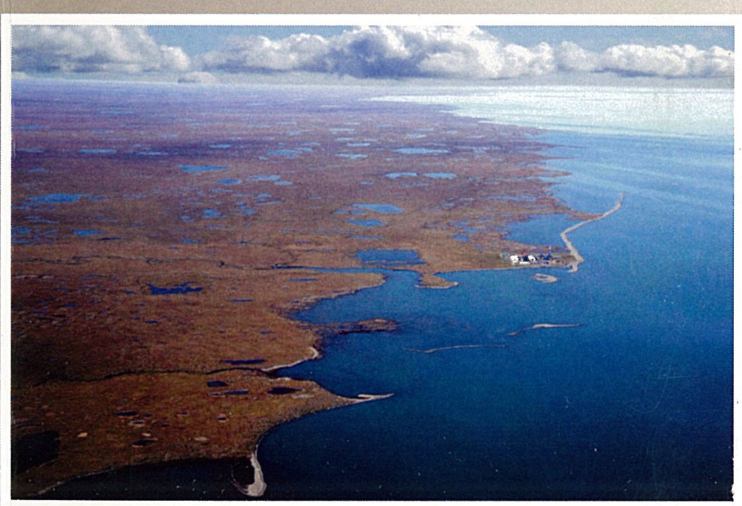
POINT THOMSON PROJECT EIS

Draft Environmental Impact Statement

Appendices Q-U

VOLUME 8



November 2011

US Army Corps of Engineers

POINT THOMSON PROJECT EIS

Appendix Q

Subsistence and Traditional Land Use Patterns Technical Report

Subsistence and Traditional Land Use Patterns

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Acronyms and Abbreviations

ADF&G	Alaska Department of Fish and Game
ADOLWD	Alaska Department of Labor and Workforce Development
AEWC	Alaska Eskimo Whaling Commission
AFN	Alaska Federation of Natives
ANILCA	Alaska National Interest Lands Conservation Act
Arctic Refuge	Arctic National Wildlife Refuge
AS	Alaska Statutes
CFR	Code of Federal Regulations
DEW	Distant Early Warning
EIS	Environmental Impact Statement
ER	Environmental Report
IAI	Impact Assessment, Inc.
MMS	Minerals Management Service
NSB	North Slope Borough
SRB&A	Stephen R. Braund & Associates
USDOI	U.S. Department of the Interior

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Chapter 1. Introduction

This appendix includes an overview of the traditional and current subsistence use patterns for Kaktovik and Nuiqsut, the two communities that hunt in and/or rely on resources that migrate through the vicinity of Point Thomson, including the importance of subsistence, the seasonal round, harvest estimates, and subsistence use areas. In addition, a brief description of Anaktuvuk Pass is included because of resource sharing patterns between residents of that community and residents from Kaktovik and Nuiqsut. While this appendix addresses all subsistence resources, it provides more in-depth analysis of subsistence uses of caribou and bowhead whales, as these resources are heavily used by Kaktovik and Nuiqsut, more detailed subsistence use data are available for these two resources, and these resources are most likely to be affected by the proposed actions.

To describe the affected environment for subsistence, the study team reviewed the Point Thomson Environmental Report (ER) (ExxonMobil 2009), as well as other sources of subsistence data including harvest amount data obtained from the Alaska Department of Fish and Game (ADF&G) Division of Subsistence and North Slope Borough (NSB) Department of Wildlife Management subsistence publications. The ER included harvest data for the majority of available study years. This appendix includes additional harvest amount and harvest location data, including unpublished subsistence harvest data from the ADF&G Division of Subsistence and the NSB Department of Wildlife Management acquired in 2002 and unpublished subsistence harvest data acquired from the NSB in 2010. This appendix also incorporates additional data from previous Environmental Impact Statement (EIS) efforts, including issues raised during a Point Thomson EIS meeting on caribou in 2002 and subsistence use area data collected in Kaktovik in 2003. Finally, this affected environment incorporates 1995-2006 subsistence use areas collected during a Minerals Management Service (MMS) funded subsistence mapping project in Kaktovik and Nuiqsut (SRB&A 2010a).

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Chapter 2. Methodology

The methodology used for evaluating subsistence resource use includes a review of the literature and available data related to North Slope communities either utilizing the Point Thomson project area for subsistence purposes or harvesting subsistence species that migrate through the Point Thomson project area.

The study team reviewed the Point Thomson ER for data relevant to assessing the potential impacts of the Point Thomson development on subsistence uses (ExxonMobil 2009). This affected environment provides a brief overview of subsistence in Kaktovik and Nuiqsut; more detailed descriptions of subsistence in the region are available in the ER as well as in other literature relating to subsistence on the North Slope. Data sources used for this affected environment include the NSB Wildlife Department subsistence reports and harvest information for Kaktovik and Nuiqsut (Brower, Olemaun, and Hepa 2000; Brower and Hepa 1998; Bacon, Hepa, Brower, Pederson, Olemaun, George, and Corrigan 2009); ADF&G Division of Subsistence reports and harvest data (Coffing and Pedersen 1985; Pedersen and Coffing 1984; Pedersen 1990; Pedersen, Coffing, and Thompson 1985; and Pedersen and Linn 2005); relevant U.S. Department of the Interior (USDOI), MMS technical reports (IAI 1990a; IAI 1990b; SRB&A and Institute of Economic Research [ISER] 1993; Human Relations Area Files 1992; Galginaitis, Chang, MacQueen, Dekin, and Zipkin 1984); environmental assessments and EISs (USDOI, Bureau of Land Management 2004; MMS 2003; LGL 1998); 1995-2006 subsistence use area data from an MMS subsistence mapping project for Kaktovik and Nuiqsut (SRB&A 2010a); the general ethnographic and subsistence literature for the North Slope (Braund and Moorehead 1995; Brown 1978; Hoffman, Libbey, and Spearman 1988; Kaleak 1996; Long 1996; NSB Contract Staff 1979; NSB 1980); unpublished subsistence harvest data for Kaktovik acquired from ADF&G Division of Subsistence in 2003; unpublished subsistence harvest data for Kaktovik acquired from the NSB Department of Wildlife Management in 2003, 2006, and 2010; data from previous EIS efforts including the Point Thomson Caribou Meeting in Fairbanks in December 2002; and additional information from a SRB&A 2003 field trip to Kaktovik (SRB&A 2003b).

Various sources provide data on traditional land use patterns for Kaktovik and Nuiqsut (Table 1). The identification and discussion of traditional land use patterns is relevant because contemporary subsistence activities are rooted in and closely linked to traditional subsistence activities. Traditional knowledge associated with subsistence, including key hunting and harvest locations, the timing of subsistence activities, and the methods of hunting, harvest, processing, and sharing subsistence resources, has been passed down through generations. Even if residents infrequently access certain harvest locations for various reasons, they often maintain cultural ties to those places. A number of reports provide data on traditional land use patterns including traditional harvest locations, Traditional Land Use Inventory sites (TLUIs), and descriptions of traditional subsistence activities through first-hand accounts from community elders (Brown 1978; Hall, Gerlach, and Blackman 1985; Hoffman, Libbey, and Spearman; Human Relations Area Files 1992; Impact Assessment, Inc. 1990a, 1990b; Jacobsen and Wentworth 1982; Libbey, Spearman, and Hoffman 1979; Pedersen 1979; Rausch 1988; Spearman, Pedersen, and Brown 1979; and Wentworth 1979).

Table 1: Subsistence and Traditional Land Use Information Sources and Adequacy

Topic	Reference	Relevance and Adequacy
Subsistence and Ethnographic Studies	ADF&G Division of Subsistence 2011	Provides household harvest and use data for the study communities of Kaktovik (all resources study years 1985, 1986, and 1992; caribou study years 1987, 1990, and 1991) and Nuiqsut (all resources study years 1985 and 1993; caribou study years 2002-2003, 2003-2004, 2004-2005, and 2005-2006). Data were extrapolated to provide estimates for the community as a whole.
	ADF&G Division of Subsistence 2003	Unpublished Kaktovik caribou subsistence harvest data by location. Provides number of caribou harvested by placename harvest location for various study years in the 1980s and 1990s.
	Bacon et al. 2009	Provides all resources household harvest data for the study communities of Kaktovik (study year 2002-03) and Nuiqsut (study years 1995-96 and 2000-01). Harvest numbers were extrapolated to provide estimates for the community as a whole.
	Braund, Stephen R. & Associates 2010a	Provides subsistence use areas for key species for the communities of Nuiqsut and Kaktovik for the 1996-2006 (Kaktovik) and 1995-2006 (Nuiqsut) time periods; key indicators (e.g., months, travel method) associated with use areas; and traditional knowledge from active harvesters regarding subsistence hunting and harvesting activities. SRB&A collected data from 38 active harvesters in Kaktovik and 33 active harvesters in Nuiqsut; active and knowledgeable harvesters were selected using social networking techniques.
	Braund, Stephen R. & Associates 2003a	Field interviews conducted by SRB&A in association with the Alpine Satellite Development Plan Final Environmental Impact Statement. Provides partial subsistence use areas for Nuiqsut for the 1994-2003 time period.
	Braund, Stephen R. & Associates 2003b	Field interviews conducted by SRB&A in preparation for the 2003 Point Thomson Environmental Impact Statement. Interviews focused on subsistence use area mapping, traditional knowledge, and issues and concerns relevant to the proposed Point Thomson Project.
	Braund, Stephen R. & Associates and ISER 1993a	Subsistence mapping and harvest study conducted in 1987, 1988, and 1989 in Barrow. Provided information regarding regional settlement patterns on the North Slope.
	Braund, Stephen R. & Associates and ISER 1993b	Subsistence mapping and harvest study conducted in 1988 and 1989 in Wainwright. Provided methods of converting bowhead whale lengths to pounds of edible weight.
	Braund, S.R. and E.L. Moorehead 1995	Provides a historical background of subsistence bowhead whale hunting in Alaska as well as a description of bowhead whale hunting patterns in each of 10 Alaska Eskimo whaling communities (excluding Point Lay).
	Brower, Olemaun, and Hepa 2000	Provides all resources household harvest data for Kaktovik for the study year 1994-1995. Harvest numbers were not extrapolated to provide estimates for the community as a whole and therefore represent only reported harvests.
	Brower and Opie 1997	Provides all resources household harvest data for Nuiqsut for the study year 1994-1995. Harvest numbers were extrapolated to provide estimates for the community as a whole.
Subsistence and Ethnographic Studies	Brown 1978	Provides extended historic and current (circa 1978) intensive subsistence use areas for all resources; resource specific use areas were provided by three Nuiqsut hunters. Defines the cultural landscape for Nuiqsut

Table 1: Subsistence and Traditional Land Use Information Sources and Adequacy		
Topic	Reference	Relevance and Adequacy
	Coffing and Pedersen 1985	Provides Kaktovik caribou harvest data (also provided in ADF&G 2010), harvest location data (also provided in ADF&G Division of Subsistence 2003), and a description of caribou hunting patterns for the 1983-84 study year.
	Fuller and George 1999	Provides 1992 all resources harvest data for eight North Slope communities including the study communities of Kaktovik and Nuiqsut; due to a low response rate in Kaktovik, harvest data should be viewed with caution.
	Galginaitis 2006-2011; Galginaitis and Funk 2004-2005	Provides GPS tracks of Nuiqsut bowhead whale hunting activities at Cross Island for 2001-2009 and description of yearly bowhead whale hunting activities, harvests, hunting conditions, and hunter observations.
	Galginaitis, Chang, MacQueen, Dekin, and Zipkin 1984	An MMS Technical Report examining the socio-cultural impacts of economic and community development in Nuiqsut. Includes a discussion of the social structure in Nuiqsut, demography, subsistence economy, significance of subsistence, and factors affecting subsistence activities and uses.
	Hall, Gerlach, and Blackman 1985	Utilizes data from 30 Anaktuvuk Pass interviews to characterize changes in subsistence use and subsistence use areas and reports lifetime subsistence use areas. Also uses existing ethnohistoric information to recreate land use patterns from the 1860s through the 1890s.
	Hoffman, Libbey, and Spearman 1988	Provides data on historical settlement patterns, a discussion of Nuiqsut land use patterns over time, a description of the Nuiqsut seasonal round, and an ethnohistory of the Nuiqsut area based on archaeological investigations of selected TLUIs.
	Human Relations Area Files 1992	Provides data on regional North Slope settlement patterns and history.
	Impact Assessment, Inc. 1990a	Study of contemporary and historic subsistence use patterns in Nuiqsut and effects of oil development on subsistence; provides maps and placenames based on verbal descriptions of hunting, fishing, and gathering areas.
	Impact Assessment, Inc. 1990b	Study of contemporary and historic subsistence use patterns in Kaktovik and effects of oil development on subsistence; provides maps and placenames based on verbal descriptions of hunting, fishing, and gathering areas.
	Impact Assessment, Inc. 1990c	Provides Beaufort Sea regional and community-level descriptions of history, population, economy, and infrastructure.
	Jacobson and Wentworth 1982	Provides data on the history of Kaktovik, a description of TLUIs in the Kaktovik area, a discussion of Kaktovik land use patterns over time including historic and contemporary (1970s and 1980s) subsistence use patterns, an analysis of the economic importance of Kaktovik, and a description of the seasonal cycle of Kaktovik subsistence activities.
	LGL Alaska Research Associates, Inc., Greeneridge Sciences, and Applied Sociocultural Research	Provides the results of monitoring of industrial noise, seals, and bowhead whales associated with BP's Northstar Development. Includes Nuiqsut bowhead whale GPS hunting tracks for 2010 and a discussion of the hunting season and hunter observations. Also discusses bowhead whale and seal behavior and distribution in 2010 and response to Northstar activities.
	Libbey, Spearman, and Hoffman 1979	Provides data on historical settlement patterns, a discussion of Nuiqsut land use patterns over time, a description of the Nuiqsut seasonal round, and a description of key TLUI sites relevant to Nuiqsut.

Table 1: Subsistence and Traditional Land Use Information Sources and Adequacy		
Topic	Reference	Relevance and Adequacy
Subsistence and Ethnographic Studies	North Slope Borough n.d.	Brief history of Anaktuvuk Pass area and the Nunamiut people.
	North Slope Borough Contract Staff 1979	Provides descriptions of historic settlement patterns, traditional and contemporary land use patterns, seasonal round, and key subsistence and cultural sites for the study communities of Kaktovik, Nuiqsut, and Anaktuvuk Pass.
	North Slope Borough Department of Wildlife Management 2003, 2006, and 2010	Unpublished Kaktovik subsistence harvest data by location. Provides number of caribou harvested by placename harvest location 1995, 1998, 1999, 2005, 2006, and 2007. Also provides bowhead whale harvest location data for Kaktovik and Nuiqsut.
	Pedersen 1990	Provides Kaktovik caribou harvest data (also provided in ADF&G 2010), harvest location data (also provided in ADF&G Division of Subsistence 2003), and a description of caribou hunting patterns for the 1987-88 study year.
	Pedersen 1986	1986 Nuiqsut subsistence use area mapping updated from 1979 lifetime use areas.
	Pedersen 1979	Lifetime to 1979 use area mapping for Nuiqsut and Kaktovik.
	Pedersen and Coffing 1984	Provides Kaktovik caribou harvest data (also provided in ADF&G 2010), harvest location data (also provided in ADF&G Division of Subsistence 2003), and a description of caribou hunting patterns for the 1981-82, 1982-83, and 1983-84 study years.
	Pedersen, Coffing, and Thompson 1985	All resources Kaktovik subsistence land use and placenames study which provides a thorough description of subsistence land use patterns, subsistence use area mapping, and documentation of harvest placename locations.
	Pedersen and Linn 2005	Provides contemporary Kaktovik fish use areas and descriptions of contemporary fishing patterns.
	Rausch 1988	Overview of historic and contemporary Anaktuvuk Pass subsistence uses and settlement patterns.
	Spearman, Pedersen, and Brown 1979	Provides data on historical settlement patterns, a discussion of Anaktuvuk Pass land use patterns over time, a description of the Anaktuvuk Pass seasonal round, and a description of key TLUI sites relevant to Anaktuvuk Pass.
	Suydam and George n.d.	Summary of bowhead whale harvests, including numbers and lengths, by Alaska Eskimos from 1994-2003.
	Suydam, George, Hanns, and Sheffield n.d.	Summary of bowhead whale harvests, including numbers and lengths, by Alaska Eskimos in 2004.
	Suydam, George, Rosa, Person, Hanns, and Sheffield n.d.	Summary of bowhead whale harvests, including numbers and lengths, by Alaska Eskimos for 2009.
	Suydam, George, Person, Hanns, and Sheffield n.d.	Summary of bowhead whale harvests, including numbers and lengths, by Alaska Eskimos for 2010.
	Wentworth 1979	Provides data on historical settlement patterns, a discussion of Kaktovik land use patterns over time, a description of the Kaktovik seasonal round, and a description of key TLUI sites relevant to Kaktovik.
	Wolfe, Scott, Pedersen, and Caulfield (2000)	Discusses the annual variability of subsistence harvests in Kaktovik and Nuiqsut.

Table 1: Subsistence and Traditional Land Use Information Sources and Adequacy		
Topic	Reference	Relevance and Adequacy
Subsistence Regulations/ Definitions	State and Federal Statutes	Alaska statutes, Alaska Administrative Code, Code of Federal Regulations (CFR), and the Alaska National Interest Lands Conservation Act (ANILCA); used to establish and describe state and federal regulations affecting subsistence in the study communities.
	Alaska Department of Fish and Game 2000	Provides a definition of subsistence, regulatory overview, and description of overall subsistence harvests in Alaska by region.
	Alaska Federation of Natives 2005	Provides the Alaska Federation of Natives definition of subsistence.
	Wolfe and Walker 1987	Provides an overview and comparison of subsistence harvests throughout Alaska, regulations related to subsistence, a discussion of subsistence as a local economy, and a description of the relationship between subsistence and economic development.
Subsistence and Cultural Impacts	Arctic Climate Impact Assessment 2004	Discussion of impacts of climate change on the Arctic, including impacts on subsistence activities in Arctic communities.
	Braund, Stephen R. & Associates 2011	Caribou subsistence monitoring study for the community of Nuiqsut for the 2010 study year; monitors impacts on caribou hunting and harvests related to CD4 and other Alpine Satellite Developments.
	Braund, Stephen R. & Associates 2010b	Caribou subsistence monitoring study for the community of Nuiqsut for the 2009 study year; monitors impacts on caribou hunting and harvests related to CD4 and other Alpine Satellite Developments.
	Braund, Stephen R. & Associates 2009	Study of the impacts and benefits of oil and gas development based on interviews with active harvesters in four North Slope communities, including Nuiqsut, and on public testimony from all North Slope communities. Documents both concerns and personal experiences with impacts and benefits.
	Callaway 1998	Discussion of impacts of climate change on subsistence in Alaskan communities.
	Haynes and Pedersen 1989	Article describing the effects of oil development on subsistence in North Slope villages. Includes descriptions of impacts on user access to subsistence harvest areas, resource availability, and competition for subsistence resources.
	Kaleak 1996	A history of whaling by Kaktovik presented by Joseph Kaleak during the 1995 Arctic Synthesis Meeting. Includes a discussion of the impacts of industrial activity on bowhead whaling success.
	Long 1996	A history of whaling by Nuiqsut presented by Frank Long, Jr. during the 1995 Arctic Synthesis Meeting. Includes a discussion of the impacts of industrial activity on bowhead whaling success.
	MBC Applied Environmental Sciences 1997	Proceedings of the MMS-Sponsored Arctic Synthesis Meeting in 1995, including discussions of biological studies on bowhead whale migrations and effects of industrial activities on bowhead whales, and observations of the effects of industrial activities on bowhead whales by local residents and North Slope organizations.
	Moulton, Williams, Richardson, and McDonald 2003	Provides data on bowhead whale avoidance responses to industrial noise, including vessel traffic.
	National Research Council 2003	A description of known and probable cumulative effects of oil and gas development on Alaska's North Slope. Includes discussions of impacts on subsistence resources and subsistence activities.

Table 1: Subsistence and Traditional Land Use Information Sources and Adequacy

Topic	Reference	Relevance and Adequacy
	Pedersen, Wolfe, Scott, and Caulfield 2000	Provides an analysis of the relationship between subsistence economies in Nuiqsut and Kaktovik and oil development activities. Includes an overview of development near Kaktovik and Nuiqsut; a description of impacts on Nuiqsut and Kaktovik subsistence users, including the failed 1985 bowhead whale hunt in the two communities, and displacement of subsistence users from traditional subsistence hunting areas; and recommendations for lessening future impacts on subsistence users.
	Richardson and Malme 1993	Provides data on bowhead whale avoidance responses to industrial noise, including barge traffic.
	USEPA 2009	EIS for the Red Dog Mine Extension Aqqaluk Project. Includes a discussion of impacts on subsistence uses since development of the Red Dog mine, including impacts on beluga and caribou harvests.
	USDOI BLM 2004	EIS for the Alpine Satellite Development Plan. Includes a discussion of impacts on Nuiqsut subsistence uses related to oil and gas development.
	USDOI MMS 2007	EIS for the Chukchi Sea Planning Area – Oil and Gas Lease Sale 193 and Seismic Surveying activities in the Chukchi sea. Discusses potential impacts of offshore oil development on hunting by North Slope Iñupiat.
	USDOI MMS 2003	EIS for the Beaufort Sea Planning Area Oil and Gas – Lease Sales 186, 195, and 202. Discusses potential impacts of offshore oil development on the Beaufort Sea communities of Nuiqsut and Kaktovik .
Population/ Demographic Data	ADCED 2003	Provides basic population information about Alaskan communities, including Nuiqsut and Kaktovik.
	ADOLWD 2010	Provides yearly population estimates for Alaskan communities.
	URS Corporation 2005	Provides demographic, population, employment, and economic information about North Slope communities.
	U.S. Census Bureau 2010	Provides U.S. Census data for Alaskan communities, including demographic, household, and communitiy level population data.
General Reference	ABR, Inc., Sigma Plus Statistical Consulting Services, Stephen R. Braund & Associates, and Kuukpik Subsistence Oversight Panel, Inc. 2007	Study on the variation in the abundance of Arctic cisco (*qaaktak)* in the Colville River based on scientific data and local traditional knowledge from a panel of Nuiqsut *qaaktaq* experts. Provides information about potential influences on yearly *qaaktaq* abundance in the Colville River.
	Craig 1989	Information about anadromous fish in Arctic Alaska.
	George, Philo, Suydam, Carrol, and Albert n.d.	Reference for additional methods of determining bowhead whale body mass (but not edible pounds).
	Johnson 1990	Reference for methods related to informant selection for SRB&A (2010a) mapping interviews.

The primary sources of data on contemporary subsistence uses are harvest data and subsistence use area data. Harvest data for the study communities are available through the Alaska Department of Fish and Game (ADF&G) and through the North Slope Borough (NSB) (Bacon et al., 2009; Fuller and George, 1999; Coffing and Pedersen 1985; Pedersen 1990; Pedersen and Coffing 1984; ADF&G Division of Subsistence 2010). Harvest data provide quantitative estimates of the amount of fish and game harvested by each study community, by subsistence species. They are useful for analyzing community harvests and uses (e.g., household participation and sharing) over time, for determining community harvest levels by uses (e.g., household participation and sharing) over time, for determining community harvest levels by species, and for comparing subsistence resources to one another in terms of household uses and harvests. Harvest data are not exact and their accuracy depends on various factors, including survey sample sizes and the accuracy of harvester recall. However, they are generally the only source of information for quantitative community-wide harvests for all resources. The most recent all resources harvest data for Kaktovik are from 2002-2003; the most recent all resources harvest data for Nuiqsut are from 2000-2001. More recent resource-specific (e.g., bowhead whale and caribou) harvest data are available for both communities.

Harvest data typically do not provide spatial information but focus on harvest amounts, sharing, and participation. However, both the ADF&G and NSB have also collected Kaktovik harvest amounts by harvest placename locations, primarily for caribou, adding a geographic layer to harvest data (ADF&G Division of Subsistence 2003, NSB Department of Wildlife Management, 2003, 2006, and 2010). These data show harvest numbers grouped by harvest placename location; while they do not record exact harvest locations, they show the general vicinity where the harvests occurred. Harvest by location data only represent reported harvests and not community totals, because harvests by location have not been generalized for the community as a whole. Therefore, for years when harvest amounts by location are the only available data, these numbers should not be used as a replacement for community harvest estimates. Harvest location by placename data are useful for understanding interannual variations in harvest activities and resource availability and for determining which areas generally provide a greater percentage of a community's harvests. Similar to harvest data, the accuracy and reliability of harvest placename location data depends on sample sizes and harvester recall. Harvest amounts by placename location data are available only for Kaktovik and are limited to caribou. The most recent year of harvest by placename location data for Kaktovik is 2007. In addition, bowhead whale harvest locations for Nuiqsut and Kaktovik are available as recently as 2010 through various sources (NSB 2010, Suydam and George n.d., Suydam, George, Hanns, and Sheffield n.d., Suydam, George, Rosa, Person, Hanns, and Sheffield n.d., and Suydam, George Person Hanns, and Sheffield n.d.).

Subsistence use area data primarily measure the geographic extent of residents' use of their environment to harvest subsistence resources. Subsistence use areas for Kaktovik and Nuiqsut are available through various sources including SRB&A (2010a, 2003a, 2003b), Brown (1978), Galginaitis (2006, 2008a, 2008b, 2009a, 2009b, 2009c, 2010), Galginaitis and Funk (2004a, 2004b, 2004c, 2005), Hall, Gerlach, and Blackman (1985), Pedersen (1979, 1986), and Pedersen and Linn (2005). There are various methods of representing subsistence use area data. The most common method is to show one polygon representing the extent of a community's use area during a certain time period. This method does not differentiate between areas used periodically or by one harvester and areas used by multiple harvesters on a regular basis. Another method is to track harvesters' activities using GPS units (Galginaitis 2006-2010; Galginaitis and Funk 2004-2005); this method has provided a more exact depiction of where bowhead whale hunters travel by boat but for Nuiqsut is currently limited to one resource.

A third method (SRB&A 2010a, Subsistence Mapping of Nuiqsut, Kaktovik, and Barrow) maps subsistence use areas on separate acetate overlays during individual interviews with active harvesters and creates subsistence use area maps differentiating between areas where only a small number of use areas were reported and areas where a higher number of use areas were reported. This is achieved by converting polygons (use areas) to a grid with each pixel being assigned a value of one. Then, the number of overlapping pixels are summed and assigned a color, with the darkest color (red) representing the highest density (or number) of overlapping pixels. This method provides a measure of harvest effort in terms of the number of respondents reporting subsistence activities within geographic areas and, in the case of multi-resource maps, includes the number of species targeted. For some resources (e.g., Kaktovik moose and walrus), maps show sharply defined ranges between high and low colors; this generally occurs for resource maps representing a small number of use areas or respondents where the transition from yellow (low numbers of use areas) to red (high numbers of use areas) is less gradual. The overlapping use area method does not represent harvest success or intensity of use in terms of frequency or duration of trips. It also does not represent all harvesters in the community, but rather a subset of harvesters systematically selected as particularly active and knowledgeable subsistence users. SRB&A employed a social network method based on the one described in Johnson (1990) to create a sample of active and knowledgeable subsistence harvesters for each community (Kaktovik, Nuiqsut, and Barrow) and used this to select respondents for the mapping study. Subsistence use areas for each respondent were mapped on an acetate sheet positioned over a 1:250,000 USGS map. Each recorded use area represented the area where the respondent reported having searched for a specific resource during the 10 years prior to each interview. Use areas depict active search areas and not areas used en route to subsistence use areas; non-hunting travel routes to subsistence use areas were mapped separately. A more detailed description of the methods associated with the SRB&A overlapping use area method is provided in SRB&A (2010a). The overlapping use areas documented by SRB&A are the primary source of subsistence use area data used to analyze potential impacts in this EIS, in addition to the harvest location by placename data provided by ADF&G and NSB. The most recent time period available for subsistence use area data is 1996-2006 (for Kaktovik) and 1995-2006 (for Nuiqsut). Bowhead whale hunting tracks for Nuiqsut are available as recently as 2009.

The two primary methods of spatially documenting subsistence uses used in this report (harvest by placename location and overlapping subsistence use area data) both provide relevant information about subsistence uses. Harvest location data are useful for identifying where harvests have occurred during specific events and/or years, and if one has time series data, for measuring the importance of an area by identifying recurring harvests at that location. Subsistence use area data are useful for representing where community residents identify as their current subsistence hunting and harvesting area and, in the case of overlapping use areas, measuring the importance of an area in terms of the number of individuals who use the area and the number of resources targeted in an area (for multi-resource maps). Neither method fully measures the cultural or traditional importance of an area or resource to a community.

Subsistence seasonal round data are available in the form of ethnographic descriptions, harvest amount or level by month data, and subsistence use area by month data. This EIS incorporates all three types of seasonal round data. It is important to note that harvest amount by month data represent seasonal round in terms of harvest success, while subsistence use area by month data represent seasonal round in terms of harvest effort. Although these two data sets (month by use area and month by harvest amount) are not directly comparable, there is generally a high correlation between harvest effort (represented by numbers of reported use areas) and harvest success (represented by harvest amounts) (see the Contemporary Seasonal Round discussions).

Another primary source of subsistence data cited in this EIS is related to impacts on subsistence and culture. The sources used in this document primarily focus on impacts related to oil and gas development (SRB&A 2009, Haynes and Pedersen 1989, Pedersen, Wolfe, Scott, and Caulfield 2000). In general, North Slope literature addressing impacts on subsistence and culture rely directly on observations and reports by local hunters as well as evidence of impacts through harvest location and subsistence use area documentation. Biological studies also provide measures of impacts on subsistence resources, which also inform impacts on subsistence users.

For the purposes of the subsistence analysis, the study area includes the North Slope communities of Kaktovik and Nuiqsut that use the Point Thomson area or harvest resources that may migrate through the Point Thomson area. Anaktuvuk Pass is also included in the affected environment for the purposes of characterizing residents' sharing of subsistence resources with Kaktovik and Nuiqsut.

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Chapter 3. Subsistence Definition and Relevant Legislation

The Point Thomson Project is located on state lands. However, resources that migrate through the Point Thomson area may be harvested elsewhere on state, federal, or private lands. In Alaska, subsistence hunting and fishing are regulated under a dual management system by the State of Alaska and the Federal government. Federal subsistence law regulates federal subsistence uses; state law regulates state subsistence uses. Subsistence activities on all lands in Alaska, including private lands, are subject to State and Federal subsistence regulations.

State regulations governing subsistence are based on Title 16 of Alaska Statutes (AS 16) and Title 5 of Alaska Administrative Code (05 AAC 99). Under state law "subsistence uses means the noncommercial, customary and traditional uses of wild, renewable resources by a resident domiciled in a rural [sic] area of the state for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation, for the making and selling of handicraft articles out of non-edible by-products of the fish and wildlife resources taken for personal or family consumption, and for customary trade, barter, or sharing for personal or family consumption" (AS 16.05.940[33]).

Federal subsistence law is based on Title VIII of the 1980 Alaska National Interest Lands Conservation Act (ANILCA) and regulations found in the Code of Federal Regulations (CFR) Title 36, Part 242 and Title 50, Part 100 (36CFR242.1 and 50CFR100.1). Under federal law, "subsistence uses means the customary and traditional uses by rural Alaska residents of wild renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of non-edible byproducts of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade" (ANILCA Title VIII Section 803).

The Alaska Federation of Natives (AFN) describes subsistence as "the hunting, fishing, and gathering activities which traditionally constituted the economic base of life for Alaska's Native peoples and which continue to flourish in many areas of the state today. .... Subsistence is a way of life in rural Alaska that is vital to the preservation of communities, tribal cultures and economies. Subsistence resources have great nutritional, economical, cultural, and spiritual importance in the lives of rural Alaskans. … Subsistence, being integral to our worldview and among the strongest remaining ties to our ancient cultures, is as much spiritual and cultural, as it is physical" (AFN 2005). Subsistence activities could include hunting, fishing, trapping, wood gathering, and berry picking.

Subsistence is part of a rural economic system, called a "mixed, subsistence-market" economy, wherein families invest money into small-scale, efficient technologies to harvest wild foods (ADF&G 2000:3). Fishing and hunting for subsistence resources provide a reliable economic base for many rural regions and these important activities are conducted by domestic family groups who have invested in fish wheels, gill nets, motorized skiffs, and snowmachines (Wolfe and Walker 1987). Subsistence is not oriented toward sales, profits or capital accumulation (commercial market production), but is focused toward meeting the self-limiting needs of families and small communities (Wolfe and Walker 1987). Participants in this mixed economy in rural Alaska augment their subsistence production by cash employment. Cash (from commercial fishing, trapping, and/or wages from public sector employment, construction, fire fighting, oil and gas industry, or other services) provide the means to purchase the equipment, supplies, and gas used in subsistence activities. The combination of subsistence and commercial-wage activities provides the economic basis for the way of life so highly valued in rural communities (Wolfe and Walker 1987).

Subsistence uses are central to the customs and traditions of many cultural groups in Alaska, including the Iñupiat (ADF&G 2000:1). These customs and traditions encompass sharing and distribution networks, cooperative hunting, fishing, and ceremonial activities. Subsistence fishing and hunting are important sources of employment and nutrition in almost all rural communities (ADF&G 2000:1). ADF&G (2000:3) estimates that the annual wild food harvest in the interior area of Alaska is approximately 6,359,597 pounds or 613 pounds per person per year, and that the annual wild food harvest in the arctic area of Alaska is approximately 10,507,255 pounds or 516 pounds per person per year. Subsistence harvest levels vary widely from one community to the next. Sharing of subsistence foods is common in rural Alaska.

Participation in subsistence activities promotes transmission of traditional knowledge from generation to generation and serves to maintain people's connection to the physical and biological environment. The subsistence lifestyle encompasses Iñupiaq cultural values such as sharing, respect for elders, respect for the environment, hard work, and humility. In addition to being culturally important, subsistence is a source of nutrition for residents in an area of Alaska where food prices are high. While some people earn income from employment, these and other residents rely on subsistence to supplement their diets throughout the year. Furthermore, subsistence activities support a healthy diet and contribute to residents' overall well-being.

Chapter 4. Affected Environment

4.1 HISTORICAL PATTERNS OF SUBSISTENCE RESOURCE USE

In order to understand the current subsistence patterns in the Point Thomson project area, it is useful to review Iñupiat historical settlement patterns and subsistence use areas. Describing historic land use and settlement patterns is key to describing and analyzing present subsistence and land use patterns because for the Iñupiat, contemporary subsistence uses are rooted in the past. While lifeways have changed dramatically from the pre-historic period, when Iñupiat were nomadic and moved seasonally between semi-permanent settlements, residents of the North Slope continue to conduct subsistence activities and travel to hunting, harvesting, and fishing areas in accordance with knowledge that has been passed down from previous generations. It is this link between past and present Iñupiat subsistence uses that allows residents to continue a "traditional" subsistence lifestyle while also participating in the modern economy. The following is a brief description of regional settlement patterns and traditional subsistence uses relevant to Alaska's North Slope. More comprehensive descriptions of historic land and subsistence use patterns are available in Human Relations Area Files (HRAF) (1992), Impact Assessment, Inc. (IAI) (1990a, 1990b, 1990c), Jacobson and Wentworth (1982), Hoffman, Libbey, and Spearman (1988), Wentworth (1979), SRB&A and ISER (1993), and Galginaitis et al. (1984).

4.1.1 Regional Settlement Patterns

The peoples of this part of the Arctic have gone through several changes in the late prehistoric through the historic period. Continuous occupation of the North Slope region around Barrow began approximately 1,300 years ago, and this period has been connected to whaling and the growth of semi-permanent coastal communities (SRB&A and ISER 1993). Before sustained contact with Euroamericans, the Iñupiat were highly mobile, with seasonal aggregation of communities for festivals, hunting, and the cooperative bowhead whale hunts. Kaktovik and Nuiqsut were once locations for trading fairs, where different groups of Iñupiat and Athabaskans would gather to trade (Human Relations Area Files [HRAF] 1992:76-78). Throughout the late 18th and early 19th century, resource shortages and conflict with neighboring Iñupiat and Athabaskan groups caused these groups to change their territories and caused groups to merge or split from other groups (HRAF 1992:74-78).

Starting in the second half of the 19th century, changes in resource distribution, fluctuations in whale, walrus, and caribou populations, and epidemic disease caused major changes in the geographic distribution and lifeways of the Iñupiat (HRAF 1992: 78-81). Commercial whaling, especially the establishment of a shore-based whaling station in Barrow in 1884, brought Iñupiat from other areas to Barrow in pursuit of wage employment and increased trade opportunities. The promise of jobs and access to trade goods in conjunction with famine and disease caused the relocation of inland peoples to the coastal villages and a decline in the overall population of the region (SRB&A and ISER 1993). The eventual depletion of whales and other marine mammals, along with increased hunting pressure caused by commercial whaling crews, contributed to critical resource shortages and famine. In response to famine and the needs of stranded commercial whalers, the federal government instituted a reindeer herding program in Point Hope, Wainwright, and Barrow, which lasted until the 1930s. This program was not successful over the long term, and by 1952, the Barrow herd had dispersed due to inattention, predation by wolves, and assimilation into wild caribou herds.

By the first decade of the twentieth century, commercial whaling had ended, and fur trapping become an alternative method for the Iñupiat to participate in the cash economy. While commercial whaling had brought Iñupiat from the interior to the coast, specifically to Barrow and Wainwright, trapping encouraged the Iñupiat to return to the interior to winter trapping camps. Trapping waned in the 1930s, as fur prices declined during the Depression and trading posts closed. Following the Depression, the Iñupiat population again aggregated into communities, due to the establishment of schools, missions, and churches and the enforcement of laws regarding truancy. Other economic opportunities drew Iñupiat to the growing cities of Fairbanks and Anchorage (Hoffman, Libbey, and Spearman 1988:8).

The discovery and development of oil and the construction and maintenance of the Distant Early Warning (DEW) line sites and related defense establishments during the Cold War have been major influences affecting the location and distribution of settlements in the arctic region (Hoffman, Libbey, and Spearman 1988:8). Wage employment provided by the Naval Petroleum Reserve, Naval Arctic Research Laboratory, DEW line sites, Federal Aviation Agency and the Weather Bureau brought inland and coastal Iñupiat to settle in Barrow. Following the passage of Alaska Native Claims Settlement Act in 1971, groups that had centralized in Barrow and other coastal villages to access services and employment began to return to formerly used lands, in particular, traditional subsistence harvest areas such as Nuiqsut and Atqasuk.

4.1.2 Traditional Subsistence Use Areas

The Iñupiat people of the area have historically used a wide area stretching along the coast from the Mackenzie Delta to Point Barrow, and the navigable streams and waters within the barrier islands of the Beaufort Sea coast. Offshore and nearshore areas were used for marine mammal hunts and fishing, while coastal areas and islands were used for caribou hunting during the summer (where the caribou are often found during periods of high insect harassment). The Iñupiat used navigable rivers for caribou, moose, and fishing. In the winter, ice fishing would occur in the rivers and nearshore waters, and the rivers became “highways” for hunters harvesting caribou, furbearers, and Dall sheep near the Brooks Range. Lifetime (referring to respondents’ lifetime before 1979) and contemporary (including 1973-1985, 1994-2003 and 1995-2006 time periods for Nuiqsut and the 1996-2006 time period for Kaktovik) use areas for Kaktovik and Nuiqsut are depicted on Figures 1 and 2. The “lifetime” data represent community-based subsistence activities rather than residents’ activities during periods of nomadism, and therefore, for Nuiqsut, the “lifetime to 1979” use area likely represents residents’ activities since the establishment of the community in 1973.

4.2 CONTEMPORARY PATTERNS OF SUBSISTENCE RESOURCE USE

Residents from Kaktovik and Nuiqsut either hunt in or utilize subsistence resources that seasonally migrate in the Point Thomson area. In addition, Anaktuvuk Pass residents receive marine mammal and other subsistence products from these coastal communities in return for caribou and other inland resources (Bacon et al. 2009). The following sections address the contemporary seasonal round, subsistence harvest data, and subsistence use areas for Kaktovik and Nuiqsut.

4.2.1 Kaktovik

Kaktovik is located on Barter Island on the northern edge of the Arctic National Wildlife Refuge (Arctic Refuge), a location that offers access to marine mammals, land mammals, and fish. The name Kaktovik means “the seining place” (Jacobson and Wentworth, 1982:3). Caribou and bowhead whale are staple subsistence resources for the area. Caribou is the “most significant terrestrial resource harvested by Kaktovik residents” (Pedersen 1990:1). Two caribou herds are found and hunted within Kaktovik’s resource use area: the Central Arctic Herd and the Porcupine Caribou Herd (Pedersen 1990:1). Seals

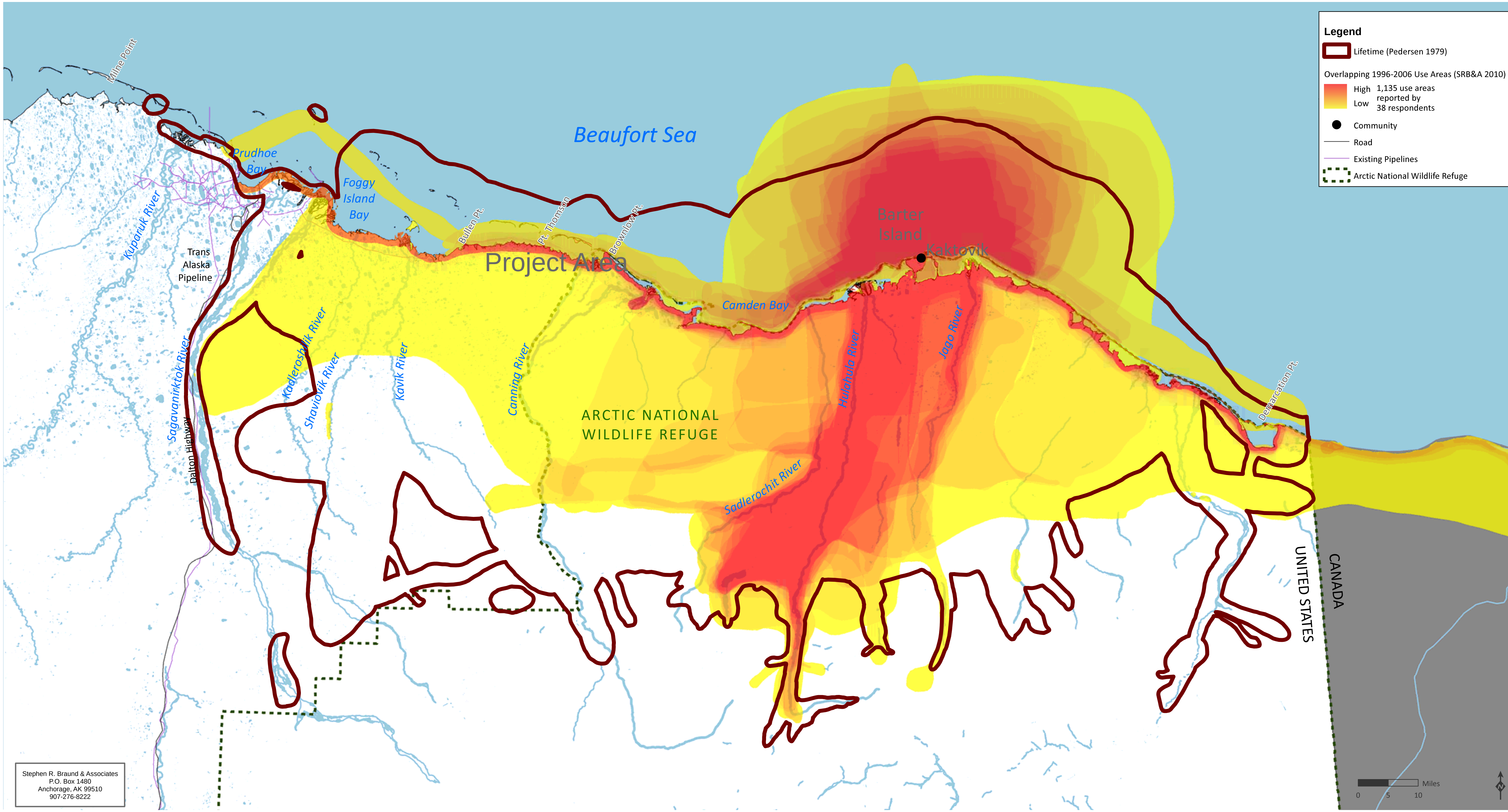

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Figure # 1

Kaktovik Lifetime and 1996-2006 Use Areas, All Resources

Respondents reported additional 1996-2006 use areas that are located in Canada and in the vicinity of Teshekpuk Lake and are not shown here.

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Pedersen 1979, SRB&A 2010

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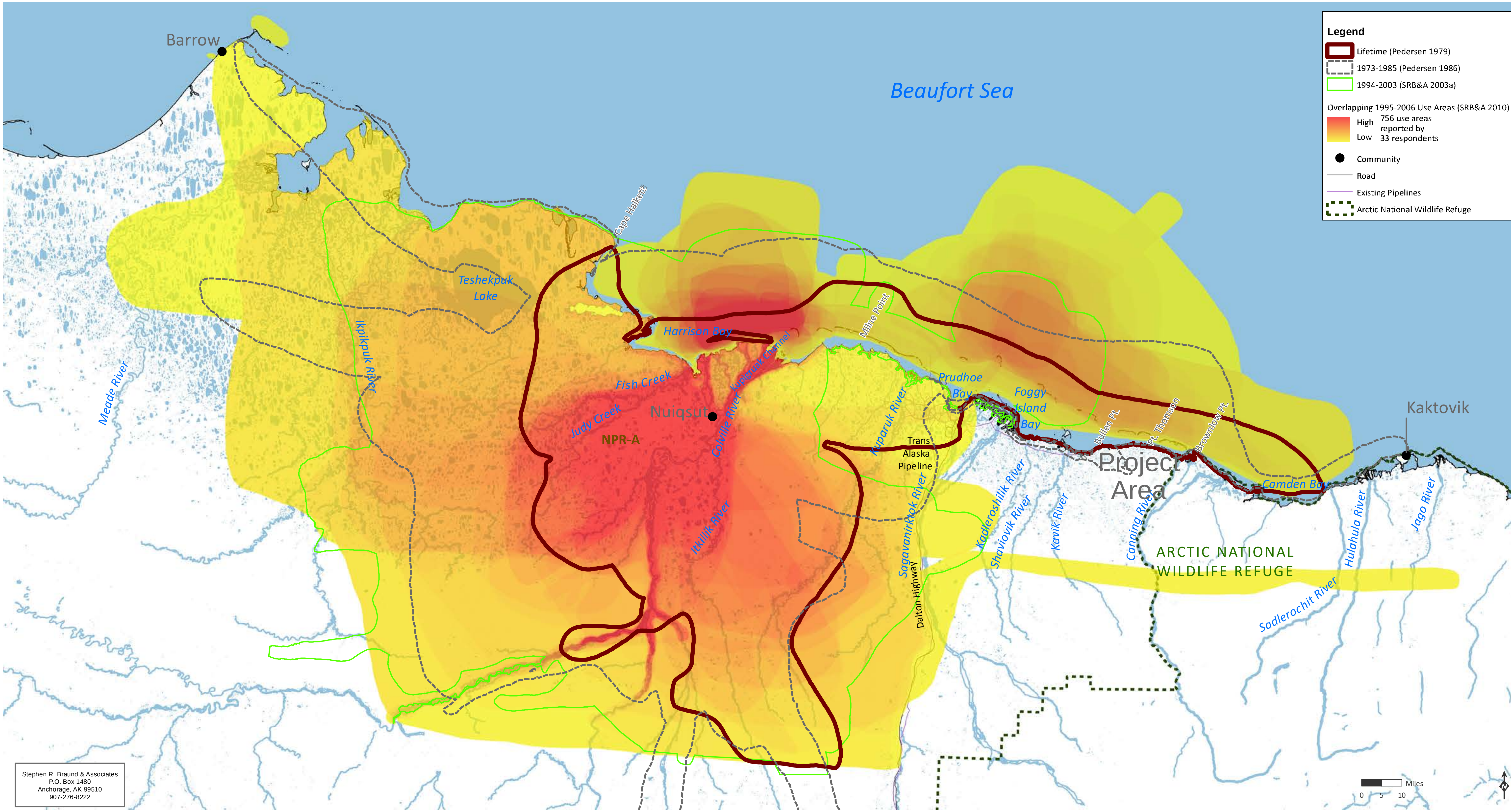

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Figure # 2

Nuiqsut Lifetime and Post-1970s Use Areas, All Resources

The 1973-1985 use areas extend south along the Anaktuvuk River to Anaktuvuk Pass and along the Kuparuk River to the Dalton Highway.

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Pedersen 1979, Pedersen 1986, SRB&A 2003a, SRB&A 2010

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(bearded, ringed, and spotted) are also important supplemental resources, as are ducks, geese, and several fish species (Jacobson and Wentworth 1982:35-68). Riverine resources are important as well, and important subsistence rivers include the Hulahula, Canning, and other regional rivers. Kaktovik is one of 11 Alaska Eskimo whaling communities. Kaktovik bowhead whaling occurs only in the fall, when the whales migrate close to shore, because the spring migration passes too far offshore for hunts to occur. Subsistence resource harvests are key components of the economy and cultural integrity of the village.

Barter Island was an important trading center for centuries. Iñupiat people would travel to Barter Island to trade with Inuit people from Canada, inland Iñupiat and Athabaskans. Barter Island was the site of a prehistoric village, *Qaaktuġvik,* occupied by the Qanmaliurat; the site contained numerous whale bones, which were found among the house ruins, indicating the longevity of the use of whales in this area (Jacobson and Wentworth, 1982: 3). Historically, Barter Island was the seasonal home of “some of the nomadic ancestors of present-day Kaktovik residents” who used the area for the harvesting of subsistence resources such as caribou, sheep, sea mammals, fish, and birds (Jacobson and Wentworth 1982:3). Barter Island was also an important stop for commercial whalers between the 1890s and 1910s. A trading post established on Barter Island by Tom Gordon in 1923 provided a market for local furs and marked the beginning of Kaktovik as a permanent settlement (Jacobson and Wentworth 1982:3). During the 1920s and 1930s, most residents of the area were semi-nomadic and lived dispersed along the coast, congregating at the trading post at Barter Island on holidays and other occasions (Jacobson and Wentworth 1982:3). Following the decline of the market for furs during the Depression and the death of Tom Gordon in 1938, many families in the area moved to Barrow or Herschel Island, Canada. The availability of employment due to the U.S. Coast and Geodetic Survey coastal mapping, DEW line construction and the consequent establishment of a school caused the Barter Island population to increase rapidly once again starting in the 1950s, as former residents returned from areas ranging from Herschel Island to Barrow (Jacobson and Wentworth 1982:5). While development provided employment for residents, it also caused physical alterations to the community including three village relocations in 1947, 1951, and 1964 (Jacobson and Wentworth 1982:5). The population of Kaktovik rose again in the 1970s, when even more jobs became available and housing improved.

The U.S. Census Bureau reported a 2000 Kaktovik population of 293 residents, 75 percent of whom were Native (U.S. Census Bureau 2010). A more recent estimate places the Kaktovik population at 286 people in 2009 (Alaska Department of Labor and Workforce Development [ADOLWD] 2010). Primary sources of employment are the NSB, NSB School District, and the village corporation (Kaktovik Iñupiat Corporation; URS Corporation 2005). Residents continue to participate in year-round subsistence activities.

4.2.1.1 Role and Importance of Subsistence Resources

Kaktovik’s location on a coastal island makes it well situated for regular access to terrestrial, marine, and riverine resources. Because few rivers in the Kaktovik area are navigable, the majority of inland travel occurs by snowmachine during the winter and spring months. During the open water season, residents’ subsistence activities are focused along the coast or in the open ocean. Like many other North Slope communities, the bowhead whale is central to Kaktovik residents’ cultural identity and an important source of food. Other marine mammals harvested by Kaktovik residents include seals and polar bears. Caribou is the primary terrestrial resource harvested, in addition to muskox, brown bear, and Dall sheep. While not harvested in the same quantities as caribou, sheep are relatively important to Kaktovik identity, as only two North Slope communities – Kaktovik and Anaktuvuk Pass – harvest them regularly (IAI

1990a). Residents harvest fish, including Dolly Varden (also known as Arctic char), Arctic cisco, Arctic grayling, broad whitefish, and certain species of salmon, from the ocean, rivers, and lakes (Jacobson and Wentworth 1982; ADF&G 2010). Waterfowl hunting, wolf and wolverine hunting, and berry and plant harvesting are also common subsistence activities in Kaktovik. Sharing of subsistence resources with other North Slope communities is common; in 1992, 92 percent of Kaktovik households received at least one subsistence resource, and 83 percent of households gave subsistence resources away. In particular, the community of Anaktuvuk Pass regularly provides caribou to Kaktovik in exchange for bowhead whale maktak and meat (Bacon et al. 2009). Participation in subsistence activities by Kaktovik households is high; in 1992, 89.4 percent of households harvested subsistence resources, while 95.7 percent of households used subsistence resources (ADF&G 2010). These percentages illustrate the importance and prevalence of subsistence practices among residents of Kaktovik.

4.2.1.2 Contemporary Seasonal Round

Various sources are available that describe the seasonal cycle of subsistence activities in Kaktovik. Table 2 summarizes Kaktovik's annual cycle of subsistence activities according to data primarily collected in the 1970s and 1980s and based on a figure in Jacobsen and Wentworth (1982). The timing of certain subsistence activities may have changed since that time because of changing climate conditions and other factors. Several more recent sources (Brower, Olemaun, and Hepa 2000; Bacon et al. 2009) provide harvest amounts by month for individual resources. SRB&A (2010a) provides months in terms of the number of use areas reported, by resource. These data are not directly comparable because they are measuring two different variables (harvest amounts versus subsistence use areas). See under Methodology for a discussion of the different types of seasonal round data available.

Figure 3 depicts 1996-2006 Kaktovik subsistence use areas by month, for all resources (SRB&A 2010a). This figure shows the number of reported subsistence use areas by month of use for key resources (excluding Dall sheep, bear, some species of fish, and plants and berries) and indicates a peak in reported use areas between May and September; the highest numbers of use areas were reported for the month of August, when residents are busy harvesting seals, caribou, and fish. Harvests by species by month between July 2002 and June 2003 are also available from the NSB's *Estimates of Subsistence Harvest for Villages on the North Slope of Alaska, 1994-2003* (Bacon et al. 2009). A high percentage of harvests occurred during the months of July and August for caribou, seal, Dolly Varden, Arctic cisco, burbot, and tomcod. The majority of birds were harvested during April and May, Dall sheep were harvested in November, bowhead whale in September, and polar bear in October and November.

Because of the focus on caribou in this EIS, Figures 4 and 5 provide harvest amount and use area by month data specific to caribou. Figure 4 presents the harvest of caribou by month as a proportion of the harvest from the ADF&G and the NSB harvest location data separately. There are three harvest peaks: July and August, March and April, and October and November, with July and August representing approximately 76 percent of all reported NSB caribou harvests and 51 percent of all reported ADF&G caribou harvests. Changes in caribou harvest seasonality over time include the apparent compression of most harvests into two months (July and August), with fewer spring and fall harvests evident in the mid to late 1990s (NSB 2003, 2010a, Figure 4). The 1980s and early 1990s data from ADF&G show a higher percentage of caribou harvests occurring in March, April, October, and November. SRB&A (2010a) provides 1996-2006 data on months of caribou harvest effort in terms of the number of use areas reported by month (Figure 5); similar to the ADF&G and NSB harvest data depicted on Figure 4, the 1996-2006 data show the number of caribou use areas peaking in July and August, and to a lesser extent, in April.

Similarly, Bacon et al. (2009) shows the highest percentage (75 percent) of 2002-2003 caribou harvests occurring in July and August, followed by October (6.3 percent), November (5.4 percent), and September, March, and April (all 3.6 percent).

The annual round in Kaktovik is based on the seasonal availability of resources. Summer (boat) and winter (snowmachine) are the main Kaktovik hunting seasons, with travel in spring and fall limited by weather and surface conditions. Seasonal weather conditions have profound effects on subsistence harvesting activity (Coffing and Pedersen 1985:23). Summer caribou hunting occurs once the ice breaks up in July until late August, peaking in July when animals seek relief from insects at the coast, and often continuing into the fall months (Pedersen 1990, SRB&A 2010a). Fishing also begins in July, usually with set gill nets, in the rivers, lagoon systems, and along the barrier islands. Dolly Varden, Arctic cisco, and broad whitefish are primarily harvested in July and August , with some fall fishing activities extending into September (SRB&A 2010a). Kaktovik hunters also harvest bearded, ringed, and spotted seals by boat throughout the summer and fall months of July through September.

The whaling season occurs from late August into September or October, when the whales migrate closest to the shore. Stormy or foggy fall weather frequently impedes whaling. Whalers do not range too far from Kaktovik, and usually hunt within 20 miles of land (Braund and Moorehead 1995:272; SRB&A 2010a). Once the whaling season is over, usually in late September, hunters focus on caribou and Dall sheep. Kaktovik's proximity to the Brooks Range allows access to Dall sheep, generally hunted in late October through November (Jacobson and Wentworth 1982:29-68). Kaktovik is unique among the 11 whaling communities due to its regular use of Dall sheep by residents (Pedersen, Coffing, and Thompson 1985). Caribou hunting occurs throughout the winter months of November through April, with less emphasis on caribou hunting during the fall rutting (October) and spring calving (May and June) seasons (SRB&A 2010a).

Table 2: Annual Cycle of Subsistence Activities–Kaktovik

	Winter					Spring		Summer			Fall	
Resource	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Fish	Low–Medium	Low–Medium	Low–Medium	Low–Medium	Low–Medium	Low–Medium	Low–Medium		Low–Medium	High	High	Low–Medium
Birds/Eggs	Low–Medium	Low–Medium	Low–Medium	Low–Medium	Low–Medium	High	High	High	High	High	Low–Medium	Low–Medium
Moose			Low–Medium	Low–Medium	Low–Medium	Low–Medium	Low–Medium					
Caribou	Low–Medium	Low–Medium	Low–Medium	Low–Medium	Low–Medium	Low–Medium	Low–Medium		High	High	Low–Medium	Low–Medium
Brown Bear						Low–Medium	Low–Medium					
Small Mammals						High	High	Low–Medium	Low–Medium	Low–Medium	Low–Medium	
Furbearers	Low–Medium	Low–Medium	Low–Medium	Low–Medium	Low–Medium	Low–Medium						Low–Medium
Dall Sheep	High	Low–Medium	Low–Medium	Low–Medium	Low–Medium	Low–Medium	Low–Medium				Low–Medium	High
Polar Bear	Low–Medium	Low–Medium	Low–Medium	Low–Medium	Low–Medium	Low–Medium	Low–Medium			Low–Medium	Low–Medium	Low–Medium
Seals	Low–Medium	Low–Medium	Low–Medium	Low–Medium	Low–Medium	Low–Medium	Low–Medium	Low–Medium	Low–Medium	High	High	Low–Medium
Bowhead Whale										High	High	Low–Medium

Notes:

- (white) No to Very Low Levels of Subsistence Activity
- (light grey) Low to Medium Levels of Subsistence Activity
- (dark) High Levels of Subsistence Activity

Sources: Jacobson and Wentworth, 1982.

Winter hunting and trapping usually begins early in November and continues throughout the winter months until April. Early November is the peak time for travel to mountain camps, and Kaktovik residents often stay in these camps from a few days to a few months. Subsistence activity slows in mid-December due to limited daylight. The primary winter subsistence resources are furbearers, Dall sheep, caribou, and fish. Wolf and wolverine hunting occurs primarily from November through April (SRB&A 2010a). Winter fishing, primarily for Dolly Varden, occurs between the winter months of November through April. Dall sheep, wolf, wolverine, caribou, and an occasional moose are also harvested from November through early April, with activities peaking in the late winter and early spring (February through April) when the days are longer (Jacobson and Wentworth 1982:29-68, SRB&A 2010a). Arctic squirrel hunting begins in April and peaks in May. Kaktovik residents may hunt ptarmigan year-round, but hunters primarily hunt ptarmigan in April and May. Arctic squirrel and ptarmigan are hunted to provide variety in the diet. Dall sheep, brown bear, wolf, and wolverine are also harvested later in the spring, but these resources become less desirable after mid-May (Jacobson and Wentworth 1982:29-68). In late May or early in June, migratory waterfowl hunting begins with a focus on geese and eiders. Waterfowl hunting also continues to a lesser extent through the summer and early fall months. Subsistence activities in June are scant because there is not enough snow for snowmachine transportation and the ice conditions make boat travel difficult.

4.2.1.3 Subsistence Harvest Estimates

ADF&G (2001) collected subsistence harvest data for Kaktovik in 1985, 1986, and 1992 (Table 3 and Table 4); ADF&G selected 1992 as the representative year for subsistence harvest data in Kaktovik, meaning that 1992 is the most representative of the available ADF&G harvest data years, but not necessarily the most statistically representative Kaktovik harvest year. Kaktovik's total annual subsistence harvests increased from 61,663 pounds in 1985 to 84,060 pounds in 1986 and 170,939 pounds in 1992 (Table 3). The 1992 harvest of 886 pounds per capita of wild resources represents nearly two and a half pounds per day per person in the community. Kaktovik residents rely heavily on large land and marine mammals and fish (Table 4). Bowhead whales, caribou, and Dolly Varden accounted for 84 percent of Kaktovik's annual subsistence harvest in terms of edible pounds in 1992, with bowhead whales alone accounting for 63 percent of the total harvest (Table 4). Bowhead whaling and caribou hunting provide the greater portion of subsistence foods by weight. The yearly contribution of these two species to the total subsistence harvest fluctuates depending on resource availability and harvest success (Table 4).

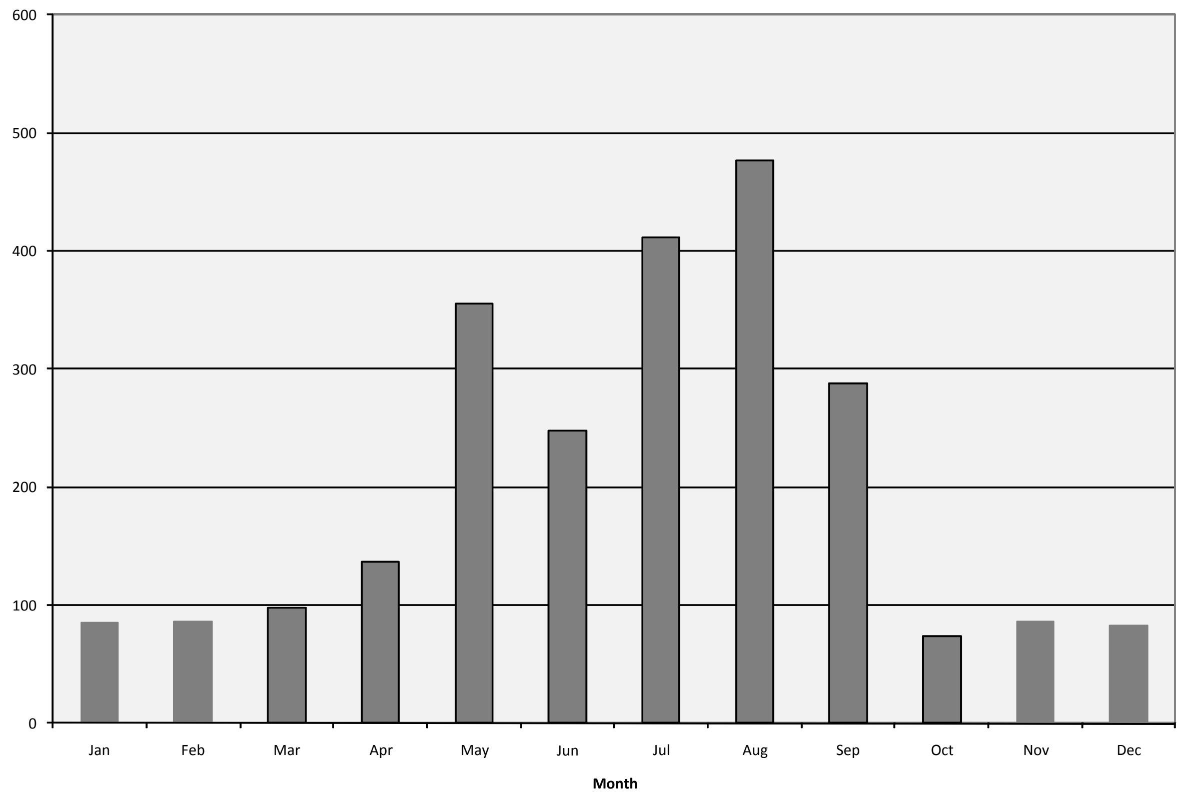

Figure 3: Kaktovik Use Areas for All Resources by Month 1996-2006

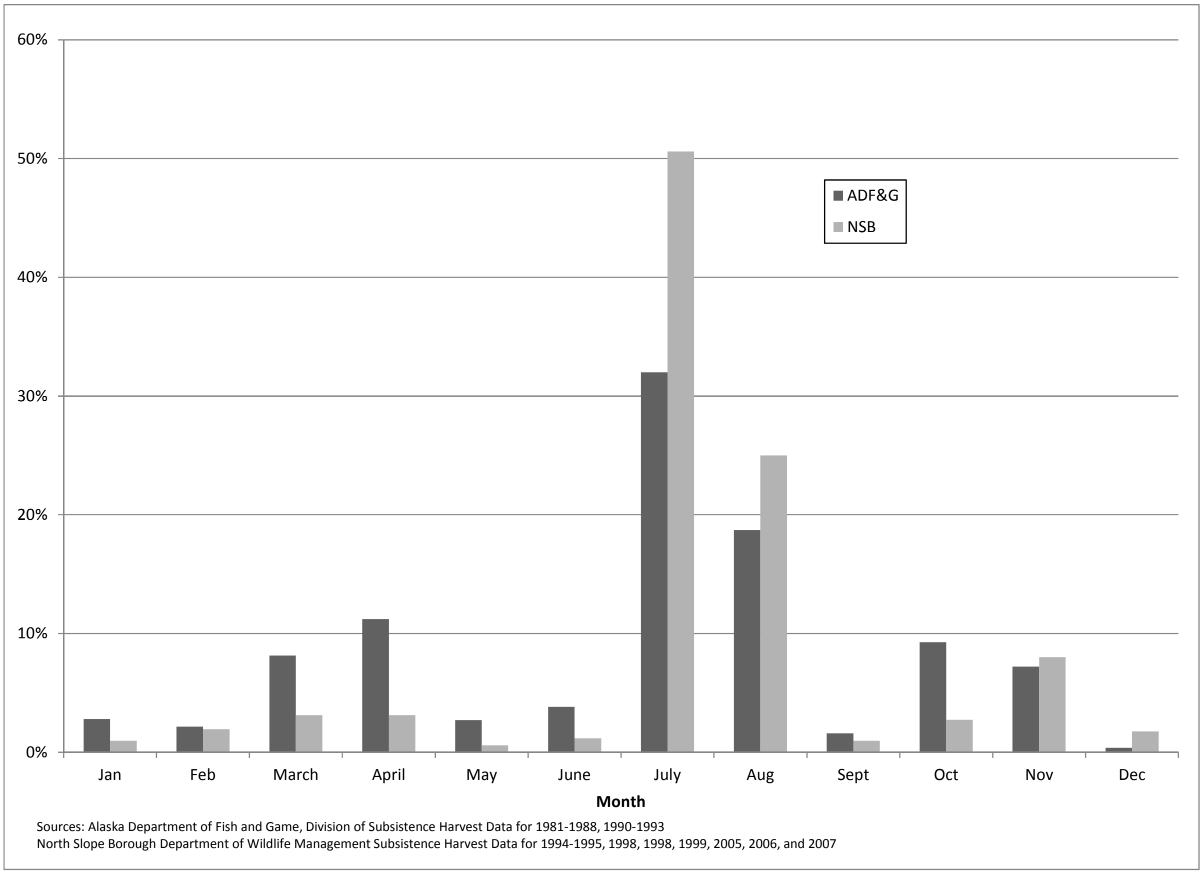

Figure 4: Kaktovik Caribou Subsistence Harvest by Month, 1981-1988, 1990-1993, 1994-1995, 1998, 1999, 2005, 2006, and 2007

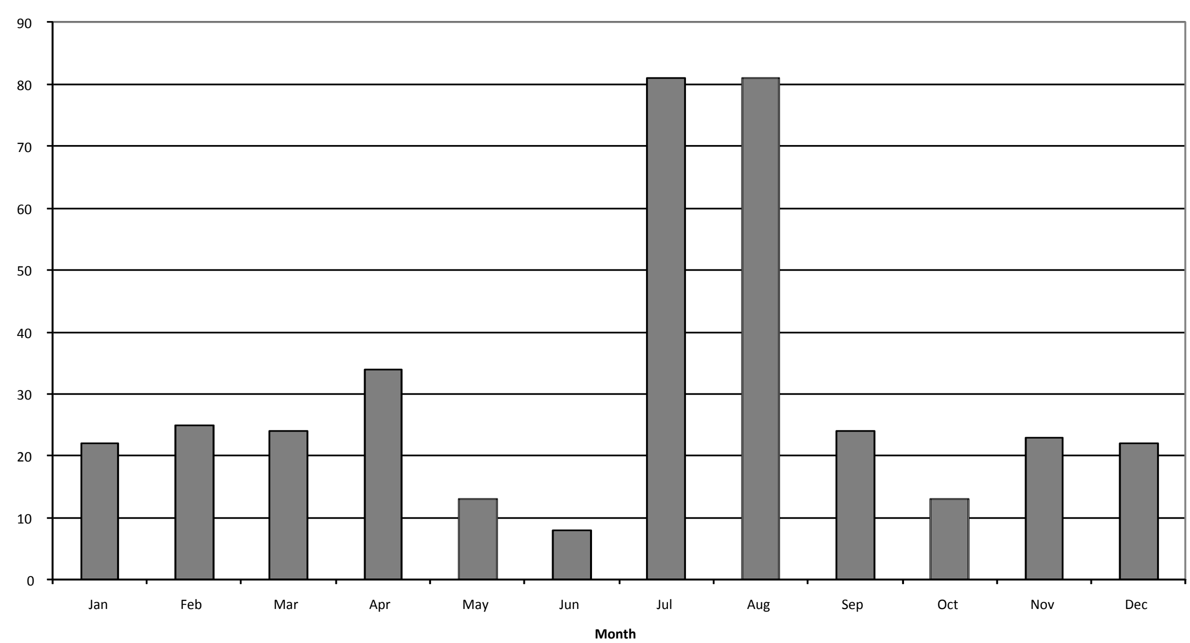

Figure 5: Kaktovik Use Areas for Caribou by Month, 1996-2006

Table 3: Kaktovik Subsistence Harvests and Subsistence Activities

		Percentage of Households					Estimated Harvest				
Study Year	Resource	Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% Total Harvest
1985	*All Resources*	*100*	*93*	*91*	*100*	*83*		*61,663*	*1,163*	*328*	*100*
	Fish	100	86	81	93	45	6,866	11,403	215	61	18
	Land Mammals	100	83	79	100	76	714	35,491	670	189	58
	Marine Mammals	88	69	57	86	41	174	10,762	203	57	17
	Birds and Eggs	88	81	79	64	62	1,831	3,995	75	21	6
	Vegetation	24	17	2	21	5		13	0	0	<1
1986	*All Resources*	*100*	*89*	*87*	*100*	*83*		*84,060*	*1,501*	*433*	*100*
	Fish	96	75	72	87	66	4,416	6,951	124	36	8
	Land Mammals	98	70	64	98	62	382	24,946	445	128	30
	Marine Mammals	96	64	60	96	64		49,723	888	256	59
	Birds and Eggs	94	72	70	77	60	1,561	2,382	43	12	3
	Vegetation	49	21	21	40	11		58	1	0	<1
1992	*All Resources*	*96*	*89*	*89*	*92*	*83*		*170,939*	*2,713*	*886*	*100*
	Fish	94	83	81	70	70	18,464	22,952	364	119	13
	Land Mammals	96	77	68	83	66	425	28,867	458	150	17
	Marine Mammals	89	64	40	87	70		115,645	1,836	599	68
	Birds and Eggs	89	68	64	77	60	1,796	3,249	52	17	2
	Vegetation	77	72	70	40	23		227	4	1	<1
1992[a]	*All Resources*							*180,970*	*2,549*	*787*	*100*
	Fish							33,063	466	144	18.3
	Land Mammals							25,180	355	109	13.9
	Marine Mammals							119,884	1,689	521	66.2
	Birds and Eggs							2,624	37	11	1.4
	Vegetation							219	3	1	<1
2002-2003[b]	*All Resources*						*3,524*	*99,482*	*1,309*		*100*
	Fish						2,363	4,167	55		4.2
	Land Mammals						186	14,906	196		15.0
	Marine Mammals						30	78,289	1,030		78.7
	Birds and Eggs						936	2,094	28		2.1
	Vegetation						9	27	0		<1

Notes: Blank cells indicate data not available

[a] These data should be viewed with caution due to a low response rate

[b] The estimated harvest numbers for the 2002-2003 data were derived by adding total harvest numbers for individual species in each resource category provided by ADF&G. For the 2002-2003 study year, total pounds were derived from conversion rates found at ADF&G (2011), and total (usable) pounds for bowhead whales were calculated based on the method presented in SRB&A and ISER (1993b). These estimates do not account for whale girth and should be considered approximate; more exact methods for estimating total whale weights are available in George, Philo, Suydam, Carroll, and Albert (n.d.).

Sources: ADF&G 2011 (for 1985, 1986, 1992); Fuller and George 1999 (for 1992*); Bacon et al. 2009 (for 2002-2003).

The importance of subsistence to Kaktovik residents is further reflected by the percent of households that use (96 percent), harvest (89 percent), try to harvest (89 percent), and share (92 percent) subsistence resources, as represented in the 1992 data (Table 3).

During a study period from December 1, 1994 to November 30, 1995, approximately 61 percent of the resources harvested in edible pounds were marine mammals and 26 percent were land mammals (these data are not included in Table 3 and Table 4 because they included only reported harvests, rather than estimated harvests for the entire community; Brower, Jr., Olemaun and Hepa 2000:33). Marine mammals such as bowhead whale, bearded seal, ringed seal, spotted seal, polar bear, and beluga whale were the most important subsistence resource for Kaktovik during the 1994-1995 study period, and the most culturally significant of these is the bowhead whale (Brower, Jr., Olemaun and Hepa 2000:36). Kaktovik hunters reported harvesting a large variety of land mammals such as caribou, Dall sheep, musk ox, moose, brown bear, and furbearers during this study period (Brower, Jr., Olemaun and Hepa 2000:34). Caribou was the most frequently harvested land mammal, with peak harvest occurring in July (64 percent), and 37 percent of the caribou for the year harvested in the general area of Brownlow Point (Brower, Jr., Olemaun and Hepa 2000:12-13, 35). Dall sheep were the second most frequently harvested land mammal resource, and most were harvested in the winter when hunters have access to the mountains by use of snowmachines. Fish, including Arctic cisco, Dolly Varden, sculpin, Arctic cod, arctic flounder, grayling, and chum salmon, accounted for 11 percent of the estimated total edible pounds in 1994-1995, and were most intensively harvested during the months of July and August (Brower, Jr., Olemaun and Hepa 2000:37). Birds such as ducks, ptarmigan, and geese, an important dietary supplement, accounted for two percent of the 1994-1995 harvest (Brower, Jr., Olemaun and Hepa 2000:36).

More recent harvest data (2002-2003) from the NSB (Bacon et al. 2009) are also depicted in Table 3 and Table 4. These data show residents harvesting an estimated 99,482 pounds of subsistence resources during the 2002-2003 study year (Table 3), with bowhead whales accounting for the majority of subsistence harvests that year, followed by caribou and Dolly Varden (Table 3).

Table 4: Selected Kaktovik Subsistence Harvests

		Estimated Harvest				
Study Year	Resource	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
1985	*Caribou*	*235*	*27,941*	*527*	*149*	*45*
	Seal	173	10,136	191	54	16
	Dolly Varden	3,104	8,727	165	46	14
	Geese	647	2,913	55	15	5
	Whitefish	3,546	2,482	47	13	4
	Moose	4	1,893	36	10	3
	Dall sheep	17	1,710	31	9	2
	Musk ox	1	748	14	4	1
	Polar bear	1	626	12	3	1
	Ducks	317	475	9	3	1
	Upland birds	867	607	11	3	1

Table 4: Selected Kaktovik Subsistence Harvests

		Estimated Harvest				
Study Year	Resource	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
1986	*Bowhead*	*3*	*43,704*	*780*	*225*	*52*
	Caribou	178	21,188	378	109	25
	Seal	62	4,837	86	25	6
	Dolly Varden	1,802	5,084	91	26	6
	Geese	371	1,410	25	7	2
	Musk ox	2	1,413	25	7	2
	Dall sheep	17	1,710	31	9	2
	Whitefish	2,402	1,682	30	9	2
	Upland birds	1,012	708	13	4	1
	Moose	1	596	11	3	1
	Polar bear	2	1,182	21	6	1
1987	*Caribou*	*185*	*22,229*	*383*	*104*	
1990	*Caribou*	*113*	*13,453*	*224*	*67*	
1991	*Caribou*	*181*	*22,113*	*369*	*94*	
1992	*Bowhead*	*3*	*108,160*	*1,717*	*560*	*63*
	Caribou	158	19,136	304	99	11
	Dolly Varden	5,741	16,337	259	85	10
	Seal	70	6,104	97	32	4
	Whitefish	8,823	6,051	96	31	4
	Dall sheep	44	4,379	70	23	3
	Musk ox	5	3,179	50	16	2
	Geese	601	2,135	34	11	1
	Moose	4	2,011	32	10	1
	Polar bear	3	1,330	21	7	1
1992[a]	*Bowhead*	*3*	*108,463*	*1,528*	*472*	*59.9*
	Dolly Varden	7,937	22,224	313	97	12.3
	Caribou	136	15,926	224	69	8.8
	Arctic cisco	7,143	7,143	101	31	3.9
	Dall sheep	53	5,249	74	23	2.9
2002-2003[b]	*Bowhead*	*3*	*75,715*	*996*		*76.1*
	Caribou	112	13,104	172		13.2
	Dolly Varden	1,162	3,254	43		3.3
	Dall sheep	18	1,782	23		1.8
	Bearded seal	8	1,408	19		1.4
	Polar bear	2	992	13		1

Notes: Blank cells indicate data not available

[a] These data should be viewed with caution due to a low response rate

[b] The estimated harvest numbers for the 2002-2003 data were derived by summing individual species in each resource category. For the 2002-2003 study year, total pounds were derived from conversion rates found at ADF&G (2011) and total (usable) pounds for bowhead whales were calculated based on the method presented in SRB&A and ISER (1993b). These estimates do not account for whale girth and should be considered approximate; more exact methods for estimating total whale weights are available in George et al. (n.d.).

Sources: ADF&G 2011 (for 1985, 1986, 1992); Fuller and George 1999 (for 1992*); Bacon et al. 2009 (for 2002-2003).

Table 5 and Table 6 provide all available years of Kaktovik bowhead whale and caribou harvest data, showing number and edible pounds harvested. Annual harvests of caribou vary widely from year to year and depend on a range of factors, including environmental conditions (e.g., snow and ice conditions, water levels), the timing and route of the caribou migration, and the distribution of caribou within residents' usual hunting areas. For all available study years between 1981 and 2003, Kaktovik respondents harvested an average of 150 caribou annually, accounting for an annual average 17,543 edible pounds (Table 5). Per capita pounds are only available for some study years (Table 3); available data (Table 5) show Kaktovik harvesting an average of 123 edible per capita pounds of caribou annually.

Table 5: Kaktovik Caribou Harvests, All Available Study Years

	Estimated Harvest		
Study Year	Number	Total Pounds	Per Capita Pounds
1981-82	43	5,031	
1982-83	160	18,720	
1983-84	107	12,519	
1985-86	235	27,941	149
1986-87	201	21,188	225
1987-88	189	22,229	104
1990	113	13,453	67
1991	181	22,113	94
1992	158	19,136	99
1994-1995*	78	9,126	
2002-2003	112	13,104	
Total	1,499	184,560	
Average**	150	17,543	123

* For the 1994-1995, data represent reported harvests and do not represent estimates for the community as a whole.

** Averages do not include 1994-1995 data which did not attempt to extrapolate to the community as a whole.

Sources: Pedersen 1990, ADF&G 2011, Bacon et al. 2009

Bowhead whale harvest numbers are available from 1964 through 2008 (Table 6). Edible pounds were calculated using bowhead whale lengths and the method provided in SRB&A and ISER (1993b). Kaktovik has harvested an average of 2.6 bowhead whales annually (an average of 3 since the 1990s), providing an average of 65,135 edible pounds of meat and blubber per year. Using 2010 census data showing a population of 239 residents in 72 households, and an estimated 53,167 edible pounds of bowhead whale in 2010, Kaktovik harvested 222 pounds of edible foods per capita in 2010, or 738 edible pounds per household. This is on the lower end of estimated mean household pounds and per capita pounds for years where community harvest data are available (Table 4).

Table 6: Kaktovik Bowhead Whale Harvests, All Available Study Years		
Year	Number	Total Edible Pounds
1964	2	
1966	0	
1967	1	
1968	0	
1972	1	
1973	3	55,597
1974	2	NA
1975	0	
1976	2	47,448
1977	2	66,450
1978	2	56,535
1979	5	124,436
1980	1	16,076
1981	3	133,885
1982	1	48,924
1983	1	45,866
1984	1	16,076
1985	0	
1986	3	80,919
1987	0	
1988	1	45,866
1989	3	120,000
1990	2	40,381
1991	2	38,773
1992	4	116,010
1993	3	58,812
1994	3	NA
1995	4	
1996	1	45,866
1997	4	103,819
1998	3	45,013
1999	3	56,345

Table 6: Kaktovik Bowhead Whale Harvests, All Available Study Years		
Year	Number	Total Edible Pounds
2000	3	57,205
2001	4	78,852
2002	3	75,715
2003	3	71,752
2004	3	73,038
2005	3	45,013
2006	3	79,692
2007	3	40,833
2008	3	57,482
2009	3	88,488
2010	3	53,167
Total	97	2,084,334
Average*	2.6	65,135

Notes: NA=Data not available; * Averages do not include unsuccessful harvest years.

Sources: Suydam and George 2004, Suydam, George, Hanns, and Sheffield 2005, NSB 2010.

4.2.1.4 Contemporary Subsistence Use Areas and Harvest Locations

From 1996 to 2006, Kaktovik subsistence users utilized an area of up to 20,341 square miles, extending along the coast from Prudhoe Bay to beyond the Mackenzie River delta, including the offshore barrier islands, and to the foothills and low passes of the Brooks Range via several river drainages (Figure 1). The 1996-2006 subsistence use areas depicted on Figure 1 are only for selected species and do not include use areas for Dall sheep, bear, ptarmigan, vegetation, and certain species of fish. Also not included are subsistence use areas located in Canada that were reported by residents who participate in subsistence activities while visiting relatives in communities such as Aklavik and Inuvik, or who were originally from those communities. Summer resource harvests tend to take place along the coast and barrier islands, while winter harvests tend to take place inland along river courses such as the Hulahula, Shaviovok, and Sadlerochit rivers (Pedersen 1990:29). A high number of overlapping contemporary (1996-2006) use areas occur along the coast between Bullen Point and Demarcation Point; inland around Hulahula, Sadlerochit, Jago, and Okpilak rivers; and offshore up to 25 miles. The following discussion focuses on resources harvested by Kaktovik residents in or near the Point Thomson area, or subsistence resources that migrate through the area and are later harvested by Kaktovik residents. Such resources include caribou, bowhead whales, seals, polar bear, walrus, fish, waterfowl, and furbearers. Table 7 depicts the number of respondents reporting subsistence use areas for the “last 10 year” time period by resource and coastal hunting area during SRB&A mapping interviews in 2005 and 2006 (SRB&A 2010a). As depicted in this table, the only resource for which more than 10 percent of Kaktovik respondents reported use areas in the project vicinity (i.e., in the coastal or offshore area between Brownlow Point and Bullen Point) was caribou.

Table 7: Number (%) of Kaktovik Respondents Reporting 1996-2006 Use Areas* by Coastal Hunting Area

	Number (%) of Respondents Reporting Subsistence Use Areas			
Resource Category	Barter Island to Konganevik	Konganevik to Brownlow Pt.	Brownlow Pt. to Bullen Pt.	Bullen Pt. to Prudhoe Bay
Caribou	35 (92%)	29 (76%)	15 (39%)	7 (18%)
Seals	24 (63%)	2 (5%)	2 (5%)	2 (5%)
Bowhead Whales	27 (71%)	0	0	0
Walrus	6 (16%)	1 (3%)	1 (3%)	0
Furbearers	13 (34%)	1 (3%)	0	0
Waterfowl	28 (74%)	3 (8%)	2 (5%)	2 (5%)
Fish	23 (61%)	6 (16%)	3 (8%)	1 (3%)
All Resources	37 (97%)	29 (76%)	15 (39%)	7 (18%)

Notes: The total number of Kaktovik respondents interviewed for all resources=38.

* Number of respondents represents the number who reported using an area at least once during the 1996-2006 time period.

Source: SRB&A (2010a)

Caribou

Caribou is the most intensively hunted resource by Kaktovik residents in the Point Thomson area, and therefore this discussion provides an in-depth analysis of Kaktovik caribou hunting patterns. Figure 6 depicts Kaktovik's 1996-2006 caribou hunting areas, as well as their lifetime caribou use areas. Also on Figure 6 are ADF&G and NSB caribou harvest placename locations (see Figures 7, 8 and 9). In general, the caribou harvest placenames are located in the vicinity of the high overlapping use areas on Figure 6. As shown on this map, only two of the placename locations lie outside of the reported 1996-2006 hunting area for caribou, and none of the locations lie outside of the lifetime caribou use area depicted on Figure 6. Pedersen and Coffing (1984) found a similar correlation between recorded harvest sites and subsistence use areas reported for caribou and stated that the "congruence between these two different types of information lends considerable credence to the idea that the informants reported well on their perceptions of where caribou hunting takes place in the eastern arctic" (Pedersen and Coffing 1984:41).

Kaktovik residents travel substantial distances from their community to hunt for caribou. A high number of 1996-2006 overlapping caribou use areas occur along the coast between Bullen Point and Demarcation Bay; along Hulahula River and portions of Sadlerochit, Okpilak, and Jago rivers; and in the foothills of the Brooks Range between Hulahula and Sadlerochit rivers, including around Kikiktat Mountain and Lake Schrader. Less intensively used caribou areas (not shown on Figure 6) occur as far west as Ikpikpuk River and beyond the Mackenzie River delta in Canada to the east. Lifetime caribou use areas (Pedersen 1979) are similar to those shown in the 1996-2006 data, and also extend further south towards the Brooks Range.

The NSB and ADF&G have both documented Kaktovik caribou harvests by place name location. These harvest data include the number of caribou harvested, the harvest date and the harvest location. Figure 7 depicts 46 Kaktovik subsistence harvest place names (NSB 2003, 2010), and Figure 8 depicts 37 Kaktovik subsistence harvest place names (ADF&G 2003). In some cases, NSB harvest place names did not have locational data; when possible (e.g., when the ADF&G and NSB place names matched), the study team assigned ADF&G locations to these NSB place names. There was no attempt to reconcile the NSB and ADF&G harvest location placenames because it was not clear whether similar placenames referred to the same geographic area or not. For example, NSB data show placenames for Point Thomson, Brownlow Point, and Canning River, while ADF&G data used the placename location Canning River Delta (including Brownlow Point) and Bullen Point to Tigvariak Island. Rather than try to speculate how the placenames could be representing similar geographic areas, in this analysis, the NSB and ADF&G harvest by placename location data are shown separately.

The place names shown on Figures 7 and 8 are associated with general harvest areas and do not necessarily represent actual harvest site locations. Figure 9 shows the percentage of ADF&G and NSB reported caribou harvests by harvest place name location and Kaktovik 1923-1983 caribou use areas. The size of each place name location depicts the percentage of caribou harvests from that location during the study years for the data source (either NSB or ADF&G). A high percentage of caribou harvests have been reported at coastal locations including Brownlow Point, Konganevik Point, the mainland south of Barter Island, Jago River mouth, and Griffin Point. Inland locations associated with high percentages of caribou harvests include Kekituk Creek and 2nd Fish Hole. Other smaller harvests occur at various coastal and inland locations. The two locations with the highest percentages of caribou harvests during the study years were the mainland south of Barter Island and Konganevik Point.

Figures 10 and 11 depict only the coastal caribou subsistence harvest placename locations for Kaktovik arranged in sequence from west to east, with Kaktovik/Barter Island and its environs in the center (see mapped placename locations on Figures 7 and 8). Summer caribou harvests at coastal sites focus on points and spits such as Brownlow, Griffin, Konganevik, Bullen. POW-D (Collinson), Manning, and Demarcation points. These figures provide caribou harvests for each placename location broken out by study year. The annual harvests (shown by location in Figures 10 and 11) indicate that when large numbers of caribou are encountered during migration or while seeking insect relief, they are harvested in corresponding numbers. The more recent NSB data emphasizes this harvest pattern, with large harvests taken at different locations yearly. The greatest coastal harvest was at Brownlow Point in 1994-1995, at Manning and Griffin Points in 1998, Griffin Point in 1999, and the mainland south of Barter Island in 2006. The data for 2005 show a more balanced distribution of harvests across the coast that year.

The majority of caribou hunting activities in the project area occur during the summer months of July and August, although caribou hunting occurs year-round. Figures 12 and 13 depict the cumulative percentage of caribou harvested by season and coastal location for 18 years of ADF&G and NSB data. Kaktovik residents primarily travel to inland sites during the winter. However, some winter harvests have been reported at coastal locations, notably Konganevik Point, POW-D (Collinson Point), locations near Kaktovik, and the Jago River area (Figures 12 and 13). Over the data years, some coastal locations resulted in substantially larger harvests of caribou than other locations. Griffin Point, Brownlow Point, Manning Point, Konganevik Point, Jago River, Canning River delta, and the Kaktovik area (including the mainland south of Barter Island) were especially productive harvest locations during the ice-free July to September period. Coastal sites such as the Canning River delta, Konganevik Point, and POW-D, and the Mainland South of Barter Island were used in both seasons based on the earlier ADF&G harvest data (1981 to 1988 and 1990 to 1993). However, similar to changes in the seasonality of caribou harvests shown in Figure 4, there have been some notable shifts with respect to the seasonality of harvest locations, with few sites west of Kaktovik being used in both seasons during the 1990s and 2000s (NSB 2003, 2010; Figure 13). Primary coastal locations used in both seasons during the NSB data years include the Jago River, areas near Kaktovik/Barter Island, and locations in Canada. Conversely, sites such as POW-D and Konganevik Point west of Kaktovik, had notable harvests in both seasons in the ADF&G data years (Figure 12). These seasonal and locational shifts are based on limited data, and are therefore not conclusive.

Kaktovik caribou hunting areas (ca. 1923-1983), including those areas used intensively during the winter and summer seasons, are also shown on Figure 9; this map shows Kaktovik caribou hunters traveling from Barter Island westward along the coast to Tigvariak Island, including the barrier islands, and inland along river drainages to the foothills of the Brooks Range. The coastal area around the Canning River delta (between Staines and Tamayariak rivers) and Brownlow Point is an "intensively used caribou hunting area" during both the summer and winter for Kaktovik hunters, who also use this area to harvest wolves, furbearers, and fish (Pedersen and Coffing 1984:47; Coffing and Pedersen 1985:Fig. 5).

When the snow and ice melts in June, travel by snowmachine is curtailed. As the coastal waters become free of ice in early to mid-July, hunters use coastal areas for resource harvests by boat. After calving, caribou aggregate along the coastline and concentrate on points to escape flies and mosquitoes. This behavioral pattern allows hunters to harvest large numbers of caribou with relative efficiency. Based on 15 years of ADF&G and NSB data, an average of approximately 65 percent of the caribou harvested were taken from coastal sites primarily in July and August by hunters in boats. The proportion of caribou harvested on the coast during the 15 years of data has varied from 51 to 78 percent annually (based on data and analysis from Pedersen and Coffing 1984:35, Pedersen 1990:21, ADF&G 2003, NSB 2003).

Inland summer hunting by boat is difficult due to the shallow and braided nature of rivers in the area (Coffing and Pedersen 1985:21). In addition, pedestrian overland hunting on the wet tundra during the summer is difficult. Pedersen (1990:29) observed coastal hunters bringing small, three-wheeled all-terrain vehicles by boat to harvest areas and camp sites, thus increasing hunters' potential range inland and making the harvest and transportation more efficient. During interviews in 2005 and 2006, respondents described using four-wheelers to travel around camps and cabins or inland from waterways (SRB&A 2010a). Distances traveled inland range from one-half mile to four or five miles from the coast (Jacobson and Wentworth 1982:18, Pedersen and Coffing 1984:23, SRB&A 2003b).

During summer, Iñupiat hunters from Kaktovik travel west or east of the community by boat along the coast, and inland up several rivers until they encounter and successfully harvest caribou (Figure 14). Hunters may travel some distance along the coast if time and resources permit, or if no caribou are present closer to the community. Kaktovik caribou hunters tend to travel more frequently and further west than east from Barter Island (IAI 1990:1-13), with the exception of the incidental harvest of caribou while travelling to visit relatives in Canada (SRB&A 2003b; Brower, Olemaun, and Hepa 2000). Some residents have noted that the caribou are fatter and healthier west of Barter Island, and therefore prefer harvesting them in that direction (SRB&A 2010a); however, most Kaktovik hunters have harvested caribou both west and east of their community. During interviews with Kaktovik hunters in 2003, harvesters reported that they regularly travel to Brownlow Point and Flaxman Island, and they travel farther west if caribou are not available closer to the community. Recognized camp sites east and west of Kaktovik have access both to caribou and protected anchorages for boats (IAI 1990:1-13, SRB&A 2003b). Coastal sites such as Konganevik Point, Canning River delta, Brownlow Point, and Bullen Point are valued for having multiple resources available for harvest, such as caribou, fish, seals, and waterfowl, as well as having protected anchorages (IAI 1990:1-17, NSB 2003).

