CHAPTER 7.0

AFFECTED HUMAN ENVIRONMENT AND IMPACTS

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7.1 INTRODUCTION

Chapter 7 presents the environmental setting and potential impacts of each alternative on the human environment. Aspects of the human environment addressed include: subsistence harvesting, cultural/ archaeological resources, land and water uses, socioeconomics, transportation, aesthetics, and recreation. Information in this chapter also supports decisions on local zoning and master plan revisions, Coastal Zone Consistency review, rights-of-way and land use permits, and Historic Preservation Act Section 106 clearance.

The human environment in the vicinity of the Northstar Unit is described in Chapter 7. Potential impacts on the human environment associated with the construction, operation, maintenance, and abandonment of each project alternative are also described. The criteria used to determine if an impact on the human environment is potentially significant were developed based on the National Environmental Policy Act (NEPA) definition of significance, which requires consideration of context (as it affects society as a whole, the affected region, the affected interest, and the locality) and intensity or severity of the impact. The range of intensity included none (no impact), negligible, minor, and significant as defined in Section 1.8. The analysis of intensity considered the magnitude of the impact, the geographic extent, duration and frequency, and the probability of an impact occurring. Professional expertise and judgement were used to determine if an impact was significant. Significant impacts would require either avoidance, minimization, or demonstration that the impact are unavoidable. The text highlights design, construction, or operational features of each alternative that are principally responsible for identified impacts, or that will substantially reduce impacts that might otherwise occur.

Chapter 7 addresses the following issues related to the project's potential impacts on the human environment:

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Issues/Concerns	Section
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7.2 TRADITIONAL KNOWLEDGE

Traditional Knowledge is included in this Environmental Impact Statement (EIS) in acknowledgment of the vast, valuable body of information about the Arctic that the Inupiat people have accumulated over many generations. This knowledge contributes, along with western science, to a more complete understanding of the Arctic ecosystem. Although Traditional Knowledge has been accumulating for a much longer time than western science, it has been maintained orally and recorded sporadically. While such transcriptions have occurred coincident to various research efforts, they rarely have been focused directly on the topics of this EIS. Therefore, in this effort to collect references to Traditional Knowledge on specific topics such as weather, marine conditions, and sea ice, the results are fragmentary and in no way represent the complete body of Traditional Knowledge on these topics.

Traditional Knowledge on the human environment was obtained from testimony by village elders, whaling captains, and other citizens from the villages of Barrow, Nuiqsut, and Kaktovik at the majority of hearings on North Slope oil and gas development held since 1979. Information also was obtained through personal interviews with concerned citizens in and around the project area. Reviews of engineering studies and environmental reports associated with previous and ongoing oil and gas exploration and development activities provided a source of additional Traditional Knowledge. Published and unpublished scientific reports and data; and environmental reports and studies conducted by universities, the oil industry, federal and state agencies, and the North Slope Borough (NSB) also were used as sources for Traditional Knowledge.

Inupiat names are spelled according to the transcripts of the hearings, and some statements have been paraphrased to make the information readily understandable.

7.2.1 Subsistence

Nearly all information on subsistence comes from Traditional Knowledge. For the purposes of this discussion, Traditional Knowledge that has been included addresses the overall importance of subsistence to the Inupiat culture and the relationships between the Inupiat, the land and water, and fish and wildlife resources. The importance of the bowhead whale to subsistence and the Inupiat culture is well known; additional knowledge on bowhead whales and subsistence can be found in Sections 6.2 and 9.2.

Testimony gathered from the Native communities describes the value and importance of subsistence in their lives and is summarized in the following text. Issues and concerns related to potential impacts to the subsistence lifestyle of the Inupiat are identified.

Subsistence filters into all aspects of Inupiat culture and provides the foundation for Traditional Knowledge passed down from generation to generation. From a western perspective, a subsistence lifestyle is dependent on natural resources and the availability of food and shelter. From a cultural perspective, it has spiritual meaning that is intertwined throughout daily life and extends throughout the community.

The importance of subsistence is described in a statement by Michael Pederson, a natural resources specialist for the Arctic Slope Native Association*: "The indigenous population in the coastal communities are dependent upon subsistence resources especially marine mammals such as bearded seals, walrus, polar bears, beluga whales, several species of fish, and the most important subsistence resource of all, the bowhead whale. Several land animals are also an important subsistence resource, such as caribou as well as migratory waterfowl. It is not only from the sea in which we gather our food, but on land where we hunt caribou, moose, wolves, wolverines, muskox, and foxes. Inupiat Eskimos do not only utilize these animals for food. We use other portions of the animals as well. Bearded seal skins are used to cover our traditional whaling boats, the umiaks. The sinew from caribou is used to stitch together the ugruk skins for our umiaks. Eskimo drums are made from the membranes of livers from bowhead whales, stomach linings from walrus, and skins from caribou. The skins from caribou are also used for making mukluks. Wolf and wolverine skins are used on our parkas. Local arts and crafts are also made from other parts of the animals not used for food.*" (Barrow Public Meeting) (USACE, 1996:46-47).

The bowhead whale is among the most important elements of the subsistence lifestyle of the North Slope Inupiat and integral to their culture. The marine environment is particularly important in supporting subsistence activities. Delbert Rexford testified at the scoping meeting in Barrow that: *"What I am most concerned about is that if and when there is development that occurs, that there is sound environmental impact statements prepared, and that the indigenous peoples, namely the people that depend on the subsistence resources, the whales, the walrus, the seals, the polar bear and other marine mammals, are*

consulted with. We speak of Kaktovik, Nuiqsut, and Barrow and other coastal communities that potentially will be impacted in the future. The sea is our garden, and our elders have always stated this." (USACE, 1996:39). Edward S. Itta, a whaling captain and President of the Barrow Whaling Captains Association testified that, " … *the ocean is what holds our culture together..[and that means]...the [bowhead] whale."* (USACE, 1996:28). Bowhead whales are harvested by the communities of Barrow, Nuiqsut, and Kaktovik and annual hunting success can range significantly from community to community and from year to year (Section 7.3). Whaling success can be highly variable. A successful hunt distinguishes periods of ample food and raw materials from those years when resources are scarce and directly affects the spiritual well-being of whaling communities.

The importance of bowhead whale hunting to the subsistence lifestyle of the Inupiat is also illustrated in a statement made by Thomas Napageak, Mayor of Nuiqsut, at a public hearing in which he stated: "*The bowhead whale hunt plays an important role in the Inupiat community...Whaling remains a primary subsistence activity for Nuiqsut; however, whales are not merely subsistence issues. They are—they are the single most important animal in the North Slope socio-cultural system. Inupiat whaling is a proud tradition that involves ceremonies, dancing, singing, visiting, and cooperation between communities in sharing food. There's a—there is a high likelihood that the reduction or elimination of whaling could have severe ramifications of the socio-cultural and family network system of the Inupiat community.*" (USDOI, MMS, 1995:25).

Concerns raised during scoping on potential restrictions on access to subsistence resources and risks associated with increased travel to subsistence resources is based on more recent experience and Traditional Knowledge. Regarding potential impacts on access, Nelson Ahvakana stated: *"Like a good example is Prudhoe Bay. They say that area is open for subsistence, and it's not. It's written on paper that it is, but the actuality, you go and take a rifle over there, the first things - first thing that you are going to find out is that security's going to take care of you. They're not going to let you go anyplace, even though you say that I'm here on a subsistence hunt. They don't have any concern whatsoever about that; their concern is primarily the protection of that field, and this is exactly what is going to happen down there."* (USDOI, MMS, 1995:16).

During hearings on State Oil and Gas Lease Sale 85, Phillip Tikluk expressed concern that oil development would result in whalers having to travel further for whales and losing meat to spoilage: *"When you catch a whale, you have to cut it up before it gets bloated...the meat is no good when it gets bloated. But then (when) the oil developers start drilling around this place, then the whales and seals will be further out; (we will) have to go way out (in the ocean) in order to go hunting"* (ISER, 1983:8). In addition, whaling captains (Frank Long Jr., 1993:7 and 8) reported that whales become spooked and disturbed as a result of industrial activity and their abnormal behavior makes them more difficult to hunt.

7.2.2 Cultural/Archaeological Resources and Human History

The Inupiat have a unique culture and lifestyle they wish to retain. It is founded on traditions, practices, and beliefs passed down by generations. The importance of preserving their culture and lifestyle was illustrated by Michael Jeffrey during an offshore lease sale hearing: "*Significant stresses caused by the*

proposal on the Inupiat peoples' spirit, on their faith in traditional leadership, and on the organizations involved in their subsistence pursuits, may have a major impact on sociocultural systems. And I guess what that boils down to is a statement I would like to support, and that is, a major oil lease sale such as this would have additional major impacts on the life of the people here, from the point of view not only of their food and health but their spirit." (USDOI, MMS, 1983:73). During a public hearing for the Chukchi Sea Sale 109, Rex Okakok of Barrow stated: *"First, let me make a general statement regarding our aspirations as Inuit in the Arctic, A) we aspire to maintain our culture and be identified as distinct people, B) we continue to harvest wildlife as the basis of our culture, C) we aspire to conserve our wildlife harvest and ecosystem of which we have reliance, D) we aspire to develop socially, economically, in manners that are consistent with our aspirations, E) we aspire to look after ourselves and control our own lives."* (USDOI, MMS, 1987:33).

The importance of archaeological site preservation also has been expressed by North Slope residents. Michael Pederson stated that: *"It will be necessary to protect those archaeological sites that are known to exist on the coast near the Northstar Unit. Protection of these sites is necessary. We, the Eskimos on the North Slope are still learning about our past history, which is not in written form."* (USACE, 1996:55).

Potential restriction to access in the vicinity of oil field facilities can also affect use of cultural sites and Inupiat sense of place in relationship to the land. Alice Woods spoke on this subject: *"Like my mother was raised at Prudhoe Bay by Niakuk....That is the house my Grandpa built. We can't even camp there."* (USACE, 1996:58). Sarah Kanaknanah was raised in the area around Prudhoe Bay and the barrier islands; when she returned to Kanigliq in recent years: *" ... the pingoes used for duck blinds are now burning pits; the fishing and camping spot is now a barge landing dock. These places are threatened by development."* (USDOI, MMS, 1979). According to Besse Ericklook: *"The [barrier] islands have historic and cultural importance. Pingok Island has whalebones and old ruins."* (USDOI, MMS, 1979).

7.2.3 Land and Water Use

Traditional land use on the North Slope is based on subsistence activities directly linked to land and water use and the knowledge necessary to use the natural resources of the region. Hunting, fishing, and gathering berries and greens require knowledge of the environment and provide a spiritual connection with the land and sea.

The relationship between Traditional Knowledge and land and water use is illustrated by a statement made by Thomas Napageak when he was Mayor of Nuiqsut: *"I was born here in the Arctic Slope, and I have traveled and hunted throughout this region. Because of my lifelong experiences, I know about our environment and the wildlife population. I am fortunate to have learned from my ancestors their knowledge which they gained through years of living in our Arctic homeland…Above all, our priority is to protect our environment. The land from the Brooks Range to the edge of the shorefast sea ice is most sacred to the Inupiat. It provides us with nourishment for our bodies and culture…We here in Nuiqsut, by*

our own personal choice, left homes and jobs in Barrow to return to our ancestral lands to live in tents like our grandparents and to live off the land. We re-established an area which has always been used by our people. The land and coastal region provides us with our subsistence which is the foundation of our culture. We cannot live without our Native food, nor would we want to if we could…I have a responsibility to my land, my ancestors, and my children and their children to protect the environment which gave birth to the Inupiaq Culture." (USDOI, MMS, 1979:1-4).

Residents of Nuiqsut have historically used the area of oil field development east to the Sagavanirktok River, but have used it less due to a variety of reasons, including restrictions on access or physical changes to traditional use areas (Nelson Ahkvakana, in Section 7.2.1 and Sara Kanaknanah in Section 7.2.2). Thomas Napageak talked about traditional fishing areas: *"Oliktok, that's number one, that's where they used to fish during the month of August...All these points, all the way to Beechey Point. Those are the points they used to do a lot of fishing."* (Pers. Comm., Nuiqsut Whaling Captains Meeting, August 14, 1996:16).

7.2.4 Socioeconomics

The subsistence lifestyle of the Inupiat and socioeconomic pressures from the west can be conflicting forces on the people of the North Slope. Traditional ways of life have changed for many residents and feelings among residents are mixed, yet, for some like Thomas Napageak who stated his preference for living in Nuiqsut, the subsistence lifestyle is preferable to the alternative. For others, the availability of jobs is paramount.

This conflicting socioeconomic view was expressed by Leonard Lampe of Nuiqsut during a public meeting for this project in Nuiqsut, who stated: "*...they need to think about their future as well in jobs and this might be the answer, but it might not be-- you know, it's a very hard decision to make. But I don't want to be the one to explain to their children or my children if there is no more culture, no more whaling. And we all know that the whaling is the base of our culture...*" (USACE, 1996:28).

Use of revenues generated from oil and gas development to compensate for subsistence and cultural impacts was discussed by several people in public meetings. Michael Pederson, a natural resources specialist for Arctic Slope Native Association, stated at a 1996 public meeting in Barrow: "*Impact funds should be made available to those communities located in the Beaufort Sea where oil and gas development is being proposed, and oil and gas lease sales will occur. Impact funds can be used to compensate communities for the possible loss of subsistence resources, as well as other potential impacts to the sociocultural and socioeconomic structures of these communities. Most communities on the North Slope survive on a mixed cash/subsistence-based economy. Subsistence is one way of putting food on the table for most residents where job opportunities are few. Impact funds should be made available as soon as possible.*" (USACE, 1996:58).

7.2.5 Transportation

Traditional Knowledge of the Inupiat includes travel to areas traditionally used for hunting, fishing, and

gathering berries and greens. The subsistence lifestyle is dependent upon Traditional Knowledge, including knowledge of travel routes, terrain, and weather patterns. Hunting, fishing, and gathering requires knowledge of migratory and seasonal growing patterns and an awareness of environmental indicators that relate to these resources.

Testimony gathered for this project in 1996 from Nuiqsut residents expressed their desire for the oil industry to respect their right of access to culturally important resources, subsistence use areas, and traditional use areas. These areas also include historically and personally valued places, such as cemetery sites, Native Allotments, sacred sites, and home sites (Section 7.2.2).

7.2.6 Visual/Aesthetic Characteristics

Traditional Knowledge was given at public meetings for this project regarding visual and aesthetic characteristics and addressed incorporating project design with the environment and minimizing visual impacts on both wildlife and village residents. Concern regarding the visual and aesthetic characteristics has also been expressed at meetings for earlier development projects and in interviews with Inupiats regarding oil development.

At the scoping meeting in Nuiqsut, Leonard Lampe stated: *"I am concerned about a few things like if we are going to have flames out on the project....because it makes whales more spooked and more dangerous for the crews...I want to make sure if there are going to be any flames out there as well as discolorization to the environment, different colors. Also lighting, beams on the project as well. We are concerned...we would like you to try to make it [the project] as close as you can to the environment."* (USACE, 1996:24).

Ruth Nukapigak was one of the 128 people to re-settle in Nuiqsut in 1973. She had been born and raised in the area but had moved to Barrow. She longed to return to the place of her birth. In an interview on August 12, 1982, she stated: "*With all our might, we do not want [oil development] to have the land, especially the beautiful areas. Areas that should never be torn up. The areas that are most pleasing to my eyes, the most beautiful, are places [where the birds nested] in front of POW II, the islands. These are the ones that I do not want to be disturbed."* (Kruse et al., 1983:19).

7.2.7 Recreation

Traditional recreation activities of the Inupiat are interwoven into their subsistence lifestyle and culture and contribute to the social and emotional well-being of the community. Recreation cannot be described in "western" context because it is based on the subsistence lifestyle of the Inupiat. Many traditional games practiced during winter evolved through a need to maintain physical strength and agility required for hunting. Celebrations by the community typically result from hunting success, particularly bowhead whales.

7.2.8 References

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7.3 SUBSISTENCE

7.3.1 Affected Environment

The Inupiat Eskimo have inhabited the Arctic coast of Alaska for over 4,000 years and continue to practice a subsistence lifestyle of resource harvesting based on close interaction with the environment. Subsistence is central to the Inupiat culture. Many factors have converged over time which affect the success of resource harvesting. Harvesting practices are influenced by natural variability of resource populations, new hunting technology, economic forces, and governmental policy. Policy decisions by the state and federal government have resulted in restricted access to resources.

This section describes the subsistence lifestyle of Barrow, Nuiqsut, and Kaktovik residents. It addresses subsistence use of the bowhead whale and caribou, which are the primary subsistence resources likely to be affected by routine project construction, operations, maintenance, or abandonment. Although other resources, such as fish, seal, and waterfowl, are harvested by and important to the communities, biological data (Chapter 6) indicate that they are either not present in the area of consideration or would not be harvested from the area of consideration in large numbers. However, marine mammals (including bowhead whales), fish, and waterfowl could be affected in the event of an oil spill. Effects on subsistence from an oil spill are discussed in Chapter 8.

North Slope Inupiat culture, like other Alaska Native cultures, is characterized by the central importance of harvesting, processing, distributing, storing, and consuming wild foods (SRB&A and PJUCS, 1993:3-5), and the ability to utilize the resources around them for clothing, shelter, fuel, and ceremonial items. Within a culture based on the harvest of wild resources, the most significant beliefs and values revolve around three fundamental relationships: 1) the relationship between humans and the environment (including wild resources), 2) the relationship among human beings, and 3) the relationship between the people and their ancestry. The importance of the first two relationships stems from the fact that humans are dependent upon one another and their environment for survival. The third relationship demonstrates the knowledge and skills passed from generation to generation and the belief that those who came before knew the correct and proper way to live. The goal of subsistence is to maintain these relationships by harvesting in a manner respectful to the environment while accumulating resources that can be shared with other members of the community. Successful subsistence, then, is not only the harvesting of resources by an individual for their own use but includes the distribution of those resources through a network of social ties anchored by kinship.

7.3.1.1 Overview of Subsistence Harvesting

The populations of Barrow, Nuiqsut, and Kaktovik are predominantly Inupiat. In 1993, Barrow (the governmental hub of the NSB) had a population of 3,908, of which 61 percent (%) were Inupiat. The

population of Nuiqsut in 1993 was 418, of which 91% were Inupiat. The Kaktovik population was 230, of which 84% were Inupiat. All three communities practice a subsistence lifestyle that is heavily dependent upon marine mammal hunting (especially bowhead whaling), caribou hunting, and fishing (Harcharek, 1994:BRW-1, KAK-1, NUI-1).

The Inupiat harvest a variety of resources depending upon the season and accessibility of resources; harvest patterns vary by individual communities (Figure 7.3-1). Some harvesters concentrate on one specific type of resource; others harvest a wide variety of resources throughout the year. Harvesters must be flexible and opportunistic, adapting to circumstances and available resources. Harvested resources are typically shared within families, within communities, and between communities.

A 1993 census of households found that 44% of Barrow households, 62% of Nuiqsut households, and 66% of Kaktovik households obtained half or more of their total meat consumption from resource harvesting (Harcharek, n.d.:BRW-34, KAK-32, NUI-32). Approximately 68% of Barrow households, and 90% and 89% of Nuiqsut and Kaktovik households, respectively, participated in subsistence activities. Participation in subsistence activities is identified by community and major subsistence resource category in Table 7.3-1. Of the 49 Nuiqsut households that reported a successful harvest from July 1, 1994, to June 30, 1995, 100% reported that they shared part of the harvest (Brower and Opie, 1997:9). Of the Nuiqsut total harvest instances reported for that study period, 87% resulted in sharing (Brower and Opie, 1997:9).

Communities on the North Slope maintain a mixed cash/subsistence economy that includes employment by government (federal, state, borough, and city), village and Native regional corporations, tribal councils, and private enterprise. Essentially, subsistence resources provide the staple of meat, fish, and fowl in the diet while income earned through employment is used to provide housing, heat and other basic living expenses, and to support subsistence activities (Kruse, 1991:317-326; Pedersen, 1995b:XXII-7).

For a detailed discussion of the cash economies of the NSB and its communities, see Section 7.6.1.

Barrow: Primary subsistence resources in Barrow have been the bowhead whale, bearded seal, caribou, fish, and migratory waterfowl, especially the king and common eider. Secondary resources have been the beluga whale, other seal species, walrus, polar bear, moose, furbearers, ptarmigan, and flora (NSB, 1979:14). In terms of useable pounds of subsistence resources harvested between 1987 and 1990, marine mammals contributed 55% of the useable subsistence resources. Terrestrial mammals contributed 30% of the subsistence resources, fish contributed 11%, and birds contributed 3.5% (SRB&A and ISER, 1993:63).

Nuiqsut: Primary subsistence resources in Nuiqsut have been bowhead whale, caribou, freshwater fish, and ocean fish. According to a recent harvest study in Nuiqsut, 49 (60%) of the 82 households surveyed reported that they harvested wildlife resources during the study period of July 1, 1994, to June 30, 1995 (Brower and Opie, 1997:8). Of the 71 Nuiqsut households interviewed, 76% reported that they attempted to harvest subsistence resources during the study period. During 1993, the community harvested approximately 76,400 pounds of whitefish, including broad whitefish, least cisco, and Arctic cisco, which totaled approximately 84% of their total fish harvest (Braund, 1997:84). Secondary resources have been

beluga whale, seal species, moose, polar bear, furbearers, migratory waterfowl, ptarmigan, and flora (NSB, 1979:14). Nuiqsut subsistence harvests were studied for the 1992/1993 season, which was characterized by high rates of use and participation. Of all households surveyed, 100% used subsistence resources, while 94% attempted to harvest and 90% successfully harvested a subsistence resource. More than 77% of households that participated in the

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study hunted for game and almost 81% fished (Pedersen, 1995b:XXII-12). Fish contributed 34% of the total pounds of harvested subsistence resources, marine and terrestrial mammals each contributed 33%, and birds and other resources constituted the remainder.

In the 1994/95 harvest period, terrestrial mammals (caribou and moose) accounted for 69% of the edible pounds of subsistence harvest by Nuiqsut hunters, fish accounted for 25%, birds for 4%, marine mammals for 2%, and plants for less than 1% (Brower and Opie, 1997:26). The considerably higher proportion of terrestrial mammals (69% in 1994/95 versus 32% in 1992/93), and the lower proportion of marine mammals (2% in 1994/95 versus 32% in 1992/1993) is likely the result of Nuiqsut hunters not landing any bowhead whales in 1994/95, whereas they harvested two bowheads in 1992 and three in 1993. Although Nuiqsut hunters generally harvest a variety of marine mammals, (e.g., bowhead and beluga whales, bearded seal, ringed seal, spotted seal, and polar bear), they only harvested ringed seal and polar bear in 1994/95 (Brower and Opie, 1997:28).

Although caribou accounted for 48% of the edible pounds of the 1994/95 Nuiqsut harvest, the 249-animal harvest was low compared to the 1985, 1992, and 1993 harvests (Brower and Opie, 1997:26). Nuiqsut hunters attributed this to the long distance they had to travel to harvest caribou, the effect of increasing musk ox that deter caribou away from hunting areas, and restrictions to traditional subsistence land use areas due to oil and gas exploration and development (i.e., areas used 10 years ago for hunting and fishing may have restricted access today due to being within development and exploration areas) (Brower and Opie, 1997:30).

The months of the highest caribou harvests were October and July in 1994/95, with the lowest harvests in May and June. This varies from the seasonal round presented on Figure 7.3-1, where April/May and August/ September were the primary months related to caribou abundance, hunter access, seasonal needs, and desirability. The months of the highest bird harvests in 1994/95 were April, May, and June, with no harvest during other months (Brower and Opie, 1997:12). In 1994/95, ringed seals were harvested in April, June, July, and August, which generally corresponds to the March/April and August/September time periods presented on Figure 7.3-1.

Kaktovik: Primary resources for Kaktovik residents have been bowhead whale, caribou, dall sheep, migratory waterfowl, and both freshwater and marine fish. Secondary resources have been beluga whales, seals, polar bears, moose, furbearers, ptarmigan, and flora (NSB, 1979:14). Fishing was the most common subsistence harvest activity with 81% of all households participating in fishing and 94% consuming fish. In terms of total pounds of subsistence resources harvested, composition of the overall harvest by major resource category shows marine mammals contributed the largest component (68%), followed by terrestrial mammals (17%), fish (13%), and birds and other resources (2%) (Pedersen, 1995a:XXI-6).

