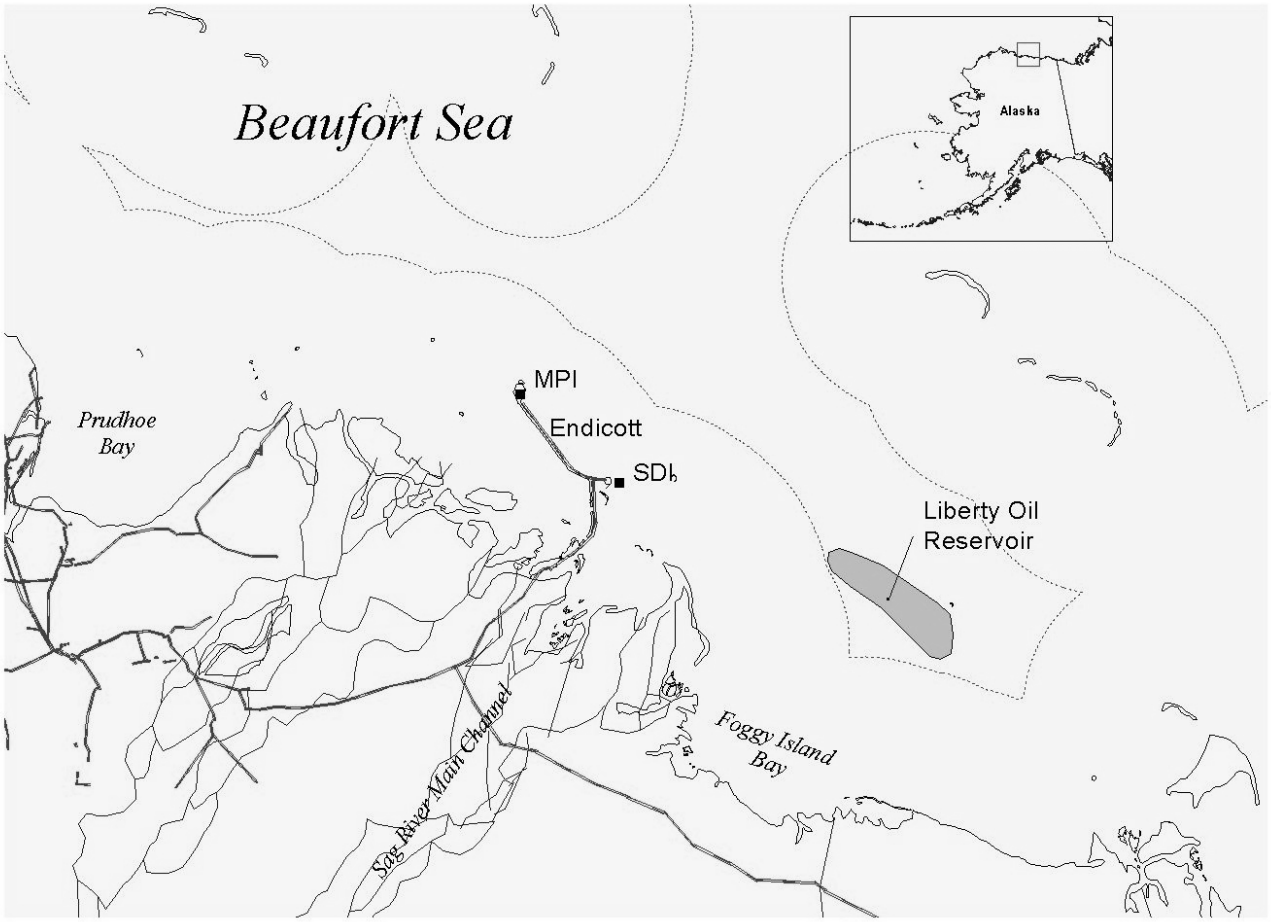
Alaska Outer Continental Shelf

OCS EIS/EA
MMS 2007-054

Liberty Development and Production Plan Ultra Extended Reach Drilling From Endicott - Satellite Drilling Island (SDI)

Environmental Assessment



U.S. Department of the Interior
Minerals Management Service
Alaska OCS Region

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Environmental Assessment

Lead Agency:
Minerals Management Service, Department of the Interior

Cooperating Organizations:
US Army Corps of Engineers, Department of Defense
State of Alaska, Department of Natural Resources
British Petroleum Exploration (Alaska), Inc.