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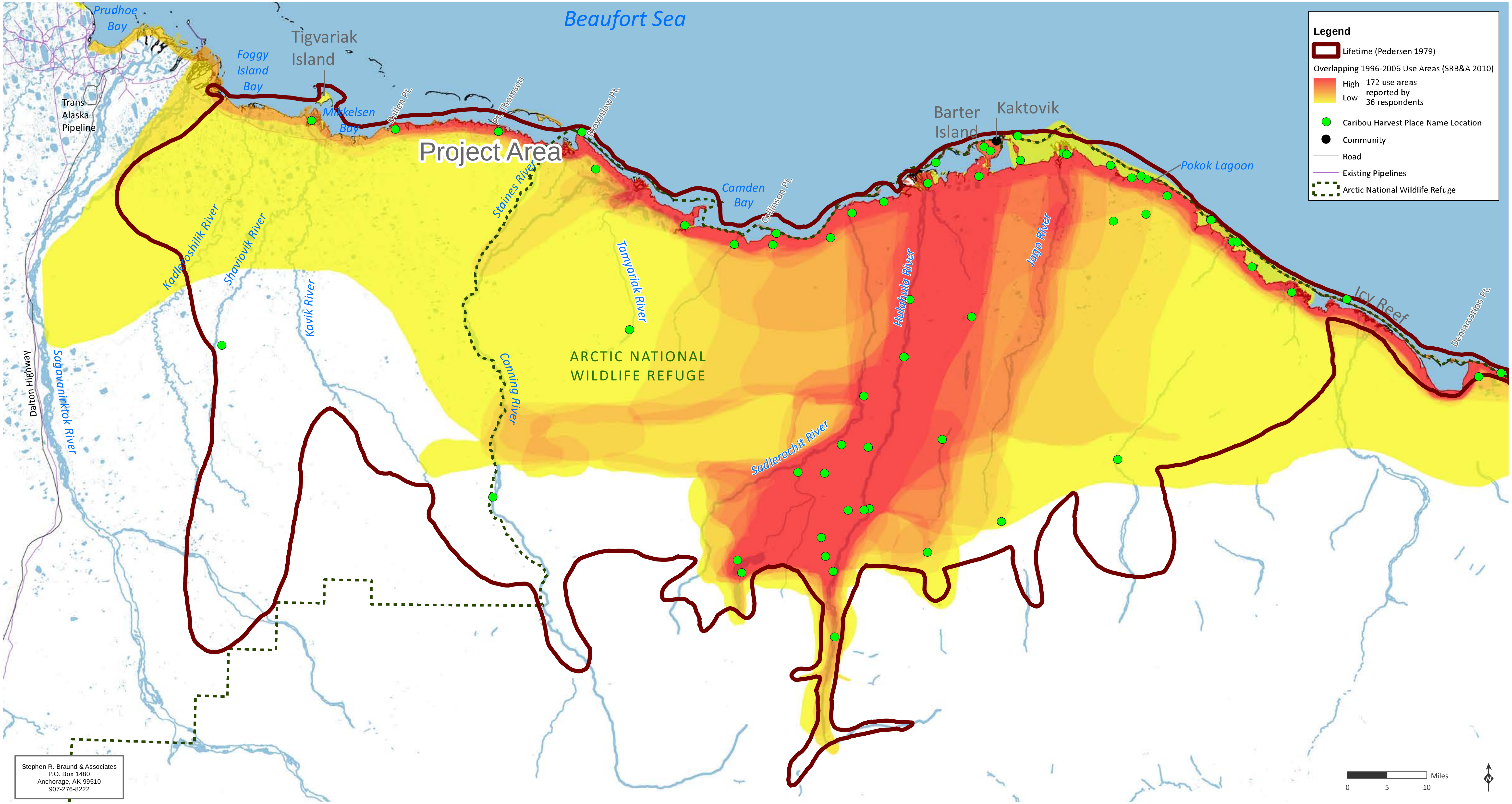

Figure # 6

Kaktovik Lifetime and 1996-2006 Caribou Use Areas

POINT THOMSON PROJECT EIS

Respondents reported additional 1996-2006 use areas that are located in Canada and in the vicinity of Teshekpuk Lake and are not shown here.

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: ADF&G 2003, NSB Department of Wildlife Management 2003, 2006, and 2010, Coffing and Pedersen 1985, SRB&A 2010

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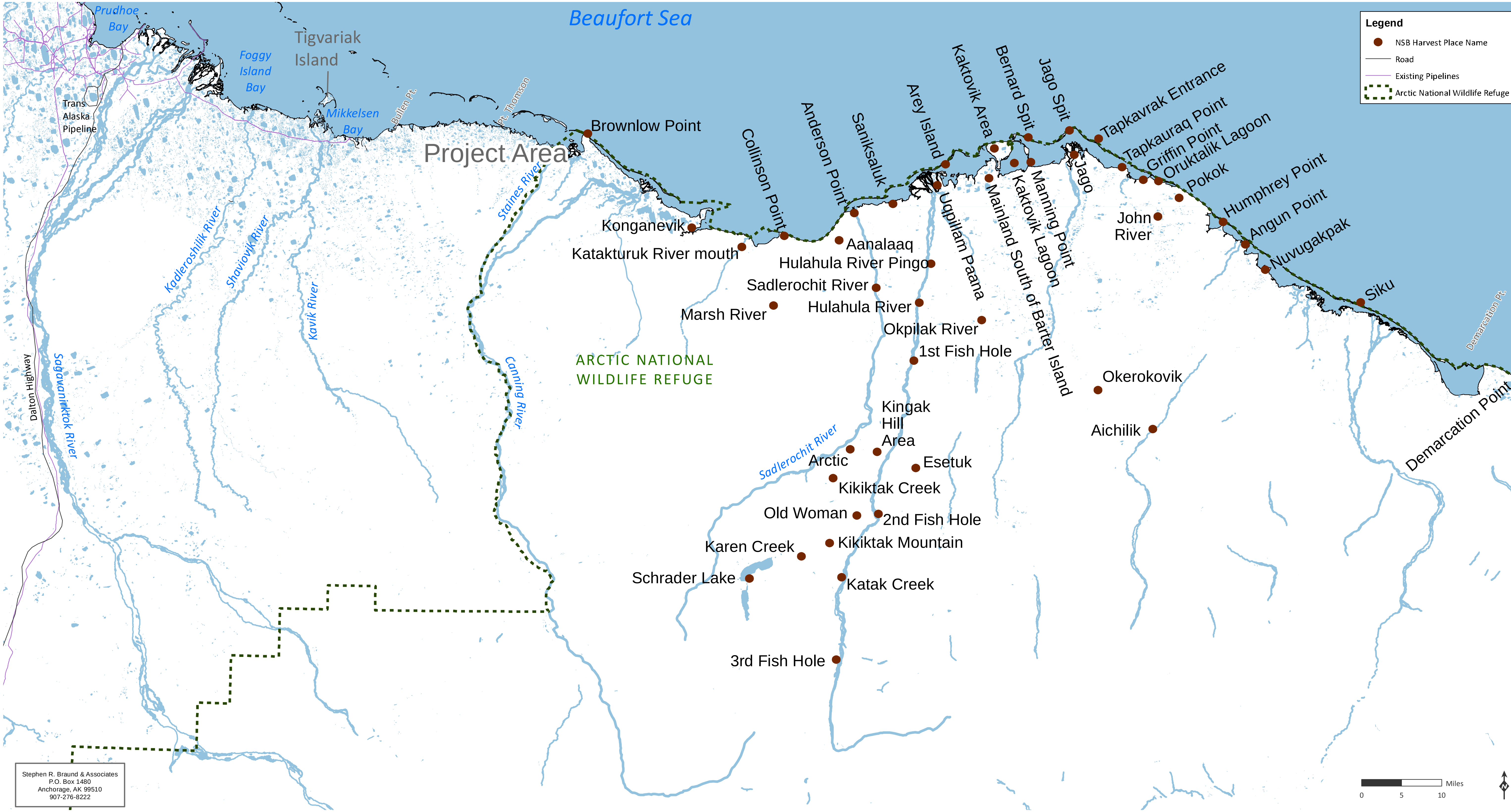

Figure # 7

North Slope Borough Subsistence Harvest Place Names, Kaktovik

The subsistence harvest place names shown here are associated with common harvest areas and do not necessarily represent actual harvest site locations.

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Source: NSB Department of Wildlife Management, 2003, 2006, and 2010

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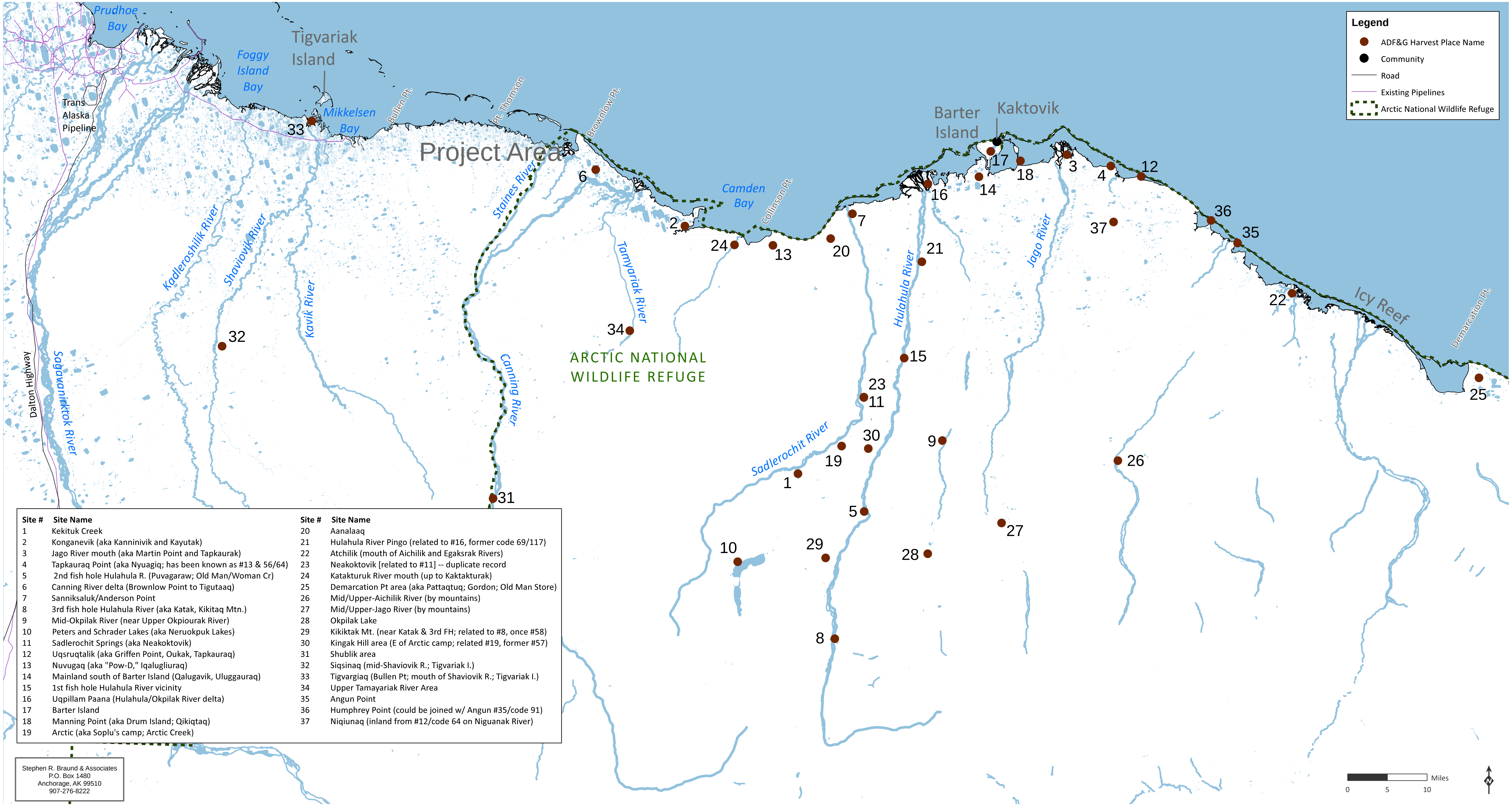

Site #	Site Name	Site #	Site Name
1	Kekituk Creek	20	Aanalaaq
2	Konganevik (aka Kanninivik and Kayutak)	21	Hulahula River Pingo (related to #16, former code 69/117)
3	Jago River mouth (aka Martin Point and Tapkaurak)	22	Atchilik (mouth of Aichilik and Egaksrak Rivers)
4	Tapkauraq Point (aka Nyuagiq; has been known as #13 & 56/64)	23	Neakoktovik [related to #11] -- duplicate record
5	2nd fish hole Hulahula R. (Puvagaraw; Old Man/Woman Cr)	24	Katakturuk River mouth (up to Kaktakturak)
6	Canning River delta (Brownlow Point to Tigutaaq)	25	Demarcation Pt area (aka Pattaqtuq; Gordon; Old Man Store)
7	Sanniksaluk/Anderson Point	26	Mid/Upper-Aichilik River (by mountains)
8	3rd fish hole Hulahula River (aka Katak, Kikitaq Mtn.)	27	Mid/Upper-Jago River (by mountains)
9	Mid-Okpilak River (near Upper Okpiourak River)	28	Okpilak Lake
10	Peters and Schrader Lakes (aka Neruokpuk Lakes)	29	Kikiktak Mt. (near Katak & 3rd FH; related to #8, once #58)
11	Sadlerochit Springs (aka Neakoktovik)	30	Kingak Hill area (E of Arctic camp; related #19, former #57)
12	Uqsruqtalik (aka Griffen Point, Oukak, Tapkauraq)	31	Shublik area
13	Nuvugaq (aka "Pow-D," Iqalugliuraq)	32	Siqsinaq (mid-Shaviovik R.; Tigvariak I.)
14	Mainland south of Barter Island (Qalugavik, Uluggauraq)	33	Tigvargiaq (Bullen Pt; mouth of Shaviovik R.; Tigvariak I.)
15	1st fish hole Hulahula River vicinity	34	Upper Tamayariak River Area
16	Uqpillam Paana (Hulahula/Okpilak River delta)	35	Angun Point
17	Barter Island	36	Humphrey Point (could be joined w/ Angun #35/code 91)
18	Manning Point (aka Drum Island; Qikiqtaq)	37	Niqiunaq (inland from #12/code 64 on Niguanak River)
19	Arctic (aka Soplu's camp; Arctic Creek)		

Figure # 8

Alaska Department of Fish and Game Subsistence Harvest Place Names, Kaktovik

POINT THOMSON PROJECT EIS

The subsistence harvest place names shown here are associated with common harvest areas and do not necessarily represent actual harvest site locations.

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: ADF&G 2003

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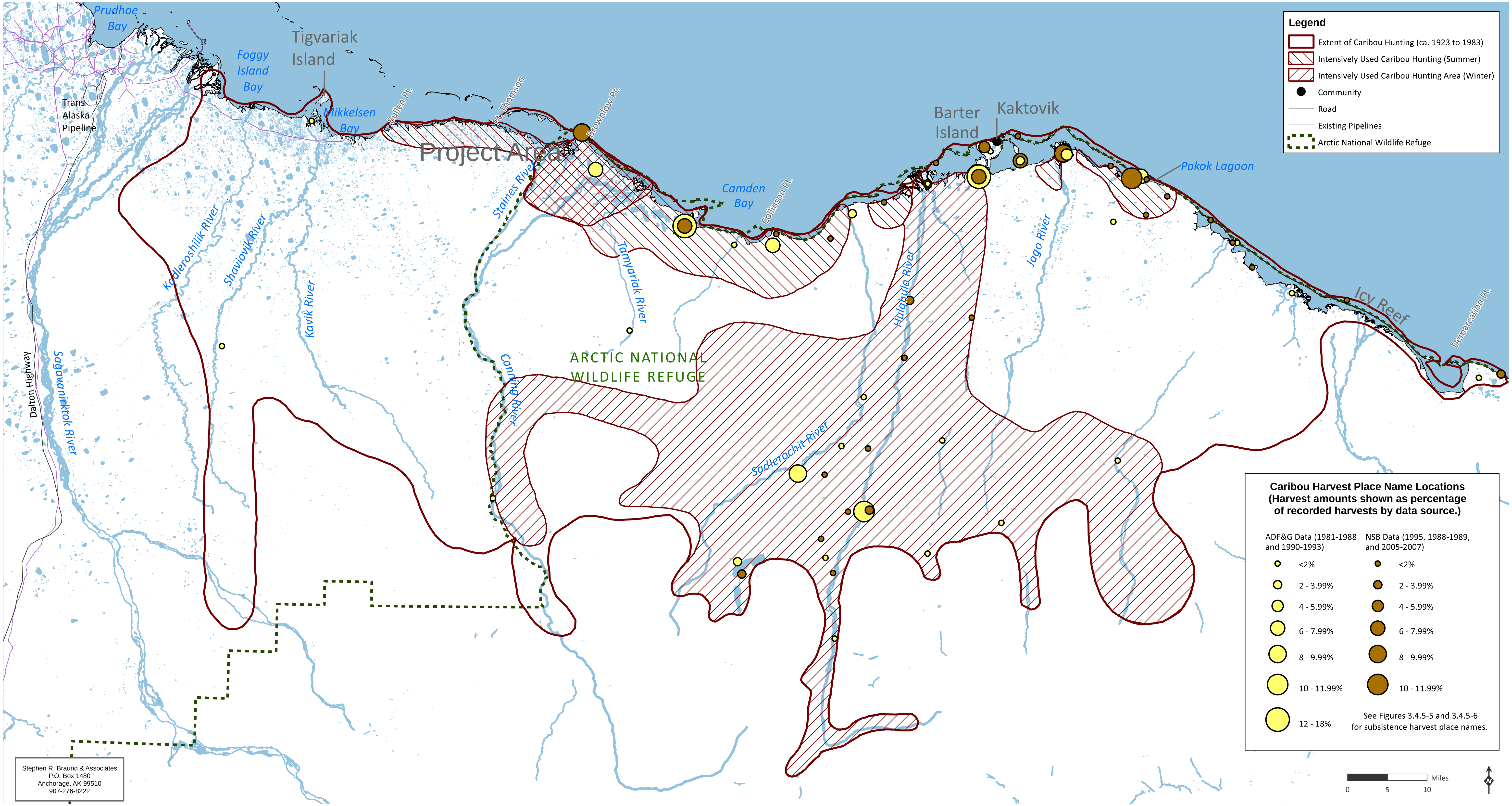

Figure # 9

Percentage of Harvested Caribou by Harvest Place Name Location, Kaktovik

POINT THOMSON PROJECT EIS

The subsistence harvest place names shown here are associated with common harvest areas and do not necessarily represent actual harvest site locations.

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: ADF&G 2003, Brower, Olemaun, and Hepa 2000, Coffing and Pedersen 1985

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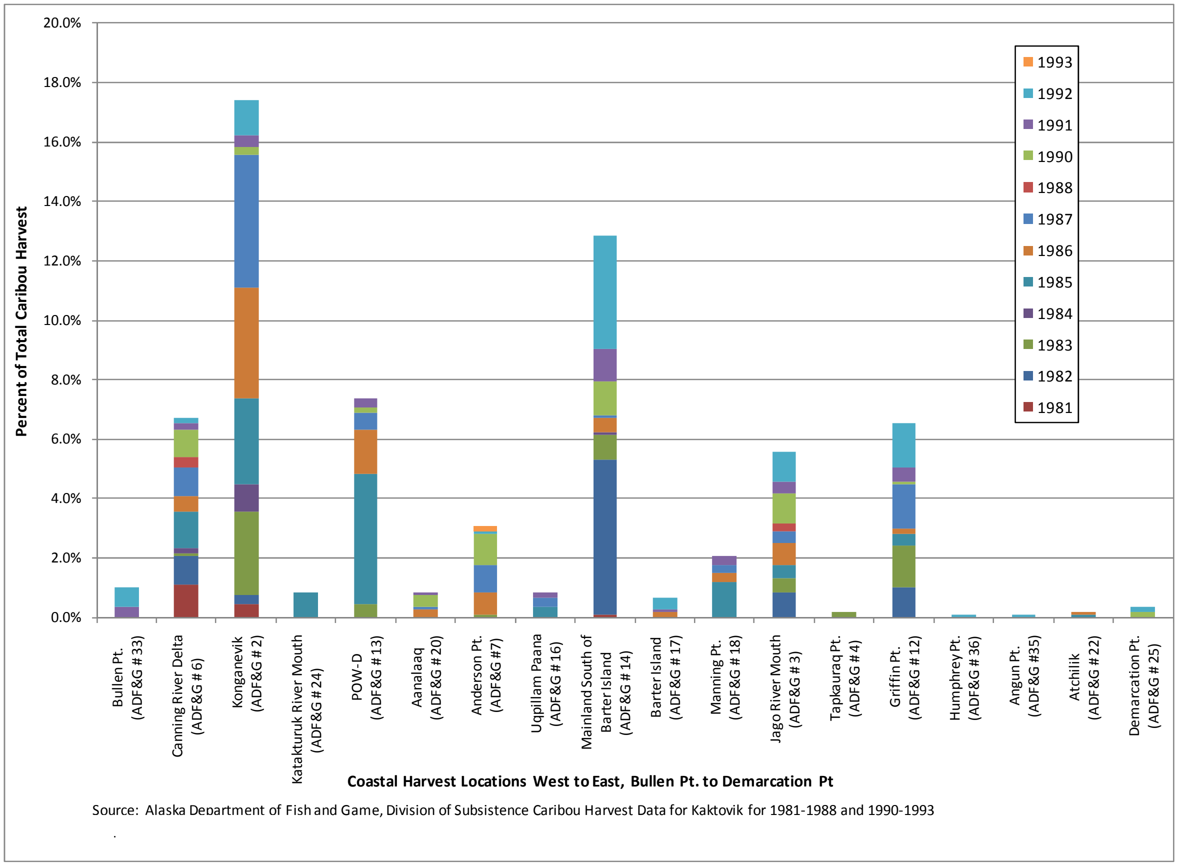

Figure 10: Kaktovik Coastal Caribou Harvests from West to East, 1981-1988 and 1990-1993

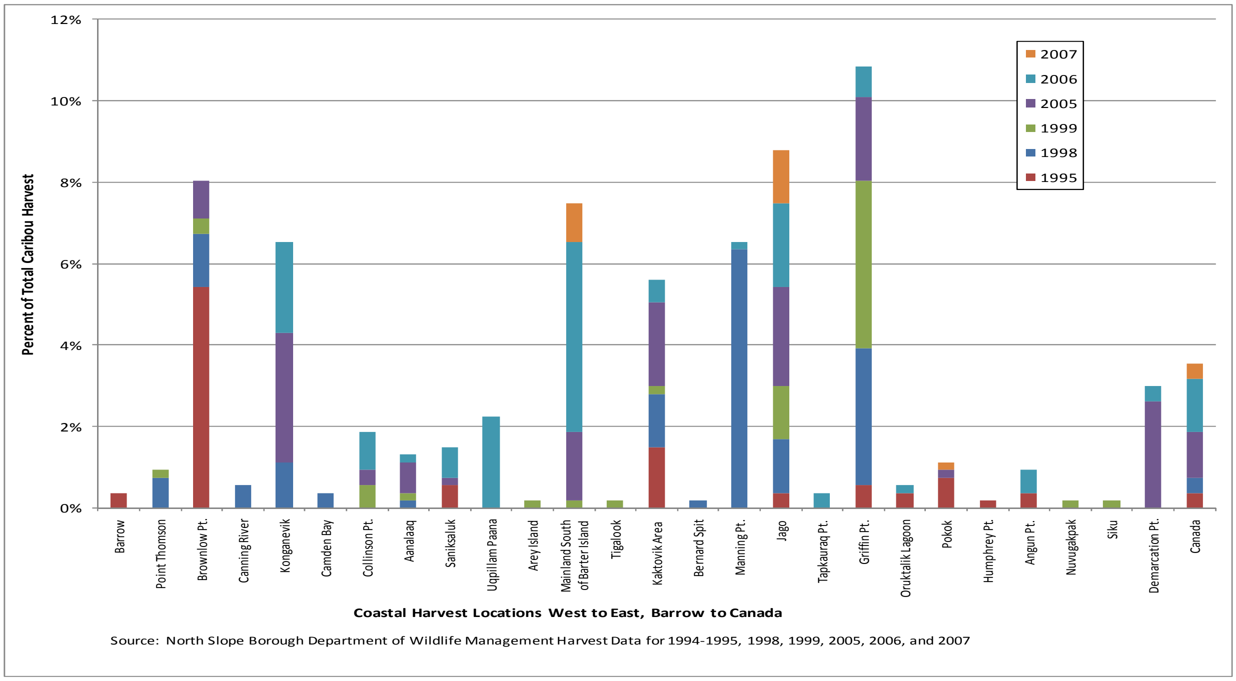

Figure 11: Kaktovik Coastal Caribou Harvests from West to East, 1994-1995, 1998 1999, 2005, 2006, and 2007

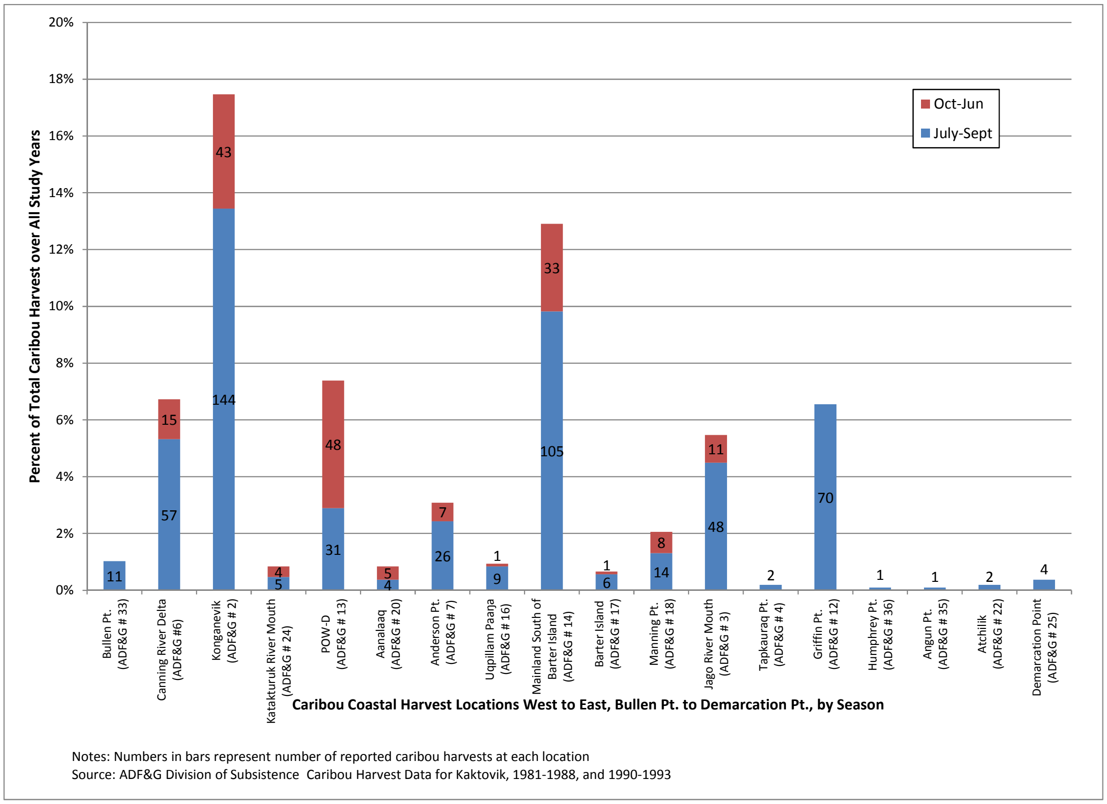

Figure 12: Seasonality of Kaktovik Caribou Harvest Locations, 1981-1988 and 1990-1993

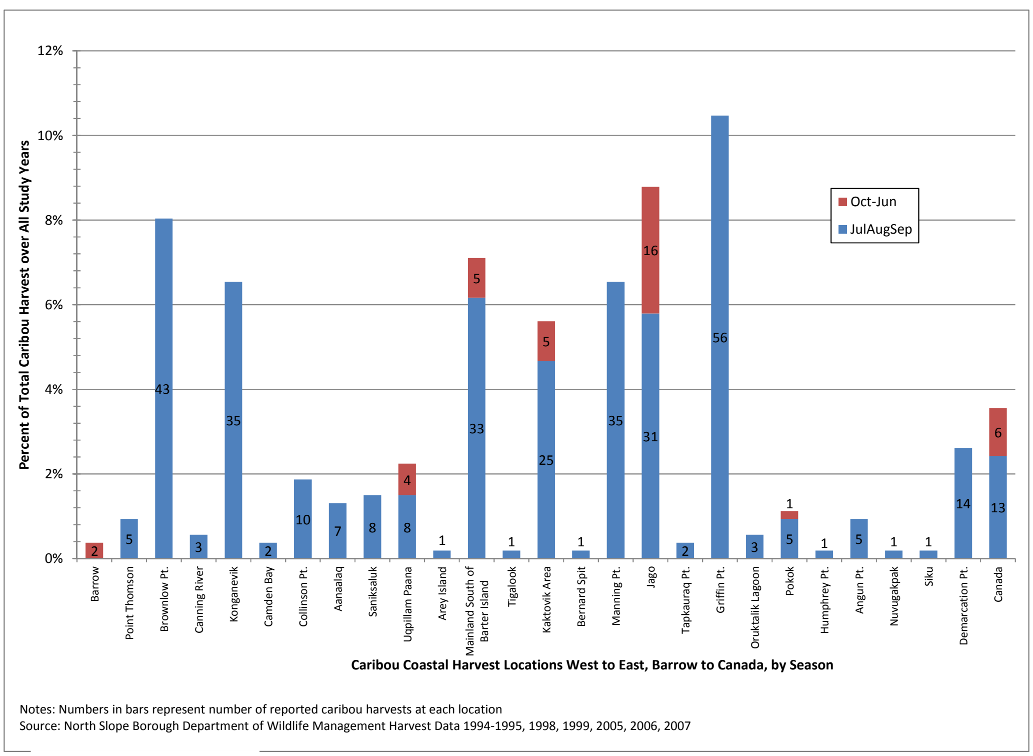

Figure 13: Seasonality of Kaktovik Caribou Harvest Locations, 1994-1995, 1998, 1999, 2005, 2006, and 2007

Figure 9 also depicts winter caribou use areas. Between the end of October and the end of May, coastal and riverine waters are frozen and there is enough snow to allow the use of snowmachines. From December through February, some hunters travel along the coast or towards the Brooks Range for subsistence hunting and trapping; however, weather conditions are generally not conducive to travel and outdoor activities during this time (IAI 1990:1-27). Travel time and distances increase as the days become longer and temperatures rise (Pedersen and Coffing 1984:45). During the winter, hunters use coastal and inland areas for caribou hunting (IAI 1990:1-14, Pedersen and Coffing 1984:45). Important inland winter harvest locations include the Hulahula, Sadlerochit, Staines, and Canning rivers (Brower, Olemaun, and Hepa 2000:54). The area west of the Staines River, up to 30 miles from the coast, was noted by some Iñupiat hunters as important winter caribou habitat (Jacobson and Wentworth 1982:41). Coastal harvest locations used in the winter, according to NSB and ADF&G harvest data, include Konganevik, POW-D, Anderson, and Manning points, in addition to the Canning River delta, Jago River area, and the mainland south of Barter Island (Figures 12 and 13).

Land use during the winter is more extensive, with hunters traveling further by snow machine to harvest fewer animals than are available in the summer. Subsistence caribou harvests are subject to hunting closures in late winter, and caribou are reportedly thinner, have a different flavor, and are present in small, dispersed groups rather than large herds (IAI 1990:1-14).

Based on 2003 Kaktovik interviews (SRB&A 2003b), Figure 15 depicts summer and winter caribou use areas in the Point Thomson vicinity. The map shows summer caribou hunting activities extending along the coast, past Point Thomson to Bullen Point, and beyond to Tigvariak Island. In addition, the map shows winter caribou hunting areas extending along the coast to Point Thomson and in an inland area beyond Point Thomson and around Mikkelsen Bay.

Figure 16 depicts 1996-2006 caribou hunting areas in the Point Thomson vicinity, as reported by Kaktovik residents during a MMS funded subsistence mapping study (SRB&A 2010a).

The overlapping use area method depicted on Figure 16 depicts the number of reported use areas overlapped on top of one another, with the darker red color representing a higher number of overlaps and the light yellow color representing a lower number of overlaps. In addition to representing the area where community residents have reported current subsistence hunting and harvesting activities, these maps illustrate the importance of hunting areas in terms of how many people use them and (for multi-resource maps) in terms of how many different resources are harvested in each area. As shown in Figure 16, the coastal area to Bullen Point shows a higher amount of overlapping use areas compared to inland areas and coastal area beyond Bullen Point. Figure 17 shows “last 12 month” caribou hunting areas as reported by Kaktovik respondents and depicts fewer numbers of overlapping hunting areas extending beyond Konganevik Point.

Table 8 depicts the number of caribou harvester respondents reporting caribou use areas by coastal area, for the “last 10 year” time period and for the “last 12 month” time period. For the coastal area west of the community of Kaktovik to Konganevik Point, nearly all respondents (97 percent, or 35 of the 36 reporting caribou hunters) reported last 10 year caribou use areas. Areas farther west of the community show gradually fewer respondents reporting use areas, with 81 percent of caribou respondents traveling between Konganevik and Brownlow Pt., 42 percent between Brownlow Point and Bullen Point, and 19 percent beyond Bullen Point. A smaller number of respondents (27) reported hunting caribou during the “last 12 months.” Of those respondents, 81 percent reported hunting in the area between Barter Island and Konganevik, 56 percent reported hunting between Konganevik and Brownlow Point, and 7 percent reported hunting between Brownlow Point and Bullen Point. According to the available data, the area west of the community to Konganevik and Brownlow Point is a caribou hunting area that is used regularly by a substantial percentage of Kaktovik harvesters. The area west of Brownlow Point to Bullen Point is one that is within a relatively high percentage of harvesters' current caribou hunting areas but is visited by most hunters only during certain years, likely when they are unsuccessful closer to the community.

Table 8: Number (%) of Kaktovik Caribou Hunter Respondents Reporting Caribou Use Areas* by Coastal/Offshore Hunting Area

	Caribou Hunter Respondents	Barter Island to Konganevik	Konganevik to Brownlow Pt.	West of Brownlow Pt. to Bullen Pt.	West of Bullen Pt. to Prudhoe Bay
10 Year (1996-2006) Respondents	36	35 (97%)	29 (81%)	15 (42%)	7 (19%)
12 Month (2004-2005 or 2005-2006) Respondents	27	22 (81%)	15 (56%)	2 (7%)	0

Notes: The total number of Kaktovik respondents interviewed for all resources=38.
*Number of respondents represents the number who reported using an area at least once during the 10 Year or 12 Month time periods
Source: SRB&A (2010a)

Residents have reported a total harvest of 118 caribou at these two locations (Canning River Delta and Brownlow Point) over all study years; harvests at these locations were reported during 15 of the 18 available study years. The two harvest placename locations within the project area (Point Thomson and Bullen Point) represent a smaller percentage of total caribou harvests over all study years accounting for a total of 16 harvested caribou (Figures 10 through 13). Harvests associated with the Point Thomson and Bullen Point locations occurred during four of the 18 available study years

During SRB&A interviews in Kaktovik in 2003, hunters described their caribou hunting activities in the vicinity of Point Thomson; their descriptions of these activities are consistent with the subsistence use area and harvest by place name location data, which shows residents regularly traveling west of the community as far as Konganevik or Brownlow Point and traveling farther when they are not successful closer to the community. Other than trips to specific destinations (e.g., camping sites at Konganevik or Brownlow Point), hunters generally do not travel farther than necessary and will harvest caribou closer to the community if they are available.

Residents described traveling to the Brownlow Point and Bullen Point areas to hunt caribou during the summer months (primarily July) by boat, and periodically during the winter and spring months by snowmachine. Residents commonly travel as far as Brownlow Point to search for caribou; when caribou are not available at Brownlow Point, they may travel farther to Bullen Point and beyond. As one individual said, "Hunters now go as far as Brownlow Point, but if they don't find anything, they go to Bar 3 [Bullen Point]. Flaxman Island is good hunting for caribou and *ugruk* in the spring" (SRB&A Kaktovik Interview March 2003).

Another respondent reported traveling to Brownlow Point on a yearly basis, saying,

> *We go to Brownlow Point in the summer time with boats. We do that frequently. I do that trip every year, multiple times each summer. I went three to four, or more times last summer. I primarily go for caribou.* (SRB&A Kaktovik Interview March 2003)

In addition to searching for caribou along the coast, residents also described hunting caribou at islands in the Point Thomson area, such as Flaxman Island and Tigvariak Island, and traveling varying distances inland either by foot or four-wheeler. Residents also travel up certain rivers, such as Canning and Staines rivers, when the tide is high enough. Hunters reported camping at Konganevik Point, Canning River, Camden Bay, Flaxman Island, Brownlow Point, and Bullen Point. Kaktovik residents provided the following additional descriptions of their caribou hunting activities in the Point Thomson area:

> *[I hunt caribou at] Tigvariak Island, Brownlow Point, Flaxman Island. Near Point Thomson [up a creek west of Point Thomson]. I mostly hunt along the coast, where I see caribou. That's in July, August. I go two to three times per year. Travel time is four to five hours, depending on the weather.* (SRB&A Kaktovik Interview March 2003)

> *I hunt caribou along the coast, to Konganevik Point, Anderson Point, Brownlow Point, Simpson Cove, Camden Bay, and Flaxman Island. I have not stopped at Brownlow Point, but I've hunted in that vicinity. Everybody hunts along the coast. If we had not gotten caribou where we did, we would have kept going [west]. That is good caribou hunting, around Camden Bay, and from Anderson Point to Brownlow Point. Caribou hunting is closed in May and June and open the rest of the year. The main [caribou hunting] season for me is in July.* (SRB&A Kaktovik Interview March 2003)

> *We got 40 caribou one year at Brownlow Point. There were seven to eight boats. It was right at Brownlow Point, on the sand bar.* (SRB&A Kaktovik Interview March 2003)

> *I go to Brownlow Point every year, every July. I don't go as far as Bullen Point every year. Just when I feel like going there. But I do go to Brownlow Point every year, and sometimes further over. There are always caribou over in that area. Sometimes we see them close. I try to find ones closer to shore. It's easier [to harvest them]. West of Brownlow Point, the coast is deep – you can follow the coastline. I go less than a half a mile [inland]; it's too far to pack the meat out [if you go farther]. I would rather catch them on the shore line.* (SRB&A Kaktovik Interview March 2003)

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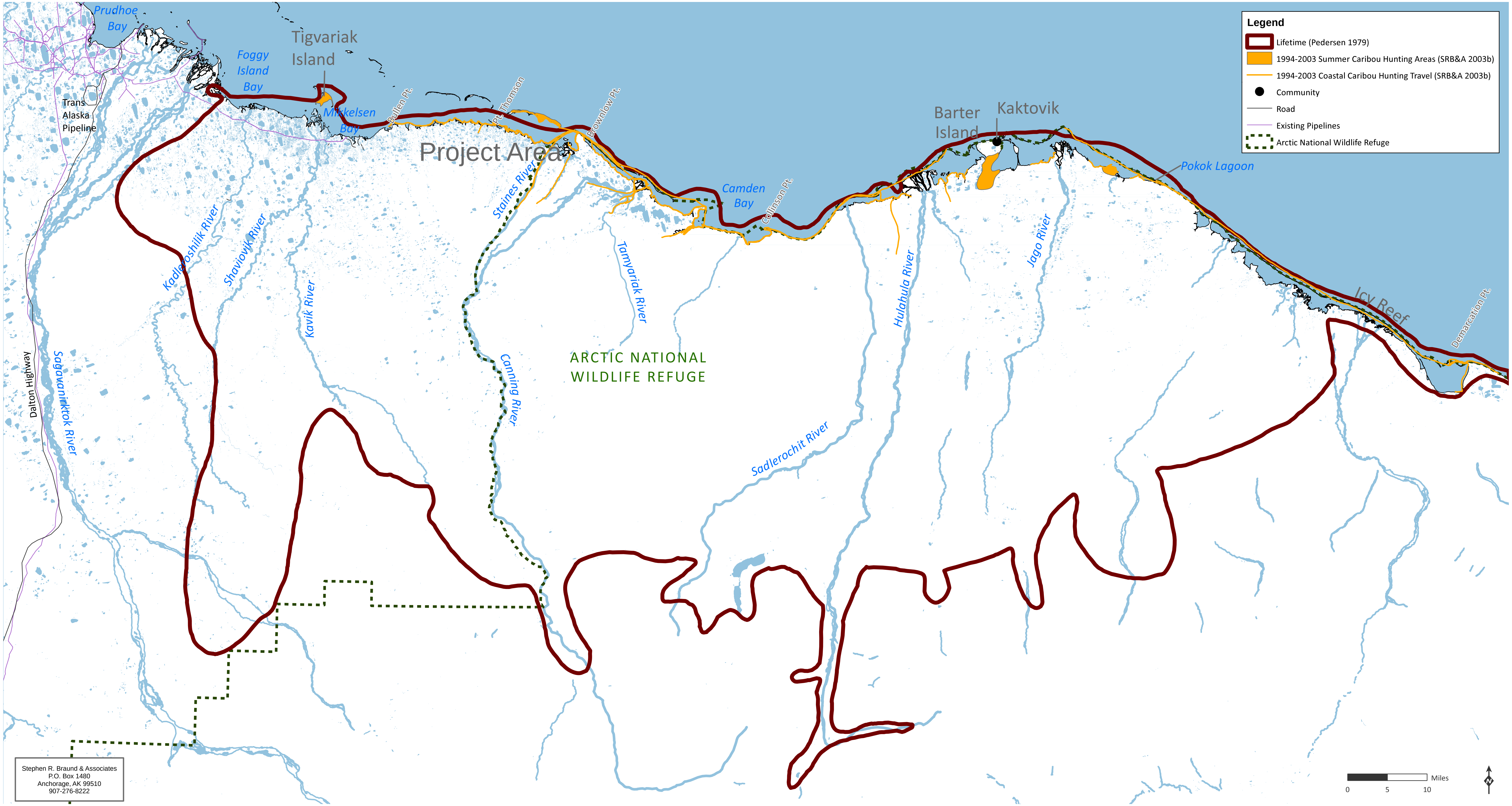

Figure # 14

Kaktovik Lifetime and 1994-2003 Subsistence Use Areas for Summer Caribou

POINT THOMSON PROJECT EIS

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Pedersen 1979, SRB&A 2003b

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Marine Mammals

Kaktovik is one of 11 Alaskan communities recognized by the Alaska Eskimo Whaling Commission (AEWC) as a bowhead whaling community. The community is allowed to harvest three bowhead whales annually, and usually meets this quota each year (see Table 5). Contemporary and historic bowhead whale subsistence use areas, as well as bowhead whale 1988-2008 harvest locations, are depicted on Figure 18. A high number of overlapping bowhead whale use areas occur up to 25 miles from shore, between Arey Island and Griffin Point. Lifetime use areas (Pedersen 1979) are similar to those collected for the 1996-2006 period, but do not extend as far offshore. Kaktovik bowhead whale harvest locations are located within the bowhead whale use areas, and extend as far as 21 miles offshore from Barter Island. While Kaktovik bowhead whale hunting activities do not currently extend as far as the Point Thomson area, bowhead whales migrate past that area during their fall migration. Kaktovik bowhead whale hunting activities occur primarily during the month of September in motorized aluminum boats. During interviews with Kaktovik hunters in 2003, respondents indicated that they no longer hunt bowhead whales before the month of September, due to the risk of meat spoilage.

As one individual explained,

> *We do not hunt [bowhead whales] until the first of September because it's still warm. There are whales going by before then. One year we got them before September 1st, and it was too warm. The meat and* maktak *spoiled. After that, we decided that before September, it was too early.* (SRB&A Kaktovik Interview March 2003)

Harvesting bowhead whales close to shore is preferable because it ensures that the whales can be towed back to shore without risking meat spoilage and without risks to hunter safety (SRB&A 2010a).

Kaktovik residents hunt both ringed and bearded seal during the summer months of June through September, with the majority of seal hunting occurring during July and August; a limited number of seal hunting occurs during the spring by snowmachine (SRB&A 2010a). Walrus are rare in the immediate Kaktovik area, and hunters generally harvest them as available during other subsistence activities (SRB&A 2010a). Seals become available during the summer after the ice breaks up; they are found with the ice pack and therefore residents' seal hunting success depends on the proximity of the ice pack to shore. Compared to bowhead whale use areas, the majority of Kaktovik seal use areas occur closer to shore, and extend along a greater expanse of coastline (see Figure 19). Both last 10 year (1996-2006) and lifetime use areas show seal hunting activities occurring between the Alaska/Canada border and the Prudhoe Bay area. A high numbers of overlapping seal use areas occur between Camden Bay and Griffin Point. A low number of overlapping use areas extend west of Camden Bay past the Point Thomson area. Kaktovik walrus use areas are located relatively close to Barter Island, although a small number of respondents reported traveling as far as Mikkelsen Bay during the 1996-2006 period (Figure 20).

A few polar bear are harvested by Kaktovik residents on an opportunistic basis throughout the year, except during the summer months (Table 1 and Table 3). Lifetime use areas for polar bear show hunting along the coast from Canada as far west as Tigvariak and the barrier islands (Figure 21). Most of the polar bears taken by the community are harvested near the village when the bears are drawn to the whale butchering site (IAI 1990a). Last 10 year (1996-2006) polar bear use areas were not mapped during the MMS project.

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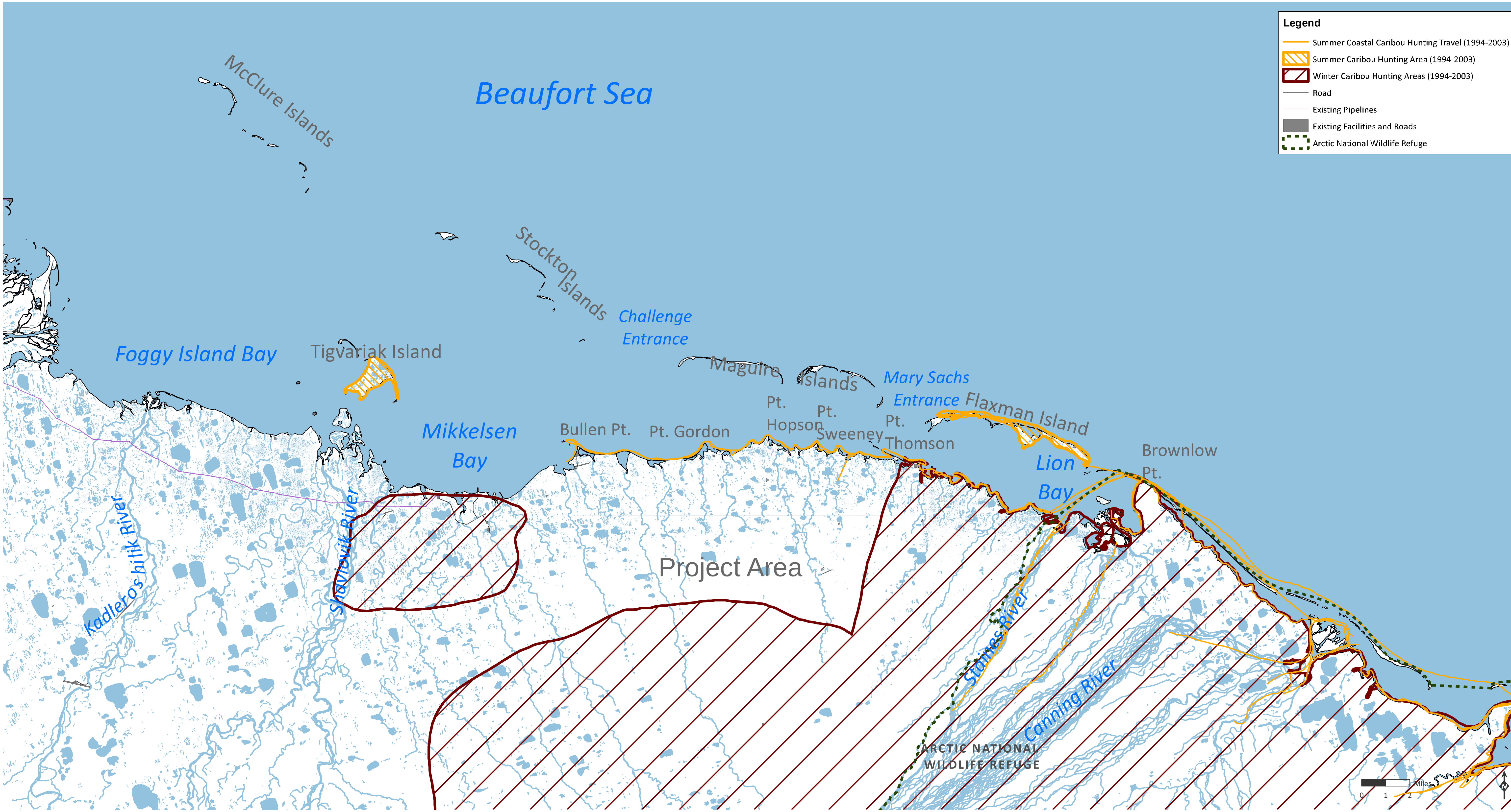

Figure # 15

Kaktovik Partial Seasonal Subsistence Use Areas for Caribou, Point Thomson Vicinity

POINT THOMSON PROJECT EIS

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: SRB&A 2003b

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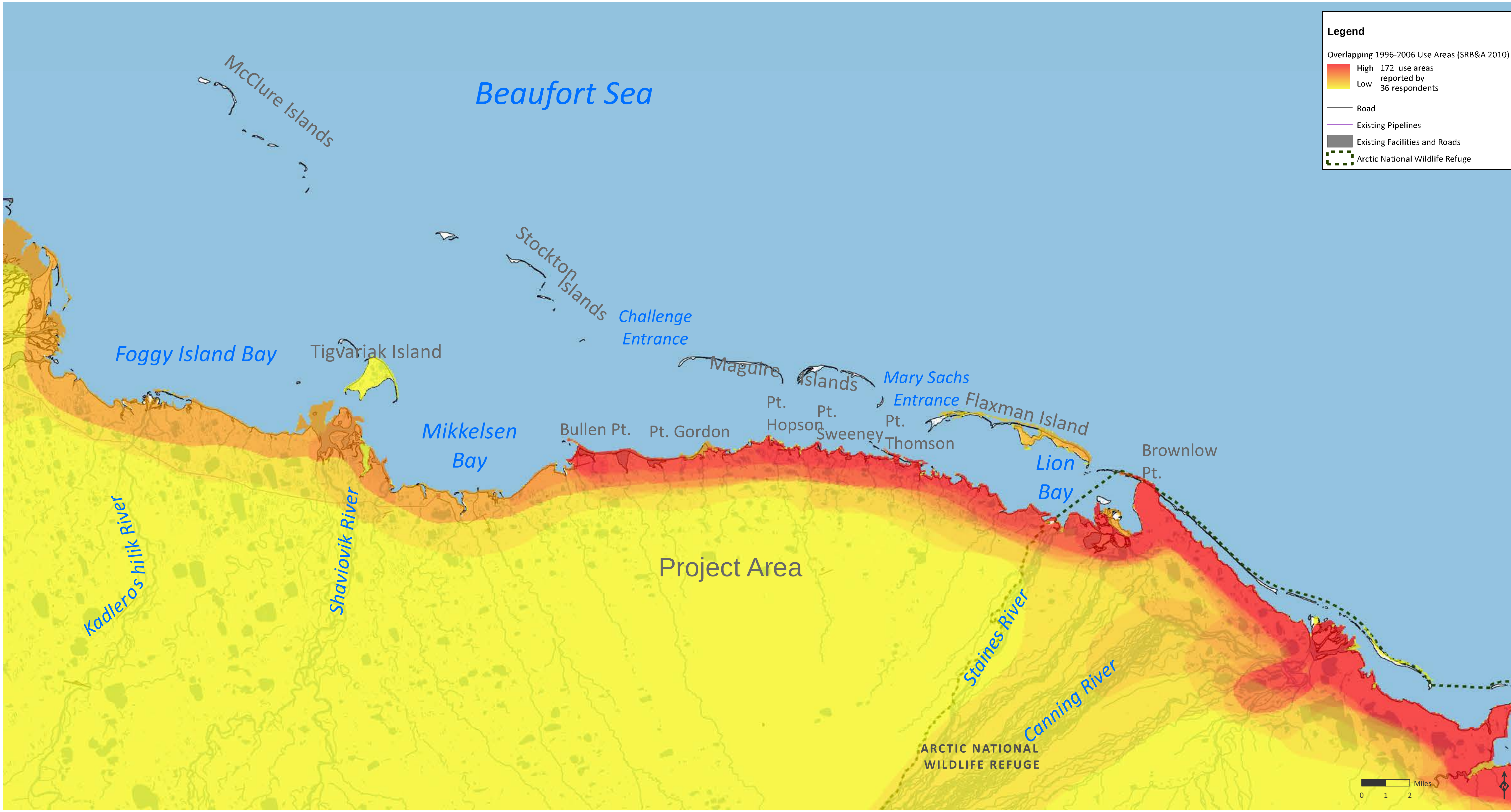

Figure # 16

Kaktovik Partial 1996-2006 Subsistence Use Areas for Caribou, Point Thomson Vicinity

POINT THOMSON PROJECT EIS

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: SRB&A 2010

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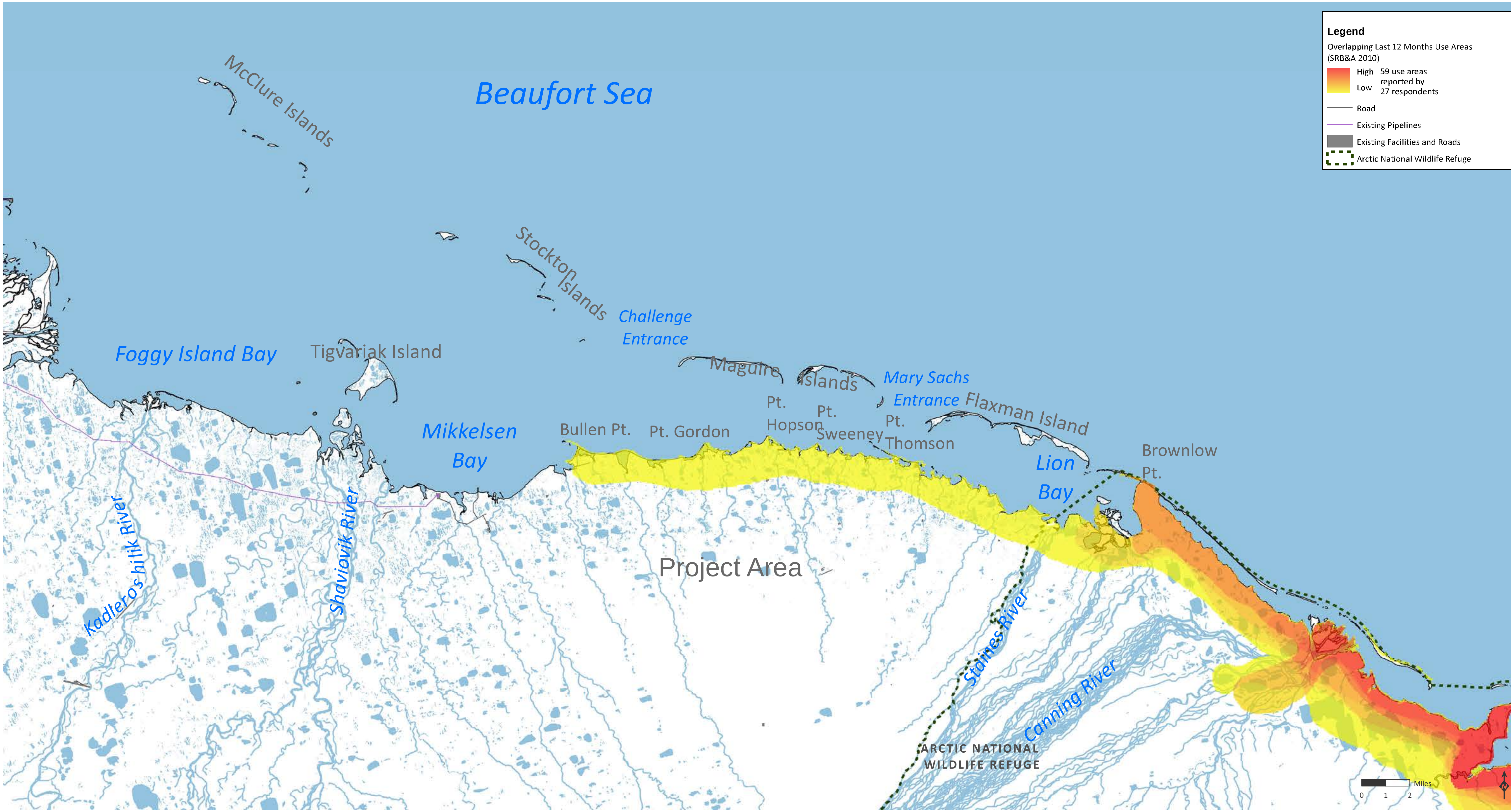

POINT THOMSON PROJECT EIS

Figure # 17

Kaktovik Partial Last 12 Months Subsistence Use Areas for Caribou, Point Thomson Vicinity

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: SRB&A 2010

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During interviews in 2003, respondents were also interviewed regarding beluga whale harvests. Several individuals noted that beluga whales are rarely in the Kaktovik area, although hunters harvest them if they are available. Respondents indicated that the availability of beluga whales has declined in recent years, observing that the whales travel too far from shore for hunters to reach them. One individual described,

> *I never see any beluga for many years now. They go too far in the ocean when they're coming back from Canada. We see them once in a while, but not all of the time. Once in a while when we're going east [we see them]. In September, they're traveling back west.* (SRB&A Kaktovik Interview March 2003)

Several individuals reported hunting beluga whales while visiting relatives in Canada during the summer months, and reported that belugas travel closer to shore there. One respondent explained,

> *I go to Shingle Point in the summer, July and August, for a month. We get fish, caribou, and beluga. I hunt beluga there if I can find them. The water is too deep here; over there it's shallow. Seven miles northeast of Shingle Point, the water is 13 feet deep. You can follow the belugas in the water, see their wake; they knock up the soil in the shallow water. It's easy to hunt them there in the shallow water. They don't dive down and [get away] over there.* (SRB&A Kaktovik Interview March 2003)

Fish

Kaktovik residents harvest fish along the coastal areas as well as in various rivers and lakes. River and lake fishing generally occurs during the winter months when residents can access these inland locations by snowmachine. Figure 22 shows contemporary Kaktovik fishing areas extending along the coast between Mikkelsen Bay and Icy Reef, and in numerous other locations farther east and west from those locations. In addition, this map depicts fishing in various rivers including Hulahula, Salderochit, Canning, and Shaviovik rivers. Kaktovik community-based subsistence fishing sites considered "most productive over time" are depicted on Figure 23; there are 13 sites on this map, 10 of which are at coastal locations. Kaktovik residents harvest multiple species of fish, including Arctic cisco and broad whitefish (primarily harvested in coastal locations); and Dolly Varden (harvested both at coastal and riverine locations). During the summer, residents travel along the coast to hunt caribou, look for seals, and set nets for arctic cisco, Dolly Varden, and other available fish. Residents travel inland in the winter by snowmachine and harvest fish such as Dolly Varden and arctic grayling through the ice. During interviews with Kaktovik residents in 2003, several individuals specifically identified Bullen Point as a favored fishing area for Dolly Varden and whitefish. Residents described,

> *I also fish in that area in the summer time, especially at Bullen Point. You catch a fish every cast – char and whitefish. That's the best rod and reel fishing. The best fishing areas are Bullen Point and Shaviovik River, where the two rivers fork together. We go there [Shaviovik] at the end of April. There's lots of eggs then. We go by snowmachine. You can pack a sled full [of fish] in a day.* (SRB&A Kaktovik Interview March 2003)

> *I go in the summertime, July and August. I go for fishing also – whitefish and char. I fish especially where the old DEW line is located (Bullen Point). Some guys charter a plane to go over there. It's good fishing place, Bullen Point.* (SRB&A Kaktovik Interview March 2003)

> *I know Bullen Point is a real good fishing spot; a lot of people talk about it.* (SRB&A Kaktovik Interview March 2003)

While traditional and current uses of the project area, particularly Bullen Point, for fish have been documented, the area is not among the “most productive” fishing sites depicted on Figure 23 and is not necessarily visited on a yearly basis. Pedersen and Linn (2005) show 2000-2001 and 2001-2002 fishing sites occurring no farther west than Anderson Point. The western-most fishing site on Figure 23 is near the mouth of Canning River.

Waterfowl

Kaktovik residents harvest various species of waterfowl including geese (white-fronted, Canada, brant, and snow) and eiders (common and king). Waterfowl hunting primarily occurs in coastal areas during the spring months of April and May and the fall months of August and September. Residents travel by snowmachine in the spring, switching to boats once the ice melts. Kaktovik contemporary geese and eider and historic wildfowl (which may include other types of birds such as ptarmigan) use areas are depicted on Figure 24. Although Kaktovik respondents identified 1996-2006 use areas that extended into Canada, these are not depicted on Figure 24. Residents’ waterfowl use areas occur primarily along the coast between Collinson Point in the west and Pokok Lagoon in the east, inland around Hulahula, Okpilak, and Jago rivers, and around and across from Barter Island. A high number of overlapping use areas extend farther to the Prudhoe Bay area in the west, and Demarcation Bay in the east. The coastal extent of historic wildfowl use areas is similar to the extent of 1996-2006 geese and eider use areas, with the exception of those 1996-2006 areas located in Canada.

Furbearers

Of the furbearers, wolf and wolverine are the primary species harvested by Kaktovik residents. The use areas for wolf and wolverines, as well as other furbearer species, are shown on Figure 25. Pre-1979 lifetime furbearer and trapping use areas extend west to east from the Kuparuk River to Demarcation Point and south into the Brooks Range. Because of decreased demand and dropping fur prices as well as the considerable time investment in setting and checking a trapline, trapping activity has decreased with time for Kaktovik residents (IAI 1990a:1-18). Kaktovik hunters however still actively engage in wolf and wolverine hunting, searching a broad inland area by snowmachine during the winter in pursuit of these animals. The 1996-2006 use areas for wolf and wolverine range over a continuous area from the Canning River to Icy Reef in the east (Figure 25). The furthest south use areas for wolf and wolverine are located near the headwaters of the Hulahula River. A high overlap of these use areas occurs directly south of the community between the Sadlerochit and Jago rivers.

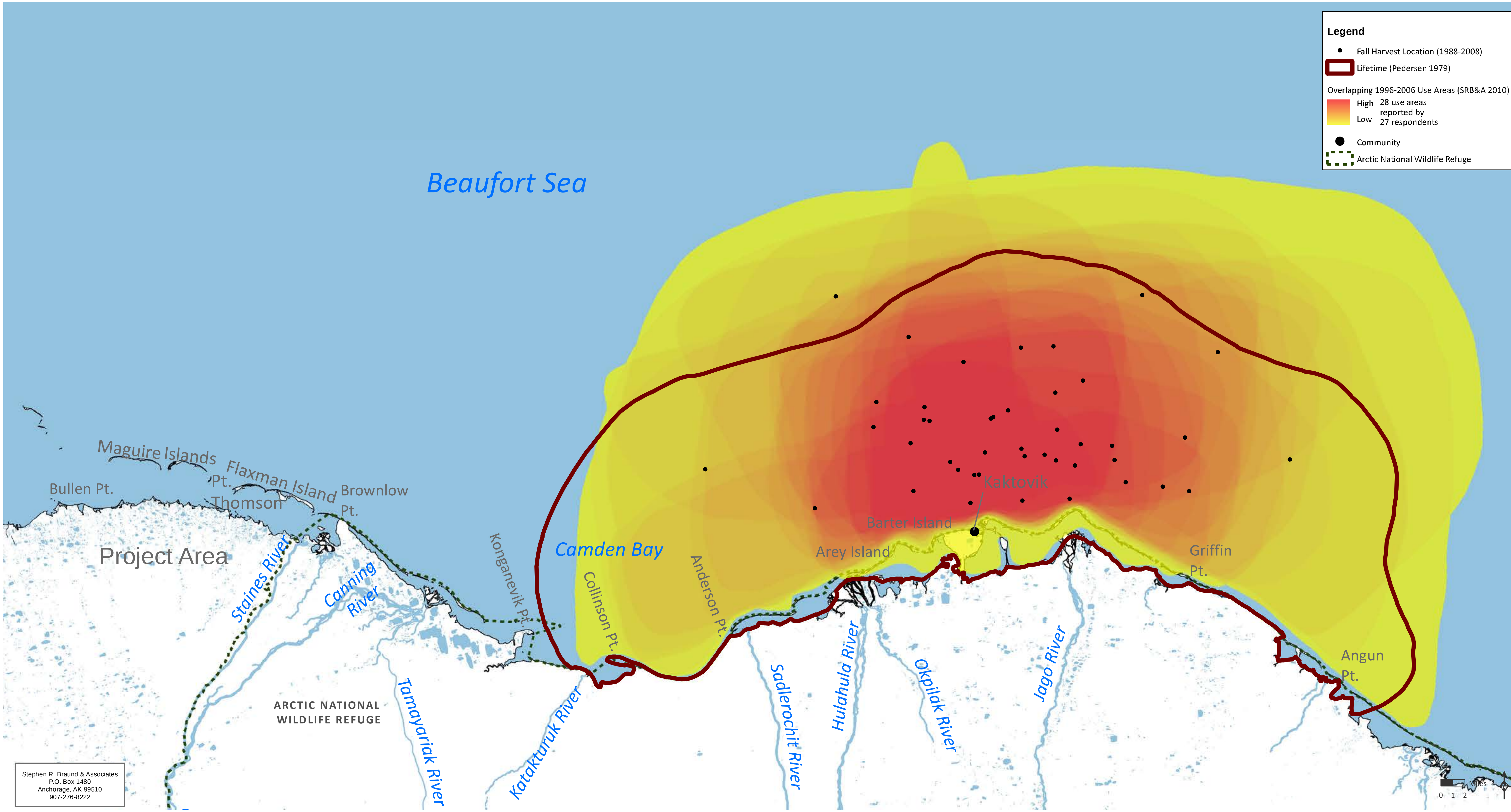

Figure # 18

Kaktovik Lifetime and 1996-2006 Bowhead Use Areas with Bowhead Whale Harvest Locations

POINT THOMSON PROJECT EIS

Respondents reported additional 1996-2006 use areas that are located in Canada and are not shown here.
Harvest locations are based on North Slope Borough Department of Wildlife Management data. Locations are shown for landed whales with GPS coordinates or specific range and bearing. Location data prior to 1988 are not specific and therefore not displayed.

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: NSB Department of Wildlife Management 2006, 2010, Pedersen 1979, SRB&A 2010

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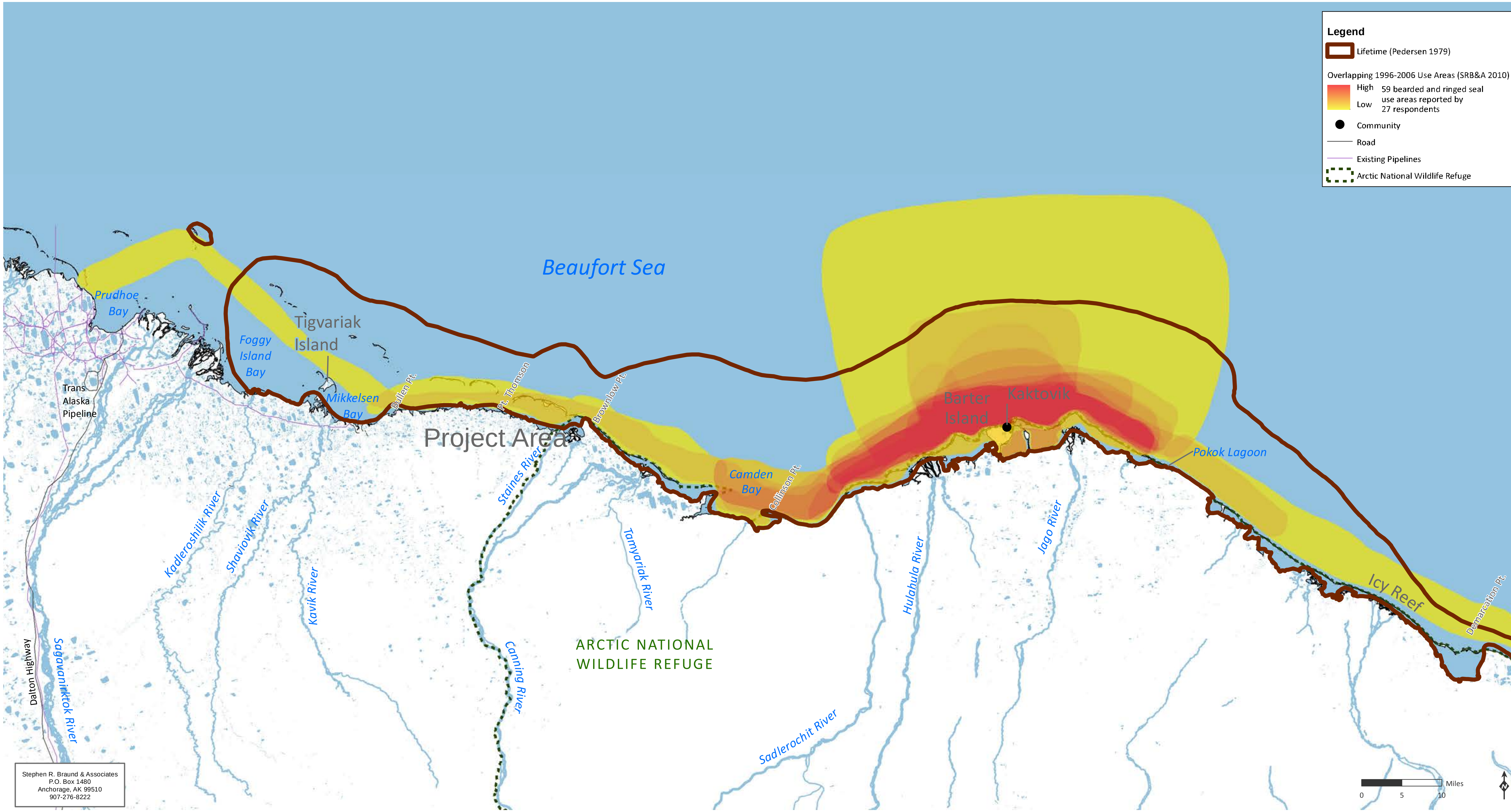

Figure # 19

Kaktovik Lifetime and 1996-2006 Seal Use Areas

POINT THOMSON PROJECT EIS

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Pedersen 1979, SRB&A 2010

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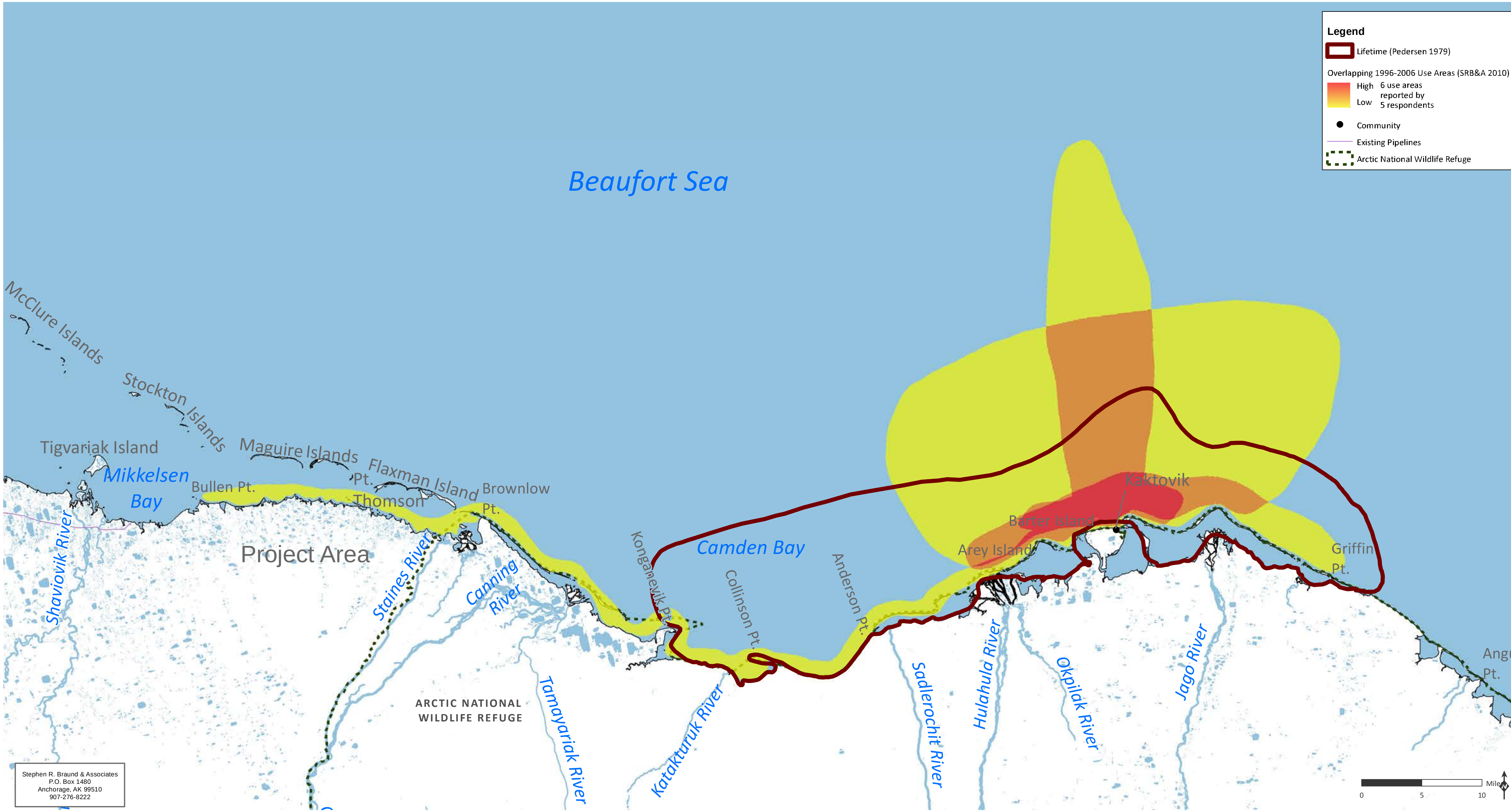

Figure # 20

Kaktovik Lifetime and 1996-2006 Walrus Use Areas

Respondents reported additional 1996-2006 use areas that are located in Canada and are not shown here.

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Pedersen 1979, SRB&A 2010

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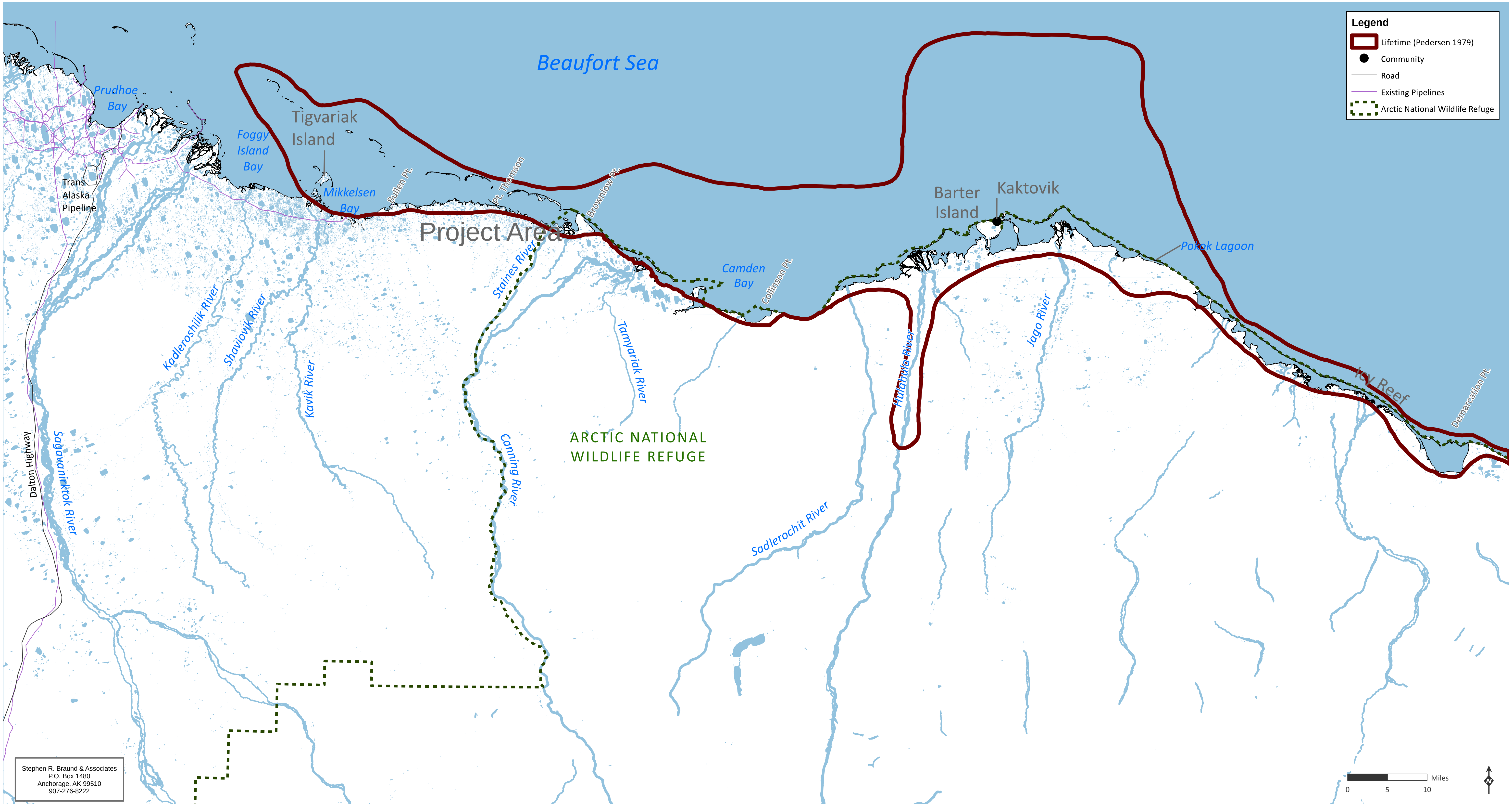

POINT THOMSON PROJECT EIS

Figure # 21

Kaktovik Lifetime Polar Bear Use Areas

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Pedersen 1979

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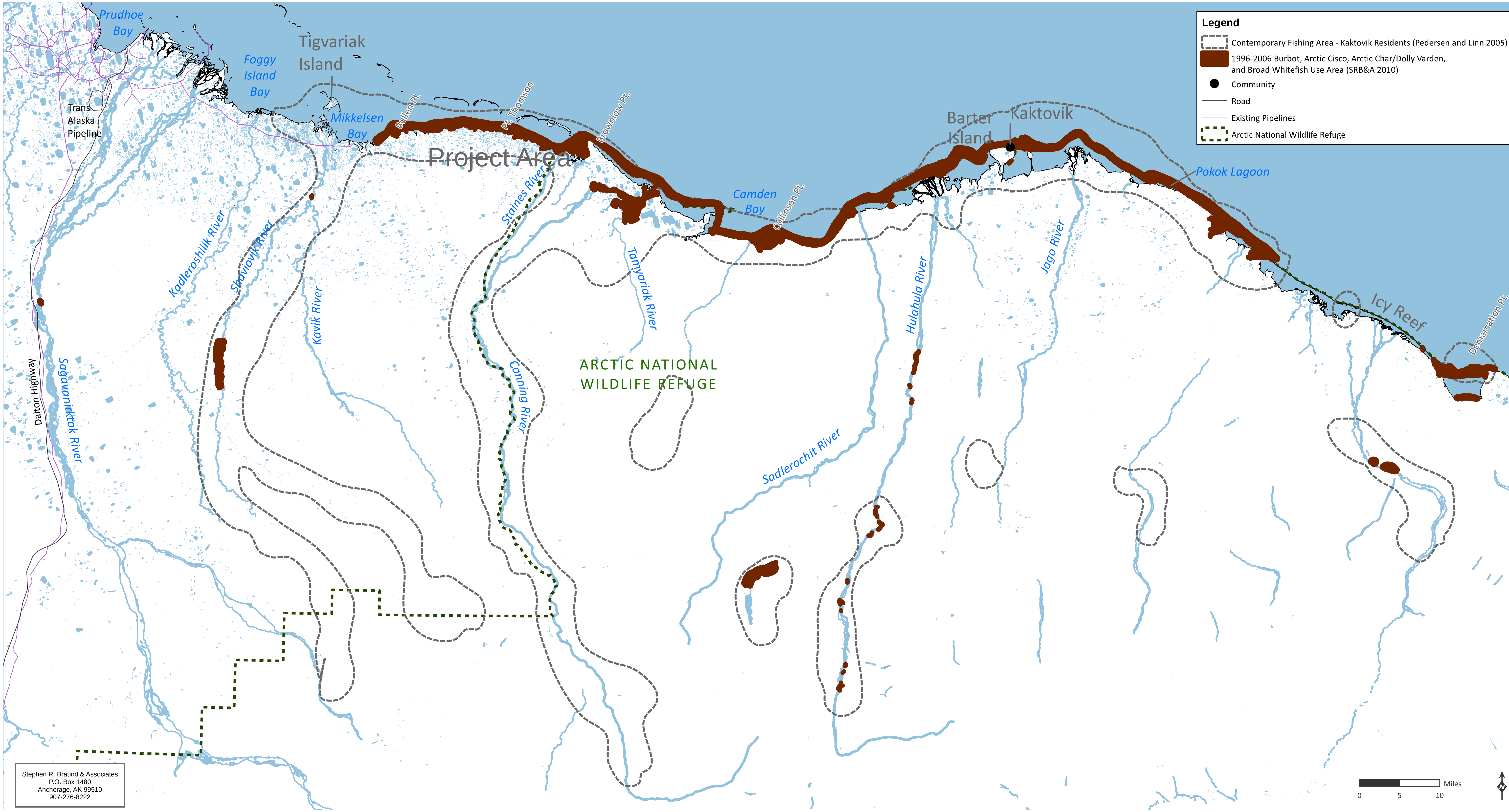

Figure # 22

Kaktovik Contemporary and 1996-2006 Fish Use Areas

POINT THOMSON PROJECT EIS

Respondents reported additional 1996-2006 use areas that are located in Canada and are not shown here.

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Pedersen and Linn 2005, SRB&A 2010

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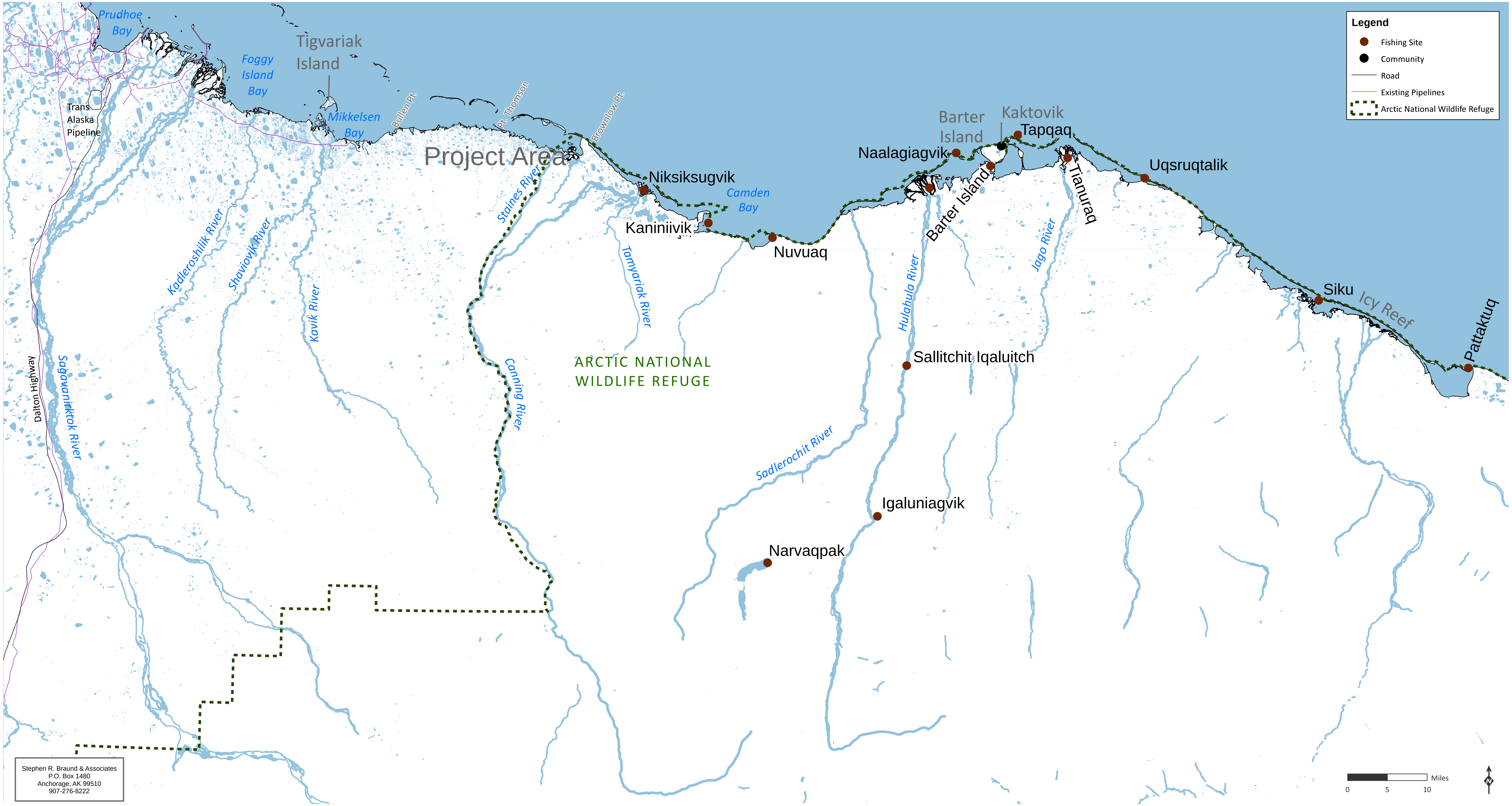

Figure # 23

Kaktovik Primary Community-based Subsistence Fishing Sites

POINT THOMSON PROJECT EIS

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Pedersen and Linn 2005

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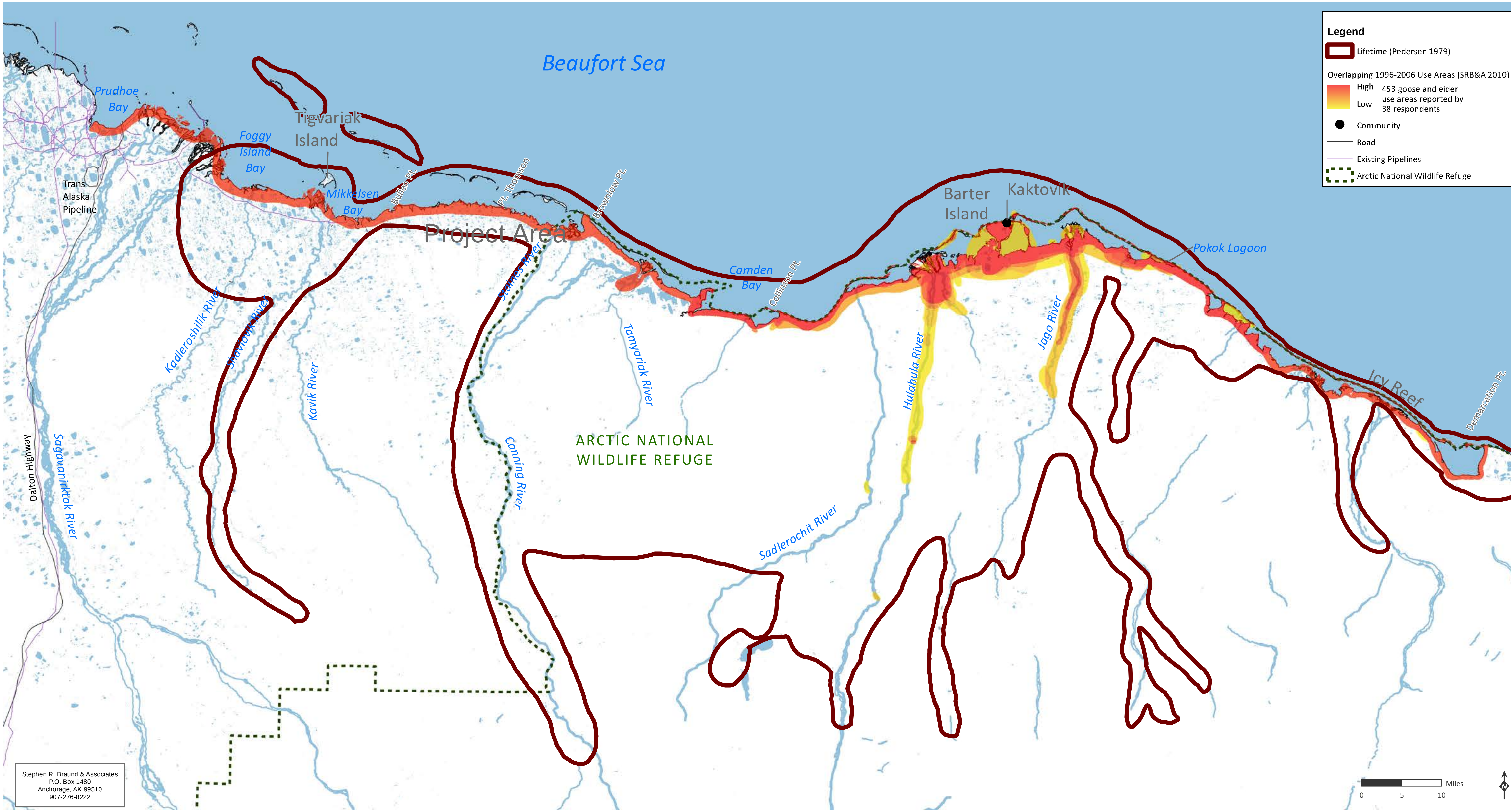

Figure # 24

Kaktovik Lifetime and 1996-2006 Wildfowl Use Areas

POINT THOMSON PROJECT EIS

Respondents reported additional 1996-2006 use areas that are located in Canada and are not shown here.

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Pedersen 1979, SRB&A 2010

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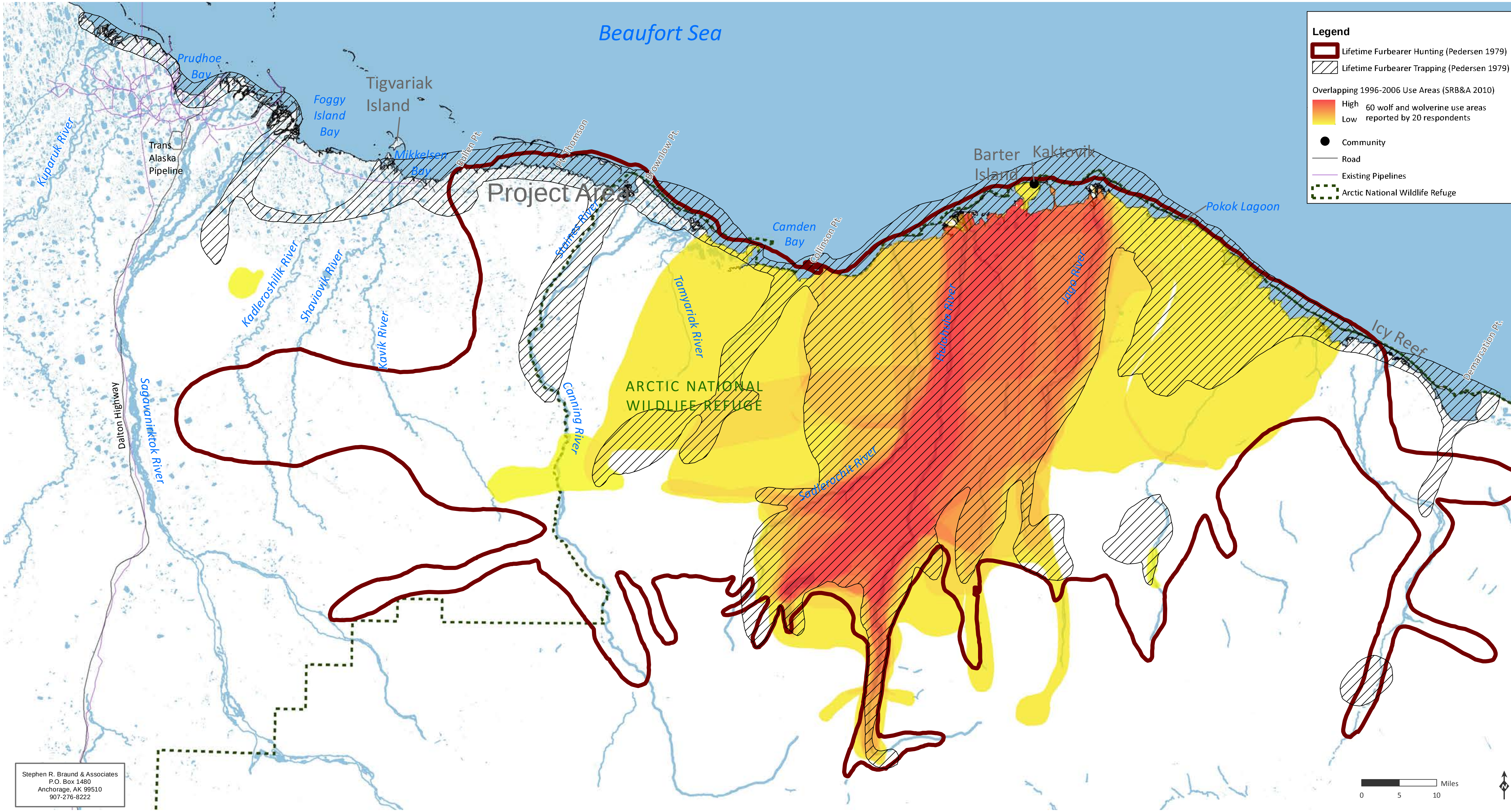

Figure # 25

Kaktovik Lifetime and 1996-2006 Furbearer Use Areas

POINT THOMSON PROJECT EIS

Respondents reported additional 1996-2006 use areas that are located in Canada and are not shown here.

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Pedersen 1979, SRB&A 2010

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Other Resources

In addition to the caribou, marine mammals, fish, waterfowl, and furbearers that are either harvested in or near the Point Thomson area or who migrate through the area and are later harvested by Kaktovik, residents also harvest a variety of other resources including moose, Dall sheep, and berries and plants. The use areas for these resources are depicted on Figures 26 through 28. As shown in the figures, these use areas are not concentrated near the Point Thomson project area.

4.2.1.5 Traditional Knowledge

In March 2003, SRB&A conducted interviews with Kaktovik subsistence users focused on gathering information relevant to the Point Thomson area; these interviews were associated with previous Point Thomson EIS efforts. During interviews, residents provided descriptions of their uses of the Point Thomson area for hunting and harvesting activities, traditional knowledge about resource habitat and movement, and suggestions for the Point Thomson project. Residents also discussed issues and concerns related to the Point Thomson Project. Residents' descriptions of their hunting areas are incorporated into the discussion above ("Contemporary Subsistence Use Areas"). Traditional knowledge related to the Point Thomson Project is also available from a Point Thomson EIS meeting on caribou for a previous Point Thomson EIS effort, which included participants from Kaktovik, held in Fairbanks, Alaska in December 2002. Although the meeting was for an earlier Point Thomson EIS effort, residents' comments pertained to aspects of the previous Point Thomson project that are still applicable, such as pipelines, traffic, and other development activities and infrastructure. Scoping testimony as provided during a January 12, 2010 public scoping meeting in Kaktovik (Appendix C) is also incorporated into the "Issues and Concerns" discussion.

Traditional knowledge for the subsistence discussion relies on personal experiences and observations as well as information provided through other hunters and from community elders. Because residents' personal experiences may vary widely, observation-based traditional knowledge may also vary depending on individual experience. This section describes residents' observations with a focus on commonalities and chooses quotes that are representative of common views or observations. This discussion does not attempt to reconcile differing or contradicting observations, but points out contradictions where present.

