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Point Thomson Gas Cycling Project

Environmental Report Addendum

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on behalf of the Point Thomson Unit owners

Table of Contents

ATTACHMENTS

Section 1 Introduction

The *Point Thomson Gas Cycling Project Environmental Report* (ER) was submitted to the regulatory community on July 30, 2001 with the objective of providing information to assist the preparation of permit applications and future National Environmental Policy Act (NEPA) analyses. The ER includes the preferred development plan based on project definition that is conceptual. Numerous development alternatives were screened during Conceptual Engineering and are covered in the ER. The information supplied in the ER is based on sound engineering judgment, representative information obtained from other North Slope projects, and field studies conducted in the project vicinity.

The ER presents the current development concept, options considered, a description of the affected environment, potential environmental consequences associated with the project, possible mitigation measures, and cumulative effects analyses.

The development concept represented in the ER and the ER Addendum will be further refined and improved during the project development process. Studies have been initiated and are presently ongoing within the Point Thomson Gas Cycling Project Team to consider various aspects of the development concept to:

1. Further define the Project layout
2. Optimize the process
3. Evaluate alternative technology
4. Ensure major project components (e.g. airstrip, dock, roads & pads) are correctly sized
5. Ensure that project plans are reasonable.

These studies are anticipated to be completed in 3rd Quarter of 2002. At that time, the development concept will be confirmed.

Project development will be further defined during Preliminary Engineering expected to begin in September 2002. At the conclusion of the Preliminary Engineering stage, the Point Thomson project will be defined in sufficient detail to allow the project to advance into Detailed Design. It is expected the project will be sufficiently defined at that time to "freeze" the development concept. Completion of this stage of work is expected during the 1st Quarter of 2003. Detail Design for the project will produce the deliverables necessary to construct and operate the proposed development project.

The ER Addendum has been developed to address comments received in meetings or in writing:

1. Meeting with the U.S. Environmental Protection Agency (EPA) and the National Marine Fisheries Service (NMFS) on April 24, 2001.
2. Meeting with the U.S. Army Corps of Engineers (USACE) on August 20, 2001.
3. Inter-agency meeting including representatives from the North Slope Borough (NSB) held on October 01, 2001.

4. Written comments received from the USACE and the Alaska Division of Governmental Coordination (DGC). The latter set of comments incorporates the concerns of different state agencies such as Alaska Department of Natural Resources (ADNR), Alaska Department of Environmental Conservation (ADEC), and Alaska Department of Fish and Game (ADF&G).

Section 2 of the addendum presents responses to comments obtained as described above. Section 3 of this addendum presents revised text and updates to the ER.

Section 2 Response to Comments

Comments from the regulatory community regarding the ER were categorized by issue. ER authors then addressed each comment under the following issues:

- Air Emission
- Air Traffic
- Bridges
- Bulk Fuel & Hazardous Substances
- Cumulative Effects
- Dock
- Dredging
- Environmental Consequences
- Facility Abandonment
- Fish
- Potential Future Developments
- Geography
- Gravel Re-use
- Local Hire
- Marine Traffic
- Mine Site
- NEPA Process
- Permitting Effort
- Pipeline
- Polar Bears
- Project Alternatives
- Proposed Facility
- Public Access
- Reservoir Character
- Seals
- Shoreline Erosion
- Site-Specific Studies
- Snow Storage
- Spills
- Stormwater
- Subsistence
- Vegetation
- Waste Management
- Water

The ER comments and responses are presented is this section by issue categories. The comments are presented in ***italic*** text with the commenter name. Responses follow each comment(s) in regular text.

AIR EMISSIONS

Commenters from the ADEC air program think that ExxonMobil should examine tapping into excess power capacity of neighboring oil and gas production facilities such as Badami. Due to unforeseen circumstances, operators at this facility have been unable to run their turbine electric generators at maximum capacity, which would be more efficient. An analysis of this possibility would be helpful.

Glenn Gray, DGC

ADEC asked if the project could tie into the Badami or Prudhoe Bay electrical grid via high line wires during the construction and drilling operations. The rationale would be to reduce diesel internal combustion emissions.

Jim Baumgartner, ADEC

ER Section 2.2.2 analyzes various power supply options, including the potential to use electrical power generated at Badami during the early phases of construction and drilling at Point Thomson. This analysis assumed that Badami would be running at capacity with a spare capacity of 2.5 megawatts (MW). A temporary power line would have to be constructed between Badami and Point Thomson regardless of the amount of spare capacity at Badami. Running approximately 20 miles of power line across the tundra, whether underground, raised on towers, or placed directly on the tundra surface, has potential negative effects (e.g., bird collisions with above-ground power lines, wind induced power line damage, presence of tower pads, and tundra scarring due to installation of underground or on-ground power lines). In addition, the timing for use of Badami power at Point Thomson may not coincide with operational needs at Badami, nor would available supply be sufficient for Point Thomson needs.

AIR TRAFFIC

Pages 7-36 and 7-55: These sections on birds and terrestrial mammals do not appear to discuss effects from air traffic, particularly during the summer. Although this was discussed in Section 5.2.4.2 (for birds) it would be a long-term effect for the life of the project and should be assessed for the cumulative case for all species sensitive to aircraft noise.

Terry Carpenter, USACE

Air traffic effects were considered under the environmental consequence (Section 5) and cumulative effect (Section 7) categories of "Disturbance" for birds (Sections 5.2.4.2 and 7.3.2.4), marine mammals (Sections 5.2.5.2 and 7.3.2.5), and threatened and endangered species (Sections 5.2.7.1 and 7.3.2.7).

Potential effects of noise due to vehicular traffic, construction activities, and operations were analyzed for terrestrial mammals; however, air traffic noise was not specifically considered in the terrestrial mammals disturbance analyses (Sections 5.2.6.2 and 7.3.2.6). Additional information is presented in Sections 3.4 and 3.5 of this addendum.

BRIDGES

Page 3-8: Culverts and bridges are mentioned for stream crossings, however, locations for these structures, and which type is proposed for each location are not provided. What is the design for a "mini-span" bridge? For this analysis information is needed about: 1) stream flow volume and timing at each crossing; 2) flood elevation at each stream crossing and anticipated elevation along the road route as a result of road construction.

Terry Carpenter, USACE

Section 5.1.2.1, Placement of Gravel and Obstruction of Flow, page 5.5. The text notes scour holes are typically created by concentrated water flow immediately downstream from culvert outlets and that proper siting and design of culverts can help mitigate these effects. It should be noted that properly sized bridges would eliminate these effects.

Glenn Gray, DGC

How are the concerns of stream crossings going to be addressed?

Jack Winters, ADF&G

Present stream crossing designs are conceptual and dependent on additional field data. Streams surveys are planned to determine stream flow and the presence and probability of use by anadromous fish. A surface recharge and hydrology study is also planned and the results will be used to design the proper type of stream crossings based on the stream size, flow, and presence or absence of fish in accordance with ADF&G guidelines.

In the ER, conventional round, corrugated culverts have been assumed for all locations where the only requirement is to provide passage for surface drainage, not stream flow. The analysis presented in Section 5.1.2.1 considers the potential effects of using this type of culvert for passage of surface drainage. The hydrologic study being planned as part of a future engineering phase will help to further define appropriate types of culverts and/or bridges by determining the freshwater discharge of selected tundra streams within the Point Thomson Unit.

Section 3.3.3, Permanent Gravel Roads, page 3-8. The text states bridges and culverts will be used to span streams crossed by project roads. It notes that multiple 6-foot radius half-pipe culverts with scour guards will be used for typical large stream crossings. The ADF&G does not consider this design to be acceptable given the size of many of the streams crossed by project roads, the 30+ year life of the project, the long-term maintenance requirements of culverts and associated inlet or outlet armor bags, and the high probability of anadromous fish use. Bridges, such as those currently being used in the western portions of the oilfields, are the preferred option for stream crossings.

Glenn Gray, DGC

Past freshwater fisheries work indicates that the streams in the Point Thomson area do not have a high probability of supporting anadromous fish populations. In addition, the ADF&G 1997 catalog of waters important to spawning, rearing, or migration of anadromous fish does not identify streams in the Point Thomson Unit as being important to anadromous fish. Results of freshwater fisheries studies planned for summer 2002 will confirm or refute the use of area streams by anadromous fish. These studies will be conducted through an agreement with ADF&G and will consist of the capture of fish through the use of nets and traps, and subsequent species identification. A surface recharge and hydrology study is planned, which will help to determine the size and flow associated with streams in the area. Results of these studies will be used to determine the most appropriate types of stream crossings, and where warranted bridges will be considered.

BULK FUEL & HAZARDOUS SUBSTANCES

In Section 5.1.2.2, Discharges, Summer and Winter Construction, Spills and Leaks, the Report states, "All storage of fuels and refilling of equipment and machinery will be conducted following the fuel transfer guidelines and liner use procedures outlined in Section 7 of the North Slope Environmental Handbook (British Petroleum Exploration – Alaska [BPXA] and Phillips Alaska Inc.) and the refueling guidelines provided in Section 17 of the ExxonMobil Production Company Safety Manual."

This statement should appear in Chapter 3.0 and also should be broadened to include refueling during operations and maintenance activities. Because most reviewers will not have ready access to documents referenced above, the state recommends that the pertinent sections of those documents be appended to the Report to allow evaluations of their applicability and adequacy for the proposed project.

The chapter should contain a discussion on the potential effects of bulk quantity oil and hazardous substance spills that may occur during transportation to or from the proposed project and during transfers to or from tanks at the proposed project.

Glenn Gray DGC

An update to ER Section 3.11, Spill Prevention and Response, regarding safety procedures, addresses refueling procedures during operations and maintenance activities and is presented in Section 3.3 of this addendum. All refueling activities will be conducted following all applicable laws and regulations.

Transportation of bulk quantities of fuel and potential effects of spills will be the responsibility of the shipper and covered under the Oil Discharge Prevention and Contingency Plan (C-Plan) for that operation. The unloading of the fuel at the dock and effect of potential fuel spills will be discussed in the C-Plan for construction and operation of the Point Thompson facility. All fuel transportation and refueling activities will be conducted following all applicable laws and regulations.

Sections 3.10 Construction Plan, and 3.14, Operations and Maintenance, should describe how petroleum products and other hazardous substances, especially those shipped in bulk quantities, would be transported to and from the proposed project location and transferred to or from storage tanks. Section 3.10 also should describe how and where these substances would be stored.

Glenn Gray, DGC

Currently Section 3.13.4.1 and Table 3-6 (page 3-37 of the ER) describe the proposed storage tanks and anticipated volumes and materials to be stored. As the Project Description is further refined during the preliminary engineering stage, additional details concerning products and volumes to be stored in tankage and other issues such as refueling techniques and procedures will be developed and included in the Project Description and/or permit application(s). All fuel transfer operations will be conducted following the applicable laws and regulations. In general, petroleum products will be shipped to Point Thomson by barge during the open water season, and by truck over the ice road in the winter. The use of hazardous materials will be minimized. Liners will be used during fuel and chemical transfers to protect the ground surface from contamination. All fuel and liquid transfer procedures will be communicated to employees during environmental sensitivity and operations training.

CUMULATIVE EFFECTS

Page 7-14, 7-15: The assumptions listed are not explained or justified; therefore, do not support the conclusion. If they are taken from discussion somewhere else in the text, reference those points.

Terry Carpenter, USACE

An expanded discussion of assumptions as originally provided on page 7-15 of the ER is provided in Section 3.6 of this addendum.

DOCK

Section 5.1.3.1, Marine Environment, Water Quality, Dock Construction, page 5-10. The text discusses water quality issues during construction of the dock for that portion of the dock that will be in floating fast ice (i.e., the area between the 6 and 7 ft isobath). In all likelihood, the ice would be artificially thickened for the entire length of the dock during construction to allow work to proceed in dry conditions, and thus generally eliminating the water quality concerns. This possibility should be discussed in the report. This comment also applies to the discussion in paragraph 3 on page 5-26 (Fish, Habitat Effects, Winter Construction).

Glenn Gray, DGC

Water quality effects due to dock construction are expected to be localized, minimal and short-term. The discussion in Section 5.1.3.1 of the ER has been updated and is included in Section 3.5

of this addendum. Specifically, the subsection discussing Water Quality impacts during Dock Construction has been revised to include the possibility of construction during the winter.

USFWS requested that ExxonMobil clarify the sealift of modules and the number of times that dredging would be required.

Louise Smith, USFWS

The current plan is for all of the modules to be moved in two sealifts. Shallower draft barges carrying drilling rigs, bulk materials and smaller modules will utilize the dock starting in 2005. Dredging may be needed to permit access of the barges up to the dock in 2005. A large sealift will transport the heavy modules in 2006. If determined necessary due to module size, a dredging operation may be conducted to the 9-ft water depth. Dredging operations may occur in both 2005 and 2006, which might result in removing approximately 30,000 cubic yards of material or more. As design develops, the project team will further define the dredging methods and timing.

Section 5.1.3.1, Marine Environment, Water Quality, Circulation, page 5-9. This section also should examine the effects of the dock on long-shore transport of sediments within the Point Thomson area. It also should provide data discussing the degree or magnitude of any temperature or salinity changes anticipated to occur as a result of dock construction. Potential impacts to movements by fish also should be discussed.

Glenn Gray, DGC

Engineers will develop the design of the dock and establish shoreline erosion rates from previously conducted studies done for the Point Thomson area. The work will include evaluating the natural rate of shoreline erosion, and assessing the potential effects of the dock on alongshore sediment transport. As stated in the discussions presented in Section 5.1.3.1, it is anticipated that any hydrographic effects (i.e., temperature and/or salinity changes) due to the presence of the proposed dock are expected to be minimal compared to naturally occurring wind driven processes. Section 5.1.3 of the ER has been updated to include additional discussion and references and is provided in Section 3.4 of this addendum.

Potential effects on fish movements due to the dock's presence are evaluated in ER Section 5.2.3.2. Section 5.2.3.2 has also been updated to include additional discussion and references and is provided in Section 3.5 of this addendum.

Page 3-11: In order to avoid erosion and maintenance problems at the dock structure, which is anticipated to be in use for the entire life of the project, up to 30 years or more, armoring of the side slopes should be analyzed. The text describes "a 750-ft long by 100-ft wide armored gravel fill structure." however; no armoring is shown in Section B of Figure 3-13. A hybrid system such as that used at the Endicott Project (linked concrete blocks through the ice zone, with gravel bags above) may be the most cost effective with little or no maintenance required following construction. Without armoring, it is unlikely that 5:1 side slopes would be maintained. Armoring may also reduce or eliminate the need for future dredging at the dock face.

Terry Carpenter, USACE

The conceptual dock layout is included in the ER. Further definition on the type of armoring of the dock will be established during the coming stages of engineering development.

The NSB regards the dock as an offshore development. Would the dock be permanent? The NSB would like to have a long-term erosion study evaluate the down current effects of the dock.

Tom Lohman, NSB

The dock is planned to be a solid-fill gravel structure extending 750 feet into the nearshore zone. Under the existing conceptual design, the dock will remain in place throughout the life of the project (approximately 30 years). The structure will provide onshore access for re-supply, oil spill response, and other continuing operations.

As discussed on the previous page, shoreline erosion rates will be established from previously conducted studies done for the Point Thomson area. The work will include evaluating the natural rate of shoreline erosion, and assessing the effects of the dock on alongshore sediment transport.

DREDGING

Section 5.2.1.1, Marine Benthos, Habitat Loss and Mortality Effects, Summer Construction, page 5-17. This section discusses dredging the channel from the dock to the 9 ft isobath and notes approximately 30,000 cubic yards of dredge spoils will be dumped at an undisclosed location. Potential locations for dredge spoil disposal sites should be provided.

Glenn Gray, DGC

Various options have been identified for disposal of dredged spoil. These options were identified in the Department of Army (DA) Permit Application dated August 20, 2001. For information purposes the Ocean Disposal of Dredged Spoil Analysis from the DA Permit Application is provided as Attachment I to this ER Addendum. It is planned that during design development and construction execution planning ocean disposal options will be assessed and results provided at a later date.

ENVIRONMENTAL CONSEQUENCES

Page 5-58: The analysis of effects should be reflected in the summary table "Project Effects and Mitigation Summary Table" in the Executive Summary. For example, Section 5.3.8 Visual Aesthetics identifies some visual effects and states that these can be partially mitigated, but does not state whether these are considered minor or significant effects. Then the summary table identifies visual effects as both "significant" and "not significant." All sections discussing effects will need to identify the level of effects and be consistently summarized in the table in order to make the document useful.

Terry Carpenter, USACE

Section 5.3.8 has been updated and re-written to include an evaluation of the significance of the identified visual effects and to better reflect the conclusions provided in the Executive Summary Table. The updated version of Section 5.3.8 is provided in Section 3.5 of this addendum.

The conclusions provided in the Executive Summary Table were not changed. As described in the Rationale column of the table, potential project effects on Aesthetic Values are determined to be not significant for area residents since these residents infrequently use the project area. However, the potential project effects on Aesthetic Values may be determined to be significant from the point of view of visitors. The rationale for significance pertains to the introduction of industrial facilities into an area that is a destination point for these occasional visitors due to its undeveloped status.

FACILITY ABANDONMENT

The development plan should include some discussion of future abandonment plans. While this subject is alluded to in the document, it appears abandonment plans have not yet been developed.

Glenn Gray, DGC

The expected life of the Point Thomson Gas Field is about 30 years. Abandonment timing will be determined based upon the need for use of the facilities. Detailed abandonment procedures will be developed at the time of project termination. Specific plans will depend upon the facilities in place and the specific requirements applicable to those facilities at the time of abandonment. Abandonment activities will be undertaken consistent with lease terms, requirements in the Unit Agreement, permit conditions, and other applicable regulatory requirements. Abandonment plans will be subject to review by multiple agencies, with input from other local, state and federal agencies, and likely will involve some degree of overlapping authority.

FISH

Section 5.2.3 Fish. This section references Section 4.8 as discussing potential project effects to fish. Section 4.7 discusses fish.

Glenn Gray, DGC

The reference to Section 4.8 in the Section 5.2.3 discussion is a typographical error. The correct reference is Section 4.7. The text has been corrected in Section 3.5 of this addendum, which provides an updated version of Section 5.2.3 of the ER.

POTENTIAL FUTURE DEVELOPMENTS

Page 3-14: The proposed location for the CPF/CWP pad appears to be very limited for future expansion needs. In which direction could expansion be done at the proposed location? An alternative location slightly inland where more options would be possible should be analyzed. A location away from the coastline may have advantages for spill control as well.

Terry Carpenter, USACE

Placement of the gravel pads is driven by the location of the reservoir. Based on existing technology it is presently not economic to move the CPF/CWP pad further inland as this moves the surface location further from the reservoir. As such, the length of the extended reach wells necessary to properly develop the resource would not be technically feasible. Also, by moving only the CPF pad inland and keeping the CWP near the shore, it would be necessary to lengthen the amount of high-pressure re-injection pipeline needed for the project. One of the project objectives is to minimize the length of this piping because of technical and costs reasons.

Given the scenario that future gas development is likely to occur in the area, possible effects of that development should be addressed now. Knowing the reservoir geology, could ExxonMobil indicate where any future roads, pads and pipelines may be proposed, should gas production be pursued? Additionally, it would be useful to know how the gas cycling project could be expanded and used for gas production to minimize future impacts.

Glenn Gray, DGC

Attachment II of this addendum provides a discussion of three potential future development actions: future gas sales from Point Thomson, Thomson Sand oil rim development, and future Brookian oil sales in the Point Thomson area, including the Sourdough and Slugger prospects. Three additional activities are mentioned, but hypothetical development scenarios for the activities are not identified: offshore prospects including Kuvlum, additional seismic exploration and exploration drilling within the Point Thomson Unit, and development in ANWR .

GEOGRAPHY

Page 1-3, 2-1, and more: "Lions Lagoon" is not shown on any map, including the referenced Figure 2-1. If this is a common use name, rather than a USGS name, please include it on the maps anyway so we are talking about the same area.

Terry Carpenter, USACE

Researchers have used Lions Lagoon as a colloquial name for the area south of the Maguire Islands (Challenge, Alaska, Duchess, North Star, Mary Sachs, and Flaxman Islands) to the mainland shore, from the western end of Challenge Island to the eastern end of Flaxman Island (URS Greiner Woodward-Clyde 1999, URS 1999 and 2000). Recently obtained information indicates that the correct name for the area is "Lion Bay" (USGS mapping website http://www.nationalatlas.gov). This is the name used by Sir John Franklin and is also the name of one of his two boats. ExxonMobil suggests that Lion Bay be used to reference the area in future documents.

GRAVEL REUSE AND REHABILITATION

Section 2.5.4 Analysis of Gravel Reuse Options, page 2-26,28. The text states Options GR-7 and GR-8 were eliminated from consideration because the potential gravel removal sites were more than two miles from Point Thomson gravel placement sites. As these sites are only 2.3 and 3.3 miles from proposed Point Thomson structures, they should be retained for consideration during project development.

There are numerous exploratory sites in the area that date as far back as 25 years ago. Eventually, these sites will have to be properly abandoned and rehabilitated. During the proposed development, the lessee will be in the area building ice roads and mobilizing equipment. What specific plans, if any, are being considered to address the rehabilitation of abandoned sites?

The document noted that a criterion of two miles was used to determine if an abandoned site was in close enough proximity to the proposed development to be considered for re-use of gravel. The three sites in the vicinity that could be used to recover gravel are located within 3.3 miles from the proposed development. What justification is used to support the two-mile criterion?

The report indicated that existing pads with potential Styrofoam insulation or hydrocarbon contamination were rejected for consideration for re-use. These pads will eventually have to be rehabilitated by the lessee. Please explain if there is any other justification for not using these sites other than for convenience and cost.

Glenn Gray, DGC

USFWS emphasized that clean up of the exploration pads needs to occur. Also, the gravel needs to be re-used, and each exploration pad should have a rehabilitation plan.

Louise Smith, USFWS

DNR also raised the gravel re-use issue. It was stated that Styrofoam was exposed at the North Staines River #1 and asked what was going to be done.

Leon Lynch, DNR

How are the concerns of re-using exploration pad gravel as much as possible going to be addressed?

Jack Winters, ADF&G

Page 2-28: Need a map of potential gravel re-use sites.

Terry Carpenter, USACE

ExxonMobil understands the importance of re-using gravel from existing exploration pads and of rehabilitating any remaining pads. As such, the Point Thomson Project Team is presently reviewing a variety of factors that will impact the final plans for gravel re-use and rehabilitation activities. Part of the work includes completing field evaluations of the existing pads to determine the potential for re-use. Results of this work will be provided at a later date.

LOCAL HIRE

What specific policies and goals are being considered to address the state's preference for local training and local hire of the area residents?

Glenn Gray, DGC

In developing Point Thomson, ExxonMobil will follow all federal and state laws including those governing the workforce. As the project moves forward, there will be opportunities for qualified, cost competitive Alaska businesses to bid on a variety of contracts related to field development and construction, as well as ongoing support once the project is on line.

MARINE TRAFFIC

The NSB requested that ExxonMobil summarize the marine traffic for the facility. This would include the size, number, and routes for the sealifts, and other project-related marine traffic. The NSB voiced concern that the marine traffic could affect fall subsistence whaling, particularly given its location to the east of other existing developments.

Tom Lohman, NSB

The current plan is for all of the modules to be moved in two sealifts. Shallower draft barges carrying drilling rigs, bulk materials and smaller modules will utilize the dock starting in 2005. A large sealift will transport the heavy modules in 2006. The sealifts are planned to be completed prior to the fall subsistence hunt. Also during summer construction activities, marine vessel traffic will take place to and from Prudhoe Bay/Endicott with several trips per day possible. Vessel traffic will also occur during the open water season throughout the operations phase of the project. This could consist of numerous local barge trips annually (see pg. 5-35 of the ER).