Bowhead Harvest Data: Recent harvest data (1964 to 1995) from Barrow, Nuiqsut, and Kaktovik whalers (Table 7.3-2) indicate bowhead harvesting success to be highly variable, ranging from no whales taken in

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Barrow in 1982 to as many as 23 at Barrow during 1976 and 1993. Nuiqsut harvest records began with the re-establishment of the community in 1973, and harvests have ranged from no whales to 4 per year; almost one-half of the annual hunts from 1973 through 1995 were unsuccessful in landing whales. Bowhead harvesting at Kaktovik also has been variable, ranging from no whales to 5 per year. In 1995, the whale strike quotas for Barrow, Nuiqsut, and Kaktovik were 22, 4, and 3 respectively. Recent Alaska Eskimo Whaling Commission (AEWC) data indicate that 45 whaling captains operate from Barrow, 10 operate from Nuiqsut, and 9 operate from Kaktovik, which may indicate that many whaling crews are unsuccessful. The relatively high number of landings reported from Barrow is likely to be a reflection of a two-season hunt and greater numbers of participants.

7.3.1.2 Factors Affecting Subsistence Activities

The success of subsistence harvesting is influenced by meteorology, ice and sea conditions, availability of game, species population cycles, industrial activities, and political and economic forces. Federal and state policy decisions have affected the way in which Alaska Natives pursue subsistence activities.

The Alaska Native Claims Settlement Act (ANCSA) (43 U.S.C. 1601, et seq.) in 1971, was passed with the intent to resolve aboriginal land claims and hunting and fishing rights of Alaska Natives in exchange for 44 million acres of land and $962.5 million (Freeman and Carbyn, 1988:56). ANCSA more clearly defined protection of subsistence resources and the responsibilities of both state and federal governments. Bowhead whales became protected under the Marine Mammal Protection Act of 1972 (16 U.S.C. 1388, et seq.) and the National Marine Fisheries Services became responsible for implementing and enforcing regulations regarding protection of the species. Local participation in management of bowhead whales was provided through a cooperative agreement between the National Marine Fisheries Services and the AEWC.

Passage of the Alaska National Interest Lands Conservation Act (16 U.S.C. 3101, et seq.) in 1980, was the first attempt at co-management of subsistence resources. This statute sought not only to protect natural resources and subsistence harvest opportunities on federal lands, but also sought to establish an administrative structure for management of public lands which would enable “rural residents who have personal knowledge of local conditions and requirements to have a meaningful role in the management of fish and wildlife and of subsistence uses on the public lands in Alaska” (ANILCA, Sec. 801(5)).

Bowhead Whales:

Historical Factors: Whaling was conducted by the Inupiat people using traditional methods until the mid-1800s, when American commercial whalers first arrived in the Alaskan Arctic. Traditionally, whaling was a community effort with many crews involved in the harvest, and the products distributed to the entire village. Only the number of whales which could be effectively harvested and consumed were taken. This form of cooperative hunting was efficient and reliable, produced a rich spiritual and ceremonial association with the bowhead, and acted as a conservation tool helping to ensure the stability of the bowhead population (Huntington, 1989:7-8).

This system was drastically changed in 1848 when commercial whalers began using weapons and techniques that made hunting more effective. Commercial whalers were concerned principally with harvesting the most whales, whose oil and baleen produced great profit. As a result, whale stocks were decimated. Commercial whalers began taking walrus when the whales became scarce and the walrus population was reduced so drastically that villages dependent upon walrus for meat starved during the winter (Huntington, 1989:9). Subsistence whaling efforts returned to low levels at the end of the commercial whaling era in the 1920s due to declines in bowhead numbers and the Eskimo population.

By the 1970s Alaskan Eskimo whale harvests had begun to increase from average annual catches of approximately 12 from 1910 though 1969 to 32 between 1970 and 1977 and there was concern that the species would become over-harvested (Huntington, 1989:13). Based on the level of subsistence whaling activity and erroneous estimates which numbered the bowhead whale population between 800 and 2,000 animals, the International Whaling Commission (IWC) voted in 1977 to ban aboriginal hunting rights to the bowhead whale.

In response, Eskimo subsistence whalers established the AEWC to fight the ban, organize the whaling communities, and manage the hunt themselves. A special meeting of the IWC in December 1977, resulted in a 1978 quota of 18 whales struck or 12 whales landed, which was later amended to 20 struck or 14 landed to accommodate fall harvesting. Certain that IWC population estimates were too low, the AEWC called for additional scientific studies. A cooperative management agreement was signed between AEWC and the National Oceanic and Atmospheric Administration in 1981, which places enforcement responsibility of IWC-set quotas with the AEWC (Huntington, 1989:35). Table 7.3-3 lists the IWC quota and harvest data from 1978 to 1991 for the ten villages that engage in subsistence whaling in Alaska. Based on an improved methodology, as suggested by subsistence whalers, bowhead whale population estimates have increased steadily since 1978. Shore-based visual surveys conducted at Point Barrow from 1978 through 1983 yielded a population estimate for that period of about 3,500 to 5,300 animals (Zeh et al., 1993:479). Revised estimates of population size, based on visual and acoustic data collected during the 1993 census off Point Barrow, indicate that the most probable size of the 1993 population was 8,200, with a 95% probability that the population was between 7,200 and 9,400 (Zeh, et al., 1996:1). This estimate was recognized by the IWC and is more in line with recent reports from local Inupiat people.

Prior to implementation of the first IWC quota for the 1978 bowhead whaling season in Alaska, Alaska Eskimos had no external control on the number of bowhead whales they could harvest. If whales were struck and lost, hunters continued hunting until they harvested what they needed for their families and community. With the implementation of the IWC quota, the categories of landed whales and struck and lost whales became monitored, and are assumed to be eliminated from the whale population.

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The AEWC monitors the annual efficiency rate (the percentage of whales landed in a year from the total quota for that year) and reports it to the U.S. Government and the IWC. Whales that are struck and lost lower the efficiency rate for that year. When the IWC periodically reviews the Alaska bowhead subsistence quota, it considers the efficiency rate in determining the quota for future years. Declining or low efficiency rates are not viewed favorably by the IWC and tend to have a negative effect on the quota determination for upcoming years. Any activity or practice that results in a lower efficiency rate tends to work toward a lower quota in the future. The AEWC and the Alaska bowhead whalers work diligently toward increasing their efficiency rate.

Environmental Factors: The bowhead whale migration is affected by meteorology, ice and sea conditions, and availability of food. The Beaufort Sea spring migration is in an easterly direction during late-April to early-June; whereas fall migration to the west extends from late-August to early-October (Figure 6.9-1). The fall migration is more leisurely with some localities being used as staging areas due to abundant food resources (W. Bodfish in NSB, 1981:296). Prevailing winds affect leads by holding them open or affecting the density of the sea ice. Whales tend to migrate closer to shore in light ice years compared to years with dense ice (George et al., 1995:378). Clear leads allow better access to migrating whales and probably more efficient recovery of struck whales (George et al., 1995:379). During years when fall storms push ice against the barrier islands in the Alaskan Beaufort Sea, whales have been known to migrate south of Cross Island, Reindeer Island, and Argo Island where the swimming is easier (T. Brower Sr. in NSB, 1980:107).

This natural variability can affect where whales are encountered and harvested on a year to year basis. When whalers must travel farther to harvest whales, costs associated with the hunt, danger of being caught in bad weather, and the risk of meat spoilage all increase.

Bowhead whales have been hunted for at least two millennia at the same sites and with the same basic hunting methods, which suggests that the effects of harvesting have not caused the basic migratory behavior to change over time (George et al., 1996:1). However, noise is known to affect migratory patterns and behavior. Studies of bowhead whales indicate that industrial noise may cause behavioral changes at distances of as much as 6.2 miles (10 kilometers [km]), and deflection behavior at ranges of 0.5 to 14 miles (1 to 23 km), although most deflections occurred at less than 6.2 miles (10 km) (George et al., 1996:5). Other studies have found avoidance behavior at a range of 1 to 9 miles (1.6 to 14.5 km) from small boats and vessels (Richardson et al., 1995a:268; Richardson et al., 1985a:116; Koski and Johnson, 1987:59-61; LGL and Greenridge, 1987:47; and Ljungblad et al., 1985:45). This is consistent with observations by whaling captains that scatter behavior from an outboard motor occurs within 3 miles (4.8 km) (T. Brower, Sr. in NSB, 1980:107). Davis et al. (1985:64) observed an unknown number of whales present around a gravel island used for drilling at a distance between 1.6 and 3.8 miles (2.6 to 6 km); however, other factors regarding this observation are unclear.

Whaling captains (Frank Long Jr., 1993:7 and 8) reported that whales become spooked and disturbed as a result of industrial activity and, hence, are more difficult to hunt due to their abnormal behavior. Local testimony indicates that it takes at least two weeks before the normal bowhead whale migration route is re-established after a disturbance (B. Rexford in USACE, 1996:62). Whalers have also noted that when

industrial activity in the Alaskan Beaufort Sea is high, harvest success is low and quotas are not easily met (J. Ningeok in USDOI, MMS, 1986:16; F. Long, Jr. in USACE, 1996:34; B. Oyagak in USDOI, MMS, 1986:11; J. Kaleak in MBC, 1996:69; T. Napageak in USDOI, MMS, 1995a:8).

Seismic exploration activity is of particular concern, and whaling crews have observed migration diversions of up to 40 miles (64 km) as a result of seismic noise (T. Napageak - Pers. Comm., Nuiqsut Whaling Captains Meeting, August 13, 1996:16). Monitoring results during a fall 1996 seismic survey within and around the Northstar Unit found that the migration band tended to narrow and shift approximately 6.2 miles (10 km) further offshore during operations (Richardson, 1997:5-52).

Caribou: Caribou winter in the foothills of the Brooks Mountain Range and move to the calving grounds on the open tundra in late April to early June. Bulls, yearlings, and non-pregnant cows join the cows and newborn calves in mid to late June. Calving occurs particularly in the Kuparuk River delta calving area and the Canning River Delta (Figure 6.8-1) with the majority of calving occurring within 24 miles (39 km) of the coast. Calving does not typically occur within the developed oil fields between Kuparuk and Sagavanirktok Rivers (Whitten and Cameron, 1985:10). The Kuparuk calving area location has shifted slightly to the west-southwest in 1987 through 1990 in response to construction of the Milne Point Road.

Early summer marks the arrival of insect season for the caribou, causing migration from the inland to the coast (Pollard and Noel, 1994:44). As insect harassment abates, the caribou return to inland feeding grounds.

The Central Arctic Herd has been extensively studied since the early 1970s due to concerns that oil field development has caused displacement. Hunters in Kaktovik have testified frequently that caribou are less abundant (N. Solomon in USDOI, MMS, 1979:16; J. Ningeok in USDOI, MMS, 1982:28; I. Akootchook in USDOI, MMS, 1990:10). Changes in caribou population during the 1970s and 1980s indicate that such fluctuations are part of herd population dynamics and may not be attributable to human intervention.

The population of the Central Arctic Herd currently is beginning to decline following an increase of 15% from 1978 to 1983 and a 5% increase from 1983 to 1994. The decline rate from 1994 to 1995 was 5% (Cameron et al., 1994:3).

7.3.1.3 Access to Subsistence Harvest Areas

Harvest Area: Subsistence harvest areas used by residents of Barrow, Nuiqsut, and Kaktovik include a large part of the project area (Figure 7.3-2). The Colville River, its tributaries, and Harrison Bay are hunted by Barrow and Nuiqsut residents; the area from the Colville River to Prudhoe Bay is hunted by residents from Nuiqsut and Kaktovik and both Nuiqsut and Kaktovik residents use areas east of Prudhoe Bay. Areas used by all three communities extend inland to the Brooks Range.

Use areas for bowhead whales and caribou (Figures 7.3-3 and 7.3-4, respectively) are expansive, since different villages or sites would be used at different times of the year in response to different subsistence resource availability. It was typical for people to move from one living site to another during the year and to settle in different villages over the course of their lives (IAI, 1990a:1-4). With the formation of permanent villages, the arrival of modern technology, motorized access to outlying resource areas, and the development of mixed wages/subsistence economies, residents continue to use broad harvest areas, although the time spent in these areas may be reduced.

With modern technology, hunters are able to travel to historic harvest areas in less time; technology has not led to a reduction in area used, it has made it more efficient to travel to key areas. Furthermore, technology has enabled North Slope residents to travel to distant traditional use areas for seasonal occupation while maintaining permanent residence in their community. Comparing the 1987-90 Barrow subsistence sites (SRB&A and ISER, 1993:43) and the Barrow key informant hunting areas from 1990 (Braund, 1997) with Barrow lifetime community harvest areas (Pedersen, 1979:10), indicates that Barrow hunters in the late 1980s continued to use the broad areas. Furthermore, modern technology (powerful outboard motors and aluminum boats) has substantially increased the Barrow fall bowhead whaling hunting area in recent decades (ACI et al., 1984:200) and modern whalers travel as much as 30 miles (48.2 km) or more offshore.

In some cases, there has been a reduction in accessible hunting areas by the construction and gradual expansion of the oil development "footprint" at Prudhoe Bay (J. Nukapigak and H. Rexford - pp. 9 and 21, respectively, in Kruse et al., 1983). In other cases, hunters claim they have to go further, or it is harder to harvest bowhead whales in the fall, due to seismic activities and oil development (P. Tikluk in ISER, 1983:8; F. Long, Jr. in USACE, 1996:34; D. Rexford in USACE, 1996:40-41).

Barrow Harvest Areas: Barrow hunters use an area from Wainwright to the southwest and to the Colville River Delta to the southeast. The majority of coastal travel is from Peard Bay to Admiralty Bay. Coastal areas are extensively used throughout summer and fall, and to a lesser extent in winter and spring. During 1990, Barrow residents utilized 80 to 90 inland cabins for subsistence hunting and fishing. Spring whaling is conducted from temporary campsites established on the seaward edge of the shorefast ice.

Nuiqsut Harvest Areas: Nuiqsut hunters use areas which range from Cape Halkett (at the northwest end of Harrison Bay) to Flaxman Island, extend south to the Brooks Range, and north approximately 30 miles (48 km) offshore (IAI, 1990b:1-5). Prime caribou harvest areas are essentially the same for both summer and winter harvests: along the coast from Cape Halkett in the west to Oliktok Point in the east (IAI,

1990b:1-16) (Figure 7.3-5). During the winter, the eastern limit is typically the boundary of the Kuparuk oil field.

Cross Island is an offshore site of particular importance, as it is used as the base camp for fall whaling by Nuiqsut hunters. Although Nuiqsut's first two landed whales (1973 and 1982) were struck near Flaxman Island, between the early 1980s and 1998, all reported whale sightings and strikes are bounded by a core whaling area around Cross Island from the Midway Islands to Bullen Point (IAI, 1990b:1-28) (Figure 7.3-6). Due to logistical considerations and migration patterns, it would be unusual to strike a whale outside of this area as the tow to the base camp would simply be too long.

Kaktovik Harvest Areas: Kaktovik residents use an area from Tigvariak Island to the Canadian border, inland to the Brooks Range, and approximately 20 miles (32 km) offshore (IAI, 1990a:1-30). Most caribou harvesting is in an area between the Canning River and Griffin Point/Pokok Lagoon (IAI, 1990a:1-13). Summer and winter use areas in 1990 are shown on Figure 7.3-7.

Fall whaling takes place using the village as a daily home base. The core area for Kaktovik bowhead whaling extends from the Okpilak and Hulahula Rivers in the west to Tapkaurak Point in the east, and 20 miles (32 km) out to sea (Figure 7.3-8). Nearly all whales caught since 1964 have been from this core area (IAI, 1990a:1-20 through 1-21). The extreme limits of the middle of Camden Bay in the west and the mouth of the Kogotpak River in the east are the logistical limits of towing a whale to Kaktovik before spoilage.

7.3.2 Environmental Consequences

Environmental impacts to subsistence harvesting have been evaluated for those resource species that would be affected by construction, operation, maintenance, or abandonment of each project alternative. This analysis applies information about species population dynamics, migration patterns, species reaction to impact events (i.e. noise), harvest information, harvesting areas, harvesting methods, access to harvesting areas, and project-related actions that would represent a potential impact to resources. Subsistence species that are most likely to be affected by project construction, operations, maintenance, or abandonment are limited to the bowhead whale and caribou. Impacts from Alternatives 2, 3, 4, and 5 are presented and summarized in Table 7.3-4.

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Figure 7.3-3 (page 1 of 2)

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Figure 7.3-4 (page 1 of 2)

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Figure 7.3-7 (page 1 of 2)

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Table 7.3-4 (page 1 of 3)

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7.3.2.1 Alternative 1 - No Action Alternative

Subsistence harvesting is expected to continue to be important to the lifestyle of Barrow, Nuiqsut, and Kaktovik residents, regardless of the alternative selected. Bowhead whaling and its cultural importance, the harvesting of other important subsistence species, and the use of subsistence products have evolved through thousands of years and will continue. Harvesting techniques are likely to continue to evolve, utilizing new equipment, technology, and methods to improve hunting and travel efficiency as they become available. Acquisition of new types of equipment would continue to be possible through continuation of the mixed wage/subsistence economy and the availability of sufficient personal income for such expenditures.

Oil field development within the North Slope is likely to continue, regardless of development of the Northstar Unit. Bowhead whale harvests in Nuiqsut and Kaktovik have been variable and in many years "unsuccessful." Such variability in harvest success is likely to continue regardless of project development. Therefore, impacts related to subsistence harvesting as a result of the No Action Alternative are not anticipated.

7.3.2.2 Alternatives 2, 3, 4, and 5

Impacts to subsistence resources and the subsistence lifestyle resulting from project construction, operation, maintenance, and abandonment under Alternatives 2, 3, 4, and 5, are discussed below. Alternatives 2, 3, 4, and 5 all use Seal Island and differ in onshore and offshore pipeline locations and lengths. Impacts to subsistence harvest resources (bowhead whale and caribou) within the project area would not differ among alternatives.

Construction Impacts: Subsistence resources most likely to be affected by construction activities are the bowhead whale and caribou. Although local residents harvest several species of marine mammals, terrestrial mammals, fish, and birds, harvesting has not been permitted within the Prudhoe Bay industrial complex since the 1970s. Available data indicate that harvest activities in the offshore portion of the project area are associated with travel through the area. A review of harvest areas used by residents of Barrow, Nuiqsut, and Kaktovik indicates that current subsistence activities are more focused in an area closer to existing communities, compared to the larger historic use area boundaries. However, more distant areas have been traditionally used and may be used in the future, depending on the distribution of fish and wildlife resources.

Among the three Alaskan Beaufort Sea communities, spring harvesting of bowhead whales during this west to east migration is only practiced by Barrow residents, and occurs approximately 150 miles (241 km) to the west of the project area. Construction activities that occur in the spring are not expected to impact the migration patterns or subsistence harvest success of the bowhead whale during the Barrow spring hunt. There is a chance that the noise associated with fall construction activities could impact the fall whale subsistence harvest of Nuiqsut residents who utilize Cross Island as a base camp. However, fall construction activities are intentionally scheduled so as to not include activities that produce relatively high levels of underwater noise. Kaktovik is located to the east of the project area, and no impacts to the

Kaktovik fall bowhead harvests are expected.

Fall whale sightings in the vicinity of the project area from 1980 through 1995 are depicted on Figure 6.9-2. Miller et al. found mean migration pattern distances from Seal Island to range from 13 to 22 miles (21 to 35 km) during light ice years and 32 to 40 miles (52 to 64 km) during heavy ice years (Miller et al., 1996:35); however, whales have been seen migrating south of Cross, Reindeer, and Argo Islands when fall storms push ice against the barrier islands in the Alaskan Beaufort Sea (T. Brower in NSB, 1980:107). The core harvest area from mid-1980s to 1990 for Nuiqsut whalers encompasses an area approximately 10 miles (16 km) to the west of Cross Island, 40 miles (64.4 km) to the east, and 30 miles (48.3 km) north (Figure 7.3-6). Seal Island is approximately 17 miles (27.4 km) to the west of Cross Island.

While the majority of construction activities are scheduled to be completed in the spring and summer months prior to the bowhead western migration, some activities could continue into the fall months when the migration is taking place. Construction activities that would take place during the fall and potentially coincide with the fall bowhead migration (late August to early October) of the first year include grading gravel on Seal Island, the installation of filter fabric and slope protection, preparation for and off loading of modules, module installation and hook-up, and drilling rig mobilization. The resupply of drilling consumables by boat and helicopter would take place during the fall of the second year and drilling and well completion would be ongoing during three fall seasons.

Although noise generated from such activities would be variable and dependent upon the types of vessels and equipment used, ocean-going tugs are likely to elicit the greatest reaction from migrating bowheads. Tugs can emit high levels of underwater noise at low frequencies. Tugs are one of the loudest types of vessels, so their sounds could travel farther than other vessels. In August 1985, underwater noise was recorded from two tugs that were keeping a barge pressed against a loading ramp at Sandpiper Island. An underwater sound level of 163 decibels (dB) in the 20 to 1,000 hertz band was recorded at a distance of 0.3 miles (0.5 km) (Miles et al., 1987:106). Peak noise levels (118 dB) in the 20 to 1,000 hertz band were noted at a range of 1 mile (1.6 km) when tugs and barges were present at Seal Island (Davis et al., 1985:61).

Avoidance reactions of bowhead whales to small boats have been observed at distances up to 2.5 miles (4 km), but most reactions have been observed at ranges of less than 1.2 miles (1.9 km), often when measured levels of underwater noise were less than 90 dB in the 1/3-octave band of maximum noise (Richardson et al., 1985a). The negative response is probably learned by association at these ranges and sound levels, and the animals probably represent the more sensitive segment of the population. The most overt responses are those for whales observed within 0.6 miles (1 km) of an approaching vessel. Whales usually avoid the approaching vessel by trying to outswim it, and response is probably mediated more by the rate of increase in the noise, level than by the absolute received level. If overtaken, the whale will turn to swim away from the path of the vessel. These animals probably represent the segment of the population that is less sensitive to vessel noise, since they are the animals seen closest to vessels. Whales tend to show little response to vessels that move slowly and are not heading toward them (Richardson et al., 1995a:268-270).

Small vessels are, however, more likely to be present than tugs and larger vessels. Observations from whalers and data from studies indicate that deflection from small vessels is likely to occur between 1.2 to 6 miles (2 to 9.7 km) (T. Brower, Sr. in NSB, 1980:107; Ljungbald et al., 1985:45; Richardson et al., 1985a:116; Koski and Johnson, 1987:59-61), which would be outside the Cross Island harvest area. Whales near the western boundary of the Nuiqsut harvest area are not expected to be affected by small vessels operating at Seal Island. Therefore, there is little likelihood that some whales in this area would be unavailable to hunters, but the overall effect of small vessel operations on the harvest is expected to be minor.

Inupiat hunters have also reported that bowheads are frightened by vessel noise and that bowheads would avoid approaching vessels that are attending a drilling vessel. The direct relationship of avoidance is further demonstrated by observations that whales are not present when vessels are present, but return in the absence of vessel operations. The avoidance response is such that whales have been observed to travel as far as possible from ship activity (A. Brower in USDOI, MMS, 1986:52; J. Ningeok in USDOI, MMS, 1986:16).

Bowheads respond to boats by spending less time at the surface, taking fewer breaths when surfacing, and changing swimming speed and direction. These types of reactions were evident at distances of at least 2.5 miles (4 km) from the vessel (Richardson et al., 1985a:116; Koski and Johnson, 1987:59-61). The underwater noise levels to which the reacting animals were exposed were often not any higher than noise levels experienced during Sea States 1-2 and, in one case, a mother and calf reacted when the nearest approaching vessel was approximately 9.3 miles (15 km) away (Richardson et al., 1985a:116; Koski and Johnson, 1987:59).

If large ships are active near Seal Island during fall bowhead whale migration, deflection behavior could occur at the western border of Nuiqsut's bowhead harvest area. If the whales are deflected at a distance of 25 miles (40 km), and if no whales were struck within the eastern range of the Cross Island whaling area, impacts to the fall whale harvest could be significant. Although highly unlikely because of the planned schedule of island construction activities, there is a slight chance that some bowheads which are close enough to hear large vessel noises might move offshore from their normal migration path. If this happened, there is a remote possibility that a few whales near the western boundary of the Cross Island whaling area might deflect offshore, making them unavailable to the hunters, thereby limiting whaling success.

To the extent that industrial activities interfere with the subsistence bowhead hunt and cause a lost whale, that whale is deducted from the year’s quota and results in a lowered efficiency rate. If this occurs, the industrial activity has negatively affected the bowhead hunt in two ways. First, the meat from that whale is lost permanently, and second, the resultant lower efficiency rate has a negative impact on future whale quota allocations by the IWC. If a crew is unable to complete the take of a skittish or spooked whale (e.g., they have struck it, but due to the whale’s abnormal behavior they cannot kill or land it), that whale counts as a struck and lost whale (lowering the efficiency rate).