U.S. Department of the Interior
Minerals Management Service
Alaska OCS Region

October 2007

Finding of No Significant Impact (FONSI)

In accordance with the National Environmental Policy Act (NEPA) of 1969, as amended, the Minerals Management Service (MMS) prepared an Environmental Assessment (EA) on British Petroleum Exploration (Alaska), Inc's (BPXA) proposed Liberty Development and Production Plan (DPP) Ultra Extended Reach Drilling (uERD) Project from Endicott Satellite Drilling Island (SDI). The proposed action consists of drilling six development wells from an expansion of the SDI to produce oil reserves from the Liberty prospect underlying BPXA's outer continental shelf (OCS) leases. The EA is dated October 2007.

The proposed Liberty development wells will be drilled from the existing Endicott industrial complex located in State of Alaska waters. Due to the location, and use of uERD, many potentially adverse impacts to the human environment are mitigated. Compared to the original Liberty project for which an Environmental Impact Statement was prepared in 2002, the current proposed action from Endicott industrial complex, has no subsea sales-oil pipeline; does not require construction of a new "stand-alone" offshore gravel island for drilling/processing; and will require 17 fewer development wells.

Based on the environmental assessment, MMS Alaska Region has determined that the proposal will not have significant effects on the quality of the human environment (40 CFR 1508.27).

Preparation of an environmental impact statement is not required.

Deborah Cranswick
Chief, Environmental Assessment Section
MMS, Alaska OCS Region

11/5/07
Date

Cleveland J. Cowles
Regional Supervisor, Leasing & Environment
MMS, Alaska OCS Region

11/5/07
Date

FOREWORD

This Environmental Assessment (EA) is based primarily on information provided to the Minerals Management Service (MMS) by BP Exploration (Alaska) Inc. (BPXA) on their proposed Liberty Development Project.

The Council on Environmental Quality (CEQ) encourages agencies to use environmental information prepared and submitted by the applicant, if appropriate. CEQ's stated intent at 40 CFR 1506.5(a) is "that acceptable work not be redone, but that it be verified by the agency." Per 40 CFR 1506.5(a):

> (a) *Information*. If an agency requires an applicant to submit environmental information for possible use by the agency in preparing an environmental impact statement, then the agency should assist the applicant by outlining the types of information required. The agency shall independently evaluate the information submitted and shall be responsible for its accuracy. If the agency chooses to use the information submitted by the applicant in the environmental impact statement, either directly or by reference, then the names of the persons responsible for the independent evaluation shall be included in the list of preparers (Sec. 1502.17). It is the intent of this paragraph that acceptable work not be redone, but that it be verified by the agency.
>
> (b) *Environmental assessments*. If an agency permits an applicant to prepare an environmental assessment, the agency, besides fulfilling the requirements of paragraph (a) of this section, shall make its own evaluation of the environmental issues and take responsibility for the scope and content of the environmental assessment.

Under a Memorandum of Understanding and consistent with CEQ regulations, the MMS, the U.S. Army Corps of Engineers, and the State of Alaska Department of Natural Resources worked closely with BPXA and its contractors to ensure that the Environmental Impact Analysis (EIA) submitted with the Development and Production Plan (DPP) included as much of the information as possible needed for the National Environmental Policy Act (NEPA) analyses prepared by the Cooperating Agencies. The EIA was designed to provide the necessary environmental information to support agencies' decisionmaking for permits required for the project.

The primary source of the information in this EA is the EIA submitted by BPXA to MMS on April 25, 2007. The information included in the EIA was reviewed and verified by MMS, U.S. Army Corps of Engineers, and State of Alaska Department of Natural Resources. Much of the information in the EIA was taken directly from the 2002 Liberty Final Environmental Impact Statement (EIS). This EA tiers from the 2002 Liberty Final EIS and summarizes and incorporates by reference additional information from the EIS. While this EA adopts major sections of the EIA, MMS also updated and expanded on the information provided in the EIA, as needed. The conclusions in the EA reflect the MMS analysts' conclusions based on MMS's

significance thresholds and consideration of additional required mitigation measures developed subsequent to submission of the DPP and EIA.

Alternatives to the proposed action described in Section 1 of the EIA were developed by BPXA and are the alternatives analyzed in this EA as required by the:

- National Environmental Policy Act (NEPA) (40 CFR 1502.14);
- Regulations of the MMS (30 CFR 250.261);
- Regulations of the U.S. Army Corps of Engineers (33 CFR 325 Appendix B), and
- U.S. Environmental Protection Agency 404(b)(1) Guidelines (40 CFR 230).

