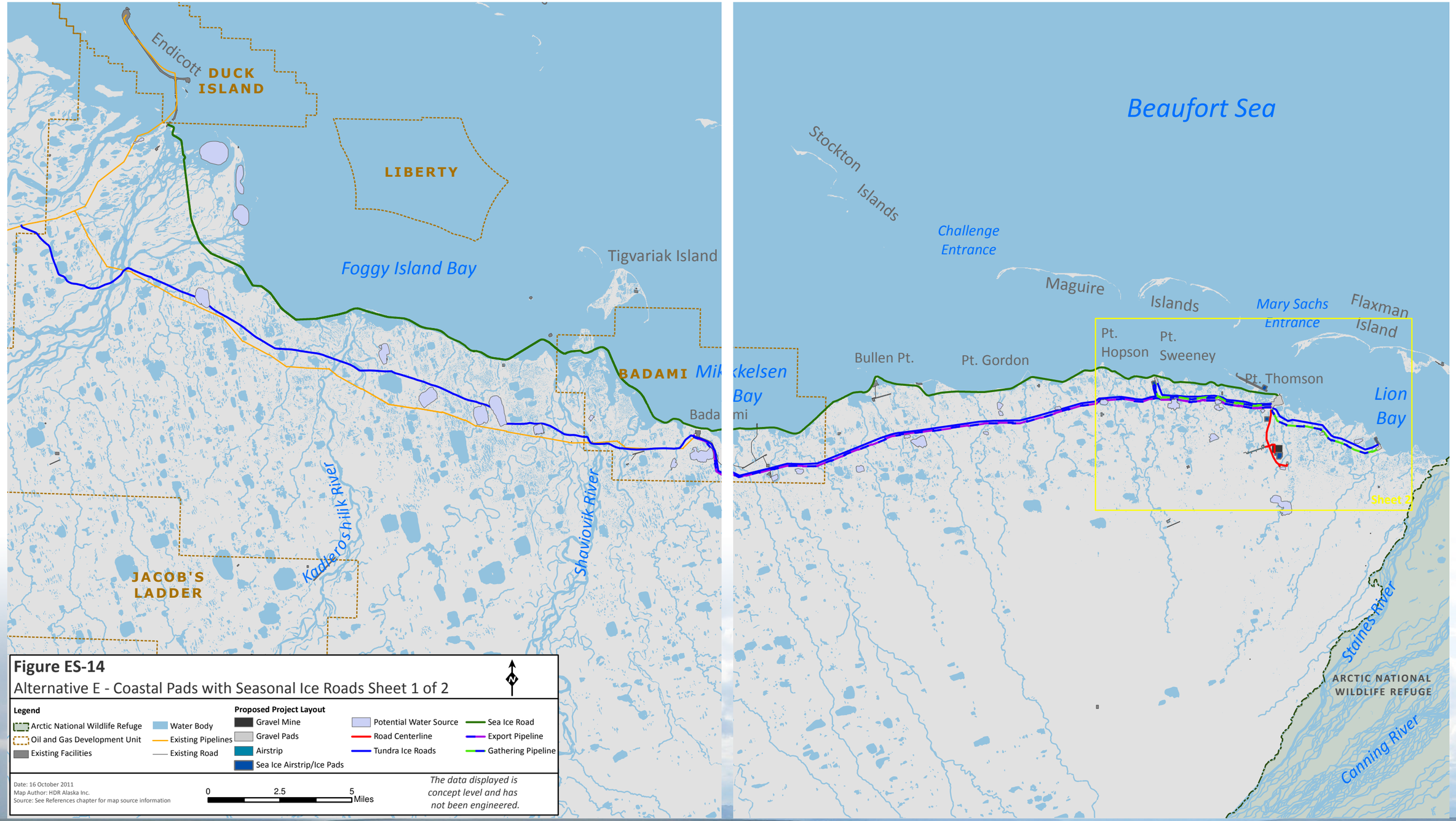


Figure ES-14
Alternative E - Coastal Pads with Seasonal Ice Roads Sheet 1 of 2

Legend

- Arctic National Wildlife Refuge
- Oil and Gas Development Unit
- Existing Facilities
- Water Body
- Existing Pipelines
- Existing Road

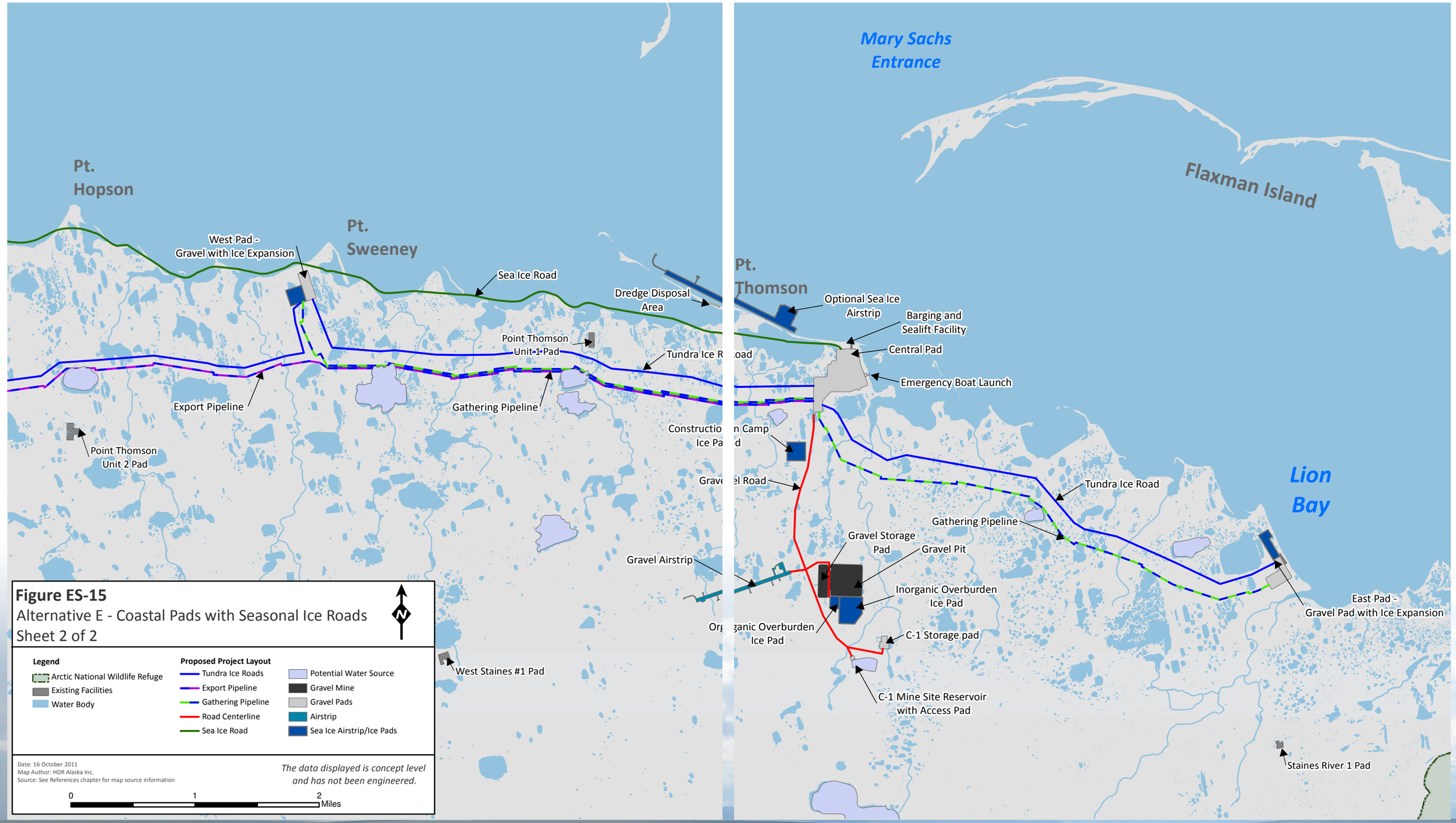
Proposed Project Layout

- Gravel Mine
- Gravel Pads
- Airstrip
- Sea Ice Airstrip/Ice Pads
- Potential Water Source
- Road Centerline
- Tundra Ice Roads
- Sea Ice Road
- Export Pipeline
- Gathering Pipeline

Date: 16 October 2011
Map Author: HDR Alaska Inc.
Source: See References chapter for map source information

0 2.5 5 Miles

The data displayed is concept level and has not been engineered.


Mary Sachs
Entrance
Flaxman Island
Pt.
Hopson
Pt.
Sweeney
Pt.
Thomson
West Pad -
Gravel with Ice Expansion
Sea Ice Road
Dredge Disposal
Area
Optional Sea Ice
Airstrip
Barging and
Sealift Facility
Central Pad
Point Thomson
Unit 1 Pad
Tundra Ice R
oad
Emergency Boat Launch
Export Pipeline
Gathering Pipeline
Constructio
n Camp
Ice Pa
d
Point Thomson
Unit 2 Pad
Grave
l Road
Tundra Ice Road
Lion
Bay
Gathering Pipeline
Gravel Storage
Pad
Gravel Pit
Gravel Airstrip
Inorganic Overburden
Ice Pad
East Pad -
Gravel Pad with Ice Expansion
Org
anic Overburden
Ice Pad
C-1 Storage pad
C-1 Mine Site Reservoir
with Access Pad
West Staines #1 Pad
Staines River 1 Pad
Figure ES-15
Alternative E - Coastal Pads with Seasonal Ice Roads
Sheet 2 of 2
N
Legend
Arctic National Wildlife Refuge
Existing Facilities
Water Body
Proposed Project Layout
Tundra Ice Roads
Export Pipeline
Gathering Pipeline
Road Centerline
Sea Ice Road
Potential Water Source
Gravel Mine
Gravel Pads
Airstrip
Sea Ice Airstrip/Ice Pads
Date: 16 October 2011
Map Author: HDR Alaska Inc.
Source: See References chapter for map source information
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and has not been engineered.
0
1
2
Miles

Table ES-1: Summary of Alternatives (1 of 2)