Resource Habitat and Movement

Caribou. Kaktovik residents provided information about caribou movement, distribution, health, and habitat. Residents' caribou hunting activities are based on their knowledge of caribou distribution and availability. Section 4.2.1.4 provides a description of Kaktovik subsistence use patterns. Because there are few navigable rivers in the Kaktovik area, hunters rely on the predictable movement of caribou from inland areas to the coast during the summer months, as they escape the heat and insects. Respondents noted that they primarily harvest caribou from the Central Arctic Herd when traveling west of the community by boat; the Porcupine Herd is no longer west of Kaktovik by the time boat travel is possible, in July. One resident described,

> *When it gets warm in the foothills and mountains, the mosquitoes come and the caribou go to the coast. We hunt the Central Arctic Herd. In the last few years, there have been more caribou in the winter time. The Central Arctic Herd is expanding, in numbers and territory. Recently, this year, there were about 40 up the Hulahula River. Most of the Porcupine herd are gone by July 1 [hunting is closed in May and June]; there are a few stragglers, we can hunt those.* (SRB&A Kaktovik Interview March 2003)

However, Kaktovik residents have also reported harvesting caribou from the Porcupine Herd in May and June, when the season is open:

> *We get a lot [of Porcupine Caribou Herd] in June. It used to be that season didn't open until July 1. People complained because the Porcupine Herd had come and gone by then, and so they opened the bull season [starting June 20th]. The Porcupine Caribou Herd mixes with the Central Arctic Herd.* (SRB&A Kaktovik Interview March 2003)

> *I would like to comment on Kaktovik and the Porcupine Herd – we hunt them also, from May to the first of July when they're on the coast. I don't think they're skinny. But the Central Arctic Herd we also hunt, and they're pretty healthy, too.* (Point Thomson EIS Caribou Meeting December 2002)

The particular location of the caribou depends on various factors, including temperature and wind conditions. When it is cool, caribou may be too far inland for hunters to access them. Furthermore, residents indicated that the caribou travel against the wind to escape insects; thus, wind direction is often an indicator of where the caribou are located. As one respondent said, "If there's an east wind, the caribou go east; if there's a west wind, they go west" (SRB&A Kaktovik Interview March 2003). Residents reported that the Central Arctic Herd will sometimes travel east along the coast as far as Barter Island when wind conditions are right, although this is rare. One individual observed,

> *Going west along the coast depends on the weather…. When the wind breezes from the east, caribou – to get away from the bugs – go toward the wind. The Central Arctic Herd goes as far as Camden Bay, to Anderson Point. In an east wind, you go toward the wind and there are no mosquitoes in front of you. So you keep traveling against the wind. The Central Arctic Herd even used to come to Barter Island; we had that herd at Barter Island one summer. It was more than one time – no one was prepared for them!* (SRB&A Kaktovik Interview March 2003)

One Kaktovik respondent noted that the Central Arctic Herd traveling so far east is a recent occurrence and also described the timing of the Porcupine Herd's movement out of residents' summer hunting area west of the community:

> *The Central Arctic Herd moving this far east is new – it started happening in the last four or five years. They came to Hulahula River one year. They always come after the Porcupine Herd leaves. The Porcupine Herd left around July 19th for years. Now, they leave on July 4th. The caribou season is closed until July. Residents can't get into the water with boats until July 4th or later in July. There's still ice on the outside [of the barrier islands].* (SRB&A Kaktovik Interview March 2003)

Several individuals reported that caribou concentrate in an area between Konganevik Point and Canning River, or Brownlow Point, during the summer. One resident indicated that they tend to migrate back and forth between those two points when residents are hunting them in July and August:

> *In July and August, the caribou are in small herds of 50 or less animals. The caribou are migrating back and forth from Canning River to Konganevik Point. When we do not see caribou at Canning River or Konganevik Point, we go to Tigvariak Island. Most people go for caribou along the coast, up to Canning River and Brownlow Point.* (SRB&A Kaktovik Interview March 2003)

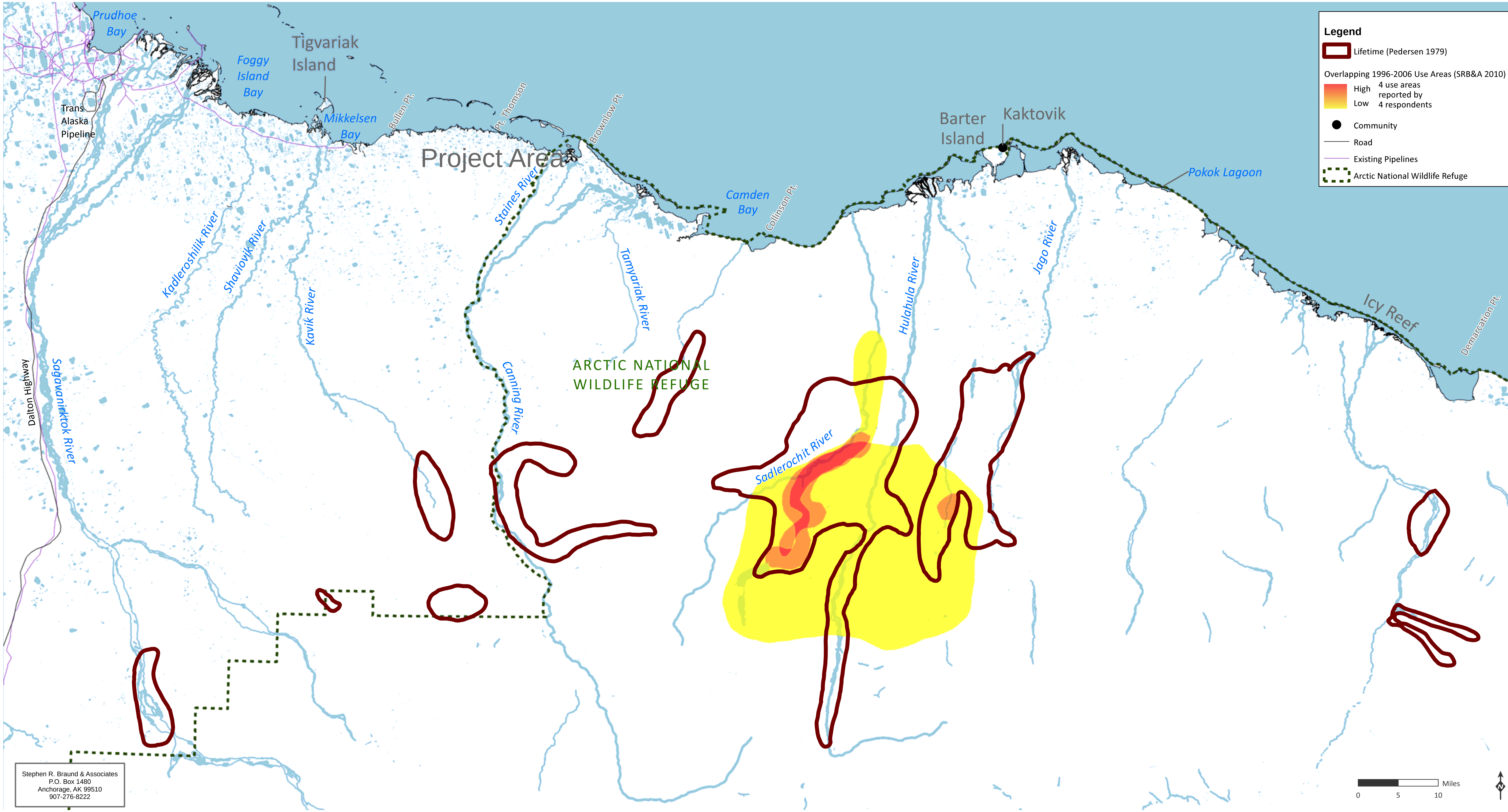

Figure # 26

Kaktovik Lifetime and 1996-2006 Moose Use Areas

POINT THOMSON PROJECT EIS

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Pedersen 1979, SRB&A 2010

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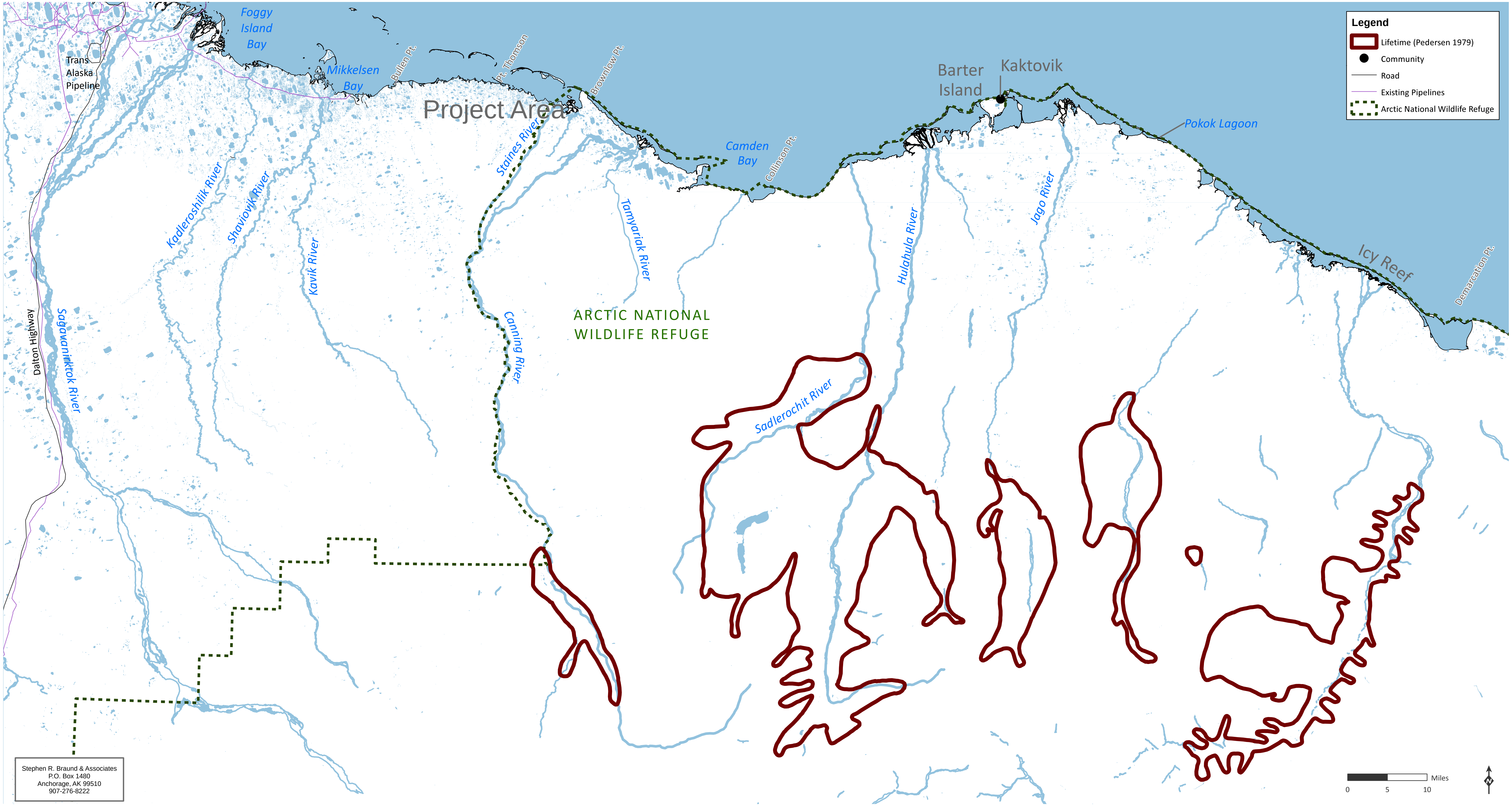

Figure # 27

Kaktovik Lifetime Dall Sheep Use Areas

POINT THOMSON PROJECT EIS

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Pedersen 1979

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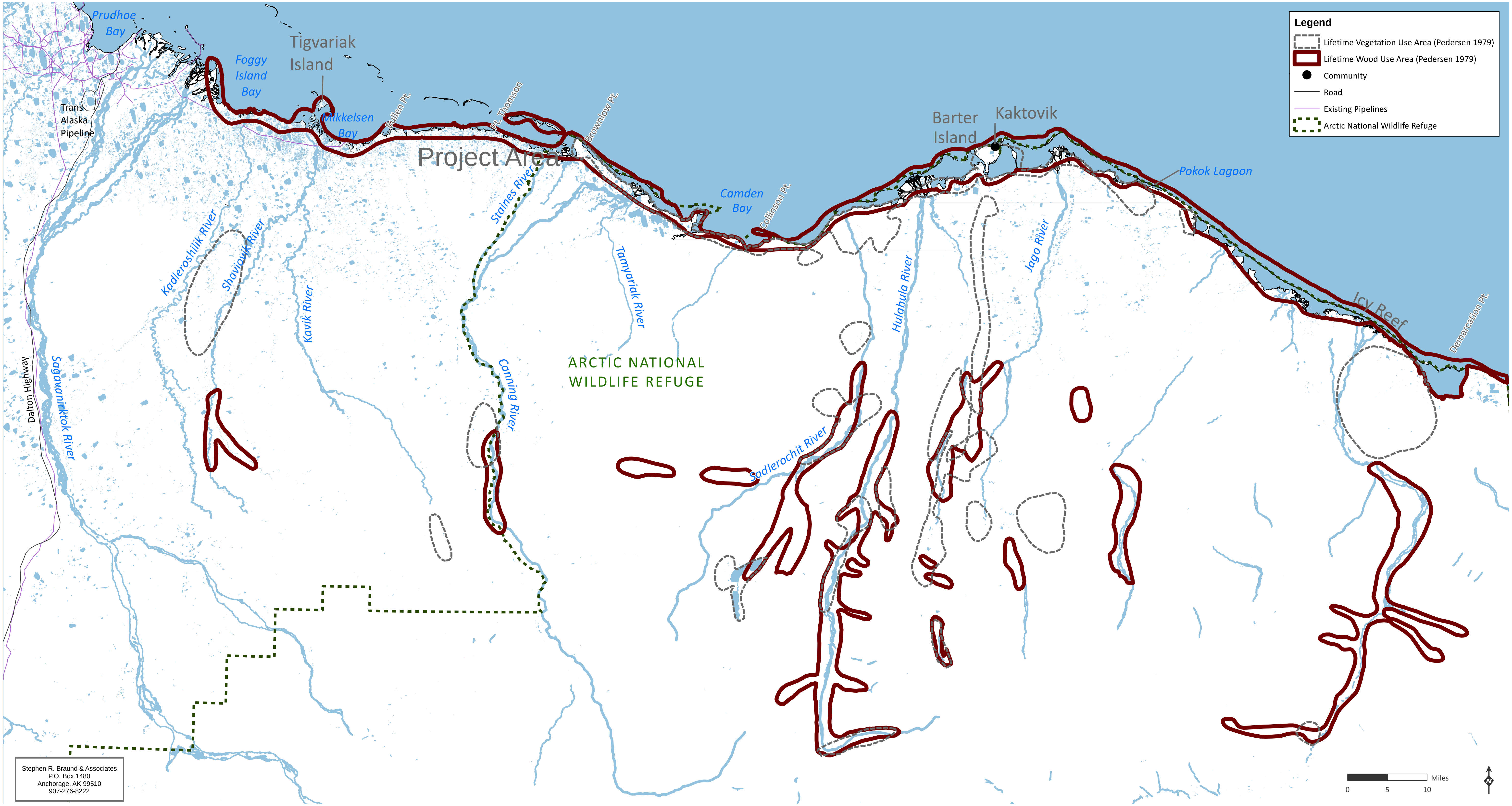

Figure # 28

Kaktovik Lifetime Vegetation Use Areas

POINT THOMSON PROJECT EIS

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Pedersen 1979

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Another individual noted,

> *At Brownlow Point we see a lot of caribou. They start traveling west along the point. Especially at Bullen Point, that is where they go down to the water all the time.* (SRB&A Kaktovik Interview March 2003)

Residents' observations regarding caribou distribution are consistent with the harvest location and use area data depicted in Figures 10 through 13, which show multiple years of substantial caribou harvests in the Konganevik, Canning River, and Brownlow Point areas as well as smaller harvests during certain years around Bullen Point and Point Thomson.

Residents generally indicated that caribou are in small herds or bunches when they see them along the coast west of Kaktovik, although they will periodically see a large herd of a thousand caribou or more. Residents described,

> *In July the caribou are in bands of about…sometimes one, sometimes 20, sometimes 40. I did catch them crossing the river [small river near Konganevik] last fall, toward the end of August, and there were at least a thousand of them crossing the river. Those caribou were going west. There were a number of herds in the area. These two were staying in the area, and the other one was moving west, and we caught them while they were crossing the river.* (SRB&A Kaktovik Interview March 2003)

> *A few years ago, there were about a thousand [caribou] wading in the water on the coast. Each boat got six or seven, because that's what our boats can haul. I've seen other bunches of about a thousand caribou.* (SRB&A Kaktovik Interview March 2003)

> *We usually just see single caribou – I haven't seen a big herd for some time. If I do, it's usually between 300 and 1,000 caribou.* (SRB&A Kaktovik Interview March 2003)

Regarding the health of the caribou they harvest, Kaktovik respondents noted that caribou from the Central Arctic Herd are usually fat and healthy; however, they sometimes harvest caribou from the Porcupine Herd that or skinny or that have sores or pus in their meat. As two respondents described,

> *Lots of the Porcupine Herd are sick. When they're sick, the herd leaves them. They look like nice big caribou, but they are nothing but skin and bones when you get there. Green pus, and warts on their legs. We never see sick caribou in the Central Arctic Herd – they are fat!* (SRB&A Kaktovik Interview March 2003)

> *In June we are waiting for the Porcupine herd, but the only ones we get have sores in the meat, gray pus in the legs. If we find sores in caribou meat, it is always in the Porcupine Herd caribou.* (SRB&A Kaktovik Interview March 2003)

One resident noted that the Central Arctic Herd winters near the mountains, where the snow is softer and food is more available, and has less distance to travel than the Porcupine Herd:

> *The Central Arctic herd lives near the mountains where the snow is soft and the food is easy to get. Along the coast it is hard snow. It's hard to get food. The Porcupine herd is skinny when they get here; they travel for miles. The Central Arctic herd is better, because they don't travel so far.* (SRB&A Kaktovik Interview March 2003)

As discussed above, Kaktovik hunters consider the coast west of their community to be key habitat for the caribou because it provides insect and heat relief for the Central Arctic Herd. Residents also noted that the Central Arctic Herd winters in the foothills south of the Point Thomson area, with one Kaktovik resident commenting during a meeting on caribou in 2002,

> *A 100 mile radius [should be considered for effects]. That is the Central Arctic Herd's wintering area, all winter long. It's outside of the [direct] area, but there are some [caribou] south of Point Thomson. They are at the Point Thomson area primarily in the summer.* (Point Thomson EIS Caribou Meeting December 2002)

Bowhead Whales. As discussed above under "Contemporary Subsistence Use Areas," Kaktovik residents hunt bowhead whales during the month of September, trying to harvest them as close to shore as possible to avoid risks to hunter safety and to ensure the meat and *maktak* do not spoil. In addition, Kaktovik bowhead whale hunters reported that they prefer to harvest smaller bowhead whales, which tend to travel closer to shore. One individual described,

> *People try to get smaller whales if they have a choice. The* maktak *is softer, easier to deal with. Three small whales is enough for our community. Most people are of a mind to try to get the small ones if they can. However, if it gets toward the end of the season, you get what you can.* (SRB&A Kaktovik Interview March 2003)

During interviews in 2003, Kaktovik hunters described changes in bowhead whales and bowhead whale habitat, primarily due to recent climate changes. Kaktovik residents observed that there is less ice in the Beaufort Sea than in the past, causing the bowhead whales to travel farther from shore or arriving earlier in the season. Two individuals expressed the following concerns about the effects of climate change on bowhead whale distribution:

> *The effect of global warming on whales is what I want to know about. We have about half as much ice now as in the past. The whales got in the habit of coming close to the coast because the pack ice wasn't too far out. Now the pack ice is farther out – how will that affect the whales?* (SRB&A Kaktovik Interview March 2003)

> *[Bowhead whales have been farther due to] global warming, I guess. I understand that the plankton are getting deeper and deeper from the heat of the sun.* (SRB&A Kaktovik Interview March 2003)

Another factor that affects bowhead whale movement, according to Kaktovik bowhead whale hunters, is noise. Residents have been voicing concerns about the effects of noise on bowhead whales, particularly noise associated with seismic activities, for some time. In 1997, MMS sponsored a workshop with North Slope bowhead whaling captains and crew members to gather information on the relationship between seismic activities and bowhead whale migration and behavior. During this workshop, residents provided their observations about the effects of seismic activities on bowhead whales; in addition, whaling captains and crew members submitted statements of their related observations and experiences as attachments to the resulting report entitled *Arctic Seismic Synthesis and Mitigating Measures Workshop – Proceedings* (MBC Applied Environmental Sciences, 1997). During the workshop, the president of the Kaktovik Whaling Captains Association recounted Kaktovik whale hunters' experiences with seismic disturbances dating back to the 1970s and described,

> *Whalers from Kaktovik, hunting out of the Camden Bay area west of Kaktovik, have stated that they could hear the noise from the [seismic] activities from their camp offshore. This level of noise will carry a distance and will send the bowhead whales into deep water. This is dangerous for those of the fall subsistence hunt as a small boat must tow up to a 40 ton whale back to the shoreline over 35 miles away. If we go out more than 30 or 40 miles to try to tow the whale back to our village the meat is going to be spoiled. Every time we catch a whale we like to have fresh meat for our community. Because of the seismic activity going on, we had to go out farther to find the whales going out into deeper water which was dangerous for the whalers. For Barrow and Nuiqsut it is the same thing.*

Suggestions for Point Thomson Project

During interviews with Kaktovik harvesters in 2003, residents' most common suggestions regarding the Point Thomson project were related to pipeline height and location, as well as hunting regulations in the vicinity of the pipeline. To prevent the pipeline from diverting caribou movement, residents provided the following two suggestions: 1) the pipeline should be raised to an adequate height to allow caribou passage; or 2) the pipeline should be buried. Several residents expressed the belief that seven feet was not high enough for the caribou; one person explained, "The pipeline should be eight feet or more. Seven feet might be too low with snow and snow drifts" (SRB&A Kaktovik Interview March 2003). Two other respondents stressed that the caribou should be able to move quickly and easily between coastal and inland areas:

> *Ten feet [for a pipeline] would be best. It needs to be high enough for them to run by – high enough for the tallest caribou to run under, without their horns getting caught. The caribou travel along the beach and then travel back up [inland]. The pipeline needs to be high enough so the caribou can get back and forth! If they're going to build it, they should go as high as they can. If they build it high enough, it will be high enough for the caribou to pass and for bullets not to hit it.* (SRB&A Kaktovik Interview March 2003)

> *Caribou go along the shore. Bar 3 used to have caribou all of the time, but there's hardly any now with all of that noise and activity. They need to build the pipeline very high so the caribou can go right through. The road is okay. I don't want to see them [caribou] get blocked by the pipeline. We want to make sure the caribou can get to the beach so we can hunt them. They need access to the beach. I've seen pipelines at Prudhoe Bay. The pipeline is very high, and they go right through.* (SRB&A Kaktovik Interview March 2003)

Other Kaktovik hunters believed that it was not the height of the pipeline, but the physical presence of the pipeline that would deflect the caribou. As one individual said, "[The height] does not make a difference. The animals will be scared to go there [because of its presence]" (SRB&A Kaktovik Interview March 2003). To avoid this issue, respondents suggested that the pipeline be buried, and one individual suggested that the pipeline alternate between running above ground and being buried. Burying the pipeline would allow easy passage of caribou as well as hunters on snowmachines or four-wheelers. Several individuals observed,

> *We could cross the road, but I don't know about a pipeline. They need to bury it. When we find those kinds of things, we look for a way out [of the area]. It maybe takes one mile or more [to navigate around structures on the landscape]. I am concerned about the caribou migration and*

> *the pipeline being a barrier to the caribou. For the pipeline height, they need to consider the snow when determining the height. Five feet is not enough. It should be 10 feet, or they should bury it. My biggest concern is about the passage of the animals. We want it underground. Five feet is not high enough [for the pipeline]. They may limit shooting around the pipeline for five miles away! This is our land and we always used it. If the caribou are right under it [the pipeline], there will be trouble. We use this land for hunting; we look for our food year round.* (SRB&A Kaktovik Interview March 2003)

> *They should put the pipeline underground; if the oil company can do anything, they should cool it and bury it. A road is okay; the caribou can go over a road easy. The main concern is the passage of the animals. They need to put the pipeline underground.* (SRB&A Kaktovik Interview March 2003)

Residents' suggestions regarding the distance of the pipeline from shore varied; however, most respondents wanted the pipeline to be as far inland as possible so that they could hunt caribou from shore without fear of shooting the pipeline or facing penalties for hunting in regulated areas. One individual said, "They should put a pipeline in 10 miles from the coast, and make it bullet proof" (SRB&A Kaktovik Interview March 2003). Respondents expressed concern that if there were a hunting buffer around the pipeline, and if the pipeline was close to shore, Kaktovik hunters would no longer be able to hunt caribou from the coast in traditional hunting areas. In addition, residents noted that some hunters do travel inland at varying distances to search for caribou, both during the summer and winter. Kaktovik hunters observed,

> *If the pipeline is a half a mile away, they will likely close the area to hunting. My primary concern is that the pipeline might divert the caribou [and they may not come to the coast]. I use a .243 [to hunt caribou]. Before I can answer whether it should be a half a mile or two miles, I need to know where I'll be able to legally hunt. I have concerns that pipeline activity will not allow the caribou to come up the coast. I do not want a pipeline there at all. I know there's a five mile buffer of no hunting along the pipeline [TAPS]. What about security guards? If there is a no hunting zone for five miles, what does it matter if the pipeline is a half a mile, two miles, or five miles [from the coast]?* (SRB&A Kaktovik Interview March 2003)

> *I don't want to see any restrictions or buffer zones in that area. We hunt there. We do not want restrictions to hunting in that area. We want access, and no restrictions; you need to move it five to 10 miles [inland], depending on what the buffer distance is going to be. Kaktovik hunters go up the Canning River five miles, depending on the tide. The silt and gravel in the delta is changing each year; it's getting shallower, there's beach erosion. It depends on the tide. On July 4, with the spring runoff and when the ocean is at high tide, you can go quite a ways up [Canning River].* (Point Thomson EIS Caribou Meeting December 2002)

> *It makes sense to move it [the pipeline] from the coast. They have to fulfill their obligation to the people who live here – they should move it [the pipeline] back 10 miles. What about a buffer zone where there's no hunting! That is why we want it 10 miles back [so there will be space for them to hunt along the coast].* (SRB&A Kaktovik Interview March 2003)

> *It's not just the pipeline [affecting hunter and caribou access], it is the shooting! We will have to hunt so far away from the pipeline. If there's no shooting within five miles, there will be no*

> *hunting over there. We go to that area for caribou, fish, and waterfowl. I camp at Camden Bay.* (SRB&A Kaktovik Interview March 2003)

> *A half a mile [from the coast] is too close. In the winter time it will be there, and if we're chasing something, we will not be allowed to hunt in that area. We travel along the coast in the winter, also, going maybe two miles from the coast.* (SRB&A Kaktovik Interview March 2003)

Issues and Concerns

As discussed above, under "Suggestions for the Point Thomson project," Kaktovik respondents' primary concerns related to the Point Thomson project were in regards to the effects of the pipeline on caribou movement and residents' subsistence activities along the coast in the Point Thomson vicinity. One Kaktovik hunter summarized many residents' concerns when he said,

> *There are regulations and restrictions on using firearms near pipelines. A coastal pipeline will hinder our hunting and the insect relief; the caribou go to the coast to cool off. There will be pipeline obstruction for their insect relief, and not only caribou, but there are moose around there, too. Who knows what is stronger – pipes or moose? If the pipeline was buried, we would be 100 percent happy. There is [currently] no option to bury the pipeline; [they should] move it 10 miles, where there will be no coastal hunting restrictions. We [Kaktovik] hunt the Central Arctic Herd in June, July, and August. The hunters sometimes go five miles inland up the Canning River, during high tides. In general, the distance we go inland along the coast is three miles. It depends on how much time you have, and how far the caribou are. We have five day weekends [during caribou hunting season]. We go out every weekend, from Brownlow to Bullen Point, to Badami, and all the way west to Tigvariak Island. We not only go west for caribou, but we also go for fish and seals.* (Point Thomson EIS Caribou Meeting December 2002)

Residents also expressed concerns about economic and social issues related to the Point Thomson Project. One individual expressed concern that the development would affect his wilderness guiding business by disrupting wilderness viewing opportunities:

> *My [in-laws] have allotments on Flaxman Island and on Brownlow Point. Last winter I camped there [at the allotment on Brownlow Point]. I plan to spend more time there. I photographed a polar bear den site with cubs. I also went to Flaxman Island. I am getting into wilderness guiding – I am concerned that [the project] will disturb the area. It's not just hunting, but the activity distracts from my use of the area. I have a business of taking people to view wildlife. It was startling to see a huge truck going across the ice. They have uglied up Flaxman Island. They were drilling mud in a pit – then the beach erosion was getting close to it, and they had to move it. The edge of the pit looked like it was 50 [feet?] from the ocean. They made a big, ugly hole on Flaxman Island. I went there in March and April, by snowmachine. I was there for several weeks. I found another polar bear den right on the river.* (SRB&A Kaktovik Interview March 2003)

Several people discussed concerns about the cumulative and social effects of development on the community of Kaktovik. These individuals were concerned about contamination and pollution related to oil and gas development, as well as potential social impacts on the community related to an influx of people to the area. One individual expressed the need for Kaktovik to find alternative sources of fuel, saying,

> *We [Kaktovik] spent 11 million dollars on diesel generators; they burn 600 gallons of diesel per day. We need alternative energy!* (SRB&A Kaktovik Interview March 2003)

Another individual made this statement regarding the cumulative effects of development on their community:

> *They build roads and we get nothing. We just get the contaminants from the ocean, nuclear submarines in the ocean and no technology to get them out. The DEW line sites are contaminated with PCBs. We are being targeted as a population, controlled by the government.* (SRB&A Kaktovik Interview March 2003)

A number of Kaktovik respondents discussed their belief that there are not enough benefits to their community associated with the Point Thomson Project. Several individuals expressed the belief that the community should be compensated for oil and gas development on their lands. Other suggestions for providing benefits to the community included road access to Kaktovik, free natural gas (similar to that provided in Nuiqsut), and job opportunities. Kaktovik respondents made the following comments regarding desired benefits of the Point Thomson Project:

> *I'm disappointed there's no permanent road – it costs $640 for a round trip to Fairbanks. The reason there are no cabins here is because of the cost of wood! One gallon of milk costs $14.* (SRB&A Kaktovik Interview March 2003)

> *I used to be pro-development, but now I'm not. They are not going to build us a road.* (SRB&A Kaktovik Interview March 2003)

> *Each kid, adult, and senior should be compensated by oil companies because it is our land. If they are to develop our land, we should be compensated for the future. The oil companies will come, develop, get what they need, and then leave. They say the benefit is jobs! That's not a benefit – we can't get those jobs. We're not all able to work in the [oil]fields.* (SRB&A Kaktovik Interview March 2003)

> *I would like to see this [Point Thomson development] happen, because for me it could mean a job. I miss working at Prudhoe Bay. How come those companies, like VECO, aren't giving locals jobs?* SRB&A Kaktovik Interview March 2003)

The primary subsistence-related concerns voiced during the January 2010 public scoping meeting in Kaktovik were similar to those voiced in 2003 and were related to potential effects of the Point Thomson Project on fish and caribou harvests, as well as potential contamination of the offshore environment from oil and fuel spills related to barge traffic. In particular, residents expressed concerns about the potential for hunting restrictions in the vicinity of the Point Thomson area and about potential effects on caribou availability either due to displacement of caribou from the coast or due to the presence of the pipeline restricting residents' ability to hunt them:

> *Another [concern] is the airstrip. You're going to have some jet planes flying in and out of there or small little planes? Now, with all these planes, we got these big planes flying in and out of there. All our caribou are migrating by there, that's going to change things around for us.* (Appendix B)

> *How close, I guess, are we going to be able to hunt around this area? A lot of our hunters hunt over that way, hunt for caribou and seals and stuff like that. I'm just wondering how our rights are going to be protected in that area.* (Appendix B)

> *We can't really travel up and down our river, so a lot of our hunting is done along the coast. And so I'm just concerned about whether that will drive the caribou up further, up inland, when they're traveling along the coast and if we'll be – still be able to get them around our area. And I'm just real concerned about that…. Being a coastal hunting community, because we – we are in ANWR and we're limited as to where we can go and hunt and our rivers being shallow, that the pipeline is only one mile from the coast. And so that's – I think that's going to really highly impact us.* (Appendix B)

Residents also reported concerns about the effects of barges and barge infrastructure on migrating fish such as Dolly Varden and Arctic cisco. One meeting attendee, George Tagarook, provided the following statement:

> *Yeah, the fish, arctic char, whitefish that goes through that area, you put 1200 feet of barge, where they going to go? We got the Colville and Mackenzie fish that migrate through there…. Not only fish go through there, there's seals that follow the fish.* (Appendix B)

4.2.2 Nuiqsut

Nuiqsut is located on the western side of the Colville River delta, and the area offers an abundant diversity of terrestrial mammals, fish, birds, and other resources. The Colville River is the largest river system on the North Slope and supports the largest over-wintering areas for whitefish (Craig 1989 as cited in Fuller and George 1999:83). Traditional subsistence activities in the Nuiqsut area have revolved principally around caribou, marine mammals, and fish. Moose, waterfowl, and furbearers are secondary but important supplementary resources. Nuiqsut's location on the Colville River, some 35 miles upstream from the Beaufort Sea, has been a prime area for fish and caribou harvests, but less advantageous for marine mammal harvests (Alaska Department of Community and Economic Development [ADCED] 2003).

While the Nuiqsut area was used historically as a trade and subsistence location, Nuiqsut was not permanently settled until 1973 when 27 families from Barrow returned to the area. Some of the men who resettled Nuiqsut had been whaling captains in Barrow. Furthermore, bowhead whaling had historically occurred along the central Beaufort Sea coast. Nuiqsut whaling occurs in the fall when the whales migrate closer to shore, as the spring migration is too far offshore. However, close family ties with Barrow often results in participation of Nuiqsut residents in Barrow's spring whale hunt (Fuller and George 1999:84). Nuiqsut whale hunting is based from Cross Island, located approximately 74 miles east of Nuiqsut (Galginaitis 2006).

Nuiqsut is located closer to areas of petroleum development than Kaktovik or Barrow, and the proximity of this development has resulted in reduced use of previous subsistence harvest areas such as the areas east of the community (Fuller and George 1999:82). The stated reasons for this loss of subsistence harvest locations include formal restriction by government or oil companies, a perception that resources are contaminated and unfit to eat, and/or difficulty in accessing the area (IAI 1990b:1-44). Subsistence activities are an important component of the Nuiqsut economy and Iñupiat culture and identity, and subsistence resource harvesting continues to be the focus of life in Nuiqsut.

The population of Nuiqsut has generally remained steady in recent years, with 433 residents reported during the 2000 census (U.S. Census Bureau 2010) and an estimated 402 residents in 2009 (ADOLWD 2010). The main sources of employment in the community include the village corporation (Kuukpik Corporation), the NSB, and the NSB School District (URS Corporation 2005).

4.2.2.1 Role and Importance of Subsistence Resources

Residents of Nuiqsut are active subsistence harvesters and their location on Nigliq Channel is well situated for yearly harvests of caribou, Arctic cisco, and various other resources. Although not located directly on the coast, Nuiqsut is one of 11 Alaska Eskimo whaling communities. Like other North Slope communities, bowhead whale hunting is central to Iñupiat cultural identity in Nuiqsut.

The primary large land mammals harvested are caribou and moose, with caribou harvests accounting for the vast majority of large land mammal harvests each year. Moose hunting is a highly important yearly activity for many residents. Along with caribou and bowhead whale, harvests of Arctic cisco generally constitute a large percentage of residents' subsistence harvests each year. Large numbers of Arctic cisco migrate from the Mackenzie River delta to the Colville River each year, and Nuiqsut residents take full advantage of this readily available resource. Nuiqsut participation in subsistence activities is high, with 90.3 percent of households harvesting at least one resource in 1993, and 100 percent of households using at least one resource (ADF&G 2010). A high percentage of Nuiqsut households participate in the sharing of subsistence resources, with 98 percent receiving subsistence resources in 1993, and 92 percent giving subsistence resources away.

4.2.2.2 Contemporary Seasonal Round

Various sources are available that describe the seasonal cycle of subsistence activities in Nuiqsut. Table 9 summarizes Nuiqsut's annual cycle of subsistence activities according primarily to data collected in the 1970s and 1980s and based on a figure from IAI (1990). Due to climate change and other factors, the timing of certain subsistence activities may have changed since that time. Several more recent sources (Brower and Opie 1997; Bacon et al. 2009) provide harvest amounts by month for individual resources. SRB&A (2010a) provides months in terms of the number of use areas reported, by resource. See under Methodology for a discussion of the different types of seasonal round data available.

Recent data for all resources for the 1995-2006 time period are depicted on Figure 29. This figure shows the number of reported use areas by month of use. Nuiqsut respondents reported a relatively steady amount of subsistence harvest effort throughout the year, with the highest numbers of use areas reported in May, July, and August. Harvests by species by month for the 1994-1995 and 2000-2001 study years are also available in Bacon et al. (2009:Tables N3 and N5). According to these data, caribou harvests occurred primarily during the months of July and August during both study years; the percentage of caribou harvested in June dropped dramatically from 12.6 percent in 1995-1996 to one percent in 2000-2001, illustrating the variability of caribou harvests based on caribou migrations. For the 2000-2001 study year, most fish harvests occurred in the summer as well as fall and early winter months (October and November); waterfowl harvests were reported in the spring and summer months; moose harvests were limited to the month of August; and marine mammal harvests (aside from bowhead whales and polar bears) were most common in July (Bacon et al. 2009:Table N5).

The seasonal round of subsistence activities in Nuiqsut is based on resource availability and environmental conditions that allow hunters to access resources at times when they are present. Waterfowl hunting begins in the spring, with the majority of geese hunting in May and eider hunting later in the summer when residents also hunt seals in boat (SRB&A 2010a). Hunters often harvest geese while participating in other subsistence activities such as jigging for burbot (IAI 1990:13-30).

Caribou are hunted year-round but are harvested primarily during the summer and fall months of June through September. Moose hunting takes place in August and September in boat accessible hunting areas south of Nuiqsut (Fuller and George 1999:84). August is the primary harvest month for caribou and moose, as water levels are adequate for traveling upriver or on the coast by boat, and the animals are usually in their best condition. Fishing is an important subsistence activity in which many of the residents of Nuiqsut participate. If weather and ice conditions permit, summer net fishing at fish camps begins in June or July (IAI 1990:13-30). Residents also travel to the ocean in the summer to hunt ringed and bearded seals and coastal caribou.

The bowhead whaling season usually occurs in September from Cross Island. Nuiqsut residents harvest polar bear on an opportunistic basis during the fall whaling season. Gill netting at campsites and near the community, especially for Arctic cisco, is the most productive between October and mid-November (SRB&A 2010a). Jigging for grayling also occurs in the fall (IAI 1990:13-30).

During the winter months, residents focus on accessing wolf and wolverine hunting areas by snowmachine and harvesting caribou as needed. Trapping can be undertaken anytime during the winter, however, most hunters avoid going out in the middle of winter because of poor weather conditions and lack of daylight (IAI 1990:13-30). Wolf and wolverine are hunted and sometimes trapped, primarily during the months of February and March (SRB&A 2010a). Other late winter and early spring activities include ptarmigan hunting and seal hunting.

Table 9: Annual Cycle of Subsistence Activities – Nuiqsut

	Winter					Spring		Summer			Fall	
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Fish	High	No/Very Low	Low/Medium	Low/Medium	Low/Medium	Low/Medium	High	No/Very Low	Low/Medium	Low/Medium	Low/Medium	High
Birds/Eggs	Low/Medium	Low/Medium	Low/Medium	Low/Medium	Low/Medium	Low/Medium	Low/Medium	High	Low/Medium	Low/Medium	Low/Medium	High
Berries	No/Very Low	No/Very Low	No/Very Low	No/Very Low	No/Very Low	No/Very Low	No/Very Low	Low/Medium	Low/Medium	High	No/Very Low	No/Very Low
Moose	Low/Medium	Low/Medium	No/Very Low	No/Very Low	No/Very Low	No/Very Low	No/Very Low	No/Very Low	No/Very Low	Low/Medium	High	Low/Medium
Caribou	Low/Medium	High	Low/Medium	Low/Medium	High	High	High	Low/Medium	Low/Medium	High	High	High
Furbearers	Low/Medium	Low/Medium	Low/Medium	Low/Medium	Low/Medium	High	High	No/Very Low	No/Very Low	No/Very Low	No/Very Low	Low/Medium
Polar Bear	Low/Medium	Low/Medium	Low/Medium	Low/Medium	Low/Medium	Low/Medium	Low/Medium	No/Very Low	No/Very Low	No/Very Low	High	Low/Medium
Seals	Low/Medium	Low/Medium	No/Very Low	No/Very Low	Low/Medium	High	Low/Medium	No/Very Low	No/Very Low	Low/Medium	High	Low/Medium
Whales	No/Very Low	No/Very Low	No/Very Low	No/Very Low	No/Very Low	No/Very Low	No/Very Low	No/Very Low	No/Very Low	Low/Medium	High	No/Very Low

Notes:

- (white) No to Very Low Levels of Subsistence Activity
- (light grey) Low to Medium Levels of Subsistence Activity
- (dark) High Levels of Subsistence Activity

Sources:
IAI 1990.
Research Foundation of the State University of New York, 1984.

4.2.2.3 Subsistence Harvest Estimates

ADF&G collected subsistence harvest data for all resources for Nuiqsut in 1985 and 1993, and caribou harvest data from 2002 to 2006. ADF&G chose 1993 as the most representative year for subsistence harvest data in Nuiqsut, meaning that 1993 is the most representative of the available ADF&G harvest data years, but not necessarily the most statistically representative Nuiqsut harvest year (Table 10 and Table 11). Table 12 and Table 13 show caribou and bowhead whale harvest data separately, for all available study years.

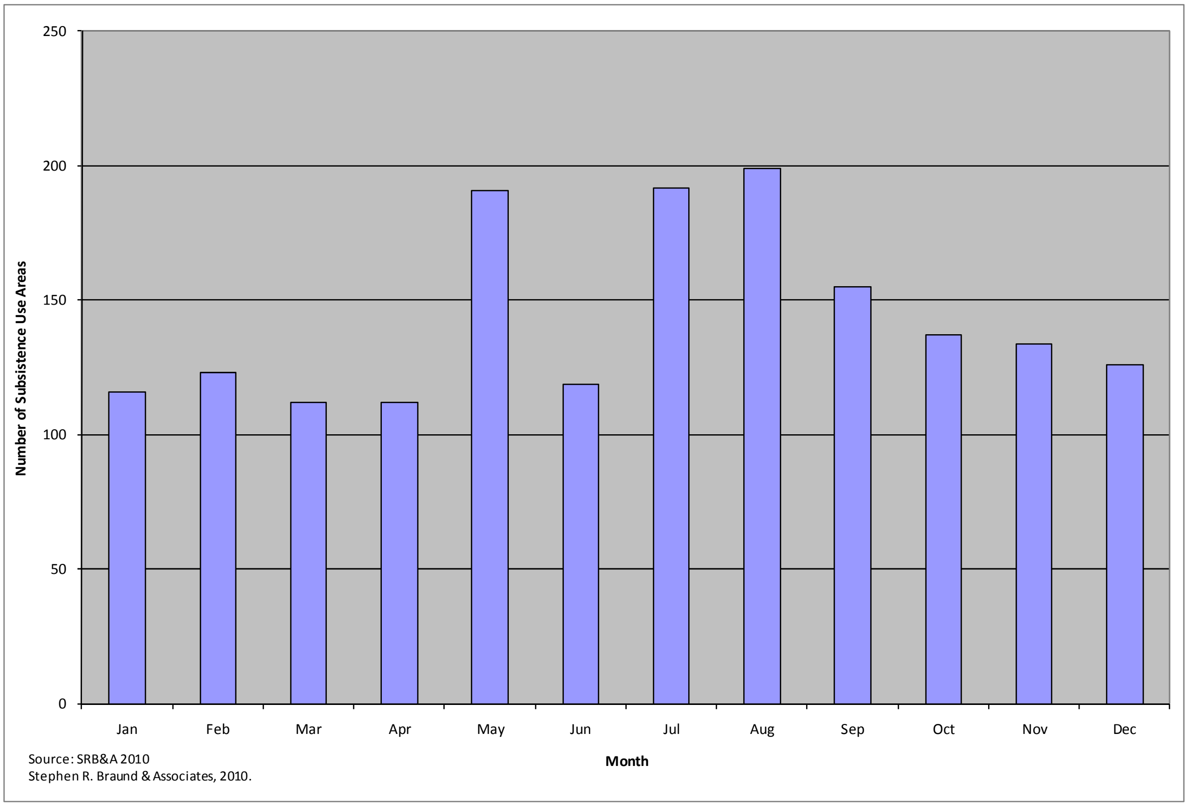


Figure 29: Nuiqsut Use Areas for All Resources by Month, 1995-2006

Table 10: Nuiqsut Subsistence Harvests and Subsistence Activities

		Percentage of Households					Estimated Harvest				
Study Year	Resource	Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% Total Harvest
1985	*All Resources*	*100*	*98*	*98*	*100*	*95*		*160,035*	*2,106*	*399*	*100*
	Fish	100	93	93	78	83	68,153	70,609	929	176	44
	Land Mammals	100	95	93	70	85	1,224	67,866	893	169	42
	Marine Mammals	100	48	23	100	30	59	13,355	176	33	8
	Birds and Eggs	98	95	95	60	80	3,952	8,035	106	20	5
	Vegetation	38	50	18	20	10		169	2	0	0
1992	*All Resources*							*150,196*	*1,430*	*359*	*100*
	Fish							51,955	495	124	34.6
	Land Mammals							41,503	395	99	27.6
	Marine Mammals							52,749	502	126	35.1
	Birds and Eggs							3,924	37	9	2.6
	Vegetation							65	1	0	
1993	*All Resources*	*100*	*94*	*90*	*98*	*92*		*267,818*	*2,943*	*742*	*100*
	Fish	100	81	81	94	90	71,897	90,490	994	251	34
	Land Mammals	98	77	76	94	82	1,290	87,390	960	242	33
	Marine Mammals	97	58	37	97	79	113	85,216	936	236	32
	Birds and Eggs	90	77	76	69	73	3,558	4,325	48	12	2
	Vegetation	79	71	71	40	27		396	4	1	0
1994-1995	*All Resources*							*83,211*			*100*
	Fish						15,200	46,600			56.0
	Land Mammals						305	32,686			39.3
	Marine Mammals*						25	1,504			1.8
	Birds and Eggs						625	2,313			2.8
	Vegetation							108			<1
1995-1996[b]	*All Resources*							*183,576*	*1,974*		*100*
	Fish						10,654	16,953	182		9.2
	Land Mammals						392	43,554	468		23.7
	Marine Mammals						178	120,812	1,299		65.8
	Birds and Eggs						702	2,179	23		1.2
	Vegetation							78	1		<1
2000-2001[b]	*All Resources*							*183,242*	*1,478*		*100*
	Fish						26,555	28,008	226		15.3
	Land Mammals						611	62,173	501		33.9
	Marine Mammals						31	87,930	709		48.0
	Birds and Eggs						1,215	5,124	41		2.8
	Vegetation							7	0		<1

Table 10: Nuiqsut Subsistence Harvests and Subsistence Activities

		Percentage of Households					Estimated Harvest				
Study Year	Resource	Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% Total Harvest

Notes: Blank cells indicate data not available

[a] Nuiqsut did not successfully harvest any bowhead whales in 1994

[b] The estimated harvest numbers for the1994-1995, 1995-1996, and 2000-2001 data were derived from summing individual species in each resource category. Total pounds were derived from conversion rates found at ADF&G (2011). For 1995-1996 and 2000-2001, total (usable) pounds for bowhead whales were calculated based on the method presented in SRB&A and ISER (1993b). These estimates do not account for whale girth and should be considered approximate; more exact methods for estimating total whale weights are available in George, Philo, Suydam, Carroll, and Albert (n.d.)

Sources: ADF&G 2011 (for 1985, 1993, 2003-2006); Fuller and George 1999 (for 1992); Brower and Opie 1997 (for 1994-1995); Bacon et al. 2009 (for 1995-1996 and 2000-2001)

Table 10 and Table 11 include harvest data from the NSB for the 1992, 1994-1995, 1995-1996, and 2000-2001 study years. Nuiqsut's total annual subsistence harvests ranged from 83,211 pounds in 1994-1995 to 267,818 pounds in 1993 (Table 10). The low harvest in 1994-1995 is primarily due to an unsuccessful bowhead whale hunt that year (Brower and Opie, 1997). The 1993 harvest of 742 pounds per capita of wild resources represents approximately two pounds per day per person in the community. In 1985 and 1994-1995, fish and land mammals accounted for the majority of Nuiqsut's subsistence harvest and marine mammals contributed a lower percentage. Other study years show a more even distribution of marine mammal, fish, and land mammal harvests. The importance of subsistence to Nuiqsut residents is reflected in the high participation rates in households that used (100 percent), harvested (90 percent), tried to harvest (94 percent), and shared (98 percent) subsistence resources in 1993 (Table 10). Caribou, whitefish, and bowhead whales contributed 89 percent of Nuiqsut's annual subsistence harvest in terms of edible pounds in 1993 (Table 11).

Table 11: Selected Nuiqsut Subsistence Harvests

		Estimated Harvest				
Study Year	Resource	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
1985	*Caribou*	*513*	*60,021*	*790*	*150*	*38*
	Whitefish	58,733	59,701	786	149	37
	Bowhead	0	7,458	98	19	5
	Geese	1,345	6,045	80	15	4
	Moose	13	6,650	88	17	4
	Seals	57	4,431	58	11	3
	Burbot	669	2,675	35	7	2
	Dolly Varden	1,083	3,060	40	8	2
	Grayling	4,055	3,650	48	9	2
1992	*Bowhead*	*2*	*48,715*	*464*	*117*	*32.4*
	Caribou	278	32,551	310	78	21.7
	Arctic cisco	22,391	22,391	213	54	14.9
	Brd. whitefish	6,248	15,621	149	37	10.4
	Moose	18	8,835	84	21	5.9

Table 11: Selected Nuiqsut Subsistence Harvests						
		Estimated Harvest				
Study Year	Resource	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
1993	*Caribou*	*672*	*82,169*	*903*	*228*	*31*
	Bowhead	3	76,906	845	213	29
	Whitefish	64,711	77,671	854	215	29
	Seals	109	8,310	91	23	3
	Grayling	4,515	4,063	45	11	2
	Moose	9	4,403	48	12	2
	Burbot	1,416	5,949	65	16	2
	Dolly Varden	618	1,748	19	5	1
	Geese	1,459	2,314	25	6	1
1994-1995[a]	*Brd. Whitefish*	*3,237*	*37,417*			*45.0*
	Caribou	258	30,186			36.3
	Arctic Cisco	9,842	6,889			8.3
	Moose	5	2,500			3.0
	Unk. Geese	474	2,133			2.6
	Ringed Seal	24	1,008			1.2
1995-1996[b]	*Bowhead*	*4*	*110,715*	*1,190*		*60.3*
	Caribou	362	42,354	455		23.1
	Brd. Whitefish	2,863	9,735	105		5.3
	Ringed Seal	155	6,527	70		3.6
	Arctic Cisco	5,030	3,521	38		1.9
	Bearded Seal	17	2,974	32		1.6
	Least Cisco	1,804	1,804	19		1.0
2000-2001[b]	*Bowhead*	*4*	*86,220*	*695*		*47.1*
	Caribou	496	57,985	468		31.6
	Arctic Cisco	18,222	12,755	103		7.0
	Brd. Whitefish	2,968	10,092	81		5.5
	White-fronted Geese	787	3,543	29		1.9
	Moose	6	3,000	24		1.6
2002-2003	*Caribou*[c]	*170*	*19,890*			
2003-2004	*Caribou*[c]	*309*	*36,153*			
2004-2005	*Caribou*[c]	*362*	*42,354*			
2005-2006	*Caribou*[c]	*295*	*34,515*			
2006-2007	*Caribou*[c]	*475*	*55,575*			

Table 11: Selected Nuiqsut Subsistence Harvests						
		Estimated Harvest				
Study Year	Resource	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest

Notes: Blank cells indicate data not available

[a] Nuiqsut did not successfully harvest any bowhead whales in 1994

[b] For 1995-1996 and 2000-2001, total pounds were derived from conversion rates found at ADF&G (2010). Total (usable) pounds for bowhead whales were calculated based on the method presented in SRB&A and ISER (1993b). These estimates do not account for whale girth and should be considered approximate; more exact methods for estimating total whale weights are available in George, Philo, Suydam, Carroll, and Albert (n.d.)

[c] For 2002-2003 through 2006-2007 caribou data, total pounds were derived from conversion rates found at ADF&G (2011)

Sources: ADF&G 2011 (for 1985, 1993, 2003-2006); Fuller and George 1999 (for 1992); Brower and Opie 1997 (for 1994-1995); Bacon et al. 2009 (for 1995-1996 and 2000-2001)

Table 12 and Table 13 provide all available years of Nuiqsut bowhead whale and caribou harvest data, showing number and edible pounds harvested. Annual harvests of caribou vary widely from year to year and depend on a range of factors, including environmental conditions (e.g., snow and ice conditions, water levels), the timing and route of the caribou migration, and the distribution of caribou within residents' usual hunting areas. For all available study years between 1985 and 2006-2007, Nuiqsut respondents harvested an average of 416 caribou annually, accounting for an average 44,887 edible pounds (Table 12). Per capita pounds are only available for some study years; the limited available data show Nuiqsut harvesting an average of 152 edible per capita pounds of caribou annually.

Table 12: Nuiqsut Caribou Harvests, All Available Study Years			
	Estimated Harvest		
Study Year	Number	Total Pounds	Per Capita Pounds
1985	513	60,021	150
1992	278	32,551	78
1993	672	82,169	228
1994-1995	258	30,186	
1995-1996	362	42,354	
2000-2001	496	57,985	
2002-2003	292	19,890	
2003-2004	429	36,153	
2004-2005	436	42,354	
2005-2006	362	34,515	
2006-2007	475	55,575	
Total	4,573	493,753	
Average	416	44,887	152

Sources: ADF&G 2011, Pedersen 2008, Fuller and George 1997, Brower and Hepa 1998, Bacon et al. 2009

Bowhead whale harvest numbers for Nuiqsut are available from 1973 through 2008 (Table 13). Edible pounds were calculated using bowhead whale lengths and the method provided in SRB&A and ISER (1993b). Kaktovik has harvested an average of 2.7 bowhead whales annually, providing an average of 68,506 edible pounds of meat and blubber per year. Using 2010 census data showing a population of 402 residents in 114 households, and an estimated 125,346 edible pounds of bowhead whale in 2010, Nuiqsut harvested 311 pounds of edible foods per capita in 2010, or 1,099 edible pounds per household. This is on the higher end of estimated mean household pounds and per capita pounds for years where community harvest data are available (Table 11).

Table 13: Nuiqsut Bowhead Whale Harvests, All Available Study Years

Year	Number	Total Edible Pounds
1973	1	12,861
1974	0	
1975	0	
1976	0	
1977	0	
1978	0	
1979	0	
1980	0	
1981	0	
1982	1	14,469
1983	0	
1984	0	
1985	0	
1986	1	32,979
1987	1	45,866
1988	0	
1989	2	78,845
1990	0	
1991	1	32,979
1992	2	46,699
1993	3	91,660
1994	0	
1995	4	110,715
1996	2	58,727
1997	3	74,967
1998	4	89,436
1999	3	120,000
2000	4	86,220
2001	3	87,159
2002	4	90,184
2003	4	55,597

Table 13: Nuiqsut Bowhead Whale Harvests, All Available Study Years

Year	Number	Total Edible Pounds
2004	3	65,131
2005	1	32,979
2006	4	76,762
2007	3	89,295
2008	4	69,736
2009	2	55,528
2010	4	125,346
Total	64	1,644,140
Average*	2.7	68,506

Notes: NA=Data Not Available; *Averages do not include unsuccessful harvest years.

Sources: Sources: Suydam and George n.d; Suydam, George, Hanns, and Sheffield n.d.; Suydam, George, Rosa, Person, Hanns, Sheffield n.d.; Suydam, George, Person, Hanns, and Sheffield n.d.; NSB 2010.

In 1992, marine resources provided over one third of the subsistence harvest (35.1 percent of the total harvest), largely due to a successful bowhead hunt at Cross Island (Table 10 and Table 11; Fuller and George 1999:82). Other harvested marine mammals included polar bear and bearded and ringed seals. Fish, including broad whitefish and least and Arctic cisco, comprised 34.6 percent of the total harvest for Nuiqsut in 1992 (Table 10 and Table 11). Approximately 28 percent of the total harvest in 1992 was land mammals, including caribou and moose. The harvest of birds, including geese and eiders, was approximately three percent of the total harvest in 1992. The highest Nuiqsut household participation rates were in fishing, caribou hunting, and moose and bear hunting (Fuller and George 1999:84).

More recent study years (1995-1996 and 2000-2001) show marine mammals and large land mammals accounting for the majority of Nuiqsut residents' subsistence harvests. In 1994-1995, when the community did not harvest a bowhead whale, fish constituted 56 percent of that year's total subsistence harvest; broad whitefish were harvested in higher quantities than caribou that year (Table 11). Commonly harvested species during all study years, in terms of their contribution toward the total subsistence harvest, included bowhead whale, caribou, broad whitefish, Arctic cisco, moose, seals, and geese (Table 11).

4.2.2.4 Contemporary Subsistence Use Areas

Nuiqsut is located approximately 16 "straight" miles from the Beaufort Sea coast on the Colville River. This is a prime hunting area for many species, many of which are migratory. Caribou pass through the area, and migratory waterfowl nest in the wet tundra areas near the river (IAI 1990:1-24). Several species of whitefish reside in the Colville River for part of their life cycle, migrating to and from other river drainages on the North Slope. In particular, the community of Nuiqsut relies heavily on the yearly migration of Arctic cisco from the Mackenzie River delta in Canada. Nuiqsut whaling is based from Cross Island, which is northeast of Prudhoe Bay and approximately 11 to 12 miles from shore. The following discussion focuses on resources harvested by Nuiqsut residents in or near the Point Thomson area or subsistence resources that migrate through the area and are later harvested by Nuiqsut residents. These resources include caribou, bowhead whales, seals, waterfowl, and fish. Nuiqsut lifetime and post-1970s use areas for all resources are shown on Figure 2. Nuiqsut residents reported traveling as far as

Barrow in the west and almost as far as Kaktovik in the east for subsistence purposes. A high number of overlapping use areas occur in the Colville River delta and along the Colville, Anaktuvuk, and Chandler rivers as well as in an overland area south and west of the community. Offshore hunting areas extend between Harrison Bay and Camden Bay.

Table 14 depicts the number of respondents reporting subsistence use areas for the "last 10 year" time period by coastal hunting area and resource during SRB&A mapping interviews in 2004, 2005, and 2006 (SRB&A 2010a). As shown in this table, the only resource for which more than 10 percent of Nuiqsut respondents reported use areas in the project vicinity (i.e., in the coastal or offshore area between Brownlow Point and Bullen Point) was bowhead whale. Twenty-one percent of Nuiqsut harvesters reported seal hunting use areas in the area west of Bullen Point to Prudhoe Bay.

Table 14: Number (%) of Nuiqsut Respondents Reporting 1996-2006 Use Areas* by Coastal Hunting Area

Resource Category	Number (%) of Respondents Reported Subsistence Use Areas: Bullen Pt. to Prudhoe Bay	Number (%) of Respondents Reported Subsistence Use Areas: Brownlow Pt. to Bullen Pt.
Caribou	2 (6%)	0
Seals	7 (21%)	3 (9%)
Bowhead Whales	19 (58%)	15 (45%)
Walrus	1 (3%)	0
Furbearers	2 (6%)	0
Waterfowl	3 (9%)	2 (6%)
All Resources	19 (58%)	15 (45%)

Notes: Total Number of Nuiqsut Active Harvester Respondents: 33.

* Number of respondents represents the number who reported using an area at least once during the 1995-2006

Source: SRB&A 2010a

Table 15 depicts the number of respondents reporting bowhead whale subsistence use areas for both a 10 year (1996-2006) and 12 month time period (2003-2004, 2004-2005, or 2005-2006). These data show that the majority of active bowhead whale hunter respondents reported subsistence use areas offshore from the Point Thomson Project Area within the 10 year time frame. In addition, 75 percent of those active bowhead whale hunters reported traveling offshore from the Brownlow Point to Bullen Point within a 12 month time frame.

Table 15: Number (%) of Nuiqsut Bowhead Whale Hunter Respondents Reporting Bowhead Whale Use Areas* by Coastal Hunting Area

	Bowhead Whale Hunter Respondents	Number (%) of Bowhead Whale Hunter Respondents Who Reported Subsistence Use Areas: Bullen Pt. to Prudhoe Bay	Number (%) of Bowhead Whale Hunter Respondents Who Reported Subsistence Use Areas: Brownlow Pt. to Bullen Pt.
10 Year (1995-2006) Respondents	19	19 (100%)	15 (79%)
12 Month (2003-2004, 2004-2005, or 2005-2006) Respondents	12	12 (100%)	9 (75%)

Notes: The total number of Nuiqsut respondents interviewed for all resources=33.

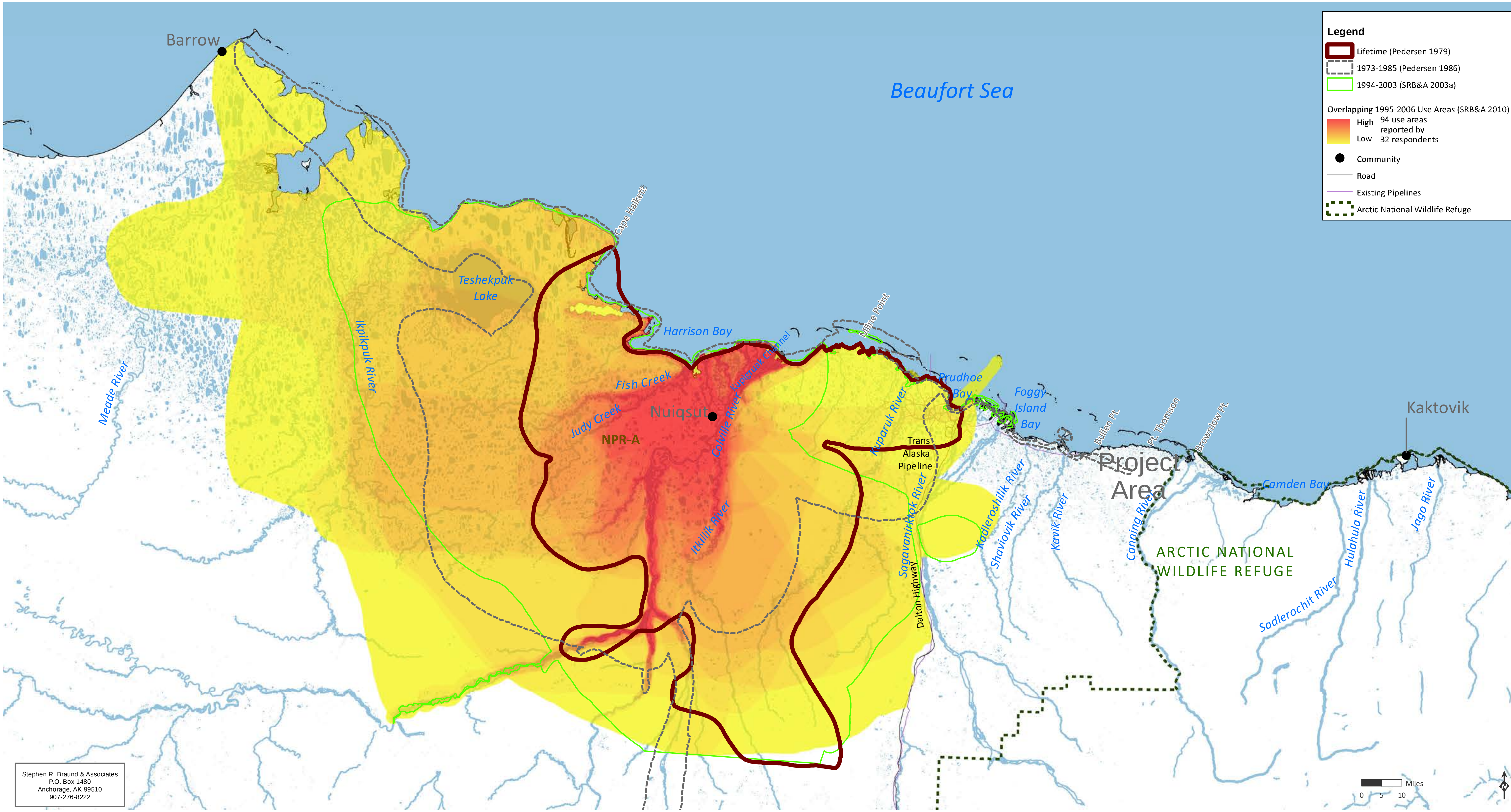
* Number of respondents represents the number who reported using an area at least once during the 10 Year or 12 Month time periods

Source: (SRB&A 2010a)

Caribou

As described above, caribou are an important migratory resource that consistently ranks among the top two resources harvested by Nuiqsut residents. Although Nuiqsut's most recent (1995-2006) caribou use areas depicted on Figure 30 do not extend as far east as Point Thomson, caribou that migrate through the Point Thomson area may later be harvested by Nuiqsut hunters. Furthermore, as discussed below under "Traditional Knowledge," Nuiqsut residents have expressed several concerns over potential impacts to caribou from the Point Thomson project that they believe will affect Nuiqsut caribou harvesters. Nuiqsut 1995-2006 caribou use areas extend from the Beaufort Sea coast south to the foothills of the Brooks Range and from the Sagavanirktok River and Prudhoe Bay in the east to Barrow and Atqasuk to the west. Areas with a high number of overlapping use areas occur primarily along the Colville, Itkillik, Chandler, Anaktuvuk, and Kikiakrorak rivers; along the coast between Atigaru Point and Oliktok Point; and in an overland area surrounding Fish Creek, Judy Creek, and Colville River to the west, and the Colville and Itkillik rivers to the east. Other mapped data shown on Figure 30 depict lifetime, 1973-1985, and 1994-2003 use areas for caribou. As discussed in Section 4.1.2, the "lifetime" data represent community-based subsistence activities rather than residents' activities during periods of nomadism, and therefore, for Nuiqsut, the "lifetime to 1979" use area likely represents residents' activities since the establishment of the community in 1973 (i.e., 1973-1979). Lifetime and 1994-2003 caribou use areas are similar to the areas with the high number of overlapping 1995-2006 use areas. The 1973-1985 caribou use areas also match the high overlapping 1995-2006 use areas in addition to extending further south and east, with a small portion of the caribou use area extending into the Point Thomson project area.

Residents hunt caribou both by boat during the summer and fall and by snowmachine during the winter and spring. The majority of winter hunting occurs west of the community toward Fish Creek and south toward the foothills of the Brooks Range. During the summer and fall, hunters travel by boat both along the coast and inland along various rivers. A few residents also reported hunting substantial distances east and west of the community, although several people commented that hunting has declined east of the community due to activities associated with oil and gas development (SRB&A 2010a).



POINT THOMSON PROJECT EIS

Figure # 30

Nuiqsut Lifetime and Post-1970s Caribou Use Areas

The 1973-1985 use areas extend south along the Anaktuvuk River to Anaktuvuk Pass.

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Pedersen 1979, Pedersen 1986, SRB&A 2003a, SRB&A 2010

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Marine Mammals

The community of Nuiqsut is not situated in a location conducive to accessing bowhead whales and, as a result, Nuiqsut whaling crews travel approximately 74 miles east of their community to Cross Island each fall and use the island as a base for all bowhead whale hunting activities. From Cross Island, residents travel long distances in search of bowhead whales. Figure 31 shows 1995-2006 bowhead whale use areas as reported by Nuiqsut respondents as well as lifetime bowhead whale use areas. Figure 32 depicts Cross Island bowhead whaling tracks from 2001-2009. These tracks were recorded by participating whaling crews using Geographic Positioning System (GPS) units for an ongoing MMS funded subsistence bowhead whaling study and represent actual boat hunting routes taken by whaling crews during each study year. The 1995-2006 use areas extend almost as far west as Thetis Island and as far east as Camden Bay, and the lifetime use areas extend between the Colville River delta and Barter Island. A high number of overlapping bowhead whale use areas occur offshore from Cross Island up to 30 miles and east of Cross Island as far as Flaxman Island. Nuiqsut 2001-2009 bowhead whale hunting GPS tracks (Figure 32) extend as far east as Flaxman Island and over 30 miles offshore from Cross Island. Bowhead whale hunting activities occur almost solely during the month of September (SRB&A 2010a). Hunters search for bowhead whales as they travel from east to west along the Beaufort Sea during the species fall migration. Their hunting area is highly influenced by weather and ice conditions; during years when hunters are blocked by ice, they are either forced to stay on Cross Island and wait for the ice to recede or, if possible, they travel east or west of the island, staying close to shore and sometimes traveling inside the barrier islands. During interviews with Nuiqsut harvesters for an MMS-funded subsistence mapping project (SRB&A 2010a), several hunters noted that ice conditions had altered whaling crews' hunting areas during certain years. Other factors affecting yearly bowhead whale harvest success include year-to-year variability in weather and ocean conditions, whale distribution and abundance, and effects from human activities(SRB&A 2010a; Galginaitis 2006, 2008a, 2008b, 2009a, 2009b, 2009c, and 2010; Galginaitis and Funk 2004a, 2004b, 2004c, and 2005). Nuiqsut bowhead whale hunters have reported impacts on bowhead whale hunting success related to industrial activities such as barges and seismic activities (Pedersen et al. 2000, Long 1996).

Between June and September, Nuiqsut residents travel in an offshore area between Cape Halkett and Camden Bay to hunt bearded and ringed seals. The extent of Nuiqsut seal hunting activities from east to west are similar for each period depicted on Figure 33; however, contemporary seal use areas extend somewhat farther offshore than historic seal use areas. The majority of seal hunting activities, as shown in terms of overlapping seal use areas on Figure 33, occur offshore from the Colville River delta between Atigaru Point and Thetis Island and between 20 and 25 miles from shore. In addition, some hunters reported harvesting seals for food while hunting bowhead whales at Cross Island.

Fish

Although Nuiqsut residents do not travel east of the Colville River delta to harvest Arctic cisco, they rely on the yearly migration of these fish along the Beaufort Sea coast from the Mackenzie River delta in Canada. The size of the Arctic cisco migration can heavily affect the amount of subsistence foods available to Nuiqsut residents from year to year. Figure 34 shows Nuiqsut 1995-2006 Arctic cisco use areas occurring primarily in the west (Nigliq) and east channels of the Colville River delta; also shown on Figure 34 is the general migration route taken by juvenile Arctic cisco between the Mackenzie River delta and Colville River delta after they are hatched (ABR, Inc., Sigma Plus, Statistical Consulting Services, Stephen R. Braund & Associates, and Kuukpik Subsistence Oversight Panel, Inc., 2007). After they hatch in the Mackenzie River delta, young Arctic cisco are carried by river currents into the ocean; the strength and direction of the winds at that time determine their next destination. With a strong east wind, some of these Arctic cisco are carried through nearshore waters as far west as the Colville River. They spend the next six to eight years wintering in the Colville River delta and feeding in the summer months in nearshore waters off of the river delta.

Once reaching maturity, the Arctic cisco migrate back to the Mackenzie River delta, spawn, and remain for the rest of their lives. Concerns about an overall decline in the number of Arctic cisco in the Colville River delta, as well as several years of particularly low Arctic cisco harvests by Nuiqsut residents in the early 2000s led to a MMS funded study, which incorporated the traditional knowledge of a Nuiqsut panel of Arctic cisco experts, to analyze variation in the abundance of Arctic cisco in the Colville River. Nuiqsut residents were particularly concerned about a possible connection between increasing oil and gas development in the area and the decline in Arctic cisco.

Other important fish harvested by Nuiqsut residents include broad whitefish, burbot, and Dolly Varden. Fish use areas, other than for Arctic cisco, are shown on Figure 35 for multiple study years. This figure depicts the majority of Nuiqsut's fish use areas, which are concentrated within the Colville River with additional use in the Itkillik River, Fish and Judy creeks, and coastal areas towards Prudhoe Bay.

Waterfowl

Nuiqsut lifetime and contemporary wildfowl use areas are depicted on Figure 36. The lifetime data include use areas for non-waterfowl birds such as ptarmigan, while the 1995-2006 data include only geese and eiders. Nuiqsut residents hunt waterfowl at various locations around nearby lakes and rivers, as well as substantial offshore distances. A couple of individuals also reported hunting waterfowl from Cross Island during the bowhead whale hunting season. However, this is not a common occurrence. For the 1995-2006 period, a high number of overlapping use areas were reported offshore from the Colville River up to 10 miles, extending east to Thetis Island, and around Colville River and Fish Creek. Goose hunting occurs almost exclusively around lakes and river drainages during the month of May, whereas the majority of eider hunting occurs offshore while residents are in boats looking for seals during the summer months of June, July, and August.

Other Resources

Nuiqsut residents also harvest a variety of other resources including moose, brown bear, polar bear, furbearers, and berries and plants. The use areas for these resources are depicted on Figures 37 through 41. As shown in the figures, these use areas are not concentrated near the Point Thomson project area.

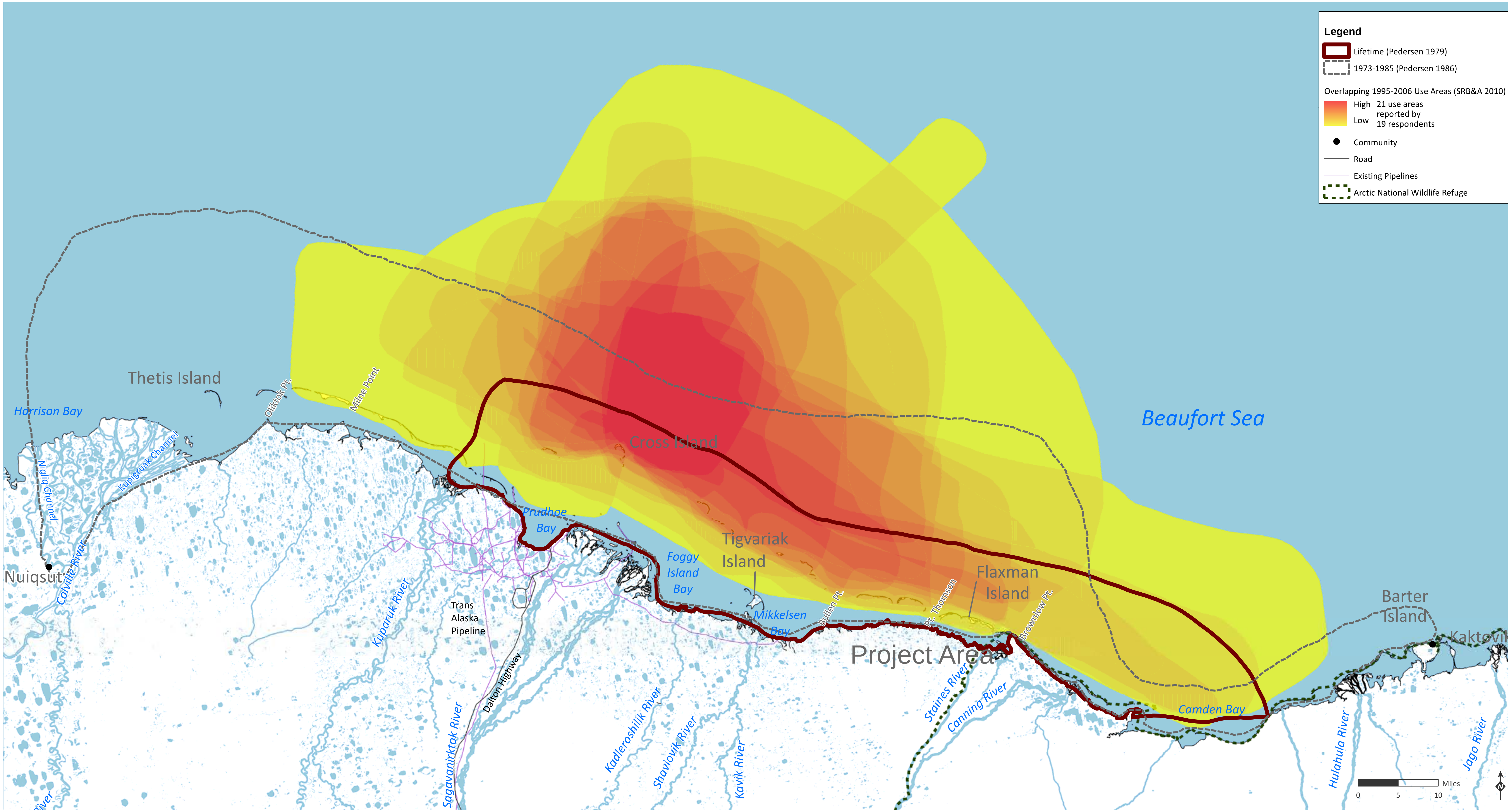

Figure # 31

Nuiqsut Lifetime, 1973-1985, and 1995-2006 Bowhead Whale Use Areas

POINT THOMSON PROJECT EIS

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Pedersen 1979, Pedersen 1986, SRB&A 2010

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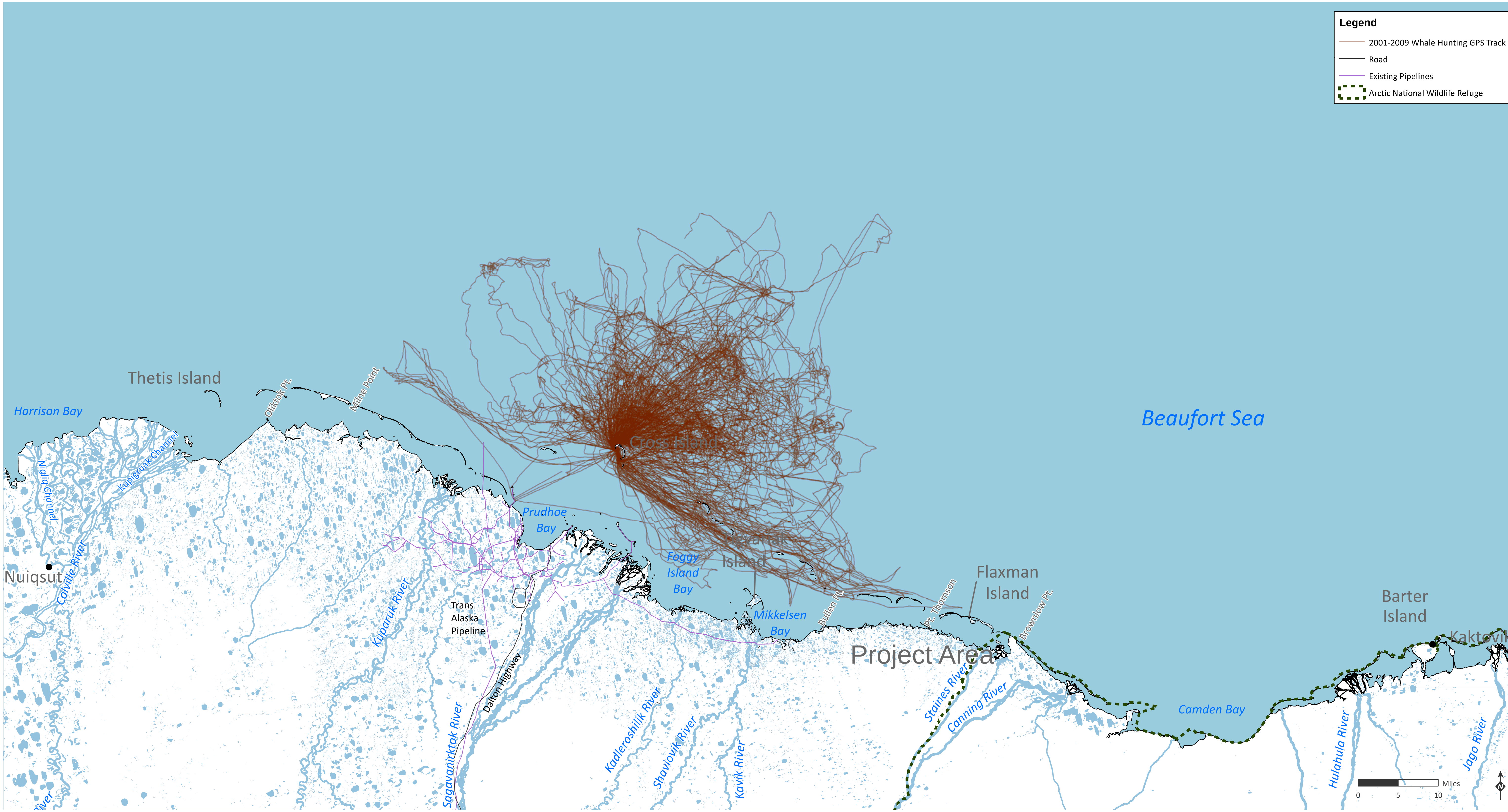

Figure # 32

Cross Island Bowhead Whale Hunting GPS Tracks, 2001-2009

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Galginaitis 2006, 2008a, b, 2009a, b, c, 2010, Galginaitis and Funk 2004a, b, c, 2005.

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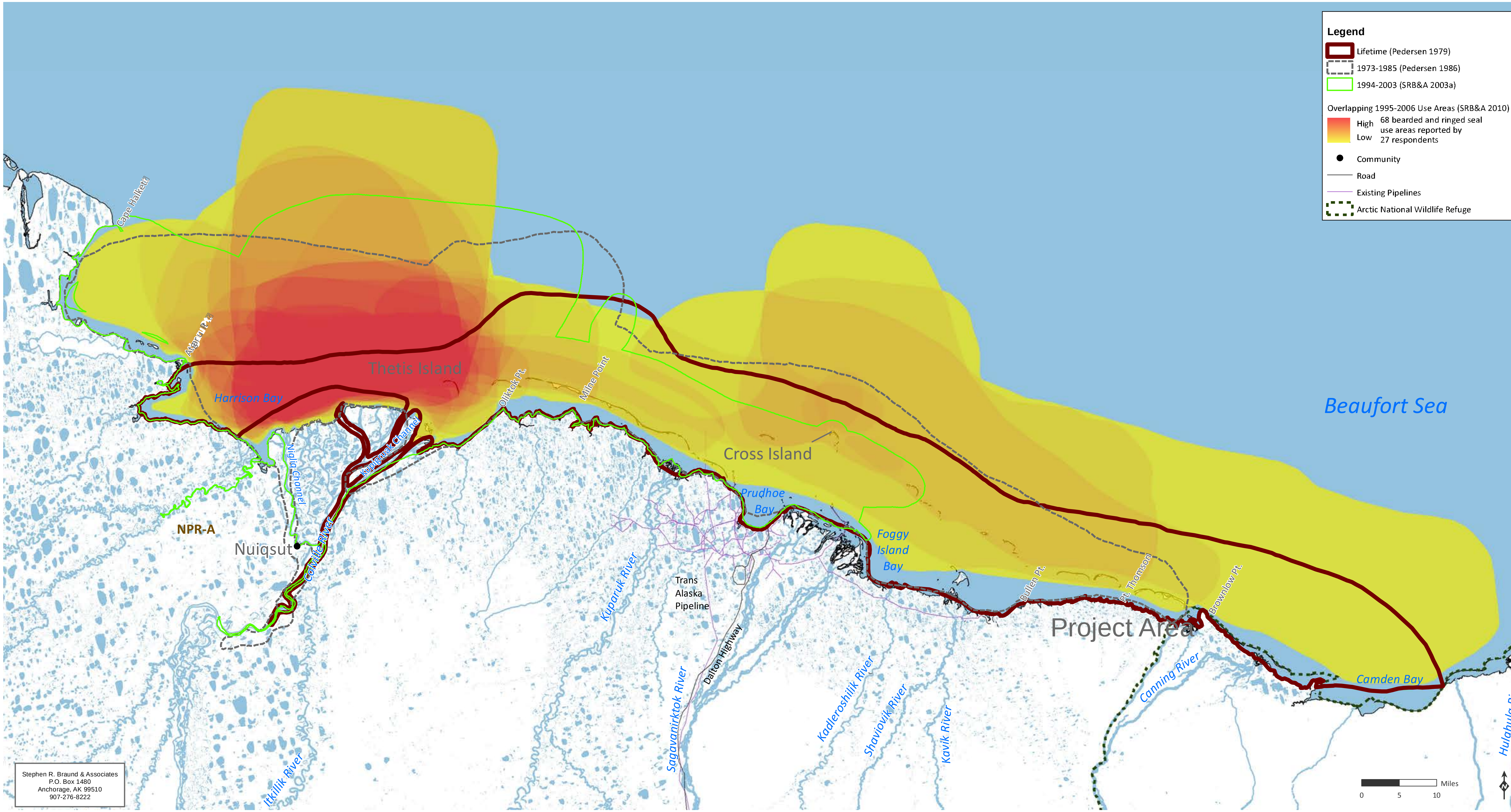

ARCTIC NATIONAL WILDLIFE REFUGE

Dalton Highway

Figure # 33

Nuiqsut Lifetime and Post-1970s Seal Use Areas

POINT THOMSON PROJECT EIS

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Pedersen 1979, Pedersen 1986, SRB&A 2003a, SRB&A 2010

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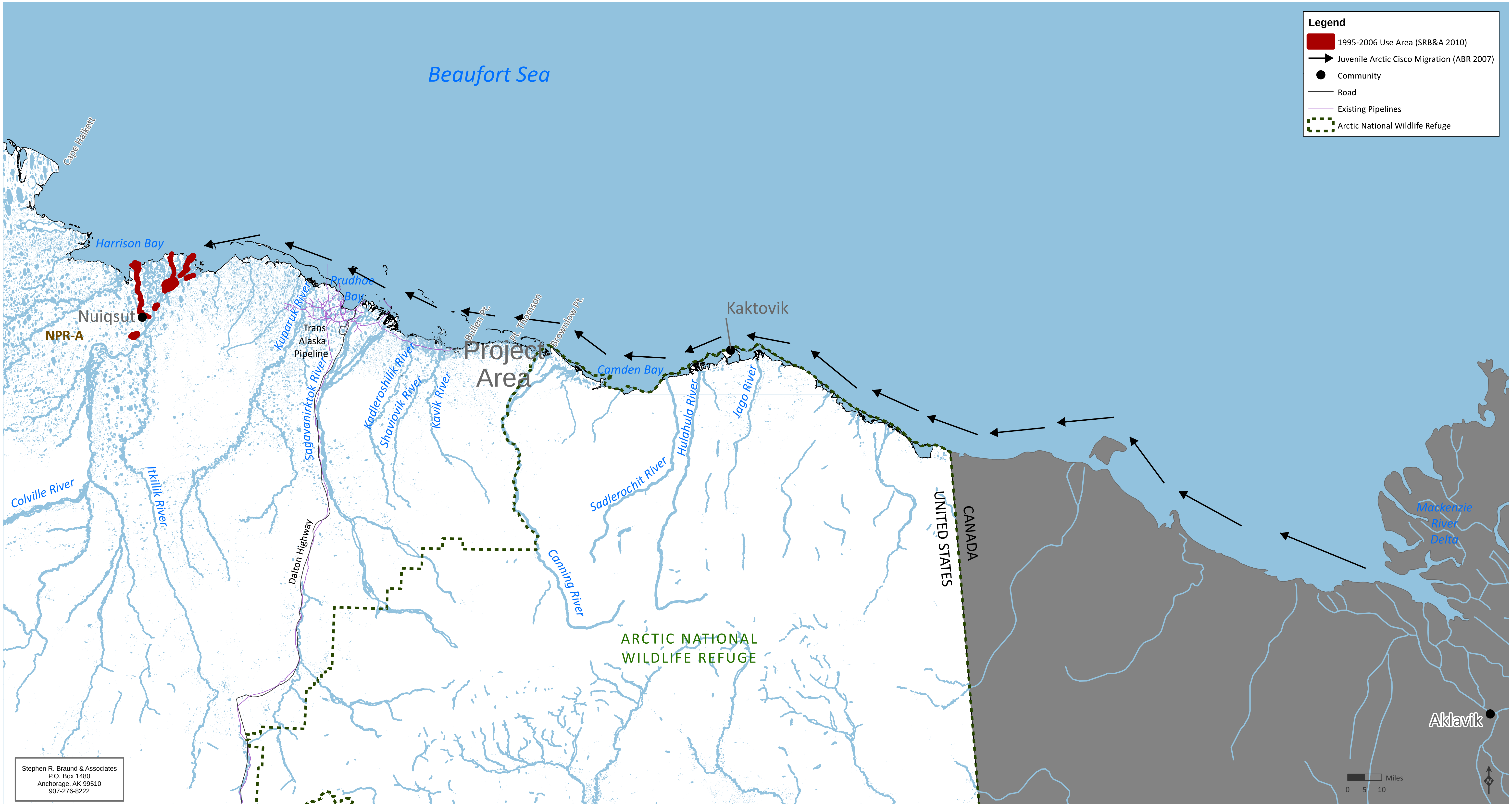

Figure # 34

Nuiqsut 1995-2006 Arctic Cisco Use Areas

POINT THOMSON PROJECT EIS

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: ABR 2007, SRB&A 2010

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Traditional Knowledge

Nuiqsut traditional knowledge related to the Point Thomson project is available from a December 2002 Point Thomson EIS meeting on caribou for a previous Point Thomson EIS effort. Although the meeting was for an earlier Point Thomson EIS effort, residents' comments pertained to aspects of the previous Point Thomson project that are still applicable, such as pipelines, traffic, and other development activities and infrastructure. A Nuiqsut representative present at the 2002 meeting provided knowledge about caribou habitat and movement, as well as key Nuiqsut issues and concerns regarding the Point Thomson project. In addition to information from the 2002 meeting, this section summarizes testimony during a January 13, 2010 public scoping meeting in Nuiqsut (Appendix C). The following is a summary of the primary Nuiqsut comments made during the caribou meeting in 2002 and during the more recent public scoping meeting in Nuiqsut.

During the 2002 meeting on caribou, the Nuiqsut representative noted the following concerns and observations:

- Pipeline height is a major concern as it could block the caribou from accessing the coast for insect relief and further alter caribou movement.
- Caribou are deterred by the shiny coating on pipelines.
- Caribou will sometimes pass through development areas (e.g., over roads and under pipelines), seemingly without being affected. However, this is only when it is necessary for their survival such as during the insect relief season. Monitoring activities should take these factors into account.
- The caribou that congregate around development areas are unhealthy and skinnier than other caribou. Residents have been catching caribou that have cysts on their organs and pale meat.
- Predators such as wolves have been observed using the pipelines to herd and kill caribou.
- The Nuiqsut representative also brought up concerns about the potential effects of Point Thomson development activities on bowhead whales, noting that seismic activity in Camden Bay once diverted the whales from shore and forced Nuiqsut whale hunters to travel farther than usual.
- Suggestions for the Point Thomson project included the following:
- There should be increased restrictions to oil and gas activities during the calving period.
- There needs to be effective restrictions and enforcement of restrictions in place for both oil companies and contractors.
- There should be a limit on the number of flights allowed. Air traffic disrupts residents' caribou hunting activities. Residents of Nuiqsut were promised that flights to and from Alpine would be limited, but the limits are frequently exceeded; residents are concerned that similar problems will arise with the Point Thomson project.
- The pipeline should be placed at an adequate distance from a road. The combination of the road and the pipeline causes more disruptions to the caribou herd and results in more traffic.
- In addition to providing suggestions for the Point Thomson project, the Nuiqsut representative voiced the following concerns related to the Point Thomson project as proposed during previous EIS efforts:
- There are certain areas where Nuiqsut residents have had difficulty navigating through areas with pipelines on their snowmachines, causing them to travel farther than necessary in order to reach their final destination.

- While burying the pipeline would benefit hunters and wildlife in terms of access, residents also have concerns about an underground oil spill. If the pipeline is buried, it should be structurally sound.
- The proximity of the Point Thomson project to the water is cause for great concern regarding the possibility of an oil spill. There should be a strict monitoring system in place to detect oil spills immediately.
- A buffer zone for hunters, while necessary to protect the pipeline from bullets, will reduce residents' hunting area. Even without a hunting buffer, hunters tend to avoid areas of development for fear of hitting a pipeline or because of difficulties accessing traditionally used areas. Traditional hunting grounds have been lost due to development.
- The cumulative effects of oil and gas development on air quality should be considered. Permits often only consider the emissions from one activity; if all of the activities were combined into one permit they would not meet air quality requirements.
- Any dredging offshore could affect fish and marine mammals. Furthermore, erosion could cause structural damage to a coastal pipeline, resulting in oil seeping into the ocean.
- Disruptions to residents' subsistence activities result in negative social effects.

During the 2010 public scoping meeting in Nuiqsut, residents' testimony pertained primarily to concerns about impacts on the health and availability of caribou, concerns about impacts on bowhead whales and marine mammals related to drilling activities, the proximity of project infrastructure to shore and potential impacts on the offshore environment related to damage from erosion, and impacts on Arctic cisco migrating through the project area to the Colville River (Appendix B).