The EIA contained the following major components:

- Summary of the project as proposed in *Liberty Development Project Development and Production Plan* and alternatives considered;
- Description of the affected environment, including physical, biological, and sociocultural components;
- Assessment of the environmental consequences of the proposed project and alternatives;
- Mitigative measures incorporated into the proposed project, including compliance with lease-sale stipulations; and
- Summary list of consultation and coordination with agencies and the public.

List of Acronyms

LIST OF ACRONYMS

AAC	Alaska Administrative Code
AAQS	Ambient Air Quality Standards
ACS	Alaska Clean Seas
ADCEC	Alaska Department of Community and Economic Development
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
ADOR	Alaska Department of Revenue
AEWC	Alaska Eskimo Whaling Commission
AHRS	Alaska Heritage Resources Survey
Al	Aluminum
ANCSA	Alaska Native Claims Settlement Act
ANIMIDA	Arctic Nearshore Impact Monitoring in the Development Area
ANS	Alaska North Slope
ANWR	Arctic National Wildlife Refuge
AOGCC	Alaska Oil and Gas Conservation Commission
API	American Petroleum Institute
As	Arsenic
ASDP	Alpine Satellite Development Plan
ASOS	Automatic Surface Observing System
ASRC	Arctic Slope Regional Corporation
Ba	Barium
BA	Biological Assessment
BACT	Best available control technology
BAT	Best available technology
bbl	Barrel(s)
Be	Beryllium
BLM	Bureau of Land Management
BMP	Best management practice
BO	Biological Opinion
BOP	Blowout preventer
bpd	Barrels per day
BPXA	BP Exploration (Alaska) Inc.
CAA	Conflict Avoidance Agreement
$CaCO_3$	Calcium carbonate
cANIMIDA	Continuation of Arctic Nearshore Impact Monitoring in the Development Area

CBD	Centers for Biological Diversity
CBS	Chukchi-Beaufort Seas (stock of polar bears)
CCP	Central Compression Plant
Cd	Cadmium
CDOM	Colored dissolved organic matter
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	Cubic feet per second
cm	Centimeter(s)
cm/yr	Centimeter(s) per year
Co	Cobalt
CO	Carbon monoxide
CO_2	Carbon dioxide
COY	cubs of the year (polar bears)
Cr	Chromium
CRA	Corrosion Resistant Alloy
Cu	Copper
dB	Decibel
dB Re 1µPa	Decibel re 1 microPascal
DOC	Dissolved organic carbon
DOT	U.S. Department of Transportation
DPP	Development and Production Plan
DS-11	Dive Site 11
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIA	Energy Information Administration and Environmental Impact Assessment
EIS	Environmental Impact Statement
EOR	Enhanced oil recovery
EPA	U.S. Environmental Protection Agency
ERA	Environmental Resource Area
ERD	Extended reach drilling
ERL	Effects Range-Low
ERM	Effects Range-Median
ESA	Endangered Species Act
Fe	Iron
FEIS	Final environmental impact statement
FG	Fracture gradient
FR	*Federal Register*
FSA	Facility Sharing Agreement
ft	foot/feet
FTE	Full-time equivalent
FWS	Fish and Wildlife Service
FY	Fiscal Year
g	Gram
gal	Gallon

g/m^2	Grams per square meter
GNOME	General NOAA Operational Modeling Environment
GPB	Greater Prudhoe Bay
gpd	Gallons per day
GPS	Global Positioning System
H_2S	Hydrogen sulfide
HAZWOPER	Hazardous waste operations
Hg	Mercury
hr	Hour
H_{sat}	Saturating irradiance
HSE	Health, safety, and environmental
Hz	Hertz
ICAS	Inupiat Community of the Arctic Slope
In	inch(es)
IOPs	Inherent optical properties
IRA	Indian Reorganization Act
ISER	Institute of Social and Economic Research
IUCN/SSC	World Conservation Union/Species Survival Commission
kg	Kilogram
KIC	Kaktovik Iñupiat Corporation
km	Kilometer
km^2	Square kilometer
kt	Knot(s)
KSOPI	Kuukpikmiut Subsistence Oversight Panel, Inc.
l	Liter
LCU	Lower Cretaceous Unconformity
LOA	Letter of Authorization
***LoSal*™**	A trademark of BP p.l.c., associated with a BP process to produce low-salinity water for enhanced oil recovery
m	Meter(s)
m/sec	meter(s) per second
m^3	Cubic meter(s)
mb	Millibar(s)
mg	Milligram(s)
mi	mile(s)
MHHW	Mean higher high water
MLLW	Mean lower low water
mm	Millimeter(s)
MMbbl	Million barrels
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
Mn	Manganese
MOU	Memorandum of understanding
mph	mile(s) per hour
MPI	Main Production Island
MPFM	Multi phase flow meter