Theme			Alternative A No Action	Alternative B Applicant's Proposed Action	Alternative C Inland Pads with Gravel Access Road	Alternative D Inland Pads with Seasonal Ice Access Road	Alternative E Coastal Pads with Seasonal Ice Roads
			No Corps permit issued	**Applicant's Proposed Action**	**Minimize coastal impacts, with gravel access road**	**Minimize coastal impacts, with no gravel access road**	**Reduce development footprint**
Main Pads[a]			▪ Existing 12[b]-acre PTU-3 Pad	▪ 55-acre Central Well/Processing Pad near coast ▪ 15-acre East Pad near coast ▪ 17-acre West Pad near coast ▪ 1-acre Badami auxiliary pads	▪ 52-acre Central Processing Pad ~2 miles inland ▪ 27-acre Central Well Pad near coast ▪ 19-acre East Pad ~ ½ mile inland ▪ 19-acre West Pad ~ ½ mile inland ▪ 1-acre Endicott auxiliary pad ▪ Deadhorse module staging pad (pending detailed engineering)	▪ 52-acre Central Processing Pad ~ 2 miles inland ▪ 27-acre Central Well Pad near coast ▪ 19-acre East Pad ~ ½ mile inland ▪ 19-acre West Pad ~ ½ mile inland ▪ 1-acre Badami auxiliary pads	▪ Enlarged 77-acre Central Well/ Processing Pad near coast ▪ 17-acre gravel East Pad, with 11-acre ice expansion ▪ 13-acre gravel West Pad, with 11-acre ice expansion ▪ 1-acre Badami auxiliary pads
Transportation to/from field	Construction	Air	▪ Helicopter	▪ Helicopter, fixed-wing aircraft ▪ 5,600-foot x 200-foot gravel airstrip (Year 2 onward)	▪ Helicopter, fixed-wing aircraft ▪ 5,600-foot x 200-foot gravel airstrip (Year 5 onward)	▪ Helicopter, fixed-wing aircraft ▪ 5,600-foot x 200-foot tundra ice airstrip (2 years) ▪ 5,600-foot x 200-foot gravel airstrip (Year 5 onward)	▪ Helicopter, fixed-wing aircraft ▪ 3,700-foot x 200-foot sea ice airstrip (2 years) ▪ 3,700-foot x 200-foot gravel airstrip (Year 4 onward)
		Land	—	▪ 52-mile seasonal tundra ice road between the Endicott Spur Road and Point Thomson for transporting materials and supplies (3 years) ▪ 30-mile seasonal tundra ice road between Badami and Point Thomson for VSM and export pipeline construction (2 years) ▪ 47-mile seasonal sea ice road for supplemental materials and equipment transport (up to 3 years, optional each year) ▪ Tundra-safe, low ground-pressure vehicles as permitted	▪ 49-mile seasonal tundra ice road between Endicott Spur Road and Point Thomson for transporting materials and supplies (3 years) ▪ 44-mile seasonal tundra ice road between Endicott and Point Thomson for VSM and export pipeline construction (2 years) ▪ 47-mile seasonal sea ice road for supplemental materials and equipment transport (up to 3 years, optional each year) ▪ Tundra-safe, low-pressure vehicles as permitted	▪ 48-mile seasonal tundra ice road between the Endicott Spur Road and Point Thomson for transporting materials, modules, and supplies (3 years) ▪ 22-mile seasonal tundra ice road between Badami and Point Thomson for VSM and export pipeline construction (2 years) ▪ 47-mile seasonal sea ice road for supplemental materials and equipment transport (up to 3 years, optional each year) ▪ Tundra-safe, low ground-pressure vehicles as permitted	▪ 44-mile seasonal tundra ice road between the Endicott Spur Road and Point Thomson for transporting materials, small modules, and supplies ▪ 22-mile seasonal tundra ice road between Badami and Point Thomson for VSM and export pipeline construction (2 years) ▪ 47-mile seasonal sea ice road for supplemental materials and equipment transport (up to 3 years, optional each year) ▪ Tundra-safe, low ground-pressure vehicles as permitted
		Water	—	▪ Coastal barging access via service pier ▪ Sealift facility, including bulkhead and mooring dolphins	▪ No direct coastal access to Point Thomson	▪ Same as Alternative C	▪ Same as Alternative B
	Drilling		—	▪ Helicopter, fixed-wing, ice roads, coastal barging	▪ Helicopter, fixed-wing, ice roads ▪ 45-mile gravel access road from Endicott Spur Road (Year 6 onward)	▪ Helicopter, fixed-wing, ice roads 48-mile seasonal ice access road from Endicott Spur Road (Year 3 onward)	▪ Helicopter, fixed-wing, ice roads, coastal barging
	Operations		—	▪ Same as drilling ▪ 52-mile tundra ice access road as needed (conservatively every 5 years)	▪ Helicopter and gravel airstrip ▪ 45-mile gravel access road	▪ Helicopter and gravel airstrip ▪ 48-mile seasonal tundra ice road (ongoing)	▪ Same as drilling ▪ 44-mile tundra ice access road as needed (conservatively every 5 years)

Table ES-1: Summary of Alternatives (2 of 2)

	Alternative A No Action	**Alternative B** Applicant's Proposed Action	**Alternative C** Inland Pads with Gravel Access Road	**Alternative D** Inland Pads with Seasonal Ice Access Road	**Alternative E** Coastal Pads with Seasonal Ice Roads
Module Transport	—	▪ To Point Thomson by sealift barge	▪ To Deadhorse by sealift barge ▪ 49-mile heavy-duty tundra ice road (3 years; this ice road would also be used for materials and supplies, above) ▪ 49-mile heavy-duty tundra ice road to demobilize drill rig (1 year)	▪ To Deadhorse by sealift barge ▪ 48-mile heavy-duty tundra ice road (3 years; this ice road would also be used for materials and supplies, above) ▪ 48-mile heavy-duty tundra ice road to demobilize drill rig (1 year)	▪ Same as Alternative B
Infield Transportation	▪ Existing modes, includes ice roads	▪ 23 miles of ice roads during construction ▪ 12 miles of gravel roads	▪ 15 miles of ice roads during construction ▪ 20 miles of gravel roads	▪ 14 miles of ice roads during construction ▪ 18 miles of gravel roads	▪ Helicopter ▪ 9 miles of seasonal ice roads connecting to East and West Pads ▪ 4 miles of gravel road between airstrip and Central Pad ▪ Tundra-safe, low ground-pressure vehicles as permitted
Infield Pipelines[c]	—	▪ 10 miles of 8-inch heat traced gathering pipelines	▪ 9 miles of 8-inch heat-traced gathering pipelines ▪ 3 miles of 10-inch production and 3 miles of 12-inch high pressure gas injection pipeline between the two Central Pads	▪ 8 miles of 8-inch heat-traced gathering pipelines ▪ 2 miles of 10-inch production and 2 miles of 12-inch high pressure gas injection pipeline between the two Central Pads	▪ 10 miles of 8-inch heat-traced gathering pipelines
Export Pipeline[c]	—	▪ 23-mile 12-inch export pipeline; tie-in at Badami	▪ 51-mile, 12-inch export pipeline; tie-in at Endicott	▪ 23-mile, 12-inch export pipeline; tie-in at Badami	▪ 22-mile, 12-inch export pipeline; tie-in at Badami
Other Infrastructure	▪ Existing 4-acre C-1 Pad	▪ 5,600-foot x 200-foot, 43-acre gravel airstrip and facilities ▪ 58-acre infield gravel mine ▪ Additional gravel pads for stockpiling, storage, and water access; ice pads for construction camps	▪ 5,600-foot x 200-foot, 43-acre gravel airstrip and facilities, located at former West Staines No. 2 airstrip site ▪ 66-acre field gravel mine; up to five additional 13 acre gravel mines along the gravel access road ▪ Additional pads for stockpiling, storage, and water access ▪ Ice pads for temporary storage and camps (construction)	▪ 5,600-foot x 200-foot, 43-acre gravel airstrip and facilities, located ~1 mile ▪ 66-acre infield gravel mine ▪ Additional pads for stockpiling, storage, and water access ▪ Ice pads for temporary storage and camps (construction)	▪ Additional pads for stockpiling, storage, and water access ▪ Ice pads for temporary storage and camps (construction) 44-acre infield gravel mine ▪ Additional pads for stockpiling, storage, and water access ▪ Ice pads for temporary storage and camps (construction)

[a] Pads consist of gravel, except where denoted differently (ice pad extensions).

[b] All measurements have been rounded up to the nearest whole unit.

[c] Pipelines (export pipeline, infield gathering pipelines, and high-pressure gas reinjection pipelines) are elevated on vertical support members (VSMs) with a 7-foot clearance.

ES 4. | AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

The Corps analyzed the existing social and environmental conditions of the project area to serve as a baseline for comparing the potential impacts of alternatives. This analysis included evaluation of issues raised by agencies and the public during scoping and issues discussed by the Corps and cooperating agencies during development of the Draft EIS. This Executive Summary focuses its discussion on resources with greater potential impacts, resources identified during scoping as being resources of concern, and/or those resources that provide substantive differentiation among alternatives. All resources are discussed in detail in Chapters 3 and 5 of this Draft EIS and impacts to all resources are summarized in **Table ES-2**.

ES 4.1 | Soils and Permafrost

On the ACP, the thermal regime of the soil and permafrost drives soil formation and properties. Stability of the thermal regime is affected by climate and disturbance activities, with human disturbance having immediate and potentially long-term effects on permafrost stability. Permafrost strongly influences surface morphology and hydrology. Changes to soils and permafrost could result in changes in or disturbance to vegetation and hydrology, which could lead to changes in wildlife habitat. The extraction and placement of gravel and long-term movement of dust and gravel have the greatest potential to impact soils and permafrost.

Key Impacts/Issues

- The main difference among the action alternatives is that gravel fill in Alternative C would cover three times more area than under Alternative B and require five additional gravel mines. Alternative E would have about 20 percent less gravel infrastructure than other action alternatives.
- Over time, fugitive dust and gravel from roads and pads onto the surrounding tundra could impact adjacent soils and permafrost. Such impacts would be more extensive under Alternative C due to the gravel access road.
- Little change would occur in the thermal regime or compaction of soil as the result of seasonal ice pad or ice road construction. Multiyear, multiseason ice pads proposed for Alternative E, only, could cause compaction of the underlying soil and inhibition of vegetation regeneration.

ES 4.2 | Hydrology

The climate and presence of impervious permafrost shape the hydrology of the project area. Hydrologic processes are active during the short summer season. Breakup (spring melting of snow and ice creating sheetflow of water) occurs on the tundra in late May to early June. Freeze up generally occurs in late September. During summer, tundra is mostly saturated and supports numerous streams, lakes, and ponds. Streams range in size from large braided rivers originating in the mountains to smaller streams originating on the tundra, and flow towards the Beaufort Sea. Thaw lakes (lakes recharged annually by surface water) occur in abundance across the ACP, but are more prominent and well defined west of the project area. Surface water bodies provide habitat for aquatic species important to the North Slope ecosystem, and even small modifications to the hydrologic regime can also affect vegetation and aquatic resources.