While it may not be possible to totally curtail and/or reroute all vessel traffic during whale migration periods, ExxonMobil will work with subsistence whalers to minimize impacts. ExxonMobil will strive to ensure that construction and operations activities at the Point Thomson facility are conducted in a manner that is compatible with the subsistence hunt of bowhead whales. ExxonMobil plans to conduct discussions with the Alaska Eskimo Whaling Commission (AWEC) on the minimization of project impacts to subsistence whale hunts.

MINE SITE

Page 3-17: Use of the proposed gravel source is described as a "one-time basis" activity, thus a closure plan to be completed the same winter as use of the site is expected to be part of the proposal. This would eliminate the need for storage of overburden on 8 acres of tundra wetlands. If an 11-acre gravel stockpile area is included, there does not appear to be a need to delay closure of the site the first winter. If the site is expected to be used repeatedly, a long-term rehabilitation plan is still needed to ensure that future excavation does not conflict with eventual rehabilitation needs. Subsequent expansion of the site could be conducted independently.

Terry Carpenter, USACE

Based on the conceptual development plan, the gravel excavation pit would be mined throughout the first winter on a one-time basis, and the pit would then be developed into a freshwater source for use during the project life (approximately 30 years). To further minimize impacts, an ice pad could be used for temporary storage of the overburden. At present, it is not anticipated that the site would be used repeatedly for gravel extraction.

USFWS emphasized that a mine site rehabilitation plan was important.

Louise Smith, USFWS

Section 3.7, Gravel Sources, page 3-17. The text states overburden will be placed on the west side of the gravel mine site. Consideration should be given to placing the overburden stockpile on the east side of the mine site to serve as a snow fence to aid in filling the isolated mine site with water, as yearly sheetflow to the mine site will be limited given the size of the area capable of providing flow to the site.

Glenn Gray, DGC

Figure 3-18B: Has snow drifting been considered during siting of the proposed overburden stockpile adjacent to the road? And, based on potential thaw and stability concerns at other mine sites, is the proposed location close to a creek a good choice for a deep mine site? The analysis of alternative gravel source locations will need to consider long-term stability and effects to adjacent waterways.

Terry Carpenter, USACE

An addendum to the Point Thomson Gas Cycling Project 404 Permit application, No. 6-2001-082 Beaufort Sea 447, contains a Draft Gravel Mining and Rehabilitation Plan, and is presented as Attachment III to this ER addendum. A surface recharge and hydrologic study is being planned for the Point Thomson area. The study will address this issue by determining runoff and discharge from tundra streams, which will aid in the analysis of alternative gravel source locations relative to waterways. The potential for using a snow fence is discussed in Attachment III of this addendum. Further refinement of the Gravel Mining and Rehabilitation Plan will continue during design development.

The proposed mine site is located near-by an unnamed stream, but it is not clear if this is an anadromous waterbody. If so, it would be useful to know if there are any plans to create deep-water, over-wintering habitat for fish upon abandonment of the mine site. If the near-by stream is not fish bearing, are there other locations near fish bearing streams that could be used?

The document mentioned visual mitigation of facilities that are to be constructed. The mine site plans detail an overburden soil stockpile site that will be approximately 30 feet high. Has ExxonMobil considered using a portion of the overburden soil for rehabilitation of abandoned exploratory sites and thereby reducing the visual impact of the proposed development while restoring abandoned pads?

Glenn Gray, DGC

The unnamed stream near the proposed mine site is assumed to have ninespine stickleback but it is not known to support anadromous fish. A fish habitat survey planned for summer 2002 will further determine which fish use this stream. There are no immediate plans to create new fish habitat upon abandonment of the mine site since the gravel mine site is presently proposed as a water source for the life of the project. It is anticipated that the majority of the overburden will support future rehabilitation efforts at the mine site and exploratory sites (see ER Section 3.7).

Page 2-25. Need a map of gravel mine site options.

Terry Carpenter. USACE

The project team considered several mine site alternatives during the conceptual engineering phase. Only one of these sites was brought forward based on gravel quality, water recharge and location. This location is presented in Figure 3-5 of the ER, with details provided in Figures 3-18A and 3-18B.

NEPA PROCESS

The ER summary table states that there are no significant impacts, but other agencies will have a different opinion. USFWS will probably request a formal consultation process for eider and polar bears, the two known endangered species that inhabit the Point Thomson Unit. Concerns were raised that this project could repeat the Alpine expansion scenario, where Alpine was initially confined to a small footprint with informal indications that no further expansion was envisioned. However, the construction of the Alpine Development coincided with the opening of NPR-A, and subsequent request to expand the Alpine Development. These changes are significantly different that originally projected, and thus agencies are now suspicious of industry projections. Analysis: the suspicion held by agencies could elevate tensions during the cumulative effects analysis, regardless if completed by the EA or EIS pathway.

Terry Carpenter, USACE

Formal consultation will be necessary under Section 7 of the Endangered Species Act (ESA) regarding the threatened Steller's and spectacled eider and consequently a Biological Opinion will be developed during the EIS process. The polar bear is not listed under the ESA and, therefore, formal consultation is not necessary for this species. Regarding potential project expansion, Attachment II of this addendum provides a discussion considering potential future development scenarios.

PERMITTING EFFORT

Table 1-2, Permits and Approvals, should also identify the following ADEC permits and approvals that are expected to be necessary for the proposed project:

- ***Public Drinking Water System plan and construction approvals,***
- ***Section 401 certifications for EPA permits, and***

- *Kitchen plan approval and food service permit.*

Table 1-2 does not identify the need for an EPA Spill Prevention, Containment, and Countermeasures (SPCC) Plan.

Glenn Gray, DGC

Section 3.2 of this addendum provides a revised and updated version of Table 1-2.

PIPELINE

The Environmental Report indicates a pipeline height of five feet. Comments on recent North Slope projects by the North Slope Borough indicate their preference to increase the height of pipelines to ensure unimpeded movement of wildlife and subsistence users. We suggest ExxonMobil consult with the North Slope Borough Planning Department about this issue and, if appropriate, consider completion of an analysis of the feasibility of higher elevations for the pipeline.

Other information about the pipeline would be useful such as the proposed pipeline design to mitigate expansion, the style of vibration dampening devices that will be used to mitigate wind induced vibration, and what, if any, pipeline leak detection systems are proposed.

Glenn Gray, DGC

The ER presents the conceptual design for the Point Thomson Gas Cycling Project. It is anticipated that preliminary engineering design studies will begin in September 2002. As the project design is developed, proposed pipeline design specifics will become available, and ExxonMobil will be consulting the NSB, the villages, and interested organizations concerning project design and mitigation. Detailed pipeline information for the export pipeline will be provided during the pipeline right-of-way permit application process.

ExxonMobil's current design basis includes a pipeline design height of five feet. The pipeline designs for the Point Thomson Unit incorporate standard North Slope practices, following all state and federal requirement guidelines.

POLAR BEAR

Section 5.2.5.2, Disturbance Effects, Operations, Polar Bears, page 5-42. Paragraph 3 states that a polar bear interaction plan can be implemented if necessary. The document should state that a bear interaction plan (polar and grizzly) will be implemented as a part of the plan of operations for pre-construction, construction, and operations to prevent potential encounters between humans and bears.

Glenn Gray, DGC

The applicant will develop and implement a wildlife interaction plan (polar and grizzly bears, fox, ravens, etc.) as a part of the plan of operations for pre-construction, construction, and operations. The plan will provide information and procedures required to minimize potential encounters between humans and wildlife. In addition, a specific Polar Bear Interaction Plan will be developed.

Section 5.2.5.3, Mortality Effects, page 5-43. This section should emphasize methods other than lethal take to mitigate encounters with polar bears.

Glenn Gray, DGC

The intent of ER Section 5.2.5.3 is to discuss direct and indirect effects of the proposed project that could potentially cause the mortality of marine mammals in the Point Thomson area. It should be stressed that killing a threatening bear is a last resort and would only be used in the event of significant threat to human life. Mitigation measures such as avoiding known polar bear dens, managing cooking odors and kitchen wastes that could be considered bear attractants, using non-lethal deterrents, and training workers in bear avoidance will be used to minimize or eliminate bear/human encounters.

PROJECT ALTERNATIVES

Section 2.1.2 Analysis of Field Development Options, Option FD-2, man-made gravel islands, was retained for future consideration in the initial evaluation and rejected in the detailed evaluation. It is unclear if a final decision has been made not to use offshore gravel islands during this development or in any future plans. Can ExxonMobil insure the hydrocarbon targets can be reached and the reservoir adequately managed by onshore facilities alone and that no waste of the resources will occur?

Glenn Gray, DGC

Point Thomson Unit Owners believe that by using extended reach drilling (ERD), the Thomson Sand Reservoir can be adequately developed and managed from onshore facilities.

Page 2-5: It might be easier to group all of the Badami options together and eliminate them once rather than bringing it up over and over. A general discussion of developing Point Thomson essentially as a satellite to Badami with airstrip, mine site, power, etc. provided from there; then identify the problems with this as done in each section, and explain why it makes sense to have Point Thomson stand alone. Then leave these Badami options out of the later discussion of each component.

Terry Carpenter, USACE

The analyses presented in ER Section 2 considered the use of Badami support facilities versus installation of new comparable facilities at Point Thomson. A summary of the discussions that eliminated the potential for the Point Thomson project use of Badami facilities is presented below:

Camp Facilities

Construction Camp Facilities. It is anticipated that the proposed Point Thomson Gas Cycling Project will require a 75-person capacity construction camp, building up in stages to the projected peak requirement of up to 450-person capacity. A 250-person capacity construction camp is currently being stored at the Badami facility. The 250-person capacity construction camp would need to be expanded at Badami. Lease costs for establishing a construction camp at Badami would be comparable with lease costs associated with locating a construction camp at Point Thomson.

Establishment of a long-term construction camp for Point Thomson at Badami was rejected for the following reasons:

- Constant transfer of personnel is an inefficient use of hours-per-person day for personnel who would work at Pt. Thomson.
- An emergency shelter(s) would need to be constructed at Point Thomson to accommodate personnel in case travel to Badami is prohibited due to poor weather conditions.
- Once ice road travel ceases; logistics of travel between Badami and Point Thomson from break-up to freeze-up is problematic. Personnel could be transferred via air or "crew boats" after break-up. In addition, a gravel road could be constructed between Badami and Point Thomson to allow year-round access; however, this would increase the footprint of the project and impact additional habitat due to placement of approximately 20 miles (mi) (32 kilometers [km]) of gravel road over the tundra.
- Daily transportation of personnel via air, water, or ice road would create additional traffic noise and air emissions.
- The Point Thomson area has limited freshwater resources for annual ice road construction.

There are considerations to use construction camps at Badami if the work activities are logistically close to Badami (ex. pipeline construction).

Permanent Camp Facilities. The Point Thomson Gas Cycling Project will require a permanent camp with the capacity to house 75 or more people. Badami is a minimal facility with a 20-person capacity permanent camp. In order to house Point Thomson personnel at Badami, the existing gravel pad would need to be enlarged and additional camp structures constructed to expand the existing camp facility.

Establishment of Point Thomson camp facilities at Badami was rejected for the following reasons:

- Constant transfer of personnel is an inefficient use of hours-per-person day.
- An emergency shelter(s) would need to be constructed at Point Thomson to accommodate all personnel in case travel to Badami is prohibited due to poor weather conditions.
- Once ice road travel ceases; logistics of travel between Badami and Point Thomson from break-up to freeze-up is problematic. Personnel could be transferred via air or "crew boats" after break-up. In addition, a gravel road could be constructed between Badami and Point Thomson to allow year-round access; however, this would increase the footprint of the project and impact additional habitat due to placement of approximately 20 miles (mi) (32 kilometers [km]) of gravel road over the tundra.

- Daily transportation of personnel via air, water, or ice road would create additional traffic noise and air emissions.
- The Point Thomson area has limited freshwater resources for annual ice road construction.

Power Facilities

The power requirements identified in the conceptual engineering work for the Point Thomson Gas Cycling Project are estimated to be over 10 megawatts (MW). The Badami facility has two 9.0 MW power generation units. Only one power generator is operated at a time, with the other unit serving as a stand by. Typically 6 to 6.5 MW are generated for Badami power requirements, leaving a spare capacity of 2.5 MW.

Additional power generation units would need to be installed at Badami or Point Thomson to make up the shortfall in power generation capacity available at Badami. In order to utilize the spare power capacity at Badami, a powerline would need to be constructed between Badami and Point Thomson.

The use of Badami power generation facility to fully or partially provide Point Thomson power requirements was rejected for the following reasons:

- Installation of an above ground powerline would have an impact on the aesthetics.
- Excavation and installation of the powerline belowground would disturb tundra habitat.
- The minimal spare capacity from the Badami power facility does not justify the installation and maintenance of a powerline to satisfy Point Thomson project requirements.

Drilling Waste Management

The Point Thomson Gas Cycling facility is designed to be a zero drilling waste discharge facility. A grind and Inject (G&I) facility and Class I disposal well are critical components of a zero drilling waste discharge facility. Badami currently has a G&I facility and a Class I disposal well. Badami facilities may have the capacity to handle drilling waste generated from the proposed Point Thomson project. Drilling wastes would have to be trucked from Point Thomson to Badami. Usage of the Badami G&I facility and Class I disposal well for Point Thomson drilling wastes was rejected for the following reasons:

- In addition to drilling wastes, produced water, camp gray water and other wastes will need to be injected into a Class I disposal well. Disposal of these fluids from Point Thomson would require transport to Badami over ice road in winter or barge in summer. Storage would be required for times when tundra travel and barge travel are not possible. Impacts would include increased disturbance to marine mammals and birds during transportation, and tundra disturbance. Additionally, since storage of wastes on site could be required, larger gravel pads would be necessary, thereby increasing the project footprint.
- Unless a gravel road is constructed between Badami and Point Thomson, the Badami facility could not be accessed via truck during periods of the year when ice roads are unavailable. A gravel road would increase the footprint of the project and impact

additional habitat due to placement of approximately 20 miles of gravel road over the tundra.

Marine Dock

Due to the remote location of the proposed Point Thomson Gas Cycling site, marine access is required for movement of large facility modules, drill rigs, and seasonal equipment and bulk supply deliveries. Air transport is not a reasonable option due to the size and weight of these items. Construction of rails and/or roads is not realistic due to the remoteness of the site, length of rail/roadway required, and the obvious associated habitat impacts.

The weight of a barge load determines the barge draft. In turn, the draft requirements of anticipated barge loads determine the necessary dock length needed to reach the required depth of water. Although barge loads and associated draft requirements have not been finalized for the proposed Point Thomson Gas Cycling Project, preliminary analyses were conducted to evaluate potential marine access options. A maximum barge load of 6,000 tons (5,443 metric tons) and a 9-foot (ft) (3 meter [m]) draft requirement were chosen for conceptual design purposes.

The Badami dock facility was designed to handle barge loads in the 1,000-ton (907 metric ton) range. The existing Badami dock would need to be modified and/or dredging would be necessary to provide sufficient water depth for Point Thomson barge draft requirements.

Modification of the Badami dock facility to accommodate Point Thomson marine transportation requirements was rejected for the following reasons:

- Only with major modifications could Point Thomson Modules be landed and staged at a Badami dock during open water season. Transport from Badami to Point Thomson during the summer months would be problematic. A gravel road would have to be constructed for transportation with a minimum crown width of 50-ft (150-m to support the 6,000-ton modules. A gravel road of this size would significantly increase the footprint of the project and impact additional habitat due to placement of approximately 20 miles of gravel road over the tundra.
- Theoretically, an ice road could be constructed for winter transport of Point Thomson modules; however, movement of such large modules presents significant technical and safety risks and would be unattractive from an economic and environmental perspective. To date, the largest modules to be transported over ice roads on the North Slope weighed approximately 2,000 tons. In addition, it may be necessary to build a gravel staging/storage area for the modules at Badami.
- If the ice road option were pursued, re-supply of Point Thomson Operations would require construction of ice roads on an annual basis thus taxing the Point Thomson area's limited freshwater resources. Additionally, during the Drilling Phase of the project, re-supply would have to occur only once per year as opposed to twice a year, thus increasing the required pad size to store re-supply materials.

Airstrip

Year-round air access is required for transport of Point Thomson personnel and emergency movement of personnel, supplies and/or equipment. Twin Otter aircraft are typically used for crew changes for other Alaska North Slope remote locations with an airstrip. However, for maintenance and servicing of large pieces of equipment the airstrip must be large enough to provide landing and take-off capabilities for a fully loaded Hercules C-130, and be adequate for 737 aircraft to provide emergency evacuations of personnel.

While the Badami airstrip could be upgraded to accommodate Point Thomson air access requirements, the modification was rejected for the following reasons:

- Multiple transportation modes for crew changes would be inefficient. From an operations point-of-view, a permanent gravel road for access between Badami and Point Thomson would be necessary as opposed to use of ice roads, boats, and helicopter transport of personnel. A gravel road would increase the footprint of the project and impact additional habitat due to placement of approximately 20 miles of gravel road over the tundra.
- Emergency evacuation of personnel from the Point Thomson site could be problematic depending on the type of emergency and time of year.
- Use of the Badami airstrip could cause logistics problems should it be necessary to send a large/heavy piece of equipment out for emergency or non-emergency repairs.

Page 2-16: Need a map of airstrip options – where are these locations that were considered? Where is the first choice location? Include some other airstrip options for discussion and analysis, e.g., an airstrip/heliport at each pad rather than road access to pads, an airstrip built into the road system as at the Alpine Project to minimize the footprint of roads/airstrips, a look at no airstrip at all (helicopter, ice road, within field gravel roads, boat, and tundra travel access). For this discussion and analysis of potential effects, information is needed about: 1) airstrip length requirements for each potential aircraft to be used; 2) number of trips for each aircraft type during different seasons; also number of trips that would be needed by barge, helicopter, road or tundra vehicle if the airstrip option is not used; 3) percent of time the Badami airstrip has been unusable, by season, by airplane and helicopter because of fog and because of other weather; 4) percent of time the Deadhorse and Alpine airstrips are unusable due to the same weather problems.

Terry Carpenter, USACE

Two airstrip options were considered during the conceptual engineering phase, and the ER presents a map of the retained option as Figure 3-10A. The retained location is situated at the highest topographic point in the area of the central pad. Other options presented above such as having an airstrip or heliport at each pad and including the airstrip in the road system were not considered to be practical or feasible and, therefore were not formally considered in the conceptual phase. Each of these options would provide less flexibility during emergency situations, would not significantly reduce the overall gravel footprint, and would increase operating costs significantly. In addition, roadway airstrips would not be properly aligned for optimal wind conditions, and would be too close to the coast where foggy conditions and wildlife disturbance issues are likely. In addition, shared road/runway facilities present safety concerns due to common usage (vehicles and aircraft). The option of no airstrip, while reducing the overall footprint, does not allow for effective access to the facility in the event of an emergency or spill. A fully capable airstrip with road access to each of the pads is critical to the operations of Point Thomson.

To address the request for additional information the following is provided:

1) Airstrip length requirements for each potential aircraft to be used are provided in Section 2.3.2.2 of the ER.
2) Details regarding the number of trips for each aircraft type during different seasons for the base case analyzed in the ER have not been determined. However, the ER on pages 5-32, 5-35, and 5-35 provides the number of vessel, aircraft and vehicle traffic as characterized at the conceptual engineering phase. Conceptual engineering only attempted to identify vehicle, plane, and vessel traffic for the base case as presented in the ER. Logistics studies are ongoing to further refine transportation needs for material, equipment, and personnel during construction and operations.
3) At present under the operations phase (no drilling), the Badami airstrip supports about three flights a week. Discussions with personnel at Badami indicate that, in general, the airstrip is not operable about 10% of the time.
4) Deadhorse is a fully functioning airport, and according to FAA has rarely been shut down due to bad weather. Small craft may be advised to stay grounded, but large aircraft with proper avionics are typically able to operate. The only reason Deadhorse would shutdown would be due to severe damage to a runway or a plane crash. The Alpine airstrip is also unable to operate about 10% of the time.

PROPOSED FACILITY

Figure 3-15B: Cross Section A-A' does not show the existing gravel off the east side of the proposed CWP as shown on Figure 3-15A.

Terry Carpenter, USACE

Figure 3-15B will be updated in the future to show the existing gravel extended east of the proposed CWP. It is anticipated that this figure will be updated during the development of the Preliminary Draft Environmental Impact Statement (PDEIS).

Figure 3-15A: The new pad for the proposed CWP mostly overlays the existing Point Thomson #3 pads, however, portions of it do not. Please explain why the eastern portion and the road to the beach are not proposed for re-use. Also please provide information about the status of the existing pad as far as contamination and closure of reserve pits, and how these issues will be addressed prior to construction of the new pad. Picking up unused gravel on the east and north sides of the existing Point Thomson #3 pad, and rehabilitation of these areas should be addressed as well.

Terry Carpenter, USACE

The CWP boundaries as presented in the *Point Thomson Gas Cycling Project Environmental Report* (URS 2001) provide a conceptual footprint of the CWP and CPF. It is anticipated that the pad boundaries will be refined during development of the design, with updates available for incorporation into the DEIS. It is unlikely that the CWP and CPF will have the same footprint as the Point Thomson #3 exploration pad, and thus, portions of the exploration pad may not be utilized. It is possible that gravel from portions of the Point Thomson #3 exploration pad that do not coincide with the CWP and CPF footprint could be removed and the gravel re-used for construction of the CWP, CPF, or other gravel structures related to this project.

PUBLIC ACCESS

Reviewers have suggested some additional information be provided regarding restrictions to access on state lands. This information should address what policies or measures will be proposed for public access to the airstrip, dock, pads and roads on state lands and what, if any, public access restrictions will be proposed to insure public safety. It is unclear if ExxonMobil will be proposing any air exclusion zones.

Glenn Gray, DGC

As with other North Slope industrial facilities, public access will be regulated to ensure facility security and safety. There is minimal documented use of the onshore area for significant subsistence use; however, local residents may occasionally pass through the Point Thomson Unit. ExxonMobil understands the necessity for public access and pass-through, and will provide access as necessary without compromising site control and safety issues.

Modeling to determine the potential need for an air exclusion zone will be conducted at a later date as the preliminary design process progresses.

RESERVOIR CHARACTER

Begin to make the point clearly that Point Thomson is indeed separate from ANWR and ANWR reserves are not being tapped into by directional drilling. This could be depicted with a good generalized map of the Point Thomson sands, its location, size, and depth; pointing out clearly that it is separate and distinct from any ANWR deposits.

Ted Rockwell, EPA

Current interpretations from available seismic records indicate that the reservoir pinches out to the east of the Point Thomson Unit area. A figure representing the Point Thomson sands reservoir is presented in ER Figure 2-1. This figure represents the best current understanding of the size and shape of the Point Thomson reservoir based on existing seismic and exploration well data. All drilling, including surface and subsurface locations, will be confined to the boundaries of the Point Thomson Unit area as required by the leases and will not enter the Arctic National Wildlife Refuge (ANWR).

SEALS

A concern was expressed over the presence of ringed seals in the area. Seal counts are incidentally recorded during the on-going polar bear surveys and we will need to check with the staff doing those counts for a tally of seal densities.

Jeanne Hanson, NMFS

Ringed seals could be present in the area during the winter construction period; however, they are more likely to be found further offshore in land fast ice, rather than in the immediate vicinity of the dock, which is mostly located in bottom fast ice (see Section 4.9.6.2 of the ER). Nevertheless, several individual seals could be displaced from the immediate area during construction activities. Any displacement would occur prior to pupping in March, and since the seals are not geographically limited to Lion Bay, population impacts are not expected (see Section 5.2.5.2 of the ER).