MSA	Magnuson-Stevens Fishery Conservation and Management Act of 1996
MSDS	Material safety data sheet
MSL	Mean sea level
MWD	Measurement while drilling
NACE	National Association of Corrosion Engineers
NCDC	National Climatic Data Center
NEPA	National Environmental Policy Act
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NGLs	Natural gas liquids
NMFS	National Marine Fisheries Service
Ni	Nickel
NO_2	Nitrogen dioxide
NOx	Nitrogen oxides
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NPDES	National Pollutant Discharge Elimination System
NPR-A	National Petroleum Reserve-Alaska
NRC	National Research Council
NSB	North Slope Borough
NSBSAC	North Slope Borough Science Advisory Committee
NSPS	New Source Performance Standards
NTU	Nephelometric turbidity units
O_3	Ozone
OCS	Outer continental shelf
OCSEAP	Outer Continental Shelf Environmental Assessment Program
OCSLA	OCS Lands Act
ODPCP	Oil Discharge Prevention and Contingency Plan
OHA	Office of History and Archaeology (ADNR)
OHMP	Office of Habitat Management and Permitting (ADNR)
OR&R	Office of Response and Restoration (NOAA)
OSHA	Occupational Safety and Health Administration
OSRP	Oil Spill Response Plan
OSRA	Oil-Spill-Risk Analysis
PAH	Polynuclear aromatic hydrocarbons
PAR	Photosynthetically active radiation
Pb	Lead
PBSG	Polar Bear Specialists Group
PFFR	Photon flux fluence rate
PHC	Petroleum hydrocarbons
$PM_{2.5}$	Very fine particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers
PM_{10}	Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers
ppb	Parts per billion
ppm	Parts per million
ppt	Parts per thousand

PS-1	Pump Station 1
PSD	Prevention of Significant Deterioration
psi	Pounds per square inch
psia	Pounds per square inch absolute
psig	Pounds per square inch gauge
RS/FO	Regional Supervisor, Field Operation
RTE	Radiative transfer equation
SAW	Sensitive Areas Workgroup
Sb	Antimony
SBS	Southern Beaufort Sea (stock of polar bears)
scf/stb	Standard cubic feet per stock tank barrel
scfd	Standard cubic feet per day
SD	Standard deviation
SDI	Satellite Drilling Island
SHPO	State Historic Preservation Officer
SO_2	Sulfur dioxide
S/T	Steranes and triterpanes
STP	Seawater treatment plant
T	Transmissivity
TAPS	Trans-Alaska Pipeline System
TDS	Total dissolved solids
Tl	Thallium
TLUI	Traditional Land Use Inventory
TOC	Total organic carbon
TPHC	Total petroleum hydrocarbons
TSS	Total suspended solids
TVDSS	true vertical depth sub sea
TVP	True vapor pressure
uERD	Ultra extended reach drilling
µg	Microgram
uERD	Ultra Extended Reach Drilling
UIC	Ukpeagvik Iñupiat Corporation
USCG	U.S. Coast Guard
USDOI	U.S Department of Interior
USGS	U.S. Geological Survey
V	Vanadium
yd	Yard(s)
$yd^{2`}$	Yard(s) square
yr	Year
Zn	Zinc
3D	3-dimensional (seismic surveys)
<	Less than
>	Greater than
≤	Less than or equal to
≥	Equal to or greater than
$\delta^{13}C$	Stable carbon isotope

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Project Summary

1. PROJECT SUMMARY

1.1 PURPOSE OF THE PROPOSED ACTION

In April 2007, BP Exploration (Alaska) Inc. (BPXA) submitted a Development and Production Plan (DPP) to the Minerals Management Service (MMS), for the Liberty Satellite Drilling Island (SDI) Project, as required under 30 CFR 250.204. On October 15, 2007, BPXA submitted a modification to the April 2007 DPP. Specifically, the modification outlined redesign of the gravel mine site, which is adjacent to the existing Duck Island Mine Site; upgrade of the Sagavanirktok River bridge superstructure, versus replacement of the entire bridge; and the bridge design basis/preliminary construction plan.