Potential impacts to hydrology include changes to streamflow and drainage patterns as a result of project components. For instance, while streams would be crossed using bridges or culverts sized to allow passage of a 50-year flood event, there could be some constriction of stream channel conveyance, which would affect stream stage and modify erosion and sedimentation conditions. Ice infrastructure could also alter natural drainage patterns, stream stage, and streamflow during spring breakup. Water withdrawal from lakes and reservoirs for ice infrastructure and other project needs could lower water levels if annual recharge doesn't keep pace. However, water use permits would require recharge monitoring, and continued water withdrawal would not be allowed if adequate recharge does not occur in the permitted water source.

Key Impacts/Issues

- The action alternatives differ in their potential effect on hydrology as a result of differences in construction and use of gravel roads, the gravel airstrip, and the gravel mine reservoir. The primary difference in the hydrological evaluation is between the absence of the project (Alternative A) and the presence of the project (action alternatives).
- Under Alternative C, the impacts from the gravel access road and associated gravel mines would extend across a larger area. Three major rivers would be crossed by the gravel access road.
- Gravel airstrips under Alternatives B and E would have greater impacts on streamflow than the other airstrip alternatives, both diverting about half the flow from Stream 22.
- Ice infrastructure impacts would be the same for the action alternatives, but would occur annually over the project lifetime under Alternative E.
- Under Alternative D, only, the infield gravel mine would be used as a primary water source during operations and Stream 24 would be diverted during breakup for 3 years to fill the reservoir. Diversion of Stream 24 to fill the gravel mine could alter streamflow and cause downstream erosion and sedimentation.

ES 4.3 | Vegetation and Wetlands

Vegetation in the study area is dominated by sedge and dwarf shrub species that are tolerant of the soil's cold and high-moisture conditions. No federally listed threatened or endangered plants are known to occur on the ACP. Fourteen species ranked as imperiled or critically imperiled by the Alaska Natural Heritage Program (AKNHP) potentially occur in the study area, but none were observed during vegetation surveys conducted in the study area.

Vegetation and wetlands would be impacted by fill placement, development of gravel mines, dust production, and by changes in drainage, thermokarst, and snow accumulation. Connection of Point Thomson to Alaska's road system increases the risk of nonnative plant species establishment and this risk would continue to be high for the life of the connection.

Key Impacts/Issues

- All action alternatives would impact vegetation and wetlands through the placement of gravel fill for roads and pads, dust produced from use of gravel infrastructure, and the development of gravel mines.
- Construction of the gravel access road in Alternative C would impact approximately 2.5 times the amount of acreage and require larger gravel mines.
- The permanent gravel road associated with Alternative C would increase the risk of nonnative species establishment.
- Vegetation and wetland impacts for Alternatives B, D, and E are similar in magnitude and extent, and all are less than those for Alternative C.

ES 4.4 | Terrestrial Mammals

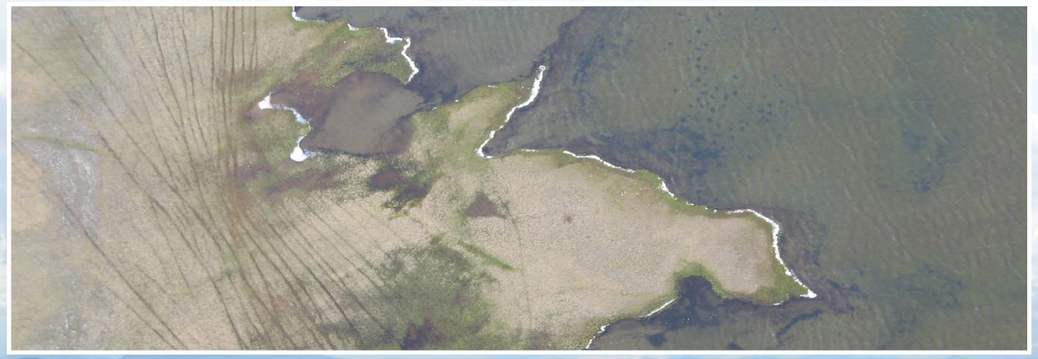
The terrestrial mammals of concern for the Point Thomson Project are caribou, muskoxen, brown bears, foxes, and small mammals. Caribou use the study area for calving, summer foraging, and parasitic insect relief. Caribou are an important subsistence resource and are hunted recreationally. Muskoxen use the study area year-round, using riverine and riparian habitats in the summer and windswept hilltops, slopes, and plateaus in winter. Brown bears occur at a low to moderate density on the North Slope. Within the study area they have been observed foraging and moving through riparian habitats. Arctic foxes spend summers on land and winters primarily along the coast and on sea ice. They are attracted to human development and their numbers on the North Slope have been stable in recent years. Red foxes tend to be most abundant in the foothills and riparian areas on the North Slope. Small mammals, such as arctic ground squirrels, collared and brown lemmings, root voles, and barren ground shrews occur in the study area. Small mammals are important because they form the prey base for many mammals and birds, and because they are an integral part of the arctic ecosystem.

Key Impacts/Issues

- Impacts from gravel infrastructure would include loss of habitat, alteration of the habitat from dust accumulation and hydrologic changes, and disturbance from traffic, noise, and human movements.
- The gravel access road under Alternative C and the inland location of gravel infrastructure under Alternatives C and D have the greatest potential to impact terrestrial mammals from gravel placement, including the following:
  - The proposed location of the all-season gravel access road would be near documented caribou calving areas, muskoxen habitat, and brown bear den sites.
  - Siting infield roads, pads, and the airstrip to the south places the infrastructure closer to caribou calving areas and brown bear den sites.
  - Separating the processing and camp facilities from the Central Drilling Pad may increase traffic between the two pads, which would increase disturbance to caribou and other animal movements in the vicinity of the infield connecting road.
- Aboveground pipelines that are less than 500 feet from gravel roads could impact caribou movements during summer insect relief periods for all action alternatives.
- Caribou and muskoxen could be reluctant to cross over the low water pipeline proposed under Alternative C. Some animals may cross and others may not, which could lead to the separation of cows from calves and could increase stress amongst the affected group of caribou. If the low pipeline is adjacent to a road, animals agitated by the pipeline could find themselves trapped between the pipeline and road and susceptible to traffic disturbance.
- The noise associated with aircraft takeoffs and landings could result in the inability of affected animals to hear biologically important sounds such as mating calls, predator alarm calls, and approaching predators. This could lead to increased stress levels, decreased reproductive capacity, and decreased survivorship in noisy areas such as airstrips and helipads.
- Alternative E would have the greatest potential noise disturbance to terrestrial mammals because the primary summer means of transportation between the Central Pad and East and West Pads would be by helicopter.

Caribou on Brownlow Spit

Aerial view of Caribou Trails



ES 4.5 | Marine Mammals

The bowhead and beluga whale, ringed and bearded seal, and polar bear are the marine mammal species of greatest concern for the Point Thomson study area because of the location of project activities relative to known species distributional ranges and anticipated timing of project activities. Marine mammals that use the study area are sensitive to:

- Habitat loss or alteration due to physical habitat changes, species' displacement from or to altered habitat, disturbances from noise or activity, or fragmentation.
- Land/ice vehicle or sea vessel collision injury or mortality.
- Altered survival or productivity related to changes in predator and prey abundance, distribution, feeding strategies, or predation risk, or from increased exposure to garbage, and spills and leaks of toxic materials.

Key Impacts/Issues

- All action alternatives would impact polar bear critical habitat because proposed infrastructure would be located within polar bear denning critical habitat.
- Alternatives C, D, and E have the greatest potential to affect polar bears and polar bear critical habitat. The gravel access road under Alternative C would increase the gravel footprint within the critical habitat. The need for annual ice roads (Alternatives D and E) would increase the potential for encountering polar bear dens during ice road construction.
- Noise from barge traffic (Alternatives B and E) has the potential to disturb bowhead whales.

Southern project area in summer

ES 4.6 | Fish and Essential Habitat

Fifty-eight fish species have been found in the Alaskan Beaufort Sea and nearshore environment near the study area. Thirteen fish species have been documented in freshwater habitats between the Canning/Staines River to the Sagavanirktok River. Of these species, the following are discussed in this Draft EIS: arctic cisco, least cisco, Dolly Varden char, arctic grayling, broad whitefish, humpback whitefish, arctic cod, Pacific salmon, and ninespine stickleback. Of these, the most commonly observed in freshwater environments of the study area are ninespine stickleback and Dolly Varden. Freshwater habitat of the study area includes shallow, seasonally flooded ponds and wetlands, small tundra streams, and larger, braided rivers and streams. Most freshwater habitat in the study area is available only during the open water season because most of these habitats freeze to the bottom during winter. Deep lakes and pools in streams that do not freeze to the bottom and provide overwintering fish habitat are rare and valuable habitats in the study area. Marine habitat in the study area includes coastal waters between the Canning/Staines and Sagavanirktok Rivers. The marine study area, particularly the nearshore environment, is used for migration, foraging, and spawning.

Bridges and culverts at fish-bearing streams could have long-term impacts to fish because changes in hydrology at the crossing structure (culvert pipe or bridge abutment) can lead to reduced water quality, changes in the streambed, and entrainment of fish in small whirlpools on the downstream sides of the crossing structures. Over time, culverts tend to have higher impacts than bridges on fish. In the study area, these impacts could reduce fish access to spawning, summer feeding, and overwintering habitats upstream of crossing structures.

Over time, water withdrawal from water bodies containing overwintering fish can reduce overwintering habitat quality through lower water levels, reduced water quality, and increased proportion of frozen water. In addition, individual fish may be impinged or entrained in water withdrawal equipment, resulting in their death.

Northern project area in summer

Depending on the water source, water withdrawal could affect Essential Fish Habitat (EFH).

Noise from pile driving and blasting is documented to impact fish by causing hearing loss, masking biologically important sounds, increasing stress levels, impacting immune systems, and causing death.

Key Impacts/Issues

- Bridges and culverts at stream crossings for the gravel access road under Alternative C (21 culverts and 27 bridges) would impact fish habitat and fish movements, and EFH. Alternatives B (5 culverts and 4 bridges) and D (5 culverts and 2 bridges) would have similar potential to impact fish within the infield gravel roads. Alternative E would have lower impacts, with only 1 bridge.
- Annual ice road access between Point Thomson and Deadhorse (Alternative D) would require annual water withdrawals from multiple water sources for the life of the project.
- Annual infield ice roads between the Central Pad and East and West Pads (Alternative E) would require annual water withdrawals from multiple water sources for the life of the project.
- Alternative C has the greatest potential to impact fish through pile driving at bridge crossings and blasting mine sites in the western portion of the gravel access road near fish overwintering areas.
- Diversion of water from Stream 24 to the gravel mine site under Alternative D could impact the ability of Dolly Varden char to move up and downstream during spring runoff in the initial years when the reservoir is filling. This impact would not occur for other action alternatives because no stream diversion would occur.
- Because the gravel access road under Alternative C would cross large braided streams, some VSMs for the export pipeline could be constructed in stream channels and floodplains. The VSMs could have similar impacts as bridge abutments and culverts and could affect EFH.
- Alternatives D and E have the most potential to have long-term impacts on overwintering of fish species because of water withdrawals.