If whales are displaced further offshore as a result of industrial activities, this not only increases the risk

and danger to hunters who travel far offshore in pursuit of bowheads, it also increases the likelihood that the meat will spoil during a long tow. A whale whose meat spoils during a long tow counts as a landed whale, and does not reduce the efficiency rate. However, the meat is lost due to spoilage, and since that whale counted against the IWC quota, it cannot be replaced. The lost meat is a permanent loss. Furthermore, if a whale is struck and killed far from shore and has to be cut loose due to ice and/or weather, it also counts against the quota, the meat is permanently lost, and the efficiency rate is lowered (as it counts as a struck-but-lost whale). In the context of the IWC quota, any disturbances to bowheads by either displacement or spooked or skittish whales has added impacts to Alaska Eskimo whalers.

Anadromous/amphidromous fish (broad whitefish, least cisco, and Arctic cisco) which migrate through the project area (Figures 6.4-1 and 6.4-2), are important to Nuiqsut subsistence harvests. Impacts to the species are expected to be negligible (Section 6.4) and annual migration to the Colville River is expected to remain unchanged and result in no impact to fish harvest success in the area.

The project area is not used by subsistence hunters in the spring and rarely in the summer, when the majority of open water construction activities will be performed. Transportation routes used for subsistence harvesting are not expected to be affected by project construction because boat traffic in the area would not be curtailed.

Onshore pipeline construction would take place during winter through early summer, possibly displacing some caribou. Onshore pipelines would be elevated on vertical support members with a minimum clearance of 5 feet (ft) (1.5 meters [m]), a height that would allow caribou free passage under the pipelines (Cronin et al., 1994:7). Because earthen ramps would be constructed over the pipeline in other locations to allow crossing, and pipeline corridors are not near calving areas, no impacts to caribou migration patterns are expected. Helicopter traffic between Seal Island and Deadhorse Airport, Prudhoe Bay airstrip, and Kuparuk airstrip would not cross caribou calving areas, although some areas used for rearing calves could be crossed. Low-level helicopter traffic would cause a short-term disturbance to caribou during insect season as the animals move to the coast. No impacts to caribou harvests are anticipated.

Operation Impacts: During project operation, noise would be generated by drilling activities and boat and helicopter traffic to and from Seal Island. Drilling noise is expected to have less effect on bowhead whale migration than that of construction noise, because drilling through the island would attenuate noise levels (Chapter 9). Measured noise levels during island drilling operations and measured ambient noise levels for the Seal Island site suggest that, under quiet noise conditions, bowheads could hear drilling noises at distances of not more than 6.8 miles (11 km) (Johnson et al., 1986:86; Malme and Mlawski, 1979:1; Richardson et al., 1985a:127-129). The worst case impact would be that the bowhead whales which swim near Seal Island would tend to avoid swimming within 6 miles (10 km) of the site. The reaction of bowhead whales to vessel noise is documented through observations from Inupiat hunters and from marine mammal surveys. Although the avoidance reaction due to noise from a small boat has been noted at distances as short as 1.2 to 2.5 miles (1.9 to 4.0 km) (Richardson et al., 1995a:268), observations related to outboard motor operations noted avoidance reactions at approximately 3 miles (4.8 km) (T. Brower, Sr. in NSB, 1980:107). Reactions to moderate-sized vessels have ranged from 6 miles (9.7 km)

(Ljungblad et al., 1985:45) to 9.3 miles (15 km) (Richardson et al., 1985a:116; Koski and Johnson, 1987:59-61).

Observations and studies of bowhead behavior associated with other large noise sources showed avoidance of noise from a drilling vessel at distances of approximately 13 to 15 miles (21 to 24 km) (LGL and Greenridge, 1987:41), which has been found to affect subsistence harvesting (T. Napageak in USDOI, MMS, 1995a:13; B. Adams in USDOI, MMS, 1995b:26; H. Brower, Jr. in USDOI, MMS, 1995b:84; B. Rexford in MBC, 1996:80; J. Kaleak in MBC, 1996:69; B. Oyagak in USDOI, MMS, 1986:11) and cause migratory path displacement during drilling activities.

The 1985 harvest failure at Kaktovik has been directly attributed to exploratory drilling operations (J. Kaleak in MBC, 1996:69). Two drilling activities during open water that year were the Hammerhead prospect, 34 miles (55 km) east of Cross Island, drilled by ship between August 10, 1985 and September 24, 1985; and the Harvard prospect, spudded from a gravel island within the Sandpiper unit in September. The location of the drilling vessel may have caused disturbance within the path of the fall migration pattern, near the Kaktovik subsistence harvest area. Nuiqsut whalers also experienced poor harvesting success during the 1985 season (B. Oyagak in USDOI, MMS, 1986:11) (Table 7.3-2). During the last several years, seismic and other oil exploration activities have been coordinated with the AEWC to minimize adverse effects on subsistence whaling, and have been subject to stipulations in agreements with the AEWC. Additional information regarding bowheads' reaction to industrial noise is provided in Chapter 9.

The displacement of the bowhead migratory path and their avoidance of the Prudhoe Bay industrial area has been observed (J. Tukle in USDOI, MMS, 1987:47; P. Tukle in USDOI, MMS, 1986:23). Displacement from migratory paths in other areas of the Alaskan Beaufort Sea has required additional travel by subsistence hunters, which can lead to meat spoilage due to extended haul distances and times (D. Rexford in USACE, 1996:41), increased risk to the hunters, and increased fuel requirements, which would lead to significant impacts to subsistence harvesting of Nuiqsut.

Information about visual impacts from colors, flares, and facility lighting is limited to Traditional Knowledge that indicates that bright colors can cause avoidance behavior in bowhead whales (Pers. Comm., Nuiqsut Whaling Captains Meeting, August 13, 1996). Facilities on Seal Island will be painted in unobtrusive colors and flare operations would not exceed 30 days per year. When operating, the flare would be smokeless, virtually transparent, and light yellow and blue. Other features that have been incorporated into the facility design include minimal usage of outside lighting and the use of directed lighting to reduce light scatter and glare. Although the distance at which the flare and/or lights would affect the bowhead is unknown, some adverse impacts are expected. If sufficiently severe, impacts to subsistence harvesting could be significant.

A large oil spill could affect subsistence harvesting. Although impacts would vary greatly depending upon quantity, location, and meteorological conditions during the time of a spill, impacts to subsistence harvesting are likely to result through the direct loss of resources, displacement of resources, and/or contamination. A discussion of effects of oil spills on subsistence is presented in Chapter 8.

Routine operation would generate some helicopter traffic associated with crew and material transfer between the Seal Island and the mainland, and routine inspection overflights of the pipeline. However, as mentioned under construction, helicopter traffic from Deadhorse to Seal Island would not cross any caribou calving areas. Some short-term disturbance could occur when caribou are present along the coast for relief from insects. However, subsistence harvest of caribou is not likely to be affected by operation activities.

Maintenance Impacts: If maintenance activities at Seal Island were to take place during the bowhead fall migration period, noise from gravel backpassing, slope protection repair, and similar activities could generate a variety of noise patterns that would have a greater impact on the bowhead migration pattern than that of routine operational noise. Under such circumstances, this noise may further contribute to significant impacts to the subsistence harvest if a deflection in bowhead whale migration patterns were to occur.

Abandonment Impacts: Abandonment impacts would depend upon the abandonment plan adopted at the end of the useful life of the project. Abandonment impacts will be addressed in the assessment of the environmental effects of the abandonment alternatives presented in that plan. If an abandonment scenario called for complete removal of all facilities and infrastructure during the bowhead whale fall migration, impacts to the Nuiqsut subsistence whale harvest could be significant. The level of impact would depend on the type of noise generated by abandonment activities and the degree of avoidance behavior of the whales. A scenario involving in-place abandonment and/or reuse of a substantial portion of the project facilities could benefit hunters because Seal Island could be used during unexpected adverse weather while traveling between Nuiqsut and Cross Island.

7.3.3 Summary of Environmental Consequences

Although several design components have been incorporated into the project to lessen the severity of impacts, noise from vessels in the vicinity of Seal Island during the fall migration and from island reconstruction and slope maintenance are expected to cause the greatest impact. The possible impacts could include reduced harvest success and increased time and travel distances which would add risk to whalers, increase the risk of meat spoilage, and increase fuel requirements. Should increase risks to whales be perceived by the IWC, the subsistence harvest quota could be reduced.

A pattern of unsuccessful annual harvests caused by construction, operation, or maintenance noise would be an irretrievable and irreversible loss of the bowhead subsistence resource and could cause declines in the sharing of Traditional Knowledge, sharing of culturally important foods, and cultural events associated with the harvest of bowhead whales. A single unsuccessful harvest season attributed to the project would be a short-term irretrievable and irreversible loss of the bowhead whale resource and temporary declines in important cultural activities. Short-term impacts would be greatest during the construction phase of the project, but disturbing noise from operations and maintenance during the fall migration could affect the productivity of the Nuiqsut whale harvest if noise-intensive activities were to occur near Seal Island during the fall harvest period.

Studies conducted after the Exxon Valdez oil spill suggest that a disruption of a complex cultural system disrupts essential systems of meaning and social integration within Native communities. A native informant in one spill-affected community observed: "When we worry about losing our subsistence way of life, we worry about losing our identity….It's the spirit that makes you who you are, makes you think the way you do and act the way you do and how you perceive the world and relate to the land. Ninety-five percent of our cultural tradition now is subsistence…its what we have left of our tradition." (Russell et al., 1996:875).

Recognizing that the potential impacts described above would be felt by North Slope Inupiat, a minority population as addressed in Executive Order 12898, questions regarding Environmental Justice are raised. For a discussion of Environmental Justice considerations, see Section 7.10.

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7.4 CULTURAL/ARCHAEOLOGICAL RESOURCES AND HUMAN HISTORY

7.4.1 Relevant Legislation Affecting Cultural Resources

NEPA was passed in 1969 with the intent to "declare a national policy which will encourage productive and enjoyable harmony between man and his environment..." (42 U.S.C. 4321). The Act stipulated that one way the Federal Government would carry out this policy is by "preserv[ing] important historic, cultural, and natural aspects of our cultural heritage..." (42 U.S.C. 4331(b)(4)). The laws which present the federal policy regarding historic preservation include the National Historic Preservation Act (NHPA) of 1966, as amended (16 U.S.C. 470 et seq.); the Antiquities Act of 1906 (16 U.S.C. 431 et seq.), which protects archaeological remains and items of antiquity; the Archaeological Resources Protection Act of 1979 (16 U.S.C. 470 et seq.); the Abandoned Shipwreck Act of 1987 (P.L. 100-298); and the Native American Graves Protection and Repatriation Act (25 U.S.C. 3001-3013). State and local governments also may dictate policy regarding historical and cultural resources, such as the Alaska Historic Preservation Act (AK 41.35.240). NEPA works in conjunction with these laws to ensure the preservation of cultural resources.

The NHPA established the National Register of Historic Places, a listing of significant archaeological sites and historic properties. Historic property is defined in the Code of Federal Regulations (at 36 CFR 800.2[e]) as "any prehistoric, or historic district, site building, structures, or object included, or eligible for inclusion in, the National Register." Section 106 of the NHPA established protocols for federal agencies to use in evaluating the effects of their actions on historic properties. These protocols are found in 36 CFR 800.1-800.15.

The NHPA dictates that a State Historic Preservation Officer (SHPO) (16 U.S.C. 470[b][1][A]) work in conjunction with each state to preserve and protect historic properties. The State of Alaska has an inventory of known historic and prehistoric sites, the Alaska Heritage Resources Survey, which is maintained by the Alaska Department of Natural Resources (ADNR), Division of Parks and Outdoor Recreation, Office of History and Archaeology.

7.4.2 Human History

Human history addresses prehistoric through present day occupation of the North Slope and the communities of Barrow, Nuiqsut, and Kaktovik.

7.4.2.1 Barrow

Barrow is located on the Chukchi Sea coast approximately 7.5 miles (12 km) southwest of Point Barrow, the most northerly point in the United States. Point Barrow marks the boundary between the Chukchi and Beaufort Seas. The project site is approximately 200 miles (322 km) east of Barrow.

The area around Point Barrow has been inhabited for approximately 4,000 years, with continuous habitation occurring for at least 1,300 years (Dumond, 1977:32,106,112,114,131-33). The Birnirk peoples, a marine-oriented culture that practiced whaling and established small, semi-permanent coastal communities, were the earliest continuous occupants. The Birnirk peoples were followed by Thule whalers, whose dispersed coastal populations increased in numbers over time leading to large, permanent Thule villages. The establishment of these settlements marked the presence of the Thule culture, the direct ancestors of present-day Inupiat Eskimos.

Europeans first encountered the Inupiat in 1826. The Inupiat were described by visitors to the Barrow area in the mid-1800s as people who hunted marine mammals, including bowhead whale, and inland resources such as caribou. Early reports also described the Inupiat as traders who exchanged resources with people residing inland. In the 1850s, commercial whaling ships began making regular stops at Point Barrow to trade firearms, ammunition, and alcohol for baleen and furs. In the mid-1800s, permanent shore-based commercial whaling stations introduced the Inupiat to wage employment and increased trade opportunities, as well as disease (Sonnenfield, 1956:82-84).

7.4.2.2 Nuiqsut

Nuiqsut is located on the west side of the Nechelik (Nigliq) Channel in the Colville River Delta, about 18 miles (29 km) upriver from the Alaskan Beaufort Sea coast. The community lies 136 miles (219 km) southeast of Barrow and is approximately the same distance from Kaktovik to the east. The Kuparuk oil fields are about 20 miles (32 km) east of Nuiqsut, and Deadhorse (in the Prudhoe Bay industrial complex) is about 60 miles (97 km) east of Nuiqsut. Nuiqsut is the community nearest to the project site.

Nuiqsut had been a traditional hunting, fishing, trapping, and trading site used for many generations until the late 1940s, when the Bureau of Indian Affairs mandated school attendance for children, and most families on the lower Colville River delta moved to Barrow. The area, however, continued to be used for hunting, fishing, and trapping and the village was reestablished in 1973. The resettlement of Nuiqsut was inspired in part by the passage of the ANCSA in 1971, which qualified those who traditionally used an area to select village lands for resettlement. In April of 1973, 27 families left Barrow by snowmachine

with many of their possessions and established a tent village on the banks of the Colville River. Permanent housing and a school, store, and village corporation office were constructed the following year (Hoffman et al., 1988:9). Nuiqsut was incorporated in 1975.

7.4.2.3 Kaktovik

Kaktovik is located on Barter Island 120 miles (193 km) east of Prudhoe Bay, 90 miles (145 km) west of the Canadian border, and 360 miles (579 km) east of Barrow. Kaktovik is the only community within the Arctic National Wildlife Refuge (ANWR) and the easternmost community of the NSB.

In August of 1827, Sir John Franklin observed 54 adults camped on Barter Island (Franklin, n.d.:146). In 1914, 30 to 40 house sites were documented on Barter Island, indicating that a village had been there in the past (Leffingwell, 1919 cited in Pedersen et al., 1985:40). The village of Kaktovik was established in 1922/1923 when a trader named Tom Gordon moved his fur trading business to Barter Island. Gordon established his post near an Inupiat settlement that had previously had little contact with Europeans. Eventually, other local people settled in the vicinity. Originally situated on a sand spit at the northeast end of the island, the community was moved several times following World War II to accommodate military construction (Jacobson and Wentworth, 1982:5). The current community faces Pipsuk Lagoon and was incorporated in 1971.

7.4.3 Overview of Archaeological Periods

The prehistoric and historic peoples who lived in the region and utilized the terrestrial and marine resources left tools and scattered artifacts throughout the area. The archaeological record extends from 7,000 years before present (B.P.) in the Prudhoe Bay area to more than 10,000 B.P. in the Brooks Range (Reanier, 1995:44). The archaeological traditions (periods) are discussed below.

7.4.3.1 Paleoindian (Paleoarctic) Tradition (Before 11,000 B.P. to 9,000 B.P.)

The Paleoarctic Tradition dates back to before 11,000 B.P. This tradition is characterized by a nomadic hunting lifestyle in which large, fluted, lanceolate points (Clovis points) were used (Forbis, 1975:21). Fluted points are characteristically found with the remains of mammoth in the central or western Brooks Range (Haynes, 1980:115). The megafauna of this time period (mastodon, bison, camels, horses, caribou, and deer) appear to have provided a dependable food source for man (Forbis, 1975:23).

7.4.3.2 Northern Archaic Tradition (9,000 B.P. to 6,000 B.P.)

Around 9,000 B.P., the Northern Archaic Tradition began as the climate grew warmer, leading to the last glacial retreat and extinction of the Pleistocene megafauna. Extinction of the megafauna and cultural adaptations such as small, side-notched projectile points, notched pebbles, end scrapers, and other tool types occurred during this time period (Chance, 1997:3). Northern Archaic sites are numerous in Alaska south of the Brooks Range.

7.4.3.3 Arctic Small Tool Tradition (6,000 B.P. to 1,500 B.P.)

Technologically sophisticated end-blades and side-blades, knives, harpoon heads, scrapers, microblades, and burins characterize the Arctic Small Tool Tradition, which began around 4,000 B.P. (Campbell and Cordell, 1975:55). The bow and arrow were first used during this period. The Norton culture, named after Norton Bay in Alaska where the type site is located, was a marine mammal culture (Chance, 1997:3). Norton peoples lived in sturdy semi-subterranean houses of rock, whale bone, and driftwood, covered with sod and lined with skins. Kayaks and skin boats (umiaq) were used for travel during summer and hand-drawn sleds were used in winter. Unrefined pottery and animal effigies and ornaments carved from ivory were identified during this tradition (Zimmerman, 1997:4).

7.4.3.4 Prehistoric Eskimo Tradition (1,500 B.P. to A.D. 1827)

The Thule culture emerged from the Birnirk culture around 1,100 B.P. and became the precursors of the North Slope Inupiat (Chance, 1997:3). This culture became the preeminent hunters of the sea, applying their creative ingenuity to develop new devices for hunting whale and walrus and to modify their clothing, allowing them to remain outdoors in cold weather for longer periods. Major subsistence activities included whaling and the associated whale harvesting ceremonies; seal hunting on ice and open water; caribou hunting with bows and arrows and probably spears; bird hunting with arrows, spears, and bolas; and fishing with spears and nets (Anderson, 1984:85).

7.4.3.5 Historic Eskimo (A.D. 1827 to Present)

Around A.D. 1826, Euro-Americans encountered the Inupiat Eskimo for the first time in recorded history. Before the first explorers arrived at the coasts and islands of northwestern and northern Alaska, some of the material goods of industrial Europe, North America, and Asia had already reached northern Alaska. Beginning in the early nineteenth century, the Inupiat and other Native Americans on the North Slope were subjected to numerous agents of cultural change. Disease, metal, alcohol, firearms, and manufactured goods were the most important influences from non-Native cultures. The coastal Inupiat suffered epidemics of measles, small pox, and influenza, causing a severe population decline in the last quarter of the 19th century. Many mountain people moved to the coast around the turn of the century, filling the void left by their coastal counterparts, and essentially restructuring the population (Lobdell, 1996:19).

7.4.4 Cultural Resources

Twenty-eight prehistoric and historic cultural/archaeological sites are known to be near the project area (Table 7.4-1). The sites are widely dispersed, and are generally located along the Alaskan Beaufort Sea coast. These and other undocumented cultural/archaeological sites contain valuable prehistoric, historic, and current cultural information that contributes to a rich and comprehensive North Slope and Inupiat history.

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There are 52 ships known to have been wrecked in the Beaufort Sea planning area (Braund, 1997). Forty of these were whaling vessels, most of which were wrecked in the vicinity of Barrow. Seven ships were freighter/trading vessels. The primary role of the remaining vessels is not known. While fewer violent storms occur in the Chukchi and Beaufort Seas compared to other areas, nearshore shipwrecks may be subject to destruction from ice movement across the sea surface, seafloor, and beaches.

There are three known cultural sites near pipeline corridors that are identified for project Alternatives 2, 3, 4, and 5. The Putuligayuk River Delta Overlook Site (XBP-007) is located on the southwest shore of Prudhoe Bay and has been excavated. Artifacts recovered from this site date from the Arctic Small Tool Tradition (6,000 to 1,500 B.P.), the Northern Archaic Tradition (9,000 to 6,000 B.P.), and the Paleoarctic Tradition (11,000 to 9,000 B.P.) indicating that this area has been used for thousands of years. A second site (XBP-019) contains three sod house ruins in the vicinity of Point McIntyre, which date from the Historic Eskimo period around 1900. The third site (XBP-040) is a Distant Early Warning (DEW) Line station at Point Storkersen. The station was operated from 1957 to 1963 as a radar and communication site. The Cold War period DEW Line system was composed of numerous stations constructed across northern Alaska and Canada which were intended to detect potential enemy attacks on North America. The DEW Line - Alaska segment was found eligible for inclusion on the National Register of Historic Places as a thematic property, which provides statutory protection under the NHPA.

In 1996, potential pipeline routes were surveyed for BP Exploration (Alaska) Inc. (BPXA) for cultural resources (Lobdell, 1996). The reconnaissance field study was performed to satisfy requirements for state, federal, and NSB permits. Lobdell also prepared a report (1994) that summarized the cultural resource knowledge for the Arctic Coastal Plain along the Alaskan Beaufort Sea. In a 1996 aerial survey along the onshore corridor, no relief that might hold discoverable cultural resources was identified. Other than the DEW Line station, the potential for cultural resources along this corridor is low (Lobdell, 1996:26). The Kuparuk River delta gravel mine site was included in the 1996 aerial survey, and no evidence of cultural resources was found (Lobdell, 1996:43).

An offshore reconnaissance survey was not performed and portions of the corridors for Alternatives 3, 4, and 5 were not surveyed. Once an alternative is chosen, the ADNR, Division of Parks and Outdoor Recreation, Office of History and Archaeology may request that a survey be performed. They will provide a letter of clearance for construction to proceed once they have determined that the construction will not disturb cultural or historical sites. If a previously unknown cultural resource is found during construction, both state and federal statutes stipulate that the federal agency and SHPO will be notified immediately. Depending upon circumstances at the time, an archaeologist may be dispatched to the site to determine if it is eligible for inclusion in the National Register of Historic Places (T. Smith - Pers. Comm., 1997:3).

7.4.5 Environmental Consequences

Impacts to cultural resources which may occur during the construction, operation, maintenance or

abandonment of the project are discussed in this section. Impacts for Alternatives 4 and 5 are identical and are addressed together. Impacts for Alternatives 2, 3, 4, and 5 are summarized in Table 7.4-2.

7.4.5.1 Alternative 1 - No Action Alternative

A decision to not issue permits for development of the project would not directly affect existing cultural resources within the area. Lack of development projects would likely result in no further surveys for, or investigation of cultural resource sites in this area. Known and presently unknown archaeological and historic resources would remain undisturbed for the foreseeable future. However, they would eventually be lost due to natural decay and environmental factors such as shoreline erosion.

7.4.5.2 Alternative 2

Construction Impacts: The Alternative 2 pipeline route and the gravel mine site were surveyed entirely and no cultural resources were identified. The potential for finding sites during construction is considered low (Lobdell, 1996:43). The DEW Line station would be protected by SHPO clearance conditions, which may require that personnel remain outside of a zone around the DEW Line station. Therefore, no impacts to onshore cultural resource sites as a result of project construction are anticipated. There are no known offshore cultural resources in the project area. The likelihood of encountering offshore cultural resources is considered low, with site destruction most probably already finished or ongoing as a result of ice movement and bottom scouring. The impacts of project construction on offshore cultural resources are considered minor.

Operation, Maintenance, and Abandonment Impacts: Operation, maintenance, and abandonment activities would occur within the same area as construction activities. Since the pipeline corridor has already been surveyed, it is not anticipated that cultural sites would be discovered or affected as a result of operation, maintenance, or abandonment activities. Consequently, no impacts from project operation, maintenance, or abandonment are anticipated. The one exception would be a large oil spill, where potential impacts to cultural resources would be significant. Coastal sites would be especially vulnerable to effects from a large, offshore spill during open water. Sites outside the surveyed area could be affected because the oil would move around. An onshore or small spill would not affect sites because of their distance from the pipeline. Potential impacts to cultural resources resulting from an oil spill are discussed in more detail in Chapter 8.