Previously, in February 1998, BPXA submitted a DPP to MMS for Liberty, as required under 30 CFR 250.204. The 1998 DPP proposed to develop the Liberty oil field from a gravel island constructed on the Outer Continental Shelf (OCS). The proposed project included a manmade offshore gravel island, processing facilities located on the island, an offshore buried pipeline, and an onshore elevated pipeline that would connect the island facilities to the Badami Pipeline, an onshore gravel mine, and onshore and offshore ice roads.

The Liberty (SDI) Project is subject to the Federal, State, and local approvals, as identified in Section 1.3 of the *Liberty Development and Production Plan*, which provides a comprehensive description of the proposed project, including all the information required under 30 CFR 250.241-262. An environmental impact analysis (EIA) document was submitted as an attachment to the DPP as required by 30 CFR 250.227. BPXA met the terms of 30 CFR 250.250 through reference to the existing State- and MMS-approved Endicott Oil Discharge Prevention and Contingency Plan (ODPCP) in accordance with 30 CFR 254.53.

The Liberty Development Project design and scope have evolved from an offshore stand-alone development in the OCS (production/drilling island and subsea pipeline), as described in the 2002 FEIS, to use of existing infrastructure involving an expansion of the Endicott SDI. This project evolution reflects a number of factors including environmental mitigation, advances in ultra-extended-reach drilling (uERD) technology, use of depth-migrated 3-dimensional (3D) seismic data, and advances in reservoir modeling among others.

This EA describes the current Liberty (SDI) Project, discusses the affected environment, and evaluates the potential direct, indirect, and cumulative impacts of the proposed action and alternatives.

1.2 NEED

The Outer Continental Shelf Lands Act (OCSLA) identifies the OCS as a vital natural resource reserve that should be made available for expeditious and orderly development. Consistent with the Act, the purpose of the Liberty (SDI) Project is to recover oil from the Liberty

oil field for production and transport of sales-quality oil to the Trans-Alaska Pipeline System (TAPS).

U.S. oil production is expected to decline over the next 2 decades. As a result, the U.S. will increasingly depend on oil imports from foreign producers. To reverse this trend, the U.S. Energy Policy encourages and facilitates domestic oil production. The Liberty field contains large energy reserves with potential recoverable reserves of up to 105 million barrels (MMbbl) of oil and up to 78.5 billion cubic feet of natural gas (including natural gas liquids [NGLs], but excluding carbon dioxide). Production from the Liberty field, therefore, will help achieve U.S. energy goals by satisfying demand for domestic oil and by decreasing U.S. dependence on foreign oil.

The Liberty (SDI) Project also will provide economic benefits to the Federal Government, the State of Alaska, and the North Slope Borough (NSB). Alaska will benefit directly from the infusion of new capital into the economy and the creation of jobs. Over the life of the project, additional benefits will accrue to the State through the State's share of the Federal royalty, the State corporate income tax, and ad valorem tax, some of which also will accrue to the NSB. This benefit will occur at a time when State revenue, heavily dependent on production from the large North Slope oil fields, is declining. The Liberty (SDI) Project will help mitigate the severity of the decline to the State of Alaska and to the U.S.

1.3 SUMMARY PROJECT DESCRIPTION

A detailed description of the proposed Liberty (SDI) Project may be found in the Liberty DPP, and the EIA is an attachment to the DPP. Following is a summary of the project.

The Liberty prospect is located about 5.5 miles (mi) offshore in about 20 feet (ft) of water and approximately 5 to 8 mi east of the existing Endicott SDI (Figure 1-1). To take advantage of the infrastructure at Endicott, BPXA has elected to drill the uERD wells from the SDI by expanding the island by approximately 20 acres to support Liberty drilling. Liberty is one of the largest undeveloped light-oil reservoirs near North Slope infrastructure. BPXA estimates the Liberty (SDI) Project could recover approximately 105 MMbbl of hydrocarbons by waterflooding and using the ***LoSal™*** enhanced oil recovery (EOR) process (***LoSal™*** is a trademark of BP p.l.c.).

The development drilling program will include one to four producing wells and one or two water injection wells. No well test flaring is planned for this drilling program. Production from the Liberty uERD project will be sent by the existing Endicott production flowline system from the SDI to the Endicott Main Production Island (MPI) for processing. The oil would then be transported to the TAPS via the existing Endicott sales-oil pipeline. Produced gas will be used for fuel gas and artificial lift for Liberty, with the balance being reinjected into the Endicott reservoir for enhanced oil recovery. Water for waterflooding will be provided via the existing produced-water injection system available at the SDI. This supply will be augmented by treated seawater if needed from the Endicott Seawater Treatment Plant. The ***LoSal™*** EOR process will be employed during a portion of the flood and will be supplied by a ***LoSal™*** facility constructed on the MPI.