Coastline near north Staines River State #1 Pad

ES 4.7 | Arctic National Wildlife Refuge

The Arctic Refuge, part of the National Wildlife Refuge system, is evaluated due to its proximity to the project and to the Thomson Sands Reservoir. The western edge of the Canning/Staines River delta forms the western refuge boundary, which is approximately 5.5 miles from PTU-3. The Alaska National Interest Lands Conservation Act (ANILCA) identified a portion of the Arctic Refuge on the coastal plain as a study area for potential future oil and gas development. This area, commonly referred to as the "1002 Area," is about 2 miles from the East Pad location in Alternative B (see **Figure ES-1**). Congress has repeatedly considered opening the 1002 Area to oil and gas development, and has seen at least one bill proposing to designate the area as official wilderness; however, Congress has not made a final decision, and the result has been the prominence of the Arctic Refuge in the ongoing national debate regarding future potential exploration and drilling.

Key Impacts/Issues

- All of the action alternatives would generally have the same potential effect on the Arctic Refuge. The primary difference in the Arctic Refuge evaluation is between the absence of the project (No Action Alternative) and the presence of the project (action alternatives). However, greater use of helicopter and fixed-wing aircraft under Alternative E would further add to the conspicuous nature of the project site to visitors at the western edge of the Arctic Refuge.
- Proximity of the Point Thomson development to the Arctic Refuge may influence management there due to potential impacts to polar bear movement, subsistence activities and traditional land use, recreation, wilderness perception, and research activities.
- The proximity of industrial facilities could be perceived as an effect to wilderness values in the Arctic Refuge and lead to an increase in the perception nationwide that wilderness qualities in the area would be diminished.

Brooks Range from Arctic Refuge

ES 4.8 | Visual Aesthetics

The project is located in an undeveloped and uninhabited area within a few miles of the Arctic Refuge. Proposed new industrial facilities, particularly drilling rigs, communications towers, flare stacks, support facilities, air traffic, and facility lights are expected to create strong "visual contrast" when compared to baseline conditions. Under all action alternatives, the pads and CPF would be dominant with strong contrast from the coastal corridor. Although removal of the drilling rig from the pads following completion of all wells would reduce the visual contrast, visual contrast would remain due to visibility of the communications tower and flare stack.

Key Impacts/Issues

- Differences between the action alternatives are small. The greatest difference is between presence of the project (any action alternative) and absence of the project (Alternative A).
- Alternatives C and D set several project components, including the CPF, back from the coastline, reducing the view of the facility from the coastal corridor; the contrast for color and texture would be expected to be stronger under Alternatives C and D than under B and E.
- Environmental consequences of changes to the viewshed include potential changes in the perception of wilderness values and experience of visitors within the northwestern corner of the Arctic Refuge, and the perception and experience of subsistence resource users traveling through or staying in the coastal corridor in summer and winter.

Visual Simulation of Central Well Pad

ES 4.9 | Noise

Noise from human activities, other than currently permitted industrial activities, is largely absent from the ambient soundscape in the study area. Existing sound levels during winter and summer conditions are dominated by natural sounds, atmospheric/meteorological phenomena, water features, and animals. The broad coastal plain surrounding the study area is principally undeveloped, but is known to have noise-sensitive human and wildlife uses year-round.

Key Impacts/Issues

- All alternatives are predicted to experience the greatest increase in noise above existing levels at locations in immediate proximity to the project site during construction, drilling, and operations. No increase in noise over existing levels is predicted at locations greater than 21 miles away, such as at the Canning River West Bank, for all alternatives.
- Alternatives B and E are predicted to experience a larger increase in noise over existing levels than Alternatives C and D at areas within 8 miles of the project site such as Brownlow Spit, Flaxman Island, and the Sea Coast during winter construction and drilling and at Mary Sachs Island during summer construction and drilling. Alternatives C and D may experience a slightly larger increase in noise at Sea Coast during summer construction and drilling.
- On a long-term basis, operational noise from Alternative E is distinctly different from the other build alternatives due to the extensive use of helicopters.
- The most dominant noise sources during operations for all alternatives are the CPF and aircraft overflight (fixed-wing and helicopter).

Noise monitor

- Modeling of project-related noise levels in the Arctic Refuge generally showed little difference between the alternatives, but would be higher during construction in winter compared to summer. For all alternatives, the increase over existing noise levels in the Arctic Refuge would be less than 10 dBA at a distance of 10 miles away from the western border of the Refuge.
- Based on monitoring data, noise from operations during winter and summer could be audible from 2 to 3 miles from the Central Pad, particularly when winds are below 11 mph. Visitors to the western-most portions of Arctic Refuge could experience project-related noise when winds are very still, but in summer, environmental conditions may help reduce project-related noise levels at locations inside the Refuge.

ES 4.10 | Subsistence and Traditional Land Use Patterns

Subsistence is a central aspect of North Slope culture and life, which is rooted in the traditional relationship of the Iñupiaq people with their environment. The majority of Kaktovik and Nuiqsut subsistence uses in the Point Thomson area occur along the coast or offshore during the open water season. Residents of the North Slope of Alaska rely on subsistence harvests of plant and animal resources for nutritional sustenance and cultural and social well-being. Subsistence is not only a source of food for North Slope residents, but the activities associated with subsistence strengthen community and family social ties; reinforce community and individual cultural identity; and provide a link between contemporary Iñupiat and their ancestors. The two communities closest to the Point Thomson Project, Kaktovik and Nuiqsut, use areas in or adjacent to the Point Thomson Project area for subsistence purposes; residents from these communities also harvest subsistence resources, such as caribou and waterfowl, which may migrate through the project area. Of the various subsistence resources harvested by Kaktovik and Nuiqsut residents, the primary activities of concern for impact from the development of the Point Thomson Project are caribou hunting, bowhead whale hunting, seal hunting, waterfowl hunting, and fish harvesting.

The primary impacts on subsistence uses resulting from the action alternatives include impacts on subsistence use areas, resource availability, and user access for caribou. These impacts, in turn, could also result in increased competition and increased costs and time for caribou hunters. Ultimately, effects on subsistence related to the proposed project could result in reduced harvests of caribou and reduced opportunities to participate in subsistence harvesting and associated activities. When subsistence users' opportunities to engage in subsistence activities are limited, then their opportunities to transmit knowledge about those activities, which are learned through participation, are also limited.

Key Impacts/Issues

- Avoidance of the project area or avoidance of certain resources (e.g., Arctic cisco, caribou) may occur if residents from Nuiqsut and Kaktovik perceive these resources to be absent near the Point Thomson Project area, or if they perceive that these resources are contaminated.
- Alternatives B and E, which include barge traffic and nearshore infrastructure, would likely have the greatest impacts on residents' subsistence activities resulting from changes in user access due to pipelines and

Caribou on the coastal plain

Changing weather looking south

infrastructure being located within 1 to 2 miles of residents' coastal hunting areas.

- Alternative E would rely more heavily on air transport, including helicopter and airplane traffic, and therefore may increase the likelihood of hunter avoidance or reduced availability of caribou due to localized changes in caribou behavior or distribution.
- Alternatives C and D would have the least direct impact on coastal subsistence uses related to hunter avoidance or user access due to the elimination of barge activity and the placement of infrastructure farther inland from residents' coastal and offshore hunting areas. However, the gravel access road proposed under Alternative C may cause greater disruption to caribou movement than other alternatives and greater cumulative impacts by opening the area to further oil and gas development.

Swans between barrier islands and the mainland

ES 4.11 | Spills

The likelihood and magnitude of spills associated with the proposed project were assessed based on past spill experience on the North Slope combined with the specific characteristics of the project, such as the type of the produced fluids and high reservoir pressures. The Corps concluded, based on historic spill data, that the probability of a small or even a medium size spill occurring over the life of the project is relatively high. The likelihood of large spills is substantially less; however, the consequence of larger spills is greater. Based on past experience on the North Slope, the likelihood of a very large spill associated with the project is very low and might approach zero as the size of the potential spill increases. The fate of spilled materials is affected by response actions (e.g., containment and cleanup), response time, and environmental factors such as:

- Physical and chemical properties of the spilled material
- Environmental degradation processes acting directly on the spilled material
- Season of the year
- Weather conditions at the time of the spill and for days to weeks thereafter
- Location relative to sensitive habitats and resources

While highly unlikely, a very large spill event would be catastrophic and could be exacerbated by environmental conditions that could enhance the spread of spilled materials or interfere with response and cleanup. A very large spill from either a blowout or uncontrolled release or from a major containment berm failure would be likely to reach both land and adjacent water bodies, especially if the spill occurs in the ice-free seasons. Because of the high reservoir pressures at Point Thomson, a blowout or uncontrolled release of produced fluids at the wellhead may result in a greater discharge rate than might be experienced in a similar situation elsewhere on the North Slope where the reservoir pressures are lower. The proximity of the drilling and production wells to streams near the pads may be the most important factor in such spill scenarios. In general, if the spilled material flows to upland tundra, the spill probably would not disperse far. However, if a very large spill reached a flowing stream, the spill could be dispersed substantial distances downstream and eventually to Lion Bay. Whether a very large spill would reach these streams would depend on several variables, including the spill type, ambient water and air as well as oil temperature and volume of material released; the topographic relief and slope; presence of snow or vegetation; and response time and actions.

The most likely spill scenario is a very small or small spill of material such as diesel, hydraulic fluid, transmission oil, or antifreeze, on gravel or ice infrastructure. Rarely would these spilled materials reach the tundra or water bodies. If they were to occur, the spills would impact the area adjacent to the road or pad and would be limited in effect. Some of these small spills could result from slow and small (pin hole) leaks of produced fluids or export fluids from the proposed pipeline, and they could occur on the tundra or into water bodies remote from the roads and pads.

A similar scenario exists for medium-to-large spills except they are much less common and occasionally reach the tundra or water bodies adjacent to the roads, pads, and airstrips. These spills would be more likely to consist of produced fluids or condensate, although medium to large spills of antifreeze, diesel, and drilling muds may occur.

The actions taken by the Applicant and its contractors, including oil spill response organizations (OSRO), would influence the potential impacts of any spill to the natural environment and human uses of it. The Applicant has designed and committed to a comprehensive slate of processes, procedures, and systems to prevent, detect, and mitigate potential spills that could occur during drilling, as well as construction, maintenance, and operation of the proposed pipeline.