Table 7.4-2 (page 1 of 1)

7.4.5.3 Alternative 3

Construction Impacts: As stated previously, portions of Alternative 3 were not included in the 1996 field survey and a survey may be required (per SHPO coordination and clearance) prior to constructing this alternative. Alternative 3 follows the same offshore corridor as Alternative 2. The onshore pipeline corridor crosses an unsurveyed route before connecting with an existing pipeline right-of-way between the Point McIntyre 1 Drill Pad and the West Dock Staging Pad. The Point McIntyre sod house site (XBP-019) is more than 450 feet (137 m) from the alignment, thus impacts to this cultural resource are not anticipated. The alignment then follows a portion of existing corridor from the West Dock Staging Pad to the Central Compressor Plant (CCP). The Putuligayuk River Delta Overlook site (XBP-007) is located along the corridor from the West Sock Staging Pad to the CCP; however, no impact is expected because this site has already been excavated. There also is another short, unsurveyed segment of the route near Pump Station No. 1 which is unlikely to have undiscovered cultural resources due to its proximity to existing roads and facilities. Therefore, no impacts to onshore cultural resources as a result of project construction are anticipated. There are no known offshore cultural resources in the project area. The likelihood of encountering offshore cultural resources is considered low, with site destruction most probably already finished or ongoing as a result of ice movement and bottom scouring. The impacts of project construction on offshore cultural resources are considered minor

Operation, Maintenance, and Abandonment Impacts: Operation, maintenance, and abandonment activities would occur within the same areas as construction activities. Since most of the pipeline corridor has already been surveyed for cultural resources, it is not anticipated that cultural sites would be impacted by operation, maintenance, or abandonment activities. The one exception would be a large oil spill. As discussed under Alternative 2, and in Chapter 8, coastal sites would be especially vulnerable to impacts from a large, offshore oil spill.

7.4.5.4 Alternatives 4 and 5

Construction Impacts: As stated previously, offshore portions of Alternatives 4 and 5 were not included in the 1996 field survey, and a survey may be required prior to constructing these alternatives. Alternatives 4 and 5 follow an existing pipeline right-of-way onshore between the West Dock Staging Pad and the CCP, and new impacts to cultural resource sites, such as the Putuligayuk River Delta Overlook (XBP-007), are not expected. There are no known offshore cultural resources in the project area. The likelihood of encountering offshore cultural resources is considered low, with site destruction most probably already finished or ongoing as a result of ice movement and bottom scouring. The impacts of project construction on offshore cultural resources are considered minor.

Operation, Maintenance, and Abandonment Impacts: Operation, maintenance, and abandonment activities would occur within the same areas as construction activities. Since the pipeline corridor follows an existing pipeline right-of-way, except for a short segment near Pump Station No. 1, it is not anticipated that cultural sites would be impacted by operation, maintenance, or abandonment activities. The one exception would be a large oil spill. As discussed under Alternative 2, and in Chapter 8, coastal sites would be especially vulnerable to impacts from a large, offshore oil spill.

7.4.6 Summary of Environmental Consequences

The Alternative 2 onshore alignment has been surveyed and did not contain cultural resource sites. The segment between the Alternative 3 landfall and the West Dock Staging Pad has not been surveyed, but there are no known cultural resources along this alignment. Onshore alignments for Alternatives 3, 4, and 5 all follow existing pipeline corridors, with the exception of a short segment near Pump Station No. 1, which is unlikely to contain resource sites because much of the area has been impacted as a result of transmission line construction. Therefore, impacts to onshore cultural resources as a result of construction, operation, maintenance, or abandonment activities are not anticipated; potential impacts to offshore cultural resources are considered minor. However, significant impacts to such resources may result in the event of a large onshore or offshore oil spill (Chapter 8). Contamination of important cultural resources could cause irreparable damage to historic artifacts and clean-up operations could cause physical damage to existing sites.

7.4.7 References

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7.5 LAND AND WATER USE

7.5.1 Affected Environment

This section describes land ownership status and existing, planned, and permissible land and water uses within the project area. It also addresses land and water ownership and jurisdiction, existing land and water use, land use regulations and management, consistency with coastal management, and permitting implications.

7.5.1.1 Land and Water Jurisdiction and Ownership

Ownership often determines what activities are allowed on lands and waters, and dictates management and permitting requirements for proposed activities. Portions of the onshore and offshore project area are owned or under the jurisdiction of the federal government, state government, NSB or are Native trust lands. In offshore areas, these include federal submerged lands of the Outer Continental Shelf (OCS); and state submerged lands, barrier islands, and tidelands located between the boundary of state waters and the mainland shoreline. In onshore areas, land is primarily owned by the State of Alaska ADNR, with a few parcels that are either federal reserved or Native trust lands. There are no lands or waters owned by local

government or private parties in the immediate project area. Current land status in the project area is depicted on Figure 7.5-1.

Federal Submerged Lands: Federal submerged (offshore) lands in the project area consist of lands on the OCS seaward of the Alaska state boundary, generally 3 miles (4.8 km) from the mainland and barrier islands coastline. Federal submerged land and associated oil, gas, and mineral resources are managed by the U. S. Department of Interior, Minerals Management Service (MMS). The Northstar Unit includes two federal oil and gas leases (Y0179 and Y0181) located approximately 3.5 miles (5.6 km) offshore. Alternative pipeline routes from Seal Island to Point Storkersen, the area near Point McIntyre, and the West Dock causeway, do not cross federal submerged lands; however, pipelines would be in waters under federal jurisdiction.

Federal Reservations: There are two federal reservation areas on the North Slope between Barrow and the Canadian border: ANWR and the National Petroleum Reserve, Alaska (NPRA). The two federal reservations, NPRA and ANWR, are located 66 miles (106 km) southwest and 140 miles (225 km) east of the project area, respectively, and would not be affected by the project. One of the DEW Line stations, a small reservation located on the coast east of Point Storkersen approximately 6 miles (9.7 km) south of Seal Island, is located in the project area. The site, originally part of the DEW Line, is a decommissioned facility that once served as part of a defense early warning system during the Cold War Era.

State Lands and Waters: The State of Alaska has jurisdiction over, and ownership of, the majority of the Arctic Coastal Plain between NPRA and ANWR. These lands were selected as part of the State Land Grant Entitlement (Section 6A of the Alaska Statehood Act) from the federal government and are managed by the ADNR. On state lands, the state owns both the surface and the right to the subsurface estate. Mineral rights include oil and gas, as well as minerals, metals, and coal.

ADNR has jurisdiction over state waters, including offshore waters within 3 miles (4.8 km) of the coast and barrier islands, freshwater lakes, and rivers. ADNR's jurisdiction and ownership responsibilities also include tide lands (land generally located underneath navigable sea water that is exposed by tidal fluctuations) and submerged lands (land under navigable sea water not exposed during tidal fluctuations) within 3 miles (4.8 km) of the coastline. The state owns the submerged/tide land surface and subsurface estate, which also includes mineral rights. Five state oil and gas lease tracts are within the Northstar Unit.

Native Allotments: Native Allotments (sometimes referred to as Indian Trust Lands) were established under the Indian Reorganization Act of 1906, allowing Native Americans to select traditional land use sites of up to 160 acres (64.8 hectares) for private use. The use of, or lease of all or part of, an allotment by another party requires 100% consensus of all family heirs and approval of the Bureau of Indian Affairs. The four Native Allotments in the project area are shown on Figure 7.5-1.

7.5.1.2 Existing Land Use

Existing land use in the project area includes oil industry housing and administrative “base camps,” oil production and processing facilities, transportation and utility corridors, and subsistence uses.

Housing and Administrative Base Camps: Housing development includes occupied and vacant dwellings, apartments, and dormitories. Large-scale residential land use within the project area is associated with oil and gas development activities and is limited to the areas of Frontier Base Camp, ARCO Base Camp, and Deadhorse. Base camp facilities include lodging, food, recreational, medical, and administrative services.

Oil Production and Processing Facilities: Oil production and processing facilities include oil development pads and platforms, processing and distribution centers, equipment maintenance and repair locations, and facilities designed for construction and storage of modules and other major oil field components.

The West Dock Staging Pad and causeway to drill site Point McIntyre No. 2 are owned jointly by a consortium of oil companies comprised of Arco Alaska, Inc., BPXA, Chevron, Exxon, Louisiana Land, Marathon, Mobil, Phillips, Shell, and Texaco. Modifications to the facilities (including the causeway) must be agreed upon unanimously by all parties.

Traditionally Used Areas: Native Allotments located in the project area would not be affected by the project. The state lands in the project area leased for oil and gas development are not open to public access. Onshore and offshore portions of the project area were traditionally used for subsistence activities. Local residents have indicated that restrictions on access have reduced subsistence activities onshore in the project area (N. Ahvakana in USDOI, MMS, 1995:16). Some subsistence use of the barrier islands still occurs, as Nuiqsut residents pass through the offshore area on their way to Cross Island.

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7.5.1.3 Land Use Regulations and Management

Land and water uses in the project area are subject to land use regulations and management plans administered by federal, state, and local government. Federal and state regulations apply to use of submerged and onshore lands. The NSB applies land use regulations to all state, local, and privately owned lands and waters within NSB boundaries, including the project area. The federal, state, and NSB governments also participate in administration of coastal management, which is discussed separately in Section 7.5.1.4

Federal Regulations: Federal land use regulations are primarily associated with federal offshore oil and gas leases and coastal management. Exploration, development, and production from federal offshore leases are subject to 30 CFR Parts 250 and 252, as well as specific stipulations attached to the lease(s) administered by the MMS.

State Regulations: The ADNR Division of Oil and Gas manages lease sales for oil and gas projects and oversees state lease tracts. The Alaska Oil and Gas Conservation Commission, on behalf of ADNR, regulates specific field operations such as well spacing, injection wells, and other aspects of reservoir management. The ADNR, Division of Land manages the surface estate, including gravel resources that are not associated with specific oil and gas lease tracts. The Division of Mining and Water Management administers the state water appropriation system, which allocates the right to use surface and subsurface freshwater. The State Pipeline Office evaluates and approves leases for pipelines and associated facilities and oversees construction and operation of all pipeline systems.

North Slope Borough Regulations: The NSB is a Home Rule municipality that is governed by state law and a municipally-adopted charter. Municipal powers adopted include platting (control over the subdivision of land) and regulation of land use, which must be based on a comprehensive plan. Platting regulations and land use controls apply within the municipal boundary, which extends to the limit of state waters in the Alaskan Beaufort Sea, and are under NSB control. A Comprehensive Plan was developed in 1984 and revised in 1996 to identify and provide direction for planning within the NSB. The plan provides the basis for the NSB's Land Management Regulations (LMRs), which establish zoning districts and performance-based land use policies. These regulations and their relationship with the project are summarized in Table 7.5-1. The portion of the Northstar Unit in state waters is also subject to NSB jurisdiction.

Policies: The intent of the NSB's Comprehensive Plan and LMRs is to maintain and protect subsistence resources (NSB, 1996:28) with responsible exploration, development, and extraction of natural resources. Compliance with this intent is accomplished through enforceable policies which follow a format common to both the NSB LMRs and NSB Coastal Management Plan (CMP), and include standards for development, required development features, policies to follow best development practices, and policies to minimize environmental impacts.

Table 7.5-1 (page 1 of 2)

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Zoning Districts Under the Land Management Regulations: The NSB LMRs include several zoning districts that apply to lands and waters within the NSB. The project area is within two of the NSB's zoning districts, Resource Development District and Conservation District:

· The Resource Development District is designed to address cumulative impacts of large-scale development projects, such as resource extraction and related transportation and processing activities. Establishment of a Resource Development District requires rezoning from another zoning district, usually Conservation District. To receive approval for rezoning to a Resource Development District, the project must not permanently and seriously impair the surrounding ecosystem that supports plants and animals used locally for subsistence. Activities must be planned, phased, and developed as a unit or series of interrelated units, under an approved Master Plan, with provisions for all necessary public and private facilities. This Master Plan is submitted with the application for rezoning. The Master Plan must meet policies of the Comprehensive Plan and CMP, as well as any conditions of approval and special policies imposed on individual Resource Development Districts at the time of designation.

· The Conservation District includes the majority of lands within the NSB boundary. The district is designed to address management of subsistence use areas, traditional land use, and preservation of the environment. The Conservation District limits the extent of resource development activities. Uses and activities are subject to policies designed to minimize environmental impact on the North Slope.

Most of the onshore portion of the project area is within the Resource Development District and covered by various Master Plans. The offshore portion of the project area is within a part of the Conservation District which was established to protect the natural ecosystem for subsistence usages. Development of the Northstar Unit will require a rezoning from Conservation District to Resource Development District. This will require preparation and approval of a Master Plan for the project, and compliance with LMR policies. In addition, the onshore portions of the project must also be covered under the Master Plan prepared for rezoning.

7.5.1.4 Coastal Management

Coastal management is a cooperative federal, state, and local land and water use program that evolved from the federal Coastal Zone Management Act of 1972. Under guidance of the federal act, the State of Alaska passed the Alaska Coastal Management Program (ACMP) in 1977. The state program is intended to balance development and land use activities, resources, and permitting among federal, state, and local governments. The ACMP includes statewide standards that apply to development activities, identifies permits and approvals that are subject to a consistency determination with coastal management plans, establishes an interim coastal boundary where activities are subject to coastal management, and identifies the process for permit review and determination of coastal consistency. The ACMP allows municipal Alaska governments to develop their own district coastal management plans (including district-specific coastal boundaries and policy guidelines) in order to address local issues and needs. The plans are subject to federal and state procedural guidelines and must be approved by the state and federal governments before they can be implemented. The project falls within the coastal boundaries of the NSB CMP and is subject to a consistency determination with ACMP standards, including the NSB CMP policies.

Coastal management criteria must be applied during existing local, state, and federal permit reviews. The statewide ACMP standards contain regulations (6 AAC 80.040-150) addressing: coastal development; geophysical hazard areas; recreation; energy facilities; transportation and utilities; subsistence; habitats; air, land, and water quality; statewide historic, prehistoric, and archaeological resources; and other resources. The NSB has more specific CMP policies that address these topics. Applicable policies are referenced in Table 7.5-1.

A formal process, called the coastal consistency review, involves the review of permit applications by appropriate government agencies, the applicant, and the general public, to ensure compliance with ACMP standards, including the policies of approved local district plans, such as the NSB CMP. If state and/or federal permits are required, a state agency coordinates the consistency review to reach the consistency determination. Conditions or stipulations may be attached to state and local permits based on the outcome of the coastal consistency determination.

7.5.2 Environmental Consequences

The following section discusses the potential impacts of the project alternatives to land and water use resources within the project area. Impacts from Alternatives 2, 3, 4, and 5 are the same; therefore, they have been addressed together and are summarized in Table 7.5-2.

7.5.2.1 Alternative 1 - No Action Alternative

Land uses within the area have been changing in response to oil field development and are likely to continue to change, regardless of project construction. The development of new fields other than Northstar would require installation of additional pipelines and would likely require new processing facilities which could require zoning changes and would require consistency with the ACMP.

7.5.2.2 Alternatives 2, 3, 4, and 5

The only anticipated changes in land status are those related to rezoning the Northstar Unit from a Conservation District to a Resource Development District. Although Alternatives 2 and 3 would cross close to the former DEW Line installation, the federal government has conveyed ownership of the site to the State of Alaska. The rezoning falls under NSB regulations and procedures and would result in an increase in oil field development land uses on the North Slope. This impact would be minor.

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The onshore portion of the pipeline crosses access roads, several existing pipelines, and utility lines. Road closures or detours, interruption of flow through existing pipelines, or interruption of utility service would result in short-term, minor impacts to existing land use during construction.

Alternative 2 and a portion of Alternative 3 would add a pipeline across a currently undeveloped area. However, given the industrial nature of the area, this impact would be minor.

Construction of the onshore pipeline for Alternatives 3 and 4 along existing right-of-ways could cause temporary road closures or detours, interruption of flow through the pipeline, or interruption of utility service but impacts would be short-term and minor to existing land use.

For Alternative 5, the landfall is at the West Dock causeway and may require widening of the causeway, which would require agreement among the consortium of companies owning the causeway. Construction of the onshore pipeline along existing right-of-ways may cause temporary road closures or detours, interruption of flow through the pipeline, or interruption of utility service but impacts would be short-term and minor to existing land use.

The offshore portion of Alternatives 2, 3, 4, and 5 would not affect existing submerged lands. Boat traffic associated with project construction offshore could temporarily affect access to offshore subsistence use, but such impacts would be negligible. Because traditional land use of the onshore portion of the project area is infrequent, onshore construction would have a negligible impact on traditional land use. See Section 7.3 for discussion of impacts on subsistence.

The project must also undergo a coastal management consistency review and determination. In order to be consistent with the ACMP standards and NSB CMP policies, conditions may be attached to federal, state, and local permits and approvals as a result of the consistency determination.

Operation Impacts: Operation of the project would have no impact to the jurisdictional and ownership status of the project area. There would be no impacts on land use from project operation. Boat traffic associated with project operation in offshore areas could temporarily affect access to offshore subsistence use, but such impacts would be negligible. An oil spill could affect land and water resources, and impacts from a large release in the project area are discussed in Chapter 8.

Maintenance Impacts: Maintenance of the project would have no impact on the existing jurisdictional and ownership status of lands or on land use within the project area.

Abandonment Impacts: Abandonment impacts would depend upon the abandonment plan that is adopted, and will be fully addressed in the assessment of the environmental effects of the abandonment alternatives. For an abandonment scenario involving complete removal of all facilities and infrastructure, impacts would be expected to be similar to those generated during construction, and the overall impact of abandonment would be expected to be minor. For a scenario involving in-place abandonment and/or reuse of a substantial portion of the project facilities, the overall impacts of abandonment would also be expected to be minor.

7.5.3 Summary of Environmental Consequences

Unavoidable, adverse impacts as a result of changes to the status of jurisdiction or ownership were identified as minor. The onshore portion of the pipeline for Alternatives 2, 3, 4, and 5 would cross access roads, existing pipelines, and utility lines. Alternative 2 and a portion of Alternative 3 would add a pipeline across a currently undeveloped area, resulting in a minor impact to land use. Some short-term and minor impacts to land use would occur during construction due to road closures or detours, and interruptions to pipeline flow or utility service. There would be no impacts to onshore industrial land use due to project operation. Because traditional land use of the onshore portion of the project area is infrequent, onshore construction and operation would have a negligible impact on traditional land use.

There would be no impacts on use of submerged lands during project construction or operation. Boat traffic associated with project construction and operation would cause negligible impacts to boat access associated with offshore subsistence uses.

Project site lands would be used for industrial purposes. However, the area could be used for other purposes following depletion of oil and gas resources. Therefore, short-term uses of the area would not preclude returning land uses to pre-construction condition.

Designated pipeline corridors would require easements, which would exclude other uses from the area covered by specific easements. Designated easements would result in temporary commitment of resources for project development and operation. However, corridors could be used for other purposes following completion of oil and gas production; therefore, long-term effects of land use changes resulting from this project are not anticipated.

7.5.4 References

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7.6 SOCIOECONOMICS

7.6.1 Affected Environment

This section describes socioeconomic characteristics of the affected environment and environmental consequences of project alternatives. The discussion addresses socioeconomic characteristics of the State of Alaska, the NSB, Barrow, Nuiqsut, Kaktovik, and Deadhorse.

7.6.1.1 State of Alaska

Regional Setting: Alaska was purchased from Russia in 1867. On January 3, 1959, Alaska was admitted to the Union as the 49th state.

Population: Alaska's estimated population as of July 1, 1993, was 599,200, approximately 0.23% of the total U.S. population, placing Alaska 49th in state population. Alaska's population growth from 1950 to 1995 is shown on Figure 7.6-1 (ADOL, 1993:15). Alaska has a diverse ethnic population, with Caucasians making up 74.8% of the total population; Alaska Natives/Native Americans (Aleuts, Eskimos, and Indians), 16.5%; African Americans, 4.6%; and Asians and Pacific Islanders, 4.1%. In 1993, the ratio of males to females in Alaska was approximately 1.1 to 1.0, consisting of 313,354 males and 285,846 females. Approximately 78% of Alaska's population resides in the urban centers of Anchorage, Juneau, Fairbanks, Ketchikan, Matanuska Susitna Borough, and the Kenai Peninsula. The overall median age for Alaskans was 29.7 years in 1993; in 1992 the median age in the U.S. was 33.4 years (ADHSS, 1995:5-7).

Employment and Income: Alaska's economy has historically been typified by boom-and-bust cycles driven by its dependence on oil, timber, mining, fishing, and tourism. The peaks and troughs in Alaska's economy are based on seasonal employment patterns and are often dependent on events outside the state's borders (such as the decline of oil prices in 1986).

Alaska's economy grew for the eighth straight year in 1995, with the unemployment rate falling to an all-time low of 7%. The declining unemployment rate is the result of an increase in wage and salary jobs and a decrease in net migration to Alaska (ANB, 1996:62). However, the job growth rate was slower than at any other time in the last decade, largely due to lay-offs in the oil and gas industry, federal downsizing, and the closure of MarkAir airlines. Alaska's employment by industry for 1996 is depicted on Figure 7.6-2.

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Figure 7.6-2 (page 1 of 2)

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Alaska was ranked 10th in the nation for per capita income ($24,182) in 1995. However, Alaska's income in relation to the rest of the nation has declined. Although the per capita income increased slightly from 1994 figures, the cost of living had a greater increase (ANB, 1996:97). In 1990, the U.S. Census Bureau noted that 9% of the Alaska population lived below the poverty level.

Fiscal Characteristics: The oil and gas industry is the largest contributor to Alaska's economy with over half of every state dollar being generated by taxes and royalties on North Slope crude oil (ANB, 1996:60). The production of oil from Prudhoe Bay oil fields peaked in 1988 and has been declining since 1991. Oil revenues will continue to decline as well (State of Alaska, 1995:1, 3).

For Fiscal Year 1996 the state budgeted $3.2 billion into the General Fund. Of that, 50% ($1.6 billion) came from oil revenues (State of Alaska, 1995:6).

7.6.1.2 North Slope Borough

Regional Setting and History: The NSB was incorporated on July 2, 1972, and adopted its Home Rule Charter on April 30, 1974. In the vicinity of the proposed project, the NSB includes the communities of Barrow, Nuiqsut, Kaktovik, and the petroleum/industrial complex of Prudhoe Bay/Deadhorse (Figure 7.6-3). Arctic Slope Regional Corporation is the regional for-profit Native corporation under the provisions of ANCSA.

Population: According to the 1993 NSB Census of Population and Economy, which provided the last comprehensive analysis of population trends, the NSB had a total resident population of 6,538. The NSB population grew 56% from 1980 to 1993. Historic population for the NSB from 1939 through 1990 is shown on Figure 7.6-4. The population in 1993 was 74% Inupiat, 17% Caucasian, 6% Asian/Pacific Islander, 2% Native American, and 1% was identified as other minority (Harcharek, n.d.:NSB-5, 9).

Employment and Income: As noted in Section 7.3.1.1, communities on the North Slope maintain a mixed cash/subsistence economy. The subsistence economy of the North Slope is described in that section. The NSB cash economy is dominated by local government, the school district, and ANCSA Native corporations (Figure 7.6-5). The NSB is the largest employer of North Slope residents, employing more than 46% of all working residents, and the school district employs more than 18% of working residents. Only a small number of NSB residents are employed by the oil industry (USDOI, MMS, 1996:III-C-8), although oil companies actively recruit from local communities and provide training.

The NSB has experienced problems with high unemployment and underemployment rates related to population growth. Causes of low employment rates include limited employment opportunities in many villages, natural population increases to the area, and migration of individuals from other parts of Alaska and the lower 48 states. The NSB's 1993 unemployment rate was 11.32% (Harcharek, n.d.:NSB-28).

The average NSB household income in 1993 was $54,645, and per capita income was $15,218. The average Inupiat household income was $44,551, with per capita income at $10,765. The average non-Inupiat household income was $74,448, and per capita income was $29,525.

Fiscal Characteristics: The NSB collects property tax revenues from petroleum industry facilities. The mill rate applied to assessed property in Fiscal Year 1996/97 was 18.5 mills; 4.96 were for operations and 13.54 were for debt service (NSB, 1997:23). Improved education, health, and other government services have been funded by tax revenues. An extensive capital improvements program, which has resulted in numerous construction jobs for permanent residents, also has been financed by tax revenue.

The financial structure of the NSB relies heavily upon revenues from oil-related activity within the borough. In 1996, the total full value of oil and gas property within the NSB totaled $12,130,115,480 (ADCRA, 1997:23). Revenue to the NSB from oil and gas property tax revenues accounted for $224,289,817, more than 98% of total tax revenues and more than 68% of total revenue for 1996. Tax revenues from oil and gas property allow the NSB to finance many projects through general obligation bonds. The total NSB general obligation debt in 1996 totaled $881,287,031. With the NSB's relatively small population, this level of general obligation per capita debt was the highest in Alaska.

Total budgeted revenue in Fiscal Year 1996/97 was estimated at $331 million (NSB, 1997:32). Property taxes (71%) were the largest source of these revenues, and nearly all property taxes (97%) were paid by the petroleum industry. Depending on world energy prices, property values could be higher or lower than projected but are not likely to be a constraining factor for future revenues.

7.6.1.3 Barrow

Regional Setting: Barrow is the NSB economic center and largest city in the NSB. From 1990 to 1993, Barrow experienced an annual growth rate of 4.27%, compared to the 3.7% rate of growth of the NSB in the same time period. Almost all the growth can be attributed to migration to Barrow (Harcharek, n.d.:NSB-5).