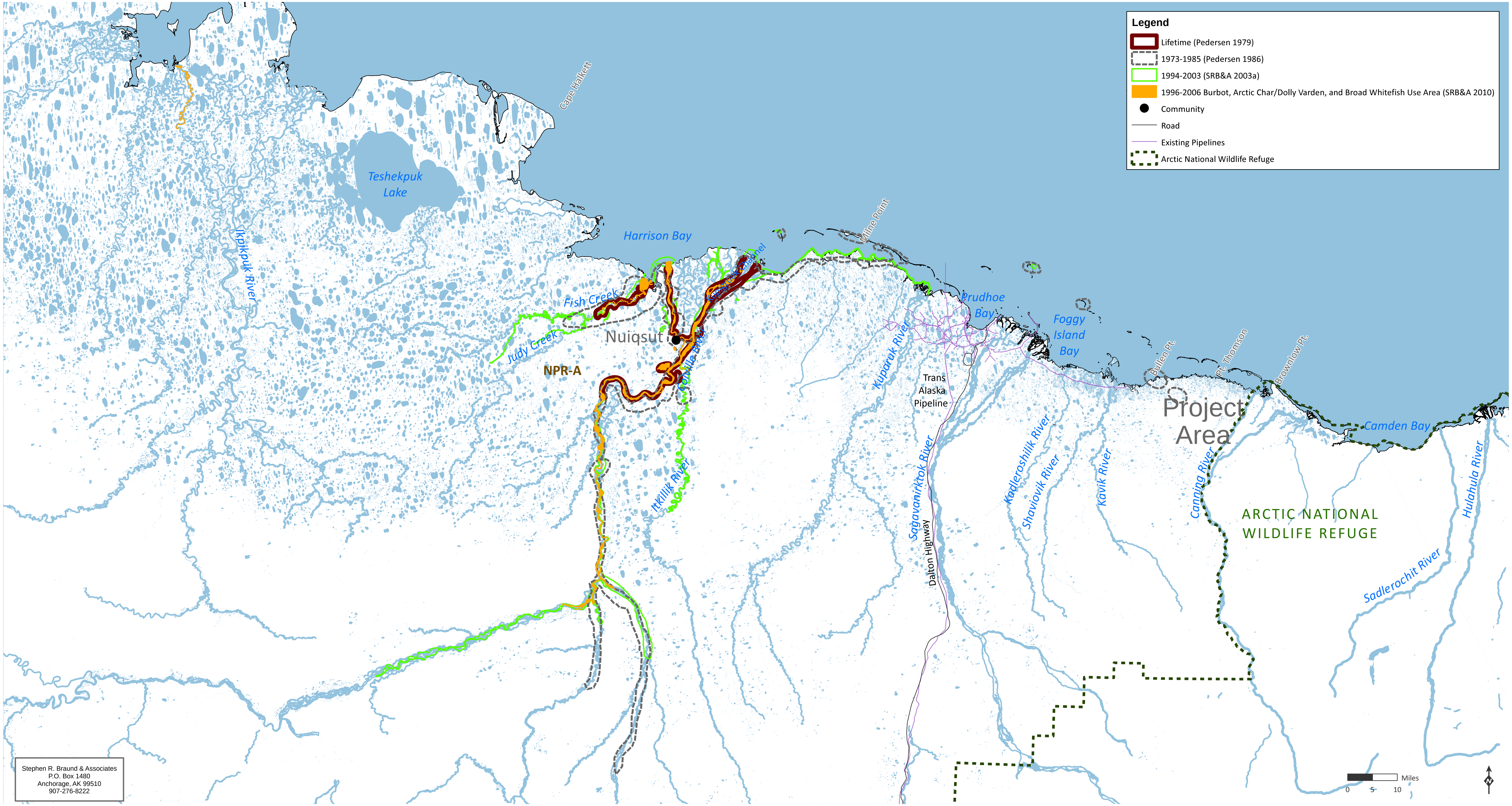

Figure # 35

Nuiqsut Lifetime and Post-1970s Fish Use Areas

POINT THOMSON PROJECT EIS

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Pedersen 1979, Pedersen 1986, SRB&A 2003a, SRB&A 2010

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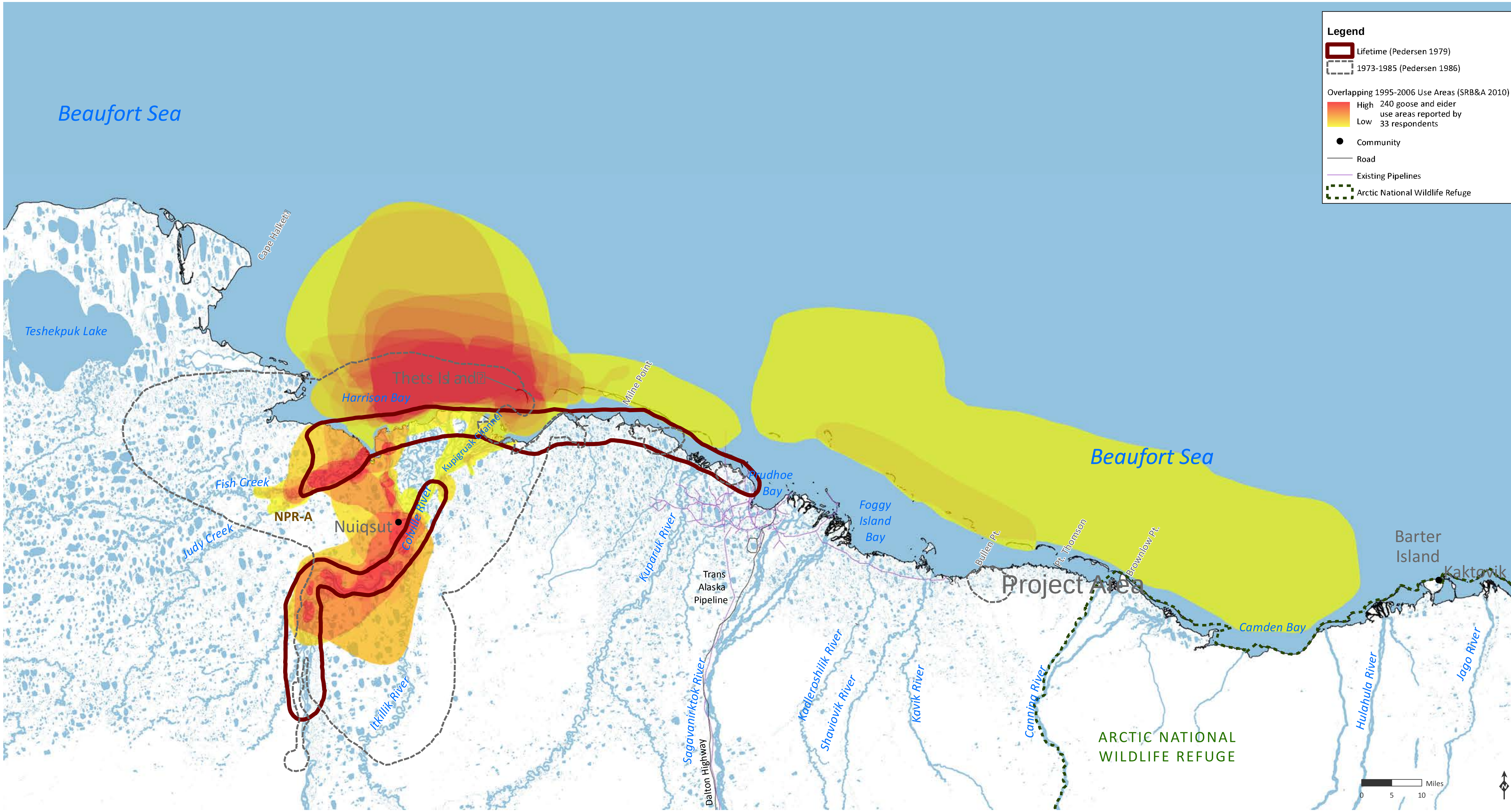

Figure # 36

Nuiqsut Lifetime, 1973-1985, and 1995-2006 Wildfowl Use Areas

POINT THOMSON PROJECT EIS

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Pedersen 1979, Pedersen 1986, SRB&A 2010

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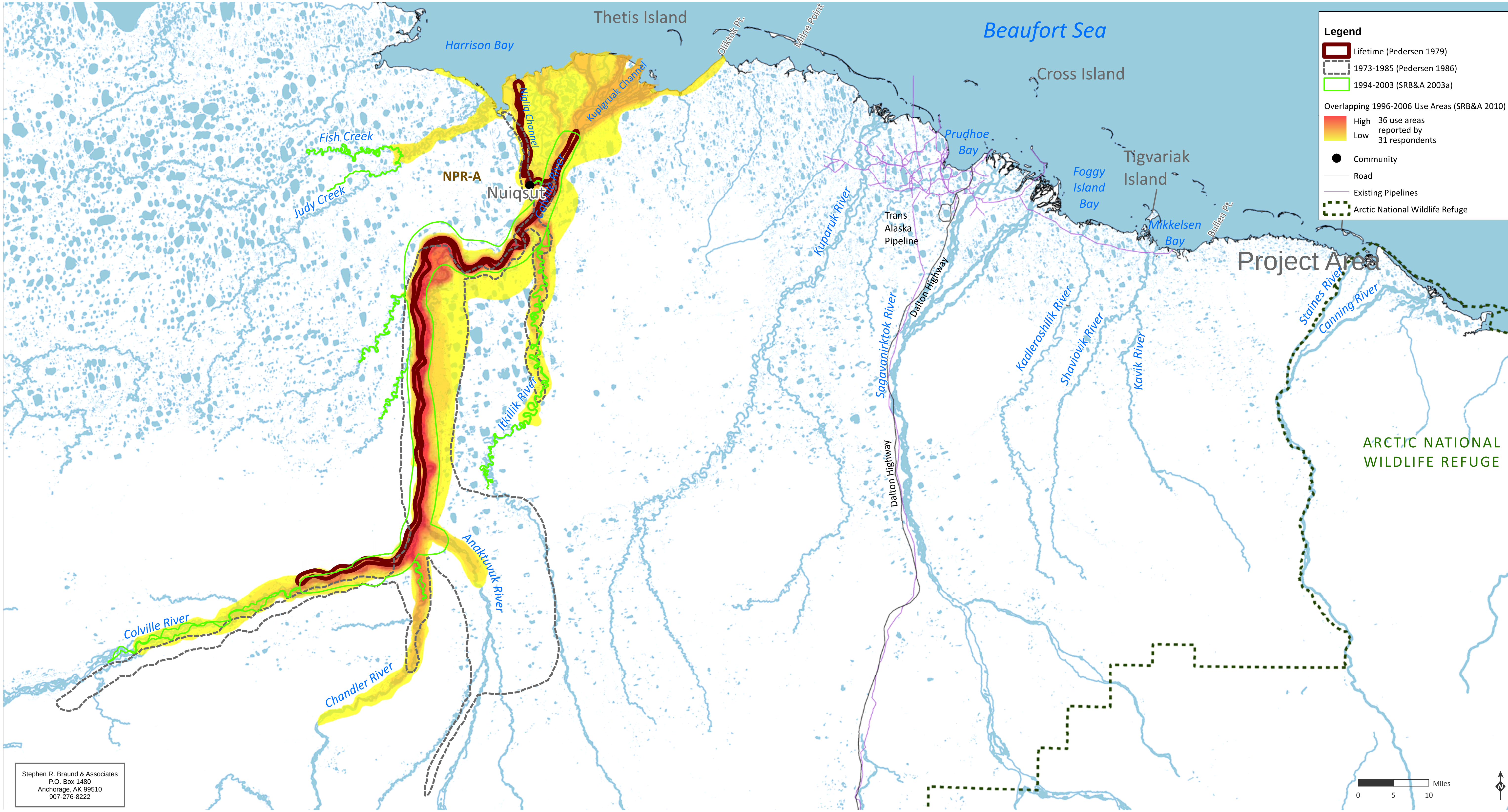

POINT THOMSON PROJECT EIS

Figure # 37

Nuiqsut Lifetime and Post-1970s Moose Use Areas

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Pedersen 1979, Pedersen 1986, SRB&A 2003a, SRB&A 2010

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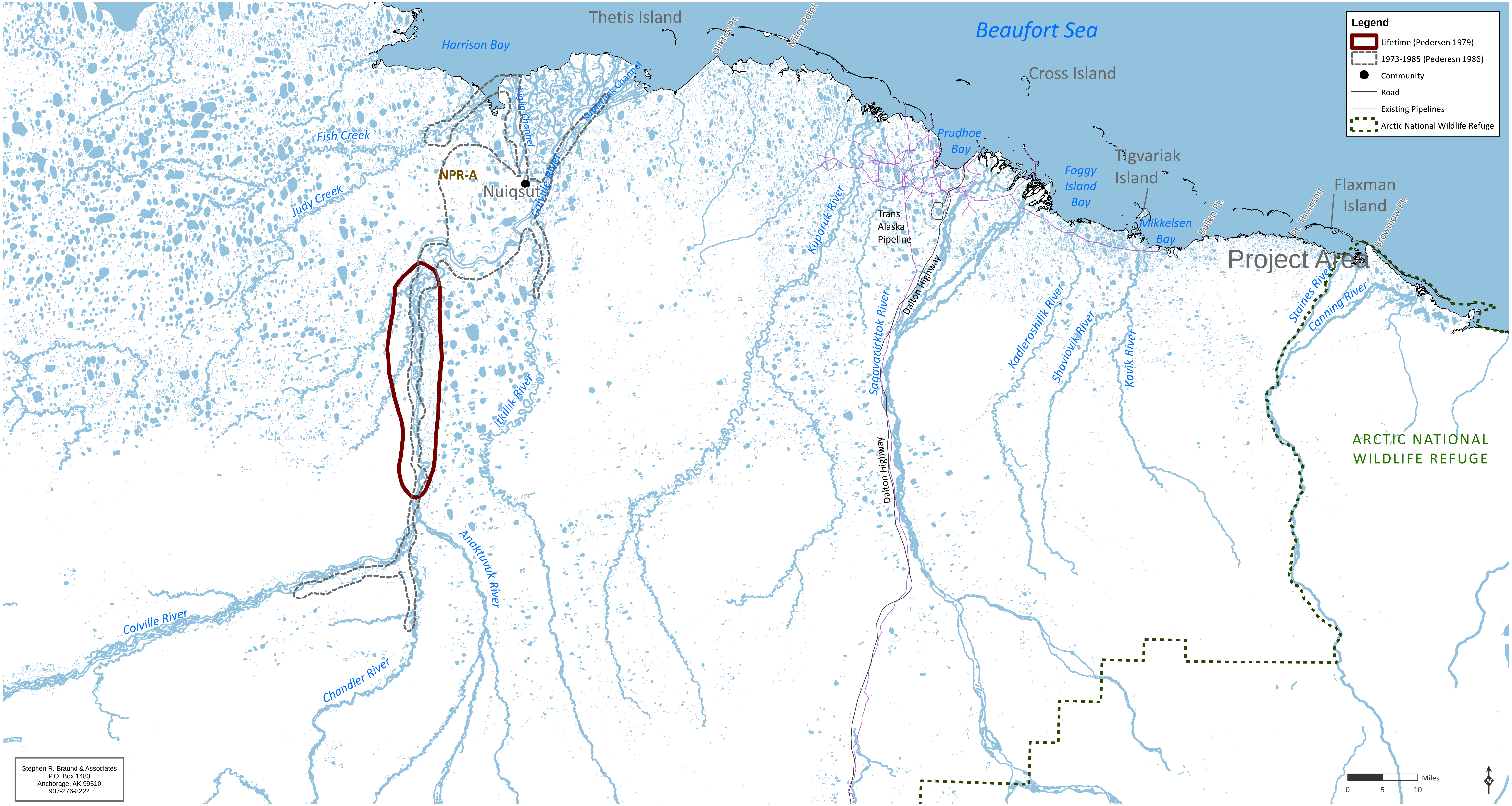

POINT THOMSON PROJECT EIS

Figure # 38

Nuiqsut Lifetime and 1973-1985 Brown Bear Use Areas

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Pedersen 1979, Pedersen 1986

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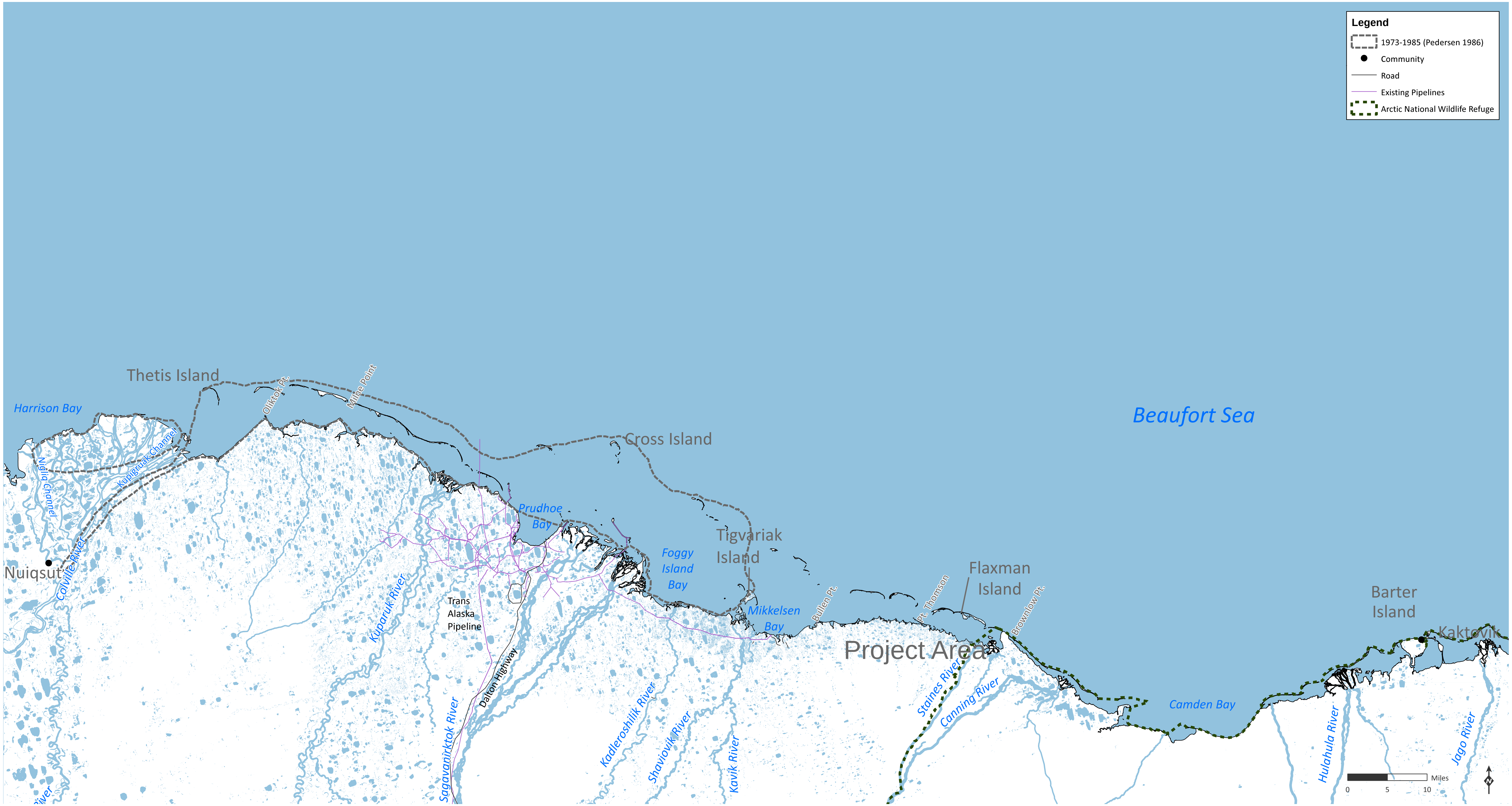

Figure # 39

Nuiqsut 1973-1985 Polar Bear Use Areas

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Pedersen 1986

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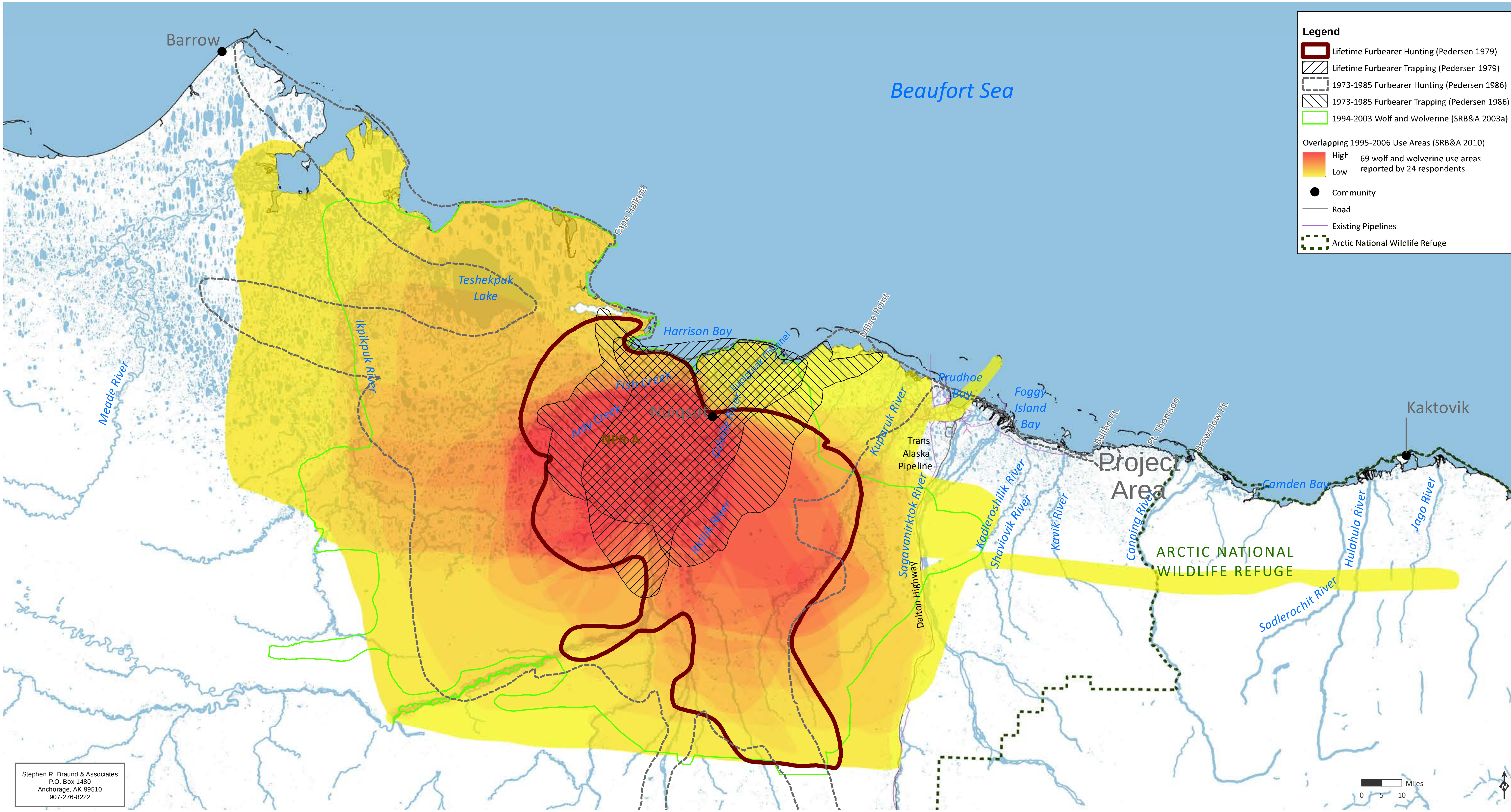

Figure # 40

Nuiqsut Lifetime and Post-1970s Furbearer Use Areas

The 1973-1985 furbearer hunting use areas extend south along the Anaktuvuk River to Anaktuvuk Pass and along the Kuparuk River to the Dalton Highway.

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Pedersen 1979, Pedersen 1986, SRB&A 2003a, SRB&A 2010

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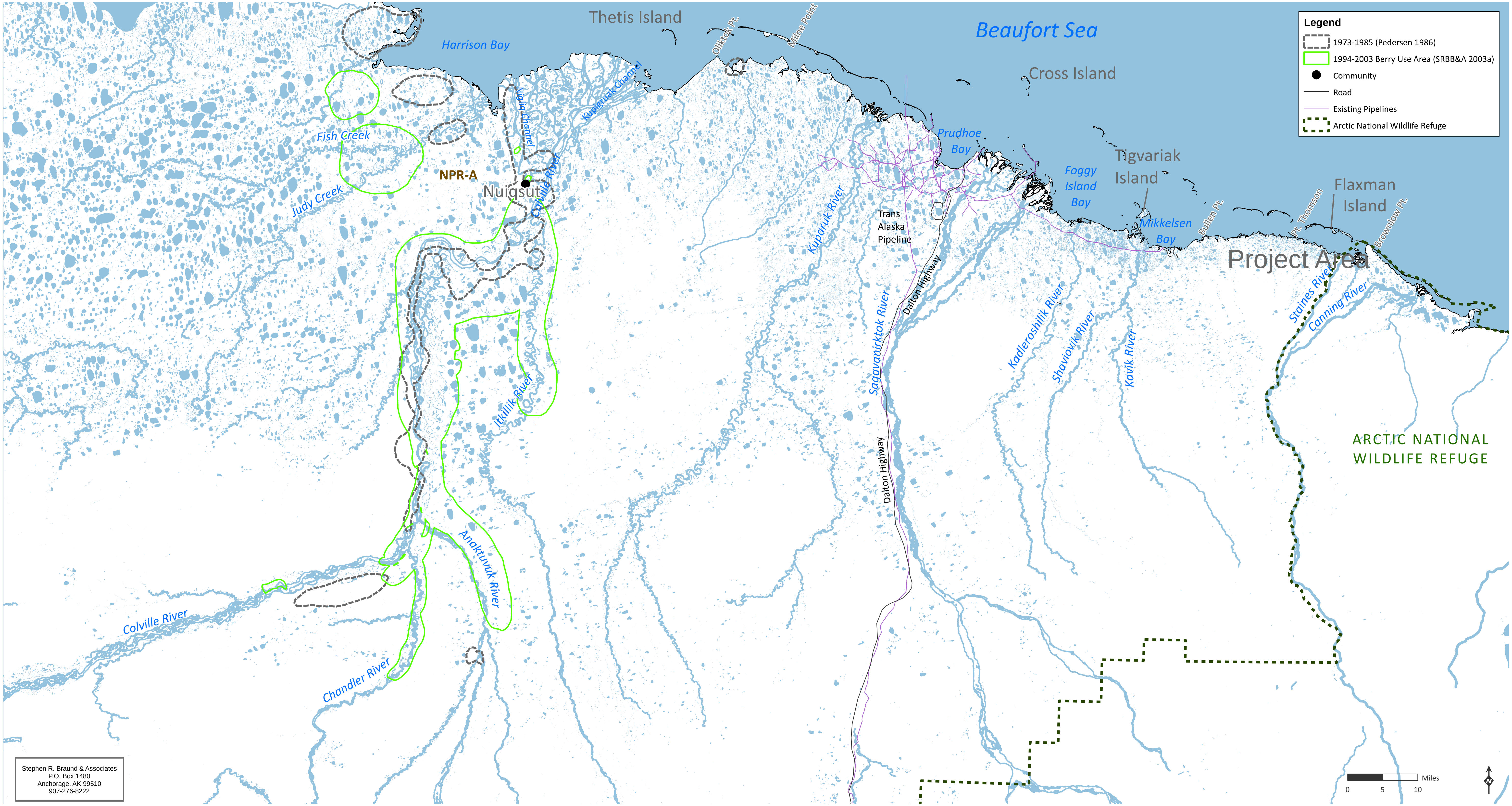

Figure # 41

Nuiqsut 1973-1985 and 1994-2003 Vegetation Use Areas

POINT THOMSON PROJECT EIS

Date: 6 June 2011
Map Author: Stephen R. Braund & Associates
Sources: Pedersen 1986, SRB&A 2003a

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Anaktuvuk Pass

This section provides a brief description of Anaktuvuk Pass subsistence use patterns as Nuiqsut and Kaktovik residents share subsistence resources harvested in the Point Thomson area with Anaktuvuk Pass residents. Because Anaktuvuk Pass residents do not directly harvest subsistence resources in the project area, the following description does not include that community's subsistence use areas, seasonal round, and subsistence harvest information.

The community of Anaktuvuk Pass is located in a major pass in the Brooks Range just south of the continental divide. The Anaktuvuk and John rivers flow north and south from the divide, respectively, with Anaktuvuk River emptying into the Colville River, and John River flowing to the Koyukuk River (Hall, Gerlach, and Blackman 1985). The people of Anaktuvuk Pass are inland Iñupiat known as the Nunamiut, meaning "people of the land" (Rausch 1988). Historically, the Nunamiut were nomadic caribou hunters whose primary hunting grounds were located in the Brooks Range. The Nunamiut consisted of multiple bands that moved through the river valleys seasonally. They relied heavily on the predictable spring and fall migration of caribou through the mountain passes of the Brooks Range.

The late 1800s and early 1900s brought major changes for the Nunamiut, with low caribou populations in the Brooks Range forcing families to travel eastward to Canada, where the caribou were still abundant, or northward to the coast, where the presence of whaling fleets provided the opportunity for jobs (North Slope Borough, n.d.). In addition to the migration of the Nunamiut out of the Brooks Range, disease (introduced by whalers) and famine led to an overall decline in the population of the Nunamiut. The early 1900s saw the rise of the fur trapping industry, which the Nunamiut engaged in while remaining primarily along the Beaufort Sea coast. When the fur industry collapsed, a number of Nunamiut families chose to return to their traditional hunting grounds in the Brooks Range. They continued their nomadic way of life well into the 1950s. In 1949, Nunamiut families from seasonal camps at Killik River and Chandler Lake joined those at Tulugak Lake, near the present day location of Anaktuvuk Pass (Rausch 1988). A post office was established at the summit of the pass in 1951, and by the mid 1950s, families were using this location as base camp and began building semi permanent structures such as log cabins, sod houses, and wall tents (North Slope Borough n.d.).

Today, the community of Anaktuvuk Pass is the only remaining settlement of Nunamiut Iñupiat. The population has remained relatively steady in recent years, with 282 residents reported during the 2000 census (U.S. Census Bureau 2010), and an estimated 287 residents in 2009 (ADOLWD 2010). Residents continue to engage in year-round subsistence activities while also participating in the local workforce. Major employers are the NSB, NSB school district, and the village corporation (Nunamiut Iñupiat Corporation) (URS Corporation 2005).

4.2.2.5 Role and Importance of Subsistence Resources

Caribou is a major source of food for the community of Anaktuvuk Pass and is the primary focus of subsistence users (Fuller and George 1997). In addition, residents rely heavily on other terrestrial mammals including Dall sheep, moose, and to a lesser extent, bear. During the winter months, hunting and trapping of furbearing animals such as wolf and wolverine is a common activity. The primary fish harvested by Anaktuvuk Pass residents are Dolly Varden, lake trout, and grayling (Bacon et al., 2009). Hunting of waterfowl such as ducks and geese is not as common as in other North Slope communities, primarily due to its inland location. Residents also harvest berries and plants such as *masu* (wild potato). Because of their inland location, Anaktuvuk Pass residents do not regularly hunt marine mammals.

However, sharing between Anaktuvuk Pass and coastal villages is common, with residents regularly trading dried caribou meat for marine mammal products such as *maktak* (Bacon et al. 2009). During interviews with Kaktovik hunters in 2003 (SRB&A 2003b), one bowhead whale hunter noted that Kaktovik has harvested a fourth whale (their quota is three bowhead whales) for Anaktuvuk Pass in exchange for caribou when it has been approved by the AEWC. However, according to bowhead whale harvest data for Kaktovik, the harvest of a fourth whale is relatively uncommon (three times since 1990) (Table 5).

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Appendix R

Human Health Impact Assessment

HEALTH IMPACT ASSESSMENT
Point Thomson Project

June 2011

Prepared for:

Point Thomson EIS

Prepared by:

State of Alaska HIA Program

Department of Health and Social Services

Signature page

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ACKNOWLEDGEMENT:

With special thanks to the Alaska Native Epidemiology Center, Alaska Native Tribal Health Consortium for the use of the data summaries and graphics in the Alaska Native Health Status Report (2009) and the Regional Health Profile- Arctic Slope (2009).

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ACRONYMS

ANWR	Arctic National Wildlife Refuge
ASNA	Arctic Slope Native Association
ATR	Alaska Trauma Registry
BMI	Body Mass Index
CDC	Centers for Disease Control
EIS	Environmental Impact Statement
ESRI	Environmental Sensitivities Research Institute
HIA	Health Impact Assessment
HEC	Health Effects Categories
IFC	International Finance Corporation
IPIECA	International Petroleum Industry Environmental Conservation Association
NCDs	Non-Communicable Diseases
NEPA	National Environmental Policy Act
NGOs	Non-Governmental Organizations
NSB	North Slope Borough
OPD	Outpatient Department
PACs	Potentially Affected Communities
PM	Particulate Matter
PTP	Point Thomson Project
SDH	Social Determinants of Health
SIA	Social Impact Assessment
STIs	Sexually Transmitted Infections
STP	Sewage Treatment Plants
WHO	World Health Organization

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EXECUTIVE SUMMARY

Project Background

This health impact assessment (HIA) aims to identify human health impacts associated with the proposed ExxonMobil development of the Thomson Sand reservoir (Figure 1). The project site is located approximately 60 miles east of Deadhorse on the Beaufort Sea coast, 60 miles west of Kaktovik, and just west of the Arctic National Wildlife Refuge, Alaska.

The U.S. Army Corps of Engineers (USACE) has not yet authorized this project which is currently in the National Environmental Policy Act (NEPA) Review/Environmental Impact Statement (EIS) process. This HIA is a standalone document that will be incorporated into the EIS as a technical appendix. Where appropriate, the HIA refers to detailed technical sections of the EIS which contain careful descriptions of the affected environment, project-specific engineering, and a comprehensive analysis of the PACs. Additionally, this HIA relies on information available as of June 2011 2010 that has been provided by (i) subject matter experts who worked on the EIS, (ii) the project proponent (*e.g.*, "Point Thomson Project Environmental Report, November 2009"), and (iii) tribal, federal and State of Alaska public health authorities.

HIA Background

HIA is an internationally used preventive health tool that anticipates the human health impacts of new or existing development projects, programs, or policies. The overall goal of HIA is to minimize negative health effects while maximizing the health benefits of a particular action.

In general, HIAs can be a) a very short desktop exercise that can be completed in a matter of weeks, b) a rapid assessment that requires in-depth analysis of baseline data, site visits, and literature review normally taking several months or c) a comprehensive HIA that meets all the requirements of a rapid assessment HIA but that also collects field data for health issues of concern. Comprehensive HIAs typically require a year or more for completion. During early screening meetings, stakeholders decided that the Pt. Thomson HIA should be a rapid assessment HIA since the health impacts from this project were expected to be few.

Limitations

This HIA has several important limitations. First, it does not address classic occupational health concerns (*e.g.* physical hazards or environmental hazards encountered while working), which are referred to as 'inside the fence' and are thoroughly addressed by federally mandated health and safety protocols. However, "cross-over" issues (*e.g.* health issues that arise as workers interact with local communities such as roadway traffic) are analyzed within the HIA. Second, this HIA does not evaluate the global implications of Alaskan development such as the contribution of the Pt. Thomson project to climate change. Third, this HIA was executed in the presence of data gaps, particularly related to human consumption of subsistence resources. As a result, the HIA reviewed subsistence reports from subject matter experts and predicted the nutritional changes for affected communities based on harvest information. The rationale and assumptions involved in this exercise are described in detail below.

HIA Approach to Health

The Alaska Collaborative HIA Working Group, composed of federal, state, and tribal medical and public health professionals and organized by the Department of Health and Social Services HIA Program, developed an Alaska-specific list of Health Effect Categories (HECs) which allows HIA practitioners to combine their human health knowledge in a specific area (*e.g.* injury prevention) with their knowledge of project design features (*e.g.* road traffic patterns, road design) in order to identify likely health impacts. HECs analyzed for the Point Thomson Project include:

- Social Determinants of Health (SDH) including psychosocial, domestic violence and gender issues
- Accidents and Injuries
- Exposure to potentially hazardous materials
- Food, Nutrition, and Subsistence Activity
- Infectious Disease
- Water and Sanitation
- Non-communicable and Chronic Diseases
- Health Services Infrastructure and Capacity

To gather a variety of perspectives, the HIA Team hosted a panel on October 29, 2010, to consider the Point Thomson Project, its implications for human health, and to rank and rate those human health impacts. This panel was conducted in a focus group format in order to discuss a collection of impacts already identified by the HIA team. The focus group consisted of members of the HIA team, state public health professionals, state officials with excellent knowledge of the project, and international HIA experts.

ExxonMobil Design Alternatives, Impacts, Mitigations

ExxonMobil has proposed several alternative designs for the Pt. Thomson facility that contain both off-shore and onshore activities. They are:

- **Alternative A** – No action
- **Alternative B** – Applicant's proposed project
- **Alternative C** – Inland pads with gravel access road
- **Alternative D** – Inland pads with seasonal ice access road
- **Alternative E** – Coastal pads with seasonal ice roads.

Because these design alternatives propose changes to the position large linear features such as pipelines, roads and the size of the workforce needed, they have slightly different implications for human health. The impacts and mitigations unique to the various alternatives are presented below:

Alternative A

The No Action Alternative would result from the Army Corps of Engineers not issuing a permit for gravel fill and other construction activities regulated by the agency under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. Without a Corps permit, it is not foreseeable that any project leading to the production of the Point Thomson hydrocarbon resources could proceed. Two production wells (PTU-15 and PTU-16) were drilled and capped on the central pad. Protective wellhead covers approximately 16 feet tall and 8 feet in diameter were installed on PTU-15 and PTU-16 and rig mats remain onsite. All other equipment and camp structures were demobilized in 2011. If the No Action Alternative is selected, the wells would continue to be monitored in accordance with Alaska Oil and Gas Conservation Commission (AOGCC) regulations and prudent operator practices until the time that they are closed or brought into production in a future project. The monitoring will have zero to minimal impacts on public health. The area is remote from human habitation, and it is in the interest of public health and safety to continue the monitoring activities.

Alternative B

The Applicant's Proposed Action would configure the drilling and production facilities onto three gravel pads to facilitate evaluation of all hydrocarbon resources, and provide flexibility for future natural gas production should the currently-proposed project prove that larger-scale natural gas production was viable. This alternative would locate the onshore gravel pads near the coastline, incorporating portions of two existing gravel pads. To facilitate the transport of large facility modules to Point Thomson, a sealift facility composed of onshore bulkheads and offshore mooring dolphins would be constructed.

This alternative appears to present health challenges because it utilizes coastal locations that could change quantity and access for subsistence resources for residents of Kaktovik and Nuiqsut. ExxonMobil has already agreed to build the pipeline 7 feet above the tundra in order to facilitate the movement of caribou and agreed to cease barging activity during the Kaktovik whaling season. The HIA team noted that even with reduced harvests that there would be only a low impact on the composition of diet and food security because other sources of subsistence and manufactured food are available to make up for the potential loss of 1 pound of caribou per person.

Finally, incineration facilities at the central pad create the potential for emission of hazardous materials due to incomplete combustion. This feature is consistent for all alternatives and received a high rating because of the duration of the project. This impact can be mitigated through stack emissions monitoring.

Under all of the action alternatives operation of the Point Thomson facility would increase the size of dividends from the Alaska Permanent Fund to all qualified residents of Alaska. This effect would continue throughout the 30-year productive life of the facility. In addition, the development at Point Thomson is predicted to add approximately $1 billion to the actual and true property value of the North Slope Bureau. Increasing the tax revenue of the NSB may have cascading effects across the borough. The NSB provides most of the services and employment in the borough; it also funds most of the capital improvement projects in the region, including health care facilities.

Alternative C

The intent of the Inland Pads with Gravel Access Road alternative is to minimize impacts to coastal resources such as marine mammals, marine fish, subsistence activities, coastal processes, and to avoid potential impacts to the proposed project from coastal erosion. To minimize impacts, this alternative would move project components inland and as far away from the coast as feasible. To provide year-round access to Point Thomson, this alternative would also include the construction of an all-season gravel road from Point Thomson to the Endicott Spur Road where it would meet the Dalton Highway. Alternative C would not include barging or associated facilities for sea access to Point Thomson.

This alternative was designed to address concerns expressed about the coastal facility footprint by moving the facilities inland and eliminating the use of barges to the site. Under this alternative, materials and supplies would be barged into West Dock in Prudhoe Bay and then trucked to Point Thomson in between 17,000 and 18,500 trips during the extended construction and drilling phases of the project.

The HIA team ranked the potential for roadway accidents and injuries as high, especially during the construction and drilling phases when traffic volumes are high. While a roadway would be off limits to tourists, local residents would very likely have egress on these roads for snow machine and automobile travel. The combination of local resident travel and industrial truck traffic creates significant risk for accidents and injuries. ExxonMobil will require their drivers to follow internal transportation standards during the proposed construction schedule. If Alternative C is selected, local access to the roadways could be restricted until construction and drilling is completed and traffic volumes decrease. Seatbelt use and speed limit enforcement could also reduce the number and severity of injuries on roads constructed for these alternatives.

If roadway accidents and injuries increased, this would create an increased burden for local clinics in Prudhoe Bay and potentially Barrow. This impact can be mitigated through developing a written action plan to augment staff and facilities to meet this rising burden should it occur.

The Subsistence and Traditional Land Use Patterns section (Section 5.22) notes that Alternative C is expected to disrupt subsistence Caribou hunting for the residents of Kaktovik because the herds congregate along the shoreline during the summer months and that the noise and traffic could disrupt the herd during the long construction period. The Subsistence section estimates that the maximum potential effects on caribou harvests may include the loss of up to 10.8 percent of annual caribou harvests, accounting for approximately 13.3 pounds per capita of caribou per year or approximately or approximately 15,000 calories of energy from very lean meat. Impacts may not occur during all years but could exceed the maximum expected annual loss during certain years if caribou are unavailable elsewhere. Because this impact would potentially continue throughout the life of the project, ExxonMobil may want to consider doing some public health research regarding human consumption of subsistence resources (i.e. nutritional surveys).

Alternative D

The intent of Inland Pads with Seasonal Ice Access Road alternative is to minimize impacts to coastal resources such as marine mammals, marine fish, subsistence activities, coastal processes, and to reduce potential impacts to the proposed project from coastal erosion. To minimize impacts, this alternative would move the project components inland and as far away from the coast as feasible. This alternative is also characterized by access to and from Point Thomson occurring primarily via an inland seasonal ice road, running east from the Endicott Spur Road to the northern end of the Point Thomson project area.

This alternative was designed to address concerns expressed about the coastal facility footprint by moving the facilities inland and eliminating the use of barges to the site. Under this alternative, materials and supplies would be barged into West Dock in Prudhoe Bay and then trucked to Point Thomson in between 16,000 and 17,500 trips during the extended construction and drilling phases of the project.

The HIA team ranked the potential for roadway accidents and injuries as high due to high traffic volumes during the construction and drilling phases. While a roadway would be off limits to tourists, local residents would very likely have egress on these roads for snow machine and automobile travel. The combination of local resident travel and industrial truck traffic creates significant risk for accidents and injuries. ExxonMobil will require their drivers to follow internal transportation standards during the proposed construction schedule. If Alternative D is selected, local access to the roadways could be restricted until construction is completed and traffic volumes decrease. Seatbelt use and speed limit enforcement could also reduce the number and severity of injuries on roads constructed for these alternatives.

If roadway accidents and injuries increased, this would create an increased burden for local clinics in Prudhoe Bay and potentially Barrow. This impact can be mitigated through developing an action plan to augment staff and facilities to meet this rising burden should it occur.

Alternative D would have the same impact on subsistence as Alternative C.

Alternative E

The intent of Coastal Pads with Seasonal Ice Roads alternative is to minimize the development footprint to reduce impacts to wetlands and surrounding water resources. To minimize the development footprint, this alternative would reduce the amount of gravel fill needed for some of the project components. In particular, the footprints of the East and West Pads would be a combination of gravel and multiyear, multi-season ice pad extensions. During drilling, the gravel pad footprint would be expanded by ice to support other associated facilities. Over the long-term during operations, the ice pad footprint would be removed and only the gravel fill would remain to support the wellheads and associated required infrastructure. An expanded Central Pad incorporating both the central well and processing infrastructure would compensate for the two smaller ice/gravel combination pads. The gravel footprint would also be reduced by the use of ice roads as much of the infield road system.

This alternative presents the same potential loss of subsistence resources as Alternative B.

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Health Impact Assessment
Point Thomson Project

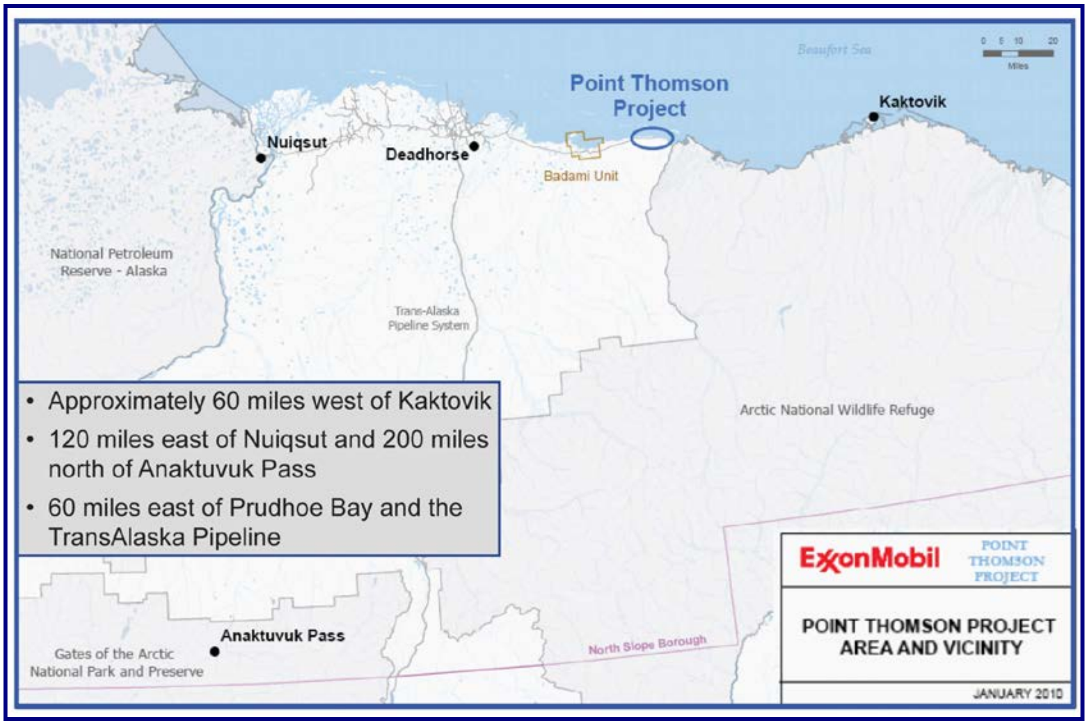
1.0 BASELINE CONDITIONS

This HIA aims to identify human health impacts associated with the proposed ExxonMobil development of the Thomson Sand reservoir (Figure 1). The project site is located approximately 60 miles east of Deadhorse on the Beaufort Sea coast, 60 miles west of Kaktovik, and just west of the Arctic National Wildlife Refuge, Alaska.

ExxonMobil operates two authorized production wells at an existing site, known as the Central Pad (CP). The proposed project recovers liquid condensate from natural gas, and may also extract crude oil. The Trans-Alaska Pipeline System would carry the extracted condensate and oil to market. Figure 2 and Figure 3 display additional maps of the project area and subsequent sections of the HIA identify potentially affected communities (PACs).

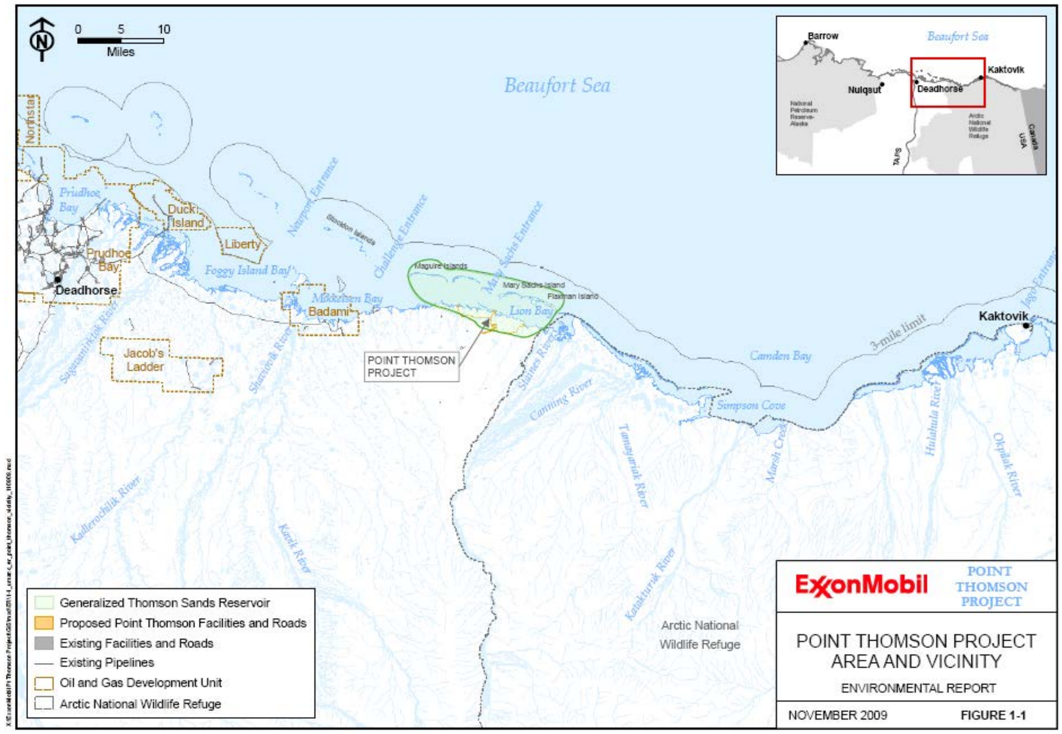
The U.S. Army Corps of Engineers (Corps) has not yet authorized this project which is currently in the National Environmental Policy Act (NEPA) Review/Environmental Impact Statement (EIS) process. This HIA is a standalone document that will be incorporated into the EIS as a technical appendix. Where appropriate, the HIA refers to detailed technical sections of the EIS which contain descriptions of the affected environment, project-specific engineering, and an analysis of the PACs. Additionally, this HIA relies on information available as of June 2011 that has been provided by (i) subject matter experts who worked on the EIS, (ii) the project proponent (*e.g.*, "Point Thomson Project Environmental Report, November 2009"), and (iii) tribal, federal and State of Alaska public health authorities.

Figure 1 Location Map Point Thomson Project



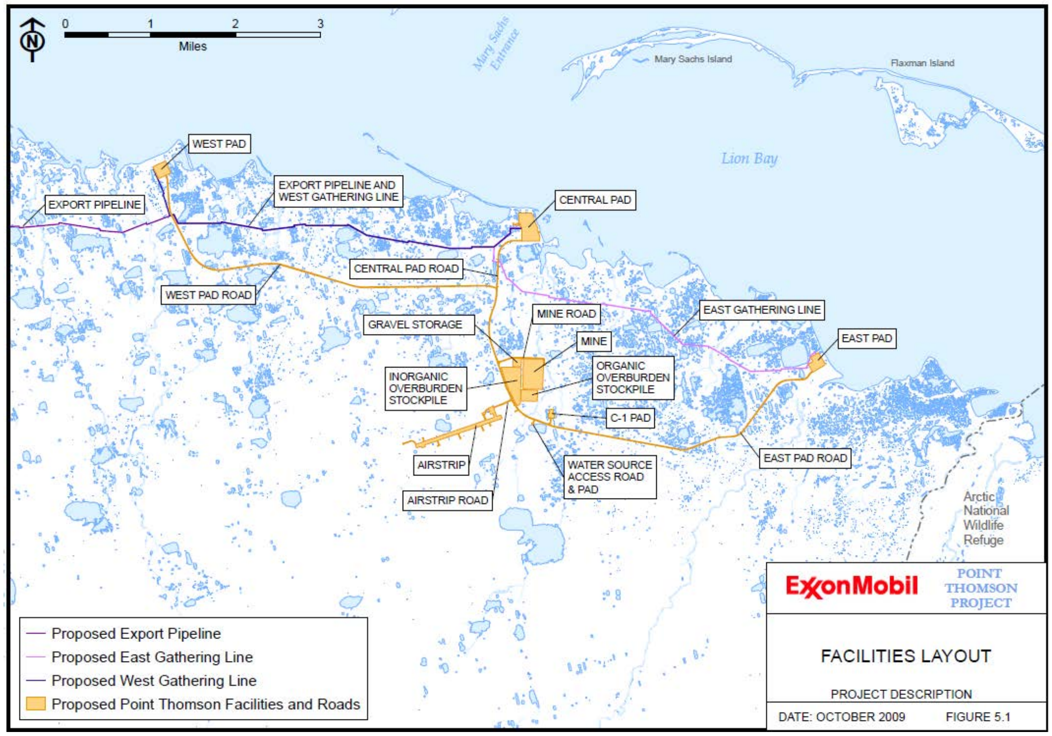
Source: ExxonMobil, 2009

Figure 2 Detailed Project Area and Vicinity



Source: ExxonMobil, 2009

Figure 3 Proponent's Proposed Facilities Layout



Source: ExxonMobil, 2009

1.1 Legal, Administrative and Legislative Framework

The State of Alaska does not currently require a formal HIA, but it has developed an HIA Toolkit to guide HIA efforts in the state. At the request of the lead federal agency, this HIA is included as part of the NEPA Review/EIS. The November 2009 Environmental Report describes the key authorizations, permits and r egulatory reviews required for construction and operation of the project. The Point Thomson Project HIA utilizes the approach described in the HIA Draft Toolkit but makes modifications unique to the setting of the project.

In addition to the Alaskan HIA Draft Toolkit, there are a variety of international guidelines (including performance standards from the International Finance Corporation (IFC)) that also inform this HIA. These international guidelines include:

- International Petroleum Industry Environmental Conservation Association (IPIECA) "Guidelines for Health Impact Assessment" (2005)
- IFC Performance Standard #4 "Community Health" (2006)
- IFC Good Practice Notes for Performance Standard #4 (2007)
- IFC "HIA Tool Kit" (2008).

1.2 HIA Framework and Methodology

HIA Definition

HIA is a preventive health tool that anticipates the human health impacts of new or existing development projects, programs, or policies. The overall goal of HIA is to minimize negative health effects while maximizing the health benefits of an action.

HIA Methods

- Analyze the sufficiency of baseline health data and highlight data gaps
- Select key health impacts and opportunities related to the project, policy, or program
- Conduct qualitative and/or quantitative data for analysis depending on available health information
- Provide a formal mechanism to engage the relevant stakeholders
- Facilitate careful discussion of key prevention issues and mitigation measures.

1.3 HIA Scope

The Point Thomson Project alternatives contain both off-shore and onshore activities. They are:

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

These alternatives are described in the EIS and summarized in the alternatives analysis section of the HIA. The specific methodology used to analyze potential health impacts is described in Section 2.2.

Areas outside the scope of the HIA

The study does not address classic occupational health concerns (*e.g.* physical hazards or environmental hazards encountered while working), which are referred to as 'inside the fence' and are thoroughly addressed by federally mandated health and safety protocols. However, "cross-over" issues (*e.g.* health issues that arise as workers interact with local communities) are analyzed within the HIA.

1.4 HIA within the NEPA Review/EIS

The HIA team performed (i) extensive literature and document reviews, (ii) close coordination with the EIS team, (iii) interviews with key project proponent staff, and (iv) limited field visits to the project area. In addition, the State of Alaska HIA Program collaborated with key tribal public health authorities to develop the critical risk analysis section of this HIA. The HIA Program reviewed and evaluated stakeholder concerns as presented in the scoping reports.

1.5 Impact Assessment Process

The available HIA guidance for impacts categorization is quite general and not consistent across published materials. For this HIA, the general risk rating system developed in the EIS has been modified and utilized. This categorization nomenclature is compatible and consistent with the terminology developed in the Draft Alaska HIA Guidance (HIA Toolkit 2011) and includes two primary components: (1) type of impact and (2) significance criteria in order to make reasonable and consistent analyses.

1.5.1 Impacts

Impacts include those effects resulting from the proposed project and project alternatives and these impacts may have beneficial or detrimental consequences to communities or individuals. Impacts are classified into three types:

Direct	caused by the action and occurring at the same time and place
Indirect	caused by the action and occurring later in time or farther removed in distance
Cumulative	incremental effects which when added to other past, present and reasonably foreseeable future actions are collectively significant over a period of time

A direct impact demonstrates a specific cause-and-effect relationship. For example, the presence of a project vehicle on roadway that subsequently has an accident in a local community would be a direct cause and effect situation.

Important indirect effects can include increases in community rates of communicable diseases that are associated with significant project triggered influx into local communities by job seekers. For example, the presence of a large project construction camp can temporarily attract a large number of job seekers and service workers into local communities, and this influx can significantly alter the spread and transmission of sexually transmitted infections (STIs).

Indirect effects are often of equal or greater significance than the more observable direct impacts that are related to accidents, injuries or sudden releases of potentially hazardous materials. The HIA analyzes both potential direct and indirect effects. Theoretically, one can imagine a vast number of hypothetical indirect effects and so, a set of most likely indirect effects was evaluated on the basis of past experiences at similar projects.

Cumulative effects health analysis is complex and often difficult to perform because the effects:

- May arise on a human receptor at any scale;
- Are triggered by multiple causes, *e.g.*, interaction of multiple health issues on one receptor (individual);
- Are generated by multiple impact pathways, *e.g.*, changes in access to key subsistence resources with subsequent changes in nutrition and community

cohesion (psychosocial) caused not just by a single project but all of the projects in an area.

Cumulative effects are an essential aspect of the NEPA process and are evaluated within the HIA for each of the alternatives.

1.5.2 Significance Criteria

To assess the beneficial and negative impacts each project, the HIA considers several critical elements which are further classified as low, medium, high, or very high:,

- Magnitude (intensity), which considers
  - Degree to which those affected will be able to adapt to the health impact and maintain pre-project level of health
  - Degree to which the potential effects on the quality of the human environment are likely to be controversial
  - Degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks
  - Unique characteristics of a geographical/cultural setting which intensify impacts
  - Degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration

- Duration/Frequency, which considers the length of time a project or a project phase lasts and/or how often an event happens
  - Less than 1 month/happens rarely
  - Short-term, less than a year/low frequency
  - Medium-term, one to six years/ intermittent frequency
  - Long-term, more than six year, life of project/constant frequency

- Geographical extent, which examines where impacts might be experienced, including:
  - Project Area
    Local, small and limited
  - Extends beyond the local area
    - Regional/Statewide
    - National/Global

- Potential or Likelihood, which examines the chances that each impact will occur (IPCC 2007)

- Exceptionally unlikely	<1 percent probability
- Very unlikely	1 to 10 percent probability
- Unlikely	10 to 33 percent probability
- About as likely as not	33 to 66 percent probability
- Likely	66 to 90 percent probability
- Very likely	90 to 99 percent probability
- Virtually certain	>99 percent probability of occurrence

Significance rating assigns a numerical score to each criteria to produce a cumulative score that can be low (0-3 points); medium (4-6 points), high (7-9 points) and very high (10-12 points) (Winkler 2010). The impact rating system used in this HIA will be described in greater detail in subsequent sections.

In general, HIAs are qualitative or semi-quantitative due to baseline data limitations, particularly if there are populations located in scattered communities. Therefore, significance is more broadly considered based on language developed within the NEPA process. Figure 4 illustrates the impact analysis scheme.

Figure 4 Impact Analyses/Significance Criteria

Project Phase	Magnitude (Low, Medium, High, Very High)	Duration / Frequency (less than a month, short-term, medium-term, long-term)	Extent (Project Area/ Local, Regional, State, Nation, Global)	Potential (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)
Construction				
Drilling				
Operation				

Typically, there is a spectrum of impacts, positive and negative, that will be identified in the HIA. Many of the negative impacts can be reduced to baseline conditions if appropriate public health mitigation management plans are developed and rigorously implemented. A sufficiently robust monitoring and evaluation (M&E) system is essential so that early detection of significant indirect effects is possible.

1.5.3 Health Effects Categories (HECs)

Based on extensive international experience, the IPIECA developed a methodology (IPIECA, 2005; IFC, 2008) that reviews a standard set of health effects categories (HECs). The Alaska collaborative HIA working group consulted these published materials and developed an Alaska-specific set of HECs.

The HEC framework allows HIA practitioners to combine their human health knowledge in a specific area (*e.g.* injury prevention) with their knowledge of project design features (*e.g.* road traffic patterns, road design) in order to identify likely health impacts. This emphasis on predicting health impacts through knowledge of design, engineering and infrastructure is extremely important because experience indicates that

(i) primary prevention is a vastly more efficient and cost-effective strategy than post-construction attempts at mitigation and

(ii) the design of facilities, structures and workforce management (*e.g.*, work scheduling) are under the control of project proponents.

Predicting health impacts based on forecasted economic changes or anticipated changes in subsistence resource usage is more complex and typically mediated by personal choices at an individual and household level. Nevertheless, this framework allows HIA practitioners to use HECs to reflect on project design features or projected socioeconomic changes in a systematic way.

The table below is taken from the HIA Toolkit and presents a list of health effects relevant for Alaskan resource development projects, including Point Thomson.

Table 1 Health Effects Categories

Health Effects Category	Pathway Description
Social Determinants of Health (SDH)	This is a broad category that considers how living conditions and social situations influence the health of individuals and communities. ◆ psychosocial issues related to drugs and alcohol, ◆ teenage pregnancy ◆ family stress ◆ domestic violence ◆ depression and anxiety ◆ isolation ◆ work rotations and hiring practices ◆ cultural change ◆ economy, employment and education Limitations: While SDH are real and important, it is extremely difficult to establish direct causality between a change in a social determinants and a particular health outcome. The language used to communicate impacts related to social determinants should reflect that SDH influence health in complex ways.
Accidents and Injuries	This category includes impacts related to both fatal and non-fatal injury patterns for individuals and communities. Changed patterns of accidents and injuries may arise due to: ◆ Influx of non-resident personnel (increased traffic on roadways, rivers, air corridors ◆ Distance of travel required for successful subsistence. ◆ Project-related income and revenue used for improved infrastructure (e.g., roadways) and improved subsistence equipment/technology.

Health Effects Category	Pathway Description
Exposure to potentially hazardous materials	This category includes project emissions and discharges that lead to potential exposure. Exposure pathways include,: • Food. Quality changes in subsistence foods (risk based on analysis of foods or modeled environmental concentrations) • Drinking water • Air. Respiratory exposures to fugitive dusts, criteria pollutants, VOCs, mercury, and other substances. • Work. Secondary occupational exposure such as a family member's exposure to lead on a worker's clothing. • Indirect pathways, such as changing heating fuels/energy production fuels in communities
Food, Nutrition, and Subsistence Activity	This section depends on the subsistence analysis and nutritional surveys (if completed) and considers: • *Effect on Diet*: This pathway considers how changes in wildlife habitat, hunting patterns, and food choices will influence the diet of and cultural practices of local communities. While nutritional surveys are the most effective way to assess dietary intake, conclusions can be drawn if certain assumptions are accepted • *Effect on Food Security*: This discussion considers project-specific impacts that may limit or increase the availability of foods needed by local communities to survive in a mixed cash and subsistence economy present in rural Alaska.
Infectious Disease	This category includes the project's influence on patterns of infectious disease: The pathways include: • Influx of non-resident personnel from outside the region • Crowded or enclosed living & working conditions and the mixing of low and high prevalence populations due to influx can create an increased risk for transmission of STIs such as syphilis, HIV, and Chlamydia. • Changes to groundwater/wetlands can alter habitat for agents that transmit vector-borne diseases. This is not a likely scenario in Alaska, but with the cumulative effects of climate change it may become an issue of greater concern in the future.

Health Effects Category	Pathway Description
Water and Sanitation	This category includes the changes to access, quantity and quality of water supplies The pathways include: • Lack of adequate water service is linked to the high rates of lower respiratory infections observed in some regions, and to invasive skin infections. • Revenue from the project that supports construction and maintenance of water & sanitation facilities. • Increased demand on water and sanitation infrastructure secondary to influx of non-resident workers.
Non-communicable and Chronic Diseases	This category considers how the project might change patterns of chronic diseases. The pathways include: • Nutritional changes that could eventually produce obesity, impaired glucose tolerance, diabetes, cardiovascular disease. • Pulmonary exposures that lead to tobacco related chronic lung disease, asthma; in-home heat sources; local community air quality; clinic visits for respiratory illness • Cancer rates secondary to diet changes or environmental exposures • Increased rates of other disorders, specific to the contaminant(s) of concern
Health Services Infrastructure and Capacity	This category considers how the project will influence health services infrastructure and capacity. The pathways include: • Increased revenues can be used to support or bolster local/regional services and infrastructure • Increased demands on infrastructure and services by incoming non-resident employees or residents injured on the job, especially during construction phases.

Source: HIA Toolkit 2011

1.5.4 Social Determinants of Health (SDH) and Psychosocial Issues

SDH and psychosocial issues are very important in Alaska, particularly for small, remote villages. HIA seeks to disentangle the determinants of health and identify the individual, social, environmental, and institutional factors that produce direct, indirect, or cumulative health impacts. This exercise is complex because many individual and institutional factors interact with each other.

- Individual factors include genetic, biological, lifestyle or behaviors, and specific circumstances. Examples of individual determinants include gender, age, dietary intake, exercise, alcohol and tobacco use, educational attainment, and employment.
- Institutional factors include the capacity, capability, and coverage of public sector services such as health, schools, transportation, and communications.

The HIA considers psychosocial issues. Subsistence-based rural populations can suffer significant anxiety/stress associated with perceived changes in their autonomy, traditional lifestyle, and cultural stability. This reaction, however, is not necessarily uniform across the community since there may be a profound generational split. Even though the generational divide may be unrelated to the project it may be accentuated by the project. Important health outcomes including drug/alcohol usage, teen/unwed pregnancy, gender violence suicides, and depression are considered within this health effects category.

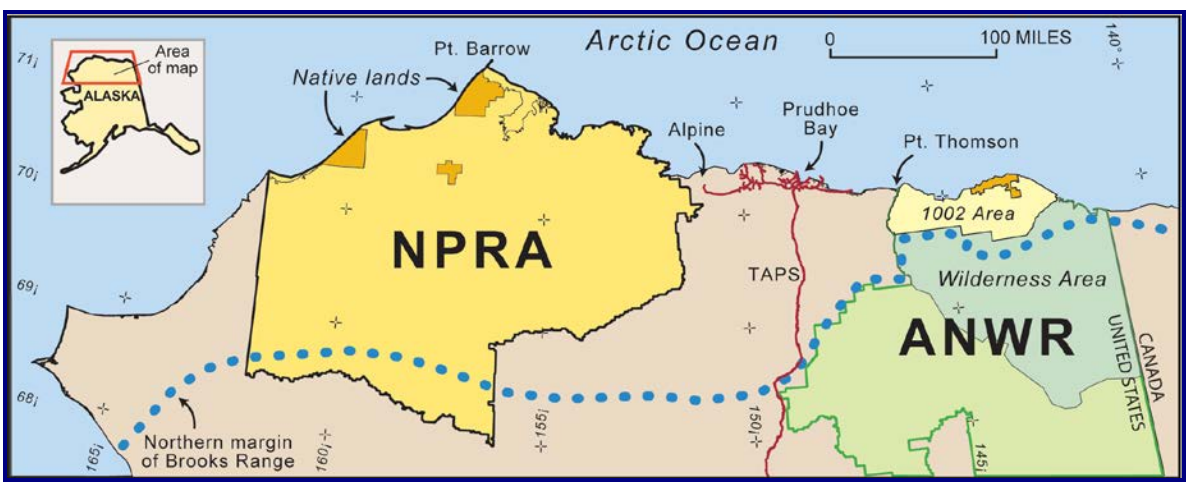
Within the SDH and psychosocial issues HEC, the Point Thomson HIA focuses on those alternative-specific potential impacts where there is a reasonable attribution of project effects.

1.5.5 Potentially Affected Communities (PACs)

A PAC is a defined community where project-related health impacts may reasonably be expected to occur. Both the ExxonMobil Environmental Report (ExxonMobil 2009) and the socioeconomics chapter of the EIS identified all communities in the North Slope Borough (NSB) as PACs.

A map of the geographical extent of the NSB is shown in Figure 5. Fewer than 7,000 people currently reside in the 88,800 square miles of the NSB–a population density of 0.08 persons per square mile. The population of the NSB decreased from 7,385 in 2000 to 6,706 residents in 2008, an annual average decline of 1.2 percent (See Table 2). Based on 2000 Census data, 83 percent of the population in the NSB is Alaska Native The communities with the greatest Alaska Native population are in Anaktuvuk Pass and Nuiqsut, both with about 90 percent Alaska Native.

Figure 5 Geographical Footprint of the NSB



Source: USGS http://energy.usgs.gov/images/alaska/NPRA_F1lg.gif

Table 2 NSB Population 1939-2008

North Slope Borough Population, 1939 - 2010								
Community	**Year**							
	1939	**1950**	**1980**	**1990**	**1998**	**2000**	**2005**	**2010**
Anaktuvuk Pass	*	66	203	259	314	282	307	324
Atqasuk	78	49	107	216	224	228	226	233
Barrow	363	951	2,267	3,469	4,641	4,581	4,174	4,212
Kaktovik	13	46	165	224	256	293	276	239
Nuiqsut	89	*	208	354	420	433	410	402
Point Hope	257	264	464	639	805	757	720	674
Point Lay	117	75	68	139	246	247	241	189
Wainwright	341	227	405	492	649	546	519	556
North Slope Borough Total	1,258	1,678	4,199	4925	7,555	7,385	6,886	6,902
Source: North Slope Bureau. http://www.co.north-slope.ak.us/nsb/gis/about_gis/about_index.htm. Point Thomson EIS, 2011 Socio-economic Chapter (Section 3.12)								

While the HIA recognizes the social, economic, and c ultural importance of all communities in the NSB, experience with HIA consistently demonstrates that the health-specific PAC footprint does not necessarily match the environmental and social PAC footprints. There are subtle but critical disciplinary differences that produce variations in the delineation of the PACs.

From an HIA perspective, the PACs have been divided into three zones based likelihood of significant health impacts from the Pt. Thomson project:

- **Zone 1 -** Kaktovik and Nuiqsut
- **Zone 2 -** Anaktuvuk Pass, Prudhoe Bay/Deadhorse, and Barrow
- **Zone 3 -** Atqasuk, Wainwright, Point Lay, and Point Hope.

Figure 6 illustrates the location of eight primary NSB communities. The Point Thomson project (PTP) is located 60 miles west of Kaktovik, 120 miles east of Nuiqsut and 200 miles north of AP. Overall population figures for the PACs are shown in Table 3.

Figure 6 Point Thomson Project and Communities in the NSB

Source: NSB 2005

Zone 1 includes Kaktovik and Nuiqsut and the coastal area between Bullen Point and Point Demarcation where residents of both Kaktovik and Nuiqsut traditionally hunt and which are caribou herd use areas. Local workers may be hired for construction and/or operation of the Point Thomson Project from both Kaktovik and Nuiqsut.

Zone 2 PACs were selected because of the possibility of impacts on Anaktuvuk Pass (AP) which are related to potential changes in employment and income. The impacts on Prudhoe Bay and Deadhorse are related to barges docking at West Dock and transportation of personnel, supplies and equipment from that transport hub. Similarly the effects on Barrow are due to its position as the regional center for the NSB and the impact on health services from increased usage and taxes generated during Point Thomson operations.

Zone 3 includes communities that are remote from the Point Thomson project and that have minimal to no interaction with workers, materials, or products related to the project. These villages include Atqasuk, Wainwright, Point Lay, and Point Hope.

1.5.6 Community Profiles (Source NSB, 2005a)

- **Kaktovik** is located on the northern shore of Barter Island, facing Kaktovik Lagoon and the Beaufort Sea. The village is on the northern edge of the region that has become the Arctic National Wildlife Refuge (ANWR), only 90 miles from the Canadian border. It is the easternmost village in the North Slope Borough (NSB) (Figure 5 and Figure 6). The community has a young population, with a high ratio of dependents to wage earners. Historically, there have been high rates of unemployment and underemployment. The community has high levels of subsistence activities and use of subsistence resources. Kaktovik's infrastructure has had several upgrades in recent years. Water and sewer projects funded by the NSB have been completed. An electric utility is functional in the community, as well as telecommunications.

- **Nuiqsut** is located approximately 30 miles from the Beaufort Sea on the Nechelik channel of the Colville River delta (Figure 5 and Figure 6). This area has been used for centuries for subsistence activities, including hunting, fishing, gathering, and traditional celebrations. The growth and development of the community has been influenced by oil and gas development. Nuiqsut is located in the northeast section of the region that has become the National Petroleum Reserve–Alaska (NPRA). The community infrastructure has had several upgrades in recent years.

Water and sewer projects funded by the North Slope Borough (NSB) have been completed. An electric utility is functional in the community, as well as telecommunications. Surface transportation to Nuiqsut is often possible in the winter months, as ice roads associated with the nearby oil field projects are constructed. The ice roads connect to the Dalton Highway.

- **Anaktuvuk Pass (AP)** is the only remaining settlement of the inland northern Inupiat. Anaktuvuk Pass is situated at approximately 2,200 feet in elevation in the Endicott Mountains of the Brooks Range, within the region that has become Gates of the Arctic National Park and Preserve. The community is located about 250 miles southeast of Barrow (Figure 5 and Figure 6). AP has historically had high rates of unemployment and underemployment. Economic and employment opportunities are very limited in Anaktuvuk Pass. The North Slope Borough (NSB) and the school district provide most local jobs. City government and the village corporation are also important employers in the community. The community has high levels of subsistence activities and use of subsistence resources. Anaktuvuk Pass has a young population; average ages in Anaktuvuk Pass are less than in the state or nation. There is a high ratio of dependents to wage earners.

- **Prudhoe Bay** is a census-designated place (CDP) located in North Slope Borough. As of the 2000 census, the population of the CDP was 5 people; however, at any given time several thousand transient workers support the Prudhoe Bay oil field and associated activities. The airport, lodging, and general store are located at Deadhorse; the rigs and processing facilities are located on scattered gravel pads laid atop the tundra. It is only during winter that the surface is hard enough to support heavy equipment and new construction happens at that time.

- **Barrow** is the largest community in the NSB with a population of about 4,054 (about 60 per cent of the borough's population). It is the hub for regional government, transportation, communications, education, and economic development. The community is located on the northern edge of the Arctic Coastal plain, on the Chukchi Sea Coast (Figure 5 and Figure 6). Barrow's infrastructure is the most extensive of any North Slope community, and includes water, sewer, electric and telecommunication utilities. Demographically, Barrow has a 65 percent Alaska Native and 35 per cent non-native population mix. Barrow has a young population; average ages in Barrow are less than in the state or nation. There is a high ratio of dependents to wage earners. The Borough is the city's primary employer, providing approximately 50 percent of employment in the city.

- **Atqasuk** is located on the Meade River, 60 miles south of Barrow. The population of the community consisted of 228 people in 2000; 94 percent Alaska Native or part Native. Education and other government services provide the majority of full-time employment in Atqasuk. Subsistence activities are important to the lifestyle; the area has traditionally been hunted and fished by Inupiat Eskimos. The North Slope Borough provides the water, sewer, refuse, washeteria, landfill, and other public services. The majority of homes and facilities and the school have running water and electricity There is one school located in the community, attended by 77 students. Local hospitals or health clinics include Atqasuk Clinic, a primary health care facility.

- **Wainwright** is located on the Chukchi Sea coast, 3 miles northeast of the Kuk River estuary. The region around Wainwright was traditionally well-populated, though the present village was not established until 1904, when the Alaska Native Service built a school and instituted medical and other services. The population of the community is 93 percent Alaska Native or part Native; most of whom are Inupiat Eskimos who practice a subsistence lifestyle. Economic opportunities in Wainwright are influenced by its proximity to Barrow and the fact that it is one of the older, more established villages. Most of the year-round positions are in borough services. Sale of local Eskimo arts and crafts supplement income. Bowhead and beluga whale, seal, walrus, caribou, polar bear, birds, and fish are harvested. The North Slope Borough provides all utilities in Wainwright. There is one school located in the community, attended by 158 students. Local hospitals or health clinics include Wainwright Health Clinic.

- **Point Hope** is located near the tip of Point Hope peninsula, a large gravel spit that forms the western-most extension of the northwest Alaska coast, 330 miles southwest of Barrow. Point Hope (Tikeraq) peninsula is one of the oldest continuously occupied Inupiat Eskimo areas in Alaska. Most full-time positions in Point Hope are with the city and borough governments. Residents manufacture whalebone masks, baleen baskets, ivory carvings, and Eskimo clothing. The population of the community is over 90 percent Alaska Native or part Native, principally Tikeraqmuit Inupiat Eskimos. The peninsula offers good access to marine mammals, and ice conditions allow easy boat launchings into open leads early in the spring whaling season which supports subsistence hunting and its strong cultural traditions. The North Slope Borough provides all utilities in Point Hope. There is one school located in the community, attended by 208 students. Local hospitals or health clinics include Point Hope Clinic.

Table 3 Population Demographics Point Thomson Area

Table 3.12-4: Demographics in the Point Thomson Area (2005-2009, 2010)										
Area	Anaktuvuk Pass		Barrow		Kaktovik		Nuiqsut		NSB Total	
General Characteristics	#	%	#	%	#	%	#	%	#	%
Total population	324		4,212		239		402		6,903	
Male	107 *(+/-35)*	46.3	2,183 *(+/-99)*	53.5	140 *(+/-41)*	53.8	18 *(+/-48)*	50.3	3,585 *(+/-73)*	53.4
Female	124 *(+/-44)*	53.7	1,895 *(+/-103)*	46.5	120 *(+/-38)*	46.2	182 *(+/-62)*	49.7	3,131 *(+/-73)*	46.6
Median age (years)	25.7 *(+/-1.5)*		28.2 *(+/-2.5)*		25.9 *(+/-6.9)*		19.2 *(+/-2.8)*		26 *(+/-0.8)*	
White	23	7.1	712	16.9	24	10.0	40	10.0	979	14.2
Black or African American	1	0.3	41	1.0	0	0.0	1	0.2	47	0.7
American Indian and Alaska Native	270	83.3	2,577	61.2	212	88.7	350	87.1	4,905	71.1
Asian	0	0.0	384	9.1	0	0.0	0	0.0	384	5.6
Native Hawaiian and Other Pacific Islander	1	0.3	99	2.4	0	0.0	0	0.0	101	1.5
Some other race	0	0.0	34	0.8	0	0.0	0	0.0	36	0.5
Two or more races	29	9.0	365	8.7	3	1.3	11	2.7	451	6.5
Hispanic or Latino (of any race)	7	2.2	131	3.1	0	0.0	0	0.0	156	2.3
Average household size	3.16 *(+/-0.82)*		3.03 *(+/-0.22)*		3.21 *(+/-0.71)*		4.02 *(+/-1.02)*		3.27 *(+/-0.16)*	

Source:Section 3.12 of the Point Thomson EIS

1.6 Baseline Introduction and Background

The HIA team performed a review of the available North Slope Borough baseline health data with data sources maintained by federal, state and tribal health authorities. Typically, Alaskan health data is reported by region or census area, which provides general health information for the HIA. Because these villages are very small, health information privacy concerns and problems with statistical validity limit the ability to analyze information at the village level. With the exception of Barrow, the PAC communities are extremely small, *i.e.*, total population levels less than 500 (see Table 3). Both state and tribal health authorities will not report an "observation" if they document fewer than six cases. Therefore, the data presented for villages in this baseline analysis are aggregated into zones and do not report at an individual village level. Experience indicates that village level data are consistent with the aggregated regional level data.

1.6.1 Sources of Information

The most current and comprehensive compendia of relevant NSB health information is the Alaska Native Epidemiology Center (AN EpiCenter) publication Alaska Native Health Status Report" (AN EpiCenter 2009a) and "Alaska native Regional Health Profile- Arctic Slope" (AN EpiCenter 2009b). The focus of this report is on t he health of Alaskan Natives who account for the majority of the Arctic Slope's population. Despite this focus, the report provides sufficient mortality and m orbidity data for Non-native Alaskans as well. In addition, the AN EpiCenter 2009b report accessed regional level data from a variety of key sources:

- National Patient Information Reporting System (NPIRS)
- State of Alaska Department of Labor (AK DOL)
- 1990 and 2000 U.S. Census
- Alaska Bureau of Vital Statistics (ABVS)
- Government Performance and Results Act (GPRA)
- Youth Risk Behavior Survey (YRBS)
- Alaska Trauma Registry (ATR)
- ANTHC Immunization Registry
- Alaska Area Diabetes Program
- ANTHC Department of Environmental Health and Engineering (DEHE)
- Alaska Native Tumor Registry.

In this report, the NSB fits the definition of the Arctic Slope Native Association (ASNA) service area with one exception, the community of Point Hope. Point Hope is a part of NSB but not part of the ASNA service area. Point Hope has an e stimated 2009 population of 705, of which approximately 90 percent is Alaskan Natives. Much of the baseline data information utilizes ASNA as a geographical service area. The HIA team determined that the exclusion of Point Hope will not materially change the key baseline health observations that apply to the NSB geographical unit. For many outcome indicators "Arctic Slope" is defined as the NSB.

Mirroring the AN EpiCenter reports, the HIA baseline data are organized into five specific sections:

- Demographics
- Mortality and Morbidity
- Health Promotion
- Health Protection
- Preventive Services and Access to Health Care.

Cross references to how these data "fit" within the health effects categories (HECs) framework are also presented in each section. In addition, brief bulleted discussions of the key observations relevant to HIA impact analysis are also discussed.

1.6.2 Demographic Health Data

Table 2 and Table 3 presented the overall population data for the NSB and the specific Zone 1 & 2 PACs. Table 4 illustrates the population estimates by age group.

Table 5 Alaska Native Population by Age Group

Arctic Slope Service Area (2006)

	Male		Female		Total	
Age (years)	Number	%	Number	%	Number	%
0-4	297	6.2%	307	6.4%	604	12.6%
5-9	261	5.5%	220	4.6%	481	10.1%
10-14	272	5.7%	256	5.4%	528	11.0%
15-19	323	6.8%	324	6.8%	647	13.5%
20-24	198	4.1%	190	4.0%	388	8.1%
25-29	116	2.4%	122	2.6%	238	5.0%
30-34	103	2.2%	93	1.9%	196	4.1%
35-39	122	2.6%	117	2.4%	239	5.0%
40-44	172	3.6%	163	3.4%	335	7.0%
45-49	152	3.2%	137	2.9%	289	6.0%
50-54	124	2.6%	97	2.0%	221	4.6%
55-59	95	2.0%	67	1.4%	162	3.4%
60-64	68	1.4%	64	1.3%	132	2.8%
65+	150	3.1%	174	3.6%	324	6.8%
Total	2,453	51.3%	2,331	48.7%	4,784	100.0%

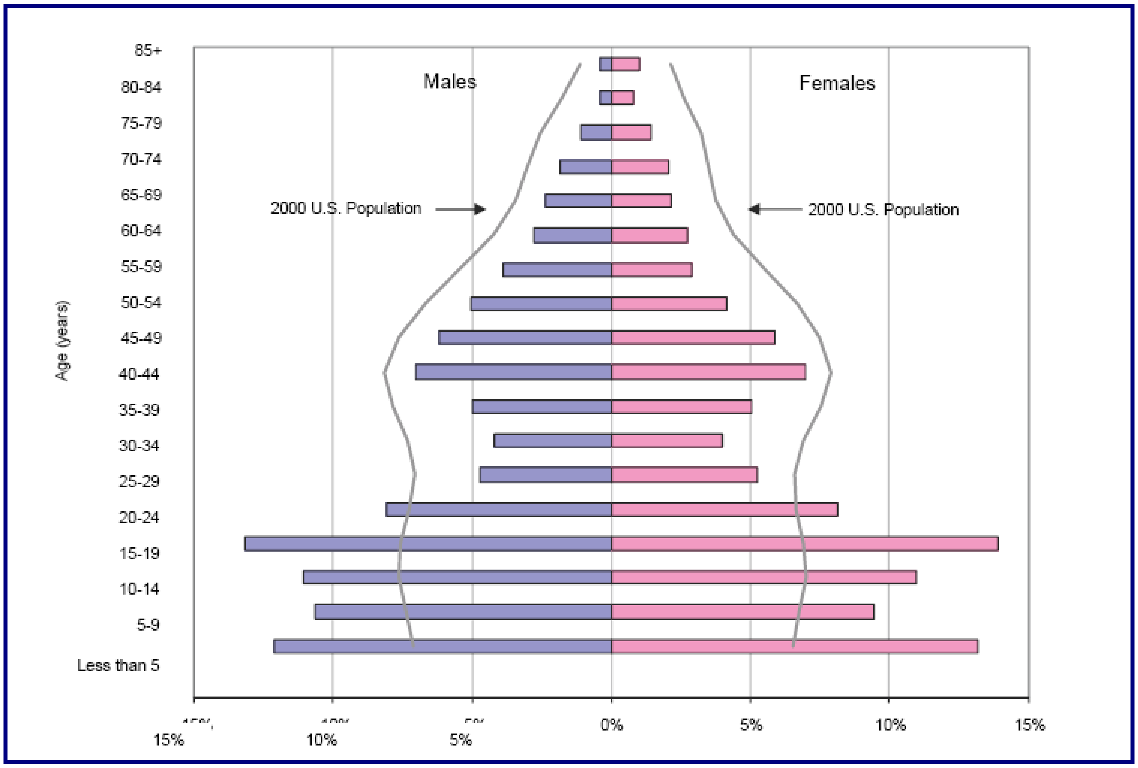
Source: AN EpiCenter 2009b

Figure 7 visually represents the population of NSB compared with the U.S. population. The grey line in the figure represents the U.S. population averages for a particular age group. The colored bars represent the relationship between U.S. averages and males (blue) and females (pink) by age category. As previously noted in the PAC overviews, the NSB communities have a significant percent (44 percent) of their native population under age 20, a much larger proportion as compared to the U.S. population. One in fifteen natives is over age 65.

The level of educational attainment in a household can influence community health. Figure 8 compares Arctic Slope Natives and the white population, not of Hispanic origin, of the U.S. based on 2000 US Census data. When compared to U.S. whites, these data demonstrate that Alaska Natives living in the Arctic Slope received an associate degree or higher at a r ate five times lower (5 percent vs. 25 per cent) than U.S. whites. Internationally, highest level of household educational attainment positively correlates with improved overall family health status. In addition, household head educational attainment levels also predict challenges or opportunities that will occur in regards to local hiring programs. This is especially true in the oil and gas extraction industry where permanent positions may require significant technical skill sets.

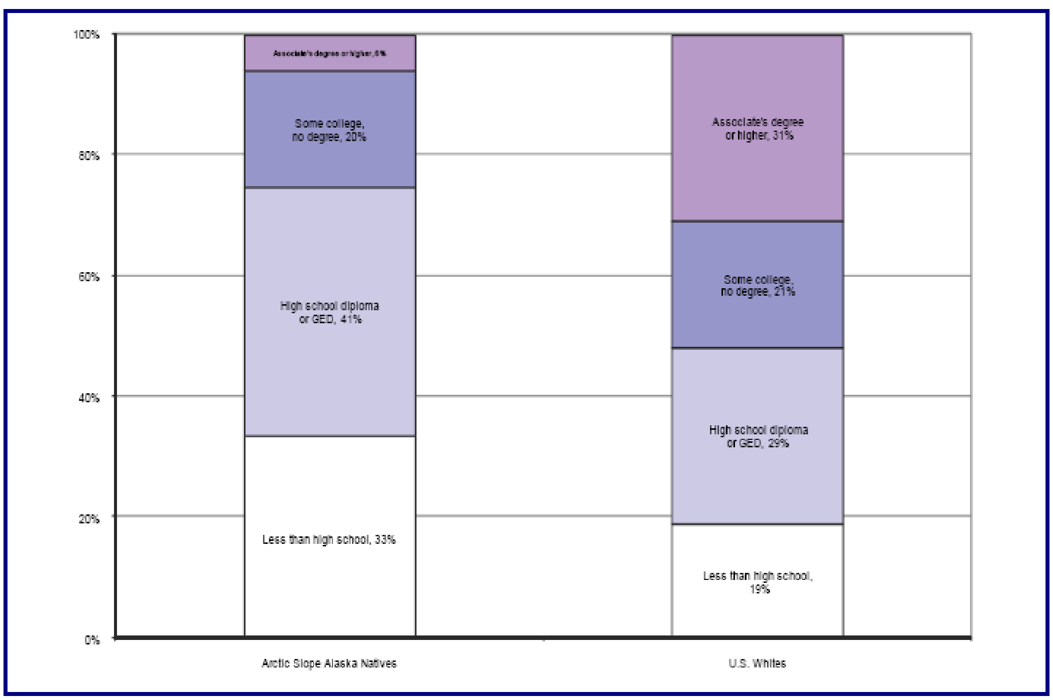
Employment is another key demographic factor that influences health. Despite the national economic recession, the NSB maintains a l ow unemployment rate relative to other regions in the state. The socio-economic section of the EIS provides greater detail and analysis of the employment situation in the NSB overall and for each PAC.

Figure 7 Alaska Native Population Pyramid, Arctic Slope Service Area (2006)



Source: AN EpiCenter 2009b

Figure 8 Highest Educational Attainment, 25 Years and Older



Source: AN EpiCenter 2009b

1.6.3 Mortality

In the Arctic Slope Service Area, the leading causes of death among Alaska Natives between 2000 - 2004 were cancer, unintentional injury and heart disease (Table 5).

Table 6: Leading Causes of Death Arctic Slope Service Area

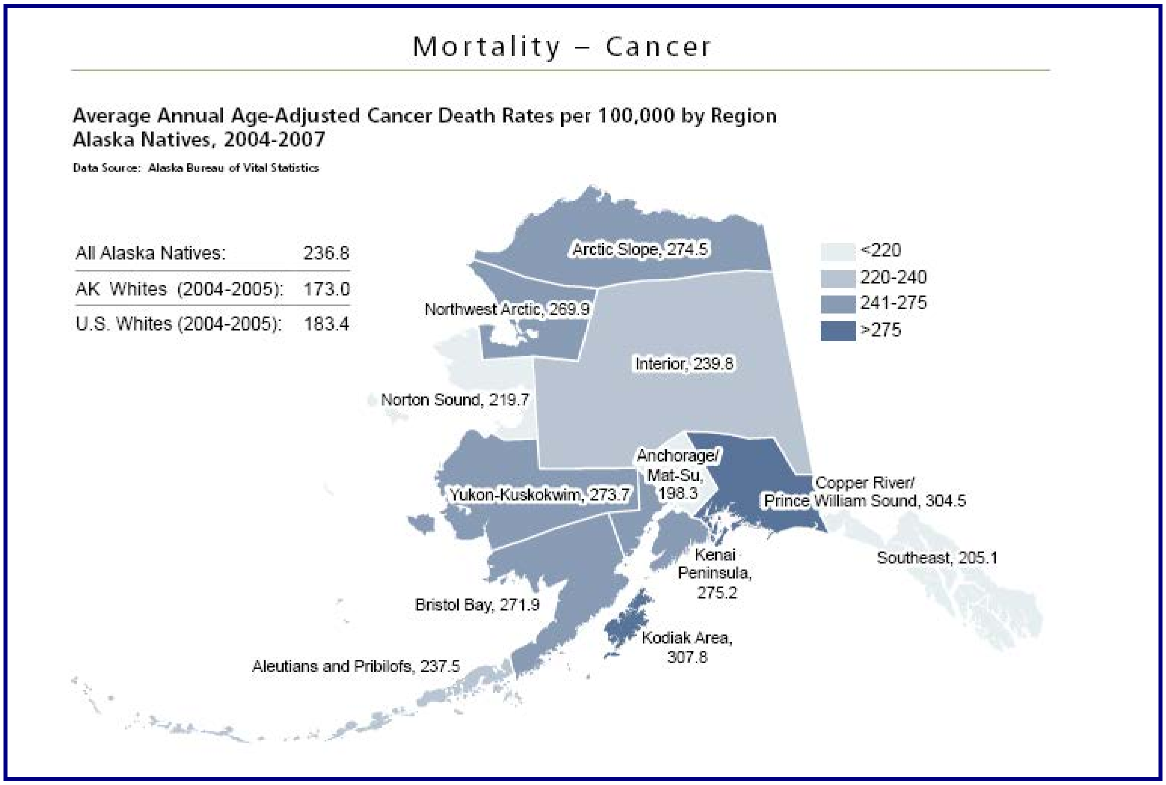
	Alaska Natives (AN) Arctic Slope service area	Number	% Deaths	U.S. Whites Rank	AN Statewide Rank
1	Cancer	36	22.1%	2	1
2	Unintentional Injury	27	16.6%	5	3
3	Heart Disease	19	11.7%	1	2
4	Suicide	15	9.2%	10	4
5	Chronic Obstructive Pulmonary Disease	11	6.7%	4	6
6	Cerebrovascular	7	4.3%	3	5
7	Pneumonia and Influenza	5	3.1%	7	7
	All other causes	43	26.4%		
	Total	163	100%		

Source: AN EpiCenter 2009b

1.6.3.1 Cancer

The cancer mortality rate has been anal yzed over time. For the Arctic Slope Service Area, the cancer death rate increased by 33 percent between 1979-1983 and 1999-2003. In comparison, the US White cancer death rate decreased by 4 percent over a similar time frame. The explanation for these findings is complex and multi-factorial. Cause-specific cancer rates are strongly influenced by a variety of lifestyle behaviors including diet and s moking habits. The Alaska Native cancer rates vary by specific geographical region. These data are shown in Figure 9. Although there appears to be a difference between the Arctic-North Slope region and ot her regions, only the Anchorage/Mat-Su region has a statistically significant lower rate than all other regions.

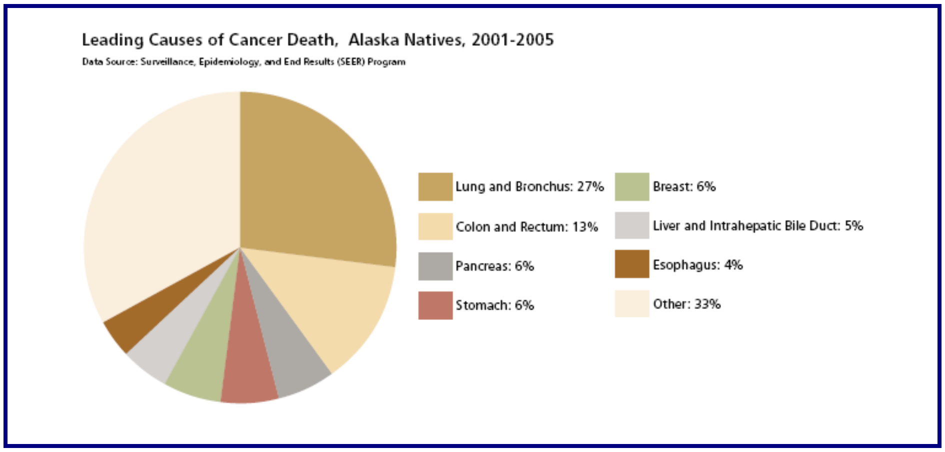
Figure 9 Alaska Native Age-Adjusted Cancer Death Rates



Source: AN EpiCenter 2009a

In addition to geographical variation, it is important to consider the types of cancers that are reported. Figure 10 presents the leading causes of cancer death for Alaska Natives from 2001 - 2005. The lung/bronchus cancer rates (Figure 10) are strongly related to the extremely high tobacco usage that occurs in Alaska Native populations. Smoking rates in Alaska Natives are significantly elevated versus US White populations. In the Arctic Slope Service Area, adult smoking rates over 90 percent have been reported (Section 1.6.4 Health Promotion).