According to a recent conversation with Dr. Steve Amstrup, seal densities are not recorded during polar bear surveys. Occasionally, field crews will record random, casual notes indicating the observance of a seal, but these are not tallied or summarized by the USGS.

SHORELINE EROSION

DNR raised the concern that the coastal facility pads could be affected by shoreline erosion and the potential rehabilitation that would be necessary.

Leon Lynch, DNR

The NSB expressed the need to collect additional information regarding shoreline erosion and its possible effects on the proposed coastal facility pads.

Tom Lohman, NSB

Engineers will develop the design of the dock and establish shoreline erosion rates from previously conducted studies done for the Point Thomson area. The work will include evaluating the natural rate of shoreline erosion, and assessing the effects of the dock on alongshore sediment transport. (See previous discussion of this proposed study provided under "Dock").

SITE-SPECIFIC STUDIES

USFWS requested access to the site-specific reports. The Environmental Report did not provide sufficient tabular and graphical representations for several species. USFWS was also interested when the 2001 LGL Studies would be available.

Louise Smith, USFWS

Copies of referenced reports are available. It is anticipated that the 2001 studies will be completed in 2002 and will also be available.

SNOW STORAGE

Section 5.2.2.1, Habitat Effects, Snow Dumps, page 5-24. The text states that ensuring snow is stored on the gravel surface as much as possible and by relocating snow dumps from year to year will minimize effects to vegetation. Given that pads are generally designed to limit the size of the footprint of the facility, there is generally little room to store snow on pads. In addition,

because of prevailing wind direction and facility placement, the ability to move snow dumps on a yearly basis may be extremely limited.

Glenn Gray, DGC

Further definition of pad designs will be done during preliminary engineering and will include considerations of snow storage options. While large accumulations of snow are possible during some winters, potential effects of snow storage are anticipated to be minimal. Snow dumps not only can be located on unused portions of pads but also could possibly be located off pad.

SPILLS

Page 5-61 and 5-75: This section will need additional analysis when information from the C-Plan is developed, such as spill scenarios and clean-up methods. Additions from the referenced risk assessment (Zelenka and Steinberg 2001) may also be helpful. Currently, the analysis does not identify where oil/condensate is likely to reach the tundra or water, how large an area could be affected by a spill event, or what methods would be employed to control, contain, and clean-up a spill, therefore no analysis of effects can be done. Little evidence is provided for concluding, "a low hazard potential overall" and "assurance that significant toxic effects on local species from a gas/condensate spill would be minimal."

Terry Carpenter, USACE

The C-plan will provide additional information to allow further characterization of potential spill impacts. The discussion in the ER is provided as a baseline for information prior to C-Plan development.

Page 7-95 and other discussions of effects: These sections need to make clear what is and is not "significant." How many polar bear injuries/deaths would be "significant?" How many spectacled eiders or long-tailed duck deaths is "significant?" Any other species? Because it probably won't be the same number for each species. Adequate spill analysis is needed to make conclusions here and elsewhere. Under oil spill cumulative effects 7.3.4.9 a large spill is identified as causing "potentially significant effects to oldsquaw and other subsistence bird populations," however, no significant effects to birds were identified in the bird discussions 7.3.4.5. Consistency is needed throughout the analysis.

Terry Carpenter, USACE

The cumulative effects evaluation criterion for biological resources was conducted to consider whether population effects could occur (ER Section 7.2.4). Therefore, the significance of an identified cumulative effect was determined for each species at the population level. A "significant" cumulative effect is one that would likely cause a change in a population that could be distinguished from natural fluctuations with scientific field techniques.

ER Section 5.2 evaluates the potential direct and indirect environmental consequences of the proposed project on biological resources. The analyses in Section 5.2 only consider the potential effects of small spills associated with construction/drilling and regular operations and maintenance activities. The probability and potential direct and indirect effects of a large oil spill, e.g., wellhead blowout, are analyzed in Section 5.4. If potential direct or indirect effects due to a "small" spill or a "large" spill were identified, the effects were carried forward to the cumulative effect analyses.

ER Section 7.3.2 presents cumulative effect analyses for biological resources. Since no potential direct or indirect effects due to "small" spills were identified in Section 5.2 analyses, they are not included in the cumulative effect analyses.

ER Section 7.3.4 presents cumulative effect analyses for "large" spills on biological resources. Since potential direct or indirect effects due to "large" spills were identified in Section 5.4 analyses, they are included in the cumulative effect analyses.

STORMWATER

USFWS requested clarification of stormwater discharge from the gravel pads.

Gary Wheeler, USFWS

If any collected stormwater exhibits sheen, the stormwater will be injected into the disposal well or disposed of in another appropriate manner. If the stormwater is clean, then the water will be released directly to the surrounding tundra under the provisions of the North Slope National Pollution Discharge Elimination System permit or a multi-sector general stormwater discharge permit.

SUBSISTENCE

The environmental report does a fair job of addressing pertinent subsistence issues associated with the proposed development of oil production facilities and infrastructure. Description of subsistence use of the area directly and indirectly affected by the proposed project is incomplete. There have been no studies published, or commissioned as part of the proposed development, which adequately chronicle area use over time or describes the extent to which the general area of the proposed development are currently used. As a consequence, evaluation of effects on subsistence, particularly on terrestrial activity, by the proposed project as presented in the environmental report, cannot be supported. Based on experience from subsistence studies undertaken in Nuiqsut and Kaktovik since 1980, the ADFG believes that direct and cumulative effects assessments made in this document underestimate level of use, character of use, timing of use, harvest effort, and harvest levels of subsistence resources in the area. We have recorded subsistence use and travel in the area for caribou, waterfowl and seal hunting, and fishing (Pedersen 1979; Pedersen and Haynes 1989; Pedersen et al. 1985; Pedersen 1995; Pedersen et al. in press).

Since the proposed development may have a lifetime of 30 years or more, it is important to obtain both current and long-term use and harvest information from the area to adequately assess its potential effect(s) on area subsistence harvest and use patterns. Consideration should therefore be given to holding scoping meetings specifically on subsistence use and TEK (traditional ecological knowledge) of the proposed area with direct participation and input from knowledgeable informants from Kaktovik and Nuiqsut.

Proposed mitigation measures should go a long way to minimize subsistence-development conflicts. However, for these measures to perform as intended the companies need to develop a better understanding of long-term and existing subsistence use of the development area. In addition, there also needs to be a commitment to monitor and regularly assess stipulation performance in cooperation with subsistence user representatives from Kaktovik and Nuiqsut (similar to the Kuukpik Oversight Panel for Alpine and the BLM NPR-A Subsistence Advisory Panel). This will be a particularly important step to take as early as possible while the proposed action is just that, and will be a valuable aid in facilitating further development in the Point Thompson area (such as developing the area's gas potential).

Mention in the environmental report is made of a "subsistence life style." Please note that what is actually being referred to is the way in which Inupiat live. This is a way of life, not a life style.

Glenn Gray, DGC

There were six additional references provided with this comment:

Pedersen, Sverre. 1979. Regional Subsistence Land Use: North Slope Borough, Alaska. Occasional Paper No. 21, Conservation and Environmental Protection, North Slope Borough, Barrow, Alaska and Anthropology and Historic Preservation, Cooperative Park Studies Unit, University of Alaska, Fairbanks, Alaska.

Pedersen, Sverre, Michael Coffing and Jane Thompson. 1985. Subsistence Land Use and Place Names Maps for Kaktovik, Alaska. Technical Paper No.109. Division of Subsistence, Alaska Department of Fish and Game, Fairbanks, Alaska.

Pedersen, Sverre. 1986. Nuiqsut Subsistence Land Use Update. Unpubl. Manuscript on file. Division of Subsistence, Alaska Department of Fish and Game, Fairbanks, Alaska.

Haynes, Terry and Sverre Pedersen. 1989. Development and Subsistence: Life After Oil. Alaska Fish and Game 21(6):24-27. Alaska Department of Fish and Game, Juneau, Alaska.

Pedersen, Sverre, Robert J. Wolfe, Cheryl Scott and Richard A. Caulfield. In press. Subsistence Economies and Oil Development. Part 1: Case Studies from Nuiqsut and Kaktovik, Alaska. Report prepared October 2000 for Coastal Marine Institute, University of Alaska, Fairbanks, Alaska. Division of Subsistence, Alaska Department of Fish and Game, Fairbanks, Alaska.

One of these six references, Pederson (1995), we have previously referenced and discussed in the ER. Two of the references, Pederson et al (in press) and Pedersen (1986 unpublished manuscript), we were unable to locate through a search of library holdings in Anchorage and with the assistance of the Alaska Resources Library and Information Services (ARLIS) librarians. We consulted the remaining three suggested references and provide the following review.

Hayes and Pedersen (1989) provide an overview of the effects of oil development on people's access to wildlife. However, there are no specific discussions on use of the Point Thomson area. The article does mention that North Slope communities including Nuiqsut and Kaktovik have experienced a gradual decline in the use of some areas for subsistence and associates the decline with continually expanding oil and gas activities on the eastern North Slope. The decline in specific areas or use is not quantified or delineated.

Pederson (1979) and Pederson et al. (1985) provide detailed, but often difficult to interpret subsistence use maps. Peterson et al (1985) analyzed 21 Kaktovik household biographies and found considerable variation in the size of the area and number of resources utilized over time. The greatest overlap of use areas by households was in the immediate vicinity of the village. The entire coastline from Brownlow Point in the west to Demarcation Point in the east was heavily used. In the westerly direction, use tapered off to one household east of Brownlow Point/Flaxman Island. While maps in both of these documents show use of the Point Thomson area for hunting of polar bear and trapping of fur bearers, and offshore areas for whaling, the maps tend to support the ER conclusion that Point Thomson is on the edge of the areas most used by villagers and is often used as a corridor to access other, more productive areas to the west and further inland.

To address the comment of holding scoping meetings specifically on subsistence use and traditional knowledge (TK), we note that scoping meetings will be held in both Kaktovik and Nuiqsut as part of the NEPA/EIS process. Subsistence use and TK information gleaned during the scoping process can be used to improve upon the discussions presently provided in the ER. The information will allow a better understanding of the actual subsistence use of the Point Thomson area, and could confirm that overall use of the area occurs, but at a lower rate than at other areas on the North Slope.

The term "subsistence life style" will be avoided in the future, and will be replaced with "subsistence way of life."

VEGETATION

Figure 4-3: The vegetation codes are incompletely shown on the color map, i.e., only the color codes are shown, not the letter/numeric codes. This information would be useful for assessing vegetation and habitat effects.

Terry Carpenter, USACE

Figure 4-3 presents color codes for cover types under Level B of Walker (1983). The land cover types are described (but not necessarily mapped) at Level C, which includes landform and dominant vascular plant taxa. The level C vegetation codes are not shown on the map itself due to the scale of the map and the fact that additional ground surveys might be necessary to further assign letter and numeric codes to break out level B classification further into Level C codes. However, the following table provides a cross reference for Level B color code, Level C vegetation codes, and the NWI classification codes.

Combined Groups for ER Vegetation Map (following Walker's Level B Land cover Units)	Level C Code and associated group color code	Level C Type	NWI Code(s)
I. Water	Ia	Water (ponds, lakes, rivers, streams, saltwater)	E1UBL R1UBV, R2UBH, R3UBH L1UBH, L2UBH, PUBH
II. Very Wet Tundra	IIb	Aquatic Graminoid Tundra (emergent vegetation)	L2EM2H, PEM1H
	IId	Water/Tundra Complex (interconnected ponds with emergent vegetation)	L2UB/EM2H, PUB/EM2H, PUB/EM1H
III. Wet Tundra	IIIa	Wet Sedge Tundra	PEM1B, PEM1E, PEM1H, PEM1F
	IIIb[1]	Wet Graminoid Tundra (wet saline tundra, saltmarsh)	E2EM1N, E2EM1P
	IIIc	Wet Sedge Tundra/Water Complex (interconnected ponds with no emergent vegetation)	L2EM2/UBH, PEM1/UBH
	IIId	Wet Sedge/Moist Sedge, Dwarf Shrub Tundra Complex (wet patterned ground complex)	PSS/EM1B, PEM1B, PEM1E, PEM1H, PEM1F
	IIIe	Wet Graminoid, Dwarf Shrub Tundra/Barren Complex (frost-scar tundra complex)	PSS/EM1B, PEM1B, PEM1E, PEM1H, PEM1F
Moist/Wet Tundra	IVa	Moist Sedge, Dwarf Shrub/Wet Graminoid Tundra Complex (moist patterned ground complex)	PSS/EM1B, PEM1B, PEM1E, PEM1H, PEM1F
V. Moist or Dry Tundra	Va	Moist Sedge, Dwarf Shrub Tundra	PSS/EM1B
	Ve	Moist Graminoid, Dwarf Shrub Tundra/Barren Complex (frost-scar tundra complex)	PSS/EM1B
	Vb	Moist Tussock Sedge, Dwarf Shrub Tundra	PEM1B
	Vc	Dry Dwarf Shrub, Crustose Lichen Tundra (Dryas tundra, pingos)	Upland
	Vd	Dry Dwarf Shrub, Fruticose Lichen Tundra (dry acidic tundra)	Upland, PEM1B, PEM1E, PEM1H, PEM1F
IX. Partially Vegetated	IXb	Dry Barren/Dwarf Shrub, Forb Grass Complex (forb-rich river bars)	Upland, PSS/EM1A
	IXc	Dry Barren/Forb Complex (river bars in active channels)	R3UFC
IX. Partially Vegetated (continued)	IXf	Dry Barren/Dwarf Shrub, Grass Complex (sand dune steppe)	Upland
	Ixh[1]	Wet Barren/Wet Sedge Tundra Complex (barren/saline tundra complex, saltmarsh)	E2USN, E2USP, E2EM1P
	IXi	Dry Barren/Forb, Graminoid Complex (saline coastal barrens)	Unknown, PSS/EM1B?

Combined Groups for ER Vegetation Map (following Walker's Level B Land cover Units)	Level C Code and associated group color code	Level C Type	NWI Code(s)
X. Light Colored Barrens (ground cover <30%)	Xa	River Gravels	R2USC, R3USC
	Xc	Barren Gravel Outcrops	Upland/Unknown
	Xe[(2]	Gravel Roads and Pads	Upland/Unknown
XI. Dark Colored Barrens (ground cover <30%)	XIa	Wet Mud	L2USD, PUSD
	XIc	Bare Peat	L2USD, PUSD

[(1]yellow was chosen to denote salt marsh areas within the Level B groups III and IX.

[(2]broken out as a darker gray to indicate gravels placed due to oil exploration/construction

WASTE MANAGEMENT

Section 3.12, Waste Management, should identify the likely generation of hazardous and universal wastes and describe how the proposed project will meet the applicable management requirements.

Glenn Gray, DGC

Any hazardous wastes generated during construction and/or operations at the Point Thomson facilities will be handled according to all applicable Resource Conservation and Recovery Act (RCRA) and State of Alaska Regulations. These requirements include, but are not limited to: providing proper storage and satellite accumulation areas that incorporate covers and/or secondary containment, segregating and properly labeling wastes, shipping the wastes to an approved TSD site, and documenting all storage and shipping procedures as explicitly required by RCRA. The project team will develop a waste management plan during the preliminary engineering process.

Section 3.12, Waste Management, should be broadened to include other waste management requirements beyond just waste disposal. For example, the first sentence of the Section reads, "All waste management disposal procedures will conform to ADEC and EPA requirements." Because many waste management regulations also include requirements for the accumulation and storage of wastes, the state recommends that the project's environmental analysis likewise broaden the discussion of waste management to include those activities.

Glenn Gray, DGC

Storage areas as required under RCRA will be set up and permitted as needed. The exact number and location of the satellite storage areas will be determined based on the results of additional engineering and design efforts, and operational planning.

Section 3.12.2, Waste Management, Waste Generated, page 3-29. Further discussion is needed regarding management of putrescible wastes and its protection from access by wildlife. Such discussion should include information on the storage of putrescible waste. Will it be stored indoors, in conexes, or in bear-proof dumpsters? How often will dumpsters be emptied? Will putrescible waste be segregated from other wastes? What measures will be implemented to ensure that outdoor storage structures will be properly used? How will trash carried in open beds of trucks be addressed?

Glenn Gray, DGC

The Wildlife Interaction Plan will address these issues. If needed, bear-proof dumpsters will be used to store putrescible wastes. It is anticipated that the wastes will be incinerated on a regular basis so that it will not be necessary to store large volumes of putrescible waste on site for extended periods. An on-site incinerator will be sized to accommodate the anticipated amount of food wastes generated. There may be instances during construction and drilling when food wastes may have to be stored and transported off site due to high manpower peaks, or if the incinerator is not operable. The wastes would then be shipped back to Deadhorse for disposal by truck via ice road in winter, or by barge during the summer. During break up and freeze up when ice road access and/or barge traffic is unavailable, it may be necessary to store the wastes in a covered, wildlife inaccessible area. During actual shipment, either by barge or truck, the wastes will be covered and inaccessible to wildlife. Environmental sensitivity training and enforcement of storage policies will help to ensure that the wastes remain inaccessible to wildlife.

WATER

AOGCC asked if there were any recharge studies associated with the fresh water sources.

Tom Maunder, AOGCC

There are plans to assess the recharge rates of the old mine site and proposed new mine sites. See comments under "Bridges" and "Mine Site" for descriptions of the proposed study.

Section 3.3.3, Permanent Gravel Roads, page 3-8. The text states the largest streams in the project area are East and West Badami Creeks. It should be noted that these streams are about 10 to 15 miles west of the Point Thomson project area.

Glenn Gray, DGC

The sentence referring to East and West Badami Creeks was erroneously included in ER Section 3.3.3 Permanent Gravel Roads. Gravel roads will not be built across these creeks.

Section 3.13.2, Water Sources, Water Source Lakes, Figure 3-19. This figure identifies potential water source lakes in the proposed project area. Information including depth, area, volume, presence of fish, and water chemistry will need to be gathered on these potential water sources before project initiation.

Glenn Gray, DGC

Section 3.13.2, Water Sources, Table 3-4, Water Use Plan, page 3-32. This table describes the Duck Island mine site as a potential water source for the project. It should be noted that the Duck Island mine site also is being considered for use as a gravel source for the Liberty Development Project. If it were used for the Liberty Development Project, it would be de-watered to mine additional gravel and thus would be unavailable as a water source for the Point Thomson Project.

Glenn Gray, DGC

A Conceptual Water Balance Study for the Point Thomson project recently completed by the project team includes the following information regarding potential water sources:

Potential Point Thomson Project Water Sources

Source	Estimated Volume (million gallons)	Basis of Estimate	Other Information	Likely Use
Duck Island Mine Site	600	Suspected depth based on historical mining records, surface area	None	Sea Ice Road to Shaviovik vicinity
Sag Mine Site C (Vern Lake)	119	Suspected depth based on historical mining records, surface area	15% fish habitat limitation included in volume estimate	Sea Ice Road to Shaviovik vicinity
Shaviovik Pit	142	Suspected depth based on historical mining records, surface area	ADFG suspects fish are present, has not yet limited permits	Year 1 and 2 Sea Ice Road to Badami vicinity
Badami Pit	9	Known depth, surface area, volume accounting for ice, fish habitat restriction, and Badami Water Rights Application	BPXA has filed water rights application, use could be restricted to amount available after water rights and habitat protection needs fulfilled	Sea Ice Road to PTU vicinity Year 2 Pipeline Work Pad
Old PTU Pit	84	D. Miller soundings, surface area, accounts for ice thickness	Various recharge assumptions need to be tested.	Sea Ice Road Year 1 Infield Roads Year 2 Pipeline Work Pad Year 3 and beyond drilling and operations
New PTU Pit	323	1590x1065x240 less 6 foot ice thickness - these are permit dimensions - factored to 75%	Assumes 100% filling during Year 1 breakup and from summer precipitation	Year 2 Pipeline Work Pad Year 3 and beyond drilling and operations
Large PTU Lake	4	raw assumption - similar NPR-A lake sizes	surface area, limited depth information	Year 2 Pipeline Work Pad

Additional work will be done to better define water source availability, recharge of water sources and water needs during design development.

Since construction for the Liberty Development has been indefinitely postponed, it is unlikely that there will be conflicts between these projects.

Page 7-12: Statement that "direct project impacts...will be mitigated" is not explained. How will they be mitigated? How are limitations on withdrawal volumes in fish-bearing waters and winter construction going to eliminate water quality effects? What happens to water quality in non-fish-bearing waters? Just because there are no fish doesn't mean there are no water quality effects.

Terry Carpenter, USACE

Limiting water withdrawal from fish bearing water bodies will mitigate the "direct project impacts." Since water quality effects such as increased turbidity and decreased oxygen under ice cannot be eliminated, they will be minimized by ensuring that sufficient water volume remains to maintain appropriate oxygen concentrations. Water removal from non-fish bearing waters will be conducted such that the water quality of these waters is also minimally impacted.

Section 3 Environmental Report Revisions

Modifications to several ER sections have occurred due to ongoing project planning and design. Therefore, the following revisions are provided.

3.1 Environmental Report Executive Summary

For the Executive Summary, page ES-1, 2nd paragraph, line 7, the following information should be added:

"Early power generating equipment, the grind and inject module, and other necessary early equipment and infrastructure may be trucked on the sea ice road in early 2005 or will be barged to the project site by August of 2005. Near shore dredging may be conducted during the summer of 2005 and 2006. Rigs may be barged to the site in summer 2005 and development drilling will begin that fall. Pipeline construction will occur in the winter of 2005-2006. Major process and utility modules will be delivered to the CPF site by barge in the summer of 2006. Project start-up is planned by the end of 2006.

For the Executive Summary, the following bulleted lines of the Project Effects and Mitigation Measures Summary Table, should be updated as follows:

Page ES-5 under Resource/Impact heading of "Birds", the Possible Mitigation Measures statement "Limit aircraft to specific routes" should be changed to read: "In as much as possible, aircraft will attempt to limit their activity to a similar set of routes, so as to minimize effects over a broad area." Page ES-7 under Resource/Impact heading of "Caribou Herds", the Possible Mitigation Measures statement "Route helicopters to minimize wildlife disturbances-consultation with USFWS" should be changed to also read: "In as much as possible, aircraft will attempt to limit their activity to a similar set of routes, so as to minimize effects over a broad area." Page ES-11 under Resource/Impact heading of "Transportation", the Possible Mitigation Measures statement "Plan air routes so that sensitive areas/species are not affected" should be changed to read: the same as the new ES-5 and ES-7 statements.

On page ES-9 in the "disruption of fall whale hunt" row, the second bullet under "Rationale" should be revised to read: "Boat traffic will be minimized outside of the barrier islands as much as is practicable during the fall whale hunt. Project-related boat traffic will be coordinated with the AEWC communications center during the whaling season.

In the row that considers "disruption from contamination or the perception of contamination" on page ES-10, the third bullet under "Possible Mitigation Measures" should read: Pressure monitoring is planned to be the primary means of leak detection for gathering lines. These lines will also be visually monitored when traveling roads to and from well pads. This is a typical means of monitoring gas gathering lines.

3.2 Environmental Report Section 1

The following changes should be made to Section 1.1 on page 1-1:

The first sentence of the second paragraph should read: "The Point Thomson Sands is a high pressure gas reservoir that was discovered in 1977."

The following sentence found in the fourth paragraph should be deleted: "Prudhoe Bay and Point Thomson Unit owners must also study the costs and benefits associated with early gas sales versus gas cycling (selling gas at a later date) at Point Thomson."