Population: Barrow's population in 1993 was estimated at 3,908, ranking Barrow as the 12th largest city in Alaska (Harcharek, n.d.:NSB-5). Barrow's population growth from 1939 to 1990 is shown in Figure 7.6-4. Barrow's size and ethnic composition is unique among the eight villages on the North Slope; it is the largest village and contains the highest proportion of non-Natives.

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Figure 7.6-4 (page 1 of 2)

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Figure 7.6-5 (page 1 of 2)

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Population comparisons in 1993 showed that 52% of Barrow's population was male, and 48% was female. Forty-six percent of the population was between 27 and 59 years old. The largest ethnic component of the population in 1993 was Inupiat (61%), followed by Caucasian (24%), Asian/Pacific Islander (10%), other Native American (3%), African American (1%), and Hispanic (1%).

Employment and Income: The labor force in Barrow in 1993 consisted of 2,258 workers, with 217 unemployed. According to the NSB 1993/94 Economic Profile and Census Report, 41.9% of the labor force was Inupiat, 38.4% Caucasian, and 19.7% other minorities. The public sector employed 64% of the working population, indicating that the NSB continues to be the major employer in Barrow (Figure 7.6-5) (Harcharek, n.d.:BRW-1, 6, 15).

The average household income in 1993 was $63,896. Inupiat household incomes averaged $53,649, while non-Inupiat household incomes averaged $75,084. Inupiat incomes experienced slightly more growth (2.66%) than non-Inupiat incomes (1.79%) from 1988 to 1993 (Harcharek, n.d.:BRW-22).

7.6.1.4 Nuiqsut

Regional Setting: Nuiqsut is approximately 60 miles (97 km) west of the Prudhoe Bay industrial complex, on the west bank of the Nechelik Channel in the Colville River Delta. The community was re-established in 1973 at the site of an abandoned, traditionally-used village. Permanent housing was constructed gradually, and Nuiqsut was incorporated in 1975.

Nuiqsut has no access to permanent, year-round roads that connect to the rest of the state or other communities in the borough. However, surface access is possible by snow machine to Prudhoe Bay/Deadhorse during winter. Marine access is available for a limited time in summer when the ice-pack in the Beaufort Sea moves away from the coast. Primary access to the community is by regularly-scheduled daily air service from Barrow and Deadhorse.

Population: The Alaska Department of Labor reports Nuiqsut's population was 410 as of July 1, 1995. Nuiqsut is characterized by a very young population, with approximately 44% of the 1993 population under the age of 15. Approximately 10.8% of residents are between the ages of 25 to 29. The population is predominantly Inupiat (more than 90%). Nuiqsut's population growth from 1939 to 1990 is shown on Figure 7.6-6.

Employment and Income: Historically, Nuiqsut's economy was based largely on subsistence activities. A cash economy developed with re-establishment of the community in 1973. The public sector and Kuukpik Corporation, provide most of Nuiqsut's employment (Figure 7.6-7). Unemployment was estimated at 5.21% of the total labor force, although there was no unemployment for those in the 18 to 26 age group.

The average household income in 1993 was $39,180; per capita income was $9,637. Inupiat household income and per capita income were lower than non-Inupiat incomes. Typically, non-Inupiats are employed as school teachers or managers in the village corporation, accounting for their higher household

and per capita incomes.

7.6.1.5 Kaktovik

Regional Setting: Kaktovik is located on Barter Island, approximately 120 miles (193 km) east of Prudhoe Bay. The village was incorporated in 1971 and was one of the original North Slope villages awarded land under ANCSA. Kaktovik is a traditional Inupiat community and participates in a variety of subsistence activities. Employment opportunities are limited; primary employers are the NSB, the City of Kaktovik, and the Kaktovik Inupiat Corporation.

Population: In 1939, Kaktovik's population was estimated at 13 (U.S. Census). Construction of the DEW Line radar station caused the population to almost triple from 1950 to 1960, and the 1990 population of 224 represented approximately 3.5% of NSB total population. Inupiat residents comprised 86% of the total population in 1993. Kaktovik's population growth from 1939 to 1990 is shown in Figure 7.6-6 (Harcharek, n.d.:NSB-15).

Employment and Income: According to the 1993 NSB Census of Population and Economy, the public sector employed 71% of the labor force (Figure 7.6-7). The local village corporation and the private sector employed most of the remainder of the work force.

Findings from a 3-year study (1991 to 1993) investigating the sociocultural consequences of OCS development in Alaska estimated Kaktovik per capita income to total $18,176. The average household income was $55,688 (Pederson, 1995:XX1-5).

7.6.1.6 Prudhoe Bay/Deadhorse

Regional Setting: Prudhoe Bay was developed initially for oil production operations in the 1970s and 1980s. The 800-mile long TAPS, was constructed in the mid-1970s to transport crude oil from Prudhoe Bay to Valdez, where marine tankers load the product and ferry it to terminals on the U.S. West Coast and other locations.

The unincorporated community of Deadhorse was developed as a result of oil discoveries and is the primary land service base for oil and gas development in the Prudhoe Bay area. A workforce of 5,000 rotates in and out of the Prudhoe Bay area on a fixed schedule. Most oil-related employees work 12-hour shifts for 7 days a week. Deadhorse has not been incorporated as a municipality under Alaska Statute, and ANCSA Native corporations were not part of its formation.

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Figure 7.6-7 (page 1 of 2)

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Population: Most of the population of Deadhorse is not considered to be permanently resident, and the number of people present at any given time is influenced directly by oil field activities. According to the 1990 U.S. Census of Population and Employment, 47 permanent residents were living in the Prudhoe Bay/Deadhorse area.

Employment and Income: Census figures in 1990 showed no unemployment, with 28 persons employed by the private sector in industries such as travel and tourism. The median household income in 1996 in Deadhorse was $102,264. As indicated above, a non-resident work force of approximately 5,000 rotates in and out of the area.

7.6.2 Environmental Consequences

Analysis of socioeconomic impacts has been included in this EIS to evaluate potential effects of the project on population, employment, income, and public finance/fiscal characteristics. Impacts from Alternatives 2, 3, 4, and 5 are identical; therefore, they have been addressed together and are summarized in Table 7.6-1. The range of effects from an oil spill would be variable and would include costs for cleanup activities, which could affect the local and state economics. Potential impacts of an oil spill on socioeconomic resources are addressed in Chapter 8.

7.6.2.1 Alternative 1 - No Action Alternative

For the No Action Alternative, there would be no impacts on population, employment income, and public finances, nor would there be fiscal impacts. The $611 million in state revenue, $392 million in federal revenue, and $64 million in NSB revenue estimated from Northstar oil and gas production would not be generated through royalties, income taxes, and property taxes that would accrue over the life of the project. A total of 830 operation and construction jobs, which would generate approximately $307 million in wages, would not be created. Past experience with oil field development projects has indicated a minimum of one-to-one correlation between direct and indirect man-hours for every man-hour of direct labor expended, which also would not be realized if the project were not constructed.

7.6.2.2 Alternatives 2, 3, 4, and 5

Fiscal Impacts: Fiscal impacts of the 158 million barrels of oil production under Alternatives 2, 3, 4, and 5 include the potential state, federal, and local revenues that would result from the project. Revenues to the state, federal, and local (NSB) governments come from a number of royalty and tax payments. These revenues are based on gross income from the project (royalties), capital investment (ad valorem tax), and net income (federal income tax). Estimates of the recoverable oil from the Northstar Unit have ranged from 145 million barrels to 172 million barrels; therefore, a mid-point estimate of 158 million barrels was used for analyses. Peak production would be achieved in the second year

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at a production rate of 65,000 barrels per day (barrels/day). After 3 years, the production rate will decline according to the profile shown in Figure 7.6-8 (Hanley, 1997a:2).

Factors influencing fiscal impact analysis results include the amount of recoverable oil, total capital and operating expenditures, estimated Alaska North Slope wellhead prices, and the ratio of state revenue to total gross revenue.

Methodology: An existing ADNR model was used as the basis for calculating state and federal revenues from the Northstar Project (ADNR, 1996:c). The ADNR model was updated to reflect the updated production scenario and current price forecasts for North Slope oil during the period from 2000 through 2014. The gross revenues were calculated using the Fall 1998 long-term oil price forecast from the Alaska Department of Revenue. Gross revenues for the 158-million-barrel model were calculated based on a production estimate of 65,000 barrels/day (ADR, 1996:31) for 3 years, after which the daily production rate declines by 35% every year.

Analysis Results: The analysis provides estimated revenues to the state, federal government, and NSB that would result from Northstar Unit development. Estimates are based on total recoverable reserves over the life of the field.

State Revenue: State revenues from the project recoverable reserves of 158 million barrels total $ 478.6 million over its anticipated 15-year life and are depicted in Table 7.6-2. This represents 25.0% of total gross project revenue. State oil and gas royalties would capture 16.11% of the total gross revenue. Other revenues and state supplemental royalties, state share of federal royalties, severance tax, spill and conservation tax, ad valorem tax, and income tax would contribute the remainder of the state revenue.

The ad valorem tax revenues to the state and NSB were calculated using the current taxation rates for the NSB and the remaining state share of ad valorem tax revenues. The capital investment assumption for the project totals $343.5 million of the total project cost of $405 million (Hanley, 1997a).

Federal Revenue: Depending on the actual location of oil produced with regard to state and federal lease tracts, and the outcome of discussions between State of Alaska and the MMS on royalty share, some oil and gas royalty revenues will be generated to the federal government. Table 7.6-2 shows the federal revenues by year for the life of the project. These revenues were calculated using the updated ADNR model. Federal revenues from the project would total $306.3 million.

NSB Revenue: Using capital expenditures provided by BPXA, analysis shows revenue from the project in its initial year would contribute approximately $6.35 million (a 3% increase) to the NSB. Over the life of the project, total property tax revenues to the NSB would be $ 64.3 million, while the state portion of the ad valorem tax would total $ 5.21 million (Figure 7.6-9).

The total ad valorem tax for the NSB and state was derived by using total capital expenditures with some slight modifications. Total project capital expenditures would be $405, including initial development drilling. The $405 million figure assumes a capital cost estimate of $271 million, with $82 million for

drilling, and $52 million for pipeline construction. Ad valorem taxes to be paid would be based on the total capital investment of $405 million, adjusted to $343.5 million to reflect the non-tangible drilling costs. This property value would be depreciated over the life of the project (Hanley, 1997b:3). The State of Alaska would make a determination of the depreciation rates; however, for purposes of this evaluation, a straight-line depreciation over 15 years has been assumed, equivalent to a rate of 6.67% a year, modified for an inflation factor over the life of the project. The respective ad valorem tax revenues under these assumptions are shown on Figure 7.6-9.

The estimated $64.3 million in revenue to the NSB generated over the life of the proposed action would constitute a beneficial impact to a special population as defined under Executive Order 12898 regarding Environmental Justice. This revenue would contribute to providing NSB services and facilities in communities affected by the proposed action, and contribute to their ability to maintain a mixed cash/subsistence economy.

Economic benefits from the Northstar development will support NSB residents in three primary ways: education, employment/contracts, and ad valorem property taxes.

First, new development will create new job opportunities in oil field construction, maintenance, operations, and support services. In support of the new job opportunities, BPXA and the Arctic Slope Regional Corporation (ASRC) have joined together to form “Itqanaiyagvik” which is comprised of six development programs designed to train NSB residents for jobs in the oil and gas industry.

Second, the Northstar project includes two ASRC subsidiaries, Houston Contracting and Alaska Petroleum Contractors, who would gain in revenue approximately $60 million. Both of these contractors are integral participants in the Northstar Project through their respective roles as the pipeline installer and fabricator of process module components. In addition, Nuiqsut’s village corporation, Kuukpik, will provide transportation and shipping services through their joint venture - Kuukpik Carlile.

Third, the Northstar project will pay approximately $64.3 million dollars in ad valorem property tax directly to the NSB over the projects estimated 15-year field life. New oil field investments and investments which extend the lives of existing oil fields provide the source from which the NSB bond’s against.

In addition, Anchorage would receive property taxes for 1998 and 1999 during construction of some of the production modules. The revenue to Anchorage during these 2 years is estimated to be $3 million.

Project Expenditures: The total capital cost of the project is estimated to be $405 million. Excluding the $150 million for specialized materials from outside

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Figure 7.6-9 (page 1 of 2)

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Alaska, 85% of that capital cost is expected to be spent in Alaska (Hanley, 1997b:3). The money spent in Alaska includes fabrication of modules and other project components, engineering services, pipeline construction, civil construction, and North Slope installation work. Direct operations costs are estimated to exceed $390 million, all of which would be spent in Alaska, as it is anticipated that supplies, camp services, and other operating expenditures would be purchased or contracted through Alaskan vendors.

In addition to the direct benefits to the state, federal, and NSB governments, there would be secondary impacts to the economy as a result of project expenditures. The job-creating impacts of these expenditures are the "multiplier effects." The secondary employment and income effects of the Northstar project expenditures on the economy of Alaska have not been determined. Historical project experience in Alaska (Hanley, 1997b:1) has demonstrated that for every direct man-hour expended there is at least one man-hour of indirect labor expended.

Construction Impacts:

Workforce: The project is estimated to generate as many as 730 jobs for Alaskans during the 18-month construction phase (BPXA, 1997:Table 1.2-4; Hanley, 1997b:1). It is assumed that a small portion (10%) of the workforce would be Alaska non-residents, who would temporarily reside in the Anchorage or Fairbanks area during the construction phase, and would represent a negligible impact to population. No population increases are anticipated within the NSB.

Employment and Income: Historical project experience in Alaska (Hanley, 1997b:1) has demonstrated that for every direct man-hour expended there is at least one man-hour of indirect labor expended. Construction of the facilities modules, the flare tower, and other project components would generate approximately 250 jobs in Anchorage over an 18-month construction period. North Slope employment demands will peak at approximately 375 workers during ice road and island construction and pipeline installation, and would require approximately 50 workers for drilling production. The majority of the workforce would be hired through contractors. Total construction requirements are estimated at approximately 2,140,000 man-hours and would generate approximately $51.6 million in Alaskan wages. Table 7.6-3 illustrates the average Alaska labor requirements, estimated duration, primary contractors, workforce location, direct man-hours, and estimated wages for the project.

Workforce composition is contingent upon several factors, including specific job requirements, availability of personnel, and local hiring policies. Historically, workers in the oil fields have come from urban centers of Alaska, and the number of NSB Native residents working directly for oil companies in or near the Prudhoe Bay industrial complex has been small, approximately 60 out of the 6,000 workers (1%) (Marshall, 1993:7).

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The overall impact from construction of the project would have a beneficial effect on employment levels and income of Alaska residents.

Operation Impacts: The operational workforce of approximately 100 would be employed at the Seal Island facilities, ice road maintenance, and onshore facilities following completion of drilling and through the 15-year life of the operation. The 100 average annual full-time jobs would generate approximately $255 million in wages, for a beneficial impact to the Alaska economy.

Maintenance Impacts: Additional maintenance workers would be assigned to Seal Island as needed from BPXA's existing work force without the creation of new jobs. No impacts to population, employment, and income are expected.

Abandonment Impacts: Abandonment impacts would depend upon the abandonment plan that is adopted, and will be fully addressed in the assessment of the environmental effects of the abandonment alternatives. An abandonment scenario involving removal of the facilities and infrastructure would most likely employ Alaska contractors and result in a minor, beneficial impact. An abandonment scenario involving in place abandonment and/or reuse of a substantial portion of the project facilities would result in a negligible, beneficial impact to the Alaska economy.

7.6.3 Summary of Environmental Consequences

If the project were not implemented, local, state, and federal revenues would continue to be generated by oil and gas projects. However, an incremental increase in revenues from the project would not become available to the taxing authorities.

Project construction and operation would have a beneficial impact to employment and would substantially increase tax and royalty revenues to local, state, and federal governments through oil production. Short-term benefits would result from the creation of construction jobs for gravel mining, island reconstruction, facilities fabrication, and drilling. Project construction would generate 730 Alaska construction jobs with estimated wages of $52 million. Long-term benefits would result from the addition of operations personnel and the generation of tax and royalty revenues. Project operation would generate an average of 100 Alaska operation jobs annually, with estimated wages of $255 million over a 15-year project life. Total project revenues from oil and gas royalties and taxes are estimated at up to $478.6 million to the State of Alaska, $306.3 million in federal revenue, $64.3 million to the NSB and $3 million to the Municipality of Anchorage over the 15-year project life.

The impacts of a large oil spill are discussed in depth in Chapter 8. A large oil spill could result in direct socioeconomic impacts. An oil spill could result in loss of revenues and increased costs to BPXA and the state and federal governments, depending on the size and duration of the spill event. Oil spill response and cleanup measures would likely generate short-term, high-wage employment. This could adversely effect services in local communities by temporarily attracting members of the local workforce from other jobs to cleanup efforts.

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7.7 TRANSPORTATION

7.7.1 Affected Environment

Construction, operation, maintenance, and abandonment of the project would require movement of personnel, equipment, materials, and supplies that could affect highway, air, marine, and rail facilities. Oil produced by the proposed project would be transported by the TAPS, operated by the Alyeska Pipeline Service Company. Major facilities that would be affected are shown on Figure 7.7-1. Materials coming into Alaska

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would be transported by rail, truck, barge, and/or air to the project site. Personnel would be transported to the Prudhoe Bay industrial complex via air, and then to the project site.

7.7.1.1 Marine Transportation Systems

Many of the supplies and equipment transported to the North Slope pass through Seward, Whittier, and Anchorage ports (Figure 7.7-1). The Port of Anchorage, which is the most northern deep draft port in the United States and is open year-round, has five terminals that provide service for every type of standard cargo vessel and for specialized carriers. Container cargo is the primary business activity at the port and has been increasing at a constant annual rate of approximately 1.5% over the last 10 years (Port of Anchorage, 1997:5). The port has handled approximately 2.5 to 3 million tons (2.3 to 2.7 million metric tons) of goods annually since 1994 (Mayer - Pers. Comm., 1997).

The Port of Seward handles container shipments, general cargo, and bulk cargo that transfer to rail, road, and air transportation systems. The Seward port accommodates mostly cruise ships, with some transfer of logs, pipe, and coal (Northern Stevedoring - Pers. Comm., 1997). Freight tonnage through the port totaled approximately 31,000 tons during 1996 (White - Pers. Comm., 1997).

The Port of Whittier is owned and operated by the Alaska Railroad Corporation (ARRC) and is a part of ARRC's interline system, which provides rail/barge service between Seattle and Whittier. In 1996, interline business increased by 29% and contributed 32% of ARRC's total freight revenues (ARRC, 1996:6). Freight offloaded at the port during 1996 totaled approximately 300,000 tons (White - Pers. Comm., 1997).

Marine transportation to the North Slope is limited to a seasonal window between late July and early September when the North Slope coast is ice-free. Port facilities on the North Slope range from shallow draft docks with causeway road connections to facilities located at Prudhoe Bay, to beach landing areas in North Slope communities (USDOI, MMS, 1986:426). Cargo ships and ocean barges typically are offloaded to shallow- or medium-draft ships for lightering to shore. Small craft are used to transport cargo up river to areas not located on the coast. Marine sealifts are scheduled as needed to bring oil field supplies and equipment to the Prudhoe Bay industrial complex by way of two docks on the West Dock causeway. A third dock is available at Endicott for off-loading supplies. The number of barges in each sealift (Table 7.7-1) has ranged up to 47 (Toruga - Pers. Comm., 1996). The shallow water at East Dock is used for unloading shallow draft barges in the Prudhoe Bay area.

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The Valdez Marine Terminal is the southern terminus of the TAPS and is the point from which North Slope Alaskan crude oil is transported to world markets. The terminal has 18 crude oil storage tanks with a total capacity of 9.18 million barrels. Facilities include a multi-berth, offloading facility that fills tankers, a ballast water treatment facility, power generation equipment, and vapor recovery incinerators.

7.7.1.2 Alaska Railroad Corporation

The ARRC has dock and handling yards at Seward, Whittier, and Anchorage ports to provide ground transportation of materials reaching Alaska by barge. The ARRC provides freight services from these ports to Fairbanks, where materials can be offloaded to trucks for road ferrying to the Prudhoe Bay complex.

Cargo shipment is ongoing throughout the year, although shipment of some commodities such as sand and gravel are seasonal. Major commodities transported by rail include sand and gravel, coal, refined fuel products, pipe, and pipe fittings. Smaller quantities of chemicals, machinery, equipment, and other materials also are transported. The ARRC is capable of handling large, heavy, and oversized loads, such as construction modules.

7.7.1.3 Highway Transportation Systems

The Seward Highway serves the Port of Seward, and the Glenn, Parks and Richardson Highways link Anchorage to Fairbanks. Materials, equipment, and supplies would be transported from Fairbanks to the Prudhoe Bay industrial complex via the Dalton Highway, which is the highway system most likely to be affected by the project.

The James Dalton Highway (commonly referred to as the Haul Road or Dalton Highway) is the only ground transportation route connecting Prudhoe Bay to Alaska's other major highway systems. The roadbed is 28 ft (8.5 m) wide with 3 to 6 ft (1 to 2 m) of gravel surfacing throughout the 416 miles (670 km) from Livengood, approximately 80 miles (129 km) north of Fairbanks, to Deadhorse (Figure 7.7-1). The highway was opened for public access in 1996 as far as Deadhorse. Permits from the oil field operators are required for access past Deadhorse into the Prudhoe Bay industrial complex.

Trucks, transporting commercial freight in support of oil field activities at Prudhoe Bay, dominate traffic along the Dalton Highway; however, privately owned vehicles and commercial tour operators also use the highway. Alaska Department of Transportation and Public Facilities annual average daily traffic counts along the Dalton Highway for 1992 through 1995 are shown in Table 7.7-2. The average daily number of vehicles crossing

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the Yukon River checkpoint in 1995 was 269, of which approximately 56 were visitors traveling the highway in private vehicles (Robbe, 1996:70).

7.7.1.4 Aviation Transportation Systems

The Prudhoe Bay industrial complex is served by the Deadhorse Airport, the Prudhoe Bay airstrip, and the Kuparuk airstrip (Figure 7.7-1). Alaska Airlines and Shared Aviation Services (operated by Arco Alaska, Inc.) each provide daily service to Deadhorse from Anchorage and Fairbanks (LFA, 1996:72), with an estimated 200,000 passengers transported to and from Deadhorse annually (Nickles - Pers. Comm., 1996). Commercial cargo service is provided into Deadhorse by Northern Air Cargo. The amount of cargo transported annually via air to the North Slope is estimated at 648 tons (St. John - Pers. Comm., 1996).

7.7.1.5 Pipeline Transportation Systems

Crude oil is collected from the North Slope oil fields and transported via the TAPS to Pump Station No. 1 at the northern terminus of TAPS. From this point, TAPS extends more than 800 miles (1,287 km) to the southern terminus at Valdez, located on Prince William Sound (Figure 7.7-1).

At the start-up of TAPS operation in 1977, the pipeline capacity was 300 to 500 thousand barrels/day with eight pump stations in operation. Construction of two additional pump stations, modifications to other stations, and the injection of drag-reducing chemicals has increased the pipeline's capacity to 2.2 million barrels/day.

Production projections for North Slope oil to the year 2015 show a steady decline in oil flow. North Slope production peaked at approximately 2 million barrels/day oil in 1988. Estimates for 1997 to 2015 range from 384,000 to 1.38 million barrels/day (Tyson, 1996:8). Daily production rates during the period from 2000 to 2015 (in 5-year increments) have been forecasted, as shown below, using expected production from all Prudhoe Bay area fields.

Year	Barrels/Day Oil
2000	1,120,000
2005	801,000
2010	560,000
2015	384,000

Because of declining North Slope oil production, Alyeska Pipeline Service Company has scheduled three pump stations to be shut down between the latter half of 1996 through the end of 1998 (APSC, 1996:30). Pump stations that have been shut down can be re-activated if flow rates increase. The recommissioning process could take several months; however, it is expected that the pipeline flow could be increased immediately by the use of large amounts of drag-reducing chemicals. The pipeline is capable of operating

at 1.75 million barrels/day, despite the shutdown of the three pump stations.

7.7.2 Environmental Consequences

Impacts to transportation which may occur during the construction, operation, maintenance, or abandonment of the project are discussed in this section. Potential impacts to transportation for Alternatives 2, 3, 4, and 5 are identical, addressed together, and are summarized in Table 7.7-3.

7.7.2.1 Alternative 1 - No Action Alternative

Highway, aviation, marine, and rail transportation systems within the State of Alaska historically have provided support for new field development and ongoing operations in the Prudhoe Bay area. Transportation of equipment and supplies along the Dalton Highway is expected to continue, regardless of the development of the project. Alaska Airlines and Shared Aviation Services currently provide passenger service to Deadhorse in support of ongoing oil field operations. It is likely that the level of service would continue to meet transportation needs as future demands dictate. Two dock facilities currently are available at West Dock and a third dock at Endicott could be made available to meet future oil and gas-related project requirements.