Key Impacts/Issues

- Because Alternative A involves suspending project engineering and planning activities, there would be no likelihood of a spill.
- In general, the impact of any particular spill is not likely to be different between the action alternatives.
- A large or very large spill would be very

unlikely to occur. However, if such a spill were to occur, the resources that would be most affected are wetlands and vegetation, birds, and marine mammals. Impacts on subsistence would be minor to moderate, but could be magnified by the perception that subsistence resources are contaminated even if they are not.

- Alternatives C and D do not have barging facilities so would not have the potential for marine spills associated with barges.
- Compared against Alternative B, there is a greater potential for more fuel truck-related under Alternatives C and D, and a greater potential for larger pipeline spill volumes under Alternative C.

ES 4.12 | Climate Change

Any of the action alternatives would emit greenhouse gases (GHG) during construction, drilling, and operations. However, the net annual change in these emissions due to the construction or operation of any of the action alternatives would be a tiny fraction of the total anthropogenic CO_2 emissions in the world. The direct annual CO_2 emissions increase associated with construction, drilling, and operation phases of the alternatives would contribute approximately 0.001 percent to the global CO_2 emissions. Over time periods of a year or longer, CO_2 emissions are essentially evenly distributed throughout the atmosphere across the globe. Therefore, the location of the GHG emissions would make little difference to any effects on global climate.

This Draft EIS identifies the impacts climate change may have on the action alternatives. Climate change may cause greater winter precipitation, possibly resulting in changes to river streamflow and stage, changes in drainage patterns and surface water interaction with permafrost, and changes in lake distribution and quantity. Greater snowfall may increase discharge in streams in the spring and summer, affecting streamflow and stream stage, as well as likely increasing stream velocity and the erosive capacity of streams. Climate change could lengthen the open-water period in the Beaufort Sea coastal areas and allow for a longer exposure of the beaches to coastal process and erosion. However, in coastal areas that are protected by barrier islands, such as the project area, these effects would not be as pronounced. Other impacts include, but are not limited to, changes in vegetation type, thawing of permafrost, drying of wetlands, and changes in groundwater recharge. The impacts of climate change are expected to be similar for all action alternatives. However, impacts on Alternatives C and D could be somewhat greater due to the reliance on seasonal, tundra ice roads for access to the project area, and E due to reliance on infield ice roads rather than all-season infield gravel roads.

ES 4.13 | Cumulative Impacts

The cumulative impact analysis evaluated project impacts which, when combined with other impacts to resources or the region from past, present, and reasonably foreseeable future actions, may cumulatively become adverse. In determining cumulative impacts, the Draft EIS considered the following:

- The established oilfields (Prudhoe Bay, Kuparuk, Endicott, Milne Point)
- Newer fields (Alpine, Alpine satellites, Oooguruk, Northstar, Badami)
- Exploration activity within the NPR-A
- Human developments and hunting associated with NSB villages
- Subsistence and cultural uses of NSB lands and waters
- The Arctic National Wildlife Refuge
- The use of the U.S. Air Force's (USAF) Alaska Radar System sites
- Ongoing scientific studies across the North Slope
- Construction of a natural gas pipeline across Alaska
- Full field development of Point Thomson
- Tourism

Key Impacts/Issues

- Potentially adverse cumulative effects were identified for coastal waters, hydrology, caribou, Arctic Refuge, socioeconomics, environmental justice, visual aesthetics, cultural resources, and subsistence and traditional land use.
- Beneficial cumulative effects are anticipated to the economy, as the proposed project, in combination with past, present, and reasonably foreseeable developments, would remove a potentially substantial percentage of total economically recoverable petroleum resources available within the area of known reserves. Developing the Point Thomson facility would slow the decline in oil production and result in a beneficial, cumulative economic effect on the NSB and the State of Alaska. These beneficial economic effects would also be experienced by minority and low-income populations.
- Cumulative impacts are discussed for each resource topic in Chapter 5 of this Draft EIS, following the project-specific impact discussion.

ES 5. | COMPARISON OF IMPACTS AND ALTERNATIVES

ES 5.1. | Additional Context of Action Alternatives

This section is intended to give the reader information to make a comparison of the alternatives. The section begins with summary information about the design and logistics of the alternatives that may not be initially evident to the reader. This contextual information will be used, in part, by the Corps in their determination of whether the Applicant's proposed project is the LEDPA. The section is then followed by **Table ES-2**, which provides the reader an opportunity to compare impacts to the human environment across the five alternatives. Each resource category is represented and categories or issues of impacts are presented so that the public can better understand the differences or similarities among the alternatives. The information presented, as well as the more detailed supporting information provided in Chapter 5, will be used as the basis for the decision maker in their identification of the environmentally preferred and agency preferred alternatives.

ES 5.1.1 | Additional Context: Alternative C

Alternative C was developed to minimize impacts to coastal resources (such as marine mammals and fish), subsistence activities, nearshore processes, and potential impacts to the project facilities from coastal erosion. To minimize these impacts, this alternative would move project components inland. The primary trade-offs with this alternative would result from 1) moving the pads inland, thereby reducing access to the

reservoir; 2) the fuel and other supply constraints of seasonal access to the site during construction; 3) the cost and environmental impacts of developing an all-season gravel road; and 4) the challenges of overland module transportation.

Moving the pads inland would have the potential trade-off that future additional pads may be needed to fully access and develop the Point Thomson reservoir. Coastal pads could be deemed necessary if, upon fully delineating the reservoir and determining the extent of reservoir connectivity, it is determined that access into more northern or eastern portions of the reservoir would be required to fully develop the resource.

Only having seasonal ice road access to Point Thomson during construction would lead to challenges in transporting and storing supplies. An estimated 7.5 million gallons of fuel would have to be trucked to Point Thomson and stored to fuel all activities that would occur before the next ice road is functional. It would take one fuel truck per hour, 24 hours a day leaving Deadhorse for Point Thomson for the duration of the ice road season to deliver the needed amount of fuel. In addition, the fuel depot in Deadhorse does not have the capacity for that amount of fuel.

A third consideration under this alternative would be substantial costs incurred from the building and maintenance of a 44-mile gravel access road. However, because project costs were not determined as part of development of alternatives, there is no basis for determining an order-of-magnitude cost for comparison.

Finally, modules would be transported over an ice road by self propelled mobile transports (SPMTs). The module would travel a walking pace and would require a large support staff. There would be a SPMT operator and guides to walk the entire distance with the module, and sufficient staff would also be needed to repair the SPMT should it malfunction. The subzero temperatures of the North Slope would double the required crew of SPMT operators and guides to allow crews to warm and rest themselves.

ES 5.1.2 | Additional Context: Alternative D

Alternative D was also developed to minimize impacts to coastal resources, similar to Alternative C, and would move project components inland and as far away from the coast as practicable and feasible. The primary trade-offs with this alternative would result from 1) moving the pads inland, thereby reducing access to the reservoir, 2) the challenges of overland module transportation, and 3) having limited, seasonal overland access to the site throughout drilling and operations.

Alternative D has the same challenges as described above for Alternative C minus the cost of the gravel access road. The absence of the gravel access road results in resupply throughout drilling and operations continuing to be provided over ice roads each winter. Air transport would be the only year-round access to Point Thomson, but would be dependent on adequate weather conditions for flying. Under Alternative D transporting any large equipment or materials over the lifetime of the project would occur only during winter ice road seasons. A consequence of this logistical trade-off could include delayed development and production of the resource (e.g., materials or equipment not arriving within the necessary time frame, thereby missing a subsequent construction or drilling season). No estimates of cost risks related to logistics were completed, so cost cannot be used as a comparison between alternatives.

ES 5.1.3 | Additional Context: Alternative E

Alternative E uses the same pad locations as Alternative B and therefore has the same potential to develop the majority of the reservoir. Alternative E was developed to minimize the infrastructure footprint to reduce impacts to wetlands and surrounding water resources. This alternative would require less gravel fill overall, by not having infield gravel roads and using multiyear ice pads during drilling. The primary trade-offs of this alternative would result from 1) logistical challenges of having only seasonal overland access between pads and 2) technical and logistical challenges of using untested hybrid drill pads of gravel and multiyear ice.

Under this alternative the access to the East and West Pads would be either by helicopter, low ground pressure tundra vehicle, or by ice road in the winter. Potential effects of this logistical constraint include: not having year-round emergency response access due to no-fly days, limited ability to perform maintenance activities in the summer season, and a limited 3 to 4-month ice road window to move large equipment and materials. As with Alternative D, the logistical trade-off could include delayed development and production of the resource (such as due to missing an ice road window to move the drill rig or not being able to resupply). No estimates of cost risks related to logistics were completed, so cost cannot be used as a comparison between alternatives.

Alternative E would use multiyear ice pads adjacent to smaller, permanent ice pads in an effort to minimize gravel fill in wetlands. Multiseason ice pads (two winters, one summer) have been used elsewhere for drilling exploration wells; however, no examples were found where a multiyear ice pad was used in support of production drilling. As intended in Alternative E, the multiyear ice pad would be used for storage of equipment and materials in support of well development. A multiyear ice pad has several potential challenges such as the viability and annual maintenance of multiyear ice, safety concerns associated with irregular melting and structural integrity, and creation and maintenance of a viable connection with the permanent gravel pad.

ES 5.2 | Comparison of Impacts

Table ES-2 provides the reader an opportunity to compare impacts across the five alternatives. Each resource category is represented and categories or issues of impacts are presented so that the reader can better understand the differences or similarities among the alternatives.