Figure 10 Leading Causes of Cancer Death Alaska Natives

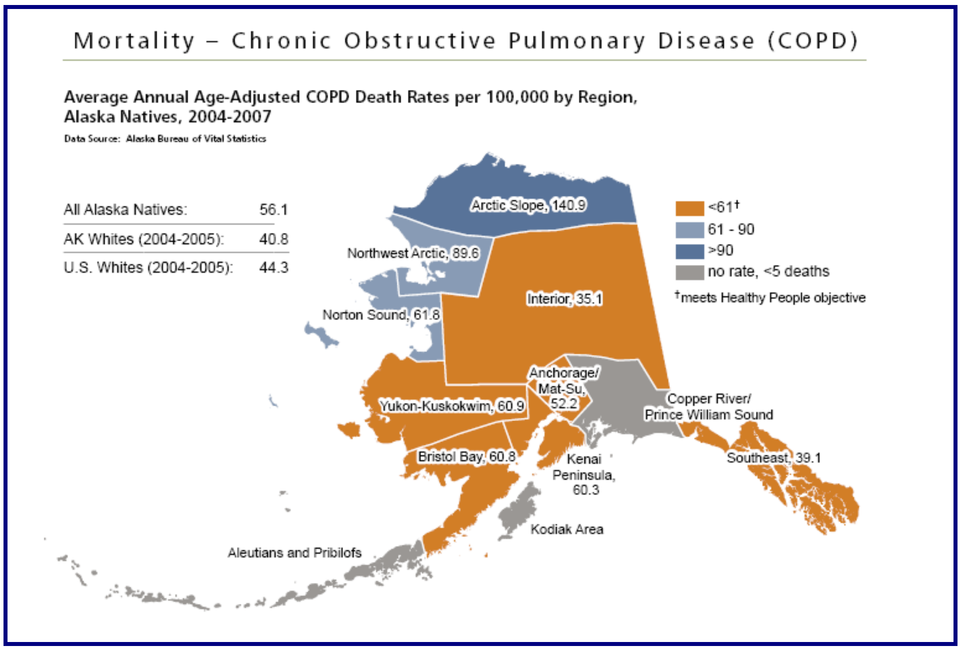


Source: AN EpiCenter 2009a

1.6.3.2 Chronic Obstructive Pulmonary Disease

High rates of chronic obstructive pulmonary disease (COPD) are seen in the Arctic Slope versus the other regions of Alaska (Figure 11). In this case, the death rate of residents of the Arctic Slope is significantly higher (p<.05) than the rate for all other regions (Figure 11). The Alaska Native COPD death rate has increased 92 percent since 1980 (p<.05). The rate peaked in 1994-1998 and appears to be decreasing. During 2004-2007, the Alaska Native COPD death rate was 40 percent higher than for Alaska Whites (p<.05) but not significantly different than for U.S. Whites. COPD rates are beginning to slowly decline in some regions potentially related to health promotion/prevention interventions.

Figure 11 Alaska Native Chronic Obstructive Pulmonary Disease

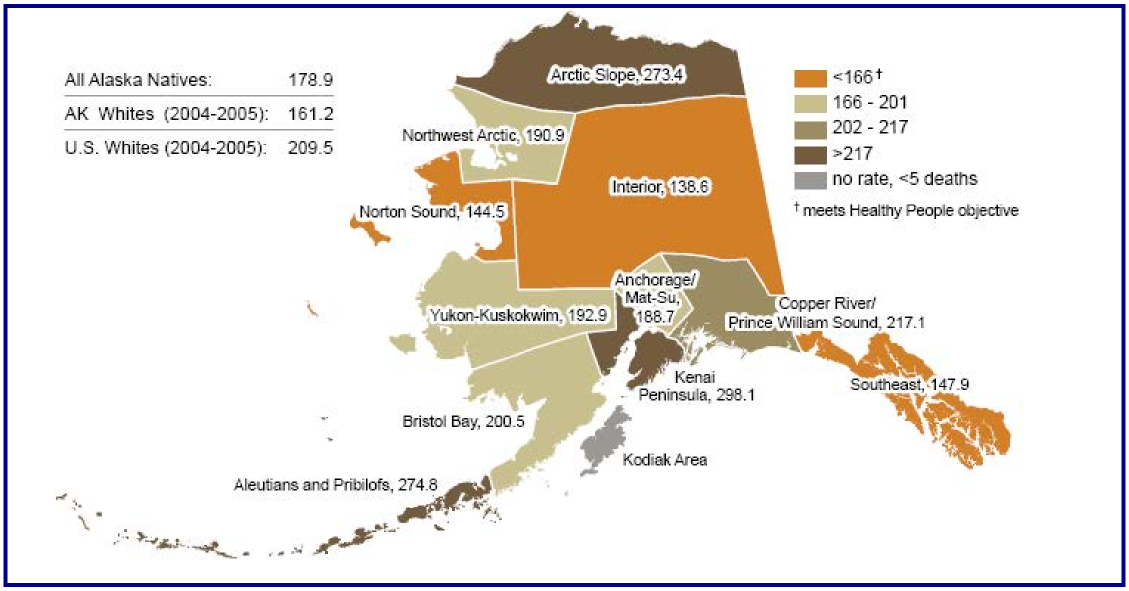


Source: AN EpiCenter 2009a

1.6.3.3 Cardiovascular Diseases

The data for cardiovascular diseases is complex. Although there appear to be variations between regions for heart disease death rates (Figure 12), only the rate in the Kodiak Area is significantly lower (p<.05) than the rate for all other regions. The rate in the Kenai Peninsula is significantly higher (p<.05) than the rate for all other regions. Interestingly, the Alaska Native heart disease death rate decreased by 43 percent between 1980 and 2007 (p<.05). Alaska Whites and U.S. Whites also experienced a similar decrease during this time period. During 2004-2007 there appear to be variations between the Alaska Native heart disease death rate and the U.S. and Alaska Whites rate; however, there is no significant difference between these populations.

Figure 12 Alaska Native Heart Disease Rate

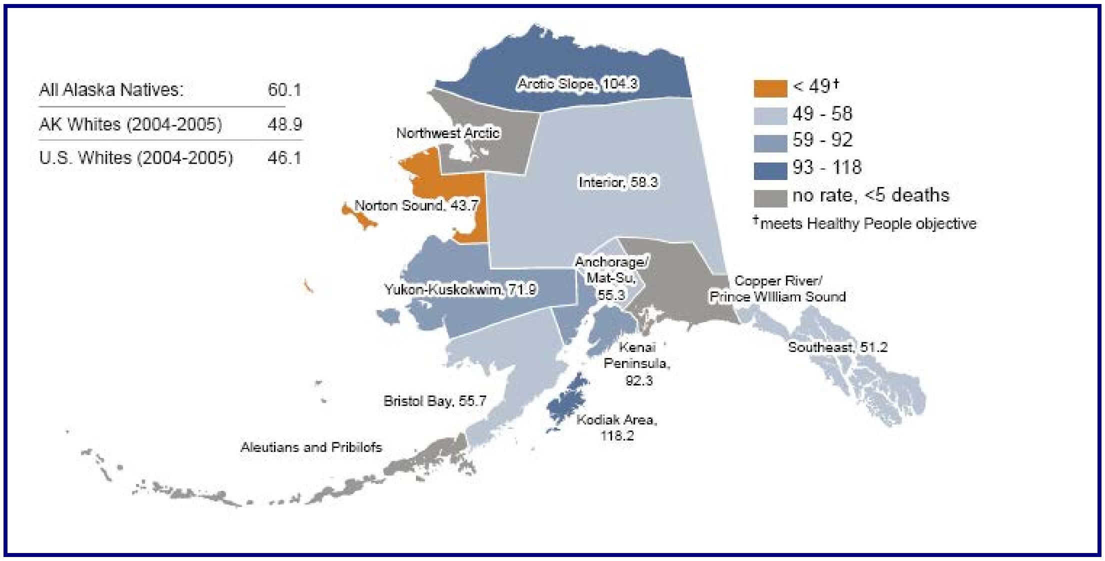


Source: AN EpiCenter 2009a

1.6.3.4 Cerebrovascular Diseases

Cerebrovascular diseases are another important cause of mortality in Alaska Natives. Although there appear to be v ariations between regions for cerebrovascular disease death rates (Figure 13), none o f the regions were significantly different than all other regions combined. Cerebrovascular disease death rates have decreased among Alaska Native people; however, the decrease is not significant. During 2004-2007, the Alaska Native cerebrovascular disease death rate was 30 percent higher than for U.S. Whites ($p<.05$) but not significantly different than for Alaska Whites.

Figure 13 Alaska Native Cerebrovascular Disease Rate



Source: AN EpiCenter 2009a

1.6.3.5 Unintentional Injury

The overall leading causes of injury for Alaska Natives and Arctic Slope residents are shown in Table 6. Regional data are shown in Figure 14.

Table 7 Leading Causes of Injury All Alaska Natives and Arctic Slope

All Alaska Natives

Injury Death – Leading Causes

Leading Causes of Injury Death, Alaska Natives, 2005-2007
Data Source: Alaska Bureau of Vital Statistics

Rank	Cause	No. of Deaths	% of Total
1	Suicide	141	28.7%
2	Unintentional Poisoning	61	12.4%
3	Motor Vehicle Traffic	46	9.3%
4	Drowning	41	8.3%
5	Homicide	39	7.9%
6	Natural/Environmental	39	7.9%
7	ATV/Snowmachine	27	5.5%
8	Other Transport (Boat, etc.)	27	5.5%
9	Suffocation	19	3.9%
10	Fire/Flame	15	3.0%
11	Fall	7	1.4%
12	Pedestrian (Other)	6	1.2%
13	Firearm	3	0.6%
	Other	9	1.9%
	Not Specified	12	2.4%
	Total	**492**	**100%**

Arctic Slope Alaska Natives 1999-2005

Cause	No. of Deaths	% Total
1. Suicide	19	39%
2. Off Road Vehicle	9	18%
Other	21	43%
Total Injury	49	100%
Total Unintentional	28	57%

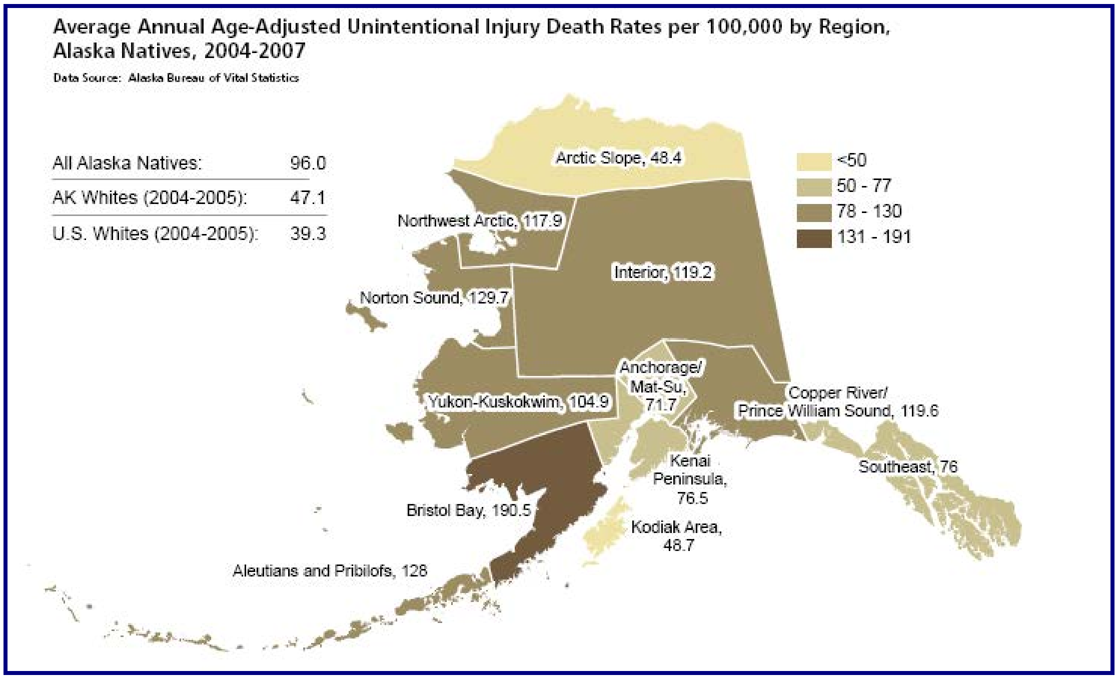
Data Source: Alaska Bureau of Vital Statistics [11]
Analysis Conducted by: AN EpiCenter

Source: AN EpiCenter 2009a

Between 1984-1988 and 1989-1993, there was a decrease in the unintentional injury death rate for Alaska Natives in the Arctic Slope Service Area, *i.e.*, 124 Alaska Natives in the Arctic Slope Service Area died as a result of an unintentional injury during 1989-1993; 71 fewer deaths than in 1984-1988. Although it appears that Arctic Slope and Kodiak's unintentional injury death rate is lower than the other regions (Figure 14), the number of deaths is too small to detect a significant difference across regions. Off road vehicles resulted in the deaths of 9 Alaska Natives in the Arctic Slope Service Area during 1999 - 2005.

Overall unintentional injury death rates for Alaska Natives are higher for men than women for all age groups. Unintentional injury death rates decreased 47 percent between 1980 and 2007 ($p<.05$). During 2004 - 2007, the Alaska Native unintentional injury death rate was 2.4 times greater than for U.S. Whites ($p<.05$) and 2.0 times greater than for Alaska Whites ($p<.05$).

Figure 14 Unintentional Injury Death Rates



Source: AN EpiCenter 2009a

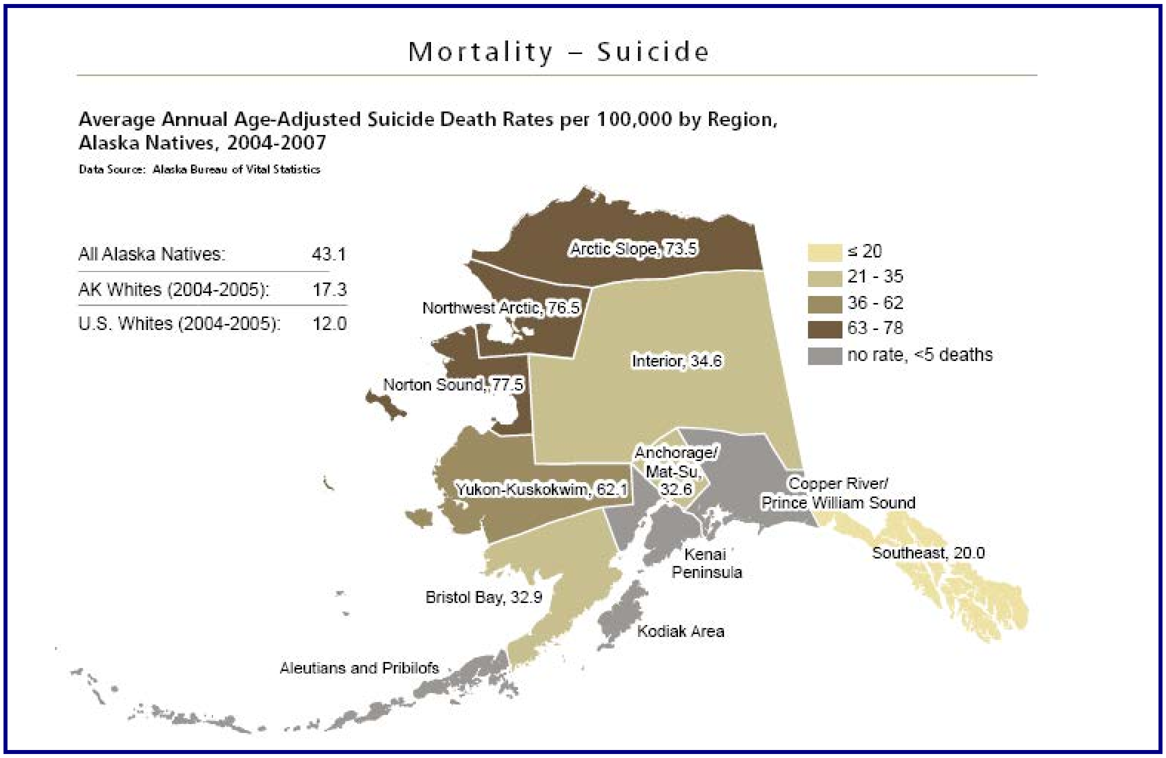
1.6.3.6 Suicide

Specific regional data are available for regional suicide rates. Although it appears that the suicide rate in the Arctic Slope (Figure 15) is higher, the number of deaths is too small to detect a significant difference across regions. Suicide rates increased 49 percent in the Arctic Slope Service Area from 1984 to 2003. Suicide was the leading cause of injury death (39 percent) in the Arctic Slope Service Area between 1999 - 2005.

The suicide death rate for the Yukon-Kuskokwim, Northwest Arctic and Norton Sound regions are significantly higher ($p<.05$) than for all other regions combined. The suicide death rate for Anchorage/Mat-Su is significantly lower than the rate for all other regions. The suicide rate for men is about 3 times that of women. Men aged 20-29 years had the highest suicide rate of any age group, male or female.

The suicide rate for Alaska Native people has not changed significantly since 1980; however, the U.S. White rate decreased by 8 percent ($p<.05$) since 1980. During 2004-2007, the Alaska Native suicide death rate was 3.6 times greater than for U.S. Whites ($p<.05$) and 2.5 times greater than for Alaska Whites ($p<.05$).

Figure 15 Suicide Death Rates by Region



Source: AN EpiCenter 2009a

1.6.3.7 Morbidity

Morbidity (illness) is tracked by following hospitalization and outpatient department data. Across all regions, (year 2007), the leading cause of hospitalizations for the Alaska Tribal Health System was childbirth and complications of pregnancy, The second leading cause was for diseases of the respiratory system, third was for injuries and poisoning and the fourth was for diseases of the digestive system. These four causes accounted for nearly 50 percent of all hospitalizations.

The leading cause of outpatient visits for the Alaska Tribal Health System during FY2007 was for diseases of the respiratory system (7.3 percent). The second leading cause was for mental health disorders (7.0 percent). During 2003 - 2005, falls were the leading cause of injury hospitalization, accounting for about one in every four (27.0 percent) injury hospitalizations. The second and third leading causes were suicide attempts (18.9 percent) and assaults (12.0 percent), respectively.

A similar pattern is seen for medical illnesses across the Arctic Slope (Table 7 through Table 9).

Table 8 Top 10 Hospital Discharges by Admission Diagnosis

All Ages, Fiscal Year 2006

Samuel Simmons Memorial Hospital			
Rank	Cause	Number	% Total
1	Complications of pregnancy/childbirth (630-677)	44	25.3%
2	Diseases of the respiratory system (460-519)	38	21.8%
3	Deliveries/childbirth (V01-V82)	38	21.8%
4	Disease of the digestive system (520-579)	10	5.7%
5	Diseases of the skin and subcutaneous tissue (680-709)	10	5.7%
6	Symptoms, signs and ill defined conditions (780-799)	8	4.6%
7	Endocrine, nutrition, metabolic, immunity disorders (240-279)	4	2.3%
8	Diseases of the nervous system and sense organs (320-389)	4	2.3%
9	Diseases of the circulatory system (390-459)	4	2.3%
10	Diseases of the muskuloskeletal system and connective tissue (710-739)	4	2.3%
	Total Discharges	**174**	

Data Source: I.H.S. NPIRS [8]

Source: AN EpiCenter 2009b

Table 9 Top 10 Inpatient by Admission Diagnosis

All Ages, Fiscal Year 2006

Samuel Simmons Memorial Hospital			
Rank	Cause	Number	% Total
1	Diseases of the respiratory system (460-519)	127	32.3%
2	Complications of pregnancy/childbirth (630-677)	76	19.3%
3	Deliveries/childbirth (V01-V82)	54	13.7%
4	Diseases of the skin and subcutaneous tissue (680-709)	34	8.7%
5	Disease of the digestive system (520-579)	23	5.9%
6	Symptoms, signs and ill defined conditions (780-799)	18	4.6%
7	Endocrine, nutrition, metabolic, immunity disorders (240-279)	13	3.3%
8	Diseases of the muskuloskeletal system and connective tissue (710-739)	12	3.1%
9	Diseases of the circulatory system (390-459)	10	2.5%
10	Diseases of the nervous system and sense organs (320-389)	8	2.0%
	Total Inpatient Days	393	

Data Source: I.H.S. NPIRS [8]

Source: AN EpiCenter 2009b

Table 10 Top 15 Outpatient Visits by ICD Recode*

All Ages, Fiscal Year 2005

Samuel Simmons Memorial Hospital

Rank	Cause	Number	% Total
1	Upper Respiratory Problems	718	11.9%
2	Accidents & Injuries	664	11.0%
3	Pregnancy, childbirth & puerperium	524	8.7%
4	Hospital Med/Surgical Follow-up	430	7.1%
5	Otitis Media	354	5.9%
6	Tests Only (Lab, X-Ray, Screening)	303	5.0%
7	Bone & Joint Disorders	249	4.1%
8	Assessment of Symptoms	243	4.0%
9	Hypertension	199	3.3%
10	Arthritis	158	2.6%
11	Musculoskeletal Disorder	146	2.4%
12	Eczema Urticaria/Skin Allergy	138	2.3%
13	Infected Skin & Abrasions	133	2.2%
14	Bronchitis, Emphysema	133	2.2%
15	Precordial & Abdominal Pain	123	2.0%
	Total Outpatient Visits	**6,046**	

Data Source: I.H.S. NPIRS [8]
* ICD Recode combines similar primary diagnoses into categories

Source: AN EpiCenter 2009b

1.6.3.8 Injury Hospitalizations

An injury hospitalization is defined as either an inpatient admission or transfer to an acute care facility due to injury. During 2000 - 2005, there were 728 injury hospitalizations to Alaska Natives in the Arctic Slope Service Area. Suicide and falls were the most common causes of injury hospitalization in the Arctic Slope Service Area; Suicide attempts accounted for 24 percent of all injury hospitalizations. Assault injury accounted for more than one out of every eight injury hospitalizations in the Arctic Slope Service Area. The Arctic Slope injury hospitalization rate is 119.4/10,000, significantly higher than for Alaska Natives statewide (99.8 per 100,000). Table 10 presents the Arctic Slope Non-Fatal Injury Hospitalization Data, 2000 - 2005.

Table 11 Arctic Slope Non-Fatal Injury Hospitalization Data, 2000-2005

Cause	No. of Hospitalizations	% Total
1. Suicide Attempts	174	23.9%
2. Falls	162	22.3%
3. Assault	104	14.3%
4. Snow machine	82	11.3%
5. ATV	55	7.6%
6. Unintentional Poisoning	15	2.1%
7. Accidentally Struck by Person or Object	13	1.8%
8. Bicycle	11	1.5%
9. Motor Vehicle Traffic Occupant	11	1.5%
10. Caught Between Objects	10	1.4%
Other	91	12.5%
Total	728	100.0%

Provided by: ANTHC Injury Prevention Program[12]
Data Source: Alaska Trauma Registry

Source: AN EpiCenter 2009b

1.6.4 Health Promotion

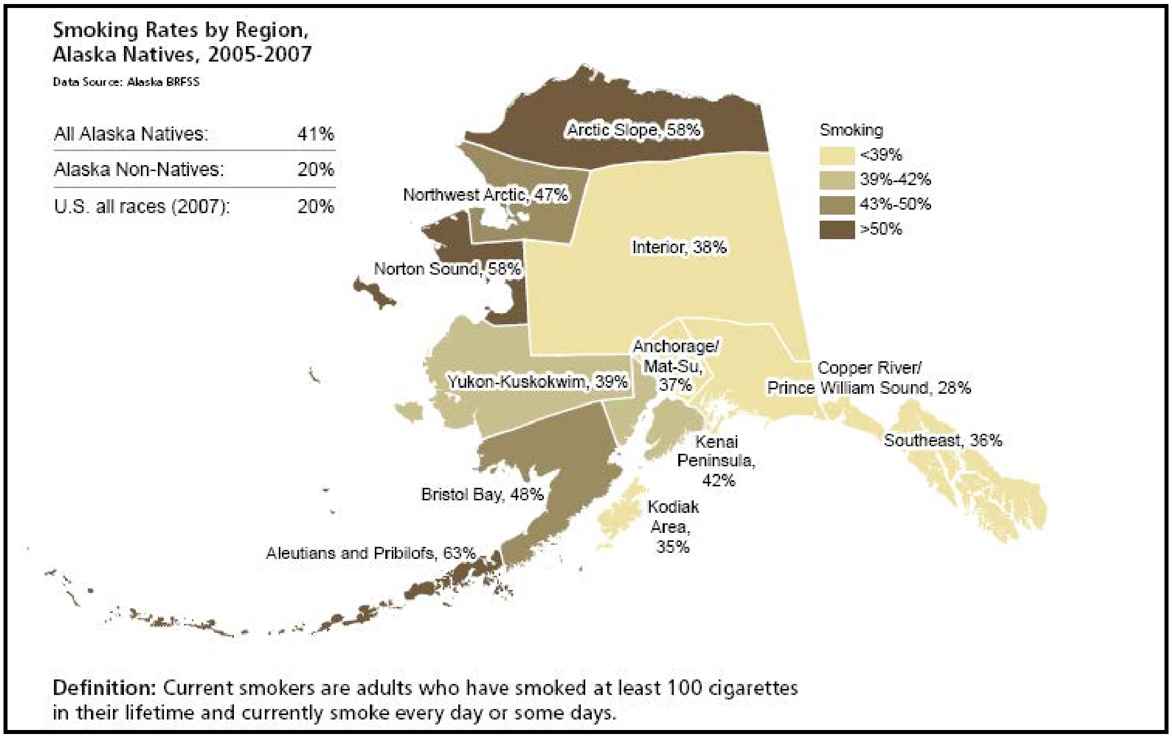
Health promotion data are focused on (i) rates of tobacco usage, (ii) substance abuse including binge drinking, (iii) obesity (adult)/overweight (children) status and (iv) physical activity of the Arctic Slope population.

1.6.4.1 Tobacco Use

Overall regional smoking rate data are shown in Figure 16. The smoking prevalence in the Arctic Slope, Norton Sound and Aleutians and Pribilofs regions is significantly higher than for Alaska Natives statewide (p<.05).Younger adults are significantly more likely to smoke (49 percent) than older adults (17 percent of those age 65 and over, p<.05). Men are more likely to smoke than women (p<.05). Smoking prevalence among Alaska Native people has remained constant since the early 1990s, while among Alaska non-Natives it has declined slightly. During 2005 - 2007, more than twice as many Alaska Native people were estimated to be c urrent smokers than Alaska non-Natives (41 percent vs. 20 percent, p<.05).

Adolescent cigarette use is defined as having smoked one or more cigarettes on one or more of the past 30 days. In 2007, 31.7 percent of Alaska Native high school students smoked cigarettes on one or more of the past 30 days. This was a slightly higher rate than that of U.S. White adolescents in 2007. In 2007, the percentage of Alaska Native high school students who had used chewing tobacco or snuff during the past 30 days was 16.6 percent. This was fifty percent higher than the rate of Alaska non-Natives.

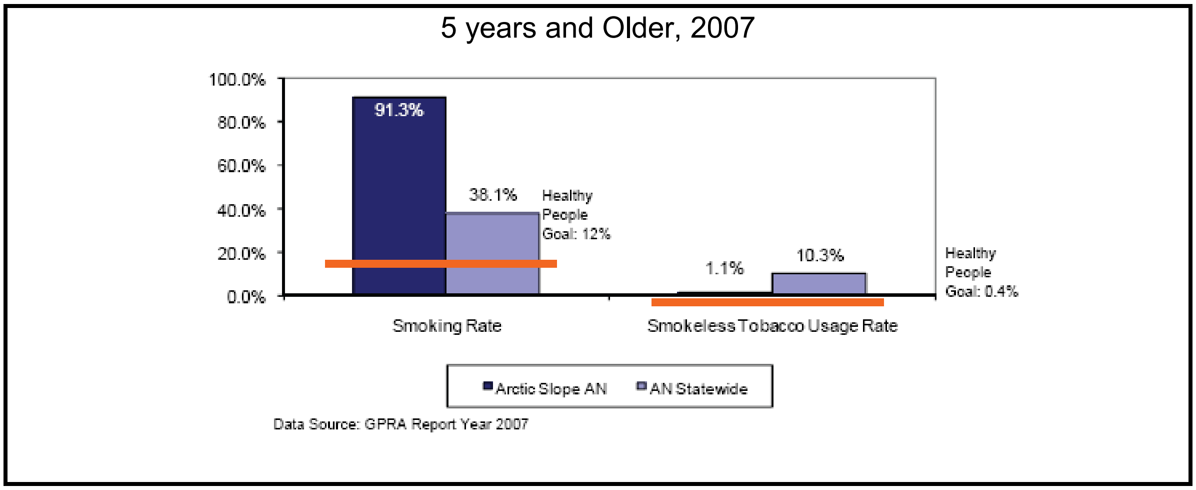
Figure 16 Tobacco Use



Source: AN EpiCenter 2009a

In the Arctic Slope, approximately 42 percent of patients were screened for tobacco use during 2007. More than 9 out of 10 (91.3 percent) Arctic Slope patients who were screened for tobacco use were smokers and 1. 1 percent of screened patients were smokeless tobacco users. These Arctic Slope specific data are shown in Figure 17 below.

Figure 17 Arctic Slope Tobacco and Smokeless Tobacco Usage Rates

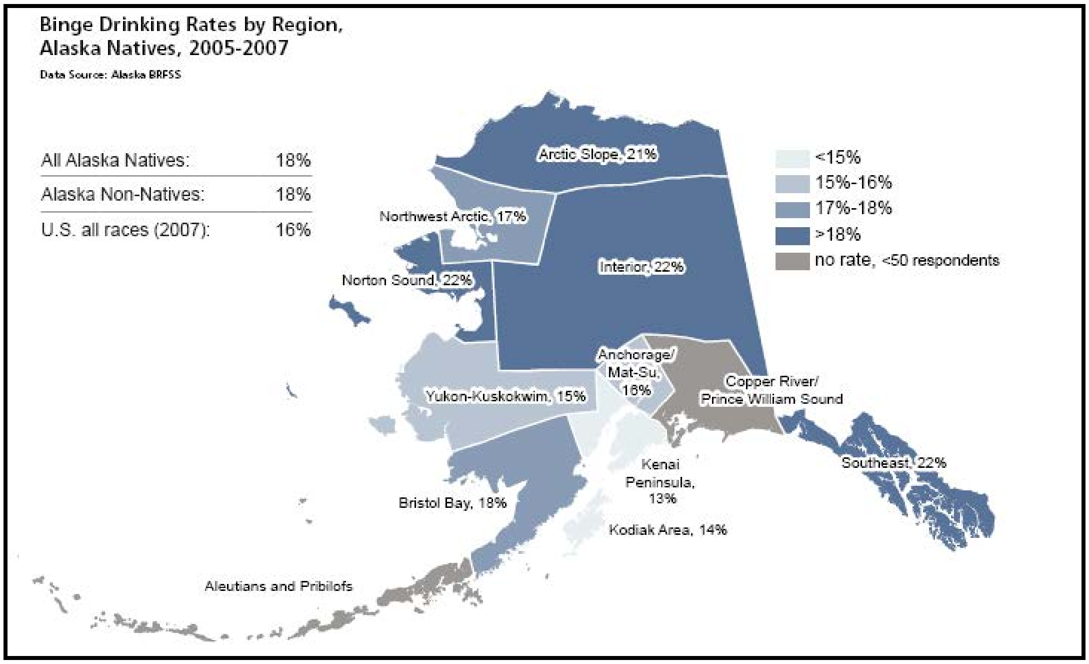


Source: AN EpiCenter 2009b

1.6.4.2 Substance Abuse

Substance abuse includes illegal drugs (*e.g.*, marijuana, cocaine) and binge drinking. Substance abuse for adolescents is defined as having used alcohol, marijuana or cocaine in the past 30 days. Binge drinking is defined as having 5 or more drinks on one or more occasion in the past 30 days. Overall Alaska Native regional data are shown in Figure 18.

Figure 18 Binge Drinking Rates by Region



Source: AN EpiCenter 2009a

Although there appears to be variations between regions, none of the region's rates of binge drinking are significantly different from Alaska Natives statewide. The prevalence of binge drinking among Alaska Native adults age 65 and older is significantly lower than for other adults (p<.05). Men are significantly more likely to binge drink than women (25 percent vs. 14 percent, p<.05). For Arctic Slope residents, the same male versus female trend is true, *i.e.*, self-reported rates of binge drinking of Arctic Slope males are more than double that for Arctic Slope females.

The prevalence of binge drinking has declined since the early 1990's, when it was estimated to be over 30 percent among Alaska Native people (p<.05). Binge drinking is equally prevalent among Alaska Natives and Alaska non-Natives at about 18 percent.

For adolescents (2007 survey data), the percent of Alaska Native high school students who report having at least one drink of alcohol on one or more of the past 30 days was less than for U.S. Whites (40.8 percent vs. 47.3 percent). Almost one-third (31.7 percent) of Alaska Native high school students report using marijuana during one or more of the past 30 days in 2007 compared to 19.9 percent of U.S. Whites. The percent of Alaska Native high school students who used any form of cocaine in the last month in 2007 was similar to that for U.S. Whites.

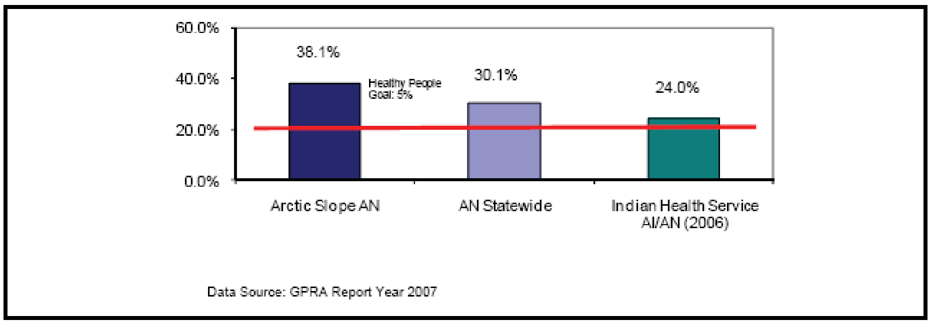
1.6.4.3 Obesity (adult) and Overweight (children)

Body mass index (BMI) is a critical indicator of obesity and overweight status. These terms are defined as:

- Obese (adults 19 – 74 years): Persons who have a current BMI assessment with a BMI of 30 or greater. Current BMI assessment requires that height and weight has been collected within the last five years or if over age 50, within the last two years.
- Overweight (children 18 and younger): Persons who have a current BMI assessment with a BMI greater than or equal to the 95th percentile using age-specific growth charts. Current BMI assessment requires that height and weight has been collected within the last year.

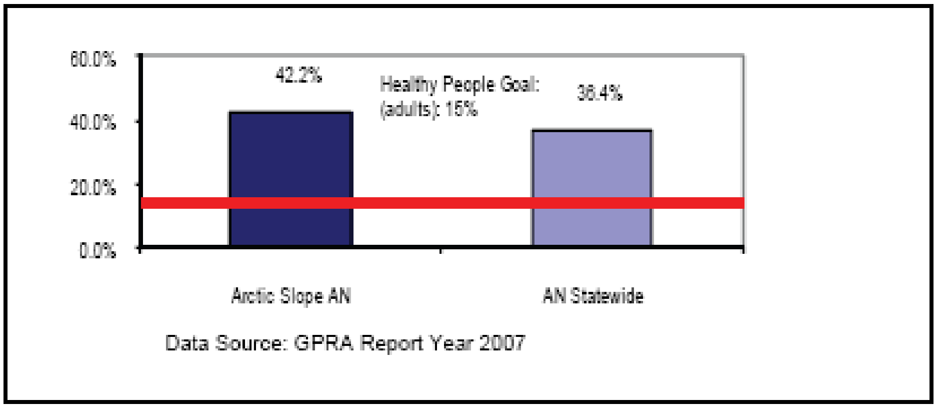
In the Arctic Slope Service Area, more than one out of every three (38.1 percent) Alaska Native children, 2-5 years meets the definition of overweight. Five out of every ten (51.6 percent) Arctic Slope patients have a current BMI assessment on record with Arctic Slope; 42 percent meet the definition of obese (>18 years) or overweight (≤18 years) as compared to 36 percent of Alaska Natives statewide. According to data from the 2007 Youth Risk Behavior Survey, 13.4 percent of Alaska Native high school students are overweight. This is slightly higher than the rate for Alaska Whites and U.S. Whites. These data are illustrated in Figure 19 and Figure 20.

Figure 19 Percent of Children who are Overweight 2-5 years, (2007 GPRA data)



Source: AN EpiCenter 2009b

Figure 20 Percent of Patients who are Obese 2-74 years, (2007 GPRA data)



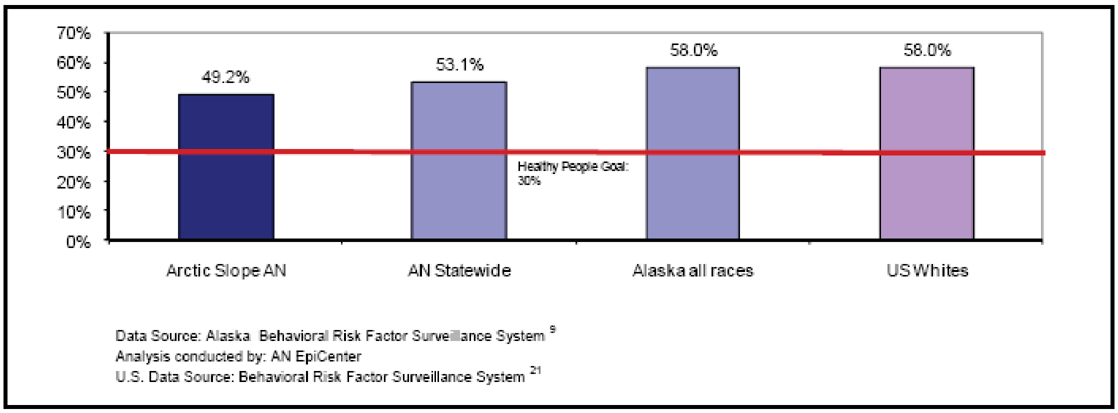
Source: AN EpiCenter 2009b

1.6.4.4 Physical Activity

Consistent physical activity is an important indicator of future cardiovascular risk. Moderate physical activity is defined as some activity that causes an increase in breathing or heart rate (30 or more minutes a day, 5 or more days per week). Vigorous physical activity is defined as some activity that causes a large increase in breathing or heart rate (20 or more minutes a day, 3 times or more a week).

The percent of Alaska Natives in the Arctic Slope service area who meet physical activity recommendations is about 4 percent less than for Alaska Natives statewide (Figure 21), and 32.1 percent of Alaska Native high school students engaged in recommended levels of physical activity. This was 15.0 percent less than Alaska non-Native students and 5.0 percent less than U.S. Whites.

Figure 21 Meets moderate or vigorous physical activity recommendations



Source: AN EpiCenter 2009b

1.6.5 Health Protection

Adequate provision of water and s anitation services is a c ritical public health infrastructure. A housing unit is considered to have water and s ewer service if it has water/sewer pipes or closed haul services. As of 2008, 94 percent of the communities in the Arctic Slope region had water and sewer service, a level significantly higher than the majority of other Native Associations (Table 11).

Table 12 Water and Sewer Rates by Region, 2008

Regional Health Corporation	2008 Housing Units with Pipes or Close Haul	2008 Total Housing Units	% Served
Aleutian Pribilofs Islands Association (APIA)	271	324	84%
Arctic Slope Native Association (ASNA)	462	491	94%
Bristol Bay Area Health Corporation (BBAHC)	1364	1572	87%
Chugachmuit	179	189	95%
Copper River Native Association	343	397	86%
Eastern Aleutian Tribes	507	541	94%
Kodiak Area Native Association	349	356	98%
Maniilaq Association	865	1140	76%
Norton Sound Health Corporation	970	1509	64%
Southcentral Foundation	212	238	89%
Southeast Alaska Regional Health Consortium	2288	2329	98%
Tanana Chiefs Conference	1150	1930	60%
Yukon-Kuskokwim Health Corporation	2753	4760	58%
Independent	1437	1556	92%
Total	**13150**	**17332**	**76%**

Data Source: ANTHC DEHE [13]

Source: AN EpiCenter 2009b

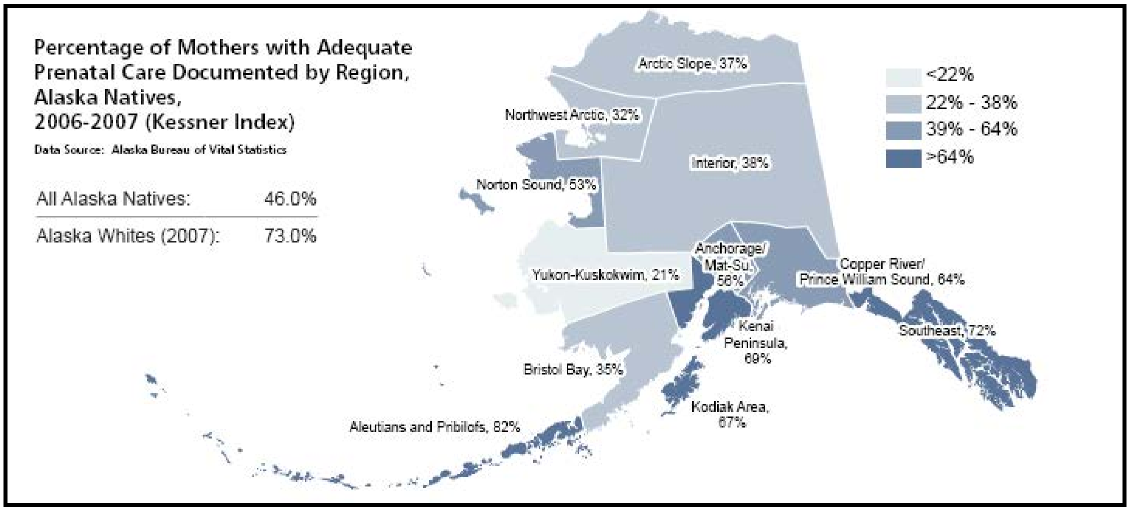
1.6.6 Preventive Services and Access to Health Care

This section includes summary information related to (i) maternal and child care (MCH), (ii) cancer screening, (iii) diabetes, (iv) immunizations, (v) family planning and (vi) infectious diseases including sexually transmitted infections (STIs).

1.6.6.1 Maternal and Child Care (MCH)

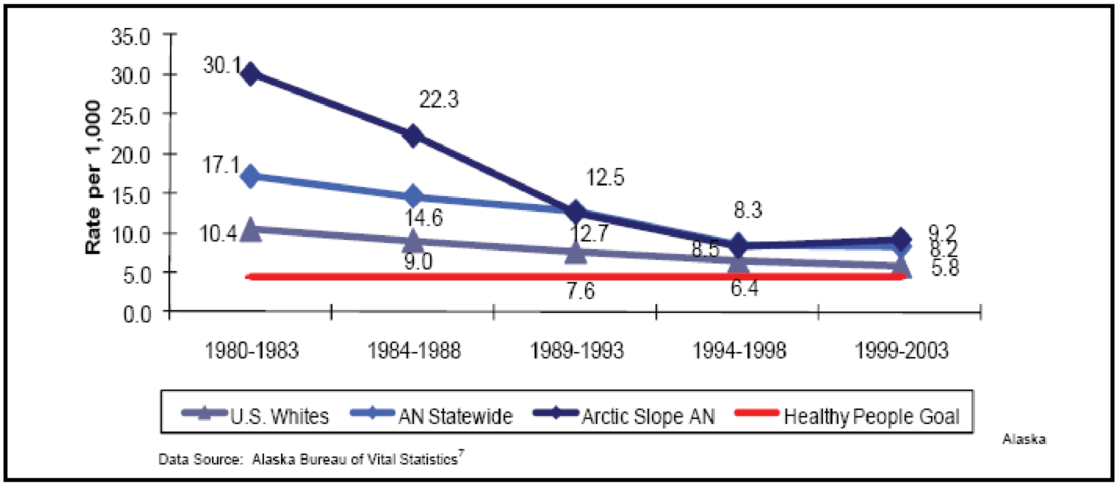
Adequate prenatal care is a critical key performance indicator. About 29 percent fewer Alaska Native mothers appear to have received adequate prenatal care as compared to Alaska White mothers ($p<.05$) (Figure 22). This may be due t o prenatal care not being documented on birth certificate forms. In addition, the percent of Alaska Native mothers with documented adequate prenatal care has decreased 15 percent since 1996. The Bristol Bay, Interior, Northwest Arctic and Yukon-Kuskokwim regions had lower rates of documented adequate prenatal care than Alaska Natives statewide ($p<.05$). This suboptimal prenatal care performance is reflected in the Arctic Slope infant mortality rate (IMR) is 1.6 times greater than for U.S. Whites. However there is improvement as the Arctic Slope infant mortality rate decreased from 30.1 from 1980 - 1983 to 9.2 from 1999-2003 (Figure 23).

Figure 22 Percentage of Mothers with Adequate Prenatal Care, Regional Data 2006-7



Source: AN EpiCenter 2009a

Figure 23 IMR 5-year intervals 1980-2003



Source: AN EpiCenter 2009a

1.6.6.2 Cancer Screening

As previously discussed (Section 1.6.3.1), the most frequently diagnosed invasive cancers for Arctic Slope Alaska Native people during 1989 - 2003 were lung (41 cases), colon/rectum (32 cases) and breast (15 cases). These three cancers accounted for over half (56.4 percent) of all cancers diagnosed. The cancers most frequently diagnosed for Arctic Slope Alaska Natives were similar to the cancers most frequently diagnosed for all Alaska Natives statewide.

There is no significant difference in breast cancer incidence between Alaska Native and U.S. White women. In 2008, 58 percent of Alaska Native women age 52-64 years had a documented mammogram within the preceding two year period. The range for the facilities reporting was from 14.3 percent to 71.6 percent.

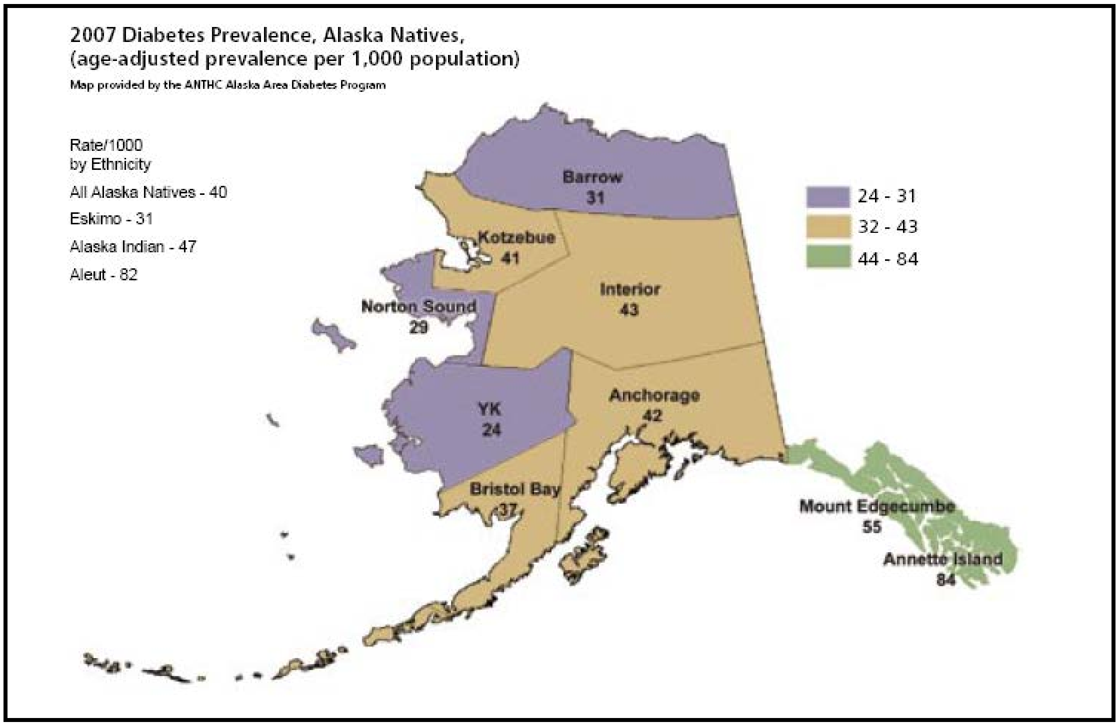
There is no significant difference in cervical cancer incidence between Alaska Native and U.S. White women. In 2008, 74 percent of Alaska Native women age 21-64 years had a documented Pap test within the preceding three-year period. The range for the facilities reporting was from 33.3 percent to 84.9 percent. More than six out of ten Arctic Slope Alaska Native women had received a pap smear within three years of the end of 2007. This is about 3 percent higher than that for all Indian Health Service (I.H.S) American Indians/Alaska Natives nationwide.

The Alaska Native colorectal cancer incidence rate is more than twice that for U.S. Whites (98.3 vs. 45.3, p<.05). In 2008, 50.1 percent of Alaska Native patients, age 51-80 years, had received colorectal cancer screening. The range for the facilities reporting was from 7.2 percent to 64 percent. Arctic Slope's Alaska Native people aged 51 to 80 years had lower colorectal cancer screenings (11.5 percent) when compared to Alaska Native people statewide (46.9 percent).

1.6.6.3 Diabetes

Diabetes mellitus, commonly referred to as diabetes, is a metabolic disease characterized by high blood sugar levels, which result from defects in insulin secretion, insulin action, or both.

Figure 24 Diabetes Prevalence

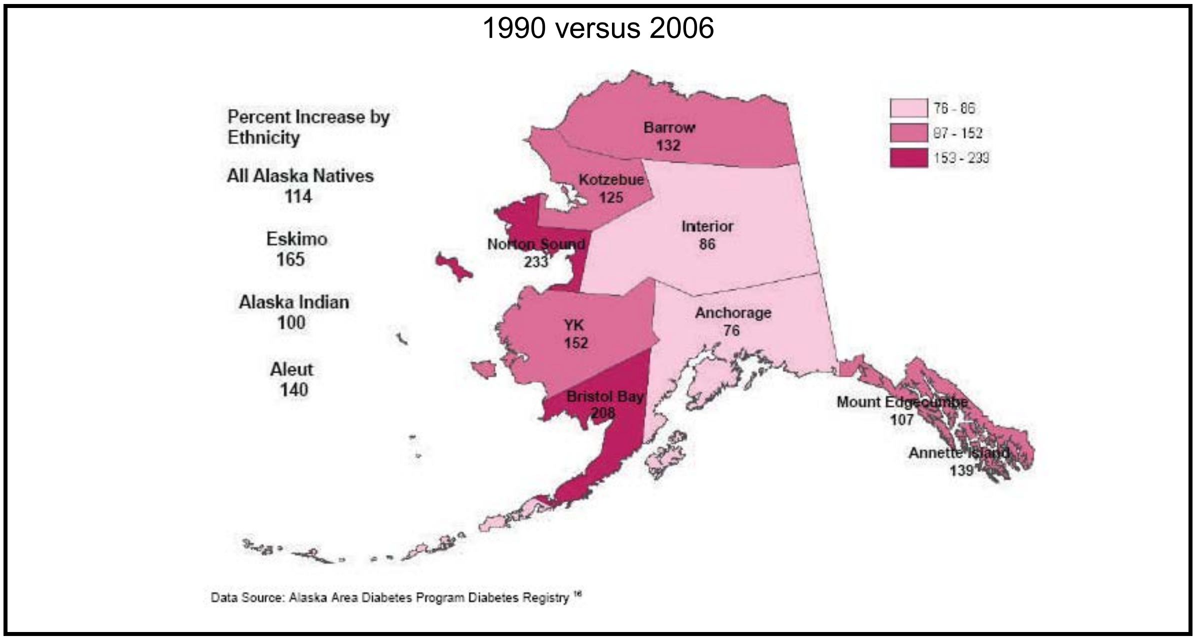


Source: AN EpiCenter 2009a

The prevalence of diagnosed diabetes among Alaska Native people for 2007 was 40 per 1,000 user population as compared to 66 per 1,000 non-Hispanic U.S. Whites (2004 - 2006). The prevalence ranged from 24 per 1,000 in the YK region to 84 per 1,000 in the Annette Island region (Figure 24). The prevalence of diabetes has increased in every region of the state between 1990 and 2007. The rate of increase was the greatest in Norton Sound (201 percent) and Bristol Bay (200 percent).

The 2006 age-adjusted prevalence of diabetes among Alaska Natives in the Arctic Slope service area (labeled Barrow service unit) is 28/1,000 (81 cases). This is 30 percent lower than for Alaska Natives statewide. The rate of diabetes has increased by 132 percent from 1990 to 2006 among Alaska Natives in the Arctic Slope service area (Figure 25).

Figure 25 Percent Rate of Increase in Diabetes Prevalence Among Alaska Natives



Source: AN EpiCenter 2009a

1.6.6.4 Immunizations

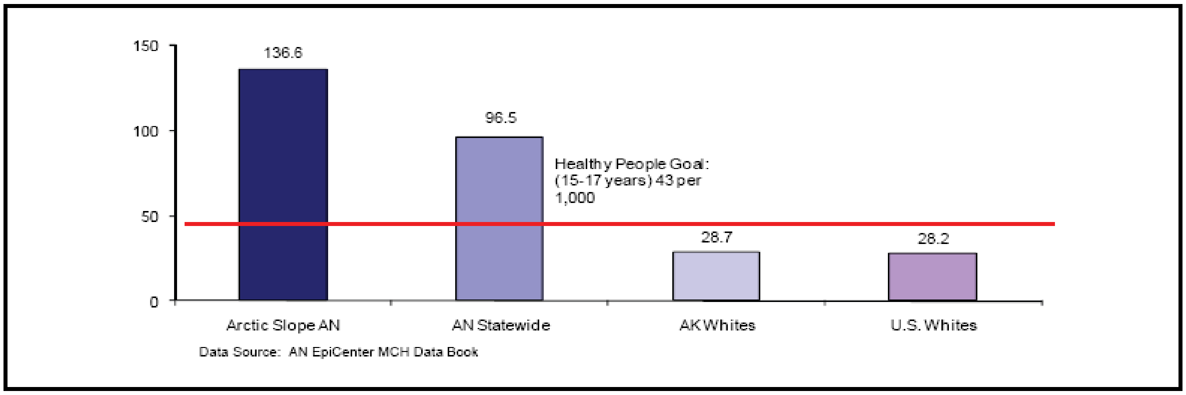
Immunization rates (greater than 80 percent coverage) for both children and adults are a critical performance indicator. By two years of age, it is recommended that all children should have received 4 doses of diphtheria-tetanus-pertussis (DTP), 3 doses of polio, 1 dose of measles-mumps-rubella (MMR), 3 doses of Hepatitis B, and 3 doses of Haemophilis Influenza, type B (Hib) vaccines. This recommendation is referred to in shorthand as "4:3:1:3:3." As of December 2007, with 82 percent 4:3:1:3:3 coverage, the Arctic Slope service area attained the Healthy People objective of 80 percent coverage.

For adults aged 65 years and older, respiratory diseases are an extremely important source of observed mortality and morbidity. By June 2007, 46 percent of Arctic Slope users 65 years and older were vaccinated against influenza in the past year as compared to 71 percent of U.S. Whites. As of June 2007, 82 percent of Arctic Slope users 65 years and older had received a pneumococcal vaccine ever as compared to 69 percent of U.S. Whites.

1.6.6.5 Family Planning

Teen birth rates, defined as live births per 1,000 females age 15-19 years, are an important key performance indicator. The teen birth rate (15 - 19 years) for the Arctic Slope Service Area is higher than for Alaska Native people statewide and nearly 5 times the Alaska White rate (Figure 26). One-half of Alaska Native high school students are sexually active.

Figure 26 Teen Birth Rate (per 1,000 females 15-19 years), 2001-2005



Source: AN EpiCenter 2009b

1.6.6.6 Infectious Diseases including STIs

Reportable infectious diseases are an i mportant performance indicator. Overall reportable infectious disease cases for Alaska Natives January 2007 - October 2008 are shown in Table 12.

Table 13 Reportable Infectious Diseases, Alaska Natives

Reportable Infectious Disease Cases,
Alaska Natives, January 1, 2007 - October 3, 2008

Data Source: Alaska Section of Epidemiology

Infectious Disease	Cases	%
Chlamydia	4103	79.3%†
Gonorrhea	476	9.2%†
Hepatitis C	198	3.8%
Pneumococcal invasive	135	2.6%
Tuberculosis, Pulmonary	52	1.0%
Chlamydia, PID	37	0.7%†
Pertussis	32	0.6%
Salmonella	25	0.5%
GAS invasive disease	24	0.5%
GBS invasive disease	18	0.3%
Chicken Pox	15	0.3%
Botulism, Foodborne	13	0.3%
Campylobacter	12	0.2%
Gonorrhea, PID	9	0.2%†
Invasive H Flu, Not Meningitis	7	0.1%
Giardia	5	0.1%
Hepatitis B	3	0.1%
Meningitis, Haemophilus	3	0.1%
Other Infectious Diseaes	10	0.2%
Total	**5177**	**100.0%**

Source: AN EpiCenter 2009b

Sexually Transmitted Infections (STI) comprised 89.4 percent of all Alaska Native reportable infectious disease cases. Chlamydia was by far the most commonly reported infectious disease, accounting for 80 percent of all reported infectious diseases. The Chlamydia rate reported for Alaska Native men is about 4 times greater than is reported for Alaska White men. The Chlamydia rate reported for Alaska Native women is about 7 times greater than is reported for Alaska White women.

The Chlamydia rate for Alaska Native people living in the Arctic Slope Service Area (1,317 per 100,000) is less than that of Alaska Natives statewide but double that of Alaska all races. The Arctic Slope gonorrhea rate of 20 per 100,000 is one-fifth that of all Alaskans.

1.6.7 Summary Arctic Slope

A summary of the key baseline data for the Arctic Slope is shown in Table 13.

Table 14 Arctic Slope Key Baseline Data

Leading Causes of Death (2004-2007)

	Cause of Death	Arctic Slope # Deaths	% of Deaths	Rate per 100,000	Rate Ratio: Arctic Slope vs. Alaska Natives
1	Cancer	25	23%	274.5	1.2
2	Heart Disease	17	15%	273.4	1.5
3	Suicide	12	11%	73.5	1.8
4	Unintentional Injury	8	7%	48.4	0.5
5	COPD	8	7%	140.9	2.6*
	Total- All Causes	111	100%	1350.5	1.3*

** significant difference, p<.05*

Adult Behaviors (2005-2007)

Measure	Arctic Slope	Lower CI[1]	Upper CI[1]	Alaska Natives Statewide	Alaska non-Natives Statewide
Obese (BMI 30+)	37%	28%	47%	31%	25%*
Current Smokers	58%	47%	68%	41%*	20%*
Smokeless Tobacco Users	4%	1%	13%	11%	4%
Meets Physical Activity Recommendations	NA	NA	NA	55%	61%
Binge Drinkers	21%	11%	36%	18%	18%

** significantly different from region, p<.05; [1] 95% Confidence Interval*

Maternal and Child Health (2006-2007)

Measure	Arctic Slope	Alaska Natives Statewide	Alaska Whites
Low Birth Weight	6%	5%	6%
Adequate Prenatal Care	37%	46%	73%*
Smoking during Pregnancy	48%	29%*	10%*
Smokeless Tobacco during Pregnancy	1%	11%*	0%
Alcohol Consumption during Pregnancy	4%	3%	2%

** significantly different from region, p<.05*

Diabetes (2007)

Measure	Barrow Service Unit	Alaska Natives Statewide
Diabetes Prevalence per 1,000	31	40
% Rate of Increase since 1990	158%	117%

Environmental Health (2008)

Measure	Arctic Slope Native Assn.	AK Tribal Health System
Water and Sewer Service Rates	94%	76%

Source: AN EpiCenter 2009a

1.6.8 Data Gaps

As previously discussed, the databases for the Arctic Slope are quite comprehensive and detailed. These data are aggregated at the regional level. Disaggregating the data for the individual PACs is an extremely difficult task and probably unnecessary at this stage of the HIA process. There may be a rationale to evaluate disaggregating a few key performance indicators for future monitoring and evaluation (M&E) purposes. However, this will require additional feasibility discussions with the "holders" of the critical databases.

2.0 IMPACT ANALYSIS

2.1 Introduction

This section details the health impacts related to each of the five alternatives and also considers the construction, drilling, and operational phases of each alternative. The most significant positive and negative impacts are associated with

(i) Transportation corridors,
(ii) Exposures to hazardous materials
(iii) Local emergency medical services,
(iv) Continued evolution of subsistence and nutrition behaviors, and
(v) Psychosocial effects, particularly related to anxiety.

These positive and negative effects are centered in the Zone 1 communities of Kaktovik and Nuiqsut as well as the coastal hunting areas utilized by both communities (generally between Bullen Point and Point Demarcation). Local workers may be hired for construction and/or operation of the Point Thomson Project, but neither local employment quotas nor employment estimates exist.

The impacts on Anaktuvuk Pass (AP) relate to potential changes in employment and income. The impacts on Prudhoe Bay and Deadhorse relate to barge docking at West Dock and the transport of personnel, supplies and equipment to Point Thomson. Barrow is the regional center for NSB and the impact on health services arises from increased usage and revenues generated during Point Thomson operations which flow from the state to regional and local agencies.

Section 2.2 details the impact analysis methodology. Section 2.2 presents Impact Analysis and Section 2.4 presents the Mitigation Strategies and recommendations based on the impacts identified.

2.2 Impact Assessment Methodology

The methodology for analyzing potential impacts during an HIA has been presented in Section 1.5. The specific methodology utilized for the Point Thomson Project is presented below. Because the Point Thomson HIA was conducted as a rapid assessment HIA, new field research (*e.g.* nutritional surveys or in depth community interviews) was not gathered. Nevertheless, the HIA team travelled to Deadhorse/Prudhoe Bay and received a briefing on the facility and the surrounding area. Additionally, stakeholder engagement meetings conducted by the EIS team were reviewed in detail as well as sections of the EIS that relate to human health such as Transportation (e.g. accidents and injuries); Socioeconomic; Environmental Justice (e.g. psychosocial issues); and Subsistence and Traditional Land Use Patterns (e.g. subsistence foods community health, and dietary impacts). A specific analysis of the HECs based on applicable baseline data is presented below. An overall baseline health picture of the NSB was presented in Section 1.6. The development of an impact rating panel is presented and discussed below.

2.2.1 Heath Effects Categories

In addition to Health Effects Categories (HEC) developed for the State of Alaska HIA Draft Toolkit, as presented in Section 1.5., discrete issues specific to the Point Thomson Project were developed, as listed in Table 14, below.

Table 15 Health Effects Category and Discrete Point Thomson Project Issues

Health Effects Category	Overview
Social Determinants of Health (SDH) including psychosocial, domestic violence and gender issues <u>Discrete PTP issues:</u> • Change in maternal child health status • Change in depression/anxiety prevalence • Change in substance abuse rate • Change in suicide rate • Change in teen pregnancy rates • Change in domestic violence	**Description** ◆ Several important psychosocial issues related to drugs, alcohol, teenage pregnancy, family stress, domestic violence, are considered. Work rotation pattern/hiring practices and effects on family and subsistence can also be considered but duplicative analysis should be avoided. ◆ Economy and employment, cultural continuity (anxiety/stress regarding perceived threats to traditional ways of life), and environmental conditions are considered. The overall contribution of project-specific effects on economy, employment and the relationship to population health status are considered. **Baseline Situation** ◆ NSB suicide rates are elevated and is the leading cause of injury death; ◆ Injury rates (all causes) is higher than AN statewide; ◆ Tobacco usage rates are extremely high and above AN statewide; ◆ Binge drinking and drugs of abuse rates in NSB are typical for AN statewide; ◆ NSB maternal/child health (MCH) has improved and is consistent with statewide AN levels; ◆ Teen birth rate in NSB is significantly higher than AN statewide ◆ Unemployment in NSB is low relative to other areas; ◆ Project will use a 2 week FIFO system. **Analysis** ◆ Psychosocial issues are already present and a concern in NSB; ◆ FIFO likely to be keep Pt Thomson at parity with other existing projects; ◆ MCH is unlikely to be materially affected; ◆ Substance abuse issues a perceived concern (voiced village stakeholder concern) ◆ Project unlikely to materially change employment picture except for modest construction season "bump." **Impact Analysis** ◆ Panel Ratings

Health Effects Category	Overview
Accidents and Injuries Discrete PTP issues: • Change in unintentional injury (*e.g.* drowning, falls, snow machine injury) rates • Change in roadway incidents and injuries due to service road access for hunters/ increased traffic from Prudhoe Bay • Changes to safety during subsistence activities	**Description** ◆ Concerns focus on potential influx of non-resident personnel (increased traffic on roadways and air corridors; Distance of travel required for successful subsistence. ◆ Will Project create new infrastructure (*e.g.* roadways) that increases traffic/usage, etc. ◆ Will project significantly increase number of vehicles on existing roadways. **Baseline Situation** ◆ Unintentional injury rates in NSB are consistent with AN and may be declining but absolute numbers are small; Off road accidents account for 18% of NSB unintentional injuries; Snow machine accidents are 11% of non-fatal injury hospitalizations. **Analysis** ◆ Unintentional injury rates are a significant contributor to the burden of disease in NSB; off road/snow machine accidents/injuries are important sources of morbidity and mortality for the NSB. **Impact Analysis** • Panel Ratings
Exposure to potentially hazardous materials Discrete PTP issues: • Changes in physiologic contaminant levels such as lead, methyl mercury, PCB, Dioxins, PM2.5 from incineration, drilling mud, or gas flaring. • Changed levels of the same substances in subsistence resources	**Description** Project emissions and discharges can lead to potential exposure. Exposure pathways include: • Quality changes in subsistence foods (risk based on analysis of foods or modeled environmental concentrations) • Drinking water • Respiratory (fugitive dust, criteria pollutants, persistent organic pollutants, volatile organics) • Secondary occupational exposure (exposure of home residents to dust/contaminants on worker clothing) • Indirect pathways could include changing heating fuels/energy production fuels in communities • Rates of disease endpoints, specific to the contaminant(s) of concern. **Baseline Situation** • Concern over exposure to potentially hazardous materials is frequently voiced in community meetings; • Distances from project facilities to physical communities is substantial such that anticipated concentrations are expected to be *de minimis;* • Exposure duration and frequency is likely to be minimal even during subsistence activities; • Project is expected to increase the number of operating incinerators,

Health Effects Category	Overview
	especially during construction. Currently incinerators are not covered by rigorous emission requirements; however, this is likely to change. **Analysis** • Stakeholder concerns are likely mismatched to actual physical exposures and potential received doses in the village setting; • Incinerators are a concern and are currently not covered by stringent emission requirements; • Different alternatives will have an impact on incinerator throughput and subsequent output. **Impact Analysis** • Panel Ratings
Food, Nutrition, and Subsistence Activity Discrete PTP issues: • Change in amount of dietary consumption of subsistence resources • Change in composition of diet • Change in food security	**Description** • *Effect on Diet*: Communities in rural Alaska continue to rely on subsistence resources to varying degrees. This pathway considers the effect of subsistence impacts on diet, in the context of other factors (such as income, personal choice work schedule/time off) that drive subsistence harvesting and food consumption patterns in Alaskan communities. Food security is considered; Project impacts on access, quantity, perceived (or actual quality) impacts and competition for resources are considered within the context of the effect of these potential impacts on diet and subsequent population level health. **Baseline Description** • Data are based on harvest surveys which use both historic data and some new survey information; • Nutritional survey data are not readily available; • Harvest data must be translated into population level potential effects; • Individual household vulnerability versus community-level must be differentiated. **Analysis** • Villages within the potential impact areas (Barrow, AP, Nuiqsut, Kaktovik) are not equivalent in terms of potential impacts; • Harvest data must be translated into potential household and community level effects; • Numerous confounding factors, *e.g.*, climate change, effects of income/food selection choices, purchasing power significantly complicate the analysis. **Impact Analysis** • Panel Ratings

<table>
<tr><th>Health Effects Category</th><th>Overview</th></tr>
<tr><td>Infectious Disease

<u>Discrete PTP issues:</u>
• Change in pediatric acute respiratory disease rates (RSV, pneumonias, asthma, Bronchiectasis)
• Change in acute adult respiratory disease rates (TB, Bronchitis, Influenza)
• Change in STD rates (esp. Chlamydia, Gonorrhea, HIV)
• Change in gastrointestinal (GID) outbreaks</td><td>Description
• Influx of non-resident personnel from outside the region, crowded or enclosed living & working conditions can facilitate the transmission of respiratory and gastrointestinal infections.
• Antibiotic-resistant staph skin infections are prevalent in parts of Alaska, presenting a risk of transmission for non-resident workers (particularly in any setting involving shared hygiene facilities, living quarters, or equipment).
• Influx of non-resident worker; mixing of low and high prevalence populations create a risk for transmission of STIs such as syphilis, HIV, and Chlamydia.
• Vector-borne diseases (VBD) could be an issue if standing groundwater/wetlands changes resulted in altered distribution of insect vectors. With the cumulative effects of climate change, VBD may become an issue of greater concern in the future.
Baseline Situation
• Respiratory diseases (COPD, pneumonia and influenza) account for 10% of the NSB mortality profile
• Respiratory diseases account for 21% of the NSB hospital discharges;
• Respiratory diseases account for 32% of inpatient admissions and is the leading admission diagnosis in the NSB;
• Respiratory diseases are the leading cause of outpatient visits (11.9%)
• STIs, particularly Chlamydia, are a significant concern; however, the NSB rate is less than AN statewide;
• Tobacco usage rates are over 90% in the NSB.
• Vector diseases are slowly increasing northward move.
Analysis
• Burden of respiratory diseases is extremely high in the NSB and for AN statewide;
• Tobacco usage rates are a major confounder
• Alternatives that increase construction population and construction duration are a potential concern;
• Project camps are closed and FIFO system drastically minimizes interaction with local communities.
• Additional ponds created during construction will potentially increase breeding sites.
Impact Analysis
• Panel Ratings</td></tr>
<tr><td>Water and Sanitation</td><td>Description
Access, quantity and quality of water supplies are considered. In rural Alaska, lack of adequate water service is linked to the high rates of</td></tr>
</table>

Health Effects Category	Overview
Discrete PTP issues: • Changes in potable water access • Change in water quantity • Change in water quality • Change in sanitation effectiveness, adequate settling pools, discharge	lower respiratory infections observed in some regions, and to invasive skin infections. Projects can have potential effects on water and sanitation such as • Revenue from the project that supports construction and maintenance of water & sanitation facilities. • Increased demand on water and sanitation infrastructure secondary to influx of non-resident workers. **Baseline Situation** • NSB has extremely high levels of water/sewer services (94%) much greater than AN statewide averages **Analysis** • Project is unlikely to materially affect baseline **Impact Analysis** • Panel Ratings
Non-communicable and Chronic Diseases Discrete PTP issues: • Change in obesity prevalence • Change in average BMI • Change in Type 2 DM rates • Change in Hypertension • Change in lung cancer rates • Change in COPD rates	**Description** • Cardiovascular diseases including stroke; • Obesity, impaired glucose tolerance, and diabetes • Cancer rates • Exercise/fitness **Baseline Analysis** • Cancer is the leading cause of death in the NSB but the burden is not significantly different across other regions except for the ANC/Mat-Su region (lower) • Lung/bronchus is the leading cancer • Tobacco usage is extremely high in NSB • Heart disease is the number three cause of NSB mortality (11.7%); cerebrovascular (4.3%) • NSB cardiovascular and cerebrovascular disease rates are not significantly different than AN statewide; • NSB obesity rates are higher than statewide AN; • NSB physical activity rates are lower than AN statewide levels • NSB diabetes rates are rising; however, the overall NSB diabetes burden is 30% lower than AN statewide levels. **Analysis** • NSB non-communicable disease rates are evolving in complex ways and appear to be multi-factorial; • The Pt. Thomson project is small relative to the size and complexity of the NSB and is unlikely to materially affect population-level effects; • Subsistence effects are determined in the specific Subsistence HEC **Impact Analysis** • Panel Ratings

Health Effects Category	Overview
Health Services Infrastructure and Capacity <u>Discrete PTP issues:</u> • Change in number of clinics and staff • Change in quality of clinics and staff • Change in services offered (*e.g.* prenatal checks, x-ray, lab services) • Change in accessibility of health care • Change in utilization/clinic burden from non-resident influx	**Description** Projects can affect health services infrastructure and capacity, through: • Revenues used to support local/regional services and infrastructure • Increased demands on infrastructure and services by incoming non-resident employees or residents injured on the job. **Baseline Situation** • NSB has a fully functioning health system including in-patient , outpatient and public health services; **Analysis** • The FIFO system will significantly limit interaction and effects on local health systems; • Changes in accident/injury rates could cascade into the local emergency management systems; **Impact Analysis** • Panel Ratings

2.2.1.1 Risk Assessment Matrix

While there are numerical risk-based environmental standards that regulate biota, air, water and soil, there are no similar quantitative regulatory endpoints for public-health outcomes. Winkler 2010 proposes a risk assessment technique that ranks the significance of identified health impacts allowing health planners prioritize management actions. The entire rating is based on a modified Delphi approach (Rowe and Wright, 1999), a technique used in judgment and forecasting situations where pure model-based statistical methods are not practicable.

The HIA team performed this evaluation, as fully described in Winkler 2010 by drawing on

(i) Available health baseline data from the literature review;
(ii) Review of the project context, alternatives and developments;
(iii) Review of pertinent sections of the Point Thomson Project Environmental Impact Statement, particularly the Socioeconomic, Environmental Justice, Subsistence, and Transportation section; and
(iv) Information and recommendations generated by a panel of Alaskan medical and public health professionals.

The HIA team created a worksheet for each of the eight HECs and each of the five alternatives. Each of the 40 worksheets was divided into the project phases: construction, drilling, and operation. The health impact parameters consider:

- **Duration** – determines how long each phase will last; ranked from under a month to beyond the life of the project
- **Magnitude** – evaluates the intensity of the impact, particularly in light of existing baseline conditions
- **Extent** – identifies the localities where the projected impact will be experienced, *e.g.*, local or regional
- **Likelihood** – evaluates the probability that the impact will occur
- **Nature** – determines whether the impact is direct, indirect or cumulative
- **Impact** – evaluates whether the impact is positive or negative, *i.e.,* whether the impact will promote or progress, degrade or detract from the well-being of defined communities or populations
- **Scoring –** as described in Figure 27 and Figure 28 below.

For the risk analysis, a 4-step procedure was developed that is illustrated on the risk assessment matrix (Figure 27 and 28), as modified from Winkler 2010**,** and as presented below.

Figure 27 Step 1 of 4-Step Risk Assessment Matrix

Step 1				
	Consequences			
Impact Level (score)	**A – Health Effect**	**B- Duration**	**C-Magnitude**	**D- Extent**
Low (0)	Effect is not perceptible	Less than 1 month	Minor intensity	Local/Project Area
Medium (1)	Effect results in annoyance, minor injuries or illnesses that do not require intervention	Short-term: 1-12 months	Those impacted will be able to adapt to the impact with ease and maintain pre-impact level of health	Local/Zone 1: Kaktovik and Nuiqsut
High (2)	Effect resulting in moderate injury or illness that may require intervention	Medium-term: 1 to 6 years	Those impacted will be able to adapt to the health impact with some difficulty and will maintain pre-impact level of health with support	Zone 2: Prudhoe Bay/Deadhorse AP Barrow
Very high (3)	Effect resulting in loss of life, severe injuries or chronic illness that requires intervention	Long-term: more than 6 years/life of project and beyond	Those impacted will not be able to adapt to the health impact or to maintain pre-impact level of health	Rest of Alaska US Global

In Step 1, the extent of the four different consequences — (A) effect; (B) duration; (C) magnitude; and (D) extent—is rated according to the criteria set forth in Figure 28. The output of this rating is a score between 0 and 3 for each consequence, depending on the estimated impact level:

- Low (score = 0)
- Medium (score=1)
- High (score=2)
- Very high (score=3).

Figure 28 Steps 2, 3, and 4 of 4-Step Risk Assessment Matrix

Step 2	***Step 3***						
Severity Rating (Magnitude + Duration + Geographic Extent + Health Effect)	***Likelihood Rating***						
	Extremely Unlikely < 1%	**Very Unlikely** 1-10%	**Unlikely** 10-33%	**About as Likely as Not** 33-66%	**Likely** 66-90%	**Very Likely** 90-99%	**Virtually Certain** > 99%
Low (0-3)	◆	◆	◆	◆	◆◆	◆◆	◆◆
Medium (4-6)	◆	◆	◆	◆◆	◆◆	◆◆	◆◆◆
High (7-9)	◆◆	◆◆	◆◆	◆◆◆	◆◆◆	◆◆◆	◆◆◆◆
Very high (10-12)	◆◆◆	◆◆◆	◆◆◆	◆◆◆◆	◆◆◆◆	◆◆◆◆	◆◆◆◆
Step 4	***Impact Rating***						
	Key: Low ◆ Medium ◆◆ High ◆◆◆ Very High ◆◆◆◆						

In Step 2, as shown in Figure 28, the scores of the consequences are summed up and based on the value the impact severity is assigned as follows:

- Low (0–3)
- Medium (4–6)
- High (7–9)
- Very high (10–12).

In Step 3 the likelihood of the impact to occur is assessed according to the following definitions, as presented in IPCC 2007:

- Exceptionally unlikely < 1 percent probability
- Very unlikely 1-10 percent probability

- Unlikely 10-33 percent probability
- About as likely as not: 33-66 percent probability
- Likely: 66-90 percent probability
- Very likely: 90-99 percent probability
- Virtually certain: > 99 percent probability.

Step 4 entails the final significance rating, which is identified through the intersection of the impact severity and the likelihood of the impact to occur, as shown in Figure 28.

A low significance indicates that the potential health impact is one where a negative effect may occur from the proposed activity; however, the impact magnitude is sufficiently small (with or without mitigation) and well within accepted levels, and/or the receptor has low sensitivity to the effect.

Impacts classified with a medium significance and above require action so that predicted negative health effects can be mitigated to as low as reasonably practicable (Winkler 2010). An impact with high or very high significance will affect the proposed activity, and without mitigation, may present an unacceptable risk. The significance is simply stated as positive (e.g. improvement of health services). If there is a negative accentuation of the health impact compared to the baseline condition, this is indicated in the risk assessment matrix by the use of a + sign to indicate a positive impact or a – sign to indicate a negative impact.

2.2.2 Expert Panel Review

Scientists and health professionals may have very different interpretations of "acceptability" or "significance." To gather a variety of perspectives, the HIA Team hosted a panel on October 29, 2010, to consider the Point Thomson Project, its implications for human health, and to rank and rate those human health impacts. This panel was conducted in a focus group format in order to discuss a collection of impacts already identified by the HIA team. The focus group consisted of members of the HIA team, state public health professionals, state officials with excellent knowledge of the project, and international HIA experts.

The Significance Scoring Tables prepared by the panel for each HEC and each alternative are presented in Annex 1.

2.3 Impact Analysis

In all alternatives, workers would fly in and fly out (FIFO) of the site and would not be allowed outside of the project site without work authorization. Residents of Kaktovik and Nuiqsut would not be allowed inside the gate unless they were employees.

All of the action alternatives (B, C, D, and E) would require camps for construction, drilling, and operations. Temporary camp modules would be self-contained and include potable and wastewater systems. They would be located on gravel pads or single-season ice pads (ExxonMobil 2010zz). A permanent operations camp would be located on the pad with the Central Processing Facility. All camp modules would contain kitchens, laundry, recreational facilities, and sleeping quarters. A minimum of two infield construction camps would be required to house up to 600 construction crew members.

In the first construction season of each alternative, a temporary 140-bed export pipeline construction camp would be required; its location would depend upon the pipeline route in that alternative. In the second pipeline construction season, crew members would be housed at one of the two main construction camps (HDR 2011tt). These construction camps would demobilize with the construction crews and equipment. A temporary drilling camp would arrive onsite with the drill rig and would house the 140-person drilling staff, and would demobilize with the drill rig at the end of the drilling phase (HDR 2011tt).

The permanent operations camp would be designed to hold up to 140 staff members, though the average operations crew would be 80 personnel (HDR 2011aa) during standard operations. This camp would arrive with the facility modules in each alternative. Utility modules associated with the operations camp would include a potable water treatment system, potable water tanks, a wastewater treatment system; storage tanks for raw water and fire abatement; and water pumps for fire fighting.

The HIA team noted that during construction, drilling, and operation activities under all alternatives, the Point Thomson facility would be self-contained and workers would have no reason to travel to any of the NSB communities, other than Deadhorse for their FIFO rotations. The lack of physical connection between Point Thomson and the other communities reduces the interaction between the workers and the local community and therefore reduces the spread of infectious disease and reduces the potential for adverse human health effects to community characteristics or culture.

Because natural gas and oil production have occurred in the NSB for the past 35 years, the construction of the Point Thomson facility represents a familiar activity for the communities and the borough. In Alternative A, no condensate would be produced; in Alternatives B, C, D, and E, ExxonMobil expects to deliver condensate and any producible oil to Trans-Alaska Pipeline System Pump Station No. 1 at Prudhoe Bay for shipment to market. Initial average production of condensate is expected to be 10,000 barrels per day (bpd). If and when the wells on the East and West Pads are deemed viable, the production of hydrocarbon liquids (oil in addition to condensate) may increase, though the extent of the potential increase would be determined by reservoir delineation and evaluation activities.

The following eight tables summarize the impact analysis of each alternative for each Heath Effects Category/Health Issue (Table 15 through Table 22).

Table 16 Summary Scoring - HEC: Water and Sanitation

Health Issue	Alt A	Alt B	Alt C	Alt D	Alt E
Construction Phase					
Changes in potable water access	No activity	No impact	No impact	No impact	No impact
Change in water quantity	No activity	No impact	No impact	No impact I	No impact
Change in water quality	No activity	No impact	No impact	No impact It	No impact
Change in sanitation effectiveness, adequate settling pools, discharge	No activity	No impact	No impact	No impact I	No impact
Drilling Phase					
Changes in potable water access	No activity	No impact	No impact	No impact	No impact
Change in water quantity	No activity	No impact	No impact	No impact	No impact
Change in water quality	No activity	No impact	No impact	No impact	No impact
Change in sanitation effectiveness, adequate settling pools, discharge	No activity	No impact	No impact	No impact I	No impact
Operation Phase					
Changes in potable water access	No impact	No impact	No impact	No impact	No impact
Change in water quantity	No impact	No impact	No impact	No impact	No impact
Change in water quality	No impact	No impact	No impact	No impact I	No impact
Change in sanitation effectiveness, adequate settling pools, discharge	No impact	No impact	No impact	No impact	No impact

Table 17 Summary Scoring - HEC: Accidents and Injuries

Health Issue	Alt A	Alt B	Alt C	Alt D	Alt E
Construction Phase					
Change in unintentional injury (e.g. drowning, falls, snow machine injury) rates	No activity	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Change in roadway incidents and injuries due to service road access for hunters / increased traffic from Prudhoe Bay	No activity	-3 = Low	-8 = High	-8 = High	-3 = Low
Changes to safety during subsistence activities	No activity	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Drilling Phase					
Change in unintentional injury (e.g. drowning, falls, snow machine injury) rates	No activity	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Change in roadway incidents and injuries due to service road access for hunters / Increased traffic from Prudhoe Bay	No activity	-3 = Low	-8 = High	-8 = High	-3 = Low
Changes to safety during subsistence activities	No activity	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Operation Phase					
Change in unintentional injury (e.g. drowning, falls, snow machine injury) rates	No impact	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Change in roadway incidents and injuries due to service road access for hunters / increased traffic from Prudhoe Bay and all–season road	No impact	-3 = Low	-6 = Medium	-6 = Medium	-3 = Low
Changes to safety during subsistence activities	No impact	-3 = Low	-3 = Low	-3 = Low	-3 = Low

Table 18 Summary Scoring - HEC: Exposure to Hazardous Materials

Health Issue	Alt A	Alt B	Alt C	Alt D	Alt E
Construction Phase					
Changes in physiologic contaminant levels such as lead, methyl mercury, PCB, Dioxins, PM2.5 from incineration, drilling mud, or gas flaring	No activity	-4 = Medium	-6 = Medium	-6 = Medium	-5 = Medium
Changed levels of the same substances in subsistence resources	No activity	-4 = Medium	-6 = Medium	-6 = Medium	-5 = Medium
Drilling Phase					
Changes in physiologic contaminant levels such as lead, methyl mercury, PCB, Dioxins, PM2.5 from incineration, drilling mud, or gas flaring	No activity	-4 = Medium	-5 = Medium	-5 = Medium	-5 = Medium
Changed levels of the same substances in subsistence resources	No activity	-4 = Medium	-5 = Medium	-5 = Medium	-5 = Medium
Operation Phase					
Changes in physiologic contaminant levels such as lead, methyl mercury, PCB, Dioxins, PM2.5 from incineration, drilling mud, or gas flaring	No impact	-4 = Medium	-5 = Medium	-5 = Medium	-5 = Medium
Changed levels of the same substances in subsistence resources	No impact	-4 = Medium	-5 = Medium	-5 = Medium	-5 = Medium

Table 19 Significance Scoring - HEC: Food, Nutrition, and Subsistence

Health Issue	Alt A	Alt B	Alt C	Alt D	Alt E
Construction Phase					
Change in amount of dietary consumption of subsistence resources	No activity	-3 =Low	-4 = Medium	-4 = Medium	-3 = Low
Change in composition of diet	No activity	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Change in food security	No activity	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Drilling Phase					
Change in amount of dietary consumption of subsistence resources	No activity	-3 = Low	-4 = Medium	-4 = Medium	-3 = Low
Change in composition of diet	No activity	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Change in food security	No activity	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Operation Phase					
Change in amount of dietary consumption of subsistence resources	No impact	-3 = Low	-4 = Medium	-4 = Medium	-3 = Low
Change in composition of diet	No impact	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Change in food security	No impact	-3 = Low	-3 = Low	-3 = Low	-3 = Low

Table 20 Summary Scoring - HEC: Health Infrastructure/Delivery

Health Issue	Alt A	Alt B	Alt C	Alt D	Alt E
Construction Phase					
Change in number of clinics and staff	No activity	No impact	No impact	No impact	No impact
Change in quality of clinics and staff	No activity	No impact	No impact	No impact	No impact
Change in services offered (e.g. prenatal checks, x-ray, lab services)	No activity	No impact	No impact	No impact	No impact
Change in accessibility of health care	No activity	No impact	No impact	No impact	No impact
Change in utilization/clinic burden from non-resident influx	No activity	-3 = Low	-8 = High	-8 = High	-3 = Low
Drilling Phase					
Change in number of clinics and staff	No activity	No impact	No impact	No impact	No impact
Change in quality of clinics and staff	No activity	No impact	No impact	No impact	No impact
Change in services offered (e.g. prenatal checks, x-ray, lab services)	No activity	No impact	No impact	No impact	No impact
Change in accessibility of health care	No activity	No impact	No impact	No impact	No impact
Change in utilization/clinic burden from non-resident influx	No activity	-3 = Low	-8 = High	-8 = High	-3 = Low
Operation Phase					
Change in number of clinics and staff	No impact	+7 = High	+7 = High	+7 = High	+7 = High
Change in quality of clinics and staff	No impact	+7 = High	+7 = High	+7 = High	+7 = High
Change in services offered (e.g. prenatal checks, x-ray, lab services)	No impact	+7 = High	+7 = High	+7 = High	+7 = High
Change in accessibility of health care	No impact	+7 = High	+7 = High	+7 = High	+7 = High
Change in utilization/clinic burden from non-resident influx	No impact	-3 = Low	-3 = Low	-3 = Low	-3 = Low

Table 21 Summary Scoring - HEC: Infectious Disease

Health Issue	Alt A	Alt B	Alt C	Alt D	Alt E
Construction Phase					
Change in pediatric acute respiratory disease rates (RSV, pneumonias, asthma, Bronchiectasis)	No activity	No impact	No impact	No impact	No impact
Change in acute adult respiratory disease rates (TB, Bronchitis, Influenza)	No activity	No impact	No impact	No impact	No impact
Change in STD rates (esp. Chlamydia, Gonorrhea, HIV)	No activity	No impact	No impact	No impact	No impact
Change in GID outbreaks	No activity	No impact	No impact	No impact	No impact
Drilling Phase					
Change in pediatric acute respiratory disease rates (RSV, pneumonias, asthma, Bronchiectasis)	No activity	No impact	No impact	No impact	No impact
Change in acute adult respiratory disease rates (TB, Bronchitis, Influenza)	No activity	No impact	No impact	No impact	No impact
Change in STD rates (esp. Chlamydia, Gonorrhea, HIV)	No activity	No impact	No impact	No impact	No impact
Change in GID outbreaks	No activity	No impact	No impact	No impact	No impact
Operation Phase					
Change in pediatric acute respiratory disease rates (RSV, pneumonias, asthma, Bronchiectasis)	No impact	No impact	No impact	No impact	No impact
Change in acute adult respiratory disease rates (TB, Bronchitis, Influenza)	No impact	No impact	No impact	No impact	No impact
Change in STD rates (esp. Chlamydia, Gonorrhea, HIV)	No impact	No impact	No impact	No impact	No impact
Change in GID outbreaks	No activity	No impact	No impact	No impact	No impact

Table 22 Summary Scoring - HEC: Non-communicable Chronic Disease

Health Issue	Alt A	Alt B	Alt C	Alt D	Alt E
Construction Phase					
Change in obesity prevalence	No activity	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Change in average BMI	No activity	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Change in type 2 DM rates	No activity	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Change in hypertension	No activity	No impact	No impact	No impact	No impact
Change in lung cancer rates	No activity	No impact	No impact	No impact	No impact
Change in COPD rates	No activity	No impact	No impact	No impact	No impact
Drilling Phase					
Change in obesity prevalence	No activity	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Change in average BMI	No activity	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Change in type 2 DM rates	No activity	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Change in hypertension	No activity	No impact	No impact	No impact	No impact
Change in lung cancer rates	No activity	No impact	No impact	No impact	No impact
Change in COPD rates	No activity	No impact	No impact	No impact	No impact
Operation Phase					
Change in obesity prevalence	No impact	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Change in average BMI	No impact	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Change in type 2 DM rates	No impact	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Change in hypertension	No impact	No impact	No impact	No impact	No impact
Change in lung cancer rates	No impact	No impact	No impact	No impact	No impact
Change in COPD rates	No impact	No impact	No impact	No impact	No impact

Table 23 Summary Scoring - HEC: Social Determinants of Health

Health Issue	Alt A	Alt B	Alt C	Alt D	Alt E
Construction Phase					
Change in maternal child health status	No activity	No impact	No impact	No impact	No impact
Change in depression/anxiety prevalence	No activity	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Change in substance abuse rate	No activity	No impact	No impact	No impact	No impact
Change in suicide rate	No activity	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Change in teen pregnancy rates	No impact	No impact	No impact	No impact	No impact
Change in domestic violence	No activity	No impact	No impact	No impact	No impact
Drilling Phase					
Change in maternal child health status	No activity	No impact	No impact	No impact	No impact
Change in depression/anxiety prevalence	No activity	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Change in substance abuse rate	No activity	No impact	No impact	No impact	No impact
Change in suicide rate	No activity	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Change in teen pregnancy rates	No activity	No impact	No impact	No impact	No impact
Change in domestic violence	No activity	No impact	No impact	No impact	No impact
Operation Phase					
Change in maternal child health status	No impact	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Change in depression/anxiety prevalence	No impact	-4 = Medium	-4 = Medium	-4 = Medium	-4 = Medium
Change in substance abuse rate	No impact	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Change in suicide rate	No impact	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Change in teen pregnancy rates	No impact	-3 = Low	-3 = Low	-3 = Low	-3 = Low
Change in domestic violence	No impact	-3 = Low	-3 = Low	-3 = Low	-3 = Low

2.3.1 Alternative A - No-Action Alternative

Alternative A is the No Action Alternative which assumes that the project does not obtain a permit from the Corps to proceed and monitoring the project site is the only activity that would occur.

2.3.1.1 Construction

In the No Action Alternative, there is not construction activity.

2.3.1.2 Drilling

There is no activity in Phase 2 – Drilling.

2.3.1.2 Operation

Monitoring is the only activity in Phase 3 – Operation. If the No Action Alternative is selected, the wells would continue to be monitored in accordance with Alaska Oil and Gas Conservation Commission (AOGCC) regulations and prudent operator practices until the time that they are closed or brought into production in a future project.

2.3.1.3 Cumulative Effects

There are no cumulative health effects under Alternative A as the facility would not be developed. Under the No Action Alternative, the Applicant would suspend project engineering and planning activities for the evaluation of the Thomson Sand and other hydrocarbon resources at Point Thomson. Evaluating the resources is integral to development and would require onsite support infrastructure and processing facilities. The Applicant would investigate whether any options exist for resource delineation, evaluation, and development without filling wetlands. At this time, it is believed that there would be insufficient space on the existing Central Pad for processing facilities and related support infrastructure to make a viable project.

2.3.2 Alternative B – Applicants Proposed Action

Alternative B is the applicant's proposed action initiating the development of the Thomson Sand reservoir and hydrocarbon production facility. Alternative B takes advantage of nearly year-round access by using seasonal modes of travel, including barge access in the summer, ice roads in the winter, and helicopters and fixed-wing aircraft as weather permits. Alternative B would configure the drilling and production facilities onto three gravel pads to facilitate evaluation of all hydrocarbon resources, and provide flexibility for future natural gas production should the currently-proposed project prove that larger-scale natural gas production was viable. This alternative would locate the onshore gravel pads near the coastline, incorporating portions of two existing gravel pads. To facilitate the transport of large facility modules to Point Thomson, a sealift facility composed of onshore bulkheads and offshore mooring dolphins would be constructed.

2.3.2.1 Construction/Drilling

Construction and drilling in this alternative are simultaneous, because there is an existing central pad and both are anticipated to be complete within a three-year period. Facilities, including the pipeline and barging facilities, are located near the coast. Health issues related to construction of Alternative B include:

- Potential negative impacts on exposure to hazardous materials
- Potential negative impacts on reduced consumption of subsistence resources

Exposure to hazardous materials

The expert panel ranked exposure to hazardous materials as medium, primarily because of the presence of incinerators with no documented plan for monitoring stack emissions. While emissions will likely be rapidly diffused over a wide area, the health panel could not deny that certain byproducts of incomplete combustion would escape the stack and some potential for exposure of wildlife and humans could exist.

Food, Nutrition, and Subsistence Activities

According to Section 5.22, Subsistence and Traditional Land Use Patterns, under Alternative B, primary potential impacts could include the loss of high-use Kaktovik subsistence use areas for caribou due to project infrastructure (West, East, and Central Pads; gathering pipelines; gravel road; and a small percentage of the export pipeline); reduced resource availability to Kaktovik hunters for caribou due to displacement from infrastructure (e.g., pipelines) and noise/traffic; reduced resource availability and access to Nuiqsut hunters for bowhead whales due to noise/traffic; and reduced user access due to avoidance of coastal hunting areas in the project vicinity for caribou and fish (Dolly Varden and whitefish) resulting from project infrastructure, noise/traffic, contamination, and hunting regulations. These impacts would affect resources of major importance including caribou, fish (Dolly Varden and whitefish), and bowhead whale
The maximum potential harvest loss associated with the Point Thomson Project is between 0.8 percent (Bullen Point and Point Thomson) and 10.8 percent (Bullen Point to Brownlow Point/Canning River delta) annually (between 1 and 13. 3 pounds of caribou per capita)

According the Environmental Justice section (Chapter 4.16), if the proposed project reduces the quantity of caribou harvested by residents of Kaktovik, they would likely purchase more food from outside the area. In addition to increasing the reliance on the cash economy and the cost of living, Kaktovik residents could experience a change in diet as caribou become a less dominant part of their diet, which may result in nutritional deficiencies.