Cargo handling through the Port of Anchorage has increased an average of 1.5% annually over the past 10 years, a trend likely to continue regardless of development of the project. Throughput at the Port of Whittier increased approximately 29% in 1996 from 1995 levels. Although future increases are likely to be less than the 1996 rate, rail connections at the port and construction of a new highway tunnel to Whittier ensure continued use of the port. Crude oil transport from the Port of Valdez has been declining, commensurate with declining oil production from the North Slope, and it is likely that the decline will continue.

7.7.2.2 Alternatives 2, 3, 4, and 5

Transportation service, facility, and equipment requirements for passenger and material movement would be consistent among the alternatives. Although variances in some construction materials and supplies would be expected, the subsequent differences in freight handling and transportation requirements are too small to predict.

Construction Impacts: Construction impacts to transportation result from the transportation of workers, materials, and supplies to the North Slope, and to and from Seal Island and pipeline construction sites.

Project construction would result in short-term increases in passenger airline traffic. Shared Aviation Services and Alaska Airlines already provide service between Anchorage, Fairbanks, and Deadhorse. Construction

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workers for the project are expected to represent less than 4% of the existing passenger load; therefore, transporting project workers is expected to represent a minor impact to passenger air travel.

The Ports of Anchorage, Whittier, and Seward and the Alaska Railroad have facilities sufficient to meet increased demands. Construction equipment and materials would arrive in Alaska via barge at the Ports of Anchorage, Whittier, and Seward. During the first year of construction, an estimated 2,500 tons (2,268 metric tons) of sheet pile and 5,600 tons (5,080 metric tons) of pipeline would be transported through the Port of Seward (T. Barnes - Pers. Comm., 1997). This represents approximately 26% of the current freight throughput.

Construction materials, equipment, and drilling supplies would be shipped through the Port of Whittier. Over the first 4 years of construction and operation, 5,478 to 16,314 tons (4,970 to 14,800 metric tons) would be shipped. This volume would represent 2% to 5% of the current Whittier throughput. Approximately 1,500 tons (1,361 metric tons) of project-related freight would be shipped through the Port of Anchorage during the first year of construction, representing less than 1% of the current 2.5 to 3 million tons (2.3 to 2.7 million metric tons) of throughput. With expected freight through the three ports ranging from less than 1% to as much as 26% of current levels (T. Barnes - Pers. Comm., 1997), impacts to the facilities are expected to be minor.

Equipment and materials would be transported to Fairbanks via the Alaska Railroad, or by truck on the Seward, Glenn, Parks, and/or Richardson Highways. North of Fairbanks, equipment and materials would be transported along the Dalton Highway by truck. Recent traffic counts indicate approximately 270 vehicles use the Dalton Highway daily. Traffic levels are expected to increase by two trucks per day during the 1-year construction period (T. Barnes - Pers. Comm., 1997), which represents less than 2% of current vehicle usage (assuming roundtrip traffic). Peak traffic months would be January, March, and August. Therefore, impacts to traffic movement are expected to be minor.

Major components of the process and infrastructure modules would be transported by barge from Anchorage to Seal Island or to Prudhoe Bay. A maximum of three barges would be required to transport equipment from Anchorage to Seal Island. Previous construction activities within the area have required the use of as many as 46 barges in a season, and sufficient barge capacity is available through existing sources to support transportation requirements for this phase of project construction. Consequently, impacts are expected to be minor.

Construction of the island and installation of facilities on the island would require approximately 60 workers to be transported to the island daily via four daily helicopter flights over a 3-month period during the summer construction period. No impacts to transportation are anticipated because boat and helicopter traffic are unlikely to affect existing aircraft and boat movement in the area.

Operation Impacts: Drilling personnel would be transported daily to Seal Island by helicopter or boat during drilling mobilization. Barges would be used to transport drilling materials and supplies from West Dock. A total of 21 barge trips are anticipated during drilling mobilization, including 5 to 6 barge trips from West Dock to transport the drill rig. Additionally, the resupply of materials and supplies would be

transported by truck over ice roads during winter and by barge during open water seasons. Transport of personnel, materials, and supplies for drilling is expected to have a negligible effect on existing local transportation systems. Therefore, impacts are expected to be negligible.

Approximately 100 workers would be required during the project drilling operations and through the 15-year life of the operation. Personnel and supplies would be transported via air, bus, and water. Potential impacts to subsistence resources caused by the transportation of personnel and supplies to and from Seal Island are discussed in Section 7.3.

Employees would be transported to and from Deadhorse via Shared Aviation Services and Alaska Airlines. Based on current availability of flights and anticipated numbers of project personnel, impacts on air transportation facilities and services are expected to be negligible. Additionally, transportation of workers from Deadhorse to Seal Island would be by bus over an ice road during winter (late December to May), crew boats or barges during open water periods, and by helicopter during other periods, utilizing transportation services supplied by BPXA. However, because employees would be housed on Seal Island, transportation requirements for a personnel movement would be limited to periodic crew replacements. Related impacts to bus, boat, and helicopter transportation facilities would be negligible.

The island is designed to support a 4-month supply of materials. Frequently needed supplies include diesel fuel, chemicals, and consumables, including perishables (i.e., food, potable water) and non-perishables (i.e., paper goods). Diesel fuel and chemicals would be transported to Deadhorse by truck then over an ice road to the island during winter, or from West Dock to the island by barge during the open water season. Low sulfur diesel fuel may also be obtained from sources outside the Prudhoe Bay area and transported to Seal Island by barge or truck. Consumables would arrive in Deadhorse by truck or air freight and be transported from Deadhorse to the island by truck over an ice road during winter, barge during summer, or by helicopter during breakup and freezeup. The amount of supplies required to support the project would be nominal compared to the larger projects in the area. The existing transportation services are sufficient to accommodate project transportation needs, and impacts are expected to be negligible.

Approximately 30 additional tankers per year would be required to transport Northstar Unit oil during the initial years of peak production (using gas cycling and assuming each tanker holds 800,000 barrels of oil), and decreasing to approximately two tankers during the last year of production. Based on existing and projected pipeline throughput during the 15-year production period, production from the Northstar Unit would represent approximately 3.7% to 4.3% of the crude oil shipped through TAPS and the Valdez Marine Terminal during the first years (years 2, 3, and 4) of production, and approximately 0.03% of the crude oil during the 15th year of production (Section 4.4.2.4).

As discussed in Section 7.7.1.5, the amount of oil produced on the North Slope is declining. The increased amount of oil produced because of the project and transported through TAPS would represent a beneficial impact to this transportation facility.

A large oil spill can be expected to have minor impacts on transportation services and facilities in the

project area and throughout Alaska due to commitment of transportation resources during the initial phases of spill response. Impacts to transportation resources due to an oil spill are discussed in Chapter 8.

Maintenance Impacts: Routine maintenance of Seal Island facilities and equipment (offshore and onshore) would result in periodic movement of personnel, materials, and equipment. The frequency and magnitude of such activities are expected to be low and related impacts to transportation systems are expected to be negligible and temporary.

Abandonment Impacts: Abandonment impacts would depend upon the abandonment plan that is adopted, and will be fully addressed in the assessment of the environmental effects of the abandonment alternatives. The current transportation system is more than sufficient to handle the minor impacts associated with project abandonment. For an abandonment scenario involving complete removal of all facilities and infrastructure, impacts would be expected to be similar. For a scenario involving in place abandonment and/or reuse of a substantial portion of the project facilities, the overall impacts of abandonment would be expected to be minor.

Removal of equipment from Seal Island and removal of pipelines and vertical support members from onshore locations could require an increase in use of barge and truck transportation activities on Alaskan highways, airports, and ports. Although it is likely that some equipment and materials would remain in the Prudhoe Bay area for use at other production sites, barges and trucks could be used to move equipment to Fairbanks, Anchorage, and elsewhere. Decommissioning and abandonment probably would not result in the intensity of barge and truck movement as would be required for construction; however, impacts to transportation would be similar and minor.

7.7.3 Summary of Environmental Consequences

Equipment and materials transported through the Ports of Seward, Whittier, and Anchorage are expected to represent an increase of 1% to 26% over current levels. Incremental increases in truck traffic along the Dalton Highway would represent approximately 2% of existing levels. These are expected to represent minor impacts to transportation facilities. Barge and boat traffic associated with project construction, and bus and truck traffic for the transport of materials and workers, would increase traffic between Seal Island and West Dock, which would result in minor impacts to transportation facilities in the project area. Northstar crude oil would total approximately 4.3% of the TAPS throughput during peak project production years; the relative contribution of the project to TAPS would decline as production from the field declines. Contributions to the throughput of TAPS would be a beneficial impact. Construction-related impacts to transportation would be short-term; operations impacts to TAPS would be long-term over the 15-year life of the project.

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7.8 VISUAL/AESTHETIC CHARACTERISTICS

7.8.1 Affected Environment

Visual characteristics of the project area and concerns of area residents relative to viewshed, including landscape and atmospheric characteristics that could affect views of the project, are described in this chapter.

7.8.1.1 Physical Appearance

The Arctic Coastal Plain is a treeless, low-relief landscape dominated by numerous lakes and ponds and

low-lying vegetation. The terrain is frozen and covered by ice and snow during the Arctic winter, which typically lasts more than 9 months with 56 days where the sun does not rise above the horizon. During the brief summer of continuous daylight (June through August), ponds, rivers, low-lying shrubs, wildflowers, birds, caribou, small mammals, and insects are noticeable features of the landscape (Strahler & Strahler, 1987:185). A low, grass-like sedge mat covers much of the area and red aquatic grass grows around ponds and lakes.

Cone-shaped hills and mounds (pingos) that reach elevations of more than 100 ft (31 m), are the only land-form on the coastal plain with any given height. Steep stream and river banks, coastal sand dune deposits, and steep coastal bluffs along the ocean create contrast in landscape elevation. Large rivers typically are braided and have broad floodplains and drainages. Smaller rivers and streams consist of thaw pools that are interconnected by narrow channels.

The nearshore area of the Alaskan Beaufort Sea is punctuated with barrier islands and changes considerably in appearance from winter to summer. Barrier islands (Section 5.3) are low elevation land masses, mostly of sand and gravel, with some low-lying tundra vegetation. During winter, the nearshore area freezes and snow and ice drift over the barrier islands, making it difficult to differentiate the shoreline from the sea ice. Although the ice is landfast north of the barrier islands, ice pressure ridges are common to heights over 13 ft (4 m) (Kovacs and Mellor, 1974:124). During the open water season, the ocean and floating ice provide visual contrast between the land and the edge of the ice pack. Seal and Cross Islands are 6 and 10 miles (9.6 and 16 km), respectively, from the shoreline, and can be seen from some onshore locations.

More than 10 onshore oil and gas fields with developed well and production facilities are located in the Prudhoe Bay area. Oil field facilities extend approximately 60 miles (96.5 km) along the coast and as much as 20 miles (32 km) inland. The facilities are characterized by gravel pads, reserve pits, large and small buildings, gravel roads, pipelines, snow fences, heavy equipment, drilling rigs, flares, lights, and powerlines. Manmade offshore structures include West Dock and Endicott causeways, which extend offshore for distances of more than 4 miles (6.4 km).

7.8.1.2 Atmospheric Conditions

Physical characteristics of the region combine to create several unique optical phenomena, including fata morganas (also referred to as loomings or mirages), light intensification, Arctic haze, and the Northern Lights (Aurora Borealis).

An almost continuous temperature inversion in the circumpolar Arctic results in abnormally refracted light which frequently results in fata morganas. As a result, distant objects and features are distorted and appear much larger or brighter than they actually are. Fata morganas are most noticeable when looking seaward during the open water season. Light intensification occurs when ice crystals are suspended in the air and cause a light source, such as a flare, to appear to be illuminated brightly. From the ground, suspended ice crystals appear as fog. If light travels through the ice crystals, the light intensifies making its source visible from a greater distance. Arctic haze, which occurs mainly during winter and spring, can

reduce visibility from 50 miles (80 km) to less than 5 miles (8 km). Although scientific research is ongoing, the predominant theory is that the haze originates from long-range transport of pollutants from industrialized Europe. Northern Lights occur frequently during winter in a variety of forms. Displays include a spectrum of colors including greens, pinks, and yellows, appearing as vertical moving streamers with luminous, expanding arcs, or fog-like glow.

7.8.1.3 Cultural Context

Nuiqsut and Kaktovik are the closest Native communities to the project. Nuiqsut is located on the Colville River, 18 miles (29 km) upriver from the Alaskan Beaufort Sea and approximately 60 miles (96.5 km) southwest of the project area. Kaktovik is located on the north shore of Barter Island, between the Okpilak and Jago Rivers on the Alaskan Beaufort Sea coast, approximately 150 miles (241 km) east of the project area. The project area, including Cross Island, is occasionally used by Nuiqsut residents during summer and fall for subsistence harvesting activities.

The Inupiat have expressed concerns about oil and gas development in the Prudhoe Bay area. Manmade color and lights are considered intrusive to the natural landscape, and some colors and bright lights are thought to affect marine mammals that are important to their subsistence lifestyle. Light from Prudhoe Bay oil field activities is sometimes visible as a distant glow from the community of Nuiqsut, serving as a constant reminder of oil and gas activity in the region. Additionally, oil and gas development is an indicator of visual change in the homogenous tundra environment and is considered as indicative of a change in the traditional subsistence way of life.

Public testimony received during scoping and other meetings held in North Slope communities indicates that people are concerned about industrialization and associated degradation of visual qualities of the area. The range of comments included visual impacts of dock facilities, degradation of rivers, and the creation of burning pits within the North Slope region. Concern also has been raised that additional oil and gas development projects will become widespread throughout the region and further reduce visual aesthetics of the area (Kruse et al., 1983:19; USACE, 1996:27).

7.8.2 Environmental Consequences

Visual impacts of the project are derived from the expected changes that would occur without the project and those that would occur from project construction, operation, maintenance, and abandonment. The level of impacts is variable and subjective, depending upon the duration and frequency of views, distance of the viewer, and viewer sensitivity. Although pipeline landfall locations differ among Alternatives 2, 3, 4, and 5, impacts to viewers and viewer sensitivity would be the same. Therefore, potential impacts for these alternatives are discussed together and are summarized in Table 7.8-1.

7.8.2.1 Alternative 1 - No Action Alternative

Although visual impacts from development and operation of the Northstar Unit would not occur if the project were not constructed, it is likely that visual qualities within the region would continue to change

as a result of industrialization. The extent of change would depend upon the sequencing and scope of development; however, facilities lighting, air emissions, and processing and transportation facilities are likely to become more widespread throughout the area of oil and gas resource development in the North Slope region. Although Seal Island is only occasionally seen by whalers, without the project it would eventually erode to below sea level.

7.8.2.2 Alternatives 2, 3, 4, and 5

Construction Impacts: Lighting from construction activities at the gravel mine, during trenching and pipe installation, and during island reconstruction is likely to appear to Nuiqsut residents as a faint glow on the horizon. During summer, viewers of the new onshore facilities would generally be limited to oil field workers who are accustomed to industrial activities and facilities of the Prudhoe Bay industrial area. View durations are likely to be limited to infrequent and/or short duration periods associated with travel to and from existing onshore facilities, which would result in minor visual impacts to oil field workers.

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Offshore reconstruction of Seal Island would not be visible from Nuiqsut due to distance (approximately 60 miles [96.5 km]) and the intervening Long Island landform. Calculations made to determine line of sight indicate the elevation of the flare tower (215 ft [65.5 m] above sea level) and of Nuiqsut (less than 50 ft [15.2 m] above sea level), would be less than that required for observation over the horizon. However, lights on elevated structures, including the Seal Island work surface, processor and compressor modules, flare tower, and worker quarters, are likely to be visible as a glow on the horizon. The intensity of the glow on the horizon would be increased under fata morgana and light intensification atmospheric conditions.

Air emissions from construction equipment and those from project operations are not expected to measurably increase atmospheric haze in the region. Air quality impacts are addressed in Section 5.4.

Operation, Maintenance, and Abandonment Impacts: The infrastructure on Seal Island would break horizontal views by introducing structures and an island base approximately 75 to 100 ft (23 to 30.5 m) above the water; the flare tower would rise approximately 215 ft (65.5 m) above sea level. However, due to its remote location, the facility would only be viewed by oil field workers and whaling crews during the fall subsistence hunt. To compensate for this visual distraction, Seal Island facilities would be painted a non-contrasting color and island piling, which would not be painted, would rust naturally. Impacts to oil field workers and subsistence hunters would be minor because the frequency and duration of views would be limited to workers within the industrial complex and the period when hunters are traveling between Nuiqsut and Cross Island.

The flare would be the highest point on Seal Island; however, it would have an open lattice support structure that would be difficult to detect visually. The flare would be used a maximum of 30 days per year. While flaring, the flame would be smokeless, virtually transparent, and light yellow and blue in color. A low pressure pilot, which would be smokeless and yellow to light orange in color, would operate continuously. Luminosity of the flare and the pilot is expected to be low because the flames would be virtually transparent.

The upper portion of the process module, compressor module, associated project lights, and flare would be visible from Cross Island (approximately 17 miles [27.3 km] from Seal Island). However, the structures would be painted in colors that would blend with the surrounding environment and would lack sharp contrast. The flare would be smokeless, virtually transparent, and light yellow to blue. Although the level of visual impacts associated with new facilities is dependent upon individual viewer sensitivity, impacts to whalers using Cross Island are expected to be minor, because the number of viewers would be relatively small and because the viewing period would generally be limited to a 2-week period during the fall whaling season. Onshore facilities and Seal Island would be visible to oil field workers; however, viewer duration is likely to be brief and the facilities would be similar to those currently in place in the area. Therefore, visual impacts to whalers on Cross Island and oil field workers are expected to be minor. As described previously, the project would be over the horizon and out of view from Nuiqsut. The glow of lights on the horizon would contribute to the existing glow produced from the Prudhoe Bay industrial complex that may be seen from the community during night/winter.

Concern has been expressed regarding the potential effects of light from the flare on the bowhead whale. Although information about such effects is not available, the flare will operate a maximum of 30 days per year with a nearly-transparent flame. Therefore, effects of the flare on the species are considered to be negligible. Information regarding the bowhead whale reaction to light and color and potential related effects on subsistence is provided in Section 7.3.

The shore approach for the pipeline would be visible from the sea, and onshore portions of Alternatives 2 and 3 would cross previously undisturbed tundra between the landfall and Pump Station No. 1. The onshore approach and valve station would be visible along the coast. Impacts to visual resources related to operation of the pipeline and ice road operations are expected to be limited primarily to oil field workers, regardless if viewed from the sea or land. Impacts to subsistence harvesters are expected to be minor because the area is seldom used by the Inupiat and because of the small number of viewers. There would be minor impacts to Nuiqsut residents due to a faint glow on the horizon.

There could be effects to the visual/aesthetic characteristics of the project area from an oil spill, and impacts are discussed in Chapter 8.

Abandonment impacts would depend upon the abandonment plan that is adopted, and will be fully addressed in the assessment of the environmental affects of the abandonment alternatives. Abandonment activities would be similar in nature to construction activities and impacts would be minor. For an abandonment scenario involving complete removal of all facilities and infrastructure, the long-term impact would be expected to be beneficial. The removal of the facilities and infrastructure would eliminate the visual contrast and the glow produced by the lights and flare. In-place abandonment and/or reuse of a substantial portion of the project facilities would result in impacts that are similar to those generated during construction, and would be minor.

7.8.3 Summary of Environmental Consequences

Construction of the facility for Alternatives 2, 3, 4, and 5 would erect structures that would interrupt horizontal views. Construction of facilities on Seal Island and the onshore pipeline approach would be visible for the life of the project (15 years) and would affect the long-term visual resources if not dismantled during abandonment. The glow caused by the lighting and occasional use of the flare seen beyond the horizon from Nuiqsut would be visible for the life of the project, as well, but the long-term visual resources would return to pre-construction levels when the project is decommissioned. Due to the remote location and because the facilities would be viewed infrequently, visual impacts would be minor.

7.8.4 References

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7.9 RECREATION

7.9.1 Affected Environment

Recreational activities on the North Slope occur mostly in ANWR and the NPRA, and along the Dalton Highway, which provides the only road access to the North Slope. The area directly south of the project area is leased for oil and gas development and the only visitor recreation that occurs in the leased units is commercial tours of the Prudhoe Bay oil field. On rare occasions, a sea kayaker or boater may recreate in Prudhoe Bay or surrounding waters. The project area is located in the Alaskan Beaufort Sea and is utilized for subsistence activities (Section 7.3), but only rarely for recreational boating. The most likely recreational activities to be impacted by the project are those that occur along the Dalton Highway.

The U.S. Department of Interior Bureau of Land Management and the Alaska Department of Transportation and Public Facilities conducted a survey recently and ascertained that the most important reason visitors travel the Dalton Highway is to view scenery and wildlife (Robbe, 1996:18). Visitors on the Dalton Highway are most likely making a day trip from Fairbanks and back to experience crossing the Arctic Circle (Robbe, 1996:76). Recent studies have shown that an average of 269 vehicles per day travel the highway from April through September, of which 56 are traveling to engage in recreational activities (Robbe, 1996:70).

Recreational opportunities available along the Dalton Highway which may be impacted by the project include scenic viewing, camping, sportfishing, hiking, hunting, and recreational goldmining. Visitors travel the Dalton Highway to view wildlife such as moose, wolf, bear, caribou, Dall sheep, Arctic fox, red fox, wolverine, musk ox, smaller mammals, waterfowl, shorebirds, passerines, falcons, and golden eagles

(Jensen, 1994:52-53). The Arctic Circle Campground and Old Man Camp, located at the Arctic Circle stop of the Dalton Highway, are the only developed camping facilities along the Dalton Highway. An undeveloped Bureau of Land Management campground is located at Coldfoot. Tent or recreational vehicle camping typically occurs at informal camping sites along the length of the Dalton Highway in conjunction with fishing, hunting, and birding.

Sportfishing is allowed along the entire length of the Dalton Highway corridor. Grayling, Arctic char, lake trout, sheefish, and several varieties of whitefish are found in the region's waterways. Several hiking locations are popular along the Dalton Highway (Jensen, 1994:48-49). The Dalton Highway is used as a means of access to sport hunting opportunities on the North Slope. Game species include black and brown (grizzly) bear, caribou, moose, musk ox, Dall sheep, wolf, and waterfowl. Only bow hunting is allowed within 5 miles (8 km) of the Dalton Highway and the TAPS. Hunting with firearms is allowed outside the 5-mile (8 km) highway and pipeline corridor.

7.9.2 Environmental Consequences

Recreational activities likely to be impacted by the project are those that occur along the Dalton Highway. The construction phase of the project is the only time when impacts to recreational activities would be noticed, and impacts would be the same for Alternatives 2, 3, 4, and 5. Therefore, potential impacts for these alternatives are discussed together and are summarized in Table 7.9-1.

7.9.2.1 Alternative 1 - No Action Alternative

In 1996, the Alaska Superior Court ruled that the Dalton Highway be open to public access for the entire length of the roadway. Prior to this ruling, the highway was open the entire length only by permit. The

Table 7.9-1 (page 1 of 2)

Table 7.9-1 (page 2 of 2)

highway is expected to become an increasingly popular route to recreational activities on the North Slope, and travel along the highway is likely to increase. Commercial tours are expected to continue in the leased oil and gas units and kayakers or boaters will occasionally recreate in Prudhoe Bay and surrounding waters. These trends will continue regardless of project implementation.

7.9.2.2 Alternatives 2, 3, 4, and 5

Construction Impacts: Truck traffic on the Dalton Highway moving equipment, materials, and supplies would increase by two trucks per day during project construction. The Dalton Highway is a narrow (28 ft [8.5 m]) gravel road, and often other vehicles pull off the road when large trucks pass. The increased truck traffic could result in impacts to recreational activities along the transportation corridor and may reduce the recreational quality of the area. However, daily peak truck traffic is expected to increase less than 2% over current levels. This increased activity would begin prior to actual construction and continue over a 1-year period until the Northstar Unit becomes operational. Consequently, the increase in daily truck trips occurring during the project construction period would have a minor impact to recreational activities along the Dalton Highway.

Operation Impacts: Production operations and related activities on Seal Island are expected to be carried out continuously during the 15-year life of the project. Operation activities are expected to have no impact on recreational activities along the Dalton Highway. Truck traffic attributable to Northstar operations would be much less than during the construction phase.

An oil spill would have a negligible, indirect affect on recreational activity in the project area and along the Dalton Highway by potentially increasing traffic on the highway during spill response cleanup activities. Impacts to recreational activities from an oil spill are discussed in Chapter 8.