Table ES-2: Comparison of Impacts[a] (1 of 7)

Impact Category	Alternative A No Action	Alternative B Applicant's Proposed Action	Alternative C Inland Pads with Gravel Access Road	Alternative D Inland Pads with Seasonal Ice Access Road	Alternative E Coastal Pads with Seasonal Ice Roads
GEOLOGY AND GEOMORPHOLOGY					
Gravel use	▪ No impact.	▪ 2.2 million cubic yards (mcy) of gravel would be mined; impacts would be negligible due to regional abundance.	▪ 5.4 mcy; impacts would be negligible due to regional abundance.	▪ 2.5 mcy; impacts would be negligible due to regional abundance.	▪ 1.7 mcy; impacts would be negligible due to regional abundance.
Geomorphologic features	▪ No impact.	▪ Impacts to geomorphologic features from gravel infrastructure and the mine would last at least the life of the project.	▪ Greater impacts due to gravel access road and associated gravel mines.	▪ Impacts similar to Alternative B	▪ Least impact due to reduced infrastructure
Petroleum hydrocarbon production	▪ No impact.	For all action alternatives, 10,000 bbl day of oil, if oil rim production is viable; impacts would be irreversible but this is the project purpose			
SOILS AND PERMAFROST					
Soil compaction and alteration of the thermal regime of the permafrost due to gravel fill placement	▪ No impact.	▪ 215 acres	▪ 605 acres	▪ 285 acres	▪ 155 acres
Potential for decreased albedo, increased thermal conductivity, and promotion of earlier spring thaw due to dust/snow-plow/gravel spray	▪ No impact.	▪ 135 acres	▪ 590 acres	▪ 185 acres	▪ 60 acres
Gravel mining could lead to talik formation and permafrost degradation	▪ No impact.	▪ 55 acres of gravel mine footprint	▪ 130 acres of gravel mine footprint	▪ 65 acres of gravel mine footprint	▪ 45 acres of gravel mine footprint
Compaction of underlying soil and inhibition of vegetation regeneration due to multiseason ice pads	▪ No impact.	▪ No impact.	▪ No impact.	▪ No impact.	▪ 20 acres
METEOROLOGY AND CLIMATE					
	▪ No impact.	▪ No impact.	▪ No impact.	▪ No impact.	▪ No impact.
AIR QUALITY					
State and federal air quality standards	▪ No impact.	▪ Air pollutants, including GHGs, would be emitted but state and federal air quality standards would be met.	Emissions would be similar to Alternative B except drilling impacts would be of greater duration (4 years compared to 3 years). State and federal air quality standards would be met.		▪ Emissions would be similar to Alternative B except drilling impacts would be of greater duration (5 years). State and federal air quality standards would be met.
Emissions from transportation would vary depending on the types and numbers of trips. Relative emissions produced in each alternative would generally be proportional to the number of trips by mode.	▪ No impact	▪ Fuel truck trips are particularly noteworthy relative to air quality because they produce fugitive dust and combustion emissions themselves and are associated with emissions produced by combustion of the fuel in construction equipment. About 883 fuel truck trips would be required during construction. See Transportation, below, for other trip information.	▪ About 3,458 fuel trucks would be required during construction. The additional fuel trucks would produce fugitive dust and combustion emissions above that produced in Alternative B and E. Additional emissions would also be associated with combustion of the additional fuel in construction equipment. Local air quality would not likely be measurably changed compared to Alternatives B and E because the emissions would tend to be scattered intermittently over a wide area. See Transportation, below, for other trip information.	▪ About 3,458 fuel trucks would be required during construction. The additional fuel trucks would produce emissions above that produced in Alternative B and E. Additional emissions would also be associated with combustion of the additional fuel in construction equipment. Local air quality would not likely be measurably changed compared to Alternatives B and E because the emissions would tend to be scattered intermittently over a wide area. See Transportation, below, for other trip information.	▪ About 883 fuel truck trips would be required during construction.

[a] The quantities in this table have been rounded to whole units. See Chapter 5 for additional detail.

Table ES-2: Comparison of Impacts[a] (2 of 7)

Impact Category	Alternative A No Action	Alternative B Applicant's Proposed Action	Alternative C Inland Pads with Gravel Access Road	Alternative D Inland Pads with Seasonal Ice Access Road	Alternative E Coastal Pads with Seasonal Ice Roads
PHYSICAL OCEANOGRAPHY AND COASTAL PROCESSES					
	▪ Over time, the existing PTU-3 Pad could extend out into the sea more than the adjacent land, due to differential erosion along the coast.	▪ Primary impacts would be from dredging and screeding associated with the barge offloading facility.	No barge offloading facility; impacts slightly higher than under Alternative A due to emergency boat launch ramp.		▪ Similar to Alternative B
HYDROLOGY					
Stream crossing structures	▪ No impact.	▪ 9 crossing structures could constrict channel flow during flood stage	▪ 50 crossing structures, including three at major water bodies	▪ 7 crossing structures	▪ One crossing structure
Gravel roads	▪ No impact.	▪ Gravel roads could alter streamflow and drainage pattern.	▪ Gravel access road would increase the geographic extent of the streamflow and drainage pattern alterations. More sheetflow culverts could be required for infield gravel roads due to greater proportion of sheetflow versus defined channels compared to Alternative B.	▪ More sheetflow culverts could be required for infield gravel roads due to greater proportion of sheetflow versus defined channels compared to Alternative B.	▪ Gravel infrastructure is minimized under this alternative.
Gravel airstrip	▪ No impact.	▪ 48% of Stream 22 (48 cubic feet per second (cfs)) would be diverted to another stream because the airstrip would block the natural drainage.	▪ 14% of Streams 18a and 18b combined (22 cfs) would be diverted.	▪ 15% of Stream 18b (15 cfs) would be diverted.	▪ 54% Stream 22 (55 cfs) would be diverted.
Water withdrawal	▪ No impact.	▪ 329.1 million gallons (MG) total for construction and drilling; 2.7 MG annually for operations.	▪ 600.2 MG total for construction and drilling; 21.1 MG annually for operations.	▪ 512.9 MG total for construction and drilling; 2.9 MG annually for operations.	▪ 594.7 MG total for construction and drilling; 13.2 MG annually for operations.
Gravel mines	▪ No impact.	▪ Infield gravel mine would permanently alter drainage pattern.	▪ Same as Alternative B	▪ Greater impacts to drainage pattern due to Stream 24 diversion (see below).	▪ Same as Alternative B
Stream 24 diversion	▪ No impact.	▪ No diversion of Stream 24	▪ Same as Alternative B	▪ Up to 80 percent of Stream 24 would be diverted for 3 years during spring breakup to fill the mine site reservoir.	▪ Same as Alternative B
WATER QUALITY					
Freshwater	▪ No impact.	▪ Primary impact would be increased turbidity due to gravel mining, gravel infrastructure, and pipeline construction.	▪ Greater impacts due to gravel access road and associated gravel mines and longer export pipeline.	Similar to Alternative B	
Marine Water	▪ No impact.	▪ Construction and operation of the barge offloading facility (including dredging and screeding) would cause temporary turbidity increases.	The Central Processing Pad would be located inland, thus decreasing potential impacts.		▪ Similar to Alternative B
VEGETATION AND WETLANDS					
Area of wetlands and uplands impacted through fill for gravel roads and pads and excavation for gravel mining	▪ No impact.	▪ 285 acres (<1% of mapped area) of wetlands and water bodies.	▪ 740 acres (1% of mapped area) of wetlands and water bodies ▪ More than 1,500 acres of fill and excavation associated with the gravel access road.	▪ 355 acres (<1% of mapped area) of wetlands and water bodies	▪ 205 acres (<1% of mapped area) of wetlands and water bodies

[a] The quantities in this table have been rounded to whole units. See Chapter 5 for additional detail.

Table ES-2: Comparison of Impacts[a] (3 of 7)

Impact Category	Alternative A No Action	Alternative B Applicant's Proposed Action		Alternative C Inland Pads with Gravel Access Road	Alternative D Inland Pads with Seasonal Ice Access Road	Alternative E Coastal Pads with Seasonal Ice Roads
VEGETATION AND WETLANDS (Continued)						
Area of vegetation and wetlands affected adjacent to gravel roads and pads (from dust, snow impoundment, and thermo-karst effects)	▪ No impact.	▪ 610 acres		▪ 2,635 acres	▪ 845 acres	▪ 260 acres
Vegetation modification from ice infra-structure	▪ No impact.	▪ 985 acres of modification from ice roads during construction and drilling. During operations the impact would be reduced because an ice access road would be constructed approximately every 5 years.		▪ 1,125 acres of modification from ice roads during construction and drilling. During operations ice roads would not be constructed.	▪ 890 acres of modification from ice roads. ▪ Impact from an ice access road would occur annually for the life of the project.	▪ 875 acres of modification from ice roads and multi-season ice pads during construction and operations. ▪ Vegetation recovery from multi-season ice pads could take 10 years or more. ▪ Impact from infield ice roads would occur annually for the life of the project.
BIRDS						
Habitat loss and alteration from gravel and ice infrastructure	▪ No impact.	▪ 1,365 acres of bird habitat lost or altered from gravel infrastructure ▪ 500 acres of bird habitat altered from ice infrastructure ▪ (<1% of available habitat)		▪ ,710 acres of bird habitat lost or altered from gravel infrastructure ▪ 685 acres of bird habitat altered from ice infrastructure ▪ (3% of available habitat)	▪ 1,955 acres of bird habitat lost or altered from gravel infrastructure ▪ 455 acres of bird habitat altered from ice infrastructure ▪ (1% of available habitat)	▪ 636 acres of bird habitat lost or altered from gravel infrastructure ▪ 415 acres of bird habitat altered from ice infrastructure ▪ (<1% of available habitat)
Disturbance from air (helicopter and fixed-wing take off/landing) and boat (barge and spill response skiff) traffic	▪ Helicopter overflights to monitor wells when birds are present near the central pad could cause temporary disturbance to birds.	▪ 1,070 acres of bird habitat disturbed by air and boat traffic.		▪ 890 acres of bird habitat disturbed by air traffic.	▪ 950 acres of bird habitat disturbed by air traffic.	▪ 1,557 acres of bird habitat disturbed by air and boat traffic. ▪ Helicopter flights for infield travel could have moderate impacts on birds in affected areas.
TERRESTRIAL MAMMALS						
Habitat loss, alteration, and disturbance from gravel infrastructure	▪ No impact.	▪ 880 acres of terrestrial mammal habitat (<1% of available habitat). ▪ Traffic on infield gravel roads may cause disturbance to calving caribou.		▪ 3,450 acres of terrestrial mammal habitat (1% of available habitat). ▪ Gravel access road crosses through caribou calving habitat, muskoxen wintering habitat, and potential brown bear denning habitat. ▪ Traffic on gravel roads may cause disturbance to calving caribou.	▪ 1,205 acres of terrestrial mammal habitat (<1% of available habitat). ▪ Infield gravel roads extend south farther into caribou calving habitat than Alternative B. Traffic on the infield gravel roads may cause disturbance to calving caribou.	▪ 460 acres of terrestrial mammal habitat (<1% of available habitat). ▪ Vehicle traffic disturbance during caribou calving would be limited to the gravel pads, but this disturbance may be replaced by noise from helicopters traveling between the pads.
Pipeline/roads within 500 feet of each other	▪ No impact.	▪ Central Pad – 1,340 ft ▪ Badami tie in – 5,955 ft		▪ Central Pad – 2,555 ft ▪ Near Airstrip – 2,395 ft ▪ Water reservoir – 2,840 ft ▪ Water pipeline on timbers has potential to fragment caribou and muskoxen herds.	▪ Near Airstrip – 11,480 ft ▪ Badami tie in – 4,955 ft ▪ West Pad – 1,235 ft	▪ Central Pad – 6,355 ft ▪ Badami tie in – 3,955 ft ▪ Water reservoir – 5,160 ft

[a] The quantities in this table have been rounded to whole units. See Chapter 5 for additional detail.