Table 1-1 is to be replaced with the following table:

Table 1-1 Point Thomson Gas Cycling Project Major Milestones

MILESTONE	TIME FRAME	DESCRIPTION
Conceptual Engineering	Aug 1998 - June 2001	
Additional Environmental Studies	Summer 2001 Winter 2002 Summer 2002	The results of environmental studies conducted previous to 2001 are summarized in Section 4 of this document. Additional environmental studies are planned for 2002.
Preliminary Engineering Detailed Engineering/ Procurement	2nd Half of 2002 - August 2005	
Gravel Construction	Dec 2004 - August 2005	Gravel construction is expected to commence late in 2004 utilizing equipment mobilized over ice roads. Most gravel work at the project site is expected to be completed in a single winter season, with gravel obtained from a new local mine site. Final grading will be completed during the summer.
Mobilize Rigs by barge	Late summer 2005	Rigs are delivered to the new dock adjacent to the central well pad.
Infrastructure Construction	Feb – Sept. 2005	Construction of infrastructure such as airport, power generation, storage tanks, temporary camps, and dock to support drilling operations.
Development Well Drilling	Fall 2005	Drilling is conducted with two rigs
Pipeline Construction	Dec 2005 - May 2006	Pipeline construction is expected to commence in winter 2005 and be completed by May 2006.
Sealift	May - Sept 2006	Major modules for CPF process and living facilities are expected to be brought into Point Thomson by sealift in the summer of 2006 and offloaded at the dock.
Module Installation	Sept - Dec 2006	-
Production	4^{th} Quarter 2006	Production of condensate from Point Thomson is expected to commence at the end of 2006

Table 1-2 is to be replaced with the following table:

Table 1-2 Permits and Authorizations

PERMIT OR AUTHORIZATION	REGULATORY AGENCY
Air Quality Permit to Construction (PSD)	Alaska Department of Environmental Conservation
Food Service Permit	Alaska Department of Environmental Conservation
Oil Discharge Prevention and Contingency Plan	Alaska Department of Environmental Conservation
Permit to Construct (wastewater disposal/drinking water systems)	Alaska Department of Environmental Conservation
Permit to Operate (wastewater disposal/drinking water systems)	Alaska Department of Environmental Conservation
Request for Temporary Water Quality Variance	Alaska Department of Environmental Conservation
Section 401 Water Quality Certification (401 cert)	Alaska Department of Environmental Conservation
Solid Waste Disposal Facility (Grind & Inject)	Alaska Department of Environmental Conservation
Temporary Drilling Waste Storage	Alaska Department of Environmental Conservation
Title V (Air) Permit to Operate	Alaska Department of Environmental Conservation
Waste Water Disposal Permit	Alaska Department of Environmental Conservation
Culvert Installation or Maintenance in Fish Streams	Alaska Department of Fish & Game
Title 16 Fish Habitat	Alaska Department of Fish & Game
Material Sales Contract (Mining & Rehabilation Plan)	Alaska Department of Natural Resources, Division of Mining, Land, & Water Management
Miscellaneous Land Use Permits (Construction & Operations)	Alaska Department of Natural Resources, Division of Mining, Land, & Water Management
Miscellaneous Land Use Permits (Field Studies)	Alaska Department of Natural Resources, Division of Mining, Land, & Water Management
Temporary Water Use Permits / Certificate of Appropriation	Alaska Department of Natural Resources, Division of Mining, Land, & Water Management
Water Right Permits / Certificate of Appropriation	Alaska Department of Natural Resources, Division of Mining, Land, & Water Management
Plan of Development (POD)	Alaska Department of Natural Resources, Division of Oil & Gas
Unit Plan of Operations	Alaska Department of Natural Resources, Division of Oil & Gas
Section 106, National Historic Preservation Act consultation	Alaska Department of Natural Resources, Division of Parks and Outdoor Recreation
Alaska Coastal Management Program (ACMP) Consistency Determination	Alaska Division of Governmental Coordination
Permit to Drill	Alaska Oil and Gas Conservation Commission
Underground Injection Certification	Alaska Oil and Gas Conservation Commission
Oil Spill Contingency Plan (DOT)	Department of Transportation
Standards Review	Federal Aviation Administration
Radio and Wire Communications and Construction Permit	Federal Communications Commission
Incidental Harassment Authorization (Construction & Operations)	National Marine Fisheries Services
Incidental Harassment Authorization (Field Studies)	National Marine Fisheries Services
Section 7 Endangered Species Act consultation (NMFS)	National Marine Fisheries Services
Land Management Regulations (LMRs): Administrative Approval (Field Studies)	North Slope Borough
Land Management Regulations (LMRs): Development Permit /Master Plan Approval	North Slope Borough
Land Management Regulations (LMRs): Request for Rezoning	North Slope Borough
Certificate of Public Convenience and Necessity	Regulatory Commission of Alaska

PERMIT OR AUTHORIZATION	REGULATORY AGENCY
Pipeline Right-of-Way Lease	State Pipeline Coordinator's Office
Department of the Army Permit (§404/10)	U.S. Army Corps of Engineers, Alaska District
Ocean Dumping Permit (§103 MPRSA)	U.S. Army Corps of Engineers, Alaska District
Oil Spill Contingency Plan (USCG)	U.S. Coast Guard
NPDES Construction Stormwater Permit	U.S. Environmental Protection Agency
NPDES Individual Permit Form 1	U.S. Environmental Protection Agency
NPDES Individual Permit Form 2D	U.S. Environmental Protection Agency
NPDES Industrial Stormwater Permit	U.S. Environmental Protection Agency
Oil Spill Contingency Plan (EPA)	U.S. Environmental Protection Agency
Spill Prevention, Containment, and Countermeasures (SPCC) Plan	U.S. Environmental Protection Agency
UIC Class I Disposal Well	U.S. Environmental Protection Agency
Letter of Authorization (Construction & Operations	U.S. Fish and Wildlife Service
Letter of Authorization (Field Studies)	U.S. Fish and Wildlife Service
Section 7 Endangered Species Act consultation (USFWS)	U.S. Fish and Wildlife Service

3.3 Environmental Report Section 2

Page 2-8, Option PCF-2 should be updated as follows:

The sentence "Under this option a permanent camp with a capacity of 75 to 90 people would be purchased and transported to Point Thomson for installation" should be changed to: "Under this option a permanent camp with a capacity of 75 or more people would be obtained and transported to Point Thomson for installation."

On page 2-12, the following bullet should be added to reasons for rejection Option MD-1:

- There would be no means of summer re-supply at Point Thomson.

3.4 Environmental Report Section 3

The third sentence in the first paragraph of Section 3.2 on page 3-5 should be amended to read:

One or two rigs will be used and will likely be mobilized by barge a year before the CPF modules are delivered to Point Thomson.

The last sentence in Section 3.4 on page 3-9 should be amended to read:

The airstrip is expected to be ready for use by the fall of the first year's construction; it will not be useable until it freezes.

The following changes should be made to Section 3.5, Dock, page 3-11:

The second paragraph, fourth line should read: "The dock will provide the capability to launch small craft oil spill response vessels during ice-free periods."

The first sentence of the last paragraph should read: "During 2005 and 2006, a channel may be dredged to the 9-ft (3-m) isobath to accommodate unloading of the 6,000-ton (5,443 metric ton) modules."

Figure 3-12 "Point Thomson Gas Cycling Project Proposed Dock and Channel" is incorrect. Section A-A' should be reversed.

The following sentence should be added to the second paragraph under Section 3.8.1.2 Flare System on page 3-19:

Flaring will be required during initial plant start up, and when the plant is started back up due to a planned or unplanned shutdown.

The bullets of Section 3.11, Spill Prevention and Response, page 3-27 should be updated and reorganized to read:

- Response Action Plan-describes deployment and response strategies for a remote facility and pipeline system, including, but not limited to, information on safety, emergency action checklists, and flow diagrams and incident reporting requirements.
- Prevention Plan-describes regular pollution prevention measures or programs to prevent spills. For instance, discussions of tank and pipeline leak detection systems and discharge detection and alarm systems. This section also covers personnel training, site inspection schedules, fuel transfer and loading, and maintenance protocols.
- Supplemental Information-describes the facility itself and the environment in the immediate vicinity of the facility. This section also includes information on response logistical support and equipment (mechanical and non-mechanical) and spill response team training.
- Best Available Technology-presents analyses of various technology used and/or available for use at the site for well source control, pipeline source control and leak detection, tank source control, leak detection, liquid level determination and overfill protection, corrosion control and surveys and mechanical response equipment.

The following paragraph should be inserted at the end of Section 3.11, Spill Prevention and Response, on page 3-27:

The following is an example of typical re-fueling guidelines that could be conducted for Point Thomson operations:

1. Check all vehicles and equipment. If a leak is apparent, or there are other obvious problems with the equipment, stop the job, and have repairs done. Surface liners may be

used to contain leaks for a short time during critical operations; however, liners are not an acceptable substitute for maintenance.

2. Park vehicles away from water bodies, tundra, and wildlife habitat. Do not park on the edges of pads.
3. Position equipment so that valves, piping, tanks, etc., are protected from damage by other vehicles or equipment.
4. Verify that adequate surface liners and sorbents are on hand.
5. Inspect hoses, connections, valves, etc., before starting any fluid transfers. Be sure that valves are in the proper on/off position and each connection is tightened properly.
6. Before starting, check all tank and container levels, valves, and vents to prevent overfilling or accidental releases.
7. Surface liners are required under all potential spill points.
8. Maintain a constant line-of-sight- with critical components throughout the transfer procedures. Be prepared to stop the transfer immediately if you notice any leak. Do not attempt to fix a leak while fluid is being transferred.
9. *Never leave fluid transfer operations unattended.*
10. After the transfer is complete, continue to take these precautions while breaking connections.
11. When finished, check the area for spills. Report all spills immediately to the appropriate number in your operating area.
12. Properly reclaim or dispose of sorbents.

The following information should be added to Section 3.12.3 on page 3-30:

Presently the plan is to have a plant incinerator installed early in the construction process and will be used to dispose of wood pallets, mud bags, and other burnable materials. It is likely that the peak use that defines rating and sizing requirements will occur during the construction and drilling phases. Emissions from the incinerator will meet PSD air permit requirements.

A new subsection 3.12.4, regarding spill waste storage and disposal should be added to the end of Section 3.12, Waste Management, on page 3-30:

3.12.4 Spill Waste Storage and Disposal (add as new section)

Contaminated materials from spill recovery operations will be handled and disposed of according to state and federal agency-approved waste management plans. ExxonMobil and the response action contractor will determine the classification of the waste as exempt, hazardous, or non-hazardous. Contaminated gravel will be temporarily stored on site, using the response action contractor's pre-approval from ADEC for the temporary storage of oily waste associated with response activities. Liquids may be temporarily stored in tankage available from the response action contractor.

The following sentence from Section 3.13.1 Permanent Camp, page 3-31, 3rd line, should be updated as follows:

The sentence "It will accommodate approximately 75 people (peak) with provisions to house both men and women" should be updated to read: "It will accommodate 75 or more people with provisions to house both men and women."

The following two sentences should be added to Section 3.13.5, Table 3-6, Proposed Tanks and Storage Areas, page 3-37 and to the first paragraph of the same page:

Under the Location/Purpose column for each of the CPF Pad and Central Well Pad locations, the Notes column for "Diesel fuel" should include the sentence: "Temporary tanks may be used to store diesel during periods of peak need. A heated multi-service tank is being considered for early diesel storage; this tank could then be used for condensate/produced water storage during upsets. Proper containment for these tanks will be provided."

The following sentence from Section 3.13.5, Storage/Tanks, page 3-37, 1st paragraph, 4th line should be amended as follows:

Replace the sentence to read, "Tankage and containment will be designed and constructed using applicable industry standards and in accordance with local, State and Federal regulations."

The following information should be added to the end of Section 3.13.5 on page 3-37.

Snow volume and potential meltwater that accumulates within the diked area will be handled as any other storm water. It will be inspected for sheen and visual contamination. If contaminated, the water will be disposed of in the disposal well.

The following sentence from Section 3.14, Operation and Maintenance, 3rd paragraph, 3rd line should be amended as follows:

The sentence "Personnel responsible for sales pipeline operations and maintenance will meet all Alaska Department of Transportation training and testing requirements" should be amended to read: "Personnel responsible for the operations and maintenance of the sales oil pipeline will meet all U.S. Department of Transportation training and substance abuse-testing, inspection, normal and abnormal operations procedures and maintenance practices. In addition, this pipeline will meet all ADEC-required criteria for leak detection, source control, metering capability and inspection frequencies."

The following sentence should be added to Section 3.14, page 3-39, 5th paragraph, 2nd line

"The leak detection system for the export pipeline will likely rely on liquid hydrocarbon flow and pressure meter data and mass balance calculations that can detect a leak volume less than 1 percent of the daily throughput.

3.5 Environmental Report Section 5

The following section is provided as an update to Section 5.1.3 Marine Environment found on pages 5-9 through 5-11 of the existing ER.

5.1.3 Marine Environment

Activities associated with the proposed project construction and operations will potentially affect nearshore circulation (hydrodynamics) and water quality (hydrography). This section summarizes the potential effects of the dock construction, long-term dock presence, one-time excavation of a dredged channel, and the subsequent ocean dumping of spoils.

5.1.3.1 Placement of Gravel and Obstruction of Circulation

Construction and subsequent long-term presence of the dock in the nearshore marine environment can affect marine waters immediately adjacent to the dock. It is anticipated that gravel placement during dock construction will temporarily increase suspended sediment in the water column. The dock itself will affect water movement and the water column structure (i.e., vertical salinity profile) in its immediate vicinity, possibly resulting in minor but observable changes in selected water quality parameters such as salinity and temperature

Circulation

Solid-fill coastal structures, as well as natural coastal features such as spits and peninsulas, often alter the alongshore flow by deflecting it offshore, which results in local spatial variations in the current velocity (i.e., speed and direction). Typically, a wake forms on the lee side (i.e. downstream) of the structures as a result of flow separation. When the alongshore flow is sufficiently vigorous, as under strong winds, an eddy (vortex) forms within the wake. This "wake eddy" has received considerable attention as an "effect" of a coastal structure; however, it is important to understand that the wake eddy is a very localized result of the structure's effect on the alongshore flow and that it has no influence on the larger-scale regional oceanographic processes. Wake eddies have been observed to occur under totally natural circumstances and at varying scales on the down-current sides of islands and peninsulas (e.g. Wolanski 1984, 1986: Wolanski and Hamner 1988), with their "effects" observable downstream only within distances equivalent to a few times their length.

Wake eddies have been observed and documented at West Dock Causeway (WDC) since earliest studies of its 1976 extension to Dock Head 3 (Grider et al. 1977, 1978; Chin et al. 1979; Niedoroda et al. 1980) and, subsequently, with WDC's extension in 1981 to accommodate the Prudhoe Bay waterflood seawater treatment plant (Mangarella et al. 1982; Savoie and Wilson 1983, 1984, 1986; Colonell and Gallaway 1990). While the presence of a wake eddy also at the Endicott Causeway was documented during 1985 to 1987 following its construction (Hachmeister et al. 1987, Short et al. 1990, 1991), a concise description and analysis of the phenomenon was not presented until a synthesis of Endicott monitoring data was prepared (Niedoroda and Colonell 1990a, 1990b).

As the wake eddy is established, a secondary (vertical) circulation soon develops within it such that vertical mixing of the water column occurs within the eddy. For stratified water columns, (i.e., water columns with a fresh or brackish surface layer and an underlying higher salinity marine bottom layer), the secondary circulation results in the mixing of higher salinity water throughout the water column. However, this occurs only when the surface and bottom layers have similar alongshore current velocities (i.e., when the two layers are "frictionally coupled"). When the layers are not "frictionally coupled," the wake eddy formation is restricted to the surface layer. In the former case, when the alongshore current is similar in both surface and bottom layers, the eddy will involve both layers and will promote mixing of bottom layer waters into the upper part of the eddy, where it is mixed further and carried downstream by the alongshore current (Niedoroda and Colonell 1988).

Nearly two decades of baseline studies and environmental monitoring have demonstrated that cold, marine water often extends to the Beaufort Sea coastline from Harrison Bay to the Arctic National Wildlife Refuge. The Point Thomson Unit coastline falls within this area. Wind-induced upwellings occur naturally and regularly due to east and northeast winds on a regional scale across the North Slope (Niedoroda and Colonell 1988, Colonell and Niedoroda 1990). Kinnetic Laboratories, Inc. (KLI) conducted oceanographic studies within Lion Bay and on the seaward side of the barrier islands. In their report (KLI 1983) they observed that major exchange of water masses in Lion Bay is driven by storm surges and local wind. Physical oceanographic studies conducted in 1997 and 1998 by URS (1999) in the Point Thomson region are consistent with the KLI study and a review of NOAA-9 polar orbiting satellite data that indicated the regional extent of marine water upwelling along the Beaufort Sea coast (Gallaway 1991).

In their analysis of the coastal oceanography of the Beaufort Sea, Niedoroda and Colonell (1990a, 1990b) demonstrated that coastal features having dimensions similar to WDC and Endicott causeways are incapable of affecting or "enhancing" regional upwelling phenomena. While the proposed Point Thomson dock might provide an alternative mechanism by which very localized upwelling of bottom water may occur, it will be far too small to affect any naturally occurring upwellings. Furthermore, because the water column within Lion Bay tends to be uniform both horizontally and vertically (URS 2000), a wake eddy on either side of the dock would serve only to increase the homogeneity of an already nearly homogeneous water body.

Water Quality

Dock Construction

Dock construction could begin in the winter and possibly continue into early spring, so sea ice could be present throughout the lagoon waters, entrances and other gaps between the barrier islands, and the Beaufort Sea during construction. Within the construction area, sea ice will be removed to allow gravel placement. Gravel placement will cause increased suspended sediment and turbidity in the adjacent nearshore waters. However, it is anticipated that the affected area of the marine environment will be quite limited because most of the dock will be located within the bottomfast sea ice zone; that is, where the seawater is frozen entirely to the seabed, immediately adjacent to the shoreline and extending to a depth of 6 ft or more. Available bathymetry indicates that the dock will extend to the 7-ft isobath, so at most, only a 1-ft water column will be affected by the 750 ft long dock construction. Low current speeds and the relatively shallow water column will confine the distribution of suspended sediment to the very near vicinity of the dock. Nevertheless, a water quality variance from the State of Alaska may be required for this minimal and short-term increase in turbidity. Further definition of dock design and methods to construct the dock will be looked at during the design process.

Sediment contamination by selected heavy metals and hydrocarbons is anticipated to be negligible, if any, since there has been only very limited industrial or military activities at the construction site. Sediment quality sampling in support of the Liberty and Northstar Developments demonstrated that the nearshore Beaufort Sea sediments are typically absent of contaminants, and all of the samples to date result in chemical-of-concern concentrations below regulatory screening levels (URS 2000, 2001).

Long-Term Presence of the Dock

Water quality alterations associated with solid-filled docks and causeways located along the Central Beaufort Sea coast have been documented for numerous years (e.g. Colonell and Gallaway 1990). The area of water quality alteration due to wake eddy development is a function of the relative difference, if any, between surface and bottom water salinities, duration of the wake eddy during strong winds, dock length, and water depth.

It is anticipated that water quality alterations associated with increased surface water salinity will be minor and only occasionally observable downcurrent of the dock. During periods of sustained easterly winds coinciding with the summer open-water season, wake eddy formation on the lee (down current) side of the structure would effectively mix the water column within the eddy as bottom waters are brought to the surface. If the nearshore waters immediately adjacent to the dock are uniform, as is usually the case (URS 2000), vertical mixing will result in no detectable changes in surface water character. On those rare occasions when the water column is stratified, (i.e., the surface water is notably fresher than the underlying saltier bottom water), then any vertical mixing associated with the wake eddy would result in surface water immediately down current of the dock becoming more saline. However, the strong winds necessary to create the wake eddy would soon homogenize the lagoon through wave-induced mixing and any effect of the eddy mixing bottom water upward would vanish. Under westerly winds, nearshore waters tend to be uniform, so any vertical mixing due to a wake eddy would not affect surface water salinity.

The following discussion regarding potential effects on fish movement is provided as an update to Section 5.2.3. Fish (pgs. 5-27 and 5-28 of the existing ER).

5.2.3 Fish

Potential effects of the Point Thomson Gas Cycling Project on fish species previously discussed in Section 4.7 of the ER are summarized in Table 5-2 and discussed in the following sub-sections.

5.2.3.1 Habitat Effects

Project activities that alter quality or quantity of fresh or marine water, in turn, have potential for altering habitats of freshwater and marine fish. Arctic cisco (*Coregonus autumnalis*), least cisco (*C. sardinella*), broad whitefish (*C. nasus*), and humpback whitefish (*C. pidschian*) are not known to overwinter or spawn in the Point Thomson area. However, the Canning River supports round whitefish (*Prosopium cylindraceum*) and Arctic grayling (*Thymallus arcticus*) populations (Section 4.7.3 of the ER). Round whitefish use the main stem of the Canning River, the delta area, and Canning River tributaries throughout their life cycle, but do not migrate extensively (Moulton and Fawcett 1984, WCC 1982). Dolly Varden charr (*Salvelinus malma*) use the Canning River perennial warm-water springs for overwintering habitat (WCC 1982). Project activities are not planned close to these areas and, therefore, will not directly impact the overwintering and spawning habitats of these fish species.

Winter Construction

Gravel mining activities (i.e., removal of tundra overburden, blasting, and mining of the gravel) are planned to take place during one winter season. Ninespine stickleback (*Pungitius pungitius*) are the only freshwater fish known to reside in Point Thomson area streams (Section 4.8.3). Ninespine sticklebacks overwinter in deep tundra lakes and rivers. The closest freshwater body to the proposed gravel mine site is an unnamed stream to the east. Due to this stream's small size and the likelihood that it freezes solid during winter, it is unlikely to provide overwintering habitat for ninespine sticklebacks. Therefore, gravel mining activities are not anticipated to impact overwintering habitat for ninespine stickleback.

Gravel placement for roads, pads, and airstrip can alter flow patterns of streams and wetlands, thereby preventing fish access to some habitats and/or modifying fish habitat. Perched lakes can provide overwintering and rearing areas for fish, but there is rarely a defined channel from perched lakes to river channels; the connection is generally through low-lying wetlands. Ninespine stickleback can be found in streams and rivers in the Point Thomson area (Section 4.7.3); however, there are no known perched lakes or streams deep enough to provide ninespine stickleback overwintering or spawning habitat in the project area (see Figure 3-19). Consequently, it can be concluded that gravel placement for roads, pads, and airstrip will not impact ninespine stickleback overwintering and spawning habitats.

Ninespine sticklebacks forage in freshwater tundra streams and brackish nearshore waters during the summer. These fish were caught along the coastline at stations in Lion Bay south of Flaxman Island throughout the openwater season during a 1999 Point Thomson fish study (LGL 2000b). The method of crossing streams will depend on the water-body width. Culverts will be designed to minimize sedimentation and subsequent blockage, and to meet the fish passage requirements of the ADF&G as determined by site-specific conditions. Accordingly, it is not anticipated that culverts and/or bridges will inhibit the passage of ninespine sticklebacks and other fish into area streams. If it is necessary to install the culverts during summer, short-term impacts to stickle back passage may occur. However, the properly designed and placed culverts will allow these fish to resume passage.

It is planned that the dock construction will commence in the winter and may conclude in the early summer in the bottomfast-fast ice zone, and will extend out to a water depth of 7-ft (2 m). Placement of gravel fill during the dock construction will eliminate 2 acres (<1 ha) of nearshore summer fish foraging habitat. However, loss of this small area compared to the total nearshore habitat associated with over 15 miles of coastline in Lion Bay is not expected to impact fish species that use the area for foraging during the open water season.