Maintenance Impacts: Maintenance activities are expected to require little or no additional truck traffic on the Dalton Highway and would, therefore, have no impact on recreational activities.

Abandonment Impacts: Abandonment impacts would depend upon the abandonment plan that is adopted, and will be fully addressed in the assessment of the environmental affects of the abandonment alternatives. For an abandonment scenario involving complete removal of all facilities and infrastructure, impacts to recreational activities would be expected to be similar to those generated during construction. Most likely, only recreational activities along the Dalton Highway would be impacted, and the overall impact of abandonment would be expected to be minor. For a scenario involving in-place abandonment and/or reuse of a substantial portion of the project facilities, the overall impacts of abandonment would be negligible.

7.9.3 Summary of Environmental Consequences

Impacts to recreation from Alternatives 2, 3, 4, and 5 would be limited to those along the Dalton Highway that would result from increased truck traffic. Truck traffic for the transport of construction equipment and materials would represent less than a 2% increase over present levels along the highway, and would

continue over a 1-year period. This increase would create minor, short-term, indirect impacts to recreation activities along the highway as a result of additional truck traffic.

7.9.4 References

Jensen, Mike. Umbrella Guide to Alaska's Wilderness Highway. Seattle: Epicenter Press, 1994.

Robbe, Gregory A. 1995 Dalton Highway Visitor Survey Results Report. Prepared for the U.S. Bureau of Land Management and the Alaska Department of Transportation & Public Facilities by Gregory A. Robbe. Fairbanks: UAF, 1996.

7.10 ENVIRONMENTAL JUSTICE CONSIDERATIONS

Executive Order 12898 requires that federal agencies make achieving Environmental Justice part of their mission by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low income populations in the United States. Inupiat Eskimos, which are a minority population covered by Executive Order 12898, reside within the area which will likely be effected by the proposed Northstar development. Section 1.4.7 of Chapter 1 provides additional details on requirements related to Executive Order 12898 regarding Environmental Justice, and steps taken during the preparation of this EIS to meet those requirements.

In Section 7.3 Subsistence and 7.6 Socioeconomics of Chapter 7, potential effects resulting from Northstar development on North Slope Inupiat communities were identified. Given that North Slope Inupiat are a minority population covered by Executive Order 12898, the cooperating judicial agencies must determine whether these potential effects are disproportionately high as compared with effects on other, non-minority populations.

The conclusion of this EIS is that the potential effects of Northstar development on North Slope Inupiat are not, on balance, disproportionately high for the following reasons. The potential adverse effects described have a low likelihood of occurrence, have largely been mitigated by proposed project design and operations, and will be further mitigated by conditions on construction and operation activities placed by agencies on project authorizations. In addition, a primary goal of Executive Order 12898 is to avoid the selective imposition of effects of federal actions on populations which do not have the ability to prevent or oppose those actions. In this case, the interests of the North Slope residents have been represented by the NSB, a home rule municipal government with planning and zoning authority under which the project was comprehensively reviewed and approved. Further, the Arctic Slope Regional Corporation and Kuukpik Corporation which represent their Inupiat shareholders of the entire North Slope and Nuiqsut, respectively, have comprehensively reviewed the proposed project, and expressed their support for Northstar development. Finally, the cooperating federal agencies have recognized their responsibility under Executive Order 13084 to engage in consultation with potentially affected federally recognized tribal governments, and have taken steps through development of the EIS to ensure that North Slope tribal government officials were kept informed regarding the process and provided the opportunity

to participate.

TABLE 7.3-1
SUBSISTENCE HARVESTS BY MAJOR RESOURCE CATEGORY

Harvest	Resource					
	Marine Mammals	**Terrestrial Mammals**	**Fish**	**Birds**	**Other Resources**	**Total**
Barrow [1, 2, 3]						
Annual Usable Pounds Harvested	386,153	211,861	79,355	24,720	572	702,660
Percent of Households Harvesting Resources	48	54	41	53	7	68
Nuiqsut [3, 4]						
Annual Usable Pounds Harvested	85,216	87,390	90,490	4,325	396	267,818
Percent of Households Harvesting Resources	37	76	81	76	61	90
Kaktovik [3, 5]						
Annual Usable Pounds Harvested	115,645	28,867	22,952	3,249	227	170,940
Percent of Households Harvesting Resources	40	68	81	64	32	89

Notes: 1 = Three years of study: April 1, 1987 - March 31, 1990. Percentage of households harvesting is a cumulative total for the three study years rather than an annual average.

Sources: 2 = SRB&A and ISER, 1993:64
3 = Braund, 1997:54, 82, and 100
4 = Pedersen, 1995b:XXII-28-30
5 = Based on a 1992/1993 study - Pedersen, 1995a:XXI-22-24

TABLE 7.3-2
DOCUMENTED ANNUAL LANDED BOWHEAD WHALES
1964 - 1995

Year	Barrow	Nuiqsut [1]	Kaktovik	Year	Barrow	Nuiqsut	Kaktovik
1964	11	--	2	1980	9	0	1
1965	4	--	0	1981	4	0	3
1966	7	--	0	1982	0	1	1
1967	3	--	1	1983	2	0	1
1968	10	--	0	1984	4	0	1
1969	11	--	0	1985	5	0	0
1970	16	--	0	1986	8	1	3
1971	12	--	0	1987	7	1	0
1972	20	--	1	1988	11	0	1
1973	17	1	3	1989	10	2	3
1974	9	0	2	1990	11	0	2
1975	10	0	0	1991	13	1	0
1976	23	0	2	1992	22	2	3
1977	20	0	2	1993	23	3	3
1978	4	0	2	1994	16	0	3
1979	3	0	5	1995	21	4	4

Notes: 1 = The community of Nuiqsut was not re-settled until 1973.
-- = Not Applicable

Source: Braund, 1997:35, 36

TABLE 7.3-3
BOWHEAD WHALE QUOTA AND HARVEST, 1978-1991[1]

Year	Quota (struck/landed)	Landed	Struck-but-lost	Total Strikes
1978	20/14	12	6	18
1979	27/18	12	15	27
1980	26/18	16	28	44
1981	65/45 No more than 17 landed per year	17	11	28
1982		8	11	19
1983		9	9	18
1984	43 strikes No more than 27 landed per year	12	13	25
1985		11	6	17
1986	32 strikes	20	8	28
1987	32 strikes	22	9	31
1988	35 strikes	23	6	29
1989	44/41 per year, 3 strike carry over per year	18	8	26
1990		30	14	44
1991		28	19	47

Note: 1 = For the nine communities which engaged in subsistence bowhead whaling prior to 1995 and ten communities after 1995 with the inclusion of Little Diomede.

Source: Braund and Moorehead, 1995:257-258; Suydam et al., 1995:336.

TABLE 7.3-4
IMPACTS OF ALTERNATIVES 2, 3, 4, AND 5 ON SUBSISTENCE RESOURCES

Action/Event	Frequency	Duration	Scope	Direct Impacts	Indirect Impacts
Ice Roads – Construction	Once	All winter	N/A	None - Ice roads would not remain to impede fall whale migration or subsistence harvesting.	None anticipated.
Ice Roads – Operations	Annually	All winter	N/A	None - Ice roads would not remain to impede fall whale migration or subsistence harvesting.	None anticipated.
Island – Construction	Once	3 Months	Western part of Nuiqsut whaling area between Cross Island and Seal Island, approximately 300 square miles (777 km^2).	Minor - To bowhead whaling if impacts were only from small boat operations; migration pattern would be deflected no more than 6 mi (9.7 km), which would have little effect on whaling from the Cross Island harvest area. Significant - To Nuiqsut's bowhead whale harvest. Possible deflection of whales of up to 25 miles (40 km) due to noise from construction activities and vessel traffic occurring during fall migration could result in a reduction in bowheads being harvested. Additional travel could result in meat spoilage and increased risk to hunters. An increase in unsuccessful whale strikes due to project-related disturbance could have an adverse effect on IWC whale harvest quotas.	A significant reduction or elimination of bowheads being harvested during an annual hunting season would have a significant but short-term sociocultural impact, resulting in the unavailability of food of great cultural importance to the Inupiat. There would be related impacts on the sharing of culturally important foods and cultural events associated with the harvest of bowhead whales.
Island – Operation/ Maintenance	Annually	15 years	Western part of Nuiqsut whaling area between Cross Island and Seal Island, approximately 300 square miles (777 km^2).	Minor - To bowhead harvest if long-term displacement from operations/maintenance noise did not occur. Significant - To Nuiqsut's bowhead harvest if long-term displacement of migrating whales due to noise from island slope maintenance and boat and helicopter activities were to occur during fall migration. Additional travel could result in meat spoilage and increased risk to hunters. An increase in unsuccessful whale strikes due to project-related disturbance could have an adverse effect on IWC whale harvest quotas. Displacement distance of whales due to colors, flares, and facility lighting is unknown, but may occur.	A significant reduction or elimination of bowheads being harvested during an annual hunting season would have a significant but short-term sociocultural impact, resulting in the unavailability of food of great cultural importance to the Inupiat. There would be related impacts on the sharing of culturally important foods and cultural events associated with the harvest of bowhead whales.

TABLE 7.3-4 (Cont.)
IMPACTS OF ALTERNATIVES 2, 3, 4, AND 5 ON SUBSISTENCE RESOURCES

Action/Event	Frequency	Duration	Scope	Direct Impacts	Indirect Impacts
Offshore Pipeline – Construction	Once	3 Months (Winter)	N/A	None - Winter construction would not affect subsistence harvesting.	None anticipated.
Offshore Pipeline - Operation/ Maintenance	Rare	15 years	N/A	None - No additional noise or vessel traffic related to offshore pipeline operation and routine maintenance.	None anticipated.
Onshore Pipeline – Construction	Once	6 Months (Winter)	N/A	None - Onshore pipeline construction would take place in the winter; caribou calving and migration would not be affected; caribou are not expected to be impacted by helicopter traffic.	None anticipated.
Onshore Pipeline - Operation/ Maintenance	Weekly	15 years	N/A	None – The pipeline would not restrict caribou migration and availability of caribou for subsistence harvest would not be impacted; caribou are not expected to be impacted by helicopter traffic.	None anticipated.
Gravel Mining Construction Operation	 Once Occasionally	 3 Months (Winter) Unknown	N/A	None - Onshore gravel mining would take place in the winter and would not affect subsistence harvesting.	None anticipated.
Large Oil Spill	Rare	Unknown	Barrow, Nuiqsut, and Kaktovik hunting and fishing areas contacted by an oil spill.	Minor - An onshore oil spill could reduce subsistence harvesting in hunting and fishing areas near the project area. Significant - An offshore oil spill and spill response activities could cause partial or complete suspension of subsistence harvesting due to destruction of habitat or displacement of marine mammals, fish, and waterfowl.	Minor – Localized disturbance from icebreaking barge activities during broken/thin ice conditions may occur even though an oil spill has not. Significant - Reduced or discontinued use of subsistence resources for years after a spill due to fears of resource contamination. Any effect on the bowhead whale population or reduction in hunting success could be reflected in reduced IWC harvest quotas for bowheads.

TABLE 7.3-4 (Cont.)
IMPACTS OF ALTERNATIVES 2, 3, 4, AND 5 ON SUBSISTENCE RESOURCES

Action/Event	Frequency	Duration	Scope	Direct Impacts	Indirect Impacts
Abandonment	Once	3 to 6 Months	Western part of Nuiqsut whaling area between Cross Island and Seal Island, approximately 300 square miles (777 km^2).	Beneficial - To Nuiqsut hunters due to the possible reuse of the project facilities during severe weather while traveling to Cross Island. Significant - To Nuiqsut's bowhead whale harvest from possible deflection of whales due to noise from abandonment activities. Type and level of noise generated and the deflection of whales is unknown. If activities occurred during fall migration, bowhead harvest could be unsuccessful.	A significant reduction or elimination of bowheads being harvested during an annual hunting season would have a significant but short term sociocultural impact, resulting in the unavailability of food of great cultural importance to the Inupiat. There would be related impacts on the sharing of culturally important foods and cultural events associated with the harvest of bowhead whales.

Notes: IWC = International Whaling Commission
km = Kilometers
km^2 = Square kilometers
N/A = Not applicable

TABLE 7.4-1
CULTURAL/ARCHAEOLOGICAL RESOURCES NEAR THE PROJECT AREA

Site	Vicinity of	Resource
HAR-001	Thetis Island	Prehistoric houses, artifacts; by 1979, site most likely destroyed by a storm
XBP-002	Anxiety Point	Hunting camp
XBP-003	Beechey Point	Ahvakana home
XBP-004	Kavearak Point	Sod houses
XBP-005	Prudhoe Bay	Semi-subterranean houses and driftwood cabin
XBP-006	Heald Point	Site destroyed by Niakuk oil field development
XBP-007	Prudhoe Bay	Fire hearths and lithic scatters from the Arctic Small Tool, Archaic, and Paleoarctic Traditions
XBP-008	Central Creek Pingo	Artifacts from the Arctic Small Tool Tradition
XBP-009	Cross Island	Cabins, house depressions, present whaling camp
XBP-010	Milne Point	Sod houses and other structures
XBP-011	Pingok Island	Naval Arctic Research Laboratory station
XBP-012	Pingok Island	Old village dating from A.D. 1500
XBP-013	Peet Island	Sod houses; by 1983, site almost entirely destroyed by natural forces
XBP-014	Cottle Island	Driftwood structures; whalebone
XBP-015	Back Point	Sod houses; scattered graves
XBP-016	Gwydyr Bay	Historic house ruin
XBP-017	Kuparuk River	Sod houses
XBP-018	Long Island	Whaling boat
XBP-019	Point McIntyre	Sod houses
XBP-020	Sagavanirktok River	Sod/wooden house
XBP-021	Sagavanirktok River	Small boat
XBP-030	Pingok Island	Grave site
XBP-034	Pingok Island	Historic or prehistoric houses
XBP-035	Spy Islands	Sod houses and graves
XBP-038	Ugnuravik Pingo	Prehistoric and historic artifacts
XBP-040	Point Storkerson	DEW Line station
XBP-043	Beechey Point	Artifacts from the Arctic Small Tool Tradition
XBP-045	East Creek Pingo	Artifacts from short-term camp

TABLE 7.4-2
IMPACTS OF ALTERNATIVES 2, 3, 4, AND 5 ON CULTURAL/ARCHAEOLOGICAL RESOURCES

Action/Event	Frequency	Duration	Scope	Direct Impacts	Indirect Impacts
Ice Roads - Construction	Once	All winter	No known resources in area.	None anticipated.	None anticipated.
Ice Roads - Operations	Annually	All winter	No known resources in area.	None anticipated.	None anticipated.
Island - Construction	Once	3 Months	No known resources in area.	Minor – To potential offshore cultural resources.	None anticipated.
Island - Operation/ Maintenance	Annually	15 years	No known resources in area.	None anticipated.	None anticipated.
Offshore Pipeline - Construction	Once	3 Months (Winter)	No known resources in area.	Minor – To potential offshore cultural resources.	None anticipated.
Offshore Pipeline - Operation/ Maintenance	Rare	15 years	No known resources in area.	None anticipated.	None anticipated.
Onshore Pipeline - Construction	Once	6 Months (Winter)	DEW Line Site Sod House Ruins Putuligayuk River Delta Overlook Site	None - Pipeline construction would avoid known cultural resource sites.	None anticipated.
Onshore Pipeline - Operation/ Maintenance	Weekly	15 years	DEW Line Site Sod House Ruins Putuligayuk River Delta Overlook Site	None anticipated.	None anticipated.
Gravel Mining Construction Operation	 Once Occasionally	 3 Months (Winter) Unknown	No known resources in area.	None anticipated.	None anticipated.
Large Oil Spill	Rare	Unknown	Any of the identified sites or unknown cultural resources in the area that are contacted by oil.	Significant - Irreparable damage to historic artifacts and interference with radiocarbon dating tests from contact with spilled oil.	Significant - Onshore spill response activities could damage integrity of coastal and onshore sites.
Abandonment	Once	3 to 6 Months	No known resources in area.	None anticipated.	None anticipated.

Notes: DEW = Distant Early Warning km = Kilometers

TABLE 7.5-1
NORTH SLOPE BOROUGH LAND MANAGEMENT REGULATIONS

NSB Municipal Code	Summary of Policy	Application to Project
19.70.040 (E)	"All nonessential boat, barge and air traffic associated with drilling activity shall occur prior to or after the period of whale migration through the area. Essential traffic (traffic that could not reasonably occur prior to or after the period of whale migration) shall avoid disrupting the whale migration, subsistence activities and be coordinated with the Alaska Eskimo Whaling Commission."	Compliance with the obligations in this policy likely will be through the development of the Master Plan for rezoning.
19.70.050 (A)	Drilling would be conducted from bottom-founded structures. NSBMC 19.20.020 (9) defines the term "bottom-founded structures" as including "gravel and grounded ice islands, single steel drilling caissons (SSDC), concrete island drilling systems (CIDS), and other offshore drilling platforms which rest on and are supported by the ocean floor, and have primary blowout preventors above the surface of the water."	The project will be drilled from an artificial island that satisfies requirements for a bottom-founded structure under the first section of this policy.
19.70.050 (B)	Drilling above threshold depth may occur year-round. The policy affirms that drilling may take place above the threshold depth at any time. "Threshold depth" is defined in NSBMC Section 19.20.020 (66) as "the depth below surface as such a significant accumulation of oil and gas can reasonably be expected to be encountered while drilling the well."	The proposed drilling program will be in compliance with this policy.
19.70.050 (C)	Drilling below threshold depth in the Beaufort Sea shall be conducted during winter (November 1 through April 15) and be completed as early as possible.	The project may conflict with compliance unless the policy is eliminated or modified through the Master Plan process.
19.70.050 (D)	Confirmation, extension drilling, well testing, and other well completion activities in the Beaufort Sea shall be completed by June 15. Consistent with NSBMC 19.70.050 (C), any additional drilling or other activities would not penetrate any new oil or gas bearing formation, or significantly increase the risk of an oil spill.	The project may conflict with compliance with this policy unless the policy is eliminated or modified through the Master Plan process.
19.70.050 (F)	Year-round drilling can occur following the unitization and approval of the Plan of Operations, NSB approval of a Master Plan, and rezoning to the Resource Development District for the proposed development.	This policy, in combination with the previous policies on drilling, indicates that in order to allow drilling outside of the November 1 through April 15 window, the area will have to be rezoned from a Conservation District to Resource Development District.
19.70.050 I.2	Similar to NSB CMP policy 2.4.4 (b), this policy requires "offshore structures must be able to withstand geophysical hazards and forces which may occur at the drill site," and that structures 'must have monitoring programs and safety systems capable of securing wells in case unexpected geophysical hazards or forces are encountered.'	Residents of Nuiqsut have expressed concern based on Traditional Knowledge whether the facility on Seal Island can withstand sea ice hazards and forces that may occur at the site. Compliance with this policy will be determined during state consistency review and development of the Master Plan for rezoning.

TABLE 7.5-1 (Cont.)
NORTH SLOPE BOROUGH LAND MANAGEMENT REGULATIONS

NSB Municipal Code	Summary of Policy	Application to Project
1970.050 I.7	Similar to NSB CMP policy 2.4.4 (g), this policy requires "offshore drilling activities, offshore petroleum storage, and transportation facilities...to have an oil spill control and clean-up plan."	Residents of Nuiqsut have expressed concern based on Traditional Knowledge whether spilled oil cannot be detected or recovered under certain types of sea ice. Compliance with this policy likely will be through state and federal approval of the ODPCP, and during state consistency review.
19.70.050 I.8	Similar to NSB CMP policy 2.4.4 (h), this policy requires "offshore oil transport systems (including pipelines) must be specifically designed to withstand geophysical hazards, specifically sea ice."	Residents of Nuiqsut have expressed concern based on Traditional Knowledge whether the facility on Seal Island can withstand sea ice hazards and forces that may occur at the site. Compliance with this policy will be determined during state consistency review and development of the Master Plan for rezoning.
19.70.050 (d)	Similar to NSB CMP policy 2.4.3 (d), it requires "development not preclude reasonable subsistence user access to a subsistence resource."	Compliance with obligations in this policy likely will be through development of the Master Plan for rezoning.
19.70.050 J.2	Similar to NSB CMP policy 2.4.5.1 (b), it requires "development that restricts subsistence user access to a resource meet three criteria": 1) that there is a significant public need associated with the proposed activity; 2) that all feasible and prudent alternatives have been rigorously explored and objectively evaluated, and cannot comply with the policy; and 3) that all feasible and prudent steps have been taken to avoid any adverse effect that the policy was intended to prevent.	Compliance with obligations in this policy likely will be through development of the Master Plan for rezoning.
19.70.050 (a)	Similar to NSB CMP policy 2.4.3 (a), this policy addresses "extensive adverse impacts to a subsistence resource that are likely and cannot be avoided or mitigated...development shall not deplete subsistence resources below the subsistence needs of local residents of the Borough."	Compliance with obligations in this policy likely will be through development of the Master Plan for rezoning.
19.70.050 I.1	Similar to NSB CMP policy 2.4.4 (a), it requires "vehicles, vessels, and aircraft that are likely to cause significant disturbance must avoid areas where species that are sensitive to noise or movement are concentrated when such species are concentrated."	Compliance with obligations in this policy likely will be through development of the Master Plan for rezoning.
19.70.050 J.1	Similar to NSB CMP policy 2.4.5.1 (a), this policy addresses "development that will likely result in significantly decreased productivity of subsistence resources and their ecosystems."	Compliance with obligations in this policy likely will be through development of the Master Plan for rezoning.

Notes: CMP = Coastal Management Program
NSB = North Slope Borough
NSBMC = North Slope Borough Municipal Code

TABLE 7.5-2
IMPACTS OF ALTERNATIVES 2, 3, 4, AND 5 ON LAND AND WATER USE

Action/Event	Frequency	Duration	Scope	Direct Impacts	Indirect Impacts
Ice Roads - Construction	Once	All winter	N/A	None anticipated.	None anticipated.
Ice Roads - Operations	Annually	All winter	N/A	None anticipated.	None anticipated.
Island - Construction	Once	3 Months	Northstar Unit - Offshore marine waters	Negligible - To traditional water use boat traffic access due to vessel traffic associated with construction activities. Rezoning of the unit from Conservation District to Resource Development District will be required prior to project construction.	None anticipated.
Island - Operation/ Maintenance	Annually	15 years	Northstar Unit - Offshore marine waters	Negligible - To traditional water use boat traffic access due to potential conflicts between barges and work boats and whaling vessels.	None anticipated.
Offshore Pipeline - Construction	Once	3 Months (Winter)	N/A	None anticipated.	None anticipated.
Offshore Pipeline - Operation/ Maintenance	Rare	15 years	N/A	None anticipated.	None anticipated.
Onshore Pipeline - Construction	Once	6 Months (Winter)	Onshore pipeline route	Negligible - To traditional land uses due to encroachment of project facilities on Native Allotments; to traditional use offshore boat access from operations boat traffic. Minor - To onshore transportation, pipeline, and utility uses as a result of pipeline construction across existing right-of-ways and facilities; zoning would be changed from Conservation District to Resource Development District. Minor – Alternative 2 and a portion of Alternative 3 would add a pipeline across a currently undeveloped area. Minor – Alternative 5 may require an agreement among the owners if need to widen West Dock causeway. Minor – Alternatives 3, 4, and 5 could disrupt access, utility services, and existing pipeline operations in the areas near West Dock and CCP. Offshore zoning would be changed from Conservation to Resource Development District.	None anticipated.

TABLE 7.5-2 (Cont.)
IMPACTS OF ALTERNATIVES 2, 3, 4, AND 5 ON LAND AND WATER USE

Action/Event	Frequency	Duration	Scope	Direct Impacts	Indirect Impacts
Onshore Pipeline - Operation/ Maintenance	Weekly	15 years	N/A	None anticipated.	None anticipated.
Gravel Mining Construction Operation	 Once Occasionally	 3 Months (Winter) Unknown	N/A	None anticipated.	None anticipated.
Large Oil Spill	Rare	Unknown	Marine waters, shorelines, or tundra contacted by oil - up to hundreds of miles from the release site.	Negligible – Change in land use due to disturbance or damage to tundra, vegetation, or surface water bodies as a result of contamination.	Negligible – Restricted access to areas for other activities during spill responses and cleanup mobilization during the summer.
Abandonment	Once	3 to 6 Months	Northstar Unit	Minor - Rezoning may be required following removal of onshore and offshore facilities. Some areas may revert to land uses in place prior to project construction.	None anticipated.