Table ES-2: Comparison of Impacts[a] (4 of 7)

Impact Category	Alternative A No Action	Alternative B Applicant's Proposed Action	Alternative C Inland Pads with Gravel Access Road	Alternative D Inland Pads with Seasonal Ice Access Road	Alternative E Coastal Pads with Seasonal Ice Roads
TERRESTRIAL MAMMALS (Continued)					
Habitat fragmentation and disturbance from water distribution method	▪ No impact	▪ Trucking water would increase traffic on infield roads which may disturb calving caribou.	▪ Caribou and muskoxen would be reluctant to cross the water pipeline elevated 12 inches above the ground, which could fragment herds.	No impact	
MARINE MAMMALS					
Barging	▪ No impact.	▪ Noise from barge operations could affect bowhead whales and ringed seals.	▪ No impact.	▪ No impact.	▪ Noise from barge operations could affect bowhead whales and ringed seals.
Habitat loss from gravel and ice infrastructure	▪ No impact	▪ 390 acres of polar bear critical habitat lost to gravel infrastructure. ▪ 985 acres of polar bear critical habitat seasonally lost to ice infrastructure (impact would be reduced after drilling).	▪ 745 acres of polar bear critical habitat lost to gravel infrastructure. ▪ 1,140 acres of polar bear critical habitat seasonally lost to or disturbed by ice infrastructure (impact would end after drilling).	▪ 355 acres of polar bear critical habitat lost to gravel infrastructure. ▪ 895 acres of polar bear critical habitat seasonally lost to ice infrastructure (impact would occur annually for the life of the project).	▪ 205 acres of polar bear critical habitat lost to gravel infrastructure. ▪ 900 acres of polar bear critical habitat seasonally lost to ice infrastructure (impact would occur annually for the life of the project for infield roads, but would be reduced after drilling for the access road).
Habitat disturbance from all project infrastructure (gravel roads, ice roads, pipelines, pads, airstrip)	▪ No impact	▪ 28,414 acres of polar bear critical habitat (impact from ice access road would be reduced after drilling)	▪ 27,823 acres of polar bear critical habitat (impact from gravel access road would continue for the life of the project)	▪ 24,863 acres of polar bear critical habitat (impact from ice access road would continue for the life of the project)	▪ 22,362 acres of polar bear critical habitat (impact from ice access road would be reduced after drilling; impact from infield ice roads would continue for the life of the project)
Disturbance from air traffic	▪ Minimal impacts to polar bears and polar bear critical habitat from helicopter overflights to monitor wells.	17,312 acres of polar bear habitat potentially disturbed by overflights.			
FISH, ESSENTIAL FISH HABITAT, AND INVERTEBRATES					
Stream crossings	▪ No impact	▪ 4 streams crossed with bridges (all fish bearing, one anadromous downstream of the crossing site) ▪ 5 streams crossed with culverts/ culvert batteries (2 fish bearing)	▪ 27 streams crossed with bridges (all fish bearing, 6 anadromous) ▪ 21 streams crossed with culverts/ culvert batteries (many fish bearing) ▪ Some anadromous streams provide EFH.	▪ 2 streams crossed with bridges (both fish bearing, neither anadromous) ▪ 5 streams crossed with culverts/ culvert batteries (2 fish bearing)	▪ One stream crossed with a bridge (fish bearing but not anadromous)
Water withdrawal from fish bearing lakes	▪ No impact	21 streams crossed with culverts/culvert batteries (many fish bearing)		Highest potential to affect overwintering fish because of tshe high annual water requirements for ice access roads (Alternative D) and infield ice roads (Alternative E).	
Diversion channel	No impact.			▪ Diversion of water from Stream 24 to the gravel mine site under Alternative D could impact the ability of Dolly Varden to move up and downstream during spring runoff in the initial years when the reservoir is filling.	▪ No impacts
Essential Fish Habitat	Marine Essential Fish Habitat in the study area is designated for arctic cod and five species of Pacific salmon (although salmon are uncommon in the Beaufort Sea). Freshwater Essential Fish Habitat for pink and chum salmon occurs in the western portion of the study area. Impacts to Essential Fish Habitat from all alternatives would be a temporary occurrence in localized areas depending on the activity.				

[a] The quantities in this table have been rounded to whole units. See Chapter 5 for additional detail.

Table ES-2: Comparison of Impacts[a] (5 of 7)

Impact Category	Alternative A No Action	Alternative B Applicant's Proposed Action	Alternative C Inland Pads with Gravel Access Road	Alternative D Inland Pads with Seasonal Ice Access Road	Alternative E Coastal Pads with Seasonal Ice Roads
LAND OWNERSHIP, USE, AND MANAGEMENT					
	▪ Would be counter to state and NSB management objectives for their lands.	▪ No change in underlying land ownership for state, federal (Arctic Refuge and Bullen Point lands), and holders of Native Allotment rights. The state would continue to manage land in the area for oil and gas leasing.	▪ Same as Alternative B, but is also most likely to contribute to other industrial uses in the future due to permanent gravel road accessing presently undeveloped project area.	Similar to Alternative B.	
ARCTIC NATIONAL WILDLIFE REFUGE					
	▪ No impact.	Proximity of project to the Arctic Refuge may influence management in the Arctic Refuge due to potential impacts to polar bear movement, subsistence and traditional land use, recreation, wilderness perception, and research activities. Proximity of industrial facilities could be perceived as an effect to wilderness values and lead to an increase the national perception that wilderness qualities would be diminished.			
SOCIOECONOMICS					
Community characteristics and culture	▪ No impact.	▪ Greater potential for displacement of subsistence resources along coast due to barge traffic and nearshore infrastructure.	▪ Fewer impacts to user access along the coast due to absence of barge traffic and nearshore infrastructure. Greater disruption as a result of the gravel access road.	▪ Fewer impacts to user access along the coast due to absence of barge traffic and nearshore infrastructure.	▪ Greater potential for displacement of subsistence resources along coast due to barge traffic and nearshore infrastructure.
Employment and income	▪ No impact.	▪ Employment peaks at 1,100 in Year 5.	▪ Construction employment overall could be up to 50% higher than Alternative B due to gravel access road construction and transport and assembly from Deadhorse. Employment peaks at 1,500 workers in Year 6.	▪ Similar to Alternative C, but fewer workers due to construction of ice road rather than gravel access road. Employment peaks at 1,200 in Year 5.	▪ Similar to Alternative B. Employment peaks at 1,210 in Year 5. Additional construction crews would be needed each winter during operation for ice road construction.
Income and tax base	▪ No impact.	▪ Increased income primarily through shareholder dividends and Alaska Permanent Fund for residents of NSB and state. Temporary increase in NSB operating budget and bonding ability during construction. Addition of approximately $1 billion to actual and true property value of NSB and could generate annual tax revenue of $47.45 million to the state.	Similar to Alternative B, but would require additional employment and contract opportunities due to increased amount of infrastructure resulting in slightly larger income and tax base revenue generation impacts.		▪ Similar to Alternative B
Utilities, community facilities, and services	▪ No impact.	▪ Utility services would largely be onsite; NSB would not see large benefits nor demand on services.	Similar to Alternative B, however greater demand on material supply chains in Deadhorse and throughout Alaska for storage areas and facilities and other infrastructure. Possible adverse impacts on local and regional fuel and raw materials supplies due to competing needs for logistics of resupplying the facility during construction. Would require 60 temporary fuel trucks for construction and increased demand on tank fabrication shops in Fairbanks for over 2 years to accommodate storage of up to 6 million gallons of diesel fuel during construction. Likely to require expansion of Deadhorse fuel depot infrastructure.		▪ Similar to Alternative B

[a] The quantities in this table have been rounded to whole units. See Chapter 5 for additional detail.

Table ES-2: Comparison of Impacts[a] (6 of 7)

Impact Category	Alternative A No Action	Alternative B Applicant's Proposed Action	Alternative C Inland Pads with Gravel Access Road	Alternative D Inland Pads with Seasonal Ice Access Road	Alternative E Coastal Pads with Seasonal Ice Roads
ENVIRONMENTAL JUSTICE					
Environmental Justice Finding	Potential impacts to subsistence resources, subsistence user access, and human health would not be disproportionately high and adverse impacts on the minority and low-income communities of Kaktovik and Nuiqsut.				
TRANSPORTATION					
Trips (land, water, and air)	▪ No impact.	▪ Approximately 11,000 trips on ice roads; 300 coastal barge trips; and 1,500 trips by helicopter and fixed-wing aircraft.	▪ Approximately 20,000 trips on ice and gravel roads; and 7,500 trips by helicopter and fixed-wing aircraft. Reliance on winter ice roads to transport materials and supplies during construction. Greater potential for accidents due to increase in trucks operating in Deadhorse unloading barges and transporting contents.	▪ Approximately 20,000 trips on ice and gravel roads; and 7,500 trips by helicopter and fixed-wing aircraft. Similar to Alternative C.	▪ Approximately 15,500 trips on ice roads; 400 coastal barge trips; and 12,000 trips by helicopter and fixed-wing aircraft. Reliance on helicopters to move equipment or materials would be expensive, weather dependent, and increase potential safety issues.
RECREATION					
	▪ Occasional helicopter operations for site monitoring and the protective wellhead covers for the two wells and rig mats would be noticeable to recreationists.	▪ Approximately 280 acres lost for recreation at footprint. Limitations on usability for recreation on 16,600 acres at project site and 19,300 acres along export pipeline. Export pipeline location parallel to coastline would be visible from coastline and ocean. Coastal hunters and subsistence hunters would likely be inhibited from shooting in direction toward pipeline. Public access to facilities on coast would likely be restricted.	▪ Approximately 750 acres lost for recreation at footprint. Limitations on usability for recreation on 39,000 acres at project site and 47,400 acres along export pipeline and gravel access road. Activities on gravel road would likely inhibit recreational hunters from shooting in directions toward road and pipeline. Inland location of facilities would help protect existing coastline recreational experience. Limited public access at Central Well Pad, but not as great as Alternatives B and E.	▪ Approximately 350 acres lost for recreation at footprint. Limitations on usability for recreation on 22,700 acres at the project site and 20,000 acres along export pipeline. Other impacts similar to Alternative C, with exception of the gravel road.	▪ Approximately 200 acres lost for recreation at footprint. Limitations on usability for recreation on 10,000 acres at project site and 22,000 acres along the export pipeline. Other impacts similar to Alternative B, but increased use of helicopters between pads likely would be visible and audible to recreationists.
VISUAL AESTHETICS					
Viewshed	▪ Well caps, existing gravel pads, and rig mats would be visible during snow-free seasons from the coastline.	Project would contrast strongly with the surrounding viewshed from many different vantage points and distances; components would be visible during daytime and nighttime for a long time period; and would be visible within the coastal corridor and from the northwest corner of the Arctic Refuge with weak to strong contrast, depending on the project phase and lighting conditions.			
Views from Key Observation Points	▪ Well caps are visible from coastline.	▪ Major project features (pads, facilities, export pipeline, and airport) would be visible from some or all key observation points due to location on coastline.	Pads and facilities setback further from the coastline, reducing visual impacts compared to B and E, but not substantially.		▪ Same as Alternative B

[a] The quantities in this table have been rounded to whole units. See Chapter 5 for additional detail.