Deposition of a sediment plume during winter dock construction is not expected to affect the integrity of the summer foraging habitat, which is used by diadromous or marine fish. As described in Section 5.1.3.1 and (updated in Section 3.4 of this addendum) it is anticipated that the affected area of the marine environment will be quite limited because most of the dock will be located within the bottomfast sea ice zone; that is, where the seawater is frozen entirely to the seabed, immediately adjacent to the shoreline and extending to a depth of 6 ft or more. Available bathymetry indicates that the dock will extend to the 7-ft isobath, so at most, only a 1-ft water column will be affected by the 750 ft long dock construction. Low current speeds and the relatively shallow water column will confine the distribution of suspended sediment to the very near vicinity of the dock.

Pipelines will be constructed during winter using onshore ice roads. Turbidity associated with construction activities required to place vertical support members (VSMs) in small creeks and defined drainages along the pipeline route is expected to be temporary. It is also anticipated that most if not all of these small drainages will be frozen to the bottom, and thus there will be no effects on water quality. Gathering and export pipelines are not expected to cross any streams or drainages that support overwintering fish.

Summer Construction

Re-grading and compaction of gravel roads, pads, airstrip, and dock during the first summer construction period may cause dust and sediment to enter freshwater and marine fish habitats, thereby increasing turbidity in these waters. While dust is not anticipated to be a problem since the gravel will be "green" upon placement, watering of gravel surfaces (if water is available) and enforcement of vehicular speed limits will limit any potential generation of dust. Potential effects due to re-grading and compaction activities are expected to be short-term and similar to naturally occurring events in both freshwater and marine environments (e.g., disturbance from ice, river runoff from spring break-up, and storm induced waves). Accordingly, any effects from dust and sediment drift to freshwater and marine waters are anticipated to be minimal.

Dredging offshore of the dockhead during the summer and disposal of the spoils at an offshore location will generate turbidity plumes (see Section 5.1.3.2 discussion). Studies have shown that diadromous and marine fishes tolerate waters with turbidity values up to 146 NTU, which equates to a visibility of approximately 2 inches (5 centimeters [cm]) (WCC 1997). It is anticipated that increased turbidity due to dredging and spoils disposal will be temporary and will be no worse than naturally occurring events which also increase the turbidity of marine waters annually (e.g., disturbance from ice, river runoff from spring break-up, and storm induced waves).

Operations and Maintenance
Vehicular traffic and maintenance of gravel roads, pads, airstrip, and dock surfaces may cause dust to enter freshwater and marine fish habitats. Watering of gravel surfaces, low traffic volumes during operations, and enforcement of vehicular speed limits will minimize the generation of dust from operations traffic and gravel maintenance activities on fish habitat. Potential effects from dust and sediment drift to freshwater and marine waters are anticipated to be minimal and within naturally occurring turbidity variation in the freshwater and marine environments (e.g., disturbance from ice, river runoff from spring break-up, and storm induced waves).

5.2.3.2 Disturbance Effects

Prey availability is not thought to be a limiting factor for North Slope diadromous and marine fish; however, the biomass of prey species in North Slope coastal waters has a patchy distribution and is variable between years due to climatic conditions (Craig 1989, Colonell and Gallaway 1990). Therefore, the variable net worth of feeding habitat along the coastline provides an impetus for the coastal distribution of foraging diadromous and marine fish (Fechhelm et al. 1989).

The summer movement patterns of diadromous fish in the North Slope coastal region are also strongly influenced by wind patterns during the brief open-water season (Moulton 1989). Migration of Arctic and least cisco from the Colville River was dependent on the prevailing wind patterns. The fish traveled in conjunction with westerly winds eastward through the barrier island lagoons, the greater the percentage of westerly winds in a given season the farther eastward the migration. Easterly winds inhibited the eastward movement of younger fish, but did not materially affect adult Arctic cisco. Fechhelm et al. (1989) also noted that dispersal was related to size, with larger, more powerful fish traversing distances quicker than smaller fish.

Persistent easterly winds assist the westward movement of young-of-the-year Arctic cisco from the Mackenzie River to the Colville River (Colonell and Gallaway 1997); consequently, both inter- and intra-annual variability of prevailing winds strongly influences the size of each year-class recruited to the western Beaufort Sea. During a 1999 Point Thomson nearshore marine fish study, young-of-the-year (YOY) Arctic cisco were first collected at the southern end of Mary Sachs Entrance on 7 August after a period of sustained easterly winds switched to a period of mixed east/west winds (LGL 2000b). Young-of-the-year Arctic cisco were found dispersed through out Lion Bay for the remainder of the summer.

During the 1999 Point Thomson fish survey, adult diadromous fish from spawning stocks in the Colville River and/or Sagavanirktok River were caught in Lion Bay (LGL 2000b). Large numbers of adult least cisco were collected in Lion Bay throughout the summer, adult broad whitefish were collected at comparable rates to those previously reported from Prudhoe and Mikkelsen Bays, and adult humpback whitefish were more abundant than expected based on previous studies conducted in Prudhoe and Mikkelsen Bays (LGL 2000b).

"Blockage", or even impedance of fish movement by a dock does not normally occur due to the physical structure, but is a result of hydrographic changes (i.e., alterations of the distribution of water mass properties such as temperature and salinity) that might be induced by the structures (Colonell and Gallaway 1990). Potential hydrographic effects of the dock are highly dependent upon its location and the nature of the surrounding environment. In stratified nearshore waters, a wake eddy can cause high salinity/low temperature water to displace the nearshore band of water on the lee side of a dock (see Section 5.1.3.1 of this ER for further discussion). Some fish species prefer to avoid such higher salinity areas, and thus could be considered "blocked" from migrating through or foraging in that area. However, blockage or impedance of fish is not expected to occur due to the presence of the 750-ft Point Thomson dock for four main reasons related to migration, oceanography, and food availability:

1. Dolly Varden charr (a migrating species of concern in the geographic area) are not restricted to warm low-salinity environments. Colonell and Gallaway (1990) cited numerous tagged fish studies that show Dolly Varden charr are powerful swimmers with widespread coastal dispersal that exploit a variety of habitats during their summer foraging. They have been taken as far as 10 mi (16 km) offshore in tow-net surveys and are known to feed on *Apheruisa glacialis* a marine amphipod that concentrates along the underside of floating icepans (Colonell and Gallaway 1990). In addition, environmental monitoring conducted from 1981 to 1984 at the West Dock Causeway and, subsequently, from 1985 to 1993 at Endicott Causeway have shown no evidence that seasonal coastal dispersal of Dolly Varden charr is affected by the physical presence or by hydrographic conditions that develop around these structures (Colonell and Gallaway 1990).

2. Both West Dock and Endicott causeways cause localized hydrographic changes;. however, there are no data indicating that either causeway impairs Arctic cisco YOY migration to rearing and overwintering areas in the Colville and Sagavanirktok Rivers (Moulton 1985, Moulton et al. 1986, Colonell and Gallaway 1990, Bickham et al. 1992, Colonell et al. 1992).

3. Due to the typical unstratified condition of Lion Bay, a wake eddy (if one were to occur) would simply mix waters with similar temperature and salinity causing no net effect. Lion Bay typically exhibits unstratified marine conditions from breakup to freeze-up (i.e., the water column is uniform from top to bottom) (see Section 4.4 of the ER). Brackish water conditions prevail in the spring in nearshore areas due to increased freshwater input from streams and rivers. Salinity of the nearshore water gradually increases to marine conditions by mid-September (Section 4.5.3.1 of this ER). The proposed dock would provide a mechanism by which localized upwellings may occur if the water column were stratified; however, the typical lack of such stratification makes this a moot issue. Because the water column within Lion Bay in the area of the proposed dock tends to be uniform, both horizontally and vertically, formation of a wake eddy on the lee side of the dock would simply mix waters with similar temperature and salinity characteristics and thus render no net changes to hydrography (see Section 5.1.3.1 discussion).

4. The principal source of food for diadromous fish in North Slope nearshore waters is demersal macroplankton, mainly mysids and amphipods, which in turn feed on marine phytoplankton (Craig et al. 1984). These plankton species are of marine origin, demonstrating the importance of marine productivity to the nearshore waters. The upwelling of marine waters into nearshore waters is thought to be the primary factor involved in maintaining the trophic richness of the coastal ecosystem along the North Slope (Craig et al. 1984, Colonell and Gallaway 1990). Two channels, Mary Sachs Entrance and the unnamed channel at the east end of Flaxman Island, allow marine

waters and associated planktonic species to enter Lion Bay. The proposed dock will not block or alter natural marine water upwelling processes or impair the trophic productivity of the nearshore waters (Niedoroda and Colonell 1989).

The preponderance of evidence indicates that the Point Thomson dock, a much smaller structure than either WDC or Endicott Causeway, will not disturb fish migration and foraging patterns, nor cause diadromous or marine fish species to avoid or be displaced from the marine habitats they use in Lion Bay.

5.2.3.3 Mortality Effects

Winter water removal for ice road construction could potentially affect freshwater fish overwintering habitat in deep tundra lakes. Under-ice dissolved oxygen concentrations in lakes on the North Slope decrease over the winter. Excessive water withdrawal during the winter may adversely affect overwintering fish populations in deep tundra lakes. However, recent water use permits for North Slope developments have limited winter water withdrawal to 15% under-ice water volume in fish bearing lakes to minimize the potential for significant impacts to overwintering fish. This limitation on permitted water withdrawal volumes is considered conservative and, consequently, adequately protective of fish species that overwinter in these lakes. Accordingly, it is not anticipated that water withdrawal from identified potential water sources (see Figure 3-19) will have adverse effects on overwintering freshwater fish.

Sport fishing conducted by personnel in area streams and rivers and from the marine dock may cause mortality due to direct take of fish species. All personnel will be required to comply with applicable ADF&G sport fishing regulations.

Contaminant spills associated with construction/drilling operations may affect freshwater, diadromous, or marine fish species. It is not anticipated that construction/drilling operations will be conducted near any important freshwater fish habitat and, further, diadromous and marine fish are not present in the area during the winter. Minor spills associated with winter construction and year-round drilling activities (e.g., fuel, produced water, and other drilling wastes) can be readily contained and collected. Contaminant spills associated with operations and maintenance are also expected to be minor and inconsequential. Personnel will be trained in spill prevention and cleanup procedures. It is not anticipated that freshwater or marine fish habitat will suffer long-term adverse effects due to minor contaminant spills. Section 5.4 discusses the risks and impacts of condensate spills in detail.

The following discussion of potential effects of noise due to air traffic on terrestrial mammals is inserted as the second paragraph of Section 5.2.6.2 Disturbance Effects, Summer Construction and Year-Round Operations, page 5-46.

A study was conducted in 1991 to consider the effects of fixed-wing military aircraft (A-10, F-15, and F-16 jets) noise on free-ranging caribou during late winter, post-calving, and insect season (Armstrong Laboratory 1993 as cited in USACE 1999). Jet overflights induced some degree of overt behavioral response, but only 13% of the overflights caused caribou to actually move. The study also collected data from a control group of undisturbed caribou and overflight disturbed caribou to determine potential effects on activity budgets and daily distance traveled. Activity budgets did not differ between the two groups in late winter; however, the overflight disturbed group spent less time lying and more time feeding or walking during post-calving and insect seasons during overflights versus times that overflights did not take place. Daily distances traveled did not differ between the two groups in late winter and insect season; however, the overflight disturbed group traveled farther than did the undisturbed group during post-calving season. The study concluded that behavioral effects from jet overflights were generally minimal, with the most prevalent effect being female caribou reacting to jet overflights by laying less and traveling more in June when newborn calves were present.

Central Arctic Herd (CAH) caribou are the more likely to be exposed to project aircraft noise than caribou from the Porcupine Caribou Herd (PCH) based on historical distribution data (Section 4.10.1). The fixed-wing military aircraft study indicates that aircraft generated noise has the potential to cause minimal behavioral disturbance mainly during calving season. Since caribou calving concentrations are spatially variable over time, it is difficult to anticipate if a large concentration of caribou would be near Point Thomson flight paths during any given year. The CAH calving concentration areas are not currently the Point Thomson Unit, and PCH calving concentration areas have not been documented in the Point Thomson Unit (Section 4.10.1.1).

It is assumed that aircraft (fixed or rotary-winged) proposed for use in the project area (Section 3.4) would likely produce lower noise levels than the military fixed-wing aircraft used in the study discussed above. It is also assumed that CAH caribou have to some extent habituated to aircraft noise due to exposure from other related North Slope activities (i.e., aerial surveys and oil field related air transport, trips to and from Kaktovik, flightseeing, ecotourism) for many years. Therefore, disturbance of caribou from aircraft noise is anticipated to be minimal, and no population level effects are expected for either the CAH or PCH.

The following text provides an update to Section 5.3.8 Visual Aesthetics found on page 5-58 of the ER.

5.3.8 Visual Aesthetics

The long-term visual and aesthetic characteristics of the project during operation have the potential to affect both the local residents and visiting recreational users. Since the visual and aesthetic characteristics of the area (see Section 4.13.7) consist of a low relief, treeless landscape, oil field facilities, particularly those located at the East Well Pad, could be visible from areas physically removed from the site. However, after the drill rig is gone from the East Well Pad, facilities and lighting at this pad will be minimal and will contribute minimally to aesthetic disturbance to recreational users of the Staines and Canning Rivers and areas to the east. For this reason, and since the project is unlikely to be visible from the Kaktovik or Nuiqsut, and subsistence activities are minimal in the area, impacts to local residents and visitors in the form of decreased localized aesthetic appeal are not expected to be significant (see the Project Effects and Mitigation Measures Summary Table on page ES-11).

Since some of the Point Thomson facilities will have flares and lights, a glow could be visible in the area. Noise from the compressors and vehicles may be heard. These impacts may be perceived as a reduction in the quality of the recreational experience for visitors for whom the visual and aesthetic value may be a key component. The presence of the oil field facilities and the potential limits to area access may be considered as a disruption to recreational use of the area. Tower-like structures such as flare stacks (100 ft [30 m]) and the microwave tower (300 ft [91 m]) will be part of the facility design. More massive structures such as modules and processing facilities are likely to be approximately 100 ft (30 m) tall. These impacts to the aesthetic beauty and recreational value for visitors to the area could be characterized as potentially significant. However, any impacts can be at least partially mitigated by choosing colors that are consistent with the natural landscape, reducing noise emissions, and reducing or redirecting light from the facilities (see the Project Effects and Mitigation Measures Summary Table on page ES-11).

3.6 Environmental Report Section 7

Section 7.3.1.4 Cumulative Effects (Physical/Chemical Resource), page 7-15, discussion of assumptions is expanded as follows:

Air Quality

- All proposed future projects in the area will fall under a New Source Review, thereby protecting the air quality of the region. The total amount of emissions for the area will be regulated and limited by these standards. This includes past, present, and potential future projects. Due to the regulatory requirements to reduce emissions, there is a low probability that the cumulative impact of these projects on air quality will be significant.
- Impacts due to dust generation may occur, but mitigation measures such as speed limit enforcements and watering of gravel surfaces will decrease the impacts due to each past, present, and future project, thereby decreasing the probability that the cumulative impact of dust generation will be significant.
- Under the New Source Review, Point Thomson project construction and operation will not significantly contribute to arctic haze. Other projects in the area would also be held to these standards. Therefore, there is a low probability that arctic haze would be a significant cumulative effect.

Surface Hydrology

- It is assumed that other projects in the area will be constructed with minimal footprint. If this is the case then the impacts due to surface runoff from pads and roads would not have a significant cumulative effect.
- Assuming that future projects are built to the same requirement as Pt. Thomson the impacts due to obstruction of flow may occur, but mitigation will decrease the significance. Therefore there is a low probability that any cumulative effects would be significant.
- In summary, Point Thomson contribution to cumulative effects related to surface hydrology is expected to be minimal.

Freshwater Quality

- Other projects in area will also be held to water withdrawal limitations as per permit requirements. The cumulative removal from a given lake will not be allowed to exceed the regulated amount. Therefore, the probability that the cumulative removal from any given fish-bearing lake would be significant is low.
- Turbidity impacts due to construction are expected to be short-term. It is likely that any construction efforts associated with additional developments will be separated in space and time from efforts associated solely with the Point Thomson Gas Cycling project. Therefore there is a low probability that turbidity impacts due to multiple projects in the area would be significant.

Marine Water Quality and Circulation

- Point Thomson contribution to cumulative effects is expected to be minimal. The dock is short, and is not expected to significantly impact circulation or water quality (see Section 5.1.3.1).
- Short-term increases in near shore turbidity during construction and dredging operations are not expected to be significant and are likely to be within range of natural perturbations. It is unlikely that any other dredging or construction projects will be occurring simultaneously in the immediate area. Therefore the probability that cumulative impacts would be significant is low.

Permafrost

- Point Thomson's contribution to cumulative effects is expected to be minimal. Facilities will be built on gravel pads to insulate permafrost. It is planned that the development of the mine site, initial gravel placement and pipeline construction will be in the winter. It is assumed that any other foreseeable projects will be constructed similarly to minimize impacts to permafrost. The probability that significant cumulative impacts would occur is low.
- Degradation of permafrost in the area of the gravel mine will be localized and minimal due to winter construction.

➢ Section 7.3.2.4, page 7-36, ***Disturbance*** (Birds), second bullet is modified to read as follows:

- Longer-term, but likely of less magnitude, generation of noise associated with operation of the facility. This could consist of generators, compressors and other machinery, flaring events, regular and maintenance-related vehicle traffic, and air traffic.

➢ Section 7.3.2.4, page 7-36, ***Disturbance*** (Birds), 1st paragraph, 5th line is modified to read as follows:

- During operations aircraft, vehicular traffic, and facility equipment noise may make areas adjacent to roads, pads, and the airstrip less attractive to birds.

➢ Section 7.3.2.5, page 7-44, ***Disturbance*** (Marine Mammals), second bullet is modified to read as follows:

- Longer-term, but likely of less magnitude, generation of noise associated with operation of the facility. This may consist of generators, compressors and other machinery, drill rigs, regular and maintenance-related vehicle traffic, and air traffic.

➢ Section 7.3.2.6, page 7-55, *Disturbance* (Terrestrial Mammals), second bullet is modified to read as follows:

- Noise from aircraft and vehicular traffic.

➢ Section 7.3.2.6, page 7-56, Central Arctic Caribou Herd – Eastern Segment (Terrestrial Mammals), second paragraph is modified to read as follows:

- Noise and visual disturbance from winter construction activities (i.e., gravel mining; gravel road, pad, airstrip construction and pipeline construction) will not impact CAH eastern segment since they are not in the Point Thomson area during the winter. The CAH eastern segment could be disturbed due to behavioral reactions in response to drilling, facility construction, aircraft and vehicular traffic during the summer construction phases. Disturbance of caribou from aircraft noise is anticipated to be minimal (Section 5.2.6.2 as updated), and vehicular traffic is anticipated to diminish to low levels during operations due to low traffic volume (Section 5.2.6.2). The presence of roads and pads and their associated traffic noise will cause minimal disturbance to female caribou with calves due to availability of other suitable habitat in the area. During Preliminary Engineering the distance between the gravel roads and gathering pipelines will be evaluated. The evaluation will take into consideration and will be impacted by the following:

    - Separation to minimize disturbance to caribou movement.
    - Suitable proximity between gravel road and pad to allow for pipeline maintenance and surveillance (including operator visual inspections from the gravel road).
    - Routing to avoid ponds and other bodies of water.
    - Terrain features affecting construction of the roads and pipelines.

  Therefore, disturbance of the CAH eastern segment from project actions is rated as not significant, and depicted as Y (NS) on Table 7-11 for disturbance in the "Potential Project Effects?" column.

3.7 New References

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Attachment I

Ocean Disposal of Dredge Spoils Analysis

(from: Department of the Army Permit Application August 20, 2001)

ExxonMobil proposes five sites for ocean disposal of spoils amounting to approximately 30,000 cubic yards (cy), which will be generated during excavation of the 400-foot (ft) by 1,000-ft channel extending north of the proposed dock. Table 1 provides corner positions for each ocean dump site and Figure 1 illustrates each site on the National Oceanic and Atmospheric Administration (NOAA) Nautical Chart (No. 16045, Revised in 1996). Once the channel is established and the proposed modules are transported to the facility, it is anticipated that no additional dredging operations will be required; however, occasional screeding may be necessary.

Table 1. Corner Locations for the Proposed Ocean Dump Sites

Dump Site	Corner	Latitude Degrees North (NAD83)	Longitude Degrees West (NAD83)
Offshore Site	Northwest Corner	70.2500°	146.2500°
	Northeast Corner	70.2500°	146.2000°
	Southwest Corner	70.2400°	146.2500°
	Southeast Corner	70.2400°	146.2000°
Spit Site	West Corner	70.1857°	146.3298°
	North Corner	70.1867°	146.3269°
	East Corner	70.1824°	146.3115°
	South Corner	70.1814°	146.3142°
Lagoon Site	North Corner	70.1971°	146.3217°
	West Corner	70.1913°	146.3325°
	South Corner	70.1906°	146.3292°
	East Corner	70.1964°	146.3183°
Barrier Island Site	North Corner	70.2072°	146.3252°
	West Corner	70.2062°	146.3280°
	South Corner	70.2019°	146.3124°
	East Corner	70.2029°	146.3097°
Channel Excavation Site	Northwest Corner	70.1804°	146.2523°
	Northeast Corner	70.1794°	146.2448°
	Southeast Corner	70.1756°	146.2497°
	Southwest Corner	70.1766°	146.2563°

The project team is currently considering five ocean dumping scenarios:

- Base Case (Offshore Site–Summer Disposal): channel excavation during the summer open-water season with spoils discharge at the offshore ocean dumping site.
- Alternative 1 (Spit Site–Summer Disposal): channel excavation during the summer open-water season with spoils discharged at the spit ocean dumping site.
- Alternative 2 (Spit Site–Winter Disposal): channel excavation during the winter, with the spoils deposited on the grounded sea ice within the spit ocean dumping site. If necessary, subsequent cleanout of the channel would occur the following summer immediately prior to the arrival of the facility modules. Material accreted into the channel will be removed and disposed at the spit ocean dumping site.

- Alternative 3 (Lagoon Site–Winter Disposal): channel excavation during the winter, with the spoils deposited on the sea ice within the lagoon dumping site. If necessary, subsequent cleanout of the channel will occur the following summer immediately prior to the arrival of the facility modules. Material accreted into the channel will be removed and disposed at the lagoon ocean dumping site.
- Alternative 4 (Barrier Island Site–Winter Disposal): channel excavation during the winter, with the spoils deposited on the sea ice within the barrier island dumping site. If necessary, subsequent cleanout of the channel will occur the following summer immediately prior to the arrival of the facility modules. Material accreted into the channel will be removed and disposed at the lagoon ocean dumping site.

The Base Case (Offshore Site–Summer Disposal), which is consistent with the Project Description as presented in Section 3.5 of the *Point Thomson Gas Cycling Project Environmental Report* (July 30, 2001), proposes an ocean dumping site offshore of Mary Sachs Entrance (Figure 1). Available bathymetry from the NOAA Nautical Chart (No. 16045, revised in 1996) indicates that the water depths are greater than 40-ft throughout this proposed dump site. Material excavated from the channel will be loaded onto barges and transported to the ocean dump site where the spoils will be discharged by unconfined dumping. The excavation and ocean dumping activities will occur in summer prior to the arrival of facility modules via ocean barges. This site was selected due to its relatively deep water depth to minimize adverse effects resulting from possible mounding of disposed spoils. This proposed ocean dumping site will be approximately 6,200-ft by 3,600-ft and sized to assure that ocean dumping operations have sufficient area so that the discharges do not need to be concentrated in one location. Also, the size of the ocean dumping site allows for barge maneuverability during discharge.