Changes to subsistence resource habitat and hunting areas cannot be directly converted into changes in human health status. Rather, changes to subsistence resource areas could negatively affect human health if one makes several interrelated assumptions. Besides assuming that complete avoidance of the area does in fact occur, one must then assume that

(a) Reduction in subsistence resource area equals a reduction in subsistence resource harvest,

(b) Reduction in subsistence harvest equals reduction in subsistence resource consumption and

(c) Residents choose to replace lost subsistence foods with less nutritious alternatives.

According to Section 5.22, less than 1 percent of the total caribou harvest may be affected by the activities described under Alternative B or 1 pound of caribou per person per year (or approximately 600 calories of very lean meat). When placed in the context of the overall subsistence harvest (including Bowhead whale harvest) this region (Bullen Point to Point Thomson) represents less than 1 percent of the overall harvest according to the data provided. It is possible that in some years residents could have successful hunts without accessing this remote region and that the actual harvest would not be materially affected. On the other hand, it is also the case that in some years, avoidance of this hunting ground may significantly challenge harvest efforts if herds are less present in other areas or if whale harvest does not occur.

Second, the reductions in subsistence resource areas could affect human health if one further assumes that a reduction in harvest produces an equal reduction in consumption of subsistence resources. Due to factors such as resource sharing and variable subsistence food consumption for different community groups (*e.g.* men vs. women, elderly vs. youth) it is difficult to know precisely to what extent a reduction in the resource affects consumption patterns in the community. For some individuals or household units with heavy reliance on traditional foods, the reduction in subsistence harvest may significantly reduce subsistence consumption. For others with different dietary habits, the reduction in harvest may have little impact.

Third, reduction in subsistence resource areas could possibly affect human health if one also assumes that residents will replace subsistence foods with less healthy alternatives. While residents will obviously replace subsistence foods using cash purchased foods, some may choose healthy replacement foods and some may not. Without current nutritional survey information for these villages, it is difficult to say precisely how a predicted reduction in subsistence resource area will ultimately affect human health. If, however, one makes all of the assumptions above and there is indeed a reduction in subsistence food consumption, this could lead to negative impacts on human health in the community. Based on the information provided in the subsistence report, the coastal region affected by the project yields a very small portion of the overall subsistence harvest for Kaktovik and would likely produce very small changes in consumption of traditional foods.

Subsistence activities are also an important component of the Nuiqsut economy and Iñupiat culture and identity. As in Kaktovik, subsistence resource harvesting continues to be the focus of life in Nuiqsut. Caribou are an important migratory resource that consistently ranks among the top two resources harvested by Nuiqsut residents. Although Nuiqsut's most recent (1995-2006) caribou use areas do not extend as far east as Point Thomson, caribou that migrate through the Point Thomson area may later be harvested by Nuiqsut hunters. Caribou use areas do extend to just east of Prudhoe Bay and cross the Dalton Highway which will experience a significant increase in traffic under Alternatives C and D.

Section 5.22 concludes by stating that given the Applicant's CAA with the AEWC, which restricts barge traffic during the Nuiqsut bowhead whaling season, Alternative B is not expected to result in reduced harvests of bowhead whales. Impacts on fish harvesting would be unlikely to occur for Nuiqsut, but are possible for Kaktovik and primarily related to impacts from user avoidance; these impacts would be limited in extent. Waterfowl hunting impacts are unlikely.

Given the assumptions involved and the relatively small amount of meat potentially lost per capita, the panel rated the impact on (i) the amount of dietary consumption of subsistence resources, (ii) change in composition of diet and (iii) the change in food security as low. (see Table 18, Summary Scoring Table, HEC: Food, Nutrition and Subsistence for individual issues).

Social Determinants of Health (SDH)

Construction of Alternative B would be a multi-year project that generates employment within the NSB and the State of Alaska. Employment would peak in the fifth year of construction when an estimate of 950 workers would be employed in construction, and drilling (HDR 2011aa).

Construction and dr illing employees will be hou sed in six construction camps with a maximum capacity of 520 workers In addition, Alternative B includes a pioneer camp that would be transported to the project site by tundra-safe, low-pressure vehicles in late fall. This pioneer camp would be located on existing gravel, would house up to 160 personnel, and would be demobilized in late fall of Year 2, once the construction camp modules arrived. Temporary camp modules would be self-contained and include potable and wastewater systems. They would be located on g ravel pads or single-season ice pads (ExxonMobil 2010zz) and access would be restricted..

ExxonMobil anticipates hiring local NSB residents as part of its construction crew or as employees of subsidiaries of the Native Corporations of Kaktovik, Kaktovik Iupiat Corporation and of Nuiqsut, Kuukpik Corporation. In 2009, 20 NSB residents were employed under these two contracts. Income in local NSB communities might also be positively impacted by the proposed seasonal hire of area residents for Marine Mammal Observers, Subsistence Advisors, and Polar Bear Monitors. Increased income is directly related to improved health (ExxonMobil 2009, ExxonMobil 2010).

The Subsistence and Traditional Land Use Patterns section (Chapter 4.13) notes that if harvests of subsistence resources (particularly caribou) decline because of the effects of infrastructure, noise/traffic, or contamination on resource availability, then there might be fewer opportunities to teach younger generations the skills necessary to hunt, harvest, and process subsistence resources, potentially weakening overall community wellbeing. The HIA team rated these potential impacts, a neg ative change to community cohesiveness, as low because the core subsistence areas near Kaktovik should not be affected by the Project.

2.3.2.2 Operation

Important health issues related to operation of Alternative B include:

- Potential negative impacts on exposure to hazardous materials
- Potential negative impacts on reduced consumption of subsistence resources

- Potential negative impacts on social determinants of health such as change in depression/anxiety prevalence
- Potential positive impact on the number and quality of health care clinics and staff, number of services available and accessibility to service providers.

Exposure to hazardous materials

The HIA expert panel ranked exposure to hazardous materials as medium, primarily because of the duration of the project. While the amount of incinerated waste would decrease after construction, there would still be no requirement for stack monitoring which precludes knowing if persistent organic pollutants are entering the atmosphere. The US Environmental Protection Agency is currently reviewing stack monitoring regulations which if enacted would change this rating.

Food, Nutrition, and Subsistence Activities

Even though hunters may avoid the Project Area for the duration of project operation, the HIA team determined that the potential impact on consumption of subsistence foods would remain low for Alternative B. This is due to the remote nature of the affected area and the relatively small contribution it makes to the subsistence caribou harvest for Kaktovik and Nuiqsut.

Social Determinants of Health

A total of 160 permanent employees are expected to work at the Point Thomson site during operation. It is unclear how many of these positions will be filled by NSB residents because of the required job skills needed during operations. Long – term (30 year) employment during operations requires facility operators, mechanical technicians, electrical technicians and instrument technicians. There will be limited positions open for less technical workers such as equipment operators, maintenance staff, and other direct support positions (ExxonMobil 2009, ExxonMobil 2010**).**

The Point Thomson facility is expected to have an operational life of 30 years and these jobs would continue throughout the life of the project. ExxonMobil has committed to continuing their local hiring program and encouraging independent contractors to "hire, train and retain" Native residents (ExxonMobil 2010). Given the fact that the NSB does not have a sufficiently developed industrial base to supply materials or other project related services, a direct hire program would be the primary method by which the NSB could benefit economically from the proposed project. Deadhorse would experience a minor increase in activity during operation of the Point Thomson facility and this would generate some minor indirect employment and income during the 30 years that the facility is expected to operate. As with the construction positions, operational jobs at Point Thomson would command premium pay due to the harsh Arctic conditions at the site, isolation, the relative scarcity of experienced or trained workers, and the commercial value of the end product. Income in local NSB communities may be positively impacted by the proposed seasonal hire of area residents for Marine Mammal Observers, Subsistence Advisors, and Polar Bear Monitors. Increased income, increased educational attainment and increased employment rates are directly related to improved health (ExxonMobil 2009, ExxonMobil 2010**).**

As with the construction activities, operation of the Point Thomson facility would be fully self-contained and workers would have no reason to travel to any of the NSB communities, other than Deadhorse. The lack of physical connection between Point

Thomson and the other communities would also reduce interaction between the workers and the local community. This lack of interaction is expected to reduce any potential for adverse effects to community characteristics or culture.

As noted previously, if harvests of subsistence resources (particularly caribou) decline because of the effects of infrastructure, noise/traffic, or contamination on resource availability, then there might be fewer opportunities to teach younger generations the skills necessary to hunt, harvest, and process subsistence resources, potentially weakening overall community wellbeing. The HIA team rated these potential effects as a negative change to community cohesiveness and possible increased anxiety/depression due to removal of historic hunting lands, as low since the majority of the core subsistence areas near Kaktovic and Nuiqsut will be unaffected.

The HIA team determined that local residents, especially of Kaktovik, might experience a modest change in their prevalence of depression and anxiety due to a low level but persistent fear of a catastrophic incident at the facility. Environmental disaster, in the Arctic, although it is not anticipated due to this project, is a real concern for local residents since it would have profound implications for their communities. This is an impact common to all action alternatives in the operations phase.

Health Infrastructure/Delivery

According to the Socioeconomics section of the EIS (Section 5.15), operation of the Point Thomson facility would increase the size of dividends from the Alaska Permanent Fund to all qualified residents of Alaska. This effect would continue throughout the 30-year productive life of the facility. In addition, the Point Thomson Project will be assessed by the Alaska Department of Revenue (AK DOR) based on the total capital investment in the project; costs related to drilling are exempt from taxation. The development at Point Thomson is predicted to add approximately $1 billion to the actual and true property value of the NSB. This would represent an increase of about 8 percent relative to the total NSB actual and true property value of $12.9 billion reported in 2009. Increasing the tax revenue of the NSB may have cascading effects across the borough. The NSB provides most of the services and employment in the borough; it also funds most of the capital improvement projects in the region, including health care facilities. This is an impact common to all action alternatives in the operations phase.

2.3.2.3 2.3.2.3 Cumulative Effects

The HIA team did not identify any cumulative health effects under Alternative B.

2.3.3 Alternative C – Inland Pads with Gravel Access Road

The intent of Alternative C is to minimize impacts to coastal resources such as marine mammals, marine fish, subsistence activities, coastal processes, and to avoid potential impacts to the proposed project from coastal erosion. To minimize potential impacts on the Caribou herd and coastal erosion, this alternative would move project components inland and as far away from the coast as practicable and feasible. To provide year-round access to Point Thomson, this alternative would also include the construction of an all-season gravel road from Point Thomson to the Endicott Spur Road where it would, connect to the Dalton Highway during construction and drilling. West Dock in Prudhoe Bay would be used for deliveries by barge; however, those materials would be transported to Point Thomson by truck. An airstrip would be built for air access.

Alternative C would not include barging or associated facilities for sea access to Point Thomson.

2.3.3.1 Construction

Construction and drilling of the Point Thomson facility would be complete and turned over in December of the eighth year, at the same time a separate all-season road would be completed. Under this alternative, materials and supplies would be barged into West Dock in Prudhoe Bay and then trucked to Point Thomson in between 17,000 and 18,500 trips during the extended construction and drilling phases of the project. Health issues related to construction of Alternative C include:

- Potential negative impacts on exposure to hazardous materials
- Potential negative impacts on reduced consumption of subsistence resources
- Potential negative impacts on traffic accidents and injuries
- Potential negative impacts on utilization/clinic burden from non-resident influx due to accidents and injuries.

Exposure to hazardous materials

The expert panel ranked exposure to hazardous materials as medium, primarily because of the need to incinerate waste and the lack of stack monitoring which precludes knowing if persistent organic pollutants are entering the atmosphere. This risk is higher than for Alternative B because the construction period is twice as long and because the amount of material for incineration increases with the size of the construction workforce.

Food, Nutrition, and Subsistence Activities

Alternative C places the facility, including the export pipeline, inland from the Beaufort Sea. Materials and supplies, including the modules will be delivered by barge to West Dock in Prudhoe Bay and trucked to the site on the Dalton Highway to Endicott Spur and into the site on a tundra ice road. While the impact to marine mammals may be less intense than under Alternative B, impacts to quantity of caribou are expected to be approximately the same as for Alternative B. The Subsistence and Traditional Land Use Patterns section (Chapter 5.22) notes that Alternative C is expected to disrupt subsistence Caribou hunting for the residents of Kaktovik because the herds congregate along the shoreline during the summer months and that the noise and traffic could disrupt the herd during the long construction period. The Subsistence section estimates that the maximum potential effects on caribou harvests may include the loss of up to 10.8 percent of annual caribou harvests, accounting for approximately 13.3 pounds per capita of caribou per year or approximately or approximately 15,000 calories of energy for very lean meat.. Impacts may not occur during all years but could exceed the maximum expected annual loss during certain years if caribou are unavailable elsewhere.

According the Environmental Justice section (Chapter 4.16), if the proposed project reduces the quantity of caribou harvested by residents of Kaktovik, they would likely purchase more food from outside the area. In addition to increasing the reliance on the cash economy and the cost of living, Kaktovik residents might experience a change in diet as caribou become a less dominant part of their diet, which may result in nutritional deficiencies.

The HIA team determined that the implications for subsistence, specifically on the amount of dietary consumption of subsistence resources, under this Alternative C are higher than Alternative B, given the substantial increase in traffic under Alternative C.

Nuiqsut's most recent (1995-2006) caribou use areas do extend to just east of Prudhoe Bay and cross the Dalton Highway which will experience a significant increase in traffic under Alternative C.

Similar to Alternative B, the panel ranked (see Table 18, Summary Scoring Table, HEC: Food, Nutrition and Subsistence for individual issues) the projected impacts on change in composition of diet and the change in food security were considered to be low.

Social Determinants of Health (SDH)

Construction employment under Alternative C could be as much as 50 percent greater than employment under Alternative B due to additional workforce needed to construct the all-season gravel road and to transport and assemble the facility modules from Deadhorse (Section 5.15, Socioeconomics). All of the construction materials needed under Alternative C would be transported overland and the size of each load would be restricted by the weight and width capacity of the transporters. The additional module assembly and commissioning would require between 8 and 10 months, rather than the 60-day to 120-day range estimated by the Applicant for Alternative B. Maximum total employment in Alternative C would peak in Year 6 at over 1,100 construction workers. Alternative C would have a total of six camps, five of which would demobilize with the construction and drilling crews.

Workforce hiring policies, security of work camps, and the ability to pass on traditional knowledge would remain the same as under Alternative B.

Accidents and Injuries / Health Infrastructure and Delivery

Alternative C relies upon trucking to transport all supplies and materials to the Point Thomson site. The Transportation section (Section 4.17) notes that the transport up the Dalton highway would be well within that road's capacity; however, because Alternative C would not use Point Thomson barging facilities, the 60 barges going into West Dock would require over 10,000 truck trips during the construction phase to deliver materials to the site. During Point Thomson's construction phase, a separate all season gravel road would be built by the applicant. The road for this alternative would start at Endicott Spur Road and end near Point Thomson. An all-season road could be used for drill rig demobilization at the end of the drilling phase. This road would likely be closed to the public and for Point Thomson only, and is not expected to have impacts to other road facilities. It is common, however, for local residents to have special access permits to major egress corridors to facilitate travel for hunting or other purposes.The HIA panel ranked the potential for increased roadway incidents and injuries as high with a cascading negative impact on the ability of the local emergency response and clinics to respond to such an increase.

2.3.3.2 7Drilling

Health issues related to the drilling phase of Alternative C include:

- Potential negative impacts on exposure to hazardous materials
- Potential negative impacts on reduced consumption of subsistence resources

- Potential negative impacts on traffic accidents and injuries
- Potential negative impacts on utilization/clinic burden from non-resident influx due to accidents and injuries.

Additional information on three of these potential impacts is discussed in the previous section, Construction. Accidents and injuries and the impact on the health care infrastructure are discussed below.

Accidents and Injuries / Health Infrastructure and Delivery

It is estimated that Alternative C would include between 6,850—8,200 truck trips during the last two years of drilling, which would pose a high risk for accidents and injuries and a high risk for the change in utilization/clinic burden from workers.

2.3.3.3 Operation

Important health issues related to operation of Alternative C include:

- Potential negative impacts on exposure to hazardous materials
- Potential negative impacts on reduced consumption of subsistence resources
- Potential negative impacts on social determinants of health such as a change in depression/anxiety prevalence
- Potential negative impacts on traffic accidents and injuries
- Potential positive impact on the number and quality of health care clinics and staff, the number of services available and accessibility to service providers.

The impacts expected during operation under Alternative C would be similar to the operation phase under Alternative B.

2.3.3.4 Cumulative Impacts

The Transportation section of the EIS (Section 4.17) notes that the construction of the all season road could potentially open the area up for additional oil and gas development. The Subsistence and Traditional Land Use section of the EIS (Section 4.13) confirms this possible cumulative effect and notes that by opening the area to further oil and gas development, the all-season gravel road proposed under Alternative C may cause greater disruption to caribou movement

2.3.4 Alternative D – Inland Pads with Seasonal Ice Access Road

The intent of Alternative D is to minimize impacts to coastal resources such as marine mammals, marine fish, subsistence activities, coastal processes, and to reduce potential impacts to the proposed project from coastal erosion. To minimize impacts, this alternative would move the project components inland and as far away from the coast as practicable and feasible. This alternative is also characterized by access to and from Point Thomson occurring primarily via an inland seasonal ice road, running east from the Endicott Spur Road (at its junction with the Dalton Highway) to the northern end of the Point Thomson project area.

Alternative D also minimizes impacts to coastal resources by moving all facilities inland, much like Alternative C. The main difference between Alternative C and D is there will only be seasonal tundra ice road access in Alternative D; the all-season gravel road would not be built.

2.3.4.1 Construction

Health issues related to construction of Alternative D include:

- Potential negative impacts on exposure to hazardous materials
- Potential negative impacts on reduced consumption of subsistence resources
- Potential negative impacts on traffic accidents and injuries
- Potential negative impacts on u tilization/clinic burden from non-resident influx due to increase in accidents and injuries.

The impacts expected during construction under Alternative D would be similar to the construction under Alternative C with the following exceptions

- Truck traffic during the construction phase on the road from Prudhoe Bay will be decreased, theoretically decreasing the burden on local clinics and em ergency services, and
- Fewer workers would be needed bec ause Alternative D does not include the construction of a gravel road.

Neither of these exceptions changes the impact scoring between Alternatives C and D. Workforce hiring policies, security of work camps, and the ability to pass on traditional knowledge would remain the same as under Alternative B.

2.3.4.2 Drilling

Health issues unique to drilling under Alternative D are expected to be similar to the drilling phase of Alternative C, with the exception of increased truck traffic from Prudhoe Bay; please see that discussion for more information.

2.3.4.3 Operation

Major health issues related to operation of Alternative 3b include:

- Potential negative impacts on exposure to hazardous materials
- Potential negative impacts on consumption of subsistence resources
- Potential negative impacts on social determinants of health such as a change in depression/anxiety prevalence
- Potential positive impact on t he number and q uality of health care clinics and staff, the number of services available and accessibility to service providers.

The operation under Alternative D would be similar to the operation under Alternative C; please see that discussion for more information

2.3.4.4 Cumulative Effects

There are no cumulative effects under Alternative D because the all season road would not be built.

2.3.5 Alternative E – Coastal Pads with Seasonal Ice Roads

The intent of Alternative E is to minimize the development footprint to reduce impacts to wetlands and surrounding water resources. To minimize the development footprint, this alternative would reduce the amount of gravel fill needed for some of the project components. In particular, the footprints of the East and West Pads would be a combination of gravel and multiyear, multi-season ice pad extensions. Land transport numbers in construction and drilling include the overland transportation of large fuel tanks, modules, and the drill rig by way of the access ice road before barging would be established.

During drilling, the gravel pad footprint would be expanded by ice to support other associated facilities. Over the long-term during operations, the ice pad footprint would be removed and only the gravel fill would remain to support the wellheads and associated required infrastructure. An expanded Central Pad incorporating both the central well and processing infrastructure would compensate for the two smaller ice/gravel combination pads. The gravel footprint would also be reduced by the use of ice roads as much of the infield road system. Nine months of the year the site would be without ground transportation, except for a gravel road from the central production pad to the airport. This alternative has direct barge access with new barge bridge landing, bulkheads, and mooring dolphins.

2.3.5.1 Construction/Drilling

Construction and drilling would take place over nearly 10 years because of the need to use only seasonal tundra ice roads. Construction and drilling in this alternative are simultaneous, because there is an existing central pad. Facilities, including the pipeline and barging facilities, are located near the coast.

Health issues related to construction of Alternative E include:

- Potential negative impacts on exposure to hazardous materials
- Potential negative impacts on accidents and injuries

Impacts to subsistence resources and activities could be greater than in Alternative B as the increased use of helicopters has the potential to disturb wildlife in the project area. All construction and drilling impacts are expected to be lower than those experienced under Alternative C because of the lack of road transport; please see that discussion for more information. Workforce hiring policies, security of work camps, and the ability to pass on traditional knowledge would remain the same as under Alternative B.

2.3.5.2 Operation

Important health issues related to operation of Alternative E include:

- Potential negative impacts on exposure to hazardous materials
- Potential negative impacts on reduced consumption of subsistence resources
- Potential negative impacts on social determinants of health such as a change in depression/anxiety prevalence
- Potential positive impact on the number and quality of health care clinics and staff, the number of services available and accessibility to service providers.

Long term employment during operations in Alternative E is expected to be higher than in the other alternatives because an additional construction crew will be needed each winter to construct an ice road to the Point Thomson facility. Other impacts would be similar to the operation under Alternative B; please see that discussion for more information

2.3.5.3 Cumulative Effects

The HIA team did not identify any cumulative health effects under Alternative E.

2.4 Mitigation Strategies

2.4.1 Introduction

Mitigation refers to measures to avoid, minimize, or eliminate an adverse effect, or maximize a potential benefit (HIA Toolkit 2011). Although mitigation is presented as the final phase in an HIA, it should be viewed as an ongoing process, beginning as the project is being conceptualized and designed, and ending only when impacts from the project and decommission have concluded. Mitigations may be:

- **Required** by regulations,
- **Negotiated** commitments made by project proponents, or
- **Voluntary** contributions made to minimize potential detriments or maximize potential benefits.

The project can use the outcomes of the risk assessment step to establish actions that will potentially mitigate the identified impacts. Similarly, project proponents may wish to formally negotiate a series of specific commitments to affected communities, *e.g.*, participatory monitoring of certain impacts, subsistence resource access, quantity and quality. Some important considerations for mitigation strategies include:

- Types of health-protection processes that may be required, *e.g.*, primary versus secondary or tertiary prevention (discussed in the next sub-section)
- Availability of different mitigation strategies (*e.g.*, engineering intervention affecting water quantity, sanitation, etc.)
- Timelines of mitigation strategies
- Availability of interim measures or modifications
- Local capacity to absorb the proposed mitigation strategies
- Roles and responsibilities for the implementing the strategies.

The proposed community health mitigation strategies have been developed to monitor, evaluate and potentially mitigate potential health impacts identified within this HIA Potential impacts, both positive and negative, were developed based on the interaction between the Alaska-specific HECs and potentially affected communities (PACs), *e.g.*, communities along significant transportation corridors, project adjacent communities, etc. The overall opportunities are organized around two fundamental public health concepts, (i) health promotion and (ii) disease prevention.

Health promotion/education

- Any intervention that seeks to eliminate or reduce exposure to harmful factors by modifying human behaviors
- Any combination of health education and r elated organizational, political and economic interventions designed to facilitate behavioral and en vironmental adaptations that will improve or protect health.

Disease prevention

- Any intervention that seeks to reduce or eliminate diagnosable conditions
- An intervention that may be applied at the individual level, as in immunization, or the community level, as in the chlorination of the water supply.

Disease prevention is often illustrated by the prevention pyramid, Figure 29, which is composed of:

- Primary - the base of the pyramid which covers population oriented actions designed before health problems develop
- Secondary - the second level covering clinical preventive services for populations at high risk, where interventions are designed to prevent a condition for those at risk of disease
- Tertiary - top of the pyramid covering treatment intervention or rehabilitation for existing, serious disease symptoms.

Figure 29 Prevention Pyramid

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The mitigations developed in an HIA are primary preventions and belong at the base of the prevention pyramid. This is significant because of:

- Its focus on all of the people as recipients
- Its broad, long-lasting impact on health
- Its role in defining and facilitating the whole system to work.

Because of the geographical size and contractual complexity of the projects, a combination of health promotion/education and primary prevention is the most efficient and cost-effective method of managing potential impacts. Therefore, the mitigation strategies propose a series of practical biological/medical approaches that are scientifically defensible but should be c ompatible with existing administrative and national health directives.

The overall strategies should be capable of detecting both "acute" and "chronic", positive and negative changes in health within the defined PACs. Acute changes are those that can be m anifested within weeks to months, *e.g.*, acute disease rate changes for respiratory infections. In contrast, chronic non-communicable disease rate changes for cardiovascular disorders or diabetes evolve over a m uch longer period of time, particularly at a community level.

Finally, the broad strategies should also consider that a variety of *positive* community-level impacts will occur. For example, rapid changes and alleviation of "income poverty" may likely produce significant improvement in overall population-level health status. Therefore, the monitoring and mitigation system should be capable of capturing a variety of positive and negative trends across the community over different time scales.

Monitoring and mitigation strategies do not neatly fall into "internal project" and "external community" categories. The project workforce is both a separate inside the fence line community but also simultaneously part of the wider external rural/urban (most workers will live in Anchorage and Fairbanks and fly in-fly out) environment surrounding the project. Therefore, many of the proposed strategies originate inside the fence line and extend into specific project affected areas. Outreach activities, whether directed towards workers, family members or the general community, should be carefully assessed and tied to appropriate outcome indicators.

2.5 Mitigation Recommendations

This section presents a series of mitigation strategies for each HEC. It is important to tie the mitigation to specific potential impacts identified in the risk analysis.

2.5.1 Alternative Impact Summary

Alternative A: The monitoring activities will have **zero to minimal impacts** on public health. The area is remote from human habitation, and it is in the interest of public health to continue to monitor the existing infrastructure to ensure compliance with environmental regulations.

The impacts and mitigations unique to each action alternative are presented below.

Alternative B: The Proposed Project presents some challenges to health because it utilizes coastal resources which could change the quantity of and access to subsistence resources for residents of Kaktovik and Nuiqsut. ExxonMobil has already agreed to build the pipeline 7 feet above the tundra in order to facilitate the movement of caribou and to cease barging activity during the Kaktovik whaling season. The HIA team noted that even with reduced harvests that there would be only a **low** impact on the composition of diet and food security because other sources of subsistence and manufactured food are available to make up for the potential loss of 1 pound of caribou per person.

Impacts to off-site accidents and injuries are expected to be **low,** and ExxonMobil has existing procedures for safe driving.

The potential for increases in contaminants from unmonitored stack emissions is expected to be **low** and can be mitigated by following EPA proposed regulations on stack emissions.

Alternative C: This alternative was designed to mitigate the impact of coastal oriented facilities on subsistence resources by moving the facilities inland and eliminating the use of barges to the site. The alternative would barge materials and supplies into West Dock in Prudhoe Bay and truck the materials and supplies to Point Thomson in over 19,500 truck trips on an all season road during the a four-year construction and drilling phases of the project.

The HIA team ranked the potential for roadway accidents and injuries as **high,** especially during the construction phase when traffic volumes are high, potentially resulting in a **high** impact to local clinics and emergency services. While a roadway would be off limits to tourists, local residents would very likely have egress on these roads for snow machine and automobile travel. The combination of local resident travel and heavy truck traffic creates significant risk of increases in accidents and injuries. Besides requiring the drivers to follow all of the ExxonMobil transportation standards, local access to the roadway could be restricted until construction is completed and traffic volumes decrease. ExxonMobil could also impose strict enforcement of seatbelt use and speed limits, and regular patrols on the roads during construction. To prepare for an increased burden of visits to local health facilities, an action plan for increased coverage and resources could be developed an put in place if demand for local health services increased under these alternatives.

Alternative C presents some challenges to health because of the length of time the area will be disturbed for subsistence resources during construction and drilling. The HIA team noted that even with reduced harvests that there would be only a **medium** impact on the composition of diet and food security because other sources of subsistence and manufactured food are available to replace the 13 pounds per year of caribou potentially lost. Because this impact would potentially continue throughout the life of the project, ExxonMobil may want to consider doing some public health research on nutritional and dietary consumption in these villages.

The potential for increases in contaminants from unmonitored stack emissions is expected to be **medium** and can be mitigated by following EPA proposed regulations on stack emissions.

Alternative D: This alternative was designed to mitigate the impact of coastal oriented facilities on subsistence resources by moving the facilities inland and eliminating the use of barges to the site. The alternative would barge materials and supplies into West Dock in Prudhoe Bay and truck the materials and supplies to Point Thomson in an estimated 17,500 trips per year during an extended (8 year) construction and drilling phases of the project.

The HIA team ranked the potential for roadway accidents and injuries as **high**, especially during the construction and drilling phases when traffic volumes are high, potentially resulting in a **high** impact to local clinics and emergency services. While a roadway would be off limits to tourists, local residents would very likely have egress on these roads for snow machine and automobile travel. The combination of local resident travel and heavy truck traffic creates a **high** risk of increases in accidents and injuries. Besides requiring the drivers to follow all of the ExxonMobil transportation standards, local access to the roadway could be restricted until construction is completed and traffic volumes decrease. ExxonMobil could also impose strict enforcement of seatbelt use and speed limits, and regular patrols on the roads during construction. To prepare for an increased burden of visits to local health facilities, an action plan for increased coverage and resources could be developed an put in place if demand for local health services increased under these alternatives.

Alternative D presents some challenges to health because of the length of time the area will be disturbed for subsistence resources during construction and drilling. The HIA team noted that even with reduced harvests that there would be only a **medium** impact on the composition of diet and food security because other sources of subsistence and manufactured food are available to replace the 13 pounds of caribou potentially lost. Because this impact would potentially continue throughout the life of the project, ExxonMobil may want to consider doing some public health research on nutritional and dietary consumption in these villages.

The potential for increases in contaminants from unmonitored stack emissions is expected to be **medium** and can be mitigated by following EPA proposed regulations on stack emissions.

Alternative E: The minimized development footprint alternative with seasonal ice roads presents some challenges to health because it utilizes coastal resources which could change the quantity of and access to subsistence resources for residents of Kaktovik and Nuiqsut. ExxonMobil has already agreed to build the pipeline 7 feet above the tundra in order to facilitate the movement of caribou and to cease barging activity during the Kaktovik whaling season. The HIA team noted that even with reduced harvests that there would be only a **low** impact on the composition of diet and food security because other sources of subsistence and manufactured food are available to replace the 1 pound of caribou per person potentially lost.

The potential for increases in contaminants from unmonitored stack emissions is expected to be **low** and can be mitigated by following EPA proposed regulations on stack emissions.

Impacts to off-site accidents and injuries are expected to be **low,** and ExxonMobil has existing procedures for safe driving.

2.5.2 Impact Mitigation Summary

Table 23 presents health impacts, mitigation strategies and recommendations which have been developed in response to the negative impacts identified at levels above 3 (medium to high impact). Low impacts may be low in intensity but have long duration as is found in the operations phase or medium in intensity but of very short duration as is common during the construction or drilling phases (see Figures 27 – and 28, Steps in the Risk Assessment Matrix).

In many situations, important public health issues surface as part of the analysis; however, it is very difficult to disaggregate causation between a project and large trends that are already occurring across populations/communities, *e.g.*, changes in non-communicable disease rates such as diabetes. In this situation, the HIA analysis tries to delineate those affects that can be

(i) Causally linked to the proposed project

(ii) Are amenable to specific project mitigations.

It may be difficult to casually tie to a specific project; nevertheless, such a prediction may be important for future government health planning. The HIA analysis differentiates mitigations that are tied to the project from those that more appropriately fall under a government role and responsibility.

This Impact Mitigation Summary is intended to provide a brief synopsis of the data presented in the sections above for those potential impacts rated at negative or positive 4 or above (medium to very high risk). This information should serve as input into the project including specific actions, responsibilities, timing, potential collaborators and performance indicators. Many of the mitigation measures require collaboration with local community members and agencies and should be very carefully planned and coordinated with the project's community affairs group in order to maximize communication, cultural sensitivity and awareness.

Any critical data gaps can be closed either by the project collecting specific data sets or by collaborating with local health officials. For example, data sets such as incinerator emissions characterization require specialized equipment that is unlikely to be available within local health departments; hence, these types of collection exercises should be directed and managed by the project and/or its key contractors. These data collection efforts are referred to as 'Project." For small communities, disaggregated data are generally not publically available; however, the overall NSB database is likely to be sufficient and applicable. If there is a need for addition household surveys, the effort is best managed as a c ollaborative effort with the relevant local and national health authorities.

Table 24 Negative Impact Mitigation Summary

Health Effects Category	Health Impact	Mitigation	Key information gaps
Alternative A – Monitoring			
No impacts			
Alternative B Construction/Drilling			
Exposure to Hazardous Materials	Potential for increases in physiologic contaminant levels from unmonitored stack emissions	Follow proposed EPA regulation on stack emissions	**Project** - Baseline stack monitoring data during construction
	Potential for increases in contaminant levels in subsistence resources from unmonitored stack emissions	Follow proposed EPA regulation on stack emissions	**Project** - Baseline stack monitoring data during operation
Alternative B Operation			
Exposure to Hazardous Materials	Potential for increases in physiologic contaminant levels from unmonitored stack emissions	Follow proposed EPA regulation on stack emissions	**Project** - Baseline stack monitoring data during construction
	Potential for increases in contaminant levels in subsistence resources from unmonitored stack emissions	Follow proposed EPA regulation on stack emissions	**Project** - Baseline stack monitoring data during operation
Social Determinants of Health	Potential for increase in depression and anxiety prevalence	Applicant should increase community education about safety measures in place for arctic projects	**Project and NSB Health Corporation -** Ongoing community engagement regarding disaster planning and potential with the people in Kaktovik and Nuiqsut who may have these fears.
Alternative C - Construction			
Exposure to Hazardous Materials	Potential for increases in physiologic contaminant levels unmonitored stack emissions	Follow proposed EPA regulation on stack emissions	**Project** - Baseline stack monitoring data during construction
	Potential for increases in contaminant levels in subsistence resources from unmonitored stack emissions	Follow proposed EPA regulation on stack emissions	**Project** - Baseline stack monitoring data during operation

Health Effects Category	Health Impact	Mitigation	Key information gaps
Food, Nutrition, and Subsistence	Potential for decrease in consumption of subsistence resource (caribou)		**Project -** Baseline nutritional surveys with ongoing monitoring
Accidents and Injuries	Potential increases in roadway accidents and injuries due to increased traffic	Restricted access, increased security and safety patrols, speed enforcement, seatbelt requirements	
Health Infrastructure and Delivery	Potential increased burden on local emergency response and clinics	Response plan for augmentation of existing health care infrastructure in local clinics	
Alternative C - Drilling			
Exposure to Hazardous Materials	Potential for increases in physiologic contaminant levels from unmonitored stack emissions	Follow proposed EPA regulation on stack emissions	**Project** - Baseline stack monitoring data during construction
	Potential for increases in contaminant levels in subsistence resources from unmonitored stack emissions	Follow proposed EPA regulation on stack emissions	**Project** - Baseline stack monitoring data during operation
Food, Nutrition, and Subsistence	Potential for decrease in consumption of subsistence resource (caribou)		**Project -** Baseline nutritional surveys with ongoing monitoring
Accidents and Injuries	Potential increases in roadway accidents and injuries due to increased traffic	Restricted access, increased security and safety patrols, speed enforcement, seatbelt requirements	
Health Infrastructure and Delivery	Potential increased burden on local emergency response and clinics	Response plan for augmentation of existing health care infrastructure in local clinics	
Alternative C - Operation			
Exposure to Hazardous Materials	Potential for increases in physiologic contaminant levels from unmonitored stack emissions	Follow proposed EPA regulation on stack emissions	**Project** - Baseline stack monitoring data during construction
	Potential for increases in contaminant levels in subsistence resources from unmonitored stack emissions	Follow proposed EPA regulation on stack emissions	**Project** - Baseline stack monitoring data during operation

Health Effects Category	Health Impact	Mitigation	Key information gaps
Food, Nutrition, and Subsistence	Potential for decrease in consumption of subsistence foods (caribou)		**Project -** Baseline nutritional surveys with ongoing monitoring
Social Determinants of Health	Potential for increase in depression and anxiety prevalence	Applicant should increase community education about safety measures in place for arctic projects	**Project and NSB Health Corporation –** Ongoing community engagement regarding disaster planning and potential with people in Kaktovik and Nuiqsut who may have these fears.
Accidents and Injuries	Potential increases in roadway accidents and injuries due to increased traffic	Restricted access, increased security and safety patrols, speed enforcement, seatbelt requirements	
Health Infrastructure and Delivery	Potential increased burden on local emergency response and clinics	Response plan for augmentation of existing health care infrastructure in local clinics	
Alternative D Construction			
Exposure to Hazardous Materials	Potential for increases in physiologic contaminant levels from unmonitored stack emissions	Follow proposed EPA regulation on stack emissions	**Project** - Baseline stack monitoring data during construction
	Potential for increases in contaminant levels in subsistence resources from unmonitored stack emissions	Follow proposed EPA regulation on stack emissions	**Project** - Baseline stack monitoring data during operation
Food, Nutrition, and Subsistence	Potential for decrease in consumption of subsistence resource (caribou)	.	**Project -** Baseline nutritional surveys with ongoing monitoring
Accidents and Injuries	Potential increases in roadway accidents and injuries	Restrict access, increase security and safety patrols, speed enforcement, seatbelt requirements	
Health Infrastructure and Delivery	Potential increased burden on local emergency response and clinics	Response plan for augmentation of existing health care infrastructure in local clinics	

Health Effects Category	Health Impact	Mitigation	Key information gaps
Alternative D - Drilling			
Exposure to Hazardous Materials	Potential for increases in physiologic contaminant levels from unmonitored stack emissions	Follow proposed EPA regulation on stack emissions	**Project** - Baseline stack monitoring data during construction
	Potential for increases in contaminant levels in subsistence resources from unmonitored stack emissions	Follow proposed EPA regulation on stack emissions	**Project** - Baseline stack monitoring data during operation
Accidents and Injuries	Potential increases in roadway accidents and injuries	Restrict access, increase security and safety patrols, speed enforcement, seatbelt requirements	
Health Infrastructure and Delivery	Potential increased burden on local emergency response and clinics	Response plan for augmentation of existing health care infrastructure in local clinics	
Alternative D - Operation			
Exposure to Hazardous Materials	Potential for increases in physiologic contaminant levels from unmonitored stack emissions	Follow proposed EPA regulation on stack emissions	**Project** - Baseline stack monitoring data during construction
	Potential for increases in contaminant levels in subsistence resources from unmonitored stack emissions	Follow proposed EPA regulation on stack emissions	**Project** - Baseline stack monitoring data during operation
Food, Nutrition, and Subsistence	Potential for decrease in consumption of subsistence resource (caribou)	.	**Project -** Baseline nutritional surveys with ongoing monitoring
Social Determinants of Health	Potential for increase in depression and anxiety prevalence	Applicant should increase community education about safety measures in place for arctic projects	**Project and NSB Health Corporation -** Ongoing community engagement regarding disaster planning and potential with people in Kaktovik and Nuiqsut who may have these fears.
Accidents and Injuries	Potential increases in roadway accidents and injuries	Restrict access, increase security and safety patrols, speed	

Health Effects Category	Health Impact	Mitigation	Key information gaps
		enforcement, seatbelt requirements	
Health Infrastructure and Delivery	Potential increased burden on local emergency response and clinics	Response plan for augmentation of existing health care infrastructure in local clinics	
Alternative E Construction/Drilling			
Exposure to Hazardous Materials	Potential for increases in physiologic contaminant levels from unmonitored stack emissions	Follow proposed EPA regulation on stack emissions	**Project** - Baseline stack monitoring data during construction
	Potential for increases in contaminant levels in subsistence resources from unmonitored stack emissions	Follow proposed EPA regulation on stack emissions	**Project** - Baseline stack monitoring data during operation
Alternative E Operation			
Exposure to Hazardous Materials	Potential for increases in physiologic contaminant levels from unmonitored stack emissions	Follow proposed EPA regulation on stack emissions	**Project** - Baseline stack monitoring data during construction
	Potential for increases in contaminant levels in subsistence resources from unmonitored stack emissions	Follow proposed EPA regulation on stack emissions	**Project** - Baseline stack monitoring data during operation
Social Determinants of Health	Potential for increase in depression and anxiety prevalence	Applicant should increase community education about safety measures in place for arctic projects	**Project and NSB Health Corporation –** Ongoing community engagement regarding disaster planning and potential with people in Kaktovik and Nuiqsut who may have these fears.

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ANNEX 1

Health Impact Analysis Alternative A							
Health Effects Category / Issues	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High)	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Water and Sanitation – Construction - Demobilization and Well Capping							
Changes in potable water access							**No impact**
Change in water quantity							**No impact**
Change in water quality							**No impact**
Change in sanitation effectiveness, adequate settling pools, discharge							**No impact**
Water and Sanitation – Drilling – No Activity							
Water and Sanitation – Operation – No Activity							

Health Impact Analysis Alternative A							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High)	**Extent** (Local, Regional, State, Nation, Global)	**Potential** ((Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Accidents and Injuries – Construction - Demobilization and Well Capping							
Change in unintentional injury (e.g. drowning, falls, snow machine injury) rates							**No impact**
Change in roadway incidents and injuries due to service road access for hunters/increased traffic from Prudhoe Bay	3 years	Low - Rig and equipment over ice road	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Changes to safety during subsistence activities	3 years	Low - Personnel and supplies by existing coastal barge and helicopter	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Accidents and Injuries – Drilling – No Activity							
Accidents and Injuries – Operation – No Activity							

Health Impact Analysis Alternative A							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Exposure to Hazardous Materials – Construction - Demobilization and Well Capping							
Changes in physiologic contaminant levels such as lead, methyl mercury, PCB, Dioxins, PM2.5 from incineration, drilling mud, or gas flaring	3 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Changed levels of the same substances in subsistence resources	3 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Exposure to Hazardous Materials – Drilling – No Activity							
Exposure to Hazardous Materials – Operation – No Activity							

Health Impact Analysis Alternative A							
Health Effects Category /Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High)	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Food, Nutrition, Subsistence – Construction - Demobilization and Well Capping							
Change in amount of dietary consumption of subsistence resources	3 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in composition of diet	3 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in food security							**No impact**
Food, Nutrition, Subsistence – Drilling – No Activity							
Food, Nutrition, Subsistence – Drilling – No Activity							

Health Impact Analysis Alternative A							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Health Infrastructure/Delivery – Construction - Demobilization and Well Capping							
Change in number of clinics and staff							**No impact**
Change in quality of clinics and staff							**No impact**
Change in services offered (e.g. prenatal checks, x-ray, lab services)							**No impact**
Change in accessibility of health care							**No impact**
Change in utilization/clinic burden from non-resident influx							**No impact**
Health Infrastructure/Delivery – Drilling – No Activity							
Health Infrastructure/Delivery – Operation – No Activity							

Health Impact Analysis Alternative A							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High)	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Infectious Diseases – Construction - Demobilization and Well Capping							
Change in pediatric acute respiratory disease rates (RSV, pneumonias, asthma, Bronchiectasis)							**No impact**
Change in acute adult respiratory disease rates (TB, Bronchitis, Influenza)							**No impact**
Change in STD rates (esp. Chlamydia, Gonorrhea, HIV)							**No impact**
Change in GID outbreaks							**No impact**
Infectious Diseases – Drilling – No Activity							
Infectious Diseases – Operation – No Activity							

Health Impact Analysis Alternative A							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Non-communicable Chronic Disease – Construction - Demobilization and Well Capping							
Change in obesity prevalence							**No impact**
Change in average BMI							**No impact**
Change in type 2 DM rates							**No impact**
Change in hypertension							**No impact**
Change in lung cancer rates							**No impact**
Change in COPD rates							**No impact**
Non-communicable Chronic Disease – Drilling – No Activity							
Non-communicable Chronic Disease – Drilling – No Activity							

Health Impact Analysis Alternative A							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Social Determinants of Health – Construction – Demobilization and Well Capping							
Change in maternal child health status							**No impact**
Change in depression/anxiety prevalence							**No impact**
Change in substance abuse rate							**No impact**
Change in suicide rate							**No impact**
Change in teen pregnancy rates							**No impact**
Change in domestic violence							**No impact**
Social Determinants of Health – Drilling – No Activity							
Social Determinants of Health – Operation – No Activity							

Health Impact Analysis Alternative B							
Health Effects Category / Issues	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High)	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Water and Sanitation – Construction/Drilling							
Changes in potable water access							**No impact**
Change in water quantity							**No impact**
Change in water quality							**No impact**
Change in sanitation effectiveness, adequate settling pools, discharge							**No impact**
Water and Sanitation - Operation							
Changes in potable water access							**No impact**
Change in water quantity							**No impact**
Change in water quality							**No impact**
Change in sanitation effectiveness, adequate							**No impact**

settling pools, discharge							

Health Impact Analysis
Alternative B

Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High)	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Accidents and Injuries – Construction/Drilling							
Change in unintentional injury (e.g. drowning, falls, snow machine injury) rates	3 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in roadway incidents and injuries due to service road access for hunters/increased traffic from Prudhoe Bay	3 years	Low (Dalton Highway access from Deadhorse; ice road between Endicott Spur and PTP for VSM and supplies; modules shipped by barge – roads can handle traffic)	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Changes to safety during subsistence activities	3 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**

Health Impact Analysis
Alternative B

Health Effects Category / Issue	Duration (Months, Seasons, Years)	Magnitude (Low, Medium, High, Very High)	Extent (Local, Regional, State, Nation, Global)	Potential (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	Nature (Direct, Indirect, Cumulative)	Impact (Positive, Negative)	Scoring
Accidents and Injuries - Operation							
Change in unintentional injury (e.g. drowning, falls, snow machine injury) rates	30 years	Low – no impact from project	Local	Unlikely	Direct	Negative	**3 = Low**
Change in roadway incidents and injuries due to service road access for hunters/increased traffic from Prudhoe Bay	30 years	Low – Road access will be well established	Local	Unlikely	Direct	Negative	**3 = Low**
Changes to safety during subsistence activities	30 years	Low	Local	Unlikely	Direct	Negative	**3 = Low**

Health Impact Analysis Alternative B							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Exposure to Hazardous Materials – Construction/Drilling							
Changes in physiologic contaminant levels such as lead, methyl mercury, PCB, Dioxins, PM2.5 from incineration, drilling mud, or gas flaring	3 years	High – due to increased number of incinerations and stack throughput and the lack of stack testing and analysis (EPA regulations)	Local - limited exposure because the nearest settlement is 60 miles west	Unlikely it would leave the site	Direct	Negative	**4 = Medium**
Changed levels of the same substances in subsistence resources	3 years	High - due to increased number of incinerations	Local	Unlikely it would leave the site	Indirect (food source)	Negative	**4 = Medium**
Exposure to Hazardous Materials – Operation							
Changes in physiologic contaminant levels such as lead, methyl mercury, PCB, Dioxins, PM2.5 from incineration, drilling mud, or gas flaring	30 years	Medium – incinerations decrease during operations	Local	About as Likely as Not	Direct	Negative	**4 = Medium**
Changed levels of the same substances in subsistence resources	30 years	Medium - incinerations decrease during operations	Local	About as Likely as Not	Indirect (food source)	Negative	**4 = Medium**

Health Impact Analysis Alternative B							
Health Effects Category /Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High)	**Extent** (Local, Regional, State, Nation, Global)	**Potential** ((Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Food, Nutrition, Subsistence – Construction/Drilling							
Change in amount of dietary consumption of subsistence resources	3 years	Low - average annual loss of between 2 and 17 pounds of caribou; barging ceases during whale season	Local	Likely	Direct	Negative	**4= Medium**
Change in composition of diet	3 years	Low - residents eat other subsistence resources although caribou are very important	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in food security	3 years	Low - residents have access to cash and stores; other subsistence resources are available	Local	Unlikely	Direct	Negative	**3 = Low**

Health Impact Analysis Alternative B							
Health Effects Category /Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High)	**Extent** (Local, Regional, State, Nation, Global)	**Potential** ((Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Food, Nutrition, Subsistence – Operation							
Change in amount of dietary consumption of subsistence resources	30 years	Medium - size of the caribou herd in 5 years is unknown	Local	Likely	Direct	Negative	**4 = Medium**
Change in composition of diet	30 years	Medium - (size of the caribou herd in 5 years is unknown	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in food security	30 years	Low -residents have access to cash and stores; other subsistence resources are available	Local	Unlikely	Direct	Negative	**3 = Low**

Health Impact Analysis Alternative B							
Health Effects Category / Issue	**Duration (Months, Seasons, Years)**	**Magnitude (Low, Medium, High, Very High**	**Extent (Local, Regional, State, Nation, Global)**	**Potential (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)**	**Nature (Direct, Indirect, Cumulative)**	**Impact (Positive, Negative)**	**Scoring**
Health Infrastructure/Delivery – Construction/Drilling							
Change in number of clinics and staff							**No impact**
Change in quality of clinics and staff							**No impact**
Change in services offered (e.g. prenatal checks, x-ray, lab services)							**No impact**
Change in accessibility of health care							**No impact**
Change in utilization/clinic burden from non-resident influx	3 years	Medium	Local	About as Likely as Not	Indirect	Negative	**3 = Low**

Health Impact Analysis Alternative B							
Health Effects Category / Issue	**Duration** **(Months, Seasons, Years)**	**Magnitude** **(Low, Medium, High, Very High**	**Extent** **(Local, Regional, State, Nation, Global)**	**Potential** **(Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)**	**Nature** **(Direct, Indirect, Cumulative)**	**Impact** **(Positive, Negative)**	**Scoring**
Health Infrastructure/Delivery - Operation							
Change in number of clinics and staff	30 years	Medium – depends on amount of tax revenues from operation	Regional	Virtually Certain	Indirect	Positive	**7 = High**
Change in quality of clinics and staff	30 years	Medium – depends on amount of tax revenues from operation	Regional	Virtually Certain	Indirect	Positive	**7 = High**
Change in services offered (e.g. prenatal checks, x-ray, lab services)	30 years	Medium – depends on amount of tax revenues from operation	Regional	Virtually Certain	Indirect	Positive	**7 = High**
Change in accessibility of health care	30 years	Medium – depends on amount of tax revenues from operation	Regional	Virtually Certain	Indirect	Positive	**7 = High**
Change in utilization/clinic burden from non-resident influx	30 years	Low – accidents tend to decrease during operations	Regional	Likely	Indirect	Negative	**3 = Low**

Health Impact Analysis Alternative B							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High)	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Infectious Diseases – Construction/Drilling							
Change in pediatric acute respiratory disease rates (RSV, pneumonias, asthma, Bronchiectasis)							**No impact**
Change in acute adult respiratory disease rates (TB, Bronchitis, Influenza)*							**No impact**
Change in STD rates (esp. Chlamydia, Gonorrhea, HIV)							**No impact**
Change in GID outbreaks							**No impact**

Health Impact Analysis
Alternative B

Health Effects Category / Issue	Duration (Months, Seasons, Years)	Magnitude (Low, Medium, High, Very High)	Extent (Local, Regional, State, Nation, Global)	Potential (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	Nature (Direct, Indirect, Cumulative)	Impact (Positive, Negative)	Scoring
Infectious Diseases - Operation							
Change in pediatric acute respiratory disease rates (RSV, pneumonias, asthma, Bronchiectasis)							**No impact**
Change in acute adult respiratory disease rates (TB, Bronchitis, Influenza)*							**No impact**
Change in STD rates (esp. Chlamydia, Gonorrhea, HIV)							**No impact**
Change in GID outbreaks							**No impact**

*Panel notes that the project may bring more RSV to local communities depending on the number of local employees – an unknown number to date

Health Impact Analysis Alternative B							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Non-communicable Chronic Disease – Construction/Drilling							
Change in obesity prevalence	3 years	Low (changes to diet due to loss of subsistence resources might lead to increased obesity)	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in average BMI	3 years	Low (changes to diet due to loss of subsistence resources would lead to increased BMI)	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in type 2 DM rates	3 years	Low (changes to diet due to loss of subsistence resources would lead to increased 2DM rates)	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in hypertension							**No impact**
Change in lung cancer rates							**No impact**
Change in COPD rates							**No impact**

Health Impact Analysis Alternative B							
Health Effects Category / Issue	**Duration** **(Months, Seasons, Years)**	**Magnitude** **(Low, Medium, High, Very High**	**Extent** **(Local, Regional, State, Nation, Global)**	**Potential** **(Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)**	**Nature** **(Direct, Indirect, Cumulative)**	**Impact** **(Positive, Negative)**	**Scoring**
Non-communicable Chronic Disease - Operation							
Change in obesity prevalence	30 years	Low (changes to diet due to loss of subsistence resources might lead to increased obesity)	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in average BMI	30 years	Low (changes to diet due to loss of subsistence resources would lead to increased BMI)	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in type 2 DM rates	30 years	Low (changes to diet due to loss of subsistence resources would lead to increased 2 DM rates)	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in hypertension							**No impact**
Change in lung cancer rates							**No impact**
Change in COPD rates							**No impact**

Health Impact Analysis Alternative B							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Social Determinants of Health – Construction/Drilling							
Change in maternal child health status							**No impact**
Change in depression/anxiety prevalence**	3 years	Medium	Local	About as Likely as Not	Direct	Negative	**4 = Medium**
Change in substance abuse rate							**No impact**
Change in suicide rate***	3 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in teen pregnancy rates***							**No impact**
Change in domestic violence							**No impact**
Change in domestic violence							**No impact**

Health Impact Analysis
Alternative B

Health Effects Category / Issue	Duration (Months, Seasons, Years)	Magnitude (Low, Medium, High, Very High	Extent (Local, Regional, State, Nation, Global)	Potential (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	Nature (Direct, Indirect, Cumulative)	Impact (Positive, Negative)	Scoring
Social Determinants of Health - Operation							
Change in maternal child health status	30 years	Low	Local	Unknown	Direct	Negative	**3 = Low**
Change in depression/anxiety prevalence*	30 years	Medium	Local	About as Likely as Not	Direct	Negative	**4 = Medium**
Change in substance abuse rate	30 years	Low	Local	Unknown	Direct	Negative	**3 = Low**
Change in suicide rate**	30 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in teen pregnancy rates***	30 years	Low	Local	Unknown	Direct	Negative	**3 = Low**
Change in domestic violence	30 years	Low	Local	Unknown	Direct	Negative	**3 = Low**

*Panel notes that local residents may fear an incident like the BP spill in the Gulf which would severely impact marine resources (see EIS)

** Panel notes that rates are already high and might be reduced if youth were targeted for employment

*** Panel notes that rates are already high and would not be affected because there is so little opportunity for employees to interact with local residents

Health Impact Analysis Alternative C							
Health Effects Category / Issues	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High)	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Water and Sanitation - Construction							
Changes in potable water access							**No Impact**
Change in water quantity							**No Impact**
Change in water quality							**No Impact**
Change in sanitation effectiveness, adequate settling pools, discharge							**No Impact**
Water and Sanitation - Drilling							
Changes in potable water access							**No Impact**
Change in water quantity							**No Impact**
Change in water quality							**No Impact**
Change in sanitation effectiveness, adequate							**No Impact**

Health Impact Analysis Alternative C							
Health Effects Category / Issues	**Duration** **(Months, Seasons, Years)**	**Magnitude** **(Low, Medium, High, Very High)**	**Extent** **(Local, Regional, State, Nation, Global)**	**Potential** **(Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)**	**Nature** **(Direct, Indirect, Cumulative)**	**Impact** **(Positive, Negative)**	**Scoring**
settling pools, discharge							
Water and Sanitation - Operation							
Changes in potable water access							**No Impact**
Change in water quantity							**No Impact**
Change in water quality							**No Impact**
Change in sanitation effectiveness, adequate settling pools, discharge							**No Impact**

Health Impact Analysis Alternative C							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High)	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Accidents and Injuries - Construction							
Change in unintentional injury (e.g. drowning, falls, snow machine injury) rates	5 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in roadway incidents and injuries due to service road access for hunters/increased traffic from Prudhoe Bay	5 years	Very high – road traffic from Prudhoe Bay will increase to approximately 6,400 trips per year, cascading impacts from accidents and injuries	Local, regional	Virtually Certain	Indirect	Negative	**8 = High**
Changes to safety during subsistence activities	5 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**

Health Impact Analysis Alternative C							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High)	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Accidents and Injuries - Drilling							
Change in unintentional injury (e.g. drowning, falls, snow machine injury) rates	2 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in roadway incidents and injuries due to service road access for hunters/increased traffic from Prudhoe Bay	2 years	Very high – road traffic from Prudhoe Bay will increase to approximately 6,400 trips per year, cascading impacts from accidents and injuries	Local, regional	Virtually Certain	Indirect	Negative	**8 = High**
Changes to safety during subsistence activities	2 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**

Health Impact Analysis Alternative C							
Health Effects Category / Issue	**Duration** **(Months, Seasons, Years)**	**Magnitude** **(Low, Medium, High, Very High)**	**Extent** **(Local, Regional, State, Nation, Global)**	**Potential** **(Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)**	**Nature** **(Direct, Indirect, Cumulative)**	**Impact** **(Positive, Negative)**	**Scoring**
Accidents and Injuries - Operation							
Change in unintentional injury (e.g. drowning, falls, snow machine injury) rates	30 years	Low	Local	Unlikely	Direct	Negative	**3 = Low**
Change in roadway incidents and injuries due to service road access for hunters/increased traffic from Prudhoe Bay	30 years	High – accidents from Prudhoe Bay will decrease as construction traffic levels decrease during operations, but new all season road will permanently increase traffic	Local	Unlikely	Direct	Negative	**7 = High**
Changes to safety during subsistence activities	30 years	Low	Local	Unlikely	Direct	Negative	**3 = Low**

Health Impact Analysis Alternative C							
Health Effects Category / Issue	**Duration** **(Months, Seasons, Years)**	**Magnitude** **(Low, Medium, High, Very High**	**Extent** **(Local, Regional, State, Nation, Global)**	**Potential** **(Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)**	**Nature** **(Direct, Indirect, Cumulative)**	**Impact** **(Positive, Negative)**	**Scoring**
Exposure to Hazardous Materials – Construction							
Changes in physiologic contaminant levels such as lead, methyl mercury, PCB, Dioxins, PM2.5 from incineration, drilling mud, or gas flaring	5 years	Very high – due to increased number of incinerations and stack throughput and the lack of stack testing and analysis (EPA regulations) and increased construction period	Local - limited exposure because the nearest settlement is 60 miles west	Unlikely it would leave the site	Direct	Negative	**6 = Medium**
Changed levels of the same substances in subsistence resources	5 years	Very high - due to increased number of incinerations	Local	Unlikely it would leave the site	Indirect (food source)	Negative	**6 = Medium**
Exposure to Hazardous Materials – Drilling							
Changes in physiologic contaminant levels such as lead, methyl mercury, PCB, Dioxins, PM2.5 from incineration, drilling mud, or gas flaring	2 years	High - increased number of incinerations, and the lack of stack testing and analysis	Local	Unlikely it would leave the site	Direct	Negative	**5 = Medium**
Changed levels of the same substances in subsistence resources	2 years	High - increased number of incinerations	Local	Unlikely it would leave the site	Indirect (food source)	Negative	**5 = Medium**

Health Impact Analysis Alternative C							
Health Effects Category / Issue	**Duration** **(Months, Seasons, Years)**	**Magnitude** **(Low, Medium, High, Very High**	**Extent** **(Local, Regional, State, Nation, Global)**	**Potential** **(Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)**	**Nature** **(Direct, Indirect, Cumulative)**	**Impact** **(Positive, Negative)**	**Scoring**
Exposure to Hazardous Materials – Operation							
Changes in physiologic contaminant levels such as lead, methyl mercury, PCB, Dioxins, PM2.5 from incineration, drilling mud, or gas flaring	30 years	Medium – incinerations decrease during operations	Local	About as Likely as Not	Direct	Negative	**5 = Medium**
Changed levels of the same substances in subsistence resources	30 years	Medium - incinerations decrease during operations	Local	About as Likely as Not	Indirect (food source)	Negative	**5 = Medium**

Health Impact Analysis Alternative C							
Health Effects Category /Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High)	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Food, Nutrition, Subsistence – Construction							
Change in amount of dietary consumption of subsistence resources	5 years	Low - average annual loss of between 2 and 17 pounds of caribou; no impact on marine mammals	Local	Likely	Direct	Negative	**4 =Medium**
Change in composition of diet*	5 years	Low - residents eat other subsistence resources although caribou are very important)	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in food security	5 years	Low - residents have access to cash and stores; other subsistence resources are available	Local	Unlikely	Direct	Negative	**3 = Low**

Health Impact Analysis Alternative C							
Health Effects Category /Issue	**Duration (Months, Seasons, Years)**	**Magnitude (Low, Medium, High, Very High)**	**Extent (Local, Regional, State, Nation, Global)**	**Potential (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)**	**Nature (Direct, Indirect, Cumulative)**	**Impact (Positive, Negative)**	**Scoring**
Food, Nutrition, Subsistence – Drilling							
Change in amount of dietary consumption of subsistence resources	2 years	Low - average annual loss of between 2 and 17 pounds of caribou	Local	Likely	Direct	Negative	**4 =Medium**
Change in composition of diet	2.5 years	Low - residents eat other subsistence resources although caribou are very important	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in food security	2 years	Low - residents have access to cash and stores; other subsistence resources are available	Local	Unlikely	Direct	Negative	**3 = Low**
Food, Nutrition, Subsistence – Operation							
Change in amount of dietary consumption of subsistence resources	30 years	Low - size of the caribou herd after construction and drilling is unknown	Local	Likely	Direct	Negative	**4 = Medium**
Change in composition of diet	30 years	Low - size of the caribou herd after construction and drilling is unknown	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in food security	30 years	Low - residents have access to cash and stores; other subsistence resources are available	Local	Unlikely	Direct	Negative	**3 = Low**

*Panel asks if increased income would replace nutritional value of caribou?

Health Impact Analysis Alternative C							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Health Infrastructure/Delivery - Construction							
Change in number of clinics and staff							**No impact**
Change in quality of clinics and staff							**No impact**
Change in services offered (e.g. prenatal checks, x-ray, lab services)							**No impact**
Change in accessibility of health care							**No impact**
Change in utilization/clinic burden from non-resident influx*	5 years	Very high – road traffic from Prudhoe Bay will increase to approximately 6,400 trips per year, cascading impacts from accidents and injuries	Local, regional	Virtually Certain	Indirect	Negative	**8 = High**

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Health Infrastructure/Delivery - Operation							
Change in number of clinics and staff	30 years	Medium – depends on amount of tax revenues from operation	Regional	Virtually Certain	Indirect	Positive	**7 = High**
Change in quality of clinics and staff	30 years	Medium – depends on amount of tax revenues from operation	Regional	Virtually Certain	Indirect	Positive	**7 = High**
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Change in utilization/clinic burden from non-resident influx*	30 years	Low – accidents will decrease as construction traffic levels decrease during operations	Local, regional	Likely	Indirect	Negative	**3 = Low**

*Panel notes that there may be impact from construction accidents on site

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Infectious Diseases - Construction							
Change in pediatric acute respiratory disease rates (RSV, pneumonias, asthma, Bronchiectasis)							**No impact**
Change in acute adult respiratory disease rates (TB, Bronchitis, Influenza)*							**No impact**
Change in STD rates (esp. Chlamydia, Gonorrhea, HIV)							**No impact**
Change in GID outbreaks							**No impact**

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Health Impact Analysis
Alternative C

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Change in STD rates (esp. Chlamydia, Gonorrhea, HIV)							**No impact**
Change in GID outbreaks							**No impact**

*Panel notes that the project may bring more RSV to local communities depending on the number of local employees – an unknown number to date

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Health Effects Category / Issue	**Duration** **(Months, Seasons, Years)**	**Magnitude** **(Low, Medium, High, Very High**	**Extent** **(Local, Regional, State, Nation, Global)**	**Potential** **(Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)**	**Nature** **(Direct, Indirect, Cumulative)**	**Impact** **(Positive, Negative)**	**Scoring**
Non-communicable Chronic Disease - Construction							
Change in obesity prevalence	5 years	Low - changes to diet due to loss of subsistence resources might lead to increased obesity	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in average BMI	5 years	Low - changes to diet due to loss of subsistence resources would lead to increased BMI	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in type 2 DM rates	5 years	Low -changes to diet due to loss of subsistence resources would lead to increased 2DM rates	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in hypertension							**No impact**
Change in lung cancer rates							**No impact**
Change in COPD rates							**No impact**

Health Impact Analysis Alternative C							
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Non-communicable Chronic Disease - Drilling							
Change in obesity prevalence	2 years	Low - changes to diet due to loss of subsistence resources might lead to increased obesity	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
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Change in COPD rates							**No impact**

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Social Determinants of Health - Construction							
Change in maternal child health status							**No impact**
Change in depression/anxiety prevalence*	5 years	Medium	Local	About as Likely as Not	Direct	Negative	**4 = Medium**
Change in substance abuse rate							**No impact**
Change in suicide rate**	5years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in teen pregnancy rates***							**No impact**
Change in domestic violence							**No impact**

Health Impact Analysis Alternative C							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Social Determinants of Health - Drilling							
Change in maternal child health status							**No impact**
Change in depression/anxiety prevalence*	2 years	Medium	Local	About as Likely as Not	Direct	Negative	**4 = Medium**
Change in substance abuse rate							**No impact**
Change in suicide rate**	2 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in teen pregnancy rates***							**No impact**
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Health Impact Analysis
Alternative C

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Social Determinants of Health - Operation							
Change in maternal child health status	30 years	Low	Local	Unknown	Direct	Negative	**3 = Low**
Change in depression/anxiety prevalence*	30 years	Medium	Local	About as Likely as Not	Direct	Negative	**4 = Medium**
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Change in teen pregnancy rates***	30 years	Low	Local	Unknown	Direct	Negative	**3 = Low**
Change in domestic violence	30 years	Low	Local	Unknown	Direct	Negative	**3 = Low**

*Panel notes that local residents may fear an incident like the BP spill in the Gulf which would severely impact marine resources (see EIS)

**Panel notes that rates are already high and might be reduced if youth were targeted for employment

***Panel notes that rates are already high and would not be affected because there is so little opportunity for employees to interact with local residents

Health Impact Analysis
Alternative D

Health Effects Category / Issues	Duration (Months, Seasons, Years)	Magnitude (Low, Medium, High, Very High)	Extent (Local, Regional, State, Nation, Global)	Potential (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	Nature (Direct, Indirect, Cumulative)	Impact (Positive, Negative)	Scoring
Water and Sanitation - Construction							
Changes in potable water access							**No impact**
Change in water quantity							**No impact**
Change in water quality							**No impact**
Change in sanitation effectiveness, adequate settling pools, discharge							**No impact**
Water and Sanitation - Drilling							
Changes in potable water access							**No impact**
Change in water quantity							**No impact**
Change in water quality							**No impact**
Change in sanitation effectiveness, adequate							**No impact**

Health Impact Analysis Alternative D							
Health Effects Category / Issues	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High)	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
settling pools, discharge							
Water and Sanitation - Operation							
Changes in potable water access							**No impact**
Change in water quantity							**No impact**
Change in water quality							**No impact**
Change in sanitation effectiveness, adequate settling pools, discharge							**No impact**

Health Impact Analysis Alternative D							
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Accidents and Injuries - Construction							
Change in unintentional injury (e.g. drowning, falls, snow machine injury) rates	5 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in roadway incidents and injuries due to service road access for hunters/increased traffic from Prudhoe Bay	5 years	Very high – road traffic from Prudhoe Bay will increase to approximately 6,400 trips per year, cascading impacts from accidents and injuries	Local, regional	Virtually Certain	Indirect	Negative	**8 = High**
Changes to safety during subsistence activities	5 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**

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Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High)	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Accidents and Injuries - Drilling							
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Changes to safety during subsistence activities	30 years	Low	Local	Unlikely	Direct	Negative	**3 = Low**

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Exposure to Hazardous Materials – Construction							
Changes in physiologic contaminant levels such as lead, methyl mercury, PCB, Dioxins, PM2.5 from incineration, drilling mud, or gas flaring	5 years	Very high – due to increased number of incinerations and stack throughput and the lack of stack testing and analysis (EPA regulations) and increased construction period	Local - limited exposure because the nearest settlement is 60 miles west	Unlikely it would leave the site	Direct	Negative	**6 = Medium**
Changed levels of the same substances in subsistence resources	5 years	Very high - due to increased number of incinerations	Local	Unlikely it would leave the site	Indirect (food source)	Negative	**6 = Medium**
Exposure to Hazardous Materials – Drilling							
Changes in physiologic contaminant levels such as lead, methyl mercury, PCB, Dioxins, PM2.5 from incineration, drilling mud, or gas flaring	2 years	High - increased number of incinerations and the lack of stack testing and analysis	Local	Unlikely it would leave the site	Direct	Negative	**5 = Medium**
Changed levels of the same substances in	2 years	High - increased number of incinerations	Local	Unlikely it would leave the site	Indirect (food	Negative	**5 = Medium**

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subsistence resources					source)		
Exposure to Hazardous Materials – Operation							
Changes in physiologic contaminant levels such as lead, methyl mercury, PCB, Dioxins, PM2.5 from incineration, drilling mud, or gas flaring	30 years	Medium – incinerations decrease during operations	Local	About as Likely as Not	Direct	Negative	**5 = Medium**
Changed levels of the same substances in subsistence resources	30 years	Medium - incinerations decrease during operations	Local	About as Likely as Not	Indirect (food source)	Negative	**5 = Medium**

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Food, Nutrition, Subsistence – Construction							
Change in amount of dietary consumption of subsistence resources	5 years	Low - average annual loss of between 2 and 17 pounds of caribou; no impact on marine mammals	Local	Likely	Direct	Negative	**4 = Medium**
Change in composition of diet*	5 years	Low - residents eat other subsistence resources although caribou are very important)	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in food security	5 years	Low - residents have access to cash and stores; other subsistence resources are available	Local	Unlikely	Direct	Negative	**3 = Low**

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*Panel asks if increased income could replace nutritional value of caribou?

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Health Infrastructure/Delivery - Construction							
Change in number of clinics and staff							**No impact**
Change in quality of clinics and staff							**No impact**
Change in services offered (e.g. prenatal checks, x-ray, lab services)							**No impact**
Change in accessibility of health care							**No impact**
Change in utilization/clinic burden from non-resident influx*	5 years	Very high – road traffic from Prudhoe Bay will increase to approximately 6,400 trips per year, cascading impacts from accidents and injuries	Local, regional	Virtually Certain	Indirect	Negative	**8 = High**

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*Panel notes that there may be impact from construction accidents on site

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Infectious Diseases - Construction							
Change in pediatric acute respiratory disease rates (RSV, pneumonias, asthma, Bronchiectasis)							**No impact**
Change in acute adult respiratory disease rates (TB, Bronchitis, Influenza)*							**No impact**
Change in STD rates (esp. Chlamydia, Gonorrhea, HIV)							**No impact**
Change in GID outbreaks							**No impact**

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Change in GI outbreaks							**No impact**

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Change in GID outbreaks							**No impact**

*Panel notes that the project may bring more RSV to local communities depending on t he number of local employees – an unknown number to date

Health Impact Analysis Alternative D							
Health Effects Category / Issue	**Duration (Months, Seasons, Years)**	**Magnitude (Low, Medium, High, Very High**	**Extent (Local, Regional, State, Nation, Global)**	**Potential (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)**	**Nature (Direct, Indirect, Cumulative)**	**Impact (Positive, Negative)**	**Scoring**
Non-communicable Chronic Disease - Construction							
Change in obesity prevalence	5 years	Low - changes to diet due to loss of subsistence resources might lead to increased obesity	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in average BMI	5 years	Low - changes to diet due to loss of subsistence resources would lead to increased BMI	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in type 2 DM rates	5 years	Low -changes to diet due to loss of subsistence resources would lead to increased 2DM rates	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in hypertension							**No impact**
Change in lung cancer rates							**No impact**
Change in COPD rates							**No impact**

Health Impact Analysis Alternative D							
Health Effects Category / Issue	**Duration (Months, Seasons, Years)**	**Magnitude (Low, Medium, High, Very High**	**Extent (Local, Regional, State, Nation, Global)**	**Potential (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)**	**Nature (Direct, Indirect, Cumulative)**	**Impact (Positive, Negative)**	**Scoring**
Non-communicable Chronic Disease - Drilling							
Change in obesity prevalence	2 years	Low - changes to diet due to loss of subsistence resources might lead to increased obesity	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in average BMI	2 years	Low - changes to diet due to loss of subsistence resources would lead to increased BMI	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in type 2 DM rates	2 years	Low - changes to diet due to loss of subsistence resources would lead to increased 2DM rates	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in hypertension							**No impact**
Change in lung cancer rates							**No impact**
Change in COPD rates							**No impact**

Health Impact Analysis Alternative D							
Health Effects Category / Issue	**Duration (Months, Seasons, Years)**	**Magnitude (Low, Medium, High, Very High**	**Extent (Local, Regional, State, Nation, Global)**	**Potential (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)**	**Nature (Direct, Indirect, Cumulative)**	**Impact (Positive, Negative)**	**Scoring**
Non-communicable Chronic Disease - Operation							
Change in obesity prevalence	30 years	Low - changes to diet due to loss of subsistence resources might lead to increased obesity	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in average BMI	30 years	Low - changes to diet due to loss of subsistence resources would lead to increased BMI	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in type 2 DM rates	30 years	Low - changes to diet due to loss of subsistence resources would lead to increased 2DM rates	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in hypertension							**No impact**
Change in lung cancer rates							**No impact**
Change in COPD rates							**No impact**

Health Impact Analysis Alternative D							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Social Determinants of Health - Construction							
Change in maternal child health status							**No impact**
Change in depression/anxiety prevalence*	5 years	Medium	Local	About as Likely as Not	Direct	Negative	**4 = Medium**
Change in substance abuse rate							**No impact**
Change in suicide rate**	5 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in teen pregnancy rates***							**No impact**
Change in domestic violence							**No impact**

Health Impact Analysis Alternative D							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Social Determinants of Health - Drilling							
Change in maternal child health status							**No impact**
Change in depression/anxiety prevalence*	2 years	Medium	Local	About as Likely as Not	Direct	Negative	**4 = Medium**
Change in substance abuse rate							**No impact**
Change in suicide rate**	2 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in teen pregnancy rates***							**No impact**
Change in domestic violence							**No impact**

Health Impact Analysis Alternative D							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Social Determinants of Health - Operation							
Change in maternal child health status	30 years	Low	Local	Unknown	Direct	Negative	**3 = Low**
Change in depression/anxiety prevalence*	30 years	Medium	Local	About as Likely as Not	Direct	Negative	**4 = Medium**
Change in substance abuse rate	30 years	Low	Local	Unknown	Direct	Negative	**3 = Low**
Change in suicide rate*	30 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in teen pregnancy rates***	30 years	Low	Local	Unknown	Direct	Negative	**3 = Low**
Change in domestic violence	30 years	Low	Local	Unknown	Direct	Negative	**3 = Low**

*Panel notes that local residents may fear an incident like the BP spill in the Gulf which would severely impact marine resources (see EIS)

**Panel notes that rates are already high and might be reduced if youth were targeted for employment

***Panel notes that rates are already high and would not be affected because there is so little opportunity for employees to interact with local residents

Health Impact Analysis Alternative E							
Health Effects Category / Issues	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High)	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Water and Sanitation - Construction							
Changes in potable water access							**No impact**
Change in water quantity							**No impact**
Change in water quality							**No impact**
Change in sanitation effectiveness, adequate settling pools, discharge							**No impact**
Water and Sanitation - Drilling							
Changes in potable water access							**No impact**
Change in water quantity							**No impact**
Change in water quality							**No impact**
Change in sanitation effectiveness, adequate							**No impact**

Health Impact Analysis Alternative E							
Health Effects Category / Issues	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High)	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
settling pools, discharge							
Water and Sanitation - Operation							
Changes in potable water access							**No impact**
Change in water quantity							**No impact**
Change in water quality							**No impact**
Change in sanitation effectiveness, adequate settling pools, discharge							**No impact**

Point Thomson Project EIS - Appendix R
DEIS

Health Impact Analysis Alternative E							
Health Effects Category / Issue	**Duration** **(Months, Seasons, Years)**	**Magnitude** **(Low, Medium, High, Very High)**	**Extent** **(Local, Regional, State, Nation, Global)**	**Potential** **(Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)**	**Nature** **(Direct, Indirect, Cumulative)**	**Impact** **(Positive, Negative)**	**Scoring**
Accidents and Injuries - Construction							
Change in unintentional injury (e.g. drowning, falls, snow machine injury) rates	3 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in roadway incidents and injuries due to service road access for hunters/increased traffic from Prudhoe Bay	3 years	Low (Dalton Highway access from Deadhorse, ice road between Endicott Spur and PTP for VSM and supplies; modules shipped by barge – roads can handle traffic)	Local, Regional, State	About as Likely as Not	Direct	Negative	**3 = Low**
Changes to safety during subsistence activities	3 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**

Health Impact Analysis Alternative E							
Health Effects Category / Issue	**Duration** **(Months, Seasons, Years)**	**Magnitude** **(Low, Medium, High, Very High)**	**Extent** **(Local, Regional, State, Nation, Global)**	**Potential** **(Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)**	**Nature** **(Direct, Indirect, Cumulative)**	**Impact** **(Positive, Negative)**	**Scoring**
Accidents and Injuries - Drilling							
Change in unintentional injury (e.g. drowning, falls, snow machine injury) rates	2 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in roadway incidents and injuries due to service road access for hunters/increased traffic from Prudhoe Bay	2 years	Low (Dalton Highway access from Deadhorse, ice road between Endicott Spur and PTP for VSM and supplies (roads can handle traffic)	Local, regional	About as Likely as Not	Direct	Negative	**3 = Low**
Changes to safety during subsistence activities	2 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**

Health Impact Analysis Alternative E							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High)	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Accidents and Injuries - Operation							
Change in unintentional injury (e.g. drowning, falls, snow machine injury) rates	30 years	Low – no impact from project	Local	Unlikely	Direct	Negative	**3 = Low**
Change in roadway incidents and injuries due to service road access for hunters/increased traffic from Prudhoe Bay	30 years	Low - No trips on Dalton Road or from the Endicott Spur are anticipated	Local	Unlikely	Direct	Negative	**3 = Low**
Changes to safety during subsistence activities	30 years	Low	Local	Unlikely	Direct	Negative	**3 = Low**

Health Impact Analysis
Alternative E

Health Effects Category / Issue	Duration (Months, Seasons, Years)	Magnitude (Low, Medium, High, Very High	Extent (Local, Regional, State, Nation, Global)	Potential (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	Nature (Direct, Indirect, Cumulative)	Impact (Positive, Negative)	Scoring
Exposure to Hazardous Materials – Construction							
Changes in physiologic contaminant levels such as lead, methyl mercury, PCB, Dioxins, PM2.5 from incineration, drilling mud, or gas flaring	3 years	High – due to increased number of incinerations and stack throughput and the lack of stack testing and analysis (EPA regulations)	Local - limited exposure because the nearest settlement is 60 miles west	Very Unlikely it would leave the site	Direct	Negative	**5 = Medium**
Changed levels of the same substances in subsistence resources	3 years	High - due to increased number of incinerations	Local	Very Unlikely it would leave the site	Indirect (food source)	Negative	**5 = Medium**
Exposure to Hazardous Materials – Drilling							
Changes in physiologic contaminant levels such as lead, methyl mercury, PCB, Dioxins, PM2.5 from incineration, drilling mud, or gas flaring	2 years	High - increased number of incinerations and the lack of stack testing and analysis	Local	Very Unlikely it would leave the site	Direct	Negative	**5 = Medium**
Changed levels of the same substances in	2 years	High - increased number of	Local	Very Unlikely it would	Indirect (food	Negative	**5 =**

Health Impact Analysis Alternative E							
Health Effects Category / Issue	**Duration (Months, Seasons, Years)**	**Magnitude (Low, Medium, High, Very High**	**Extent (Local, Regional, State, Nation, Global)**	**Potential (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)**	**Nature (Direct, Indirect, Cumulative)**	**Impact (Positive, Negative)**	**Scoring**
subsistence resources		incinerations		leave the site	source)		**Medium**
Exposure to Hazardous Materials – Operation							
Changes in physiologic contaminant levels such as lead, methyl mercury, PCB, Dioxins, PM2.5 from incineration, drilling mud, or gas flaring	30 years	Medium – incinerations decrease during operations	Local	About as Likely as Not	Direct	Negative	**5 = Medium**
Changed levels of the same substances in subsistence resources	30 years	Medium - incinerations decrease during operations	Local	About as Likely as Not	Indirect (food source)	Negative	**5 = Medium**

Health Impact Analysis Alternative E							
Health Effects Category /Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High)	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Food, Nutrition, Subsistence – Construction							
Change in amount of dietary consumption of subsistence resources	3 years	Low (average annual loss of between 2 and 17 pounds of caribou; barging ceases during whale season)	Local	Likely	Direct	Negative	**4 = Medium**
Change in composition of diet*	3 years	Low (residents eat other subsistence resources although caribou are very important)	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in food security	3 years	Low (residents have access to cash and stores; other subsistence resources are available)	Local	Unlikely	Direct	Negative	**3 = Low**

Health Impact Analysis Alternative E							
Health Effects Category /Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High)	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Food, Nutrition, Subsistence – Drilling							
Change in amount of dietary consumption of subsistence resources	2 years	Low (average annual loss of between 2 and 17 pounds of caribou; barging ceases during whale season)	Local	Likely	Direct	Negative	**4 = Medium**
Change in composition of diet*	2.5 years	Low (residents eat other subsistence resources although caribou are very important)	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in food security	2 years	Low (residents have access to cash and stores; other subsistence resources are available)	Local	Unlikely	Direct	Negative	**3 = Low**
Food, Nutrition, Subsistence – Operation							
Change in amount of dietary consumption of subsistence resources	30 years	Medium (size of the caribou herd in 5 years is unknown)	Local	Likely	Direct	Negative	**4 = Medium**
Change in composition of diet*	30 years	Medium (size of the caribou herd in 5 years is unknown)	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in food security	30 years	Low (residents have access to cash and stores; other subsistence resources are available)	Local	Unlikely	Direct	Negative	**3 = Low**

*Panel asks if increased income would replace nutritional value of caribou?

Health Impact Analysis Alternative E							
Health Effects Category / Issue	**Duration** **(Months, Seasons, Years)**	**Magnitude** **(Low, Medium, High, Very High**	**Extent** **(Local, Regional, State, Nation, Global)**	**Potential** **(Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)**	**Nature** **(Direct, Indirect, Cumulative)**	**Impact** **(Positive, Negative)**	**Scoring**
Health Infrastructure/Delivery - Construction							
Change in number of clinics and staff							**No impact**
Change in quality of clinics and staff							**No impact**
Change in services offered (e.g. prenatal checks, x-ray, lab services)							**No impact**
Change in accessibility of health care							**No impact**
Change in utilization/clinic burden from non-resident influx*	3 years	Medium	Local	About as Likely as Not	Indirect	Negative	**3 = Low**

Health Impact Analysis Alternative E							
Health Effects Category / Issue	**Duration** **(Months, Seasons, Years)**	**Magnitude** **(Low, Medium, High, Very High**	**Extent** **(Local, Regional, State, Nation, Global)**	**Potential** **(Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)**	**Nature** **(Direct, Indirect, Cumulative)**	**Impact** **(Positive, Negative)**	**Scoring**
Health Infrastructure/Delivery - Drilling							
Change in number of clinics and staff							**No impact**
Change in quality of clinics and staff							**No impact**
Change in services offered (e.g. prenatal checks, x-ray, lab services)							**No impact**
Change in accessibility of health care							**No impact**
Change in utilization/clinic burden from non-resident influx*	3 years	Medium	Regional	About as Likely as Not	Indirect	Negative	**3 = Low**

Health Impact Analysis Alternative E							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Health Infrastructure/Delivery - Operation							
Change in number of clinics and staff	30 years	Medium – depends on amount of tax revenues from operation	Regional	Virtually Certain	Indirect	Positive	**7 = High**
Change in quality of clinics and staff	30 years	Medium – depends on amount of tax revenues from operation	Regional	Virtually Certain	Indirect	Positive	**7 = High**
Change in services offered (e.g. prenatal checks, x-ray, lab services)	30 years	Medium – depends on amount of tax revenues from operation	Regional	Virtually Certain	Indirect	Positive	**7 = High**
Change in accessibility of health care	30 years	Medium – depends on amount of tax revenues from operation	Regional	Virtually Certain	Indirect	Positive	**7 = High**
Change in utilization/clinic burden from non-resident influx*	30 years	Low – accidents tend to decrease during operations	Regional	Likely	Indirect	Negative	**3 = Low**

*Panel notes that there may be impact from construction accidents on site

Health Impact Analysis Alternative E							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High)	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Infectious Diseases - Construction							
Change in pediatric acute respiratory disease rates (RSV, pneumonias, asthma, Bronchiectasis)							**No impact**
Change in acute adult respiratory disease rates (TB, Bronchitis, Influenza)*							**No impact**
Change in STD rates (esp. Chlamydia, Gonorrhea, HIV)							**No impact**
Change in GID outbreaks							**No impact**

Health Impact Analysis Alternative E							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High)	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Infectious Diseases - Drilling							
Change in pediatric acute respiratory disease rates (RSV, pneumonias, asthma, Bronchiectasis)							**No impact**
Change in acute adult respiratory disease rates (TB, Bronchitis, Influenza)*							**No impact**
Change in STD rates (esp. Chlamydia, Gonorrhea, HIV)							**No impact**
Change in GID outbreaks							**No impact**

Health Impact Analysis Alternative E							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High)	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Infectious Diseases - Operation							
Change in pediatric acute respiratory disease rates (RSV, pneumonias, asthma, Bronchiectasis)							**No impact**
Change in acute adult respiratory disease rates (TB, Bronchitis, Influenza)*							**No impact**
Change in STD rates (esp. Chlamydia, Gonorrhea, HIV)							**No impact**
Change in GID outbreaks							**No impact**

*Panel notes that the project may bring more RSV to local communities depending on the number of local employees – an unknown number to date

Health Impact Analysis
Alternative E

Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Non-communicable Chronic Disease - Construction							
Change in obesity prevalence	3 years	Low (changes to diet due to loss of subsistence resources might lead to increased obesity)	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in average BMI	3 years	Low (changes to diet due to loss of subsistence resources would lead to increased BMI)	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in type 2 DM rates	3 years	Low (changes to diet due to loss of subsistence resources would lead to increased 2DM rates)	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in hypertension							**No impact**
Change in lung cancer rates							**No impact**
Change in COPD rates							**No impact**

Health Impact Analysis
Alternative E

Health Effects Category / Issue	Duration (Months, Seasons, Years)	Magnitude (Low, Medium, High, Very High	Extent (Local, Regional, State, Nation, Global)	Potential (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	Nature (Direct, Indirect, Cumulative)	Impact (Positive, Negative)	Scoring
Non-communicable Chronic Disease - Drilling							
Change in obesity prevalence	2 years	Low (changes to diet due to loss of subsistence resources might lead to increased obesity)	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in average BMI	2 years	Low (changes to diet due to loss of subsistence resources would lead to increased BMI)	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in type 2 DM rates	2 years	Low (changes to diet due to loss of subsistence resources would lead to increased 2DM rates)	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in hypertension							**No impact**
Change in lung cancer rates							**No impact**
Change in COPD rates							**No impact**

Health Impact Analysis
Alternative E

Health Effects Category / Issue	Duration (Months, Seasons, Years)	Magnitude (Low, Medium, High, Very High	Extent (Local, Regional, State, Nation, Global)	Potential (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	Nature (Direct, Indirect, Cumulative)	Impact (Positive, Negative)	Scoring
Non-communicable Chronic Disease - Operation							
Change in obesity prevalence	30 years	Low (changes to diet due to loss of subsistence resources might lead to increased obesity)	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in average BMI	30 years	Low (changes to diet due to loss of subsistence resources would lead to increased BMI)	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in type 2 DM rates	30 years	Low (changes to diet due to loss of subsistence resources would lead to increased 2DM rates)	Local	About as Likely as Not	Indirect	Negative	**3 = Low**
Change in hypertension							**No impact**
Change in lung cancer rates							**No impact**
Change in COPD rates							**No impact**

Health Impact Analysis Alternative E							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Social Determinants of Health - Construction							
Change in maternal child health status							**No impact**
Change in depression/anxiety prevalence*	3 years	Medium	Local	About as Likely as Not	Direct	Negative	**4 = Medium**
Change in substance abuse rate							**No impact**
Change in suicide rate**	3 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in teen pregnancy rates***							**No impact**
Change in domestic violence							**No impact**

Health Impact Analysis Alternative E							
Health Effects Category / Issue	**Duration** (Months, Seasons, Years)	**Magnitude** (Low, Medium, High, Very High	**Extent** (Local, Regional, State, Nation, Global)	**Potential** (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	**Nature** (Direct, Indirect, Cumulative)	**Impact** (Positive, Negative)	**Scoring**
Social Determinants of Health - Drilling							
Change in maternal child health status							**No impact**
Change in depression/anxiety prevalence*	2 years	Medium	Local	About as Likely as Not	Direct	Negative	**4 = Medium**
Change in substance abuse rate							**No impact**
Change in suicide rate**	2 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in teen pregnancy rates***							**No impact**
Change in domestic violence							**No impact**

Health Impact Analysis
Alternative E

Health Effects Category / Issue	Duration (Months, Seasons, Years)	Magnitude (Low, Medium, High, Very High	Extent (Local, Regional, State, Nation, Global)	Potential (Exceptionally Unlikely, Very Unlikely, Unlikely, About as Likely as Not, Likely, Very Likely, Virtually Certain)	Nature (Direct, Indirect, Cumulative)	Impact (Positive, Negative)	Scoring
Social Determinants of Health - Operation							
Change in maternal child health status	30 years	Low	Local	Unknown	Direct	Negative	**3 = Low**
Change in depression/anxiety prevalence*	30 years	Medium	Local	About as Likely as Not	Direct	Negative	**4 = Medium**
Change in substance abuse rate	30 years	Low	Local	Unknown	Direct	Negative	**3 = Low**
Change in suicide rate**	30 years	Low	Local	About as Likely as Not	Direct	Negative	**3 = Low**
Change in teen pregnancy rates***	30 years	Low	Local	Unknown	Direct	Negative	**3 = Low**
Change in domestic violence	30 years	Low	Local	Unknown	Direct	Negative	**3 = Low**

*Panel notes that local residents may fear an incident like the BP spill in the Gulf which would severely impact marine resources (see EIS)

**Panel notes that rates are already high and might be reduced if youth were targeted for employment

***Panel notes that rates are already high and would not be affected because there is so little opportunity for employees to interact with local residents

Appendix S

Hydrology and Hydraulics Analysis Report

Memo

To:	Point Thomson EIS Team		
From:	Glen Krogman and Robin Beebee	Project:	Point Thomson Project EIS
CC:		Date:	6/29/2011
Subject:	EIS Hydrology and Hydraulics Analysis	Job No:	123515

HDR Alaska, Inc. (HDR) completed an analysis of the potential impact of proposed gravel roads and airstrips on sheetflow and streams to address Lead and Cooperating Agency and Applicant comments received on the Point Thomson Project Preliminary Draft Environmental Impact Statement (EIS). Agency and Applicant discussed the comments during a workshop on March 1, 2011, a presentation of hydrology and hydraulics by the Applicant on March 8, 2011, and during an Agency meeting to discuss hydrology and wetlands impacts on March 15, 2011. A memo dated March 22, 2011 was sent to the agencies to describe the approach to evaluate the potential impacts of the proposed project on hydrology and hydraulics. This memo summarizes the result of the analysis.

HDR compared the following impacts between alternatives for gravel roads: number of stream crossings, area of increased inundation upstream of roads during sheetflow events, and area of decreased inundation (drying) downstream of roads during sheetflow events. For airstrips, HDR estimated the change in contributing area for each watershed traversed by airstrips and consequent change in runoff to streams. Additional hydrologic impacts are summarized in the EIS Hydrology Section.

The study area included all proposed gravel road stream crossings, the area upstream and downstream of these crossings that would likely be impacted, and the watershed areas that would be changed by proposed airstrips.

Stream Crossings and Watershed Delineations

The stream centerlines mapped and produced by HDR for the Point Thomson Project EIS Wetland Functional Assessment, December 2010 (stream centerlines) were used to identify points for watershed area delineations. The base watershed delineations for the area were obtained from the Hydrologic Unit Code (HUC) boundaries compiled by the U.S. Geological Survey (USGS) National Hydrography Dataset (NHD) and the U.S. Department of Agriculture (USDA) National Resources Conservation Services (NRCS) Watershed Boundary Dataset (WBD) sources. Watersheds were updated by using the 2009 high-resolution aerial photography and 2006 light detection and ranging (LiDAR) topography for the infield gravel roads for all alternatives. The infield watersheds are superimposed on a relict alluvial fan of the Canning River, and topography on the fan is subdued. Drainage divides are low and some error in watershed areas should be expected.

Streams 17a and 17b both drain the same lake. Without more detailed information, HDR assumed that each stream would drain approximately half of the watershed area. HUC watersheds were the best available information for the Alternative C gravel access road. HDR cropped these watersheds to the proposed road crossing. See Figure 1 for watershed lines and stream crossing locations. Table 1 shows the number of gravel road stream crossings for each alternative.

Table 1: Gravel Road Stream Crossings	
Alternative	Number of Streams Crossed by Gravel Roads
B	9 (infield)
C	50 (4 infield, 46 gravel access road)
D	7 (infield)
E	1 (infield)

The Applicant proposes to build bridges to cross all streams with estimated 50-year (2 percent chance) flows of 500 cubic feet per second (cfs) or more. All other streams would be crossed with one or more culverts. The design flow was estimated by using the area of each contributing watershed and USGS regression equations developed for the North Slope region of Alaska (Curran et al. 2003). The USGS equations for the 50-year flow event have an estimated standard error of 52 percent, in addition to the error introduced by the watershed delineation. For some Alternative B crossings, the estimated flows from this analysis conflict with the Applicant's estimated flows. This discrepancy is a result of differences in watershed delineations. Where actual streamflow measurements exist (as for all Alternative B crossings), these are considered to be more accurate representations of flow than the regression-based estimates. Actual structure types would be determined for the project in the design phase based on field measurements.

Tables 2a and 2b list all mapped crossings, estimated design flows, and proposed structures. The Applicant also proposes to add culverts along the gravel roads to drain sheetflow between streams. The final placement for these culverts would be determined during road layout, but they are proposed to be approximately every 500 feet with additional culverts installed as needed.

Table 2a: Infield Gravel Road Stream Crossing Structure Analysis			
Stream Name	Contributing Area (square miles)	50-year (2%) Flow (cfs)	Likely Structure*
Alternative B			
17A	0.1	11	Culvert
17B	0.1	11	Culvert
18A	1.6	137	Culvert
18B	3.5	261	Bridge*
21	9.9	628	Bridge
22	1.9	154	Bridge*
24A	5.5	381	Culvert
24B	10.7	673	Bridge
27	0.01	1	Culvert
Alternative C			
22	3.6	272	Bridge*
24A	4.3	310	Culvert
24B	8.9	575	Bridge
28	0.3	36	Culvert
Alternative D			
17A	2.3	11	Culvert
17B	3.6	11	Culvert
22	2.3	183	Culvert
22	3.6	271	Bridge*
24A	5.0	357	Culvert
24B	9.0	579	Bridge
28	0.2	26	Culvert
Alternative E			
24B	8.9	575	Bridge

* Bridge proposed based on field data rather than watershed area.