Notes: CCP = Central Compressor Plant
N/A = Not applicable

TABLE 7.6-1
IMPACTS OF ALTERNATIVES 2, 3, 4, AND 5 ON SOCIOECONOMICS

Action/Event	Frequency	Duration	Scope	Direct Impacts [1, 2]	Indirect Impacts
Ice Roads – Construction	Once	All winter	State of Alaska; NSB	Beneficial - Total project construction revenues estimated at $478.6 and $306.3 million in state and federal, respectively, taxes and royalties, and $64.3 and $3 million in NSB and MOA, respectively, taxes and royalties; 730 Alaska construction jobs ($51.6 million in wages). Negligible - Temporary increase in population in Anchorage and Fairbanks due to construction jobs.	Expect at least a one-to-one correlation of direct and indirect man-hours.
Ice Roads - Operations	Annually	All winter	State of Alaska; NSB	Beneficial – 100 annual Alaska operation jobs ($255 million in total wages).	Expect at least a one-to-one correlation of direct and indirect man-hours.
Island - Construction	Once	3 Months	State of Alaska; NSB	Beneficial - Total project construction revenues estimated at $478.6 and $306.3 million in state and federal, respectively, taxes and royalties, and $64.3 and $3 million in NSB and MOA, respectively, taxes and royalties; 730 Alaska construction jobs ($51.6 million in wages). Negligible – Temporary increase in population in Anchorage and Fairbanks due to construction jobs.	Expect at least a one-to-one correlation of direct and indirect man-hours
Island - Operation/ Maintenance	Annually	15 years	State of Alaska; NSB	Beneficial – 100 annual Alaska operation jobs ($255 million in total wages).	Expect at least a one-to-one correlation of direct and indirect man-hours.
Offshore Pipeline – Construction	Once	3 Months (Winter)	State of Alaska; NSB	Beneficial – Total project construction revenues estimated at $478.6 and $306.3 million in state and federal, respectively, taxes and royalties, and $64.3 and $3 million in NSB and MOA, respectively, taxes and royalties; 730 Alaska construction jobs ($51.6 million in wages). Negligible – Temporary increase in population in Anchorage and Fairbanks due to construction jobs.	Expect at least a one-to-one correlation of direct and indirect man-hours.

TABLE 7.6-1 (Cont.)

IMPACTS OF ALTERNATIVES 2, 3, 4, AND 5 ON SOCIOECONOMICS

Action/Event	Frequency	Duration	Scope	Direct Impacts [1, 2]	Indirect Impacts
Offshore Pipeline - Operation/ Maintenance	Rare	15 years	State of Alaska; NSB	Beneficial – 100 annual Alaska operation jobs ($255 million in total wages).	Expect at least a one-to-one correlation of direct and indirect man-hours.
Onshore Pipeline – Construction	Once	6 Months (Winter)	State of Alaska; NSB	Beneficial – Total project construction revenues estimated at $478.6 and $306.3 million in state and federal, respectively, taxes and royalties, and $64.3 and $3 million in NSB and MOA, respectively, taxes and royalties; 730 Alaska construction jobs ($51.6 million in wages). Negligible – Temporary increase in population in Anchorage and Fairbanks due to construction jobs.	Expect at least a one-to-one correlation of direct and indirect man-hours.
Onshore Pipeline - Operation/ Maintenance	Weekly	15 years	State of Alaska; NSB	Beneficial – 100 annual Alaska operation jobs ($255 million in total wages).	Expect at least a one-to-one correlation of direct and indirect man-hours.
Gravel Mining Construction Operation	 Once Occasionally	 3 Months (Winter) Unknown	State of Alaska; NSB	Beneficial - Total project construction revenues estimated at $478.6 and $306.3 million in state and federal, respectively, taxes and royalties, and $64.3 and $3 million in NSB and MOA, respectively, taxes and royalties; 730 Alaska construction jobs ($51.6 million in wages). Negligible - Temporary increase in population in Anchorage and Fairbanks due to construction jobs.	Expect at least a one-to-one correlation of direct and indirect man-hours.
Large Oil Spill	Rare	Unknown	State of Alaska, NSB, Anchorage, Fairbanks	Significant - Loss of revenues and increased costs; sudden increase in high wage paying jobs and subsequent inflation due to hiring of local labor for cleanup operations; reduced access to community services due to rapid expansion of workforce needed for cleanup operations.	None anticipate.

TABLE 7.6-1 (Cont.)
IMPACTS OF ALTERNATIVES 2, 3, 4, AND 5 ON SOCIOECONOMICS

Action/Event	Frequency	Duration	Scope	Direct Impacts [1, 2]	Indirect Impacts
Abandonment	Once	3 to 6 Months	Seal Island and pipeline route, depending on abandonment method.	Negligible Beneficial – From in place abandonment and/or reuse of a substantial portion of the facilities. Minor Beneficial – From removal of the facilities and infrastructure.	Expect at least a one-to-one correlation of direct and indirect man-hours.

Notes: 1 = Construction impacts (jobs and wages) reflect totals for the project, including: ice road construction, island construction, onshore and offshore pipeline construction, and gravel mining.
2 = Operation impacts (jobs and wages) reflect totals for the project, including: island operation/maintenance and onshore pipeline operation/maintenance.
MOA = Municipality of Anchorage
NSB = North Slope Borough

TABLE 7.6-2
STATE AND FEDERAL REVENUES FROM THE NORTHSTAR PROJECT AT 158 MILLION BARRELS

Component	2000	2001	2002	2003	2004	2005
Oil Production Rate (thousands of barrels per day)	32,065	65,000	65,000	65,000	61,935	43,700
ANS Market Price for Oil ($/Barrel)	$13.27	$15.90	$16.23	$16.66	$17.13	$17.61
ANS Wellhead ($/Barrel)	$9.07	$11.49	$11.74	$12.10	$12.52	$12.27
Gross Revenues	**$106,152,786**	**$272,600,250**	**$278,531,500**	**$287,072,500**	**$283,030,563**	**$195,712,635**
State Revenues						
State Royalty	$17,108,777	$43,935,324	$44,891,271	$46,267,834	$45,616,390	$31,543,250
State Supplemental Royalty	$2,472,753	$6,350,027	$6,488,191	$6,687,148	$6,592,994	$4,558,985
Net Profit Share Lease	$0	$0	$0	$0	$0	$0
State Share of Federal Royalty	$1,069,299	$2,745,958	$2,805,704	$2,891,740	$2,851,024	$1,971,453
Severance Tax	$3,876,207	$9,954,097	$10,170,678	$10,482,556	$10,334,963	$7,146,518
Spill & Conservation Tax	$200,493	$514,867	$526,070	$542,201	$534,567	$369,647
Ad Valorem Tax	$515,250	$491,308	$467,366	$443,424	$419,482	$395,540
Income Tax	$1,603,948	$4,118,937	$4,208,557	$4,337,609	$4,276,537	$2,957,180
Total State Revenues	**$26,846,728**	**$68,110,517**	**$69,557,837**	**$71,652,513**	**$70,625,957**	**$48,942,574**
Federal Revenues						
Royalty (net of state share)	$2,940,432	$7,551,027	$7,715,323	$7,951,908	$7,839,947	$5,421,240
Income Tax	$14,373,087	$36,910,074	$37,713,165	$38,869,617	$38,322,338	$26,499,491
Total Federal Revenues	**$17,313,519**	**$44,461,101**	**$45,428,488**	**$46,821,525**	**$46,162,285**	**$31,920,731**

TABLE 7.6-2 (Cont.)
STATE AND FEDERAL REVENUES FROM THE NORTHSTAR PROJECT AT 158 MILLION BARRELS

Component	2006	2007	2008	2009	2010	2011
Oil Production Rate (thousands of barrels per day)	30,834	21,755	15,350	10,831	7,642	5,392
ANS Market Price for Oil ($/Barrel)	$18.10	$18.62	$19.16	$19.72	$20.31	$20.91
ANS Wellhead ($/Barrel)	$12.61	$13.00	$13.36	$13.76	$13.58	$13.94
Gross Revenues	**$141,918,110**	**$103,227,475**	**$74,852,740**	**$54,397,614**	**$37,879,101**	**$27,435,035**
State Revenues						
State Royalty	$22,873,119	$16,637,301	$12,064,110	$8,767,332	$6,105,022	$4,421,739
State Supplemental Royalty	$3,305,881	$2,404,610	$1,743,641	$1,267,153	$882,366	$639,079
Net Profit Share Lease	$0	$0	$0	$0	$0	$0
State Share of Federal Royalty	$1,429,570	$1,039,831	$754,007	$547,958	$381,564	$276,359
Severance Tax	$5,182,191	$3,769,389	$2,733,275	$1,986,349	$1,383,169	$1,001,800
Spill & Conservation Tax	$268,044	$194,968	$141,376	$102,742	$71,543	$51,817
Ad Valorem Tax	$371,598	$347,656	$323,714	$299,772	$275,830	$251,889
Income Tax	$2,144,355	$1,559,747	$1,131,010	$821,937	$572,346	$414,538
Total State Revenues	**$35,574,758**	**$25,953,503**	**$18,891,133**	**$13,793,243**	**$9,671,841**	**$7,057,222**
Federal Revenues						
Royality (net of state share)	$3,931,132	$2,859,401	$2,073,421	$1,506,814	$1,049,251	$759,950
Income Tax	$19,215,712	$13,977,000	$10,135,061	$7,365,437	$5,128,830	$3,714,704
Total Federal Revenues	**$23,146,844**	**$16,836,401**	**$12,208,482**	**$8,872,251**	**$6,178,081**	**$4,474,654**

TABLE 7.6-2 (Cont.)
STATE AND FEDERAL REVENUES FROM THE NORTHSTAR PROJECT AT 158 MILLION BARRELS

Component	2012	2013	2014	Total
Oil Production Rate (thousands of barrels per day)	3,804	2,684	1,894	**158,003,390**
ANS Market Price for Oil ($/Barrel)	$21.52	$22.15	$22.80	**N/A**
ANS Wellhead ($/Barrel)	$14.61	$14.96	$15.31	**N/A**
Gross Revenues	**$20,285,401**	**$14,655,714**	**$10,583,956**	**$1,908,335,380**
State Revenues				
State Royalty	$3,269,423	$2,362,080	$1,705,829	**$307,568,802**
State Supplemental Royalty	$472,534	$341,394	$246,546	**$44,453,303**
Net Profit Share Lease	$0	$0	$0	**$0**
State Share of Federal Royalty	$204,339	$147,630	$106,614	**$19,223,050**
Severance Tax	$740,729	$535,159	$386,477	**$69,683,557**
Spill & Conservation Tax	$38,314	$27,681	$19,990	**$3,604,322**
Ad Valorem Tax	$227,947	$204,005	$180,063	**$5,214,844**
Income Tax	$306,508	$221,445	$159,922	**$28,834,575**
Total State Revenues	**$5,259,794**	**$3,839,393**	**$2,805,441**	**$478,582,453**
Federal Revenues				
Royality (net of state share)	$561,906	$405,963	$293,176	**$52,860,890**
Income Tax	$561,906	$405,963	$293,176	**$253,485,560**
Total Federal Revenues	**$1,123,811**	**$811,927**	**$586,351**	**$306,346,450**

Notes: Methodology: State and federal revenues for 158 million barrels of total production were estimated using ratios calculated from the model published by the ADNR Oil & Gas Division 1996 Northstar Economic Evaluation. Gross revenue was estimated using a total production of 158 million barrels and the Fall 1998 Base Price Forecast for ANS Wellhead oil prices for the period 2000 to 2014. Ad Valorem tax was estimated from data provided by Hanley, 1997a.

ADNR = Alaska Department of Natural Resources
ANS = Alaska North Slope
N/A = Not applicable

Source: Dames & Moore production scenario for 158 million barrels production, November 1998

TABLE 7.6-3
PROJECTED ESTIMATED ALASKA EMPLOYMENT

Material/Service	Average No. of Personnel	Estimated Duration (months)	Primary Contractor	Location of Workforce	Estimated Direct Man-hours	Estimated Wages (total $)
Construction						
Engineering	40	8	Veco/PN&	Anc/NS	70,000	$2,228,800
Anc Fabrication	250	17	D	Anc	900,000	$18,912,600
NS Island Construction	60	10	Veco/APC	NS	180,000	$3,782,520
NS Pipeline Construction	200	6	AIC	NS	360,000	$7,565,040
NS Facilities Installation	90	4	HCC/AIC	NS	110,000	$2,224,420
NS Drilling	50	21	Veco	NS	320,000	$8,896,000
BPXA Directs	40	27	Nabors	Anc	200,000	$7,984,000
			N/A			
Subtotal	730	N/A	N/A	N/A	2,140,000	$51,594,380
Operation						
BPXA Operation	100	180	N/A	NS	N/A	$255,000,000
TOTAL	**830**	**N/A**	**N/A**	**N/A**	**N/A**	**$306,594,380**

Notes:
AIC = Alaska Interstate Construction
Anc = Anchorage
APC = Alaska Petroleum Contractors
BPXA = BP Exploration (Alaska) Inc.
HCC = Houston Contracting Co.
N/A = Not applicable
Nabors = Nabors Alaska Drilling
NS = North Slope
PN&D = PN&D, Inc. Engineering Consultants
Veco = Veco Operations Inc.

Source: BPXA, 1997:Table 1.2-4; Hanley, 1997b

TABLE 7.7-1
NUMBER OF SEALIFT BARGES, 1968-1996

Year	Number Barges	Year	Number Barges
1975	47	1986	27
1976	21	1987	6
1977	7	1988	0
1978	10	1989	3
1979	2	1990	3
1980	10	1991	1
1981	14	1992	0
1982	15	1993	3
1983	26	1994	4
1984	11	1995	0
1985	13	1996	0

Source: Toruga - Pers. Comm., 1996

TABLE 7.7-2
ANNUAL AVERAGE DAILY TRAFFIC ALONG THE DALTON HIGHWAY [1]

Highway Section	Number of Vehicles			
	1992	1993	1994	1995
Yukon Crossing (Milepost 55.6)	225	200	200	269
Bonanza Creek (Milepost 124.7)	N/A	N/A	N/A	154
Dietrich Camp (Milepost 209.1)	N/A	N/A	N/A	147
Kuparuk River (Milepost 288.8)	100	100	100	143

Notes: 1 = During visitor traffic season
N/A = Not applicable

Source: Robbe, 1996:70

TABLE 7.7-3
IMPACTS OF ALTERNATIVES 2, 3, 4, and 5 ON TRANSPORTATION

Action/Event	Frequency	Duration	Scope	Direct Impacts	Indirect Impacts
Ice Roads - Construction	Once	All winter	N/A	None anticipated.	None anticipated.
Ice Roads - Operations	Annually	All winter	N/A	None anticipated.	None anticipated.
Island - Construction	Once	3 Months	Freight through Ports of Anchorage, Whittier, and Seward; traffic along the Dalton Highway; passengers through Anchorage, Fairbanks, and Deadhorse airports; personnel and materials by helicopter, boat, barge, and bus in the Prudhoe Bay area; module barges from Anchorage.	Minor - From overall project construction activities to ports resulting from 1% to 26% increase in freight traffic; <2% increase in freight traffic along the Dalton Highway; <4% increase in passenger traffic through Anchorage, Fairbanks, and Deadhorse airports; module barges from Anchorage.	None anticipated.
Island - Operation/ Maintenance	Annually	15 years	Freight levels at Ports of Anchorage, Whittier, and Seward; traffic on the Dalton Highway; passengers by air; personnel and materials by helicopter, boat, barge, and bus in the Prudhoe Bay area.	Negligible – Increase (over current levels) in freight traffic at ports and along the Dalton Highway; increase (over current levels) in passenger and freight traffic through Anchorage, Fairbanks, and Deadhorse airports; increase in local helicopter, barge, boat, and bus passenger and freight traffic within the Prudhoe Bay area.	Beneficial impact associated with production of crude oil volumes representing approximately 4% of Trans Alaska Pipeline System throughput.
Offshore Pipeline - Construction	Once	3 Months (Winter)	Freight through Ports of Anchorage, Whittier, and Seward; traffic along the Dalton Highway; passengers through Anchorage, Fairbanks, and Deadhorse airports.	Minor – From overall project construction activities to Ports resulting from 1% to 26% increase in freight traffic; <2% increase in freight traffic along the Dalton Highway; and <4% increase in passenger and freight traffic through Anchorage, Fairbanks, and Deadhorse airports.	None anticipated.
Offshore Pipeline - Operation/ Maintenance	Rare	15 years	Local transportation of personnel and materials within the Prudhoe Bay industrial complex.	Negligible – Increase (over current levels) in freight traffic at ports and along the Dalton Highway; increase (over current levels) in passenger and freight traffic through Anchorage, Fairbanks, and Deadhorse airports; increase local helicopter, barge, boat, and bus passenger and freight traffic within the Prudhoe Bay area.	None anticipated.

TABLE 7.7-3 (Cont.)

IMPACTS OF ALTERNATIVES 2, 3, 4, and 5 ON TRANSPORTATION

Action/Event	Frequency	Duration	Scope	Direct Impacts	Indirect Impacts
Onshore Pipeline - Construction	Once	6 Months (Winter)	Freight through Ports of Anchorage, Whittier, and Seward; traffic along the Dalton Highway; passengers through Anchorage, Fairbanks, and Deadhorse airports; personnel and materials by helicopter, boat, barge, and bus in the Prudhoe Bay area.	Minor - From overall project construction activities to ports resulting from 1% to 26% increase in freight traffic; <2% increase in freight traffic along the Dalton Highway; <4% increase in passenger and freight traffic through Anchorage, Fairbanks, and Deadhorse airports.	None anticipated.
Onshore Pipeline - Operation/ Maintenance	Weekly	15 years	Local transportation of personnel and materials within the Prudhoe Bay area.	Negligible – Increase (over current levels) in freight traffic at ports and along the Dalton Highway; increase (over current levels) in passenger and freight traffic through Anchorage, Fairbanks, and Deadhorse airports; increase in local helicopter, barge, boat, and bus passenger and freight traffic within the Prudhoe Bay area.	None anticipated.
Gravel Mining Construction Operation	 Once Occasionally	 3 Months (Winter) Unknown	N/A	None anticipated.	None anticipated.
Large Oil Spill	Rare	Unknown	Dalton Highway and Anchorage, Fairbanks, and Deadhorse Airports.	Minor – Focused commitment of transportation resources during the initial phase of spill response efforts, which would taper as efforts stabilized.	None anticipated
Abandonment	Once	3 to 6 Months	Freight through Ports of Anchorage, Whittier, and Seward; traffic on the Dalton Highway; passengers through Anchorage, Fairbanks, and Deadhorse airports; personnel and materials by helicopter, boat, barge, and bus in the Prudhoe Bay area.	Minor – From increased traffic along the Dalton Highway; increased transportation of equipment and materials through the ports and airport passenger service.	None anticipated.

Notes: < = Less than % = Percent N/A = Not applicable

TABLE 7.8-1
IMPACTS OF ALTERNATIVES 2, 3, 4, AND 5 ON VISUAL/AESTHETIC CHARACTERISTICS

Action/Event	Frequency	Duration	Scope	Direct Impacts	Indirect Impacts
Ice Roads – Construction	Once	All winter	Within a few miles of the construction activities associated with each alternative.	Minor - To oil field personnel from intrusion of equipment and lighting for ice road construction; to Nuiqsut residents due to a faint glow on the horizon as a result of lighting from construction activities.	None anticipated.
Ice Roads – Operations	Annually	All winter	6 to 9 miles (9.7 to 14.5 km) offshore route.	Minor - To oil field personnel from intrusion of equipment and lighting for ice road construction; to Nuiqsut residents due to a faint glow on the horizon as a result of lights from equipment for ice road construction.	None anticipated.
Island – Construction	Once	3 Months	Within a few miles of the construction activities associated with each alternative.	Minor – To Nuiqsut residents due to a faint glow on the horizon as a result of lighting from construction activities; to oil field workers from intrusion of equipment; area subjected to minor visual impacts of the island and facilities.	None anticipated.
Island – Operation/ Maintenance	Annually	15 years	Within 20 miles (32 km) of Seal Island.	Minor – To oil field workers and subsistence hunters from intrusion of equipment, personnel, the island, facilities, and the flare; to Nuiqsut residents as a faint glow on the horizon from lights. Negligible - To bowhead whales from visual impact as a result of infrequent flare operation.	None anticipated.
Offshore Pipeline – Construction	Once	3 Months (Winter)	Within a few miles of the construction activities associated with each alternative.	Minor – To oil field personnel from intrusion of equipment and lighting for pipeline installation; to Nuiqsut residents due to a faint glow on the horizon as a result of lighting from construction activities.	None anticipated.
Offshore Pipeline - Operation/ Maintenance	Rare	15 years	Within a few miles of the construction activities associated with each alternative.	None anticipated.	None anticipated.

TABLE 7.8-1 (Cont.)
IMPACTS OF ALTERNATIVES 2, 3, 4, and 5 ON VISUAL/AESTHETIC CHARACTERISTICS

Action/Event	Frequency	Duration	Scope	Direct Impacts	Indirect Impacts
Onshore Pipeline – Construction	Once	6 Months (Winter)	Within a few miles of the construction activities associated with each alternative.	Minor - To oil field personnel from intrusion of equipment and lighting during construction.	None anticipated.
Onshore Pipeline - Operation/ Maintenance	Weekly	15 years	Within a few miles of the construction activities associated with each alternative.	Minor - To oil field workers and subsistence harvesters from creation of the onshore pipeline approach and valve station and, for Alternatives 2 and 3, a new pipeline corridor through previously undeveloped areas.	None anticipated.
Gravel Mining Construction Operation	 Once Occasionally	 3 Months (Winter)	Immediate vicinity of gravel mine site.	Minor - To oil field workers from intrusion of equipment and lighting; to Nuiqsut residents due to a faint glow on the horizon as a result of lighting from construction activities.	None anticipated.
Large Oil Spill	Rare	Unknown	Areas contacted by oil.	Negligible (Winter) - Reduction of quality of visual resources if spill occurred when viewer sensitivity would be low due to darkness and reduced level of outdoor activities; impacts would include staining of shoreline and presence of oil on the water. Minor (Summer) – Degradation of quality of visual resources if spill occurred when subsistence activities were ongoing (viewer sensitivity would be high). Visual impacts would include heavy equipment, staining of shoreline and tundra, plus presence of oil on the water.	None anticipated
Abandonment	Once	3 to 6 Months	Seal Island and pipeline route, depending on abandonment method.	Beneficial - If all equipment and facilities were removed and the island protection removed. Minor - During the abandonment process, impacts would be similar, but less than those of construction.	None anticipated.

Notes: km = Kilometers
N/A = Not applicable

TABLE 7.9-1
IMPACTS OF ALTERNATIVES 2, 3, 4, AND 5 ON RECREATION

Action/Event	Frequency	Duration	Scope	Direct Impacts	Indirect Impacts
Ice Roads – Construction	Once	All winter	N/A	None - No recreational activities occur in the project area during the winter.	None - No additional materials would be transported along the Dalton Highway.
Ice Roads – Operations	Annually	All winter	N/A	None - No recreational activities occur in the project area during the winter.	None - No additional materials would be transported along the Dalton Highway.
Island – Construction	Once	3 Months	N/A	None - Recreational activities do not occur in the project area.	Minor - To enjoyment of recreational activities along the Dalton Highway due to less than 2% increase in traffic for transporting equipment and construction materials.
Island - Operation/ Maintenance	Annually	15 years	N/A	None - Recreational activities do not occur in the project area.	None anticipated.
Offshore Pipeline – Construction	Once	3 Months (Winter)	N/A	None - No recreational activities occur in the project area during the winter.	None anticipated.
Offshore Pipeline – Operation/ Maintenance	Rare	15 years	N/A	None - Recreational activities do not occur in the project area.	None anticipated.
Onshore Pipeline – Construction	Once	6 Months (Winter)	N/A	None - No recreational activities occur in the project area during the winter.	None anticipated.
Onshore Pipeline – Operation/ Maintenance	Weekly	15 years	N/A	None - Recreational activities do not occur in the project area.	None anticipated
Gravel Mining Construction Operation	 Once Occasionally	 3 Months (Winter)	N/A	None - No recreational activities occur in the project area during the winter.	None anticipated.
Large Oil Spill	Rare	Unknown	N/A	None anticipated	Negligible – Reduced enjoyment of recreational activities due to increased vehicle traffic along the Dalton Highway.

TABLE 7.9-1 (Cont.)
IMPACTS OF ALTERNATIVES 2, 3, 4, AND 5 ON RECREATION

Action/Event	Frequency	Duration	Scope	Direct Impacts	Indirect Impacts
Abandonment	Once	Winter 3 to 6 Months	N/A	None anticipated.	Negligible - For in-place abandonment, to recreational activities along the Dalton Highway due to the possible increase (% unknown) in traffic for transporting materials from the North Slope. Minor - For facility removal, to recreational activities along the Dalton Highway due to the increase (% unknown) in traffic expected for transporting materials from the North Slope.

Notes: N/A = Not applicable
% = Percent