Alternative 1 (Spit Site–Summer Disposal) is similar to the Base Case, except that the ocean dump site will be located immediately seaward of the Point Thomson spit (Figure 1). As with the Base Case, discharge at this location will occur during the summer, immediately prior to the arrival of facility modules via ocean barges. Spoils will be transported with barges to the dump site where the spoils will be discharged by unconfined dumping. This site was selected to minimize the distribution of suspended sediment entrained in the water column by discharging in shallow water. Available aerial photography indicates that the excavation area and spit ocean dump site are located within the same active sediment transport regime where the prevailing alongshore currents move nearshore sediments toward the west. Thus, it is anticipated that the spoils material will be similar, if not the same, as the sediments found at the spit ocean dump site. Ice movement and storm related wave action are anticipated to rework the spoils deposits. This proposed ocean dumping site will be approximately 2,500-ft by 500-ft.

Alternative 2 (Spit Site–Winter Disposal) utilizes the spit ocean dump site as presented in Alternative 1; however, excavation of the channel and ocean dumping will occur in winter, when the site is covered with grounded sea ice. The excavation and ocean dumping techniques will be similar to those used at the Northstar Development and proposed for the Liberty Development. Excavated spoils will be transported by truck or other heavy equipment on an ice road constructed on the nearshore grounded sea ice. Spoils will be distributed throughout the dump site such that the final thickness will be, on average, 2 ft. Ultimate disposal will occur as the sea ice melts during breakup, releasing the spoils into the water and onto the seafloor. It is possible that storm events could result in sufficient sediment accreting into the channel prior to the arrival of the facility modules to cause a navigation hazard. If discovered prior to the sealift, this material will be removed during the summer open-water season and disposed into the spit ocean dump site via unconfined dumping. It is anticipated that the channel excavation activities will create small stockpiles of material that will be placed on the sea ice prior to transportation to the spit ocean dump site. Thus, this alternative requires a contingency site so that spoils temporally placed on the sea ice immediately adjacent to the channel excavation could be abandoned and disposed in place as a result of an unforeseen situation that requires operations to cease. Also, spoils will be entrained into the sea ice surrounding the excavation activities and it is not practical to remove these spoils from the sea ice. It is anticipated that a negligible amount of spoils will be discharged at the channel excavation contingency ocean dumping site.

Alternative 3 (Lagoon Site–Winter Disposal) is similar to Alternatives 2 and 4; with this alternative utilizing the lagoon ocean dump site. The channel excavation and ocean dumping will occur in winter. The excavation and ocean dumping techniques will be similar to those used at the Northstar Development and proposed for the Liberty Development. Excavated spoils will be transported by truck or other heavy equipment on an ice road constructed on the sea ice. Spoils will be distributed throughout the dump site such that the final thickness will be, on average, 2 ft. Ultimate disposal will occur as the sea ice melts during breakup, releasing the spoils into the water and onto the seafloor. It is possible that storm events may result in sufficient sediment accreting into the channel prior to the arrival of the facility modules to cause a navigation hazard. If discovered prior to the sealift, this material will be removed during the summer open-water season and disposed into the lagoon ocean dump site via unconfined dumping. It is anticipated that the channel excavation activities will create small stockpiles of material that will be placed on the sea ice prior to transportation to the lagoon ocean dump site. Thus, this alternative requires a contingency site so that spoils temporally placed on the sea ice immediately adjacent to the channel excavation may be abandoned and disposed in place as a result of an unforeseen situation that requires operations to cease. Also, spoils will be entrained into the sea ice surrounding the excavation activities and it is not practical to remove these spoils from the sea ice. It is anticipated that a negligible amount of spoils will be discharged at the channel excavation contingency ocean dumping site.

Alternative 4 (Barrier Island Site–Winter Disposal) is similar to Alternatives 2 and 3; with this alternative utilizing the barrier island ocean dump site. The channel excavation and ocean dumping will occur in winter. The excavation and ocean dumping techniques will be similar to those used at the Northstar Development and proposed for the Liberty Development. Excavated spoils will be transported by truck or other heavy equipment on an ice road constructed on the sea ice. Spoils will be distributed throughout the dump site such that the final thickness will be, on average, 2 ft. Ultimate disposal will occur as the sea ice melts during breakup, releasing the spoils into the water and onto the seafloor. It is possible that storm events may result in sufficient sediment accreting into the channel prior to the arrival of the facility modules to cause a navigation hazard. If discovered prior to the sealift, this material will be removed during the summer open-water season and disposed into the spit (Alternative 2) or the lagoon (Alternative 3) ocean dump sites via unconfined dumping. It is anticipated that the channel excavation activities will create small stockpiles of material that will be placed on the sea ice prior to transportation to the barrier island ocean dump site. Thus, this alternative requires a contingency site so that spoils temporally placed on the sea ice immediately adjacent to the channel excavation may be abandoned and disposed in place as a result of an unforeseen situation that requires operations to cease. Also, spoils will be entrained into the sea ice surrounding the excavation activities and it is not practical to remove these spoils from the sea ice. It is anticipated that a negligible amount of spoils will be discharged at the channel excavation contingency ocean dumping site.

40 CFR §228.6 Specific criteria for site selection.

(a) In the selection of disposal sites, in addition to other necessary or appropriate factors determined by the Administrator, the following factors will be considered:

(1) Geographical position, depth of water, bottom topography and distance from coast;

Offshore Ocean Dump Site (Base Case–Summer Activities)

Geographical Position	Provided in Table 1.
Water Depth	NOAA Nautical Chart No. 16045 (Revised in 1996) indicates that the water depth is greater than or equal to 40-ft throughout the proposed ocean dump site.
Bottom Topography	Available bathymetry indicates a gentle seaward slope toward the north. Fine-scaled structures are not apparent, possibly due to the limited number of soundings within the proposed ocean dump site.
Distance from Coast	Approximately 4.5 statute miles north of the mainland shore, and 2.3 to 2.7 statute miles north of the barrier islands.

Spit Ocean Dump Site (Alternative 1–Summer / Alternative 2–Winter Activities)

Geographical Position	Provided in Table 1.
Water Depth	NOAA Nautical Chart No. 16045 (Revised in 1996) indicates that the water depth is typically less than the 1-fathom (6-ft) isobath.
Bottom Topography	Available bathymetry indicates a relatively steep shoreface within 500 ft of the shoreline with water depths reaching 8 to 9 ft. It is anticipated that grounded ice movement and wave actions from storm events control the bathymetric features within the proposed ocean dump site.
Distance from Coast	Immediately adjacent to and north of the Point Thomson spit.

Lagoon Ocean Dump Site (Alternative 3–Winter Activities)

Geographical Position	Provided in Table 1.
Water Depth	NOAA Nautical Chart No. 16045 (Revised in 1996) indicates that the water depth is typically less than the 2-fathoms (12-ft).
Bottom Topography	Available bathymetry indicates a relatively gentle seafloor with the deepest soundings observed near the mid-point between Point Thomson and the small barrier islands and shoals toward the north.
Distance from Coast	Approximately 2,500 ft north of the Point Thomson spit

Barrier Island Ocean Dump Site (Alternative 4–Winter Activities)

Geographical Position	Provided in Table 1.
Water Depth	NOAA Nautical Chart No. 16045 (Revised in 1996) indicates that the water depth varies from 4 ft on the shoals and up to 8 ft in the small channel that separates the shoals.
Bottom Topography	Available bathymetry indicates a narrow (~600-ft) northeast to southwest oriented 8-ft deep channel that separates shoals (water depth of 4-6 ft) associated with the barrier island complex.
Distance from Coast	Approximately 6,500 ft north of the Point Thomson spit.

(2) Location in relation to breeding, spawning, nursery, feeding, or passage areas of living resources in adult or juvenile phases;

In addition to the summary information below, please refer to the *Point Thomson Gas Cycling Project Environmental Report*, Section 4.7.4 (Fish), 4.8.1.3 (Birds), and 5.2.3.2 (Birds) for further information. Since the activities are time-dependent (i.e., seasonal), the summary tables identify species that will be in the area during ocean dumping activities.

Dump Site (Base Offshore Ocean Case–Summer Activities)

Spawning Area	None
Brood Rearing Area	None
Molting Area	None
Post-Molting Area	None
Foraging Area	Dolly Varden (*Salvelinus malma)*
Migration Area	Arctic cisco (*Coregonus autumnalis*)

Spit Ocean Dump Site (Alternative 1–Summer Activities)

Spawning Area	None
Brood Rearing Area	None
Molting Area	Long-tailed ducks [Oldsquaw] (*Clangula hyemalis*) and Common Eiders (*Somateria mollissimall*)
Post-Molting Area	Long-tailed ducks and Common Eiders
Foraging Area	Long-tailed ducks, Common Eiders, and other waterfowl, Arctic cisco, Dolly Varden, Least cisco (*Coregonus laurettae*), Broad whitefish (*Coregonus nasus*), Humpback whitefish (*Coregonus pidschian*), Arctic flounder (*Liopsetta glacialis*), Arctic cod (*Boreogadus saida*), Fourhorn sculpin (*Myoxocephalus quadricornis*), and Ninespine stickleback (*Pugitius pugitius*)
Migration Area	Arctic cisco

Spit Ocean Dump Site (Alternative 2–Winter Activities)
Lagoon Ocean Dump Site (Alternative 3–Winter Activities)
Barrier Island Dump Site (Alternative 4–Winter Activities)

Breeding Area	None: grounded sea-ice zone†
Spawning Area	
Nursery Area	
Feeding Area	
Passage Area	

† If cleanout of the channel is required during the summer, the spoils will be disposed at the spit or lagoon ocean dump site.

(3) Location in relation to beaches and other amenity areas;

Offshore Ocean Dump Site (Base Case–Summer Activities)
Spit Ocean Dump Site (Alternative 1–Summer Activities)
Spit Ocean Dump Site (Alternative 2–Winter Activities)
Lagoon Ocean Dump Site (Alternative 3–Winter Activities)
Barrier Island Dump Site (Alternative 4–Winter Activities)

Beaches and Other Amenity Areas	No recreational beaches or other amenity areas have been identified within the Point Thomson Unit. Sections 4.13.6 and 4.13.7 in the *Point Thomson Gas Cycling Project Environmental Report* present a summary of the recreation and aesthetic characteristics of the area.

(4) Types and quantities of wastes proposed to be disposed of, and proposed methods of release, including methods of packing the waste, if any;

Offshore Ocean Dump Site (Base Case–Summer Activities)

Spit Ocean Dump Site (Alternative 1–Summer Activities)

Type of Wastes	Naturally occurring sediments found within the proposed 400-ft by 1,000-ft channel extending north into the lagoon from the proposed dock. Geotechnical and geological surveys of the area conducted in the 1980s determined that the lagoon deposits were primarily Holocene sediments consisting predominantly of soft to medium stiff silts, often organic-rich silts, minor clay and sand deposited in a protected lagoon (HLA 1982). Boring 17 located approximately at the northern end of the channel in 9-ft of water encountered about 2 ft of gray sand overlying dark gray clayey silt (HLA 1982). The NORTEC (1994) report illustrates that a thin mantle of granular Holocene seafloor sediments covers the underlying fine-grained Holocene silt lagoon deposits. Sediment quality (geochemistry) results (Battelle 1987, A.D. Little 1990) analyzed sediments from two stations near the project areas for selected metals and hydrocarbons. While these studies did not analyze for all of the parameters listed in *Dredged Material Evaluation Framework, Lower Columbia River Management Area (Corps et al. 1998)*, those that were analyzed resulted in concentrations below the regulatory screening level. The lagoon sample contained 86 percent sand and 14 percent silt and clay, while the sample collected immediately north of Mary Sachs Island contained over 95 percent sand and gravel and 4.3 percent silt and clay (A.D. Little 1990). Note: Figure 1 illustrates the HLA (1982) geotechnical borehole (Boring 17) and the sediment quality stations (Battelle 1987, A.D. Little 1990).
Estimated Quantity of Waste (Spoils)	30,000 cubic yards
Proposed Methods of Release	Unconfined discharge from barge(s).

Cited References:

A.D. Little 1990. Monitoring Hydrocarbons and Trace Metals in Beaufort Sea Sediments and Organisms. Final Report to: U.S. Department of the Interior Mineral Management Service, Anchorage, Alaska. OCS Study MMS-90-0054. October 1, 1990.

Battelle Ocean Sciences 1987. Final Report on Beaufort Sea Monitoring Program: Analysis of Trace Metals and Hydrocarbons from Outer Continental Shelf (OCS) Activities, Prepared for U.S. Department of the Interior Mineral Management Service, Anchorage, Alaska. OCS Study MMS-87-0072. December 21, 1987.

Harding Lawson Associates (HLA) 1982. Point Thomson Development Project Winter 1982 Geotechnical Investigation. Prepared for Exxon Company, U.S.A., HLA Job No. 9612,031.08. June 1982.

Northern Technical Services (NORTEC) 1984. Geotechnical Engineering Criteria Point Thomson Development Area. Prepared for Exxon Company, U.S.A., April 1984.

U.S. Army Corps of Engineers, et al. 1998. Dredged Material Evaluation Framework: Lower Columbia River Management Area. November 1998.

Spit Ocean Dump Site (Alternative 2–Winter Activities)
Lagoon Ocean Dump Site (Alternative 3–Winter Activities)
Barrier Island Dump Site (Alternative 4–Winter Activities)

Type of Wastes	Naturally occurring sediments found within the proposed 400-ft by 1,000-ft channel extending north into the lagoon from the proposed dock. Geotechnical and geological surveys of the area conducted in the 1980s determined that the lagoon deposits were primarily Holocene sediments consisting predominantly of soft to medium stiff silts, often organic-rich silts, minor clay and sand deposited in a protected lagoon (HLA 1982). Boring 17 located approximately at the northern end of the channel in 9-ft of water encountered about 2 ft of gray sand overlying dark gray clayey silt (HLA 1982). The NORTEC (1994) report illustrates that a thin mantle of granular Holocene seafloor sediments covers the underlying fine-grained Holocene silt lagoon deposits. Sediment quality (geochemistry) results (Battelle 1987, A.D. Little 1990) analyzed sediments from two stations near the project areas for selected metals and hydrocarbons. While these studies did not analyze for all of the parameters listed in *Dredged Material Evaluation Framework, Lower Columbia River Management Area (Corps et al. 1998)*, those that were analyzed resulted in concentrations below the regulatory screening level. The lagoon sample contained 86 percent sand and 14 percent silt and clay, while the sample collected immediately north of Mary Sachs Island contained over 95 percent sand and gravel and 4.3 percent silt and clay (A.D. Little 1990). Note: Figure 1 illustrates the HLA (1982) geotechnical borehole (Boring 17) and the sediment quality stations (Battelle 1987, A.D. Little 1990).
Estimated Quantity of Waste (Spoils)	30,000 cubic yards
Proposed Methods of Release	Deposit, on average, 2-ft thick layer of spoils on grounded sea-ice throughout ocean dump site. Use conventional heavy equipment to transport, dump, and grade spoils. Ultimate disposal will occur when sea-ice melts, releasing spoils into the water column and onto the seafloor. Note: if necessary, spoils generated from the cleanout of the channel immediately prior to the arrival of the facility modules will be disposed within the spit or lagoon ocean dump site as an unconfined discharge from barge(s).

Cited References:

A.D. Little 1990. Monitoring Hydrocarbons and Trace Metals in Beaufort Sea Sediments and Organisms. Final Report to: U.S. Department of the Interior Mineral Management Service, Anchorage, Alaska. OCS Study MMS-90-0054. October 1, 1990.

Battelle Ocean Sciences 1987. Final Report on Beaufort Sea Monitoring Program: Analysis of Trace Metals and Hydrocarbons from Outer Continental Shelf (OCS) Activities, Prepared for U.S. Department of the Interior Mineral Management Service, Anchorage, Alaska. OCS Study MMS-87-0072. December 21, 1987.

Harding Lawson Associates (HLA) 1982. Point Thomson Development Project Winter 1982 Geotechnical Investigation. Prepared for Exxon Company, U.S.A., HLA Job No. 9612,031.08. June 1982.

Northern Technical Services (NORTEC) 1984. Geotechnical Engineering Criteria Point Thomson Development Area. Prepared for Exxon Company, U.S.A., April 1984.

U.S. Army Corps of Engineers, et al. 1998. Dredged Material Evaluation Framework: Lower Columbia River Management Area. November 1998.

(5) Feasibility of surveillance and monitoring;

Offshore Ocean Dump Site (Base Case–Summer Activities)

Spit Ocean Dump Site (Alternative 1–Summer Activities)

Feasibility of Surveillance and Monitoring	It will be feasible to conduct surveillance and monitoring activities prior to and during the ocean dumping operations. Also, post-operations monitoring will be feasible.
Possible Surveillance and Monitoring Methods	**Baseline:** bathymetry survey and surficial seafloor sediment quality (geochemistry) study **Surveillance:** water quality survey **Post-Dumping Monitoring:** confirmation bathymetry survey and surficial seafloor sediment quality (geochemistry) study

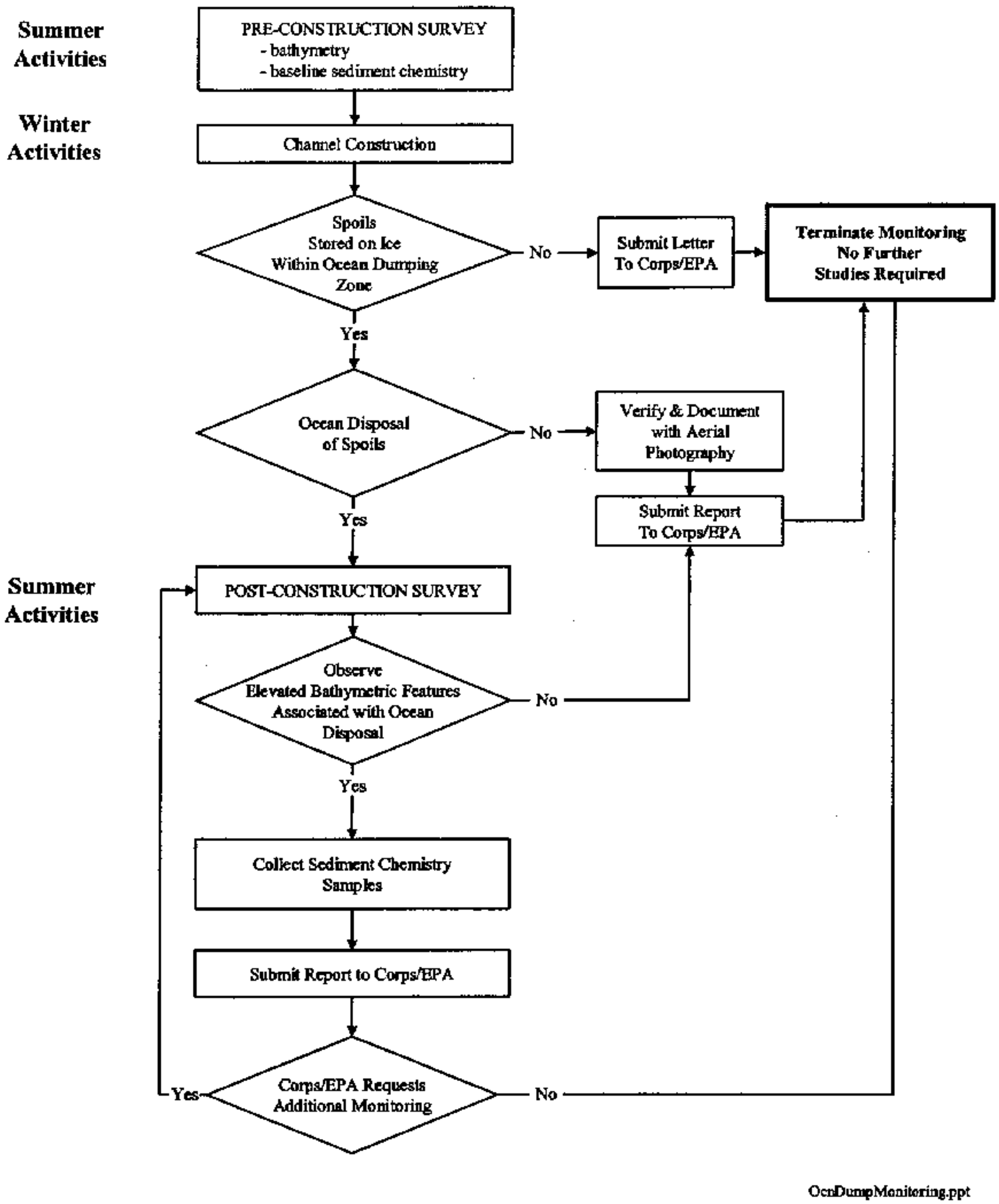
Spit Ocean Dump Site (Alternative 2–Winter Activities)

Lagoon Ocean Dump Site (Alternative 3–Winter Activities)

Barrier Island Dump Site (Alternative 4–Winter Activities)

Feasibility of Surveillance and Monitoring	It will be feasible to conduct baseline and post-operations monitoring at the site. Sea-ice melting and breakup will prevent surveillance and monitoring.
Possible Surveillance and Monitoring Methods	Figure 2 illustrates an ocean dumping monitoring program based on the Northstar Development, where spoils were placed on the sea-ice within an ocean dumping site (zone).

FIGURE 2. EXAMPLE OF AN OCEAN DUMPING MONITORING PROGRAM



(6) Dispersal, horizontal transport and vertical mixing characteristics of the area, including prevailing current direction and velocity, if any;

In addition to the summary information below, please refer to Section 4.4.2 of the *Point Thomson Gas Cycling Project Environmental Report* for further information.

Offshore Ocean Dump Site (Base Case–Summer Activities)
Spit Ocean Dump Site (Alternative 1–Summer Activities)
Spit Ocean Dump Site (Alternative 2–Winter Activities)
Lagoon Ocean Dump Site (Alternative 3–Winter Activities)
Barrier Island Dump Site (Alternative 4–Winter Activities)

Hydrodynamics	The following is an excerpt from KLI (1983): "Coastal currents, both inside and outside the barrier islands were found to be wind driven, with tidal influences significantly only in the lagoon entrance. A simple pattern of easterly and westerly water flow through the study region was found for both west wind and east wind conditions. For east wind conditions, flow outside the barrier islands was to the west, relatively slow (<25 cm/s) at 50-ft depth and faster (to 75 cm/s) at 25-ft depth. Flow under easterly wind conditions is into the lagoon at Mary Sachs Entrance and inshore at Challenge Entrance. Flow inside the lagoon is to the west, exiting the area near Bullen Point. This flow pattern simply reverses under westerly winds, except that flow is still into the lagoon through Challenge Entrance. Correlation coefficients for wind and currents were found to be 0.80 for the case of the deep (50-ft) offshore station with a lag of about 21 hours. A coefficient of 0.82 was found for a shallow station in the lagoon at the west end, with no significant lag." *(Volume 1, page 2)*

Pertinent References:

Kinnetic Laboratories Inc. (KLI) 1983. Final Report Oceanographic Engineering Services Point Thomson Development Project. Volumes 1 and 2. Prepared for Exxon Company U.S.A. Agreement No. PTD-8204, KLI Reference No. KLI-83-9, February 1, 1983.

URS Greiner Woodward Clyde 1999. Final Technical Report (Version 2.0) Physical Oceanography of the Point Thomson Unit Area: 1997 and 1998 Regional Studies. Prepared for BP AMOCO and Point Thomson Unit Owners. Project No. 74-986002NA.00. May 25, 1999.

URS Corporation 2000. Technical Report Point Thomson Unit 1999 Physical Oceanography / Meteorology Baseline Study. Prepared for BP AMOCO and Point Thomson Unit Owners. Project No. 74-09900007.00 April 27, 2000.

(7) Existence and effects of current and previous discharges and dumping in the area (including cumulative effects);

Offshore Ocean Dump Site (Base Case–Summer Activities)
Spit Ocean Dump Site (Alternative 1–Summer Activities)
Spit Ocean Dump Site (Alternative 2–Winter Activities)
Lagoon Ocean Dump Site (Alternative 3–Winter Activities)
Barrier Island Dump Site (Alternative 4–Winter Activities)

Existence of Previous Discharges and Dumping	No publicly available records have been found that note the discharge of wastes from industrial and/or military sources within the area.