Table ES-2: Comparison of Impacts[a] (7 of 7)

Impact Category	Alternative A No Action	Alternative B Applicant's Proposed Action	Alternative C Inland Pads with Gravel Access Road	Alternative D Inland Pads with Seasonal Ice Access Road	Alternative E Coastal Pads with Seasonal Ice Roads
NOISE					
Potential for project-related noise effect on Arctic Refuge	▪ Minor predicted increases in noise due to occasional helicopter flights.	Greatest predicted increase in noise in coastal environment during construction, drilling, and operations. Increase of less than 10 dBA predicted inside Arctic Refuge at a distance of 10 miles from the western border.			
Potential for project-related noise in study area	▪ Infrequent helicopter flights would have minor effect, particularly in areas directly in the flight path.	▪ Larger increase in noise compared to Alternatives C and D at Brownlow Spit, Flaxman Island and the Sea Coast monitoring locations during winter construction and at Mary Sachs Island during summer construction and drilling.	May experience a slightly larger increase in noise along coast during summer construction and drilling.		▪ On a long-term basis, operational noise from Alternative E is distinctly different from the other build alternatives due to the extensive use of helicopters.
CULTURAL RESOURCES					
Unidentified cultural resources	▪ No impact	▪ No direct impacts to cultural resources; ▪ 43 sites would be potentially indirectly affected.	▪ One cultural resource site potentially directly affected as a result of the all season gravel road; 44 sites potentially indirectly affected with construction of optional sea ice road; 12 without optional sea ice road.	▪ No cultural resource sites potentially directly affected as a result of the all season gravel road; 42 sites potentially indirectly affected with construction of optional sea ice road; 27 without optional sea ice road.	▪ No cultural resource sites potentially directly affected as a result of the all season gravel road; 43 sites potentially indirectly affected with construction of optional sea ice road; 37 without optional sea ice road.
Documented cultural resources sites	▪ No impact.	Low probability for discovering unidentified cultural resources in the Point Thomson area due to continuous alteration of coastal areas and barrier islands.			
SUBSISTENCE AND TRADITIONAL LAND USE					
Caribou harvest	▪ Minor impacts to the harvest amount of caribou for Kaktovik due to noise/ traffic for monitoring activities; however, impacts are unlikely.	▪ Minor impacts to the harvest amount of caribou for Kaktovik are probable.	Minor impacts to the harvest amount of caribou for Kaktovik are probable. Increased helicopter traffic could affect local caribou behavior and distribution and result in additional effects on hunter success or increased user avoidance during periods of helicopter activity.		
Fish and/or seal harvest	▪ No impact	▪ Impacts to fish and seal harvests for Kaktovik. User avoidance would likely be higher in due to coastal infrastructure and barging activity.	▪ Impacts to fish harvest for Kaktovik. Impacts to Kaktovik caribou harvests would likely be higher due to more widespread disruption, increased caribou displacement, and decreased hunter success as a result of the gravel access road.	▪ Impacts to fish harvest for Kaktovik	▪ Impacts to fish and seal harvests for Kaktovik. Increased disturbance to caribou may result from increased helicopter activity. User avoidance would likely be higher in due to coastal infrastructure and barging activity. Increased disturbance to caribou may result from increased helicopter activity.
HUMAN HEALTH					
	▪ No impact.	▪ Negative impacts from exposure to hazardous materials and changes in anxiety/depression prevalence. ▪ Positive impacts from increased tax revenues to fund health care clinics and services.	▪ Negative impacts from exposure to hazardous materials, reduced dietary consumption of subsistence resources, increased roadway incidents and injuries, and an increase in utilizations/clinic burden from nonresident influx due to accidents and injuries. ▪ Positive impacts from increased tax revenues to fund health care clinics and services.		▪ Negative impacts from exposure to hazardous materials, changes in anxiety/depression prevalence. ▪ Positive impacts from increased tax revenues to fund health care clinics and services.

[a] The quantities in this table have been rounded to whole units. See Chapter 5 for additional detail.

ES 6. | MITIGATIVE MEASURES

Mitigation is considered by the Corps in two ways during the NEPA process: Applicant-proposed avoidance and minimization measures (identified in this Draft EIS as Design Measures), and resource-specific mitigation measures intended to offset or compensate for unavoidable adverse impacts (referred to as Mitigation Measures). Other federal agencies will use the Point Thomson EIS as part of their decision-making processes, and are asked as part of this process to comment on and/or propose additional design and mitigation measures pertinent to their permitting or authorization processes.

Design measures are project components that have been incorporated into the design of the action alternatives, and are described in this Draft EIS. A listing of design measures is found in Chapter 4 of the EIS and under applicable resource discussions in Chapter 5. The Corps encourages the public and agencies to comment on the adequacy of the proposed mitigation and to suggest additional conditions that would avoid, minimize, rectify, or compensate for the identified impacts. Mitigation measures will be addressed in the Final EIS and Record of Decision, and will include consideration of measures suggested by the public and agencies during the Draft EIS comment period.

ES 7. | NEXT STEPS

The Corps invites interested parties to comment on this Draft EIS. The public may comment by mail, email, through the project website, or at a public meeting.

Public meetings will be held in Barrow, Nuiqsut, Kaktovik, Fairbanks, and Anchorage. Visitors to these meetings will be able to view project related material and speak with project representatives in an open house setting. Oral comments will be taken during the public meeting and visitors may also submit comments in writing.

All comments received will be reviewed and substantive comments will be addressed in the Final EIS. The Corps will consider comments substantive if they:

- Provide additional or new information that is relevant to the EIS analysis
- Present other reasonable alternatives or components, provided that a rational basis for consideration of the alternative or component is included
- Question the accuracy or adequacy of the information presented in the EIS, provided that a rational basis for the question is included

The Corps will make a decision on whether or not to issue a permit after the Final EIS has been issued. At that time, the Corps will prepare a ROD that will describe, in detail, the Corps' evaluation of the permit application. If the permit is granted, the ROD will also include any conditions attached to the Corps approval. At this time the Corps plans to publish a Final EIS in early fall of 2012 and a ROD in late 2012.

Ways to Comment

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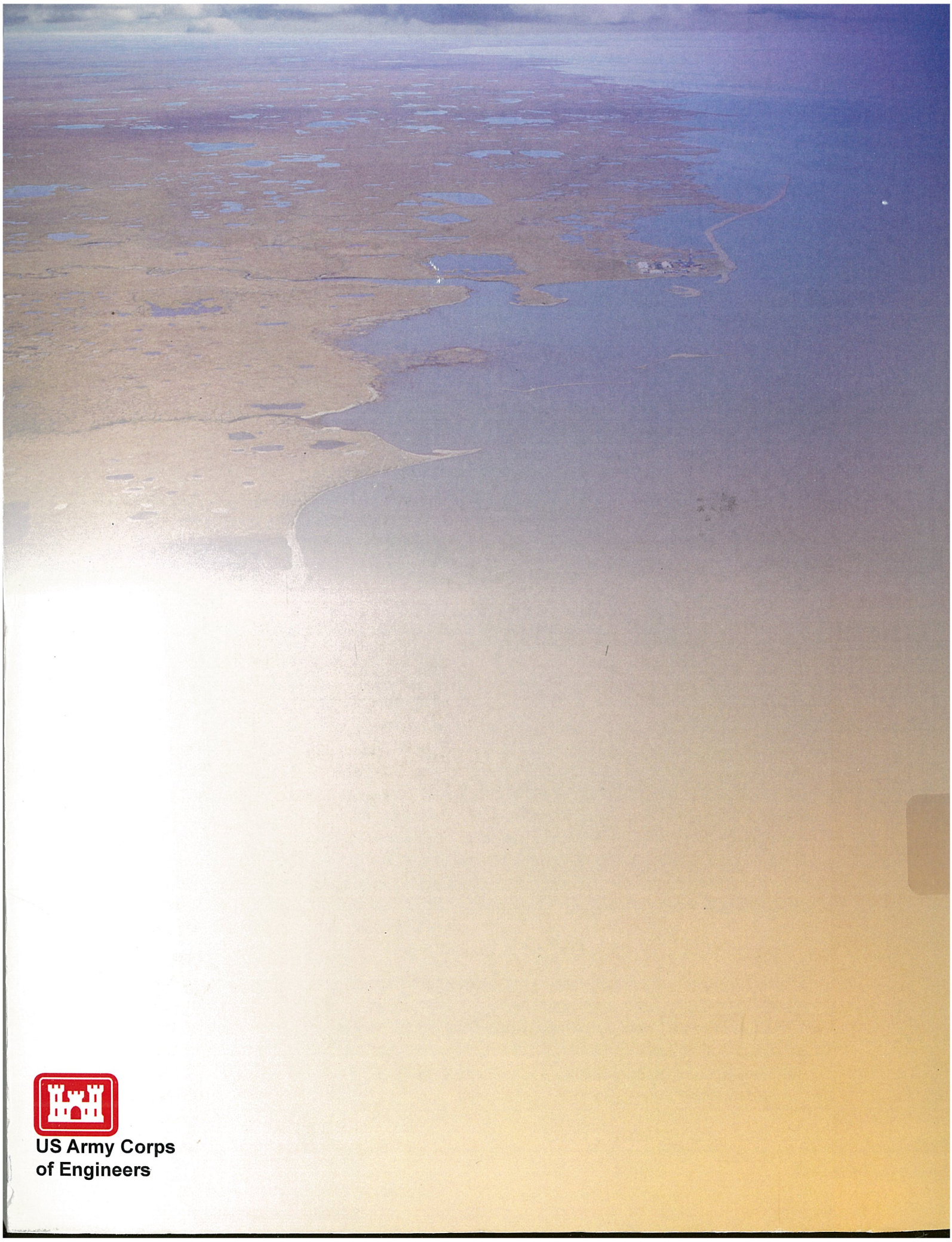

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