Table 2b: Alternative C Gravel Access Road Stream Crossing Structure Analysis			
Stream Name	Contributing Area (Square Miles)	50-year (2%) Flow (cfs)	Likely Structure
Sagavanirktok River (six channels)	5,036.9	119,985	Bridges
unnamed	2.6	207	Culvert
unnamed	4.9	347	Culvert
unnamed	0.2	24	Culvert
unnamed	0.2	22	Culvert
unnamed	0.8	77	Culvert
unnamed	1.1	102	Culvert
Shaviovik Slough (two crossings)	--	--	Not analyzed
unnamed	0.0	1	Culvert
unnamed	0.0	1	Culvert
unnamed	0.1	10	Culvert
unnamed	0.4	38	Culvert
unnamed	0.1	14	Culvert
unnamed	2.0	166	Culvert
unnamed	8.8	570	Bridge
unnamed	0.9	82	Culvert
unnamed (three crossings)	3.1	238	Culvert
unnamed (two channels)	9.3	596	Bridge
unnamed	0.7	64	Culvert
Unnamed (two channels)	2.7	214	Culvert
unnamed	6.6	446	Culvert
unnamed	882.7	27,669	Bridge
No Name River (three crossings)	142.5	5,953	Bridges
West Badami Creek	30.1	1,608	Bridge
Middle Badami Creek	16.8	984	Bridge
East Badami Creek	83.6	3,800	Bridge
unnamed	13.9	838	Bridge
unnamed	33.4	1,755	Bridge
Stream 16	27.5	1,489	Bridge
West Shaviovik Creek	44.2	2,222	Bridge
Kadleroshilik River (two crossings)	570.5	19,155	Bridges
Shaviovik River (nine braids)	882.7	27,669	Bridges

General Impacts of Road Crossings on Streams

Culverts and bridges are typically narrower than natural streams at flood flow. This is especially true in the study area where stream channels are shallow and wide, and a majority of flood volume flows out of bank rather than in the channel. As an example, Stream 18a, which the Applicant proposes to cross with a 48-inch culvert, has an annual flooded width of about 100 feet; and Stream 22b, which the Applicant proposes to cross with a 65-foot bridge, has an annual flooded width of about 740 feet. When flow is concentrated through a culvert or bridge, flow depth upstream of the structure increases and velocity slows, creating a backwater. The backwater will increase inundation of the land surface. As flow exits the structure, it gradually expands in width downstream. Within the flow expansion zone are areas that would normally be inundated with sheetflow that are drier. Flow velocities also typically increase through structures. Undersized structures may increase velocities enough to cause erosion problems downstream. A detailed hydraulic analysis is necessary to fully describe the hydraulic impacts of each structure, which is beyond the level of detail of an EIS. A more generalized estimate of impacts is used to compare between alternatives in this analysis.

Upstream Impacts

The extent and volume of upstream inundation at crossings during sheetflow events was estimated by using the Applicant's proposed design criteria and conservative assumptions. The Applicant proposes to design culverts to a maximum headwater depth equal to the culvert diameter. Assuming that culverts would not exceed 48 inches in diameter, the maximum ponded water depth immediately upstream of the road crossing would be 4 feet. This water surface was used to estimate the inundated area and the volume of inundation. For reference, at the west end of the Alternative C gravel road alignment where the natural ground surface is flattest, the ponded area would extend 5,700 feet upstream of the road, while on the east end of the project area where the slopes are steeper, the ponded extent would be about 1,200 feet. Figure 2 shows Alternative C gravel access road potential inundation areas. Figures 3, 4, 5, and 6 show the inundation areas upstream of proposed infield roads for Alternatives B, C, D, and E.

Assuming the headwater would match the culvert height is likely a conservative assumption for the sheetflow culverts. A 4-foot diameter thin-edge projecting culvert under inlet control conditions can convey 66 cfs. Based on the USGS regression equations for Region 7, a contributing drainage area of approximately 435 acres is required to generate a 50-year design flow of 66 cfs. Many of the identified stream crossings have a contributing area less than 435 acres.

Larger river crossings with bridges are more complicated, and require more detailed design and hydraulic information to determine upstream impacts. For the purposes of this analysis, the same 4-foot backwater assumed for the culverts was applied to all crossings. Because bridges tend to constrict the channel less than culverts, this is likely to be a conservative estimate.

Table 3 shows total areas of increased and decreased inundation for each alternative.

Table 3: Area of Inundation

Alternative	Area of Increased Inundation (Ponding) Upstream of Gravel Roads (acres)	Area of Decreased Inundation (Drying) Downstream of Gravel Roads (acres)
B	1,140	433
C	17,481	3,000
D	1,004	640
E	208	0

Upstream Time of Inundation Estimate

An analysis was conducted to estimate a time of inundation upstream of the gravel road based on the approach agreed upon during the March 3, 2011 meeting with the agencies. The agreed upon approach consisted of the following tasks:

- Determine a quantity of flow upstream of the embankment using the upstream inundation area, depth of flow, typical culvert spacing, and typical ground slope upstream of the embankment.
- Calculate a flow rate based on culvert inlet control calculations.
- Determine a time to drain the volume of flow based on the calculated volume and flow rate.

GIS was used to determine the upstream limits of inundation at 1 foot intervals from 1 to 4 feet. Trapezoidal areas were determined for the 1-foot intervals. The 500-foot spacing between culverts was multiplied by the cross sectional area to obtain a volume in cubic feet. The Federal Highway Administration (FHWA) Hydraulic Design Circular 5 was used to determine inlet control rates for a 4-foot diameter thin-edge projecting culvert at half, three-quarters, and full intervals. The average rate was determined for each 1-foot drawdown interval. A time to drawdown was determined for each 1-foot volume by dividing the cubic foot volume by the cfs rate. The times for each 1-foot drawdown were then added together to obtain a time to draw down the volume of flow on the upstream side of the culvert.

The drawdown time analysis was conducted for the two representative cross sections. The cross section with the 5,700 foot upstream impact zone had a drawdown time of 106 hours or 4.4 days. The cross section with the 1,180-foot upstream impact zone had a drawdown time of 10 hours or 0.4 days. This drawdown time would begin after the sheetflow event occurred, so for a sheetflow event that lasted 4 days, the maximum time of inundation with the gravel road would increase from 4 days to 8.4 days according to these estimates. Calculations are shown in the attachment to this memo.

Downstream Indirect Impacts

The extent of downstream indirect impacts was calculated by assuming a typical hydraulic expansion angle of 2:1 and spacing between culverts of no more than 500 feet. This method is described in the attachment to this memo.

The following figure shows an idealized representation of flow contraction and expansion through an embankment opening with flow expansion on the right side of the figure (from Hydrologic Engineering Center, 1995, *Flow Transitions in Bridge Backwater Analysis* (RD-42), September).

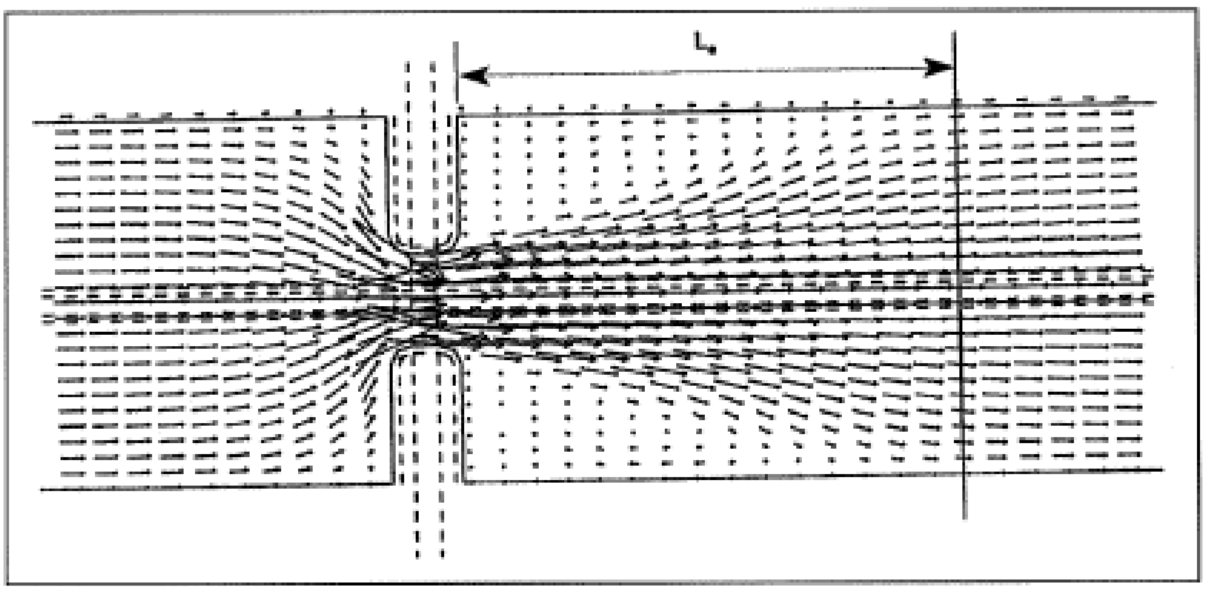


Figure 1: Typical Velocity Vector Plot for Idealized RMA-2 Model with Expansion Reach Limit Shown

The 2:1 ratio results in a downstream impact zone of 500 feet assuming a 500-foot culvert spacing. The area impacted was estimated in GIS by adding a 500-foot buffer to the downstream end of each proposed road that would be oriented perpendicular to the flow direction.

In this 500-foot zone, the area directly downstream of the culvert would be inundated with flow while the area downstream of the embankment would be in the shadow and is expected to be somewhat drier. It is not possible to determine an amount or percentage of how much wetter or drier the areas would be without a detailed modeling exercise. Only the 500-foot distance downstream of the embankment is defined, identifying the zone of indirect impacts.

Drainage Area Changes due to Airstrips

Proposed gravel airstrips would be oriented at an angle to drainage direction because of predominant winds. The airstrips would be too wide to efficiently cross-drain with culverts. The result is that for each alternative, the airstrip would capture a portion of a stream's drainage area and route it into another stream. Because discharge is dependent on drainage area, streams may experience increased or decreased flows after the airstrip is built. Table 4 shows the effects of airstrips on drainage basin area and mean annual (2-year) flood flows.

Table 4: Effects on Drainage from Airstrips

Alternative	Stream with Decreased Flow[a]	Stream with Increased Flow[a]	Approximate Change in Drainage Area (square miles)	Approximate Change in Q2[b] (cfs)
B	22 (101)	24B (198)	1.8	48
C	18A (57) and 18B (100)	21 (220)	0.8	22
D	18B (100)	21 (220)	0.5	15
E	22 (101)	24 (345)	2.1	55

[a] Current mean annual 2-year flow (cfs) in parentheses.
[b] Mean annual 2-year flood flow.

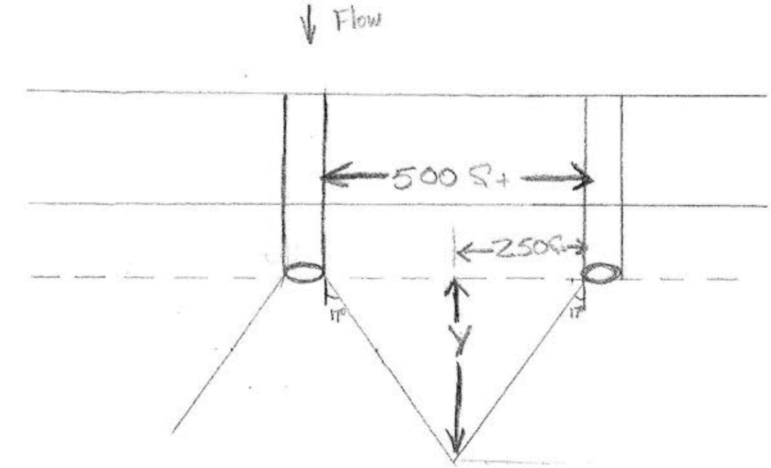
Conclusion

Tables 1, 2, and 3 all reflect the greater impact of the gravel access road on streams in Alternative C. The 43-mile road runs perpendicular to the natural streamflow direction, and crosses approximately 44 stream channels. Among the infield gravel roads, Alternative E crosses the fewest streams and thus has the least potential impact to changing inundation. Each alternative has a gravel airstrip which captures drainage from one stream and diverts it into another. The Alternative E airstrip diverts the largest drainage area, and thus the most flow, while the Alternative D airstrip diverts the smallest drainage area.

Attachment

HDR ONE COMPANY *Many Solutions*			
Project: Pt Thompson	Computed:	Date: 3-29-11	
Subject: downstream dist. calc.	Checked:	Date:	
Task:	Page:	of:	
Job #:	No:		

Downstream Indirect Impacts



Option 1

$$\tan 17° = \frac{500/2}{Y}$$

$$Y = \frac{250}{\tan 17°}$$

rounding

$$Y = 817.7 \text{ ft} \Rightarrow 820 \text{ ft}$$

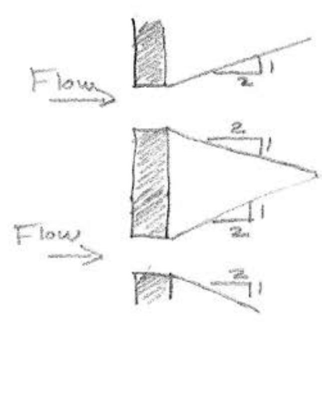
17° expansion angle is the angle of flow expansion downstream of a blockage in a river channel per HEC-23 design guideline

Option 2

HEC-RAS expansion guidance recommends a 1:2 H:V based on the USACE HEC RD-42 the impact distance is

250 ft horz
1:2 H:V

Y = 500 ft



Point Thomson

Evaluate Time Required for Passage of Upgradient Inundation

4/26/2011

GTK

Assumptions

1 culverts are assumed to be circular, 4-ft diameter
2 culverts will be designed so WSE does not exceed the top of culvert
3 this analysis is a conservative analysis for sheet flow culverts without conducting hydrology
4 culverts are assumed to be then edge projecting and inlet-controlled
5 culverts used are ssumed to be smooth steel pipe although in inlet control calculations this has no effect
6 the nomograph for C.M. pipe culverts with projecting entrance are applicable to inlet controlled smooth pipe culverts
7 profile areas were taken from GIS at two locations to represent a steep and flat ground gradient, a flat backwater from the road embankment was assumed with length measurements used to get volumes at 1, 2, 3, and 4 foot depths

See figure for cross sections and locations

cross section 1

culvert capacity %	culvert diameter ft	depth at culvert ft	HW / D ft/ft	Discharge cfs	Distance	depth	Ave Trapezoidal length	width ft	incremental volume ft^3	Average Discharge cfs	time sec	time min	time hr	time day
100%	4	4	1	66	5700	1	5620	500	2,810,000	54.5	51560	859	14	0.6
75%	4	3	0.75	43	5540	1	5445	500	2,722,500	32.5	83769	1396	23	1.0
50%	4	2	0.5	22	5350	1	4845	500	2,422,500	16.5	146818	2447	41	1.7
25%	4	1	0.25	11	4340	1	2170	500	1,085,000	11	98636	1644	27	1.1
					0					Total time:	380783	6346	106	4.4
											sec	min	hr	day

cross section 2

culvert capacity %	culvert diameter ft	depth at culvert ft	HW / D ft/ft	Discharge cfs	Distance ft	depth	Ave Trapezoidal length	width ft	incremental volume ft^3	Average Discharge cfs	time sec	time min	time hr	time day
100%	4	4	1	66	1180	1	1030	500	515,000	54.5	9450	157	3	0.1
75%	4	3	0.75	43	880	1	692.5	500	346,250	32.5	10654	178	3	0.1
50%	4	2	0.5	22	505	1	378.75	500	189,375	16.5	11477	191	3	0.1
25%	4	1	0.25	11	252.5	1	126.25	500	63,125	11	5739	96	2	0.1
					0					Total time:	37319	622	10	0.4
											sec	min	hr	day

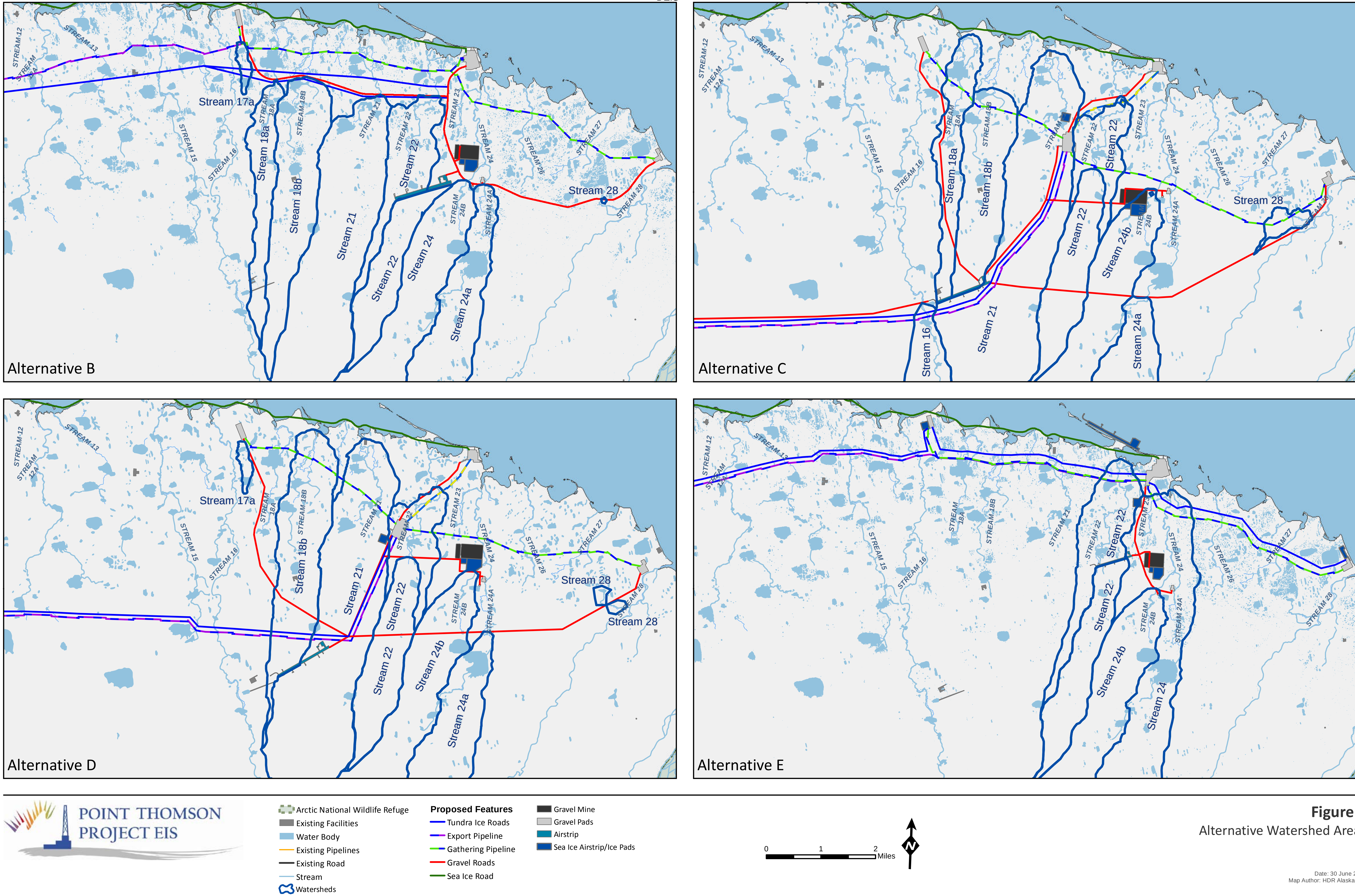


Figure 1
Alternative Watershed Areas

Date: 30 June 2011
Map Author: HDR Alaska Inc.

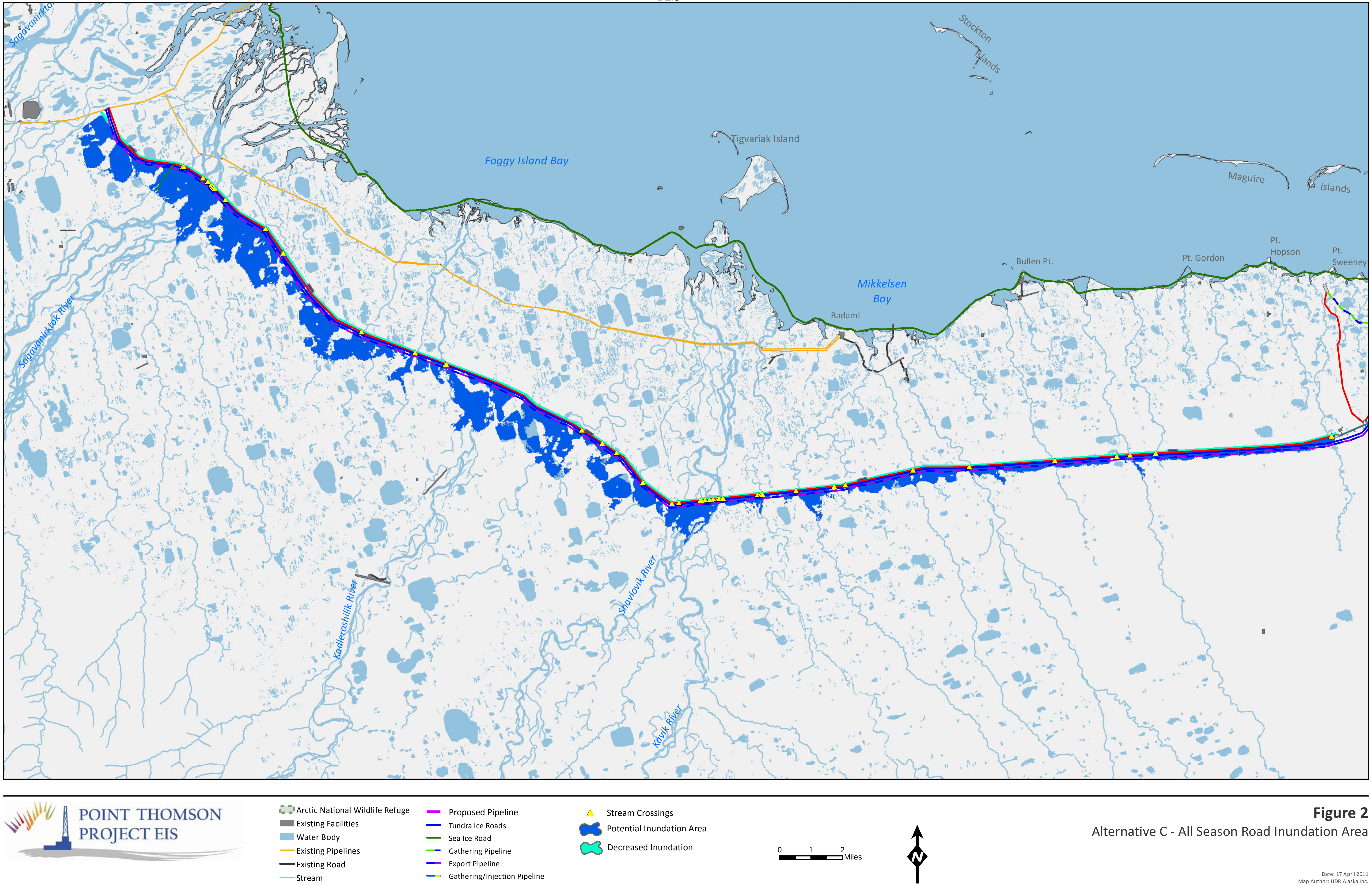
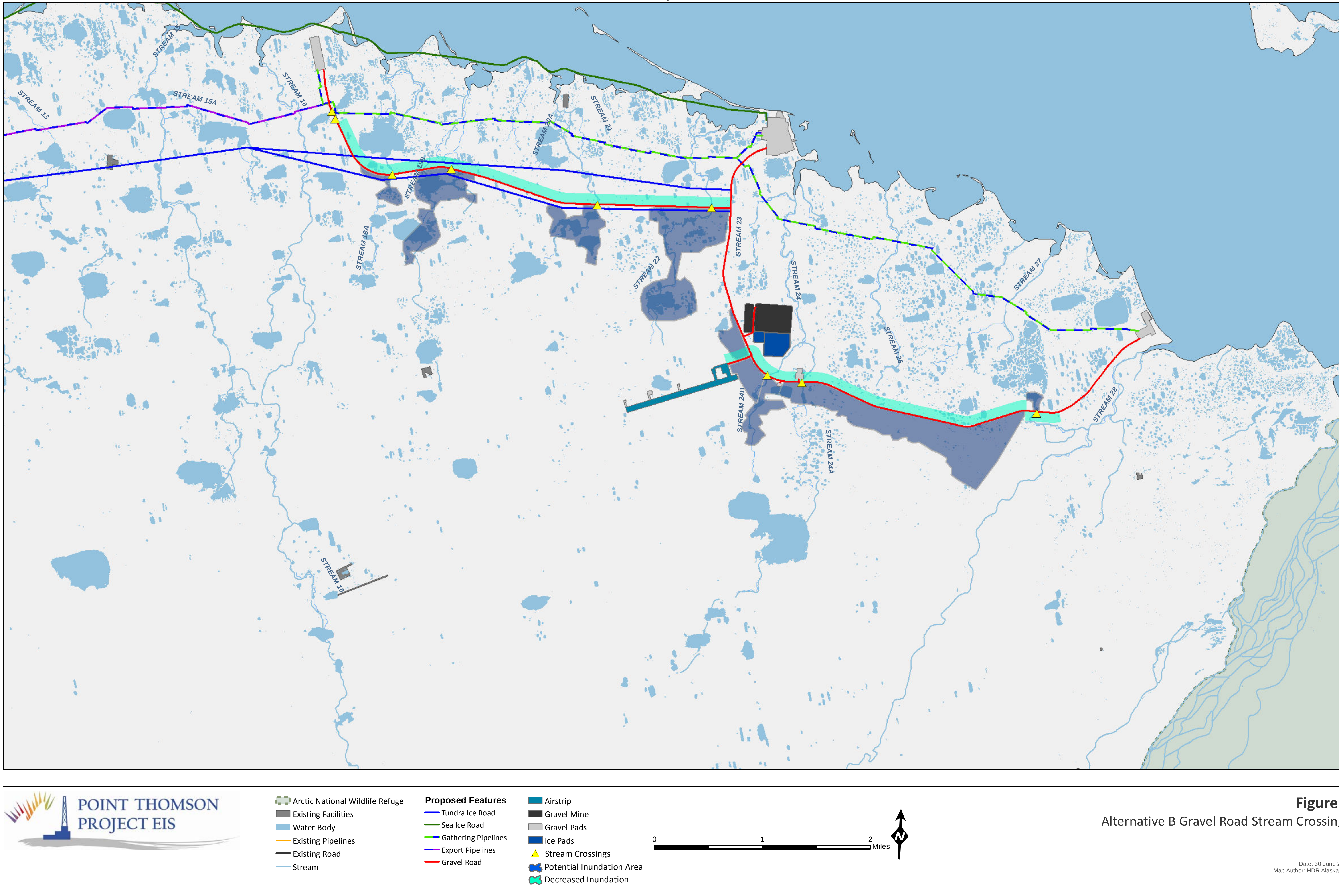


Figure 2
Alternative C - All Season Road Inundation Area

Date: 17 April 2011
Map Author: HDR Alaska Inc.



POINT THOMSON PROJECT EIS

Figure 3

Alternative B Gravel Road Stream Crossings

Date: 30 June 2011
Map Author: HDR Alaska Inc.

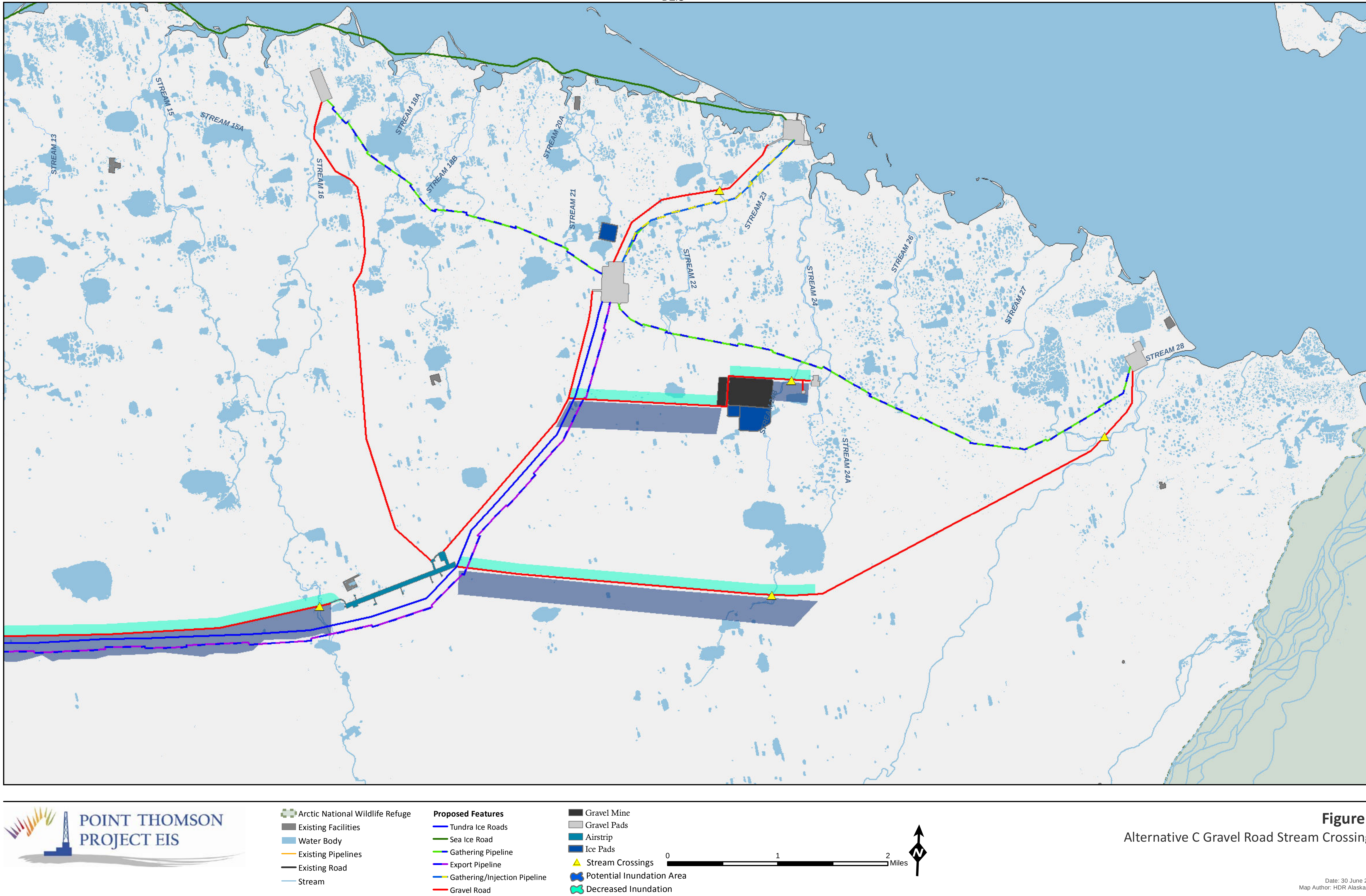


Figure 4
Alternative C Gravel Road Stream Crossings

Date: 30 June 2011
Map Author: HDR Alaska Inc.

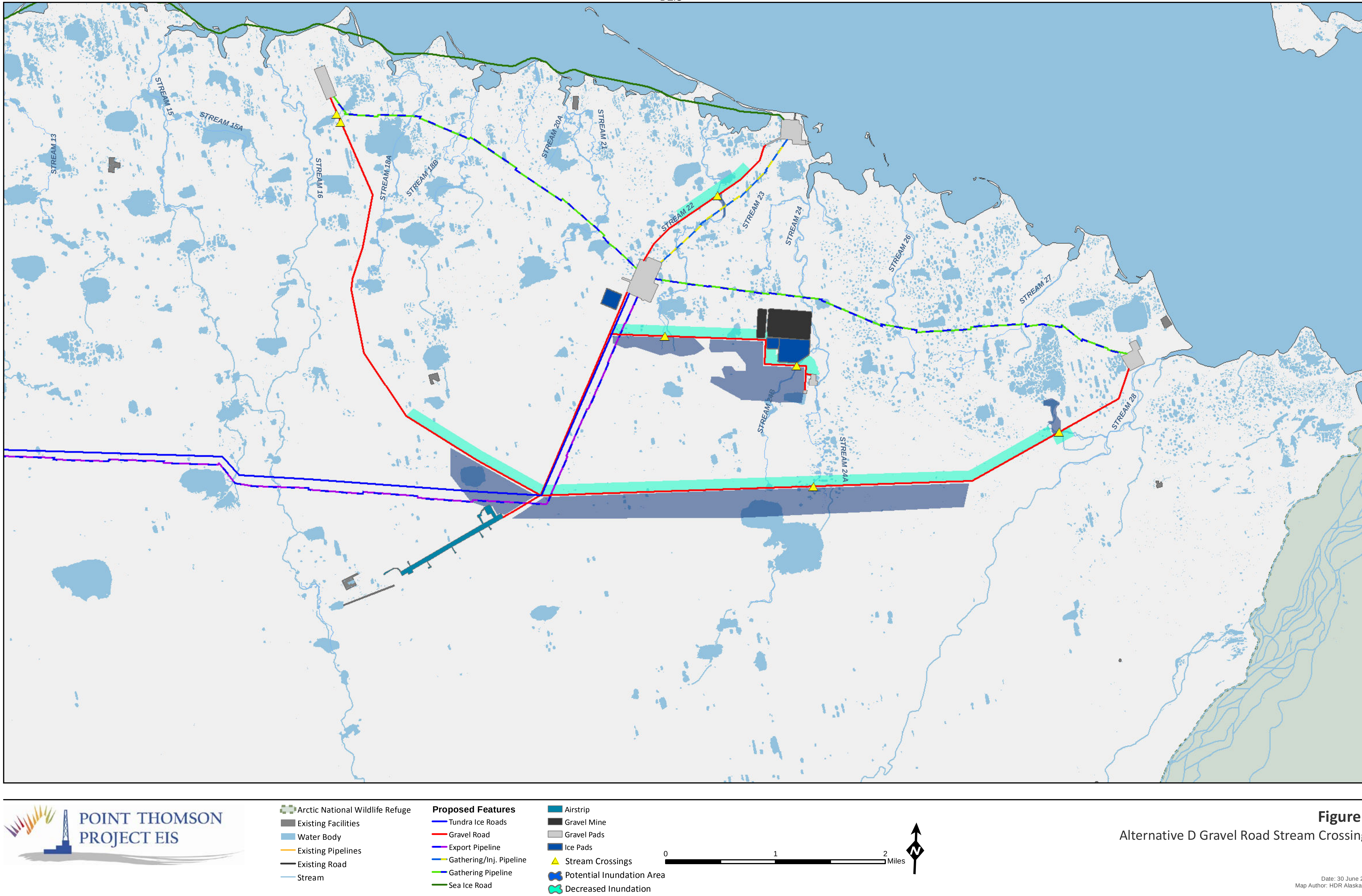


Figure 5
Alternative D Gravel Road Stream Crossings

Date: 30 June 2011
Map Author: HDR Alaska Inc.

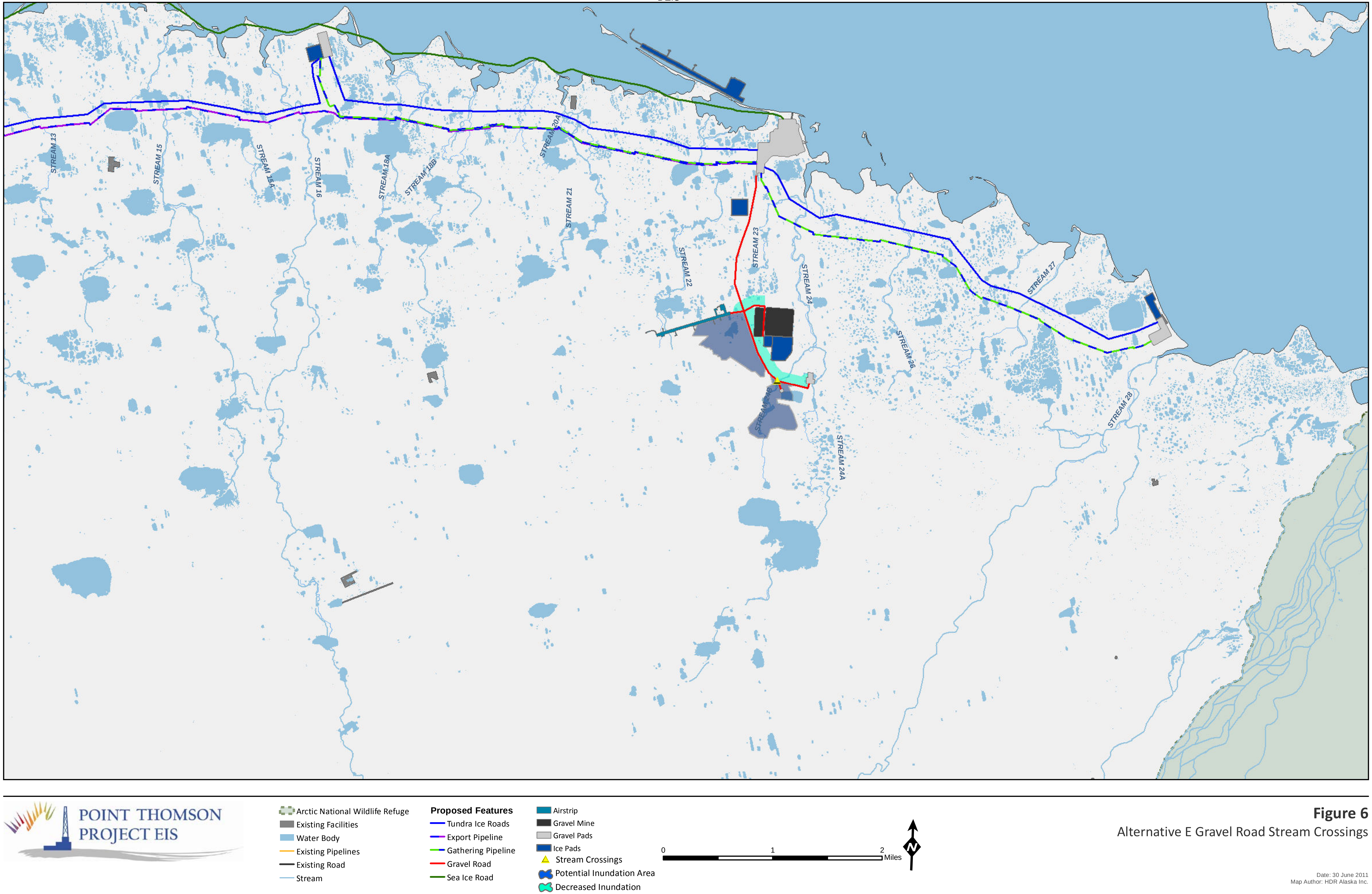


Figure 6
Alternative E Gravel Road Stream Crossings

Date: 30 June 2011
Map Author: HDR Alaska Inc.

Appendix T

Essential Fish Habitat Consultation

POINT THOMSON PROJECT EIS

Essential Fish Habitat Assessment

USACE
Post Office Box 6898
Elmendorf AFB, AK 99506

November 2011

Contents

Figures

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1 Essential Fish Habitat Background

The Sustainable Fisheries Act of 1996 (Public Law 104-297), which amended the Magnuson-Stevens Fishery Conservation and Management Act (MSFCA), requires Federal agencies to consult with the National Marine Fisheries Service (NMFS) on activities that may adversely affect Essential Fish Habitat (EFH). The MSFCA defines EFH as "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." In addition, it states "for the purpose of interpreting the definition of essential fish habitat: 'waters' includes aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; 'substrate' includes sediment, hard bottom, structures underlying the waters, and associated biological communities; 'necessary' means the habitat required to support a sustainable fishery and a healthy ecosystem; and 'spawning, breeding, feeding, or growth to maturity' covers a species' full life cycle" (Public Law 94-265).

According to Section 600.810 of Subpart J of the MSFCA, adverse effect is "any impact which reduces quality and/or quantity of EFH." This section also states that "adverse effects may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, or reduction in species' fecundity), site-specific or habitat-wide impacts, including individual, cumulative or synergistic consequences."

The objective of the Point Thomson Project EFH assessment is to determine whether or not the proposed action alternatives "may adversely affect" designated EFH for relevant federally-managed fisheries species within the proposed action area. It also describes the conservation measures proposed to avoid, minimize, or otherwise offset potential adverse effects to designated EFH resulting from the proposed action.

2 Proposed Action and Alternatives

2.1 PROJECT AREA

The Point Thomson Project, located on the North Slope of Alaska 60 miles east of Prudhoe Bay on the coast adjacent to Lion Bay, proposes to develop hydrocarbon resources within the Thomson Sand reservoir. The project area is defined to extend eastward from Deadhorse to the Canning/Staines River, and from the lagoon side of Flaxman Island and the Maguire Islands along the Beaufort Sea coast to approximately 8 miles south of the coast line. Most of the Thomson Sand Reservoir is offshore, under state coastal waters, while most of the proposed facilities would be located on land. The western boundary of the Arctic National Wildlife Refuge is approximately 2 miles from the easternmost extent of the proposed project. An export pipeline and transportation routes would extend from the Point Thomson facilities to existing facilities to the west. Figure 1 shows the general location of the Point Thomson Project.

2.2 PROJECT DESCRIPTION

The U.S. Army Corps of Engineers (Corps), the lead federal agency responsible for complying with the National Environmental Policy Act (NEPA), defines the Point Thomson Project's overall project purpose as: 1) produce hydrocarbon liquids from the Thomson Sand Reservoir, 2) delineate the Thomson Sand Reservoir, and 3) test the oil rim and natural gas deposits of the Thomson Sand Reservoir and potential hydrocarbon deposits of the Brookian Group sandstones. Development would result in building facilities associated with the exploration and recovery of hydrocarbon liquids.

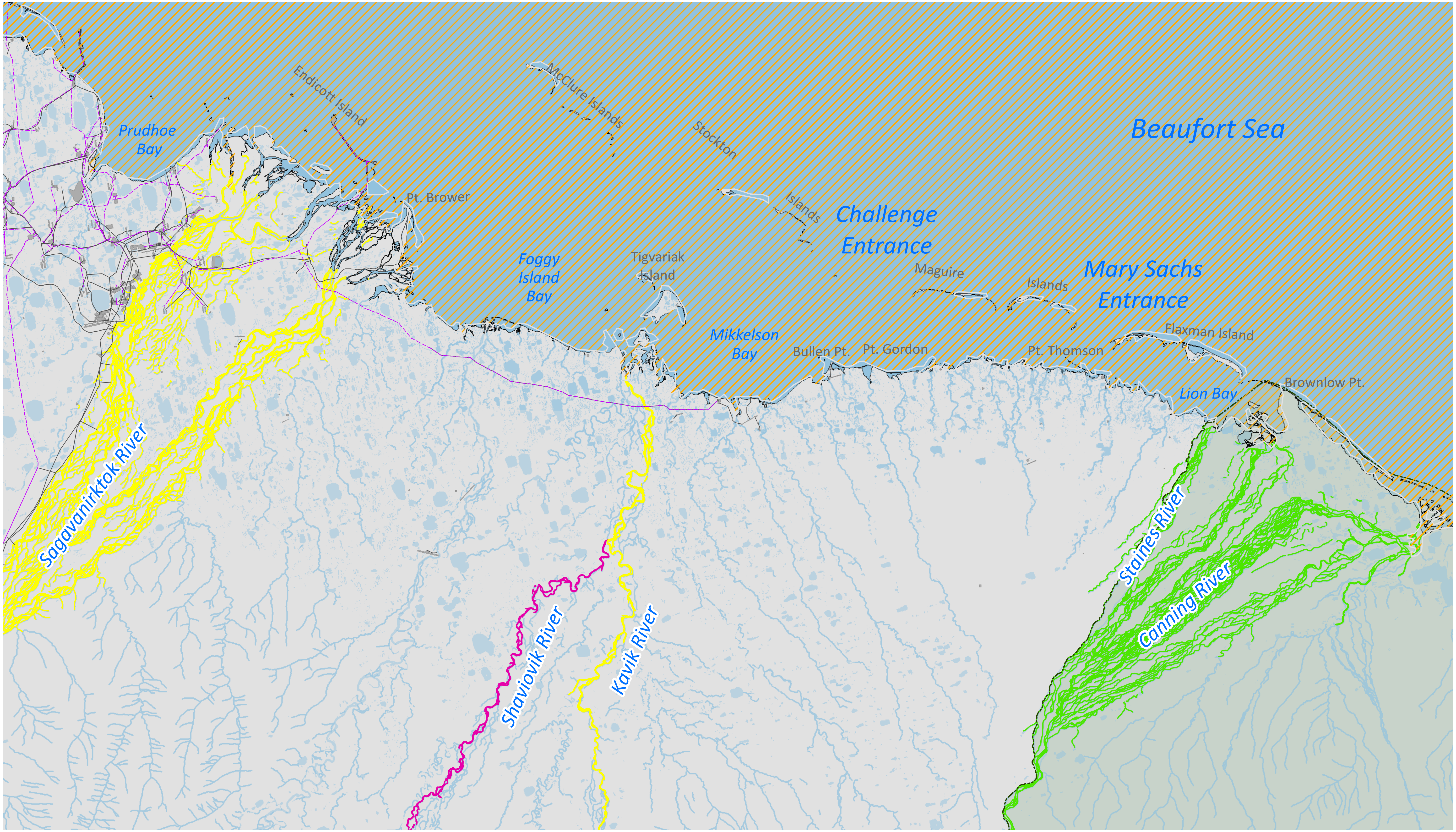
All action alternatives being evaluated in the Environmental Impact Statement being prepared for the project would include the following components: gravel pads to support drilling and production operations; export and infield pipelines; gravel and/or ice roads and airstrips to support transportation needs; and waste disposal and support facilities. While each alternative has a unique configuration of pads for drilling and production, they all incorporate a combination of a Central Well Pad, a Central Processing Facility (CPF), an East Well Pad, and a West Well Pad. The Central Pad is the largest in all the alternatives and would be the primary location for construction, drilling, and operations activities. Each alternative would have five wells capable of either production or injection. Additionally, one disposal well would be drilled at the CPF. Production and injection wells would be drilled using directional drilling techniques to reach the offshore reservoir. The East and West Pads would have wells that would be used initially to delineate and evaluate the reservoir, and to determine whether the rim of oil surrounding the gas reservoir would be viable for production. In addition to infield pipelines, a 22-mile-long export pipeline would be constructed to transport hydrocarbon liquids from Point Thomson to an existing common carrier pipeline at the Badami Development to the west. Pipelines would be elevated on vertical support members (VSMs) with a minimum 7 foot clearance between the bottom of the pipe and the tundra surface. Pipeline stream crossings would be accommodated by adjusting the spacing of VSMs. Gravel roads would cross creeks and small tundra streams with culverts or bridges, but only bridges would be used to cross the larger drainages. In order to build gravel roads, ice roads would be built along the proposed alignment and gravel would be laid in the winter. The project would also include infrastructure such as communications towers and staging facilities at Badami, Prudhoe Bay, and/or Deadhorse. Placement of gravel structures (for pipelines, pads, roads, and airstrip) would involve permanent placement of fill in wetlands while construction of project ice structures (pads, roads and airstrip) would involve seasonal marine and freshwater water extractions for the life of the project. Freshwater also would be extracted annually for drilling activities, dust suppression, potable water, and other camp needs. Below are details of the project for each proposed alternative.

2.2.1 Alternative A: No Action

Under the No Action Alternative, the Corps would not issue a permit for placement of fill in wetlands and other waters of the U.S. and the Applicant would suspend project engineering and planning activities for the evaluation of the Thomson Sand and other hydrocarbon resources at Point Thomson. The two existing wells have been capped, and only ongoing monitoring activities would take place.

2.2.2 Alternative B: Applicant's Proposed Action

Alternative B would utilize seasonal and infield ice roads, marine transport by coastal and oceangoing (sealift) barges, air transport by helicopters and fixed-wing aircraft, and gravel roads. This alternative includes construction of a sealift facility and a service pier on the coast at the Central Pad to allow docking by sealift and coastal barges. A small amount of dredging and screeding would be needed to level the seafloor for barge landing. Infield gravel roads would be constructed to connect the Central, East, and West Pads, airstrip, gravel mine and stockpile, and freshwater supply sources. During construction, there would be seasonal ice access roads between the Endicott Spur Road and Point Thomson to provide winter access and to support export pipeline construction. Infield ice roads would be constructed to support gathering pipeline construction. A gravel airstrip would be constructed south of the Central Pad, approximately 3 miles inland from the coast. During operations, ice access roads would be constructed approximately once every 5 years.



POINT THOMSON PROJECT EIS

Legend

- Marine Essential Fish Habitat (Arctic Cod/Salmon)
- Freshwater Essential Fish Habitat
- Pink Salmon Spawning
- Chum Salmon Presence/Pink Salmon Presence
- Chum Salmon Presence/Pink Salmon Spawning
- Upland
- Arctic National Wildlife Refuge
- Existing Facilities and Roads
- Existing Road
- Existing Pipelines

N

0 2.5 5 Miles

Figure 1

Point Thomson Project Area
Essential Fish Habitat

Date: 21 October 2011
Map Author: HDR Alaska Inc.
Source: NMFS 2005, ADF&G Johnson and Blanche 2011

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2.2.3 Alternative C: Inland Pads with Gravel Access Road

Alternative C would minimize impacts to coastal resources to the extent possible by locating project components inland from the coastline and reducing coastal access to the Point Thomson site. The alternative is composed of four gravel pads (a Central Processing Pad 2 miles inland, East and West Pads both one-half mile inland, and a Central Well Pad) and a gravel access road between Point Thomson and the Endicott Spur Road in lieu of constructing a coastal barge facility at Point Thomson. The gravel access road would allow year-round access to Point Thomson and would remove direct marine transport, therefore, no barge facilities would be built. A 51-mile export pipeline would be constructed from the Central Pad to connect to the existing Endicott common carrier pipeline. The proposed pipeline route from Point Thomson to Endicott would be 500 feet south of and parallel to the gravel access road. Under this alternative, the pipeline would cross larger, braided rivers which contain EFH.

2.2.4 Alternative D: Inland Pads with Seasonal Ice Access Road

Alternative D would minimize impacts to coastal resources to the extent possible by locating project components inland from the coastline and reducing coastal access to the Point Thomson site. Similar to Alternative C, no barging facilities would be built. The alternative is composed of the same four gravel pads as described in Alternative C. Alternative D would require construction of a sea or tundra ice road between the Endicott Spur Road and the Point Thomson site annually for the life of the project.

2.2.5 Alternative E: Coastal Pads with Seasonal Ice Roads

Alternative E would reduce impacts to wetlands and surrounding water resources by minimizing the development footprint. To achieve this, this alternative would reduce the amount of gravel fill needed for some of the project components. During drilling, the gravel well pad footprints would be expanded by multiyear ice pads to support all the necessary equipment. Over the long term during operations, the ice pad footprint would be removed and only the gravel fill would remain. The gravel footprint would also be reduced by the use of seasonal ice roads for much of the infield road system. Alternative E would include barging facilities as described for Alternative B.

3 Essential Fish Habitat

3.1 EFH DESCRIPTIONS

In 2009, the Arctic Fisheries Management Plan (AFMP) was developed by the North Pacific Fisheries Management Council (NPFMC) for fish in the Chukchi and Beaufort seas (NPFMC 2009, 74 CFR 56734). Increasing water temperatures, changes in fish stock distributions, and changes in ice cover could favor development of commercial fisheries in AFMP waters. The current policy prohibits commercial fishing in the Chukchi and Beaufort seas until there is sufficient information available to enable sustainable management of commercial fisheries in the Arctic (NPFMC 2009, 74 FR 56734). EFH is designated in the Arctic Ocean for snow crab (*Chionoecetes opilio*), saffron cod (*Eleginus gracilis*), arctic cod (*Arctogadus glacialis*) and Pacific salmon. Of these, arctic cod is the only species in the Arctic Management Area for which designated EFH extends into the study area. In addition, nearshore and marine EFH has been designated for all five species of Pacific salmon: pink (*Oncorhynchus gorbuscha*), chum (*Oncorhynchus keta*), Chinook (*Oncorhynchus tshawytscha*), sockeye (*Oncorhynchus nerka*), and Coho (*Oncorhynchus kisutch*) salmon. Freshwater EFH is designated for pink and chum salmon in the

Canning/Staines, Kavik/Shaviovik, and Sagavanirktok Rivers; however, salmon are infrequently encountered on the Arctic Coastal Plain.

EFH is designated based on best available scientific information (NMFS 2005). The MSFCA defines categories to describe the level of understanding used to designate EFH; Level 1: Presence/absence distribution data are available for some or all portions of the geographic range of the species; Level 2: Habitat-related densities of the species are available; Level 3: Growth, reproduction, or survival rates within habitats are available; and Level 4: Production rates by habitat are available (NMFS 2005). In addition, Level 0 was established to describe EFH for those life history stages where EFH could be inferred from another life history stage or a species with similar habitat characteristics. Arctic cod EFH is designated based on Level 1 information for adults and late juveniles. There is insufficient data available to designate EFH for eggs, larvae, and early juveniles (NPFMC 2009). Pacific salmon EFH in Alaska is designated based primarily on Level 1 information for all species and life stages (NMFS 2005). **Table 1** displays the level used to determine EFH status for Pacific salmon species in the Arctic.

Table 1. EFH Information Levels for Alaska Stocks of Pacific Salmon

Species	Eggs and larvae	Juveniles fresh water (fry – smolt)	Juveniles estuarine	Juveniles marine	Adults, immature/ maturing marine	Adults freshwater
Chinook	1	1	1	1	1	1
Coho	1	1	1	0a	1	1
Pink	1	0a	0a	0a	0a	1
Sockeye	1	1	0a	0a	0a	1
Chum	1	0a	0a	0a	0a	1-2

0a - Some information on a species' life stage upon which to infer general distribution.
Data from NMFS 2005.

3.2 EFH SPECIES

3.2.1 Arctic Cod

Arctic cod is a demersal marine fish species with a circumpolar distribution (Fechhelm et al. 2009). Distribution is associated with lowered salinity, higher water temperatures (Moulton and Tarbox 1987), and/or the presence of ice (Morrow 1980). Arctic cod move inshore to spawn during winter. Migrations occur from nearshore to offshore, which are partially associated with spawning and the movement of ice (Morrow 1980). Arctic cod may feed along the transition layer between marine and brackish water masses (Moulton and Tarbox 1987). Because arctic cod associate with specific oceanographic conditions, their abundance in nearshore waters is variable (Moulton and Tarbox 1987). In 2010, 77 percent of the arctic cod captured in Lion Bay were captured in a 3 day period in late August (Williams and Burrill 2011). During this time, winds from the north to northwest resulted in the onshore water movement and likely resulted in the increase of arctic cod (Williams and Burrill 2011). Young-of-the-year arctic cod were captured in the Beaufort Sea and Kaktovik Lagoon (approximately 68 miles east of Point Thomson) in November 1975 (Griffiths et al. 1977). Marine EFH for arctic cod in the Point Thomson Project area is shown in Figure 1.

3.2.2 Pink Salmon

Pink salmon are the most abundant salmon species in the North Pacific Ocean, accounting for roughly half of all commercially harvested salmon (Heard 1991). They are distinguished from other salmon species by having a fixed two-year life span, being the smallest of the Pacific salmon as adults (averaging 20 inches in length [Morrow 1980] and 2.2 - 5.5 pounds in weight), young animals migrating to sea quickly after emerging, and maturing males develop a marked hump (Heard 1991). While pink salmon are rare along the Beaufort Sea coast, small runs do occur in some of the larger streams of the North Slope. Pink salmon are known to inhabit the Canning/Staines Rivers and are known to spawn in the Shaviovik, Kavik, and Sagavanirktok Rivers (Johnson and Blanche 2011). Pink salmon generally do not migrate far upstream to spawn and may spawn in the intertidal areas (Morrow 1980). Site selection for spawning is influenced by substrate, water depth, and current velocity with pink salmon preferring coarse gravel, shallow water, and moderate to fast current velocity (Heard 1991). In general, newly emerged fry show a preference for saline water over fresh water which may facilitate migration from the natal stream area. A single adult pink salmon was captured in Lion Bay, near Point Thomson in 2010 (Williams and Burrill 2011). Freshwater EFH for pink salmon in the Point Thomson Project area is shown in Figure 1.

3.2.3 Chum Salmon

Chum salmon are widely distributed throughout the Pacific Ocean. They spawn in streams of various sizes and fry migrate seaward soon after emergence. The maturing adults return to spawn at various ages, usually between two to five years, with adults averaging 25 inches in length (up to 42.8 inches) and 12 pounds in weight (up to 45.8 pounds) (Morrow 1980, Salo 1991). Chum salmon tend to select spawning sites in areas with upwelling spring water and a relatively constant water temperature. Unlike pink salmon that prefer to spawn in areas of high current velocity, chum salmon will spawn without much regard to surface water velocity (Salo 1991). Chum salmon are known to be present in the Canning/Staines and Sagavanirktok Rivers, yet there are no records of spawning (Johnson and Blanche 2011). In addition, no juvenile chum salmon have ever been caught in the nearby Prudhoe Bay area (Fechhelm et al. 2009). Three adult chum salmon were captured in Lion Bay during 2001 (Wilson 2001). Freshwater EFH for chum salmon in the Point Thomson Project area is shown in Figure 1.

3.2.4 Sockeye, Chinook and Coho Salmon

Chinook, sockeye, and Coho salmon are particularly rare, and no known spawning stocks have been found on the North Slope (Craig and Haldorson 1981, Fechhelm and Griffiths 2001). Some evidence indicates that Chinook salmon occurrence on the North Slope may be increasing (BLM 2008), and scientists have postulated that climate change could allow invasion of southern stocks from the Bering Sea northward, where spawning populations might be established (Babaluk et al. 2000).

4 Analysis of Effect to EFH

Impacts to EFH from the Point Thomas Project would be temporary in nature and minor in magnitude. Below are detailed analyses of impacts to EFH for each proposed alternative.

4.1 MPACTS TO EFH FOR ALTERNATIVE A

Because development of the field would not take place, no impacts to fish or EFH would occur under Alternative A.

4.2 IMPACTS TO EFH FOR ALTERNATIVE B

Project activities under Alternative B that could affect Pacific salmon and arctic cod EFH include construction of and water withdrawal for ice roads, dredging and screeding to accommodate barges, and vessel traffic. Marine and freshwater withdrawal and ice road construction would not likely affect EFH because arctic cod and salmon would not be present during winter, and ice roads would be slotted at fish streams before breakup to allow fish passage. Dredging and screeding would affect a small amount of habitat (approximately 3 acres). Sediment deposition would reestablish the habitat adjacent to the bulkhead over time after sealift barging ceased; however, screeding for coastal barges would occur annually. Vessel traffic could affect EFH because repeated disturbances from noise and prop wash could mask biologically important sounds; however, this would occur for discrete periods of time and would be concentrated during barge docking activities at Point Thomson.

4.3 IMPACTS TO EFH FOR ALTERNATIVE C

Project activities under Alternative C that could affect EFH include construction of and water withdrawal for tundra and sea ice roads and construction of bridges and culverts over freshwater EFH (Sagavanirktok, Kavik, and Kadleroshilik Rivers) (Johnson and Blanche 2011) for the gravel access road. However, marine and freshwater withdrawal and ice road construction would not likely affect EFH because arctic cod and salmon would not be present during winter, and ice roads would be slotted at fish streams before breakup to allow fish passage. Potential for marine EFH impacts would be reduced under Alternative C because barge infrastructure would not be constructed and no barging would occur and because the East and West Pads and the Central Processing Pad and processing facilities would be located farther from the coast. Impacts to freshwater EFH (primarily for pink salmon) may be higher under Alternative C than Alternative B because of the construction of the longer export pipeline and gravel access road.

4.4 IMPACTS TO EFH FOR ALTERNATIVE D

Project activities under Alternative D that could affect EFH include construction of and water withdrawal for tundra and sea ice roads. However, marine and freshwater withdrawal and ice road construction would not likely affect EFH because arctic cod and salmon would not be present during winter, and ice roads would be slotted at fish streams before breakup to allow fish passage. Potential for marine and freshwater EFH impacts is reduced under Alternative D because barge infrastructure would not be constructed and no barging would occur (compared to Alternative B and similar to Alternative C), the East and West Pads and the Central Processing Pad and facilities would be located farther from the coast (compared to Alternative B and similar to Alternative C) and the gravel access road would not be constructed (compared to Alternative C and similar to Alternative B).

4.5 IMPACTS TO EFH FOR ALTERNATIVE E

Project activities under Alternative E that could affect EFH include construction of and water withdrawal for ice roads, dredging and screeding to accommodate sealift barges, and vessel traffic. Marine and freshwater withdrawal and ice road construction would not likely affect EFH because arctic cod and salmon would not be present during winter and ice roads would be slotted at fish streams before breakup to allow fish passage. Dredging and screeding would affect a small amount of habitat (approximately 3 acres) and sediment deposition would reestablish the habitat over time after sealift barging ceased. Vessel traffic could affect EFH because repeated disturbances from noise and prop wash could mask biologically important sounds; however, this would occur for discrete periods of time and would be concentrated during barge docking activities at Point Thomson.

5 Proposed Mitigation Measures

The Applicant has included the following Design Measures as part of the project design to avoid or minimize impacts on fish and EFH. Additional avoidance, minimization, and mitigation measures will be evaluated by the Corps during the NEPA and permitting process.

- Minimizing impact to natural stream flow conditions through application of hydrology study results to pad, road, bridge, and culvert design using conservative criteria.
- Constructing ice roads in a manner that protects fish habitat and slotting ice roads at designated stream crossings at the end of the season.
- Limiting lake withdrawal volumes and using proper withdrawal methods to protect fish.
- Implementing a tracking system including coordination with other water users to ensure water withdrawal limitations are met.
- Maintaining natural stream flow through the design of bridges and culverts to accommodate fish passage.
- Implementing spill prevention and response programs.
- Managing snow melt and runoff under site-specific Stormwater Pollution Prevention Plans to protect water quality.
- Using long-reach directional drilling to develop offshore resources without placing drilling structures in marine waters.
- Limiting dredging/screeding for the barge-bridge system and service pier to a small area in the vicinity of the Central Pad (Alternatives B and E only).
- Dredging the barge landing area through the ice during the winter preceding an open water sealift to minimize sedimentation effects on water quality (Alternatives B and E only).
- Limiting structures in marine waters to six vertical piles for the service pier and eight mooring dolphins for barge landings (Alternatives B and E only), and a small boat launch at the shoreline (all action alternatives).
- Locating the sealift bulkhead and approach gravel ramp for the service pier above MHW to minimize the effect on sediment transport or deposition (Alternatives B and E only).
- Maintaining the barge-bridge system in place for the minimum time period needed to offload the modules (estimated 2 to 4 weeks) each sealift open water season, which limits the effects on coastal sediment transport (Alternatives B and E only).
- Conducting field surveys during breakup and other times to identify natural drainage patterns and to measure streamflows at proposed road crossings.
- Routing infield roads a sufficient distance inland to avoid coastal marshes and estuarine habitat, as well as major stream crossings.

- Routing the export pipeline and gathering lines to avoid locating VSMs in lakes, and crossing streams at locations that minimize the need for VSMs in active channels.
- Designing bridges and culverts at stream crossings for a 50-year flood design flow to reduce impacts to natural drainage to the extent practicable.
- Reducing surface discharge of wastewaters through use of a disposal well, including zero discharge of produced water and drilling wastes.
- Implementing dust control measures for roads and construction areas to avoid impacts of dust on nearby water bodies.
- Constructing a permanent service pier on piles, not fill, for offloading coastal barges to reduce the number of barge trips and minimize disturbance to the ocean bottom and associated impacts to marine water quality (Alternatives B and E only).
- Installing mooring dolphins and pilings through the ice in the winter to minimize potential suspended sediment effects on water quality (Alternatives B and E only).

6 Conclusion

The habitats most likely affected by the project would be freshwater streams and lakes. Bridges and culverts at fish-bearing streams could have long-term impacts on EFH due to construction of culvert pipes or bridge abutments; Alternative C has the most potential for impacting EFH (primarily pink salmon) due to crossing structures because the all-season gravel road would cross large braided streams. Additionally, water withdrawal from water bodies has the potential affect EFH; all action alternatives would involve some degree of water withdrawal for ice roads. However, adverse impacts to EFH are unlikely because arctic cod and salmon would not be present during winter months, ice roads would be slotted at fish streams before breakup and the proposed mitigation measures would reduce impacts associated with water withdrawals.

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Appendix U

Oil Discharge Prevention and Contingency Plan

ExxonMobil

OIL DISCHARGE PREVENTION AND CONTINGENCY PLAN

POINT THOMSON DRILLING PROGRAM
NORTH SLOPE, ALASKA

October 2008

STATE OF ALASKA

SARAH PALIN, GOVERNOR

DEPT. OF ENVIRONMENTAL CONSERVATION
DIVISION OF SPILL PREVENTION AND RESPONSE
INDUSTRY PREPAREDNESS PROGRAM
Exploration Production & Refineries

555 Cordova Street
Anchorage, AK 99501
PHONE: (907) 269-3094
FAX: (907) 269-7687
http://www.dec.state.ak.us

March 17, 2009

File No.: 305.30
(ExxonMobil)

OIL DISCHARGE PREVENTION AND CONTINGENCY PLAN APPROVAL

Mr. Craig Haymes
ExxonMobil
3301 "C" Street, Ste. 400
Anchorage, AK 99503

Subject: **Plan Approval for the ExxonMobil Point Thomson Drilling Program, Oil Discharge Prevention and Contingency Plan, North Slope, Alaska. Plan Number 08-CP-5097.**

Dear Mr. Haymes:

The Alaska Department of Environmental Conservation (ADEC) has completed our review of your application for the above referenced Oil Discharge Prevention and Contingency Plan (plan). ADEC coordinated the State of Alaska's public review for compliance with 18 AAC 75, using the review procedures outlined in 18 AAC 75.455. Based on our review, ADEC has determined that your plan is consistent with the applicable requirements of the referenced statute/regulation and is hereby approved.

This approval applies to the following plan:

Plan Title:	**Point Thomson Drilling Program Oil Discharge Prevention and Contingency Plan**
Supporting Documents:	**Alaska Clean Seas Technical Manual, dated 2008, consisting of two volumes, as revised and updated**
Plan Holder:	**ExxonMobil 3301 "C" Street, Ste. 400 Anchorage, AK 99503**

Covered Facilities: **ExxonMobil facilities will be located near the Beaufort Sea, approximately 60 miles east of Prudhoe Bay at ExxonMobil's Unit 3 Pad. The plan is for a multi-well drilling program from an existing gravel pad used for the Point Thomson Unit (up to 6 wells at PTU 3) well, the existing gravel pad for the N. Stains No.1 well (1 well at East Pad) and an ice pad located west of PTU 3 (2 wells at west pad).**

PLAN APPROVAL: Approval of the referenced plan is hereby **effective March 17, 2009.**

A certificate of approval stating that the contingency plan has been approved by ADEC is enclosed. **This approval is subject to the following terms and conditions:**

TERMS AND CONDITIONS

The following items must be completed and/or received as specified to complete the plan in accordance with AS 46.04.030(e).

1. **Proof of Oil Spill Primary Response Action Contractor**. The plan holder must submit to ADEC fully executed Statement of Contractual Terms with the attestations required by 18 AAC 75.445(i)(1) with Alaska Clean Sea's to provide response resources as identified in the plan.

   The plan holder has submitted a completed Statement of Contractual Terms to ADEC prior to undertaking drilling operations on the project. The actual contracts are not required to be part of the contingency plan document. The Statement of Contractual Terms form can be found on ADEC's website (www.dec.state.ak.us).

   This condition is reasonable and necessary to assure ADEC that all the necessary contracts to implement a response to a discharge or well control event are in place prior to the start of drilling operations. 18 AAC 75.425(e)(3)(H) and 18 AAC 75.445(i)

2. **Notice of Changed Relationship with Response Action Contractor.** Because the plan relies on the use of a response contractor for its implementation, ExxonMobil must immediately notify us in writing of any change in the contractual relationship with the plan holder's response action contractor, and of any event including but not limited to any breach by either party to the response contract that may excuse a response contractor from performing, that indicates a response contractor may fail or refuse to perform, or that may otherwise affect the response, prevention, or preparedness capabilities described in the approved plan.

   This condition is reasonable and necessary because there are certain risks associated with allowing a plan holder to rely in part or total upon a response contractor instead of obtaining its own response capability. The risks arise, in part, because the certainty of the contractor's response is dependent upon the continuation of the legal relationship between *the contractor and the plan holder. Given this risk, ADEC must be promptly informed of any change of the contractual relationship between the plan holder and the response contractor, and of any other event that may arguably excuse the response contractor from performing or that would otherwise affect the response, prevention, or preparedness capabilities described in the approved plan. ADEC may seek appropriate modifications to the plan or take other steps to ensure that the plan holder has continuous access to sufficient resources to protect the environment and to contain, cleanup, and mitigate potential oil spills. 18 AAC 75.425(e)(3)(H) and 18 AAC 75.445(i)*

3. **Well Control Event:** ExxonMobil has indicated the desire to use voluntary ignition in the event of a gas condensate blowout if well control cannot be regained by surface control measures as allowed in 18 AAC 75.434(g). ExxonMobil has provided air dispersion modeling information to the ADEC Air Quality section for review to ensure State and Federal air quality standards would not be exceeded in the event they did ignite the blowout. The ADEC Air Quality group has not yet completed their review and therefore as a condition of approval ExxonMobil cannot drill below 5000 feet true vertical depth until this review has been completed. ADEC approval for voluntary ignition language written in Section 1.1.3 must be removed from the ODPCP until the Air Quality review is finalized and approved. ExxonMobil must maintain sufficient response equipment and personnel to respond to their established 5700 bopd blowout RPS during well drilling operations. Once the Air Quality review is completed the standard seasonal drilling restrictions as outlined in condition of approval #7 will apply to drilling operations.

   This condition is reasonable and necessary to assure ADEC that all the necessary equipment and personnel to implement a response to a discharge or well control event are in place prior to the start of drilling operations. 18 AAC 75.434 and 18 AAC 75.445(d)

4. **Blowout Contingency Plan.** A copy of the Blowout Contingency Plan (BCP) must be maintained at the active exploration site and made available to ADEC upon request. The BCP must be developed prior to the onset of drilling activities.

   This condition is necessary to ensure that the plan holder is prepared to control a potential well blowout. ADEC may review the blowout contingency plan when performing site inspections and/or in Anchorage. 18 AAC 75.425(e)(1)(I), 18 AAC.445(d)(2), and 18 AAC 75.480

5. **Contact Information and Communications:** Prior to drilling, ExxonMobil must update all contact information for personnel and supporting operations referenced in Table 1-4 (ExxonMobil Contact List). An email update copy once known will suffice but hard copies must also be provided to ADEC and all plan copy holders in accordance with 18 AAC 75.425(e)(1)(A) and (B).

   This condition is reasonable and necessary in order to comply with the above-referenced regulations.

6. **Facility Diagram.** ExxonMobil must provide layout drawings of the ice pad to all holders of the plan prior to drilling. The drawing should detail the geographic orientation of the pad and relative locations of the drilling rig, access ice road, facilities, oil storage tanks, testing tanks, crew quarters, and equipment stored on the pad.

   This condition is reasonable and necessary under the requirements of 18 AAC 75.425(e)(1)(H).

7. **Seasonal Drilling Restrictions.** To reduce the risk of an oil discharge and to ensure the effectiveness of planned spill response methods prior to periods when the planned response methods are rendered ineffective by environmental limitations, all drilling operations into hydrocarbon bearing formations must be performed from November 1 through April 15 of each drilling season that the plan approval is in effect. In the initial drilling season, well drilling will not encounter the 5000 feet true vertical depth threshold prior to the April 15 deadline. The well will not be advanced past the threshold into hydrocarbon-bearing formations until drilling resumes in the second season. New drilling penetrations above hydrocarbon-bearing threshold depths and well testing may be conducted as needed.

   This condition is reasonable and necessary to reduce the risk of an oil discharge by using specific temporary measures during periods when planned spill response methods are rendered ineffective by environmental limitations, in accordance with 18 AAC 75.445(f). The plan accounts for a 30-day response time, which includes both source control and cleanup. The drilling end date is based on the expected tundra closure date of May 15.

8. **Final Copy of the Plan.** Prior to conducting exploration activities, the plan holder must submit to ADEC updated versions of the approved plan, including all revisions instituted during the recent plan review. ExxonMobil must send three complete plan copies to the ADEC office in Anchorage and one copy to the ADEC office in Fairbanks. In addition, you must send a complete updated version of the plan to each reviewer and any other controlled document holder of your plan.

EXPIRATION: This approval **expires March 17, 2014.** After the approval expires, Alaska law prohibits operation of these facilities until an approved plan is once again in effect.

AMENDMENT: Before any change to this plan may take effect, the plan holder must submit an Application for Amendment to the plan with any additional information needed to evaluate the proposed amendment. This is to ensure that changes to the plan do not diminish the plan holder's ability to respond to a discharge and to evaluate any additional environmental considerations that may need to be taken into account (18 AAC 75.415).

RENEWAL: To renew this approval, the plan holder must submit a completed renewal application and plan to ADEC no later than 180 days prior to the expiration of this approval. This is to ensure that the submitted plan is approved before the current plan in effect expires (18 AAC 75.420).

REVOCATION, SUSPENSION OR MODIFICATION: This approval is effective only while the plan holder is in "compliance with the plan" and with all of the terms and conditions described above. ADEC may, after notice and opportunity for a hearing, revoke, suspend or require the modification of an approved plan if the plan holder is not in compliance with it, or for any other reason stated in AS 46.04.030(f). In addition, Alaska law provides that a vessel or facility that is not in "compliance with the plan" may not operate (AS 46.04.030). ADEC may terminate approval prior to the expiration date if deficiencies are identified that would adversely affect spill prevention, response or preparedness capabilities.

DUTY TO RESPOND: Notwithstanding any other provisions or requirements of this contingency plan, a person causing or permitting the discharge of oil is required by law to immediately contain and cleanup the discharge regardless of the adequacy or inadequacy of a contingency plan (AS 46.04.020).

NOTIFICATION OF NON-READINESS: Within twenty-four (24) hours after any significant response equipment specified in the plan becomes non-operational or is removed from its designated storage location, the plan holder must notify ADEC in writing and provide a schedule for the equipment's substitution, repair, or return to service (18 AAC 75.475[b]).

CIVIL AND CRIMINAL SANCTIONS: Failure to comply with the plan may subject the plan holder to civil liability for damages and to civil and criminal penalties. Civil and criminal sanctions may also be imposed for any violation of AS 46.04, any regulation issued hereunder, or any violation of a lawful order of ADEC.

INSPECTIONS, DRILLS, RIGHTS TO ACCESS, AND VERIFICATION OF EQUIPMENT, SUPPLIES AND PERSONNEL: ADEC has the right to verify the ability of the plan holder to carry out the provisions of its contingency plan and access to inventories of equipment, supplies, and personnel through such means as inspections and discharge exercises, without prior notice to the plan holder. ADEC has the right to enter and inspect the covered vessel or facility in a safe manner at any reasonable time for these purposes and to otherwise ensure compliance with the plan and the terms and conditions (AS 46.04.030[e] and AS 46.04.060). The plan holder shall conduct exercises for the purpose of testing the adequacy of the contingency plan and its implementation (18 AAC 75.480 and 485).

FAILURE TO PERFORM: In granting approval of the plan, ADEC has determined that the plan, as represented to ADEC by the applicant in the plan and application for approval, satisfies the minimum planning standards and other requirements established by applicable statutes and regulations, taking as true all information provided by the applicant. ADEC does not warrant to the applicant, the plan holder, or any other person or entity: (1) the accuracy or validity of the information or assurances relied upon; (2) that the plan is or will be implemented; or (3) that even full compliance and implementation with the plan will result in complete containment, control, or cleanup of any given oil spill, including a spill specifically described in the planning standards.

The plan holder is encouraged to take any additional precautions and obtain any additional response capability it deems appropriate to further guard against the risk of oil spills and to enhance its ability to comply with its duty under AS 46.04.020(a) to immediately contain and clean up an oil discharge.

COMPLIANCE WITH APPLICABLE LAWS: If amendments to the approved plan are necessary to meet the requirements of any new laws or regulations, the plan holder must submit an application for amendment to ADEC at the above address. The plan holder must adhere to all applicable state statutes and regulations as they may be amended from time to time. This approval does not relieve the plan holder of the responsibility for securing other federal, state, or local approvals or permits, and the plan holder is still required to comply with all other applicable laws.

INFORMAL REVIEW OR ADJUDICATORY HEARING: Any person who disagrees with this decision may request an adjudicatory hearing in accordance with 18 AAC 15.195 - 18 AAC 15.340 or an informal review by the Division Director in accordance with 18 AAC 15.185.

Informal review requests must be delivered to the Director of the Division of Spill Prevention and Response, 410 Willoughby Avenue, Suite 303, PO Box 111800, Juneau, Alaska 99811-1800 within 15 days of the permit decision.

Adjudicatory hearing requests must be delivered to the Commissioner of the Department of Environmental Conservation, 410 Willoughby Avenue, Suite 303, PO Box 111800, Juneau, Alaska 99811-1800, within 30 days of the permit decision. If a hearing is not requested within 30 days, the right to appeal is waived. Anyone who submits a request for an informal review or an adjudicatory hearing should also send a copy of the request to the undersigned.

If you have any questions, please contact Gary Evans at 269-7536 or me at 269-3054.

Sincerely,

Betty Schorr
Program Manager

Attachment: Summary of Basis for Department Decision

Enclosure: Certificate of Approval, 09CER 002

cc
Gary Evans, ADEC
cc w/o enc:
Ed Meggert, ADEC
Mark Fink, ADF&G
Jack Winters/Mac McLean, ADNR
Carl Lautenberger, USEPA
Capt. Mark Hamilton, USCG Sector Anchorage
Trustees for Alaska
Northern Alaska Environmental Center
Gordon Brower, NSB
Rex Okakok, NSB
Susan Harvey, Harvey Consulting
Mike Barker, ExxonMobil
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MANAGEMENT APPROVAL AND MANPOWER AUTHORIZATION

OIL DISCHARGE PREVENTION AND CONTINGENCY PLAN
POINT THOMSON DRILLING PROGRAM
NORTH SLOPE, ALASKA

This Oil Discharge Prevention and Contingency Plan (ODPCP) has been prepared for onshore drilling activities within the Point Thomson area of North Slope region of Alaska conducted by ExxonMobil Corporation.

This plan is approved for implementation as herein described. Oil discharge prevention and response resources (e.g., manpower, equipment, and materials) will be provided, as necessary to implement this plan.

Craig A. Haymes Alaska Production Manager ExxonMobil Corporation	10/31/08 Date

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RECORD OF REVISIONS

REVISION NUMBER	REVISION DATE	SUMMARY OF REVISION CHANGE
1	July 2009	Edits to Section 1.6.3, Table 2-1, Section 3.2, Section 5.1.2, and Appendix B reflect an increased capacity of the largest tank at the facility and corresponding increase to the response planning standard (RPS). Minor edits include additional tanks in the bulk storage tank area and administrative edits.

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OIL DISCHARGE PREVENTION AND CONTINGENCY PLAN POINT THOMSON DRILLING PROGRAM

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LIST OF ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
μg/m[3]	micrograms per cubic meter
μm	micrometer
AAC	Alaska Administrative Code
ACP	Area Contingency Plan
ACS	Alaska Clean Seas
ADEC	Alaska Department of Environmental Conservation
ADNR	Alaska Department of Natural Resources
AOGCC	Alaska Oil and Gas Conservation Commission
API	American Petroleum Institute
ARRT	Alaska Regional Response Team
ASME	American Society of Mechanical Engineers
BAT	best available technology
bbl	barrels
BHA	bottom hole assembly
BMP	best management practices
BOP	blowout preventer
bopd	barrels of oil per day
boph	barrels of oil per hour
BOPE	blowout prevention equipment
BTU	British Thermal Units
CAA	Conflict Avoidance Agreement
Central Pad	Point Thomson Central Pad
CFR	Code of Federal Regulations
cy	cubic yard
EPA	U.S. Environmental Protection Agency
ERD	extended reach drilling
ExxonMobil	ExxonMobil Production Company
FOSC	Federal On-Scene Coordinator
GOR	gas-to-oil ratio
gpm	gallons per minute
HAZCOM	hazard communication
HAZWOPER	Hazardous Waste Operations and Emergency Response
HDPE	high-density polyethylene
ICS	Incident Command System
IMS	Incident Management System
IMT	Incident Management Team

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

IP3	Integrated Pore Pressure Prediction
LEPC	Local Emergency Planning Committee
LOSC	Local On-Scene Coordinator
LWD	logging while drilling
MAD	Mutual Aid Drill
MMS	Minerals Management Service
mmscf/d	million standard cubic feet per day
mph	miles per hour
NARRT	ExxonMobil North American Regional Response Team
NCP	National Contingency Plan
NPREP	National Preparedness for Response Exercise Program
NSB	North Slope Borough
NSSRT	North Slope Spill Response Team
NSTC	North Slope Training Cooperative
ODPCP	Oil Discharge Prevention and Contingency Plan
OIMS	Operations Integrity Management System
OPA 90	Oil Pollution Act of 1990
ORR	Oil Recovery Rate
OSEA	Office of Safety and Environmental Affairs
OSHA	Occupational Safety and Health Administration
OSRO	Oil Spill Removal Organization
PM-10	particulate matter 10 microns in diameter
PPE	personal protective equipment
psi	pounds per square inch
psia	pounds per square inch absolute
PWD	pressure while drilling
QI	Qualified Individual
RCG	Regulatory Compliance Group
RMROL	realistic maximum response operating limitation
RPS	response planning standard
SCAT	Shoreline Cleanup Assessment Team
scf/bbl	standard cubic feet per barrel
SCIPUFF	Second-Order Closure Integrated PUFF
SEPC	State Emergency Planning Committee
SHE	Safety, Health and Environment
SOP	standard operating procedures
SOSC	State On-Scene Coordinator

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

SPCC	Spill Prevention, Control, and Countermeasures
SRT	Spill Response Team
TBD	to be determined
TF	task force
TRUE	Training to Reduce Unexpected Events
TTLA	tank truck loading/unloading area
UHF	ultra high frequency
UOP	Unified Operating Procedure
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
VHF	very high frequency
WWCI	Wild Well Control, Inc.

INTRODUCTION

This Oil Discharge Prevention and Contingency Plan (ODPCP) is for the Point Thomson Drilling Program. Section 3.1.1 provides an overview of the drilling program. Exxon Mobil Corporation (ExxonMobil) is the operator of the facility, which is located near the Beaufort Sea, approximately 60 miles east of Prudhoe Bay, Alaska. ExxonMobil's address, phone, and fax numbers are provided below:

ExxonMobil	Street Address:
P.O. Box 196601	3301 C Street, Suite 400
Anchorage, AK 99519	Anchorage, AK 99503
Phone: (907) 561-5331	Fax: (907) 564-3789

For additional information, please contact Mike Barker, Regulatory Manager, at 907-564-3617.

This ODPCP follows the Alaska Department of Environmental Conservation (ADEC) ODPCP requirements of Title 18, Alaska Administrative Code (AAC) Chapter 75, Part 425 (18 AAC 75.425). Pertinent regulatory citations are shown in the title block of each section.

This ODPCP relies on information provided in the Alaska Clean Seas (ACS) *Technical Manual*. Information in the ACS *Technical Manual* is incorporated by reference and is not repeated in this ODPCP.

DISTRIBUTION

This ODPCP will be accessible to ExxonMobil employees and contractors at the Point Thomson drill site. Hard copies of the ODPCP will be distributed to regulatory agencies. Additional copies will be located in the Anchorage office of ExxonMobil and at ACS Base in Deadhorse, Alaska. A record of ODPCP distribution will be maintained at the Anchorage office of ExxonMobil.

UPDATING PROCEDURES [18 AAC 75.415]

This ODPCP has been prepared to address the initial drilling operations and associated support (non-drilling) operations. This plan will be reviewed and updated when substantive changes in operations occur. It will also be reviewed on an annual basis. Below is a list of key factors that may cause revisions to this ODPCP:

- Plan amendments that are a result of additional state and federal response planning requirements,
- Changes in response procedures,
- Changes in Plans of Operations or other changes that affect response planning standards,
- Change in oil spill response organizations,
- Change in Qualified Individual,
- Changes in the National Contingency Plan (NCP) or Area Contingency Plan (ACP) that have a significant impact on the appropriateness of response equipment or response strategies, or
- Change in ownership.

Routine updates will be submitted for ADEC review within five days after the date the proposed change occurs. Routine updates will be limited to revisions of personnel, training, and other changes that do not affect the ability to respond to a spill. Other modifications to this ODPCP will be considered amendments and must be approved by ADEC before taking effect.

Routine updates and approved amendments will be provided for ODPCP distribution. Upon receipt of revisions, the recipient will replace pages as instructed. It will be the responsibility of each ODPCP holder to ensure that updates are promptly incorporated into the ODPCP. This process will indicate the completeness of the ODPCP since revisions will be consecutively numbered.

RENEWAL [18 AAC 75.420]

This ODPCP will be submitted for renewal to the approving agencies every five years, based on the ADEC five-year renewal schedule.

PART 1 RESPONSE ACTION PLAN [18 AAC 75.425(e)(1)]

1.1 EMERGENCY ACTION CHECKLIST [18 AAC 75.425(e)(1)(A)]

1.1.1 Response Tiers

A spill response operation on the North Slope falls into one of three categories:

- **Tier I:** Small, local operational spill dealt with by on-scene personnel and equipment;
- **Tier II:** Larger spill that could affect the area around the facility or operation and that uses equipment and/or trained personnel from the other operating areas of the North Slope; or
- **Tier III:** A major spill response using resources outside of the North Slope.

The Incident Management Team (IMT) response organization structure described in this plan is based on the Incident Command System (ICS) and is described in Alaska Clean Seas (ACS) *Technical Manual*, Volume 3, Section 2.0, "Organizational Approach" and Section 3.0, "Incident Management System."

The IMT is organized and staffed to conduct a major oil spill response operation. Personnel on the IMT have appropriate training and work experience to provide guidance and make decisions essential for ensuring that oil spills, regardless of size and location, are cleaned up in accordance with procedures that are environmentally acceptable. Also, personnel filling these positions are required to be familiar with oil spill response techniques for use on the North Slope.

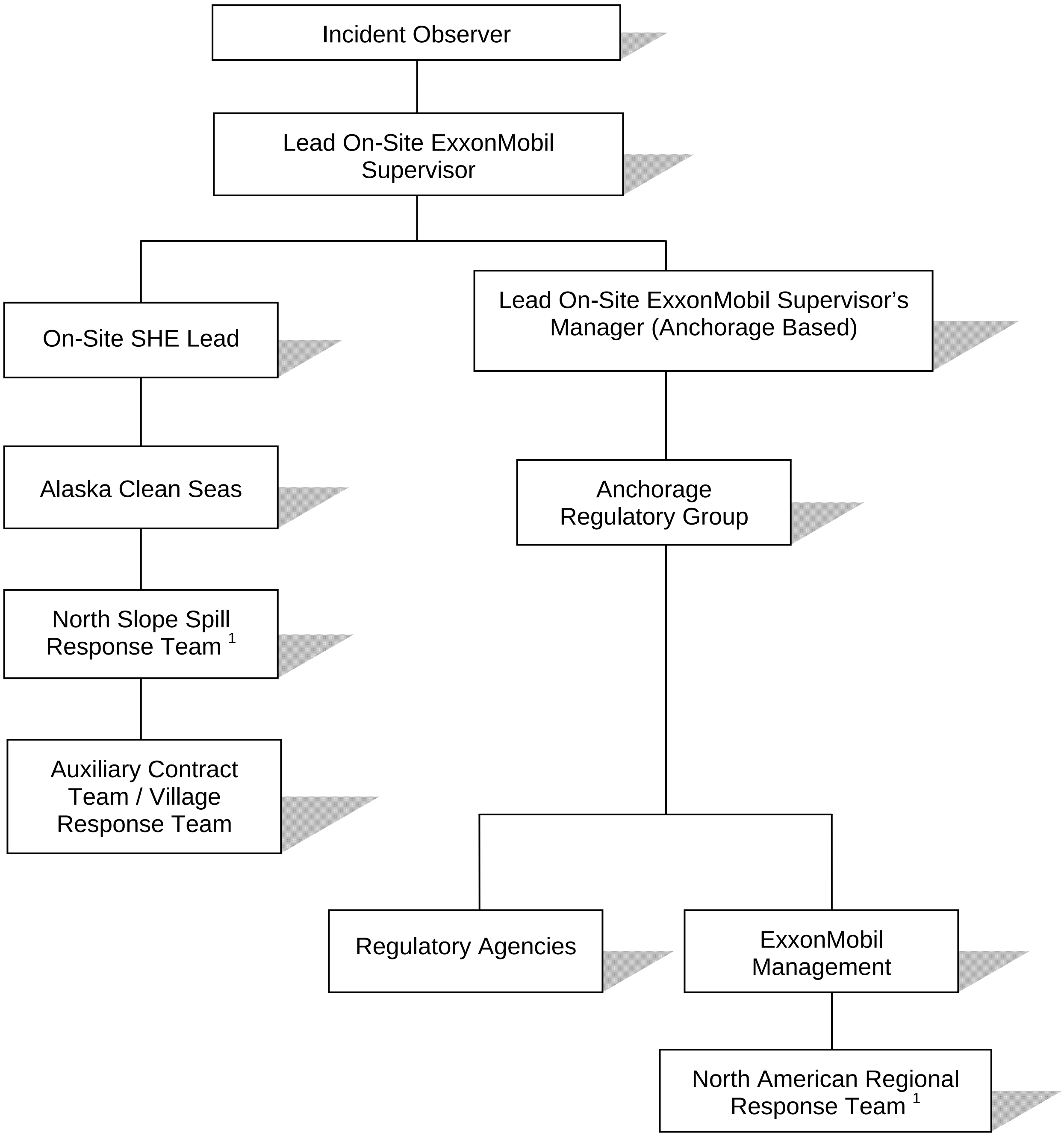
To facilitate use of this plan in a spill event, Tier I actions are described separately from Tier II and Tier III actions.

Tier I Emergency Actions

The Lead On-Site ExxonMobil Supervisor will be the initial Incident Commander for a Tier I incident and responsible for ensuring notifications shown in Figure 1-1 and the actions shown in Table 1-1 are carried out. This person could be a Drilling Supervisor, Construction Supervisor, or Logistics Supervisor depending on the location of the incident and nature of operations at the time. The Incident Commander, or designee, will be responsible for making sure safety is considered in response decisions and internal notifications are completed. The Incident Commander will be in charge of the on-site Spill Response Team (SRT) personnel and has the authority to commit ExxonMobil and contractor resources available in the area to contain and clean up oil spills.

Table 1-1 outlines the emergency action checklist to be followed in the event of a Tier I spill event. If the initial Incident Commander, On-Site Safety, Health and Environment (SHE) Lead, or other ExxonMobil Supervisor determines that the spill is a Tier II or III event, additional actions shown in Table 1-2 will be initiated. Actions described are intended to be general guides, and actions taken during any spill event will depend on circumstances of the event.

Figure 1-1
Immediate Spill Notifications
Tier I, II, and III Spills



[1] North Slope Spill Response Team (NSSRT) and North American Regional Response Team (NARRT) are notified for Tier II and Tier III spills as necessary.

Table 1-1
Immediate Action Checklist

TIER I SPILL RESPONSE	
PERSONNEL	**ACTIONS TO BE TAKEN**
FIRST PERSON TO SEE THE SPILL	Assess safety of situation, determine whether the source can be stopped, and stop the source of spill, if possible. Immediately notify Lead On-Site ExxonMobil Supervisor. Provide information on: • Personnel safety • Source of the spill • Type of product spilled • Amount spilled • Status of control operations
LEAD ON-SITE EXXONMOBIL SUPERVISOR / INCIDENT COMMANDER	Immediately notify: • On-Site SHE Lead • ACS On-Site Technician • Lead On-Site ExxonMobil Supervisor's Manager at the Anchorage office Report to scene, if required. Make an initial assessment of the spill and associated safety and environmental issues. Stop the source of spill, if possible. Initiate actions to report spill to agencies (Figure 1-1, Table 1-5). If necessary, mobilize Spill Response Team (SRT) and on-site equipment required to control and clean up spill. Begin response operations. Assess response activities. If response is adequate, remain at Tier I. If additional capabilities are needed, go to Tier II or III response. Supervise control and recovery operations. Upon completion, ensure appropriate storage and disposal of oily wastes/materials. Confirm success of cleanup and plan remediation, if required. Prepare written report of cleanup activities.

Table 1-2
Immediate Response and Notification Actions

TIER II OR TIER III SPILL RESPONSE	
BEFORE Activation of IMT	
PERSONNEL	**ACTIONS TO BE TAKEN**
FIRST PERSON TO SEE THE SPILL	Assess safety of situation, determine whether the source can be stopped, and stop the source of spill, if possible. Immediately notify on-site Lead On-Site ExxonMobil Supervisor. Provide information on: • Personnel safety • Source of the spill • Type of product spilled • Amount spilled • Status of control operations
LEAD ON-SITE EXXONMOBIL SUPERVISOR / INCIDENT COMMANDER	Immediately notify: • On-Site SHE Lead • ACS On-Site Technician • ACS (Deadhorse) • Notify Lead On-Site ExxonMobil Supervisor's Manager at the Anchorage office. Report to scene, if required. Make an initial assessment of the spill and associated safety and environmental issues. Ensure the source of spill is stopped, if possible. Initiate actions to report spill to agencies (Figure 1-1, Table 1-5). Mobilize SRT and on-site equipment to initiate control and clean up of spill. Supervise control and recovery operations until relieved. Activate IMT, and assess other resource requirements.
ON-SITE SHE LEAD	Account for the safety of all personnel. Determine whether a threat of fire or explosion exists. If a threat exists, suspend control and response operations. Determine appropriate personal protective equipment (PPE) and brief site workers.
After Activation of IMT	
SHE LEAD	• Activate ACS, (907) 659-2405 (24 hours). • Initiate necessary permits for agency approval (ACS *Technical Manual* Volume 1, Tactic A-3). • Prepare cleanup and waste management plan for agency approval.
INCIDENT COMMANDER (Operations Technical Manager or Operations Manager)	• Further activate Mutual Aid via NSSRT, IMT and NARRT as necessary. • Continue internal notifications. • Coordinate staff activity. • Manage incident operations and approve release of major resources and supplies.