(8) Interference with shipping, fishing, recreation, mineral extraction, desalination, fish and shellfish culture, areas of special scientific importance and other legitimate uses of the ocean;

Offshore Ocean Dump Site (Base Case–Summer Activities)
Spit Ocean Dump Site (Alternative 1–Summer Activities)
Spit Ocean Dump Site (Alternative 2–Winter Activities)
Lagoon Ocean Dump Site (Alternative 3–Winter Activities)
Barrier Island Dump Site (Alternative 4–Winter Activities)

Interference with other legitimate uses of the ocean	It is anticipated that the one-time disposal of spoils to establish a channel that allows facility modules to be offloaded at the proposed dock will not interfere with all other legitimate and current uses of the Beaufort Sea waters and the adjacent lagoon. Subsistence hunting of bowhead whales, fish, and other marine organisms will not be affected by the proposed ocean dumping. Please refer to Sections 4.13.3 and 4.13.5 in the *Point Thomson Gas Cycling Project Environmental* Report for further information.

(9) The existing water quality and ecology of the site as determined by available data or by trend assessment or baseline surveys;

Offshore Ocean Dump Site (Base Case–Summer Activities)
Spit Ocean Dump Site (Alternative 1–Summer Activities)
Spit Ocean Dump Site (Alternative 2–Winter Activities)
Lagoon Ocean Dump Site (Alternative 3–Winter Activities)
Barrier Island Dump Site (Alternative 4–Winter Activities)

Water Quality	Please refer to Section 4.4.3 in the *Point Thomson Gas Cycling Project Environmental Report* for further information.
Benthos	Please refer to Section 4.5 in the *Point Thomson Gas Cycling Project Environmental Report* for further information.

(10) Potentiality for the development or recruitment of nuisance species in the disposal site;

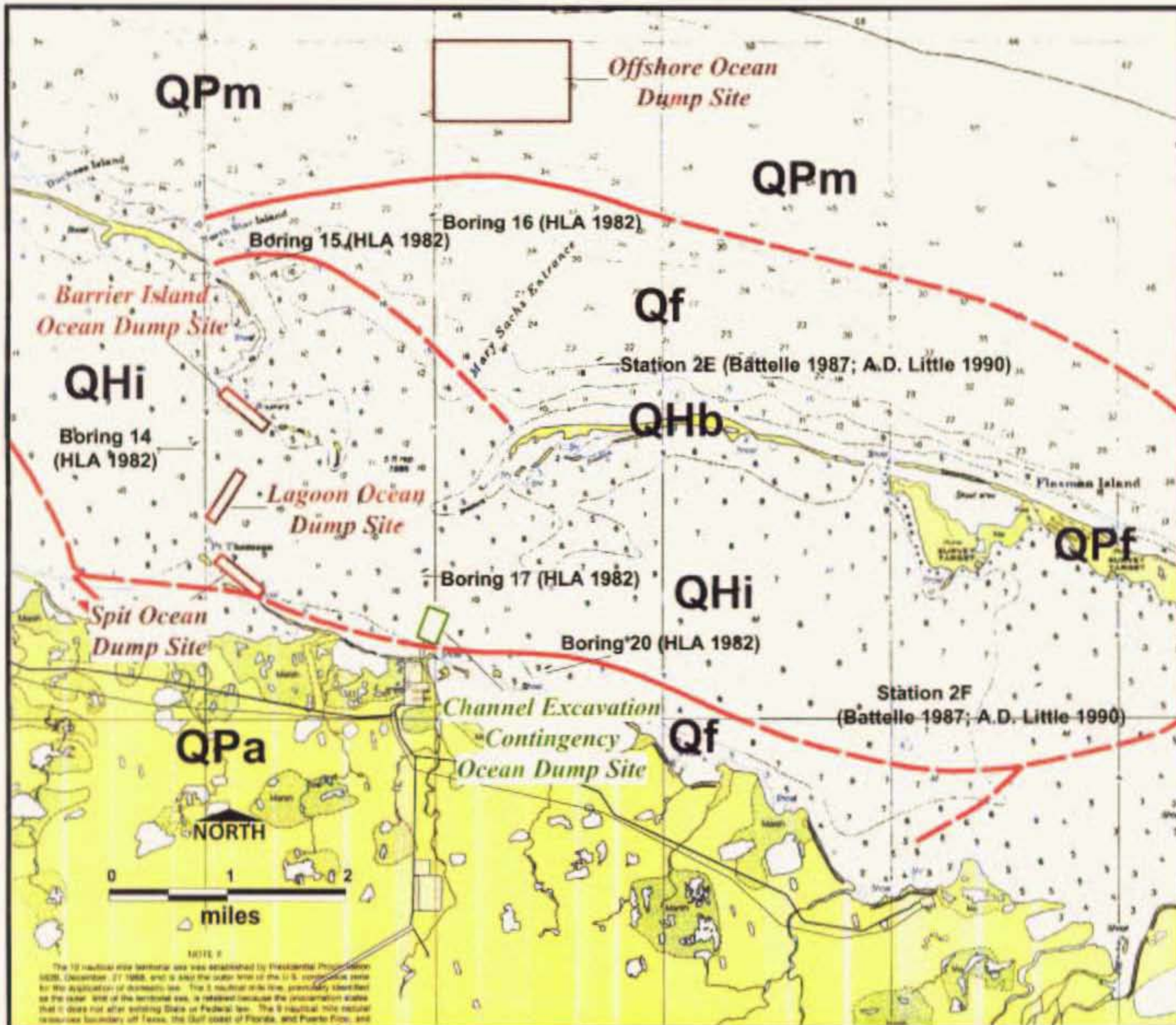
Offshore Ocean Dump Site (Base Case–Summer Activities)
Spit Ocean Dump Site (Alternative 1–Summer Activities)
Spit Ocean Dump Site (Alternative 2–Winter Activities)
Lagoon Ocean Dump Site (Alternative 3–Winter Activities)
Barrier Island Dump Site (Alternative 4–Winter Activities)

Nuisance Species associated with Beaufort Sea Ocean Dumping	As noted in Section 4.5 of the *Point Thomson Gas Cycling Project Environmental Report*, the benthos that will be excavated with channel sediments are the same as those found in the proposed ocean dump sites. Thus, the proposed ocean dumping activity will not introduce nuisance species into the area.

(11) Existence at or in close proximity to the site of any significant natural or cultural features of historical importance.

Offshore Ocean Dump Site (Base Case–Summer Activities)
Spit Ocean Dump Site (Alternative 1–Summer Activities)
Spit Ocean Dump Site (Alternative 2–Winter Activities)
Lagoon Ocean Dump Site (Alternative 3–Winter Activities)
Barrier Island Dump Site (Alternative 4–Winter Activities)

Significant Natural or Cultural Features of Historical Importance	No significant natural features of historical importance have been identified within the Point Thomson Unit. It is anticipated that the proposed ocean dumping activities will not affect the known archaeological sites, Leffingwell's Camp located on Flaxman Island, and other cultural features. Section 4.12 in the *Point Thomson Gas Cycling Project Environmental Report* presents a summary of the cultural resources in the area.



ExxonMobil

Point Thomson Gas Cycling Project

Figure 1

Proposed Ocean Dumping Sites

Legend:

Holocene Deposits
QHb Beach Deposits
QHi Lagoon Deposits
Qf Flaxman Lag Deposits

Pleistocene Deposits
QPf Flaxman Formation
QPm Marine Silt and Clay
QPa Alluvium

Base map from the National Oceanic and Atmospheric Administration (NOAA) nautical chart No. 16045, revised in 1996.

Geology and geotechnical data from HLA 1982. Sediment chemistry stations from Battelle 1987 and A.D. Little 1990.

URS Anchorage, Alaska

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Attachment II
Potential Future Development Scenarios

II.1 Identification of Potential Future Development Scenarios

II.1.1 Approach and Assumptions

Potential future development scenarios in the Point Thomson area have been identified to assist in the analysis of project impacts in the forthcoming project EIS. For the purposes of this analysis, only oil and gas related activities in the Point Thomson area of the Eastern North Slope are considered, but there may be other activities, which have not been captured. The analysis is based on publicly available information about oil and gas prospects in the area. It is important to emphasize that most of the major decision factors and necessary information, including timing, to determine the feasibility of future development in the area are currently unknown. Therefore, assumptions regarding economically recoverable reserves and the commerciality of development have been made to develop these hypothetical future development scenarios.

II.1.2 Brief Description of Prospects and Activities

The following potential prospects and related activities have been identified in the Point Thomson area. Several of these are identified in this analysis as having sufficient information to speculate about future development scenarios. The rationale for not further analyzing other possible prospects and activities is also presented.

II.1.2.1 Point Thomson Gas Sales

For the purposes of this analysis, it is assumed that sales of Point Thomson gas may possibly occur some time in the future and that these sales would likely initially occur simultaneously with continued injection (cycling) of some portion of the total gas production. It is assumed that gas sold from Point Thomson will be dehydrated and conditioned for delivery via a gas pipeline to Prudhoe Bay for further treatment as necessary to prepare it for sales as part of an Alaskan North Slope gas sales project. Several alternatives are undergoing feasibility studies for allowing gas sales from the Prudhoe Bay Unit, but at present, none contemplate gas sales from the Point Thomson Unit. This analysis addresses only the Eastern North Slope impacts associated with delivery of conditioned Point Thomson gas to Prudhoe Bay and does not address the impacts associated with various Prudhoe Bay Unit gas sales alternatives and their associated facilities.

II.1.2.2 Development of the Thomson Sand Oil Rim

There have been evaluations of the feasibility of developing and producing the thin oil rim contained in the Thomson Sand since initial discovery. Although considerable resource is thought to be present, achieving economic production continues to be unlikely due to several major technical challenges. Even with horizontal wells, production of this oil is believed to be extremely poor as a result of the rapid gas and water breakthrough that is expected to occur (this oil has a low API gravity, so mobility is poor). Although development of the Thomson Sand oil is included as a reasonably foreseeable future development, the probability of this occurring is very low. Future Plans will continue to reassess development of the oil rim with the implementation of the gas cycling project. As project wells are drilled into the gas cap, the additional data obtained will better define the structure and improve the resource description. If determined to be economic, the oil rim would likely be developed from Point Thomson Cycling Project well pads and share other Point Thomson infrastructure. A hypothetical scenario for development of this potential resource is presented in Section II.2.

II.1.2.3 Development of Area Brookian Reservoirs

There are several confirmed or suspected accumulations of oil in Brookian age reservoirs in the Point Thomson area, both within and outside of the Point Thomson Unit. These include: the Flaxman reservoir in the northeastern corner of the Unit, other accumulations believed to exist in the proximity of the currently proposed Central and Eastern Well Pad sites, accumulations discovered with the Sourdough and Yukon Gold wells to the southeast of the Unit, and the Slugger Exploration Unit located west of the Point Thomson Unit. Factors favoring development of any of these Brookian prospects are marginal based on the experience to date with other Brookian age reservoirs (e.g., Badami Unit). A substantial improvement in sand continuity and quality would need to be demonstrated before an economic development could be brought forward.

Development of the Brookian from Point Thomson Well Pads

Past Point Thomson wells have identified potential Brookian prospects in a strata above the Point Thomson sands. As development drilling for this project proceeds, additional information about the Brookian formation will be obtained and evaluated. If, after the evaluation of this information is complete and potential production is determined to be economic, these accumulations might be developed. A hypothetical scenario for development of these potential resources is presented in Section II.2.

Yukon Gold and Sourdough Area Development

In the 1990's, BP Exploration (Alaska) Inc. drilled three wells south of the proposed Point Thomson development: the Sourdough #2 and Yukon Gold in the 1993-1994 winter drilling season, and the Sourdough #3 well in the 1996-1997 winter drilling season. In 1997, BPXA announced that oil was discovered by the Sourdough #2 and #3 exploratory wells. A hypothetical scenario for development of these potential resources is presented in Section II.2.

Slugger Unit Development

In 2001, the Slugger Exploration Unit was formed. This Unit is located south of the Badami field. The terms of the Exploration Unit agreement require that a commitment well be drilled no later than the 2003 winter season, or leases in the Unit will expire. Initially, this analysis assumes that a commitment well is drilled, and that oil is found. It is then further assumed that additional exploration and drilling in the unit occurs and proves up commercially developable oil reserves. A hypothetical future development scenario is presented in Section II.2.

II.1.2.4 Kuvlum and other Offshore Prospects

Kuvlum is an oil find located offshore of the Arctic National Wildlife Refuge in OCS waters. Other wells drilled in this offshore area include the Stinson well and the Warthog well. Development of any of these reservoirs poses significant technical, environmental, and economic challenges, and, at this time, these challenges continue to constrain development of these resources. Therefore, hypothetical development scenarios have not been identified.

II.1.2.5 ANWR

A single well was drilled on Kaktovik Inupiat Corporation (KIC) lands in the 1980's, over 30 miles from the proposed Point Thomson Development. There is no publicly available information about the results of the KIC well.

Before any oil and gas exploration or development activities could occur in ANWR, Congressional authorization of oil and gas leasing would be required. It is assumed that, if oil and gas leases were to be issued, planning and studies would be required prior to lease sales and before initiating any exploration activity. The first activity could be acquisition of seismic data, or exploratory wells could be drilled. It is likely that several years of exploratory activity would be required before any commercially developable reserves could be identified, and more years for engineering and permitting would be required before development could occur. Any development would require significant developable reserves to be commercial, given the distance to the Trans-Alaska Pipeline System, the necessity for crossing a major river system (Canning and Staines rivers). Thus, for the purposes of this analysis, hypothetical development scenarios have not been identified.

II.1.2.6 Seismic Exploration and Exploratory Drilling

At this time the Point Thomson Unit Owners do not plan any further seismic exploration or exploratory drilling within the Unit in support of gas cycling development or to support future gas sales development. There is a potential for future exploratory drilling and seismic exploration in areas outside of the Unit. Scenarios have not been developed for such routine exploratory activities as they are already subject to other existing regulations and would not be related to the proposed Point Thomson development.

II.2 Hypothetical Development Scenarios

Following are the hypothetical development scenarios for the cases referenced above. These scenarios have been developed using publicly available information, using technical judgment and recent industry experience to predict the approximate shape and size of potential future developments. These scenarios should not be considered predictive of actual future locations, commercial reserves, timing, or likely development schemes. It is important to emphasize that these scenarios are very speculative in nature, and are presented only for preliminary analysis purposes. Additional information concerning the location and extent of regional resources would substantially change any of these schemes. Likewise, any advances in oilfield technology could result in substantive changes in the nature of these hypothetical scenarios. It is also important to recognize that for any and all future development scenarios, significant effort and emphasis will be placed on minimizing the areal footprint and maximizing utilization of existing infrastructure and well pads.

II.2.1 Gas Sales Simultaneous with Point Thomson Gas Cycling

It is assumed that sales of natural gas from Point Thomson will only be technically and economically feasible after either a gas pipeline is constructed from Alaska to markets in Canada or the lower 48 states, or for export until there is some other world-scale alternative available in Alaska. Although not certain, it is considered most likely that gas treating and pipeline facilities providing such access will originate in the Prudhoe Bay area, since this is where the largest gas reserves and most complete infrastructure are currently located.

For the purposes of this hypothetical scenario it is assumed that a new gas pipeline to Prudhoe Bay would be constructed along a ROW that parallels the currently planned Point Thomson condensate sales pipeline and the existing Badami sales pipeline. Depending on the gas specifications and the final optimized design, this gas pipeline would be either buried or above-ground (installed on VSMs) (Figures 1 and 2). If installed on VSMs it might require new VSMs or might (with some modifications to existing VSMs) be able to share existing Point Thomson, Badami and Endicott VSMs. For the purposes of this analysis it is assumed that the pipeline is above ground and will have its own new VSMs and that all rivers along the route would be crossed with pipeline bridges.

To produce dehydrated and conditioned gas at Point Thomson (for transportation to Prudhoe Bay for CO_2 removal), expansion of the Central Production Facility Pad would be required to accommodate additional facilities, including:

- Gas dehydration equipment
- Gas conditioning equipment (hydrocarbon dewpoint)
- Separation train upgrades
- Booster compressors
- Flare relief system expansion
- Utilities system upgrades
- Gas metering and pigging facilities.

While drilling of additional wells may (or may not) be required, it is not yet known if additional well pads would be required under this scenario. As stated previously, every effort would be made to minimize the footprint and use existing well pads when possible.

It is assumed that conventional North Slope winter construction techniques would be used for construction. An ice road would be built to support onshore pipeline construction, which could be completed in a single winter season. Gravel pad expansion would also occur in the winter. Modules would be transported to the site in the open water season, and hooked up to the new pipeline and existing facilities in the fall. Gas sales from Point Thomson could commence about one year after construction began, provided sales gas pipeline capacity was available to meet this schedule.

II.2.2 Thomson Sand Oil Rim Development from Point Thomson Well Pads

Under this scenario, it is assumed that these reservoir fluids would be compatible with gas condensate, and suitable for transport in the gas condensate pipeline and in other downstream sales pipelines. New wells would likely be drilled on the existing Point Thomson well pads, or project wells deepened or sidetracked, to produce these fluids, and only minor pad expansions, if any, would be needed. Facilities modifications and expansions could be required, including:

- New gathering lines from the well pads and /or PW, SW, GL lines to well pad
- Minor well pad expansion with new well pad manifolding
- CPF pad expansion
- New lower pressure separation train
- PW treatment upgrading (water production expected)
- New gas processing train expansion
- Utilities upgrade
- Flare relief system upgrade
- Class 2 produced water disposal well(s)
-

About 18 months would be required for NS construction under this scenario. Modules would be delivered to the site via the Point Thomson dock, set in place, and connected in the fall. Startup would be about one year after North Slope construction begins.

II.2.3 Brookian Development from Point Thomson Well Pads

Under this scenario, it is assumed that these reservoir fluids would be compatible with gas condensate, and suitable for transport in the gas condensate pipeline and in other downstream sales pipelines. New wells would likely be drilled on the existing Point Thomson well pads to produce these fluids, and minor pad expansions would be needed (Figure 3). Facilities modifications and expansions would be required, including:

- New gathering lines from the well pads and /or PW, SW, GL lines to well pad
- Well pad expansion with new well pad manifolding
- CPF pad expansion
- New lower pressure separation train
- PW treatment upgrading
- New gas processing train expansion
- May require pipeline, compression, and other support facilities for gas injection (if a miscible gas injection project is conducted)
- May require SW intake and SW injection system (if water flood is conducted)
- Utilities upgrade
- Flare relief system upgrade
- New Class II produced water disposal well(s)

About 12 months would be required for NS construction under this scenario. Modules would be delivered to the site via the Point Thomson dock, set in place, and connected in the fall. Startup would be about one year after North Slope construction begins.

II.2.4 Sourdough Area Brookian Development

For the purposes of this analysis, it is assumed a satellite development would be located in the vicinity of the Sourdough #3 well, located about three miles south of the East Well Pad. It is also assumed that these reservoir fluids would be compatible with gas condensate, and suitable for transport in the gas condensate pipeline and in other downstream sales pipelines. This hypothetical scenario is shown on Figure 4.

Satellite development is assumed to include an 8-acre pad, flowlines on VSMs (oil, gas, and water), and a buried power cable. It is assumed 15 wells, a well manifold, a test separator, and an emergency shelter would be located on the pad. Gravel would be obtained by expanding the proposed Point Thomson gravel mine site.

The satellite pipelines would be routed north to intersect with the eastern gathering pipeline ROW and the road would tie-in to the gravel road from the eastern well pad to the CPF. Pipelines would parallel the eastern gathering pipeline ROW back to the CPF. Facilities modifications at the CPF would be similar to those identified under the above scenario for Point Thomson Brookian development.

About one year would be required for North Slope construction. Ice roads would be built for pad, road, and pipeline construction. Modules would be delivered in the open water season to the Point Thomson dock, and then transported over the gravel road to the satellite pad. Modules would be installed and facilities connected at the CPF in the fall. Production would commence about one year after construction began.

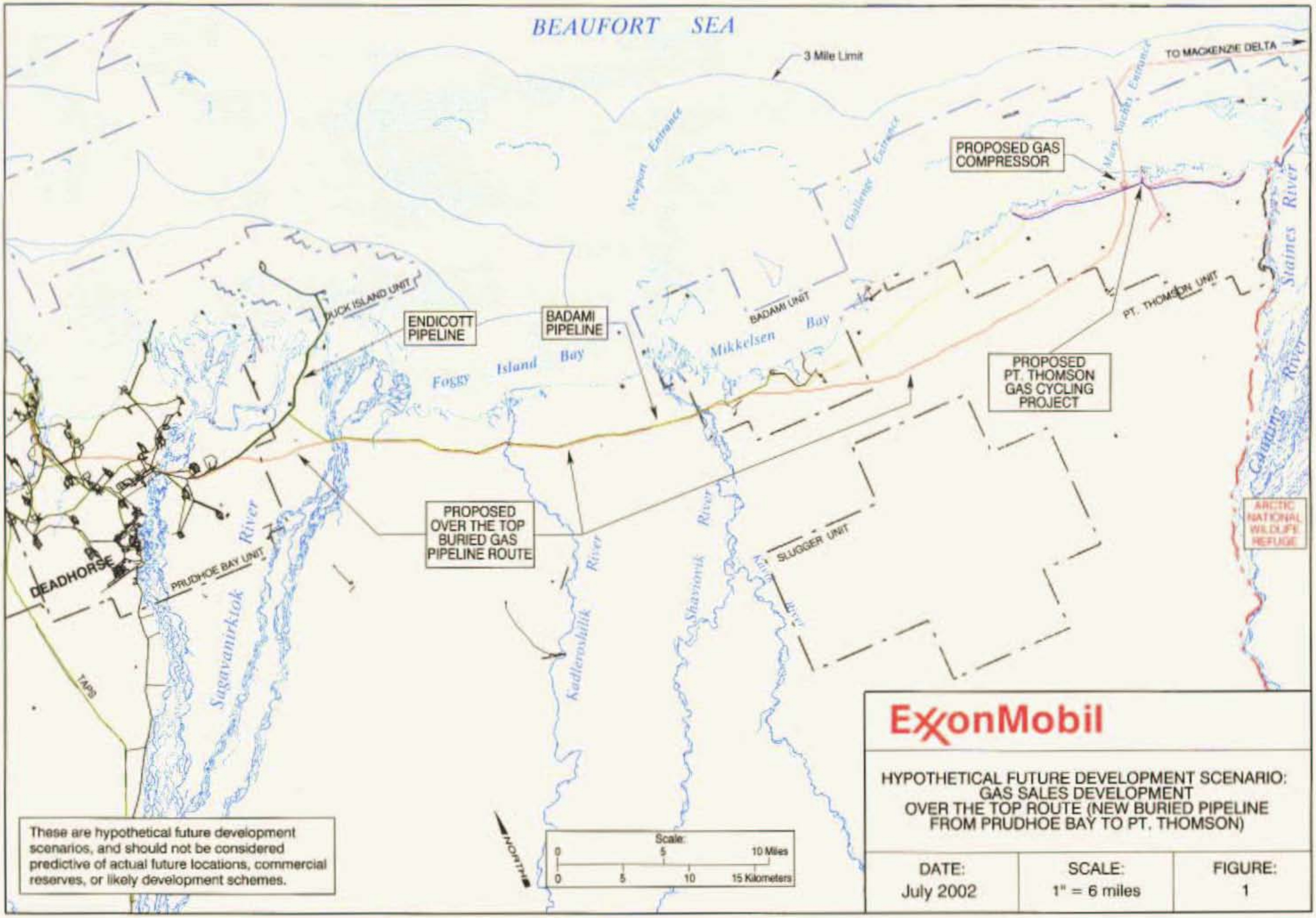
II.2.5 Slugger Development

The most likely potential scenario for production of these reserves is by developing as a satellite to the existing Badami field facilities. It is assumed that the best location for development of reserves is located in the centroid of the Slugger Exploration Unit, about six miles south of the Badami CFP (Figure 5). It is assumed this crude oil would be compatible with fluids transported in the Badami pipeline and other downstream sales pipelines.