Associated onshore facilities to support this project will include upgrade of the existing West Sagavanirktok River Bridge, ice road construction, and development of a new permitted mine site adjacent to the Endicott Road to provide gravel for expanding the SDI. Existing North Slope infrastructure also will be used to support the project.

All wells for this project will be outside current industry performance for this depth. As a result, the state-of-the-art of uERD must be advanced. BPXA first plans to drill a single well to ensure that such drilling is feasible. If that well is successful and the technology is proven, then BPXA will proceed with drilling additional wells and installing new facilities to complete the project as described in this document

1.4 DEVELOPMENT ALTERNATIVES

For purposes of the EIA submitted with the DPP, BPXA examined the impacts of three development alternatives in addition to the SDI expansion:

- The offshore, stand-alone drilling island evaluated in the 2002 FEIS;
- A drilling pad at Point Brower, with processing at Endicott; and
- A drilling pad near the Kadleroshilik River with processing at Badami.

Figure 1-2 shows these alternatives, which are discussed briefly below. Table 1-1 presents of a comparison of the proposed SDI expansion with these three alternatives in terms of major project components. A brief description of each alternative is provided below.

1.4.1 Offshore Island Project

BPXA's originally proposed Liberty Project involved a self-contained offshore drilling operation with processing facilities on an artificial gravel island with a buried sales oil pipeline to shore to connect with the Badami sales oil pipeline for shipment to the TAPS. The island would have been located in Foggy Island Bay in 22 ft of water about 6 mi offshore and 1.5 mi west of the abandoned Tern Island.

Infrastructure and facilities necessary to drill wells and process and export 65,000 barrels (bbl) of oil per day to shore would be installed on the island. The project involved 14 producing wells, 6 water injection wells, 2 gas injection wells (1 of which would be preproduced), and 1 disposal well (23 total) at a wellhead spacing of 9 ft. Space for up to 40 well slots would be provided. Produced gas would be used for fuel gas and artificial lift, with the balance being either reinjected or exported for use in an EOR program at the nearby Badami Unit. Seawater would be treated and used to waterflood the Liberty reservoir. Produced water would be commingled with treated seawater and injected as waterflood. A 12-inch (in) sales-oil pipeline would be built to transport crude oil to the Badami sales-oil pipeline, and a 6-in products pipeline would import fuel gas for drilling and start-up activities to Liberty from the Badami products pipeline prior to first Liberty production, and would then export product to the Badami pipeline after startup. The offshore portion of the pipelines would be approximately 6.1mi long. The overland portions will be approximately 1.5 mi long to a tie-in point with the Badami pipeline system.

Associated onshore facilities to support this project would include use of existing permitted water sources, ice road and ice pad construction, and development of a gravel mine site in the Kadleroshilik River floodplain. In addition, existing North Slope infrastructure would be used in support of this project.

In accordance with the National Environmental Policy Act (NEPA), MMS prepared the 2002 *Liberty Development and Production Plan Final Environmental Impact Statement* (USDOI, MMS, 2002). The FEIS analyzed the environmental impact as well as the impacts associated with modifying five project components (island location and pipeline route, pipeline design, upper slope protection system, gravel mine site, and pipeline burial depth). The proposed project

was compared to three alternatives consisting of combined project components. In addition, the FEIS evaluated the effectiveness of potential mitigating measures and cumulative impacts resulting from the BPXA proposal and the alternatives.

1.4.2 Point Brower Drilling Pad

This alternative would involve building a new gravel pad onshore at Point Brower to access the Liberty reservoir by means of uERD. A 15.2-mi-long pipeline would be built from the pad to the Endicott facilities on the MPI, where the oil would be processed for shipment in the Endicott sales oil line. The project would also involve construction of a 7.3-mi-long gravel road to connect the pad to the existing Endicott Road to provide the necessary logistical support for the uERD wells.

1.4.3 Kadleroshilik Pad

This alternative would involve a new gravel pad onshore near the mouth of the Kadleroshilik River to access the Liberty reservoir by means of uERD. An 11.5-mi-long pipeline would be built from the pad to the existing Badami facilities, where the three-phase fluid would be processed to ship oil through the Badami sales oil pipeline. A gravel road 15.2 mi long would be constructed from the pad to the Endicott Road to provide for necessary logistical support.