Satellite development is assumed to include a 5-acre pad, flowlines on VSMs (oil, gas, and water), a gravel road and a buried power cable. It is assumed 8 wells, a well manifold, a test separator, and an emergency shelter would be located on the pad. Gravel would be obtained by expanding the existing East Badami Creek gravel mine site.

The satellite pipeline would connect with facilities at Badami. A road would be built to access the satellite pad. It is assumed that only minor modifications to Badami facilities would be required.

About one year would be required for construction. Ice roads would be built for pad, road, and pipeline construction. Modules would be delivered in the open water season to the Badami dock, and then transported over the gravel road to the satellite pad. Modules would be installed and facilities connected at Badami in the fall. Production would commence about one year after construction began.



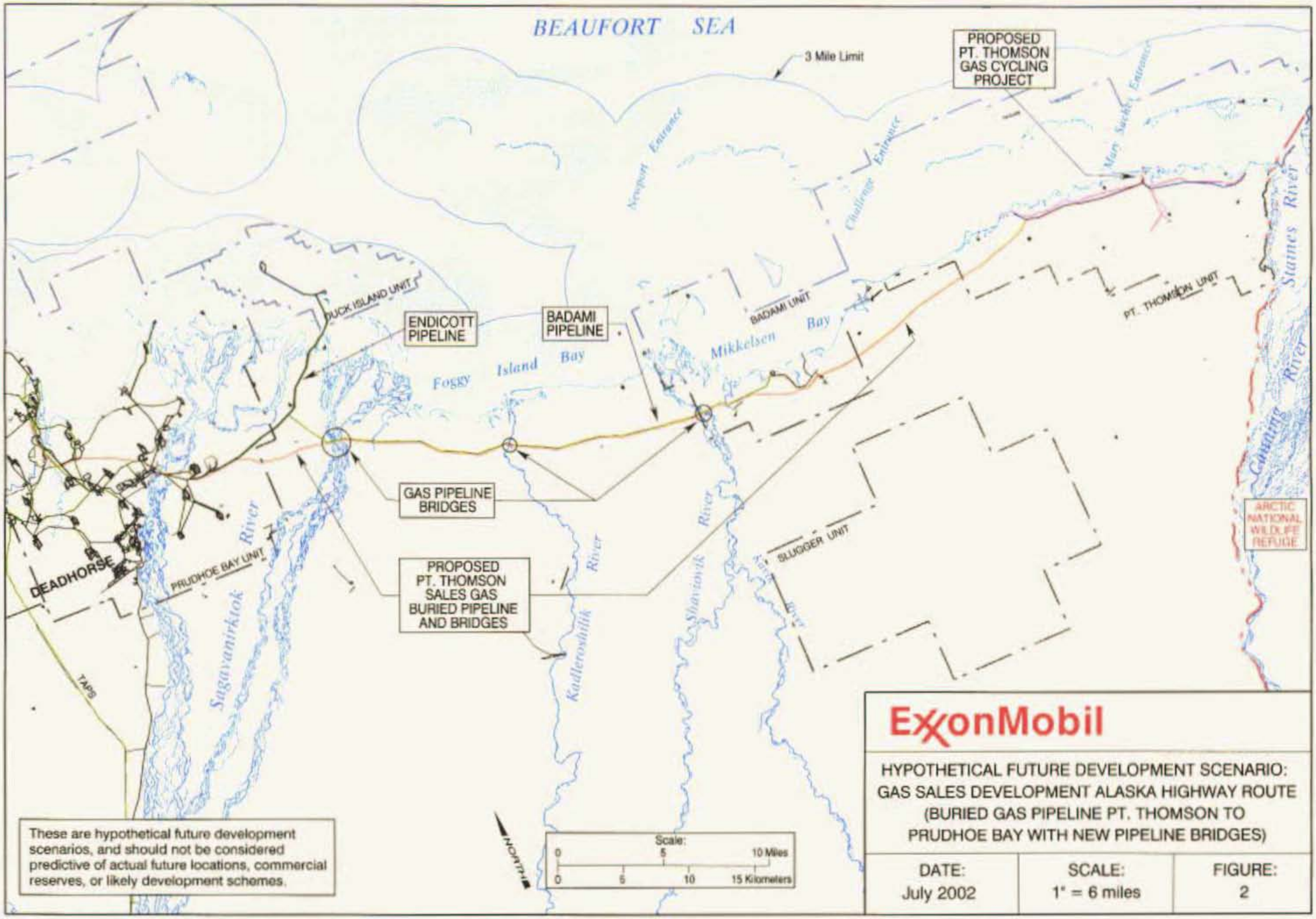
These are hypothetical future development scenarios, and should not be considered predictive of actual future locations, commercial reserves, or likely development schemes.

ExxonMobil

HYPOTHETICAL FUTURE DEVELOPMENT SCENARIO:
GAS SALES DEVELOPMENT
OVER THE TOP ROUTE (NEW BURIED PIPELINE FROM PRUDHOE BAY TO PT. THOMSON)

DATE:	SCALE:	FIGURE:
July 2002	1" = 6 miles	1

figure_1.dgn



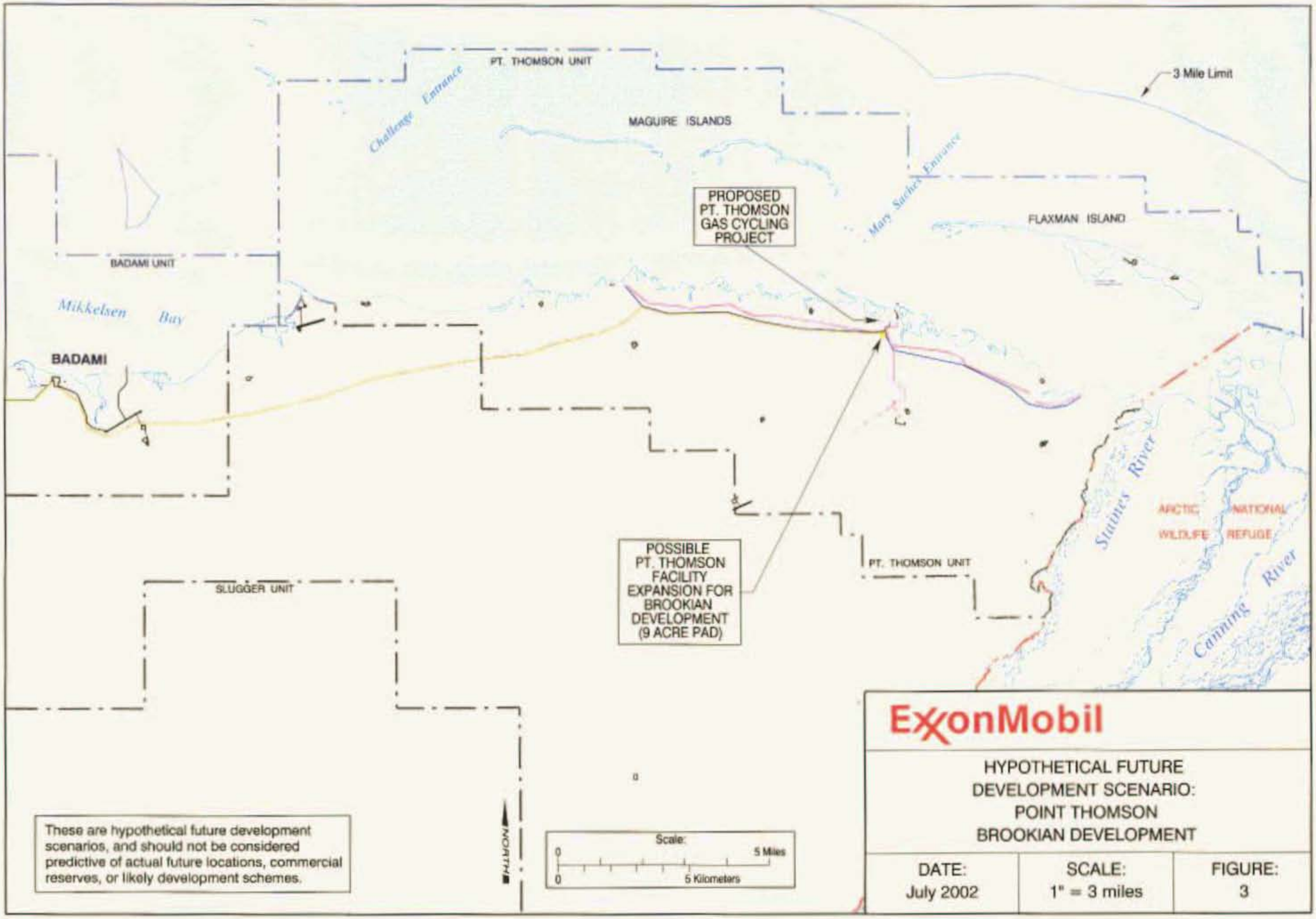
These are hypothetical future development scenarios, and should not be considered predictive of actual future locations, commercial reserves, or likely development schemes.

ExxonMobil

HYPOTHETICAL FUTURE DEVELOPMENT SCENARIO: GAS SALES DEVELOPMENT ALASKA HIGHWAY ROUTE (BURIED GAS PIPELINE PT. THOMSON TO PRUDHOE BAY WITH NEW PIPELINE BRIDGES)

DATE:	SCALE:	FIGURE:
July 2002	1" = 6 miles	2

figure_2.dgn



These are hypothetical future development scenarios, and should not be considered predictive of actual future locations, commercial reserves, or likely development schemes.

ExxonMobil

HYPOTHETICAL FUTURE DEVELOPMENT SCENARIO: POINT THOMSON BROOKIAN DEVELOPMENT

DATE:	SCALE:	FIGURE:
July 2002	1" = 3 miles	3

figure_3.dgn

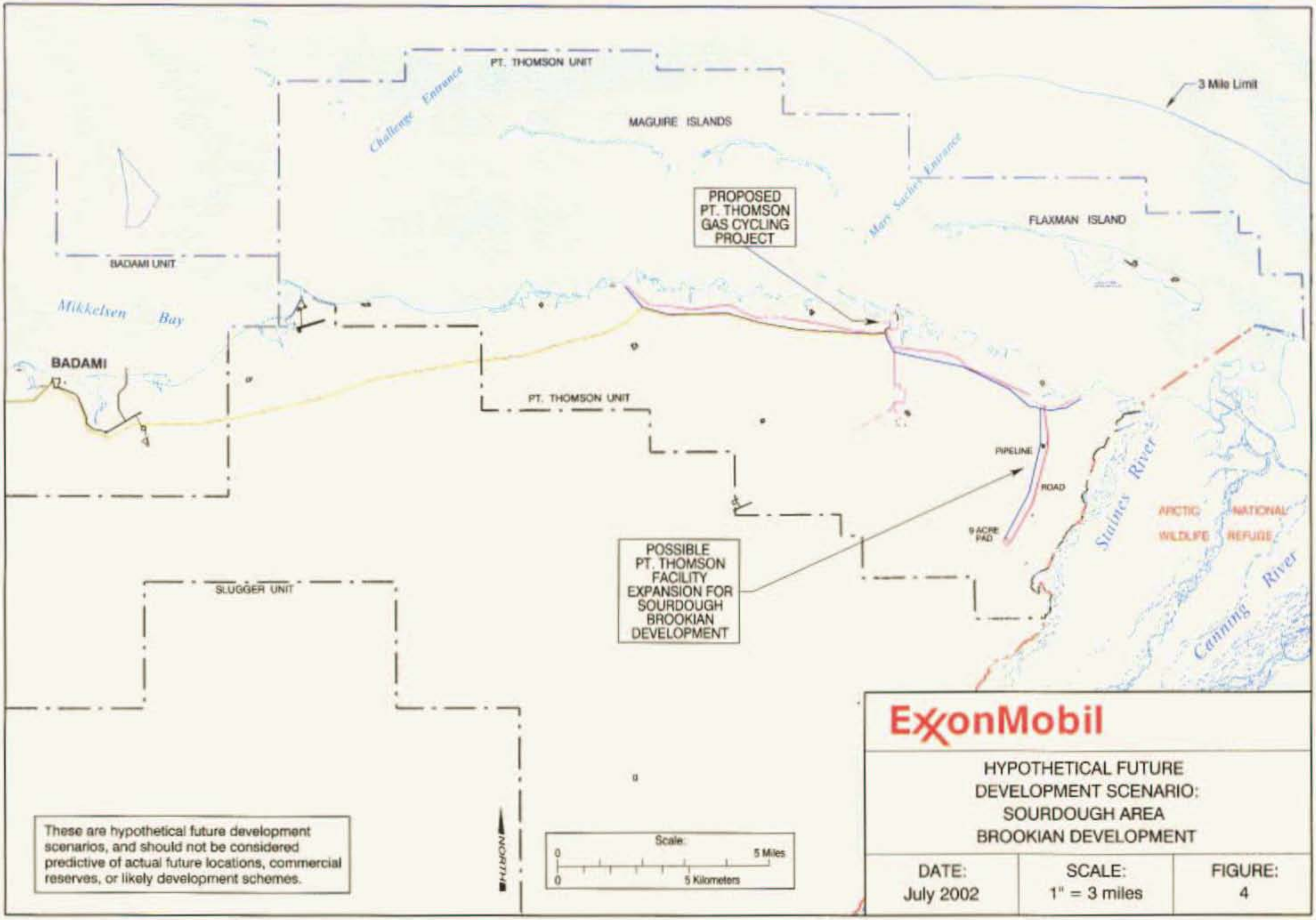
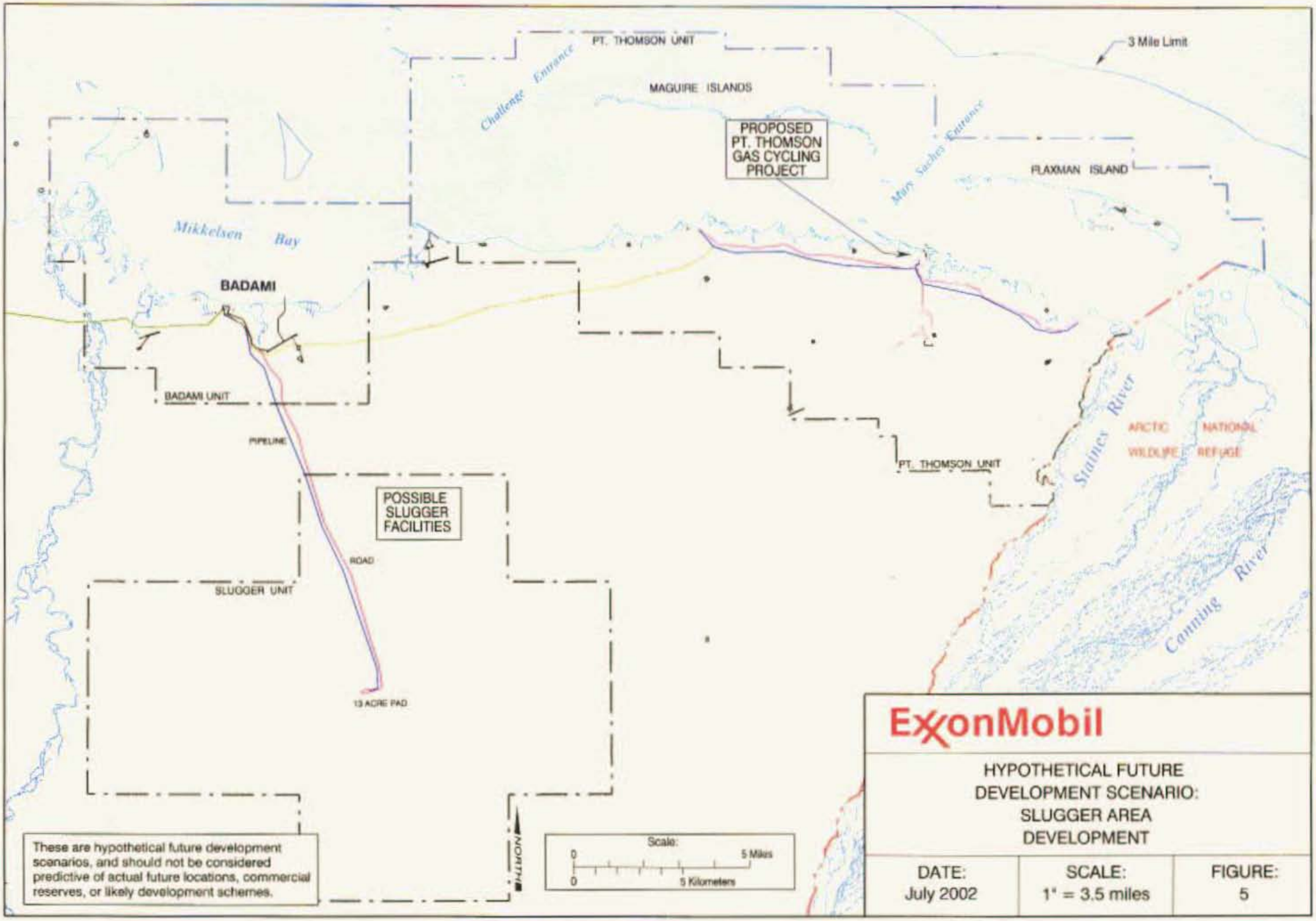

PT. THOMSON UNIT
Challenge Entrance
MAGUIRE ISLANDS
3 Mile Limit
Mary Sachs Entrance
PROPOSED PT. THOMSON GAS CYCLING PROJECT
FLAXMAN ISLAND
BADAMI UNIT
Mikkelsen Bay
BADAMI
PT. THOMSON UNIT
PIPELINE
ROAD
9 ACRE PAD
Staines River
ARCTIC NATIONAL WILDLIFE REFUGE
Canning River
POSSIBLE PT. THOMSON FACILITY EXPANSION FOR SOURDOUGH BROOKIAN DEVELOPMENT
SLUGGER UNIT
NORTH
Scale
0
5 Miles
0
5 Kilometers
These are hypothetical future development scenarios, and should not be considered predictive of actual future locations, commercial reserves, or likely development schemes.
ExxonMobil
HYPOTHETICAL FUTURE DEVELOPMENT SCENARIO: SOURDOUGH AREA BROOKIAN DEVELOPMENT
DATE: July 2002
SCALE: 1" = 3 miles
FIGURE: 4

figure_4.dgn



ExxonMobil

HYPOTHETICAL FUTURE DEVELOPMENT SCENARIO: SLUGGER AREA DEVELOPMENT

DATE:	SCALE:	FIGURE:
July 2002	1" = 3.5 miles	5

figure_5.dgn

Attachment III

Draft Gravel Mining and Rehabilitation Plan

Point Thomson Gas Cycling Project
Draft Gravel Mining and Rehabilitation Plan
October 2001

OVERVIEW

The proposed Point Thomson gravel mine will serve as a major source of gravel for construction of the Point Thomson Gas Cycling facilities and a maintenance stockpile. Other sources will include use of gravel obtained from nearby abandoned and/or rehabilitated sites. This Draft Gravel Mining Rehabilitation Plan is prepared to satisfy State of Alaska and U.S. Federal resource agencies regulatory requirements. This draft plan will continue to be refined based on agency consultation and as final project design evolves. This draft will be updated with additional details of the rehabilitation approach, proposed performance standards, and needed monitoring in the future as project design progresses.

The proposed Point Thomson gravel mine site is located approximately two miles south of the Point Thomson Unit #3 exploratory well pad (refer to Tab 20, Figure 20-2 in the Department of the Army [DA] Permit Application). Preliminary results from a geotechnical investigation conducted in March 2000 indicate the presence of gravel to a depth of 30 to 60 feet overlain by an overburden layer of peat and silt that ranges from 3.5 and 12 feet thick. A vegetation analysis conducted for the Point Thomson Gas Cycling Project Environmental Report indicates that tundra vegetation impacted by gravel mine development (including overburden storage area and gravel stockpile) will mainly consist of Moist or Dry Tundra and Wet Tundra, and to a lesser degree Moist/Wet Tundra.

MINING PLAN

The Point Thomson gravel mine development pit will be mined on a one-time basis during the first winter construction season. The gravel mine will be located within a 38.6-acre area to the east of the airstrip access road, west of an unnamed creek, and north of the airstrip (refer to Tab 20, Figure 20-22 in the DA Permit Application). Construction of the Point Thomson Gas Cycling facilities will require approximately 2,000,000 cubic yards (cy) of gravel, including a 200,000 cy gravel stockpile for future maintenance of roads, pads, and the airstrip.

An overburden storage site has been located between the western edge of the gravel mine and the east of the airstrip access road (refer to Tab 20, Figure 20-22 in the DA Permit Application). Based on the options for reuse of gravel exploratory pads in the Point Thomson Unit, part of the overburden could be stockpiled near exploratory pads for future rehabilitation efforts. It is anticipated that approximately 470,000 cy of overburden will be removed from the 38.6-acre gravel mine site.

The proposed 11.4-acre gravel stockpile area is located adjacent to the northeast corner of the gravel mine site, with the west side adjoining the airstrip access road (refer to Tab 20, Figure 20-22 in the DA Permit Application). A secondary use of the gravel surface provided by the stockpile is to serve as a storage area. This will be particularly useful during the drilling phase of the project.

The gravel mine site area will be accessed using an ice road or other acceptable tundra travel methods. Overburden material will be removed in a north to south direction for approximately 1,590 feet beginning near the western boundary of the gravel mine site and extending east for approximately 1,065 feet. Blasting could potentially be necessary to aid in overburden removal. Overburden will not be removed from the western bank of the unnamed creek.

Blasting will be conducted in 20-foot lifts to loosen material and provide 2-inch minus gravel material for construction. Gravel mining will be conducted from north to south with the northern portion of the mine being deepest if required. Gravel extraction within the development pit may be conducted to a maximum depth of 60 feet, depending on the quality of material available (refer to Tab 20, Figure 20-23 in the DA Permit Application). Gravel mining will not extend into the western bank of the unnamed creek.

It is anticipated that mining will be concentrated in portions of the development pit where the thickest gravel deposits are encountered, resulting in variable post-mining contours. Slopes in the gravel mine pit will be left at angles no steeper than 2:1 to reduce the need for headwall modification or re-contouring for slope stability. If necessary, the boundaries of the gravel mine area will be contoured once mining activities are completed to ensure that spring snowmelt runoff will not carry sediments into the unnamed creek to the east of the site.

REHABILITATION PLAN

The Point Thomson Gas Cycling Project proposes to develop the gravel mine pit into a freshwater source for use throughout the project life. It is anticipated that the gravel mine site will produce a freshwater reservoir generally between 20 and 40 feet deep, with some areas potentially up to 60 feet deep. A reservoir of this depth will allow for use of freshwater in both summer and winter for project needs (e.g., construction of ice roads or pads, dust control, and water for maintenance, operations, camps, and facilities).

Ground surface elevation at the mine site area slopes from the southwest (≈ 28 feet mean sea level [MSL]) to the northeast (≈ 21 feet MSL). A series of temporary berms potentially could be created to capture drifting snow in order to enhance water flow into the gravel mine pit during the facility construction phase(s). Once the gravel mine pit is filled with water, the berms will be re-contoured. Site preparation after gravel extraction activities are completed and the pit is filled with water will include contouring the boundaries of the pit to reduce sediment runoff and re-vegetation. As the design of the project progresses a more detailed description of interim rehabilitation efforts will be developed.