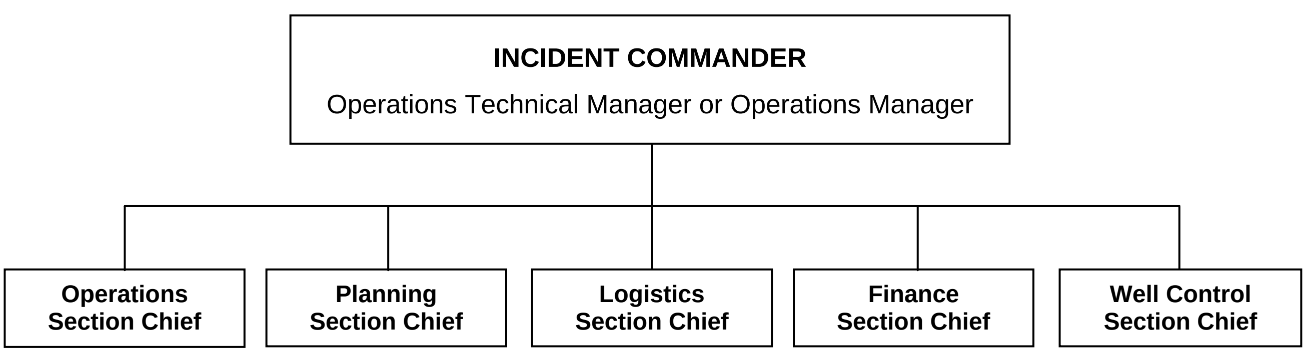
Table 1-2 (Continued)
Immediate Response and Notification Actions

TIER II OR TIER III SPILL RESPONSE	
AFTER Activation of IMT (Continued)	
PERSONNEL	**ACTIONS TO BE TAKEN**
OPERATIONS SECTION CHIEF	• Activate Mutual Aid through ACS, as necessary. • Establish staging areas, as required • Provide the Logistics Section Chief with information on initial equipment, personnel, material, and supply needs. • Supervise control and recovery operations. • Ensure appropriate storage and disposal of oily wastes/materials.
PLANNING SECTION CHIEF	• Ramp up Planning Section. • Ensure agency notifications have been made and updates are provided. • Compile and display status information in Command Post. • Assist in development of planning process. • Document all aspects of the response. • Provide environmental and permitting support as needed.
LOGISTICS SECTION CHIEF	• Order equipment, personnel, material, and supplies as requested. • Provide transportation support. • Provide support for field operations and Command Post operations.
FINANCE SECTION CHIEF	• Issue cost code for tracking of expenses. • Notify insurance representatives as warranted. • Track expenditures and provide audit function as needed.
WELL CONTROL MANAGER (Drilling Supervisor or Drilling Operations Superintendent)	• Determine if incident requires well control specialist, and if so, contact Wild Well Control (281) 784-4700. • Identify well control options based on circumstances of incident. • Notify rig contractors and coordinate activities. • Implement logistics plan to provide support for the well control specialists.

Tier II and III Emergency Actions

Tier II and III spills may involve activation of the IMT, the NSSRT, and the NARRT; emergency actions and IMT organization are shown in Table 1-2 and Figure 1-2, respectively. The Lead On-Site ExxonMobil Supervisor will serve as the initial Incident Commander in a Tier II/III incident until relieved as described in this plan.

Figure 1-2
Point Thomson Incident Management Team for Tier II/III Event



Emergency actions described are intended to be general guides and actions taken during any spill event will depend on circumstances of the event; further information regarding spill responder roles is provided in the ACS *Technical Manual,* Volume 3.

1.1.2 Incident Management Team

The IMT is organized and staffed to conduct a major oil spill response operation as shown in Figure 1-2. Personnel on the IMT have appropriate training and work experience to provide guidance and make decisions essential for ensuring that oil spills, regardless of size and location, are cleaned up in accordance with procedures that are environmentally acceptable. Also, personnel filling these positions are familiar with oil spill response techniques for use on the North Slope.

The ACS *Technical Manual,* Volume 3, describes the Incident Management System (IMS) and contains detailed position descriptions. The Incident Commander, or designee, will be responsible for making sure that safety is considered in response decisions and that internal and external notifications are completed. Initial actions and communications are shown in Table 1-3.

Table 1-3
Incident Commander Initial Actions

INCIDENT COMMANDER INITIAL ACTIONS	• Initiate immediate actions to safeguard personnel, minimize environmental damage, and protect property. • Assess the situation to permit an effective first response, including immediate voluntary ignition. • Consult with on-site response team members, as appropriate, on the present status of the spill (continuing or controlled), the volume of the spill, and the status of containment and cleanup efforts. • Notify the Drilling Operations Superintendent and Operations Technical Manager or Operations Manager of the situation and recommendations for necessary response resources. • Ensure ACS is contacted to request additional equipment and personnel from North Slope area and requesting additional resources from beyond the North Slope, as required. • Authorize contract labor, equipment, and support services. • Establish a Command Post, including communication facilities, at Point Thomson Central Pad (Central Pad), the existing gravel pad used for the Point Thomson Unit No. 3 well. • Consult with appropriate regulatory agencies on response priorities and actions. Ensure continuing agency liaison. • Determine how the response priorities and actions will be implemented using available resources. • Approve oil spill containment and cleanup procedures. • Authorize response team personnel to request permits for in situ burning, chemical agents, and shoreline response techniques, as appropriate. • Keep ExxonMobil management informed about response activities.

As necessary, ExxonMobil will use the resources of other North Slope operators through ACS, Mutual Aid, spill response cooperatives, and contractors. The Incident Commander has the authority to commit ExxonMobil and contractor resources available in the area to contain and clean up oil spills.

1.1.3 Specific Information for a Well Control Event (Tier II/III)

If a well control-related event is detected, the first priority will be to determine the cause of the event and, if possible, to control it immediately and notify the on-site Drilling Supervisor as soon as possible. In a well control event, the on-site Drilling Supervisor will consult with the Lead On-Site ExxonMobil Supervisor and will direct well control operations. The on-site Drilling Supervisor has the authority and responsibility to take appropriate response actions and notify ExxonMobil management.

The Drilling Supervisor will direct operations at the site to bring the well under control by surface techniques. This may entail:

- Working with the Well Control Section Chief (Drilling Operations Superintendent) and well control specialists to assess well and rig equipment conditions for applicability of surface control techniques;
- Implementing well ignition procedure, if a decision is made to ignite the well; and
- Documenting actions related to well control.

The Drilling Operations Superintendent, based in Anchorage, has the primary responsibility for well control measures. In the event of a blowout, the Drilling Operations Superintendent will decide how best to initiate forward actions, including surface intervention alternatives, assistance from specialists, relief well planning, etc. ExxonMobil certifies that a site-specific blowout contingency plan is in place and will be available for inspection at the site.

Wild Well Control, Inc. (WWCI), the blowout control contractor, has successfully dealt with blowouts and other complicated well control events under Arctic and near-Arctic conditions in locations including Alaska, the North Sea, Russia, China, the Caspian Sea, and Northern Canada.

1.2 REPORTING AND NOTIFICATION [18 AAC 75.425(e)(1)(B)]

1.2.1 Internal Notification Procedures

ExxonMobil requires its employees and contractors to report all spills of oil, regardless of size, to the Lead On-Site ExxonMobil Supervisor. The spill observer will report to the Lead On-Site ExxonMobil Supervisor and spill notifications will be made as shown in Figure 1-1. A Spill Report Form will be completed for reportable spills. See Figure 1-3 for an example. ExxonMobil may also elect to streamline spill reporting and have certain spills reported directly to the appropriate agencies by designated field personnel.

The Lead On-Site ExxonMobil Supervisor is responsible for ensuring that the appropriate supervisor or manager in Anchorage is promptly notified of spills. The Lead On-Site ExxonMobil's Anchorage-based supervisor or manager will initiate further reporting as shown in Figure 1-1. The Anchorage supervisor or manager will provide preliminary information on the size and movement of the spill, including whether its discharge is continuous and the estimated time of arrival to sensitive areas, if applicable.

The Regulatory Compliance Group (RCG) will notify ExxonMobil management and make the required notifications to ExxonMobil business groups for a Tier II or III response in accordance with internal procedures.

1.2.2 External Notification Procedures

The RCG determines whether a spill is reportable to agencies and makes any required notifications as shown on Figure 1-1. Table 1-5 includes the regulatory agency reporting requirements. See Section 3.3 and ACS *Technical Manual*, Volume 3, for a description of the command system, including the Incident Commander and those members of the IMT who notify agencies.

1.2.3 Qualified Individual Notification and Responsibilities

As required by the Oil Pollution Act of 1990 (OPA 90)[1], a response plan is to identify the Qualified Individual (QI) who has full authority to implement removal actions on behalf of ExxonMobil. The QI must

[1] The Oil Pollution Act of 1990, as Amended Through P.L. 106–580, Dec. 29, 2000

have authority to commit the financial resources of the organization necessary to prevent or clean up a spill. In the event of a spill requiring notification of the Federal On-Scene Commander (FOSC), the QI will be notified and will ensure that agency notification occurs. The contact list in Table 1-4 notes those individuals or job roles that will fulfill the QI role for ExxonMobil.

The prerequisites for designation of a QI are:

- Available on a 24-hour basis,
- Speaks English fluently,
- Located in the United States,
- Trained as a QI and alternate QI under the response plan, and
- Familiar with the emergency response plan and its implementation.

The QI will be trained in and authorized to carry out the following responsibilities:

- Activate and engage in contracting oil spill removal organizations and other response-related resources,
- Act as a liaison with the FOSC, and
- Acquire funds to carry out response activities.

1.2.4 Written Reporting Requirements [18 AAC 75.300]

Depending on the type and amount of material spilled, individual government agencies have oral and written reporting requirements that must be adhered to by ExxonMobil (Table 1-5).

ADEC regulations (18 AAC 75.300) require notification to ADEC of certain spills on state lands or waterways. After notification of the discharge has been made to ADEC, ADEC will, at its discretion, require interim reports until cleanup has been completed. A written final report must be submitted within 15 days of the end of cleanup operations, or if no cleanup occurs, within 15 days of the discharge. The final report will contain the following information:

- Date and time of discharge;
- Location of discharge;
- Name of facility or vessel;
- Name, mailing address, and telephone number of person or persons causing or responsible for the discharge and the owner and the operator of the facility or vessel;
- Type and amount of each hazardous substance discharged;
- Cause of the discharge;
- Description of any environmental damage caused by the discharge or containment to the extent the damage can be identified;
- Description of cleanup actions taken;
- Estimated amount of hazardous substance cleaned up and hazardous waste generated;
- Date, location, and method of ultimate disposal of the hazardous substance cleaned up;
- Description of actions being taken to prevent recurrence of the discharge; and
- Other information the Department requires to fully assess the cause and impact of the discharge.

Figure 1-3
Initial Spill Report Form

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION

OIL & HAZARDOUS SUBSTANCES SPILL NOTIFICATION FORM

CLEAR FORM

ADEC USE ONLY

ADEC SPILL #:	ADEC FILE #:	ADEC LC:

PERSON REPORTING:	PHONE NUMBER:	REPORTED HOW? (ADEC USE ONLY) ☐ Phone ☐ Fax ☐ Troopers
DATE/TIME OF SPILL:	DATE/TIME DISCOVERED:	DATE/TIME REPORTED:
INCIDENT LOCATION/ADDRESS:	DATUM: ☐ NAD27 ☐ NAD83 ☐ WGS84 ☐ Other ________ LAT. LONG.	PRODUCT SPILLED:

QUANTITY SPILLED: ☐ gallons ☐ pounds	QUANTITY CONTAINED: ☐ gallons ☐ pounds	QUANTITY RECOVERED: ☐ gallons ☐ pounds	QUANTITY DISPOSED: ☐ gallons ☐ pounds

	POTENTIAL RESPONSIBLE PARTY:	OTHER PRP, IF ANY:	VESSEL NAME:
Name/Business:			
Mailing Address:			VESSEL NUMBER:
Contact Name:			> 400 GROSS TON VESSEL:
Contact Number:			☐ Yes ☐ No

SOURCE OF SPILL:	CAUSE CLASSIFICATION: ☐ Accident ☐ Human Factors ☐ Structural/Mechanical ☐ Other
CAUSE OF SPILL: ☐ Under Investigation	

CLEANUP ACTIONS:

DISPOSAL METHODS AND LOCATION:

AFFECTED AREA SIZE:	SURFACE TYPE: *(gravel, asphalt, name of river etc.)*	RESOURCES AFFECTED/THREATENED: *(Water sources, wildlife, wells, etc.)*

COMMENTS:

ADEC USE ONLY

SPILL NAME:	NAME OF DEC STAFF RESPONDING:	C-PLAN MGR NOTIFIED? ☐ Yes ☐ No
DEC RESPONSE: ☐ Phone follow-up ☐ Field visit ☐ Took Report	CASELOAD CODE: ☐ First and Final ☐ Open/No LC ☐ LC Assigned	CLEANUP CLOSURE ACTION: ☐ NFA ☐ Monitoring ☐ Transferred to CS or STP

COMMENTS: **Status of Case:** ☐ **Open** ☐ **Closed** **DATE CASE CLOSED:**

REPORT PREPARED BY:	DATE:

Revised 2/5/2008

Table 1-4
ExxonMobil Contact List

POSITION	NAME	TELEPHONE
EXXONMOBIL CONTACTS		
Anchorage Office General Number (24-hour)		(907) 564-3633
Alaska Production Manager and QI	C.A. Haymes	(907) 564-3689
Operations Technical Manager and Alternate QI	G.G. Peters	(907) 564-3734
Regulatory/Environmental Manager	D.M. Barker	(907) 564-3617
Drilling Operations Superintendent	Jim Holub/Les Sept	(907) 564-3643
POINT THOMSON CENTRAL PAD		
Drilling Supervisor	J. Campbell/R. Hafner	(907) 433-3501
SHE Lead	C. Clark/M. Wiley	(907) 433-3501
ACS Environmental Contact	J. Serra/G. Guild	(907) 943-1312
IMT		
Incident Commander – Primary	G.G. Peters	(907) 564-3734
Incident Commander – Alternate	D.M. Barker	(907) 564-3617
Deputy Incident Commander – Primary	D.M. Barker	(907) 564-3617
Deputy Incident Commander – Alternate	G.S. Wong	(907) 564-3607
Operations Section Chief – Primary	C. Rivera	(907) 564-3739
Operations Section Chief – Alternate	P. Walsh	(907) 564-3680
Operations Section Chief – Alternate	R. Dragnich	(907) 564-3711
Planning Section Chief – Primary	J.B. Wilkinson	(907) 564-3759
Planning Section Chief – Alternate	P. Thayer	(907) 564-3691
Logistics Section Chief – Primary	M. Pohler	(907) 564-3722
Logistics Section Chief – Alternate	P.L. Hughes	(907) 564-3787
Finance Section Chief – Primary	R. Spilman	(907) 564-3714
Finance Section Chief – Alternate	P.L. Hughes	(907) 564-3787
Well Control Section Chief – Primary	L. Sept	(907) 564-3643
Well Control Section Chief – Alternate	J. Holub	(907) 564-3643
WELL CONTROL SPECIALISTS		
Wild Well Control, Inc.		(281) 353-5481
Critical Well Coordinator at Prudhoe Bay		(907) 659-2805
ALASKA CLEAN SEAS, OIL SPILL REMOVAL ORGANIZATION (OSRO)		
Prudhoe Bay Office		(907) 743-8989
Operations Manager		(907) 659-3202

Table 1-5
Agency Reporting Requirements for Oil Spills

Agency	Spill Size	Verbal Report	Phone Numbers	Alaska Contact	Written Report
National Response Center (Notifies all appropriate federal agencies)	See specific federal agency below for guidance on reportable spill size.	Immediately	(800) 424-8802 (24-hour)	24-hour line	Not required; form is completed during phone notification process
EPA	Any size to navigable waters of the U.S. (includes tundra) or to land that may threaten navigable waters	Immediately	(907) 257-1342 (M-F, 8-5) (206) 553-1263 (907) 271-3424 (FAX) (M-F, 8-5)	Carl Lautenberger Seattle office, 24-hour EPA fax number	For facility requiring Spill Prevention, Control, and Countermeasure (SPCC) Plan if spill is 1,000 gallons or more or if it is second spill in 12 months
U.S. Coast Guard (USCG)	Any size in or threatening navigable waters	Immediately	(907) 907-271-6769 (24-hour) (907) 271-6751 (FAX)	Western Alaska Sector Office USCG fax number	Not required, but requested
U.S. Department of the Interior, U.S. Fish and Wildlife Service (USFWS)	Any size that poses a threat to fish and wildlife	Immediately	(907) 271-2797	---	---
Alaska Department of Environmental Conservation (ADEC)	ON WATER Any volume	Immediately	(907) 451-2121 (907) 451-2362 (FAX) and (800) 478-9300 (M-F after 5, Sat, Sun)	Ed Meggert ADEC fax number or Alaska State Troopers	Fax immediately after verbal report; a follow-up report within 15 days of end of cleanup
	ON LAND <1 gallon	None			None[1]
	1 to 10 gallons	None			Include in monthly written report
	>10 to 55 gallons	Within 48 hours of knowledge of the spill			Include in monthly written report; a follow-up report within 15 days of end of cleanup.
	>55 gallons	Immediately			Fax on same day spill occurs
	IN SECONDARY CONTAINMENT <55 gallons	None	(907) 451-2121 (907) 451-2362 (FAX) and (800) 478-9300 (M-F after 5, Sat, Sun)	Ed Meggert ADEC fax number or Alaska State Troopers	None
	>55 gallons	Within 48 hours of knowledge of the spill			Within 48 hours of knowledge of the spill
Alaska Department of Natural Resources (ADNR)	Same as ADEC	Same as ADEC	DNR Oil Spill Hotline (907) 451-2678 (907) 451-2751 (FAX) Clark Cox: ADEC Primary Notification Contact (907) 269-8565 (907) 269-8913 (FAX)	DNR Spill Report Hotline Or Clark Cox	Copy of ADEC Spill Report sent to ADNR
Alaska Oil and Gas Conservation Commission (AOGCC)	All spills from wells or involving any crude loss	Immediately	(907) 279-1433 (24-hour) 276-7542 (FAX)		Within 5 days of loss

Table 1-5 (Continued)
Agency Reporting Requirements for Oil Spills

Agency	Spill Size	Verbal Report	Phone Numbers	Alaska Contact	Written Report
North Slope Borough (NSB)	ON WATER Any volume	Immediately	(907) 852-0440 (Barrow) (907) 852-0322 (FAX) (907) 852-0284 (Local Emergency Planning Committee [LEPC]-Barrow) (907) 852-6111 or (907) 852-2995 (NSB police-Barrow) (907) 428-7000 (State Emergency Planning Committee [SEPC]-Anchorage)	Permitting and Zoning Department Waska Williams, Office of Safety and Environmental Affairs (OSEA)	Fax a follow-up written report to the following contacts: NSB Permitting and Zoning Division (907) 852-5991 and NSB/OSEA (907) 852-0327 In addition: Weekly reports of all spills are to be submitted to the NSB office
	ON LAND (gravel pad or road; ice pad, or road; snow-covered tundra) >55 gallons	Immediately			
	IN SECONDARY CONTAINMENT >55 gallons	Immediately			

A hazardous substance discharge or release is to be reported as soon as the person has knowledge to ADEC as per 18 AAC 75.300. Immediately report hazardous substance spills to the Anchorage Regulatory Compliance Group who will contact the following individuals:

1. **National Response Center** (800) 424-8802 or (202) 426-2675
2. **ADEC** 1-800-478-9300 (24 hour notification), Central (Anchorage) 269-3063, During business hours 269-7648

[1] Spills of oil less than one gallon to gravel pads are not reportable to agencies; all spills regardless of size are reported to ExxonMobil.

1.3 SAFETY [18 AAC 75.425(e)(1)(C)]

The principal sources of information concerning safety procedures and practices to be followed in the event of a spill are:

- ACS *Technical Manual,* Volume 1, Tactics S-1 through S-8 include site entry procedures, site safety plan development, and personnel protection procedures;
- *Alaska Safety Handbook* distributed to all North Slope employees and contractors;
- ExxonMobil *Upstream Safety Manual*; and
- *North Slope Subarea Contingency Plan*.

Immediate general safety precautions should ensure that the area is secured and ignition sources are eliminated. When possible, response operations should be performed upwind of the spill. Site monitoring should be conducted for hydrocarbon vapors, benzene, oxygen levels, and hydrogen sulfide to ensure appropriate levels are maintained. Supervisors should be aware of where personnel are conducting spill response activities, and ensure that workers are wearing PPE. Personnel should be monitored for signs of hypothermia or heat stress.

Evacuation plans will be maintained on site at the Point Thomson facility.

1.4 COMMUNICATIONS [18 AAC 75.425(e)(1)(D)]

ExxonMobil's Point Thomson communications are designed for compatibility with the communications equipment available through ExxonMobil's Anchorage office, ACS's North Slope Emergency Response Communication Network, and the Nabors 27E drilling rig used for drilling operations.

Communications during the Point Thomson Drilling Program will use a terrestrial spread spectrum or microwave radio, and the on-site personnel will have the following additional equipment and capabilities:

- Traditional phone service
- Satellite phones
- Radios for on-site use

ACS's Oil Spill Repeater and Coast station located at Badami will be used for spill response communications. The ACS Badami Oil Spill fixed VHF repeater channel is OS-43, which transmits on 154.585 MHz and receives on 150.980 MHz (ACS Tactic L-5). There should be handheld coverage to Badami from the West Pad well and a mobile radio will be used for the Central Pad and East Pad. Spill response communication equipment to be included at the drilling location includes:

- 6 Handheld radios
- 2 Global positioning systems
- 2 Backboarded Mobile radios
- 1 Bagphone cellphone

Additionally, a temporary ACS Wooden Console (VHF base, UHF base, VHF Marine Base) will be installed at the drilling rig camp.

Further information on communications is provided in Tactic L-5 of the ACS *Technical Manual*.

1.5 DEPLOYMENT STRATEGIES [18 AAC 75.425(e)(1)(E)]

The initial actions to spill events are described in Sections 1.1 and 1.2. This section describes actions to mobilize additional equipment and personnel when the on-site resources are not adequate to address a spill.

1.5.1 Transport Procedures [18 AAC 75.425(e)(1)(E)(i)]

There are a number of transport options available for mobilizing equipment and personnel for a spill response as shown in Table 1-6. These options vary with the season and weather conditions, and include vessels, helicopters, fixed-wing aircraft, vehicles, Rolligons, and air boats.

Table 1-6
Seasonal Transportation Options

MODES OF TRANSPORTATION	SEASONS		
	SUMMER	WINTER	BREAK-UP/FREEZE-UP
Vessels	X		
Helicopters	X	X	X
Fixed-Wing Aircraft		X	
Vehicles		X	
Rolligons	X	X	X
Air Boats	X		X

The general alternatives and estimated air support travel times are listed in the ACS *Technical Manual* Tactics L-3 and L-4. Estimated travel time from the Prudhoe Bay area to Point Thomson is 1.8 hours by ice road (at 35 miles per hour [mph]) and 16.8 hours by boat. Actual transportation times vary with weather, safety considerations, wildlife considerations, and terrain. Illustrations of transportation strategies are found in the scenarios in Section 1.6.3.

Table 1-6 shows that a wide variety of transportation modes provides alternatives in adverse weather conditions. Rolligons and helicopters are options for transportation in all seasons. Fixed-wing aircraft and on-road vehicles are an option for reaching Point Thomson during winter in which a 5,000-foot ice airstrip will be constructed at Point Thomson, and an ice road will link the Prudhoe Bay road system to Point Thomson.

When poor visibility and icing conditions limit air transportation and the use of air strips, ground and vessel transportation are alternatives depending on the season. Low temperatures and wind generally do not directly affect land transportation options. White-out conditions affect air and vehicle transportation options similarly.

1.5.2 Notification and Mobilization of Response Action Contractor [18 AAC 75.425(e)(1)(E)(ii)]

ACS is the primary response action contractor. The 24-hour phone number for ACS is listed in Table 1-4.

Sections 1.1 and 1.2 describe immediate response and notification actions, which include notification of ACS. While ACS is mobilizing additional personnel and equipment to the spill site, ExxonMobil personnel will determine safety procedures, notify government agencies and additional ExxonMobil personnel, and proceed with source control measures. In addition, if safe to do so, response personnel will deploy on-site spill containment equipment.

1.6 RESPONSE SCENARIOS [18 AAC 75.425(e)(1)(F)]

The following subsections provide information on the strategies for responding to incidents at ExxonMobil's drill sites. This information supports the discussions in Section 1.6.3, Response Scenarios. Where warranted, a narrative discussion has been provided; otherwise, the reader is directed to the relevant portion of the scenarios.

The scenarios that follow were developed in accordance with 18 AAC 75.425(e)(1)(F)and (I) and 18 AAC 75.445(d). They describe equipment, personnel, and strategies that could be used to respond to an oil spill. The scenarios are for illustration purposes only and are not performance standards or guarantees of performance. The scenarios assume conditions of the spills and responses only for the purposes of describing general procedures, strategies, tactics, and selected operational capacities.

Some details in the scenarios are examples. Although some equipment is named, it may be replaced by functionally similar equipment. The response times in the scenarios are for illustration only. They do not limit the discretion of the persons in charge of the spill response to select any sequence or take whatever time they deem necessary for a safe and effective response.

The response strategies illustrate an effective response to reduce the risk, magnitude, or environmental impact of an oil spill, and consider the variation of receiving environments and seasonal conditions. Each response scenario will address the following:

i. Procedures to stop discharge,
ii. Fire prevention and control,
iii. Discharge tracking,
iv. Protection of sensitive areas,
v. Containment and control strategies,
vi. Recovery strategies,
vii. Damaged tank transfer – lightering procedures,
viii. Transfer and storage strategies,
ix. Temporary storage and ultimate disposal,
x. Wildlife protection, and
xi. Shoreline cleanup.

In situ burning could be used in a spill response to reduce the quantity of oil, regardless of whether a scenario illustrates in situ burning as a primary response option. In this plan, in situ burning means burning oil where it has spilled, as an oil removal technique. In situ burning excludes ignition of hydrocarbons in an aerial blowout plume or burning of oily waste material.

Actual responses to an oil spill event depend on personnel safety considerations, weather and other environmental conditions, agency permits, response priorities, and other factors. In any incident, ensuring the safety of personnel will be given highest priority. The scenarios assume the agency on-scene coordinators and other agency officials will immediately grant any required permits. ACS maintains pre-approved permits as listed in ACS *Technical Manual,* Volume 1, Tactic A-3.

The scenarios are generally based on information contained in the ACS *Technical Manual*, except where the information does not apply to condensate, a non-persistent material, and meteorological data from the Point Thomson area are used for blowout plume wind.

The scenarios assume reduced operational hours per shift and reduced skimming rates (less than nameplate capacity) to account for realistic maximum operating limitations and other down-time factors.

1.6.1 Temporary Storage and Disposal [18 AAC 75.425(e)(1)(F)(x)]

Temporary storage of oil, oily waste, and debris recovered during a spill cleanup may include tanks, pits, or basins at facilities near the site or at a facility coordinated through the North Slope Mutual Aid Agreement. If the Mutual Aid Agreement does not cover appropriate temporary storage sites, then specific agreements, leases, or contracts will be developed at the time of the cleanup with North Slope operators to safely and efficiently store and treat recovered wastes.

The spill location or other logistical considerations may require storage of oil, oily waste, and debris in smaller, more portable containers that can be brought to the scene via truck or aircraft. Other temporary storage options during a spill response include lined natural depressions (approval required), construction of lined dikes, and portable storage (e.g., pillow tanks, inflatable tanks, open-top drums, vacuum trucks, dump trucks).

The method of disposal for oil and contaminated materials from spill recovery operations, or for oily waste from normal operations, must be approved by agencies before disposal occurs. At the time of the spill, the IMT would determine a reuse, recycle, or disposal method best suited to the state of the oil, the nature and degree of contamination of recovered debris, and the logistics involved. Agency approvals must be received before disposal occurs. An initial determination would be made regarding the classification of the waste as exempt, hazardous, or non-hazardous. This classification may be made on a case-by-case basis. The SHE Lead will provide assistance in determining the classification, should the status of the waste material be in question. In general, the following guidelines apply:

- Spilled material will be re-used or recycled when possible.
- Spilled material that comes out of a well, either during drilling, testing or workover operations, is exempt and therefore a non-hazardous waste.
- Material spilled during drilling, testing or workover operations that did not come out of a well is non-exempt and the cleanup waste may need to be tested to determine whether it is a hazardous waste.
- Non-well-related spills (e.g., from filling a tank) are non-exempt, even though they may occur on a well pad. The cleanup waste may need to be tested to determine whether it is a hazardous waste.

Recycling is the preferred method for handling recovered crude oil or condensate. If recycling is not an option, injection into an available annulus or North Slope disposal well is preferred. Reuse is the preferred option for recovered diesel (e.g., as freeze protection during drilling operations). In this case, the diesel will be stored on site. If the diesel is not suitable for freeze protection, it will be tested to determine if it is hazardous. If the diesel is determined to be hazardous, it will be stored on site until it can be shipped to an approved hazardous waste disposal facility. If the diesel is determined to be non-hazardous, it may be injected in an available Class I North Slope disposal well.

Liquid oil in excess of immediate disposal capacity will be stored in tanks. Sources of tankage include:

- Fuel tanks at Point Thomson,
- Drilling waste and bulk storage tanks at Point Thomson,
- Spill response equipment at Point Thomson,
- ACS spill response equipment located in Deadhorse, and
- North Slope contractors and Mutual Aid partners.

Contaminated gravel will be temporarily stored by a contracted OSRO or on site after ADEC approval for the temporary storage of oily waste associated with response activities. If stored on site, the materials may be transported later by truck over ice road or by vessel to Deadhorse for treatment or disposal. Alternatively, contaminated gravel may be remediated or disposed of at the spill site (e.g., by washing, incineration, bioremediation).

In the event of a blowout, recovered contaminated snow will be stored at the drill site within impermeable containment cells until transferred to an off-site area where it would be stored in large, impermeably lined containment cells (e.g., 10,000 square feet each or larger). Storage cells would be constructed using gravel to build perimeter berms, lined, and monitored until contents have been processed and the cell demobilized. For planning purposes, the Duck Island Gravel Mine site, located between Deadhorse and the Endicott Causeway, has been tentatively designated as the off-site storage area.

Oil recovered by vacuum trucks from the containment cells is taken to an approved facility for oil recovery or disposal.

Non-oily wastes are classified and disposed of accordingly. Recovered liquids would also be stored at the drill site in tanks, impermeable bladders, or pillow tanks which will have been placed within lined and diked secondary containment cells. Snow melters, oil-water separators, and water treatment systems would be deployed to the well site prior to the onset of break-up as necessary. Throughout the summer months, the containment areas would be monitored to protect wildlife and ensure the integrity of the containment systems is maintained. A minimum of 1 foot of freeboard would be maintained by removing and treating the affected snow and water.

Other solid waste may be incinerated on site or stored for later transport to Prudhoe Bay for disposal. Any incinerators used will be designed and operated in compliance with the Incinerator Emissions Standards, outlined in 18 AAC 50.050. A percentage of the waste handled by the incinerators can be oily waste. Non-combustible solid waste and the majority of oily waste will be stored for later transport to Prudhoe Bay for disposal.

Specific types and capacities of temporary storage are described in the ACS *Technical Manual,* Volume 1, Tactics D-1 through D-5. Additional sources of temporary storage tanks include other oil companies and service companies in the North Slope area. These storage tanks include 500-barrel Tiger tanks and 200- to 300-barrel vacuum trucks. Mobile tankage is estimated at 20,000 barrels in the North Slope area.

The storage of cleanup materials is described in the ACS *Technical Manual,* Volume 1, Tactics D-1 through D-5.

1.6.2 Wildlife Protection

Wildlife protection strategies may entail, in order of priority: (1) Containment and controls to limit the spread and area influenced by the spill and response operations; (2) hazing of birds and mammals; and (3) capture and relocation of wildlife at direct threat. These options are discussed in Section 3.10, Protection of Environmentally Sensitive Areas, and in the ACS *Technical Manual*, Tactics W-1 through W-5.

1.6.3 Response Scenarios [18 AAC 75.425(e)(1)(F)]

This section contains spill response strategies that address the following spill scenarios:

- Scenario 1 – Point Thomson (Brookian formation) oil well blowout during winter,
- Scenario 2 – Diesel tank rupture during winter, and
- Scenario 3 – Diesel tank rupture during summer.

A response strategy for a Thomson Sand gas condensate blowout event during winter is included in this section. Section 3.11.4 of this plan provides the background information for the use of voluntary ignition to a gas condensate blowout.

Voluntary ignition of a gas condensate blowout is ExxonMobil's preferred tactic for ensuring the safety of personnel and protection of the environment from the effects of liquid condensate spills at Point Thomson. Condensate lends itself to voluntary ignition as the best option for a spill response in that it ignites readily and the volume that could impact land and water is significantly reduced by evaporation to the atmosphere. Point Thomson condensate meets the requirements of ADEC regulations [18 AAC 75.434(g)] for planned voluntary ignition of a blowout. The condensate has an American Petroleum Institute (API) gravity degrees greater than 35, would be produced with a gas to oil ratio (GOR) greater than 2,000, and ignition would result in combustion efficiency greater than 90 percent. Modeling shows that the soot resulting from combusted condensate would not result in exceeding the 24-hour National Ambient Air Quality Standards.

Combustion of a Point Thomson blowout will be efficient due to the high velocity of the reservoir fluids exiting the well leading to significant air entrainment. The estimated combustion efficiencies are expected to be 99 percent for the gaseous components and approximately 90 percent for the liquids.

SCENARIO 1
POINT THOMSON OIL (BROOKIAN FORMATION) WELL BLOWOUT DURING WINTER

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Table 1-7
Point Thomson (Brookian Formation) Oil Well Blowout During Winter Scenario Conditions

PARAMETER	PARAMETER CONDITIONS
Spill Location	Point Thomson Exploration Well, Central Pad
Date	March 15
Duration	15 days
Type of Spill	Uncontrolled, unobstructed well blowout open to atmosphere
Quantity of Oil Spilled	Initial Response Planning Standard (RPS) Volume = 85,500 barrels (bbl) (5,700 barrels of oil per day [bopd] for 15 days);
Emulsification Factor	N/A (oil falls to snow/ice; no oil reaches open water)
Oil Type	Point Thomson Brookian crude
Wind Direction and Speed	Wind data are derived from the MMS meteorological station at Badami. The data were collected during winter months (November 1 through April 30) from 2001 to 2006. The predominant wind directions were determined from the 16 cardinal compass directions that occur over 10 percent of the time. For November to April, the predominant wind directions are from the ENE, E, SW, and WSW. See Figure 1-4. • Day 1 through 4: wind from ENE • Day 4 through 7: wind from E • Day 7 through 11: wind from SW • Day 11 through 15: wind from WSW The average wind speed is 12.4 knots.
Air Temperature	-26.3 degrees Fahrenheit (ºF) Temperature data are derived from the MMS meteorological station at Badami. The data were collected during winter months (November 1 through April 30) from 2001 to 2006.
Surface	The well location is approximately 52 air miles from the Deadhorse airport, or 48 ice road miles from the Endicott causeway. The winter period is characterized by stable landfast (also called shorefast) ice. The sheet ice grows to an average maximum thickness of 6 to 7 feet by the end of May. As a result, the ice in the shallow waters between Point Thomson and Brownlow Point becomes frozen to the seafloor at the end of the ice growth cycle (Vaudrey, 1985c). Once the nearshore ice is established and stable, the seaward fast ice edge remains close to the 60-foot water depth in most years. The average water depths at the fast ice edge are approximately 45 to 50 feet from December to March. Off Flaxman Island, these water depths correspond to distances of 7 to 8 miles from shore in January to March. The discharge plume is projected to deposit oil to frozen, snow-covered tundra and shorefast ice.
Trajectory	The aerial plume of discharged oil follows trajectories dictated by the predominant wind directions. The aerial plume dimensions are predicted by the S.L. Ross plume dispersion model published in ACS *Technical Manual*, Volume 1, Tactic T-6. The simulated discharged oil is ejected through a 6.3-inch ID well into the air at 5,700 bopd 1,100 standard cubic feet per barrel (scf/bbl) GOR. The S.L. Ross model predicts the following fallout footprint: • On Days 1-4, 19,409 bbl of the oil moves WSW falling over snow covered tundra and frozen, snow covered ponds. • On Days 4-7, 19,067 bbl of the oil moves W over snow covered tundra and frozen snow covered ponds. • On Days 7-11, 25,821 bbl of the oil moves NE over the sea ice • On Days 11-15, 21,204 bbl of the oil moves ENE over the sea ice Each discharge plume extends a maximum of 7,500 feet from the well. At that distance, the plume is a maximum of 1,300 feet wide (Figure 1-5). The S.L. Ross model states that 10 percent of the oil discharged is in the form of miniscule droplets (50 micrometer [µm] or less) which do not reach the ground. As a conservative measure for response planning purposes, response calculations presented in this scenario are based on the full RPS volume, including droplets less than 50 µm.

Table 1-8
Point Thomson Oil (Brookian Formation) Well Blowout During Winter Response Strategy

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS TECHNICAL MANUAL TACTIC
(i) Stopping Discharge at Source	The Drilling Supervisor notifies the Drilling Operations Superintendent. The Lead On-Site ExxonMobil Supervisor takes the role of the Initial Incident Commander until relieved by the Operations Technical Manager or Operations Manager. Efforts are made by the drilling organization to bring the well under control while the Initial Incident Commander oversees containment and recovery operations. Once it has been determined that control of the well cannot be immediately regained, or the safety of personnel is at risk, personnel are evacuated to pre-designated safe areas with adequate shelter, survival equipment, and communication equipment per the well control blowout contingency plan. The Incident Management Team is activated. A well control contractor is dispatched within 12 hours. The well control specialists attempt to stop the blowout by means of surface mechanisms. Surface intervention methods control the blowout on Day 15.	A-1 A-2 Volume 3 IMS Section 1.9 of this plan
(ii) Preventing or Controlling Fire Hazards	The On-Site SHE Lead, at the direction of the Incident Commander, establishes access zones and routes and firefighting operations to protect assets and workers. The On-Site SHE Lead determines PPE requirements and provides hot and warm zone access information. Access to the spill site is carefully controlled and the scene is secured by Security. Monitoring protocol is established by the On-Site SHE Lead at work areas for personnel protection. The monitoring protocol establishes safety zones according to applicable Occupational Safety & Health Administration (OSHA) and fire hazard standards. Containment and recovery operations are allowed without respiratory protection in areas where safety criteria are met. Recovery operations and oil field operations and traffic are not allowed downwind of the blowout in areas where cleanup workers may become exposed to flash fire hazard or oil particulate matter at concentrations in excess of permissible exposure limits.	S-1 through S-6
(iv) Surveillance and Tracking of Oil	The extent of oil on the snow is delineated beginning on Day 1 so it can be found if subsequent snowfall or blowing snow covers the spill. The delineation team will use Tucker snowcat and snow machines for ground transportation. Oil falling to the stable sea ice is expected to stay in place.	T-1, T-4A, T-7
(v) Protection of Sensitive Resources	The ACS *Technical Manual* Map Atlas (Volume 2) is consulted to determine shoreline sensitivities and priority protection sites. No priority protection sites lie within the spill trajectory.	Volume 2, Map Atlas Map Sheet 103 and 104
(vi) Spill Containment and Control Actions	**Days 1 through 15:** The On-Site SHE Lead determines PPE requirements and safety procedures. Work zones and decontamination zones are established. Access to the spill site is carefully controlled and the scene is secured by Security. **Containment Task Force 1:** Snow containment berms and trenches are built around the perimeter of the pad, at a safe distance away from the trajectory plume to reduce the spread of oil as much as possible. The berms are raised and/or shored up on an ongoing basis, as needed. The trenches are maintained throughout the response and are used in recovery operations.	S-1 through S-4 C-1, C-11, C-12

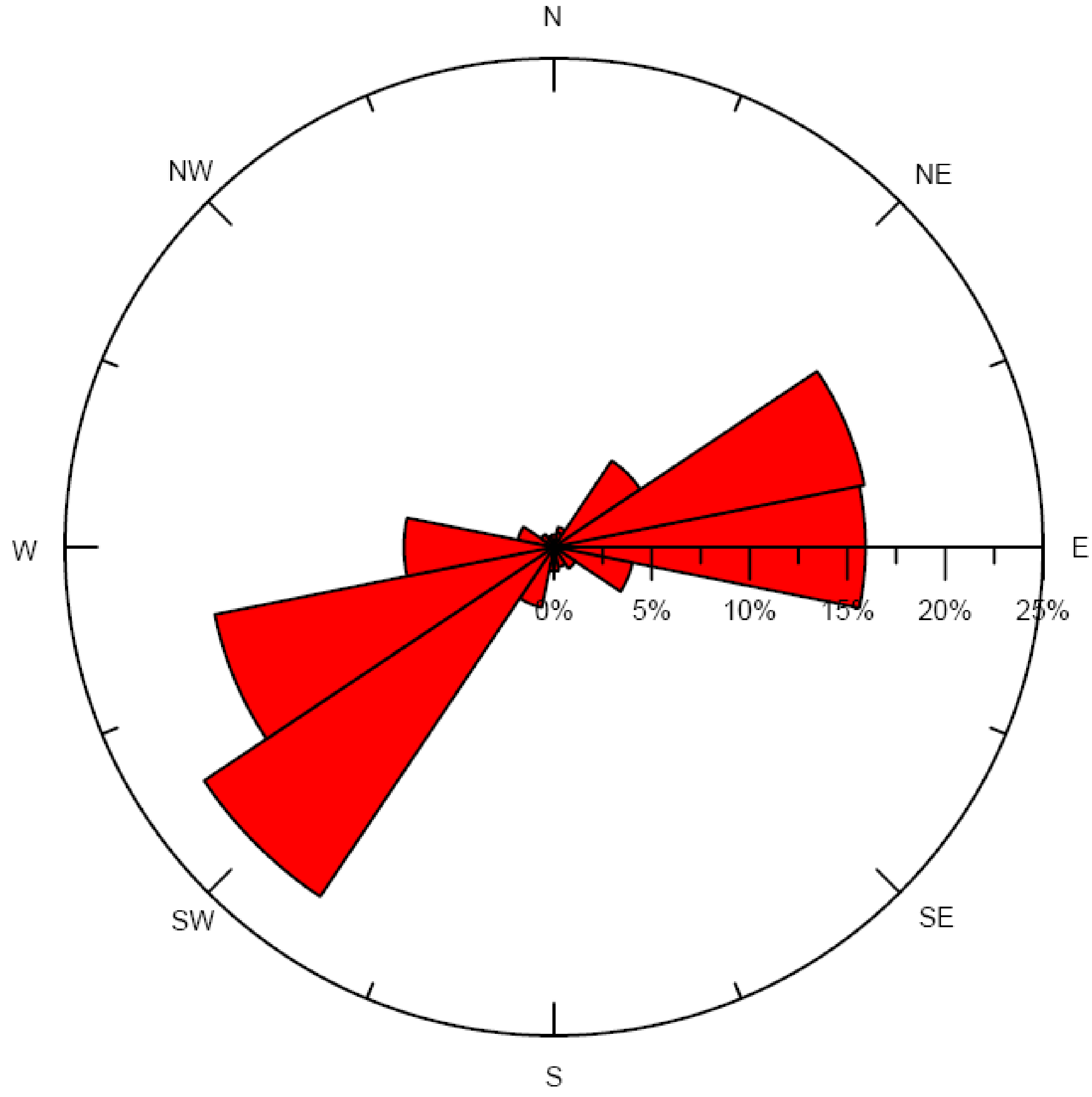
Table 1-8 (Continued)
Point Thomson Oil (Brookian Formation) Well Blowout During Winter Response Strategy

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS TECHNICAL MANUAL TACTIC
(vii) Spill Recovery Procedures	**Day 1:**	
	On Day 1, the equipment for the recovery and transfer of oiled snow and recovered oil is trucked to the spill site via existing ice roads. Recovery equipment and time to deployment are summarized in Table 1-9. Personnel for recovery operations are detailed in Table 1-10. Information on heavy equipment for the response is summarized in Table 1-11. Sources of North Slope response equipment are listed in the ACS *Technical Manual*, Volume 1.	L-2
	An ExxonMobil Field Command Post, decontamination site, and staging area are established at the Central Well Pad on the first shift. The Unified Command's recovery operations objective is to recover the RPS volume of 85,500 barrels within the shortest possible time, consistent with minimizing damage to the environment.	
	Days 2 through 15:	
	Task forces focus on any areas where oil recovery operations can safely occur.	
	Task Force 1 (TF-1): On Day 2, TF-1 begins recovery of oil. TF-1 consists of vacuum trucks, pneumatic pumps, hoses, and Fastanks. TF-1 recovers oil as it is available in low-lying areas outside of the plume perimeter. Oil is recovered by direct suction using vacuum trucks (Tactic R-6) and by hoses and pumps in a series (Tactic R-24). The oil recovered by Tactic R-24 is directed to Fastanks located in safe areas where the oil can be transferred by vacuum trucks from the well site to a recycling center. Oil recovered by TF-1 is transported to an approved facility for oil recovery or disposal.	R-6 R-24
	On Day 4, as the wind shifts and changes the orientation of the oil plume, limited oiled snow recovery operations begin in Plume 1. TF-1 continues recovery of oil as it is available in plumes 1 and 2.	
	Task Force 2 (TF-2): On Day 4, TF-2 begins mechanical recovery of heavily oiled snow in plume 1. TF-2 consists of dump trucks, bobcats, and front-end loaders. Each of the TF-2 units involves four dump trucks, which averages 32.5 cubic yards (cy) in capacity. Bobcats and loaders are shared among teams. TF-2 recovers contaminated snow in plume 1 and transports it to the temporary contaminated snow storage cells located at Duck Island Gravel Mine.	R-1, R-3
	Task Force 3 (TF-3): On Day 4, TF-3 begins recovery of lightly oiled snow in plume 1. TF-3 consists of dump trucks, loaders, and snow machines. TF-3 recovers contaminated snow in plume 1 and transports it off site to the temporary contaminated snow storage cells located at Duck Island Gravel Mine.	R-2 R-1A
	On Day 7, as the wind shifts and changes the orientation of the plume, limited oiled snow recovery operations begin at plume 2.	
	On Day 11, the wind shifts again and changes the orientation of the plume. Limited oiled snow recovery operations begin at plume 3.	
	Days 16 through 30:	
	Surface control is achieved. Task forces focus on any areas where discharged oil remains.	
	TF-1: TF-1 liquid recovery operations are complete by the end of Day 30.	R-6, R-24
	TF-2: On Day 16, TF-2 has full, unhindered access to all oiled snow. TF-2 increases mechanical recovery equipment and personnel and continues recovery at all oiled plumes. Each of the TF-2 units involves eight dump trucks, with an average capacity of 32.5 cy each. Loaders are shared among teams. TF-2 recovers oiled snow and transports it to the temporary contaminated snow storage cells at Duck Island Gravel Mine.	R-1, R-3
	TF-3: On Day 16, TF-3 has full, unhindered access to all oiled snow. TF-3 increases recovery equipment and personnel and continues recovery at all oiled plumes. TF-3 recovers contaminated snow and transports it to the temporary contaminated snow storage cells at Duck Island Gravel Mine.	R-1A, R-2

Table 1-8 (Continued)
Point Thomson Oil (Brookian Formation) Well Blowout During Winter Response Strategy

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS TECHNICAL MANUAL TACTIC
(vii) Spill Recovery Procedures (Continued)	**TF-4:** As recovery operations on the ice pad and in oiled areas in plumes 1 through 4 continue to proceed, TF-4 delineates and removes embedded oil in the ice and on the gravel pad. Oiled ice and gravel are removed mechanically and transported to Duck Island Gravel Mine.	R-5
(viii) Lightering Procedures	Not applicable.	Not applicable
(ix) Transfer and Storage of Recovered Oil/Water; Volume Estimating Procedure	Oiled snow is loaded into lined dump trucks for transport to containment cells located at the Duck Island Gravel Mine. Liquid levels in snow storage areas are monitored by operations personnel. As oiled snow melts in the containment cells, oily liquids are hauled to an approved facility for recycling by vacuum truck. Recovered liquid oil is transported via vacuum truck directly to an approved facility for oil recovery or disposal. Stored liquids are sampled to determine oil content, gauged with ullage tape, manifested, and logged with the assistance of the Waste Management Team.	D-5 D-1
(x) Plans, Procedures, and Locations for Temporary Storage and Disposal	Oiled snow is stored in lined containment cells (10,000 square feet each or larger) constructed at the Duck Island Gravel Mine. Storage pits are constructed using gravel to construct 2-foot-perimeter berms. Storage areas are lined. There is over 300,000 square feet of liner material located on the North Slope, which is owned by Mutual Aid members. The storage pits are monitored until contents have been processed. Oil recovered by vacuum trucks from the containment cells is taken directly to an approved facility for oil recovery. Non-oily wastes are classified and disposed of accordingly.	D-5 D-1 D-3
(xi) Wildlife Protection Plan	The wildlife protection strategy is submitted to Unified Command. Polar bear monitors are mobilized to the site. Hazing is employed as necessary. The Wildlife Stabilization Center in Deadhorse is put on standby. No oiled animals are encountered.	W-1 W-2B W-5
(xii) Shoreline Cleanup Plan	A shoreline monitoring and cleanup plan is submitted to Unified Command before break-up in case oiled shorelines are discovered after break-up. At break-up, Shoreline Cleanup Assessment Teams (SCAT) monitors the tundra and adjacent shorelines for oiling according to the plan and finds none. On-shore and pad-oiled areas are cleaned up to ADEC's satisfaction by Day 30, the shortest possible time consistent with minimizing damage to the environment. The oil removal capacity illustrated in this scenario exceeds the RPS volume.	SH-1

Figure 1-4
Point Thomson Wind Rose
November 1 – April 30, 2001 through 2006
Average Wind Direction, Frequency in Percent



Veltkamp, B., and Wilcox, J.R., *Study Final Report for the Nearshore Beaufort Sea Meteorological Monitoring and Data Synthesis Project*, prepared for the U.S. Department of the Interior, Minerals Management Service, Alaska OCS Region, September 2007.

Per convention, the wind rose illustrates direction of wind origin (i.e., where the wind is coming from).

Figure 1-5
Point Thomson Blowout During Winter:
Scenario Blowout Plume

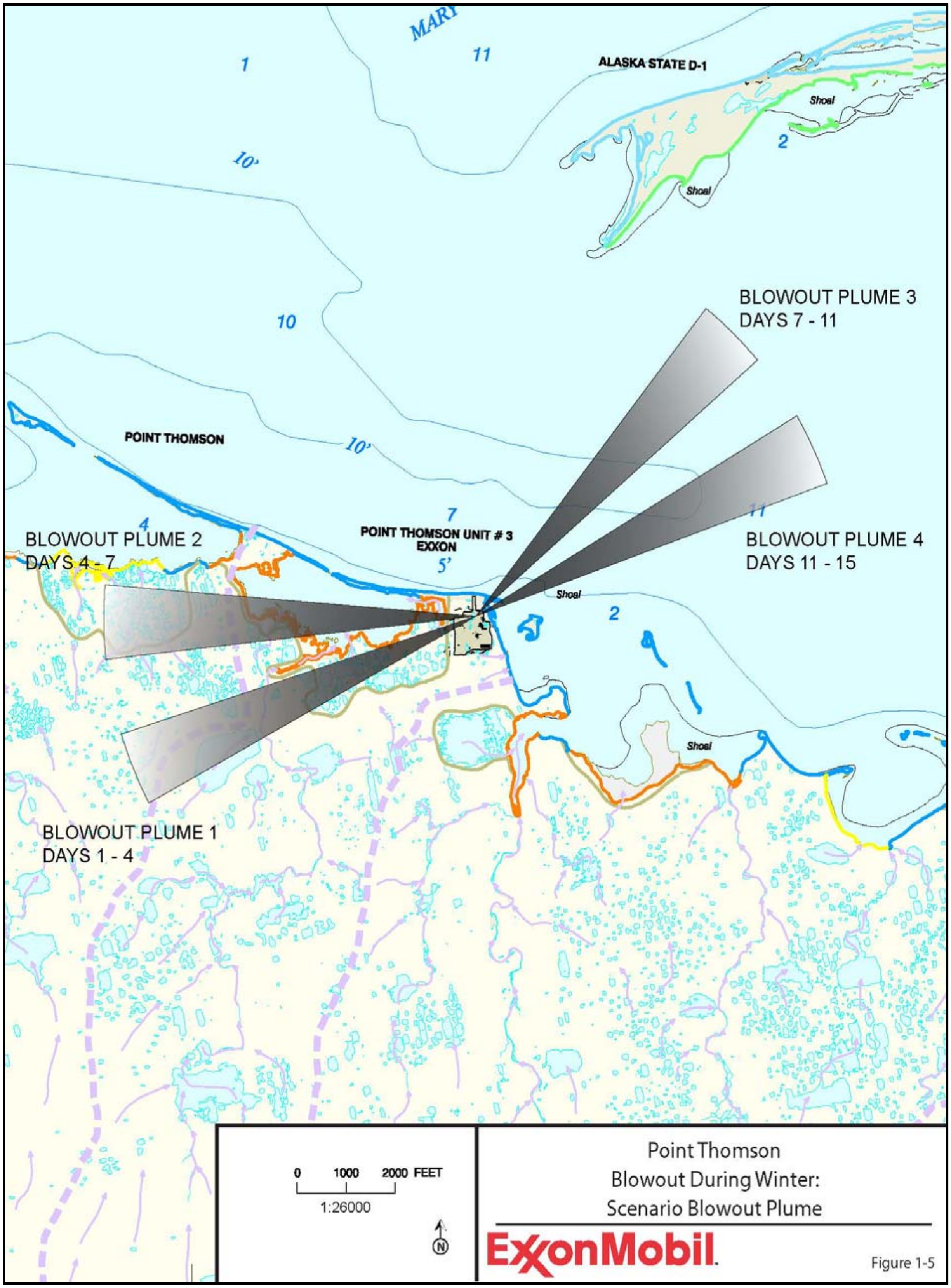


Table 1-9
Point Thomson Oil (Brookian Formation) Well Blowout During Winter Recovery and Handling Capability

A	B	C	D	E	F	G
Spill Recovery Tactic	**Number of Systems**	**Recovery System**	**Oiled Snow Recovery Rate [cy/hr or bbl/hr]**	**Mobilization and Transit Time to Site [time]**	**Operating Time [hr/day]**	**Handling Capacity [cy/day or bbl/day] (B x D X F)**
Day 2 to 21: Liquid Recovery						
TF-1: R-6, L-6	8	Vacuum trucks recover liquids from Fastanks and from ground. Liquids are transported to an approved facility for oil recovery or disposal.	37.5	See notes 1-2	20	6,000
TF-1: R-24, R-6, L-6	2	Fastanks and 3-inch to 4-inch diaphragm pneumatic pumps are used to recover liquids that are difficult to access. Storage is temporarily on site.	37.5	See notes 1 and 3	20	1,500
				Total Daily Liquid Recovery:		**7,500 bbl/day**
Day 2 to 15: Limited Oiled Snow Recovery (During Blowout)						
TF-2: R-1, R-3	2	Mechanical Recovery: rubber-tracked dozer, front-end loader or Bobcat, 8 dump trucks (averaging 32.5 cy), sorbents	57.8	See notes 4-5	20	2,311
TF-3: R-2	3	Manual Recovery: shovels, brooms, snow blowers, 3 snow machines or Argos, front-end loader, dump truck	3.0	See notes 4, 6	20	180
Day 16 to 30: Oiled Snow Recovery (Post Blowout)						
TF-2: R-1, R-3	5	Mechanical Recovery: Rubber-tracked dozer, front-end loader or Bobcat, 8 dump trucks (averaging 32.5 cy), sorbents	57.8	See notes 4-5	20	5,778
TF-3: R-2	8	Manual Recovery: shovels, brooms, snow blowers, 3 snow machines or Argos, front-end loader, dump truck	3.0	See notes 4, 6	20	480
TF-4: R-5	5	Trimmer, Front-end loader, 2 dump trucks	8.9	See note 7	20	890

1. Mobilization completed on Day 1; limited recovery occurs in upwind locations established as safe working zones on Day 2.
2. Tactic R-6 liquid recovery rates are based on a distance of 70 road miles from the well to an approved facility for oil recovery or disposal. The time in transit, including load/unload time is 8 hours. The load time is calculated using an average pumping rate of 150 bbl/hr. The assumed travel speed is 35 mph. Tactic L-6 inventory lists 18 vacuum trucks available on the North Slope with a minimum of 300 bbl.
3. Tactics R-24 and L-6 consist of 3-inch to 4-inch 297 bbl/hr diaphragm pumps and hoses used to recover oil to Fastanks near the plume deposition area, with concurrent recovery and transportation of free liquids off site by vacuum trucks. The handling capacity is based on vacuum truck recovery rate during winter, including loading, offloading, and transit time as outlined in Tactic R-6.
4. Limited oiled snow recovery occurs between Days 2 and 15. By the end of Day 15, full access to the oiled-snow plumes allows full recovery.
5. Tactics R-1 and R-3 mechanical recovery rates are based on a distance of 70 road miles from the well to temporary storage area. Transit time includes loading, unloading, and time in transit round trip. A total of 4.85 hours transit time is required based on a speed of 35 mph, 0.17 hr load time, and 0.08 hr unload time. Approximately 161 dump trucks are available for North Slope response (Tactic L-6, Table 9A). The average volume of the Maxi-haul (43 units) and the Euclid B-70 (39 units) dump trucks is 32.5 cy.
6. Tactic R-2 recovery rate is based on one six-man crew recovering 30 cy in 10 hours.
7. A trimmer is capable of recovering 390 cy of ice per hour. [Reference: Coastal Frontiers Corp. 2001. *Spring Break-Up Equipment Access Test Program*, June 2001. Prepared for BP Exploration (Alaska), Inc., 21 pp.] One trimmer can supply 10 (20 cy) dump trucks per hour. The R-5 handling capacity calculation in this case is based on dump truck transit time of 4 hours and a 8.9 cy/hr handling rate.

Table 1-10
Point Thomson Oil (Brookian Formation) Well Blowout During Winter
Staff for Operation of Oil Recovery and Transfer Equipment

Containment and Recovery Operators	ACS Tactic	Day 1		Days 2-15		Days 16-18		Days 18-30		NOTES
		A Shift	B Shift	A Shift	B Shift	A Shift	B Shift	A Shift	B Shift	
Skilled Technicians										
TF-1	R-6	0	0	7	7	7	7	0	0	1 team leader per unit
TF-2	R-1, R-3	0	0	3	3	10	10	10	10	1 team leader per unit
TF-3	R-2, R-1A	0	0	5	5	10	10	10	10	1 team leader per unit
TF-4	R-5	0	0	0	0	5	5	5	5	1 team leader per unit
TF-5	R-24, R-6	0	0	6	6	6	6	6	6	1 team leader per unit
Subtotal		**0**	**0**	**21**	**21**	**38**	**38**	**31**	**31**	
Equipment Operators										
TF-1	R-6	0	0	8	8	8	8	0	0	Vacuum Trucks (2 staff per shift per truck)
	R-24, R-6	0	0	4	4	4	4	0	0	300 bbl Vacuum Trucks (2 staff per truck)
TF-2	R-1, R-3	0	0	16	16	40	40	40	40	Dump Trucks (8 trucks per TF-2 unit)
		0	0	3	3	5	5	5	5	Rubber Tracked Dozers
		0	0	3	3	5	5	5	5	Loaders
		0	0	3	3	10	10	10	10	Bobcats
TF-3	R-2, R-1A	0	0	5	5	10	10	10	10	Dump Trucks
		0	0	3	3	5	5	5	5	Loaders (shared)
		0	0	10	10	20	20	20	20	Argo or snow machine (2 per TF-3 unit)
TF-4	R-5	0	0	0	0	10	10	10	10	Dump Truck (2 trucks per TF-2 unit)
		0	0	0	0	5	5	5	5	Loader
		0	0	0	0	5	5	5	5	Trimmer
Sub-Total		**0**	**0**	**51**	**51**	**127**	**127**	**115**	**115**	Most personnel are transporting oiled snow. Transportation personnel do not stay overnight at well site.
General Technicians										
TF-1	R-24, R-6	0	0	18	18	18	18	0	0	Initial setup of hoses
TF-3	R-2, R-1A	0	0	30	30	60	60	60	60	Shovel and broom recovery personnel (6 per unit)
Sub-Total		**0**	**0**	**48**	**48**	**78**	**78**	**60**	**60**	
Total		**0**	**0**	**124**	**124**	**243**	**243**	**206**	**206**	

Table 1-11
Point Thomson Oil (Brookian Formation) Well Blowout During Winter
Oil Recovery and Transfer Equipment

Containment and Recovery Equipment	Task Force	ACS Tactic	Number of Equipment		Notes
			Days 2-15	Days 16-30	
Dump Trucks					
	TF-2	R-1, R-3	16	40	8 per unit
	TF-3	R-1A, R-2	5	10	1 per unit
	TF-4	R-5	-	10	2 per unit
		Subtotal:	**21**	**60**	
Front-End Loaders					
	TF-2	R-1, R-3	3	5	1 per unit, (shared)
	TF-3	R-1A, R-2	5	5	0.5 per unit (shared)
	TF-4	R-5	-	5	1 per unit
		Subtotal:	**8**	**15**	
Rubber-Tracked Dozers*					
	TF-2	R-1, R-3	3	5	Shared
Snow Machines and Argos					
	TF-1	R-24	4	4	2 per unit
	TF-3	R-1A, R-2	10	20	2 per unit
		Subtotal:	**14**	**24**	
Snow Blowers					
	TF-3	R-1A, R-2	5	15	1 per unit
Bobcats**					
	TF-2	R-1, R-3	3	20	1 per unit
Backhoes					
	TF-4	R-5	-	3	1 per unit
Super Suckers					
	TF-4	R-5	-	2	1 per unit
Trimmers					
	TF-4	R-5	-	5	1 per unit
Vacuum Trucks***					
	TF-1	R-6	10	10	Units emptying Fastanks are shared.

* 5 Rubber-tracked dozers (with blades) and 5 loaders are shared amongst the 10 TF-2 teams.
** Bobcats are needed for hard-to-reach areas.
*** Approximately 161 dump trucks are available for North Slope response (Tactic L-6, Table 9A). The average volume of the Maxi-haul (21 units) and the Euclid B-70 (39 units) dump trucks is 40 cy; calculations are based on capacities of 35 cy.

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SCENARIO 2
DIESEL TANK RUPTURE DURING WINTER

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Table 1-12
Scenario Conditions
Diesel Tank Rupture During Winter

PARAMETER	PARAMETER CONDITIONS
Spill Location	Diesel storage tank, ExxonMobil Point Thomson Central Pad
Date	Winter
Duration	Instantaneous
Type of Spill	Catastrophic tank rupture
Quantity of Oil Spilled	Total tank volume 4,900 bbl Retained in secondary containment (60%) - 2,940 bbl Credit for impervious containment under tank (25%) 490 bbl RPS volume [18 AAC 75.432(d)(4)] 1,470 bbl
Oil Type	Arctic diesel containing red or pink dye
Wind Direction and Speed	Predominant winter winds in the area are ENE, E, SW and WSW. The average wind speed is 12.4 knots. Wind data are derived from the MMS meteorological station at Badami. The data were collected during winter months (November 1 through April 30) from 2001 to 2006.
Current	Not applicable
Air Temperature	-22 °F Temperature data are derived from the MMS meteorological station at Badami. The data were collected during winter months (November 1 through April 30) from 2001 to 2006.
Surface & Trajectory	The Central Pad surface consists of rig matting boards placed over insulating mats and gravel. It is assumed that little infiltration below the matting boards occurs due to snow/ice sealing the cracks or spaces between matting boards. The tank is located within a lined secondary containment area. Although it is unlikely a catastrophic failure and full release of the shop-fabricated tank would occur, for purposes of scenario planning, it is assumed that a sudden release occurs and approximately 1,470 barrels escapes the containment, and flows onto the pad and frozen, snow-covered tundra (see Figure 1-6).

Table 1-13
Response Strategy
Diesel Tank Rupture During Winter

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS TECHNICAL MANUAL TACTIC
(i) Stopping Discharge at Source	The entire contents of the tank are lost and 1,470 barrels escapes secondary containment. The immediate objective is to stabilize the weakened area of the containment area and prevent the further escape of oil. The IMT is activated. All notifications to personnel and agencies are made.	Not applicable
(ii) Preventing or Controlling Fire Hazards	The personnel immediately shut down nearby ignition sources. The On-Site SHE Lead is on the scene with equipment and personnel to suppress the threat of an explosion. Throughout the first few hours of the spill, the On-Site SHE Lead verifies that sources of ignition are shut down or removed from the area. The On-Site SHE Lead provides access zone information and determines PPE requirements. Access to the spill site is controlled by security. Monitoring protocol is established by the On-Site SHE Lead for work areas to ensure personnel protection.	S-1 through S-6
(iv) Surveillance and Tracking of Oil	The extent of the diesel is marked on the snow and ice so it can be found if subsequent snowfall or drifting covers the spill. The dye in the diesel aids in detection.	T-1
(v) Protection of Sensitive Resources	The diesel that spreads off pad is absorbed into the snow. No open water is present. The ACS *Technical Manual* is consulted to determine shoreline sensitivities and priority protection sites. No priority protection sites lie in the spill trajectory. The area is monitored for wildlife that may be at risk from the spill.	ACS Atlas Map 103 W-6
(vi) Spill Containment and Control Actions	The On-Site SHE Lead determines PPE requirements and safety procedures. Work zones and decontamination zones are established. Access to the spill site is carefully controlled and the scene is secured by Security. A staging area and field command post are set up on the Central Well Pad. **Task Force 1 (TF-1): Containment** In order to contain diesel that was released from the tank, snow containment berms are built around the perimeter of the release. Within 2 hours, portions of the pad and adjacent frozen, snow-covered tundra are enclosed within the berm. The berm is shored up on an ongoing basis, as needed. Visqueen and sorbent booms are used to contain runoff. Sorbent booms are also placed around the edge of the pad to contain any diesel that may have infiltrated below the rig matting boards.	S-1 through S-4 C-1
(vii) Spill Recovery Procedures	**Task Force 2 (TF-2): Liquid Recovery** By Hour 3.5, a vacuum truck begins recovery of released diesel by direct suction. The vacuum truck can effectively recover released diesel within 400 feet of the truck. In order to enhance liquid recovery, select rig mats are removed and sumps are excavated. **Task Force 3 (TF-3): Oiled Snow Recovery** On pad, diesel is retained by snow berms. A loader and backhoe mechanically remove oiled snow. A Bobcat is used for hard-to-reach areas. Lightly oiled snow is mixed with heavily oiled snow as necessary. Four lined dump trucks (per tactical unit) transport the snow to a stockpile in a temporary lined containment area in Deadhorse or Prudhoe Bay. Off pad, diesel is retained by snow-covered tundra and frozen ponds. A Bobcat with trimmer attachment mechanically removes diesel-contaminated snow on the tundra and ponds. A lined dump truck transports the gravel to a stockpile in an interim lined containment area in Deadhorse or Prudhoe Bay.	R-6 R-1, R-3

**Table 1-13 (Continued)
Response Strategy
Diesel Tank Rupture During Winter**

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS TECHNICAL MANUAL TACTIC
(vii) Spill Recovery Procedures (continued)	**Task Force 4 (TF-4): Oiled Gravel Recovery** After the oiled snow is removed and the surface structures have been cleaned, the rig mats are selectively removed and oil-contaminated gravel is excavated by a trimmer and backhoe. Loaders place gravel in lined dump trucks that haul it to Deadhorse or Prudhoe Bay. The TF-4 handling capacity calculation in this case is based on dump truck transit time. After the diesel-impacted material is removed, grid sampling is conducted.	R-5, R-26
(viii) Lightering Procedures	A vacuum truck from TF-2 recovers remaining oil from tank and secondary containment.	R-27
(ix) Transfer and Storage of Recovered Oil/Water; Volume-Estimating Procedure	Recovered diesel is hauled by vacuum truck to Prudhoe Bay for processing and reuse. Diesel-contaminated snow is stored in lined temporary snow containment areas located in Deadhorse or Prudhoe Bay. As snow melts, recovered diesel is reused or disposed of at local facilities (if not hazardous). Any liquids determined to be hazardous are drummed and shipped to approved facilities for ultimate disposal. Stored liquids are sampled to determine oil content, gauged with ullage tape, manifested, and logged with the assistance of the Waste Management Team.	D-1 D-2
(x) Plans, Procedures, and Locations for Temporary Storage and Disposal	Temporary storage facilities are located in Deadhorse or Prudhoe Bay for contaminated snow, ice, gravel, and oily wastes. Diesel liquids are recycled and manifested. Diesel-contaminated snow is stored in lined temporary snow containment areas located in Deadhorse or Prudhoe Bay. As snow melts, recovered diesel is reused or disposed of at local facilities (if not hazardous). Any liquids determined to be hazardous are drummed and shipped to approved facilities for ultimate disposal. Non-liquid oily wastes are classified and disposed according to classification. Non-oily wastes are classified and disposed accordingly. Diesel-contaminated gravel is excavated and stockpiled in Deadhorse or Prudhoe Bay. The diesel is treated by injection or thermal remediation as approved by ADEC.	D-1 D-5 D-2 D-3 D-4
(xi) Wildlife Protection Plan	The wildlife protection strategy is submitted to Unified Command. Polar bear monitors are mobilized to the site. Hazing is employed as necessary. The Wildlife Stabilization Center in Deadhorse is put on standby. No oiled animals are encountered.	W-1 W-2B W-5
(xii) Shoreline and Tundra Cleanup	Not Applicable.	

Figure 1-6
Point Thomson Diesel Tank
Rupture During Winter

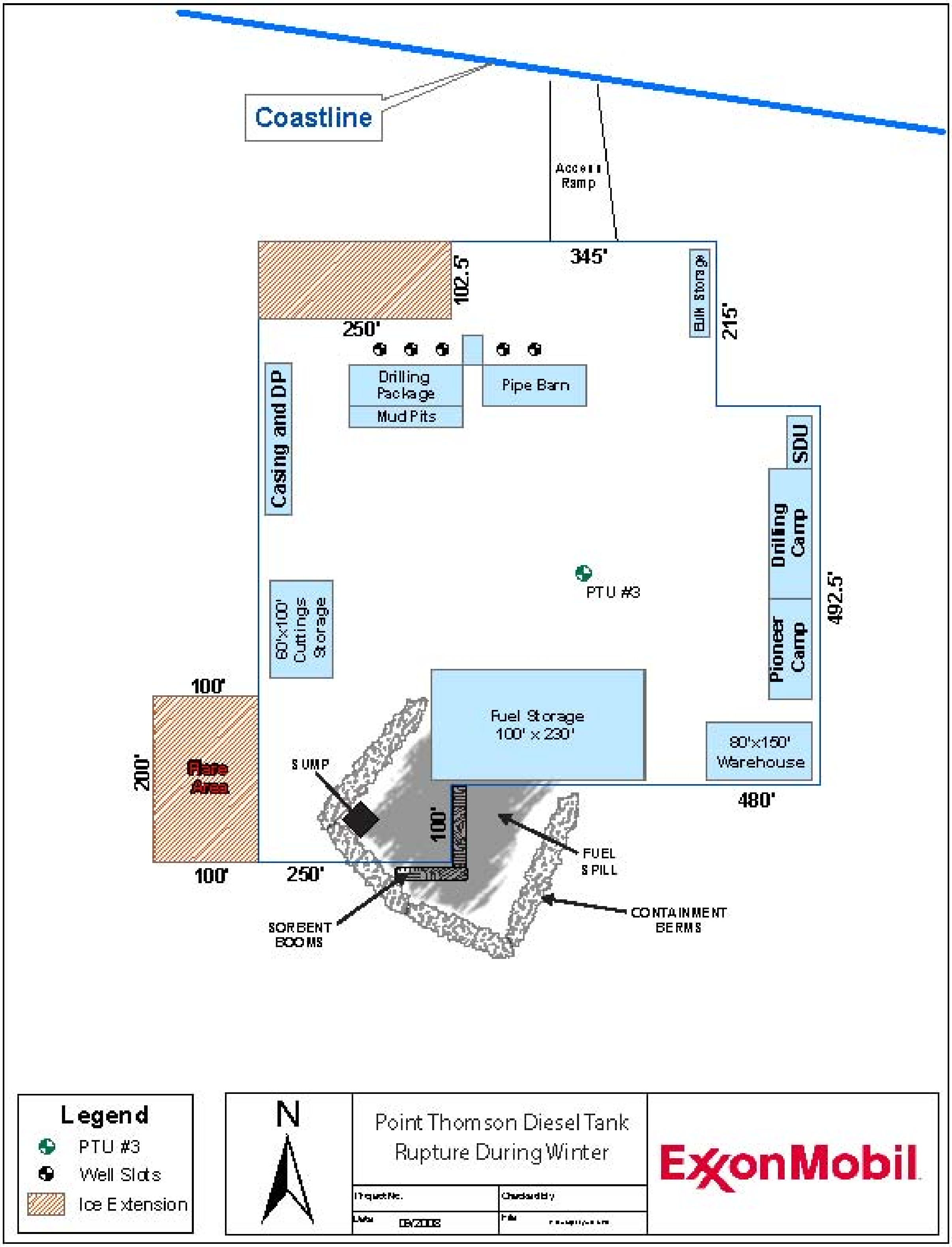

Table 1-14
Winter Oil Recovery Capacity

A	B	C	D	E	F	G
TASK FORCE / SPILL RECOVERY TACTIC	**NUMBER OF SYSTEMS**	**RECOVERY SYSTEM**	**DERATED OIL RECOVERY RATE (boph or cy/hr)**	**MOBILIZATION, TRANSIT, AND DEPLOYMENT TIME TO SITE[1] (hours)**	**OPERATING TIME (hours per day)**	**DAILY OIL RECOVERY CAPACITY (bopd or cy/hr) (B x D x F)**
TF-2 Liquid Recovery: R-6	3	Vacuum Truck[2]	37.5	3.5	20	2,250
TF-3 Oiled Snow Recovery: R-3, R-26	2	Bobcat, Front-end Loader, and four 35-yard Dump Trucks[3]	30.4	3.5	20	1,215
TF-4 Oiled Gravel Recovery: R-5	1	Bobcat, Front-end Loader, and four 35-yard Dump Trucks[3]	30.4	3	20	607

1. Time values taken from the ACS *Technical Manual* includes 1 hr mobilization time, 2 hours travel time, and 0.5 hours deploy time.
2. Vacuum Trucks operate 20 hours per day. The trucks recover diesel on site and transport it to Prudhoe Bay for processing. The recovery rates are based on 70 miles travel (each way), 150 boph pumping rate, and a travel speed of 35 miles per hour.
3. Each dump truck travels 70 miles to unload contaminated snow and gravel and 70 miles to reload. Thirty-five yard construction dumps are used. Each truck has an oil recovery rate of 7.6 cy/hr .

Table 1-15
Major Equipment for Recovery and Transfer

TACTIC	NO. TACTICAL UNITS	EQUIPMENT PER TACTICAL UNIT	TOTAL QUANTITY
TF-1: C-1	1	Front-end Loader	1
TF-2: R-6	3	Vacuum Truck	3
TF-3: R-3, R-26	2	Front-end Loader	1
		Bobcat	1
		Dump Trucks (4)	8
TF-4: R-5	1	Bobcat	1
		Trimmer	1
		Front-end Loader (shared with R-26)	1
		Dump Trucks (4)	4

Table 1-16
Staffing to Operate Oil Recovery and Transfer Equipment

LABOR CATEGORY	TACTIC	NO. TACTICAL UNITS	NO. STAFF PER UNIT	NO. STAFF PER SHIFT[1]
Team Lead	TF-1: C-1	1	1	1
	TF-2: R-6	2	1	2
	TF-3: R-3	1	1	1
	TF-4: R-5	1	1	1
Skilled Technician	TF-2: R-6	2	1	2
	TF-3: R-3	2	2	2
	TF-4: R-5	1	2	2
Equipment Operator	TF-1: C-1	1	1	1
	TF-2: R-6	3	2	6
	TF-3: R-3, R-26	2	5	10
	TF-4: R-5	2	5	10
Total	-	-	-	38

[1] The staffing schedule is shown in the column for number of staff per period. Number of staff recovering oil becomes zero after Hour 72.

SCENARIO 3
DIESEL TANK RUPTURE DURING SUMMER

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Table 1-17
Scenario Conditions
Diesel Tank Rupture During Summer

PARAMETER	PARAMETER CONDITIONS
Spill Location	Diesel storage tank, ExxonMobil Point Thomson Central Pad.
Date	August For the purposes of this scenario, the tank rupture occurs while drilling operations are inactive.
Duration	Instantaneous
Quantity of Oil Spilled	Total tank volume 4,900 bbl Retained in secondary containment (60%) 2,940 bbl Credit for impervious containment under tank (25%) 490 bbl RPS volume [18 AAC 75.432 (d)(4)] 1,470 bbl
Oil Type	Arctic diesel containing red or pink dye.
Wind Direction and Speed	Predominant summer winds in the area are East-northeast. The average wind speed is 10 knots. Wind data are derived from the MMS meteorological station at Badami. The weather data presented are the summer averages from 2001 through 2005.
Current	Not applicable
Air Temperature	47 ºF
Surface & Trajectory	The Central Pad surface consists of rig matting boards placed over insulating mats and gravel. Some infiltration below the matting boards can be expected due to the cracks or spaces between matting boards. The tank is located within a lined secondary containment area. Although it is unlikely a catastrophic failure and full release of the shop-fabricated tanks would occur, for purposes of scenario planning, it is assumed that a sudden release occurs and approximately 1,470 barrels escapes the containment, and flows onto the pad and surrounding tundra (see Figure 1-7).

Table 1-18
Response Strategy
Diesel Tank Rupture During Summer

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS TECHNICAL MANUAL TACTIC
(i) Stopping Discharge at Source	The entire contents of the tank are lost and 1,470 barrels escapes secondary containment. By Hour 1, the on-site crew begins stabilizing the weakened area of the dike with gravel or sacks of drilling mud materials to prevent further escapement of diesel from the containment area. The IMT is activated. All notifications to personnel and agencies are made. By Hour 4, additional personnel are mobilized from Deadhorse.	Not applicable
(ii) Preventing or Controlling Fire Hazards	The on-site personnel immediately shut down nearby ignition sources. When the SHE Lead is on scene, he/she will have equipment and personnel to suppress the threat of an explosion. Throughout the first few hours of the spill, the SHE Lead verifies that sources of ignition are shut down or removed from the area. The On-Site SHE Lead provides access zone information and determines PPE requirements. Access to the spill site is controlled and the scene is secured by the Site Safety Officer. Monitoring protocol is established by the Site Safety Officer for work areas to ensure personnel protection.	S-1 through S-6
(iv) Surveillance and Tracking of Oil; Forecasting Shoreline Contact Points	Once safety zones and a decontamination unit have been set up by Hour 6, the oiled area is delineated.	T-1, T-2 T-4, T-7
(v) Protection of Environmentally Sensitive Areas and Areas of Public Concern	The ACS *Technical Manual* is consulted to determine shoreline sensitivities and priority protection sites. No priority protection sites lie in the spill trajectory. The area is monitored for wildlife that may be at risk from the spill.	ACS Atlas Map 103 W-6
(vi) Spill Containment and Control Actions	**Task Force 1 (TF-1): Containment** By the end of Hour 1, the area is stabilized as described above and response teams are notified and activated. By Hour 2, on-site personnel deploy sorbent boom and excavate small (four by four feet) sumps on the pad to intercept oil. Sorbent boom is also deployed along the edge of the rig matting boards adjacent to the tundra to intercept oil. By Hour 4, additional response personnel arrive on scene by helicopter. Application for permits and documentation of spill volume estimates are undertaken by Hour 6. By Hour 6, the staging and decontamination area is set up. By Hour 7, response personnel place additional shoreseal boom and sandbags on the oiled perimeter of the pad and shoreseal boom on the tundra to deflect and contain oil. Concurrent with containment operations, crews construct a lined containment area to store oiled gravel. The lined containment would most likely be constructed on top of the cuttings waste storage cell.	A-1, A-2, Volume 3 IMS, B-1 C-4 L-2
(vii) Spill Recovery Procedures	**Task Force 2 (TF-2): Liquid Recovery (Initial)** By Hour 3, response personnel set up trash pumps and hoses (which are stored on site). Liquids collecting in sumps (on pad) or naturally occurring depressions (off pad) are pumped into empty storage bladders or tanks. There is enough empty on-site storage to contain the entire 1,470 bbls that escapes secondary containment.	R-24

Table 1-18 (Continued)
Response Strategy
Diesel Tank Rupture During Summer

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS TECHNICAL MANUAL TACTIC
(vii) Spill Recovery Procedures (continued)	**Task Force 3 (TF-3): Liquid Recovery (Secondary)** By Hour 7, additional personnel and equipment are deployed. The liquid recovery rate is significantly increased with the addition of 4-inch trash pumps and hoses. **Task Force 4 (TF-4): Oiled Gravel Recovery** After released liquids are recovered and transferred to storage containers, oil-contaminated gravel is removed by a front-end loader. The oiled gravel is placed in lined containment cells located on pad. The R-26 handling capacity is based on excavation and transit time. TF-4 targets a maximum recovery of 372 cy per day of oiled gravel. The task force recovery rates are detailed in Table 1-19, while major recovery equipment and oil recovery staffing are shown in Table 1-20 and Table 1-21. Recovery operations simulated in this scenario meet the full RPS volume. The released oil is recovered as free liquid and oiled gravel.	R-24 R-26
(viii) Lightering Procedures	Oil remaining in the ruptured tank and secondary containment is lightered to empty bladders or tanks by pumps and hoses in a series.	R-27
(ix) Transfer and Storage of Recovered Oil/Water; Volume-Estimating Procedure	By Hour 8, response personnel begin recovering fluids directly from the tundra and pad depressions. Oily sorbents are deployed and retrieved as necessary. Diesel volume in solids is estimated with grab samples.	D-1
(x) Plans, Procedures, and Locations for Temporary Storage and Disposal	Temporary storage facilities are established on site. Recovered liquids will be stored in empty bladders or tanks until they can be hauled to an approved disposal site in winter or processed for on site use. Recovered diesel suitable for drilling freeze-protection is stored on site for later use. Unsuitable diesel that tests hazardous is drummed, stored, and then shipped to an EPA-approved facility. Non-hazardous diesel unsuitable for freeze-protection is hauled to an approved disposal site. • Non-liquid oily wastes are classified and disposed according to classification. • Non-oily wastes are classified and disposed accordingly. • Diesel-contaminated gravel is excavated and stockpiled in lined temporary storage located on the pad.	D-1 D-2 D-4
(xi) Wildlife Protection Plan	Immediate response activities include the preparation of wildlife deterrent systems. A Wildlife Task Force is on scene by Hour 6 and excludes birds and mammals from entering oiled areas, monitors the oil trajectory area, and prepares to capture oiled animals. The Task Force operates on foot Days 1 through 10. The wildlife stabilization and treatment center at Deadhorse is made operational and staffed by International Bird Rescue & Research Center staff by Hour 24. No oiled animals are encountered.	W-1 through W-6
(xii) Shoreline and Tundra Cleanup	Tundra and gravel areas are cleaned over 30 days to the satisfaction of ADEC. Monitoring programs established for these areas.	R-9 and R-26

Figure 1-7
Point Thomson Diesel Tank
Rupture During Summer

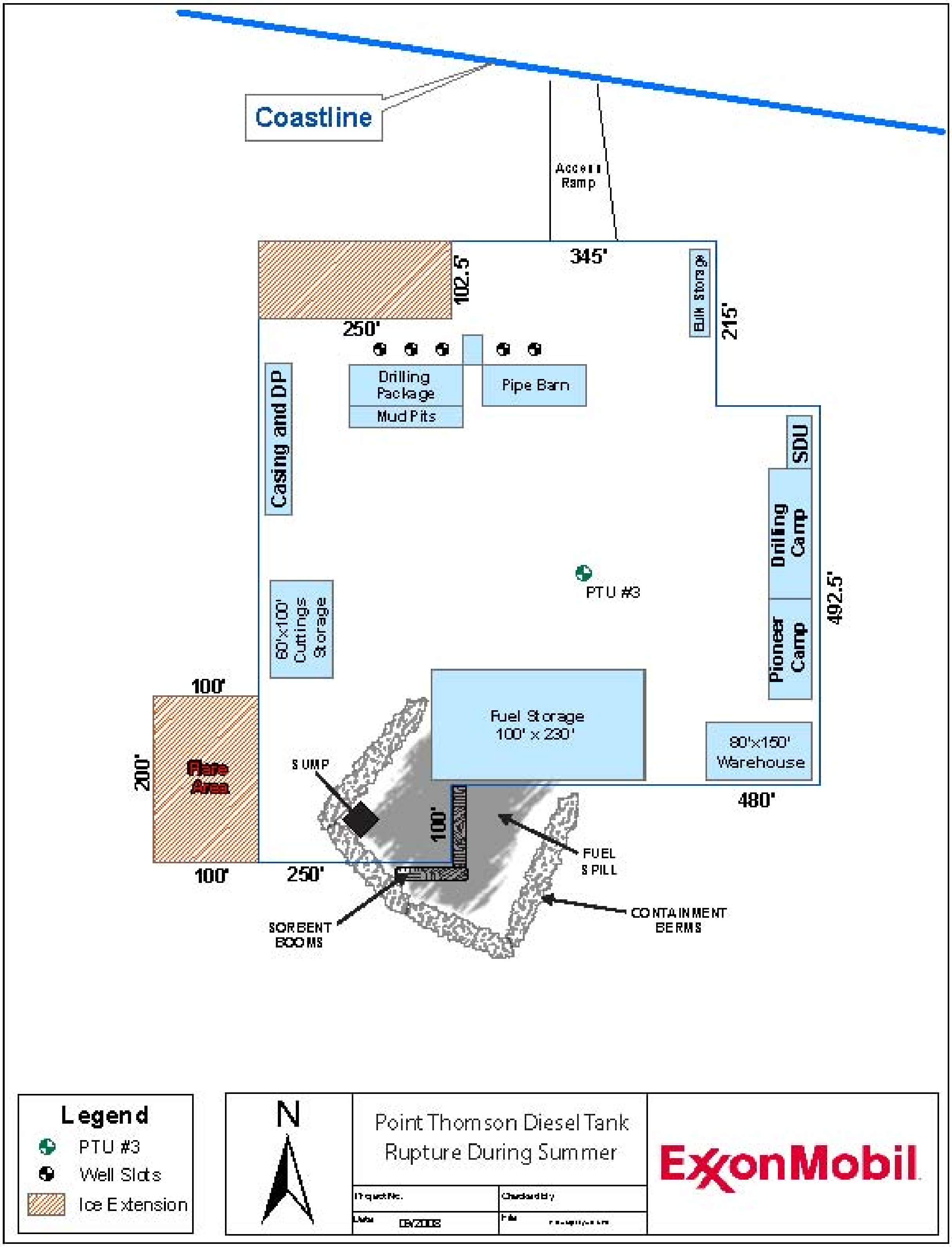

Table 1-19
Diesel Tank Rupture Oil Recovery Capability

A	B	C	D	E	F	G
TASK FORCE / SPILL RECOVERY TACTIC	**NUMBER OF SYSTEMS**	**RECOVERY SYSTEM**	**DERATED OIL RECOVERY RATE (boph)**	**MOBILIZATION, TRANSIT, AND DEPLOYMENT TIME TO SITE[1] (hours)**	**OPERATING TIME (hours in a 24-hour shift)**	**DAILY DERATED OIL RECOVERY CAPACITY (bopd) (B x D x F)**
TF-2 Liquid Recovery: R-24	1	3-inch diaphragm pump (diesel) and hoses	143	3	20	2,857
TF-2 Liquid Recovery: R-24	1	2-inch trash pump (diesel) and hoses	314	3	20	6,286
TF-3 Liquid Recovery: R-24	2	Trash Pump with 4-inch Discharge Hose[2] and Manta Ray Skimmer	690	7	20	27,600
TF-4 Oiled Gravel Recovery: R-26	1	Front-End Loader	18.6 cy/hour[2]	1.5	20	372 cy/day

1. Time values taken from the ACS *Technical Manual,* Tactics R-6 and R-26. Includes 1 hr mobilization time, and 0.5 hr deploy time.
2. Loader recovery calculation: Tc/(Lt+Tt+Ut)=3 cy/[0.08 hour + (0.005 * 2 trips/10 mph) + 0.08 hour] = 18.6 cy/hour, where,
   Tc = Loader Capacity = 3 cy
   Lt = Load Time = 0.08 hour
   Tt = Travel Time = 0.005 mile from spill site to temporary disposal site at 10 mph
   Ut = Unload Time = 0.08 hour

Table 1-20
Major Oil Recovery Equipment Equivalents

RECOVERY TACTIC	NO. TACTICAL UNITS	EQUIPMENT PER TACTICAL UNIT	TOTAL QUANTITY
TF-2: R-24	2	3-inch Diaphragm Pump (diesel)	1
		2-inch Trash Pump (diesel)	1
		Suction and Discharge Hose	260 feet
TF-3: R-24	2	4-inch Trash Pump (diesel)	2
		Suction and Discharge Hose	260 feet
TF-4: R-26	1	Front-End Loader	1

Table 1-21
Staffing to Operate Oil Recovery Equipment

LABOR CATEGORY	TACTIC	NO. STAFF PER SHIFT
Team Lead	TF-1: C-1	1
	TF-2: R-24	1
	TF-3: R-24	1
	TF-4: R-26	1
Equipment Operator / Technician	TF-1: C-1	1
	TF-2: R-24	1
	TF-3: R-24	10
	TF-4: R-26	4
Total	-	20

RESPONSE STRATEGY 1

POINT THOMSON GAS CONDENSATE BLOWOUT DURING WINTER

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RESPONSE STRATEGY PARAMETERS

The following response strategy describes methods and equipment that could be used in response to a hypothetical gas condensate blowout of a Point Thomson well.

For the purposes of this strategy, ExxonMobil's Central Pad experiences a gas condensate blowout on March 1. This response strategy takes place during the winter drilling season and assumes that the Beaufort Sea and nearby lakes are frozen.

ExxonMobil's drilling efforts at Point Thomson are designed to delineate and develop the Thomson Sand reservoir and other hydrocarbon reservoirs at Point Thomson. Scenario 1 presents a simulated blowout with the highest projected RPS volume, which is a blowout in the Brookian reservoir. Section 5.1.1 provides the RPS volume calculations used in Scenario 1. A Thomson Sand gas condensate well has the potential to discharge a greater volume of liquid hydrocarbons than the exploration facility RPS volume in 18 AAC 75.434(b); however, ExxonMobil's strategy of voluntary wellhead ignition, as provided for in this section, greatly reduces the amount of oil spilled and resources needed for a response. Section 3.11.4 discusses the reduced volume in greater detail.

The following strategy presents a situation when both the Brookian and underlying Thomson Sand reservoirs are open to the wellbore. In this simulation, the higher-pressure Thomson Sand formation would overwhelm the Brookian formation and a gas condensate blowout event would occur. Reservoir analyses indicate that approximately 27,000 bopd of liquid gas condensate with a GOR of 12,828 would flow from the well. The response strategy references voluntary ignition for the following reasons:

- The characteristics of the gas condensate meet the GOR and API gravity requirements described in 18 AAC 75.434(g);
- The combustion efficiency will be greater than 90 percent;
- Modeling shows that the ambient air quality standards for PM-10 (particulate matter 10 microns in diameter) will be met; and
- Well control experts will require the well be ignited to prevent condensate pools before attempting surface control of the well.

A discussion of the reservoir, the composition of the gas condensate and modeling efforts undertaken to evaluate plume dispersion, condensate deposition, and effect on ambient air quality is presented in Section 3.11 of this ODPCP.

Table 1-22
Point Thomson Gas Condensate Blowout During Winter Response Strategy

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS TECHNICAL MANUAL TACTIC
(i) Stopping Discharge at Source	The Drilling Supervisor notifies the Drilling Operations Superintendent. The Lead On-Site ExxonMobil Supervisor takes the role of the Initial Incident Commander, until relieved by the Operations Technical Manager or Operations Manager. Efforts are made by the drilling organization to bring the well under control while the Initial Incident Commander oversees containment and recovery operations. Once it has been determined that control of the well cannot be immediately regained, or the safety of personnel is at risk, personnel are evacuated to pre-designated safe areas with adequate shelter, survival equipment, and communication equipment per the *Blowout Contingency Plan*. The Incident Management Team is activated. A well control contractor is dispatched within 12 hours. The well control specialists attempt to stop the blowout by means of surface mechanisms. Surface intervention methods control the blowout on Day 15. The scenario assumes that the blowout is voluntarily ignited on Day 1, Hour 2. The effect of the ignition on operations is to (1) increase safety by removing toxic and flammable gases, and pooling of oil/condensate and (2) decrease pollution of the frozen land and water surface.	A-1 A-2 Volume 3 IMS Section 1.9 of this plan
(ii) Preventing or Controlling Fire Hazards	The On-Site SHE Lead , at the direction of the Incident Commander, establishes access zones and routes and firefighting operations to protect assets and workers. The On-Site SHE Lead determines PPE requirements and provides hot and warm zone access information. Access to the spill site is carefully controlled and the scene is secured by Security. Monitoring protocol is established by the On-Site SHE Lead at work areas for personnel protection. The monitoring protocol establishes safety zones according to applicable OSHA and fire hazard standards. Containment and recovery operations are allowed without respiratory protection in areas where safety criteria are met. Recovery operations and oil field operations and traffic are not allowed downwind of the blowout in areas where cleanup workers may become exposed to flash fire hazard or oil particulate matter at concentrations in excess of permissible exposure limits.	S-1 through S-6
(iv) Surveillance and Tracking of Oil; Forecasting Shoreline Contact Points	The extent of condensate on the snow is delineated beginning on Day 1 so it can be found if subsequent snowfall or blowing snow covers the spill. The delineation team will use Tucker snowcat and snow machines for ground transportation. Condensate falling to the stable sea ice is expected to stay in place.	T-1, T-4A, T-7
(v) Protection of Sensitive Resources	The ACS *Technical Manual* Map Atlas is consulted to determine shoreline sensitivities and priority protection sites. No priority protection sites lie within the spill trajectory.	Volume 2 Map Atlas Map Sheet 103 & 104
(vi) Spill Containment and Control Actions	**Days 1 through 15:** The On-Site SHE Lead determines PPE requirements and safety procedures. Work zones and decontamination zones are established. Access to the spill site is carefully controlled and the scene is secured by Security. **Containment Task Force 1:** Snow containment berms and trenches are built around the perimeter of the pad, at a safe distance away from the trajectory plume to reduce the spread of oil as much as possible. The berms are raised and/or shored up on an ongoing basis, as needed. The trenches are maintained throughout the response and are used in recovery operations.	S-1 through S-4 C-1, C-11, C-12

Table 1-22 (Continued)
Point Thomson Gas Condensate Blowout During Winter
Response Strategy

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS TECHNICAL MANUAL TACTIC
(vi) Spill Containment and Control Actions (Continued)	After well ignition at Hour 2, the total volume of condensate falling to the frozen ground and ice surface is reduced to less than 14 barrels per day. This condensate falls to the ground and is absorbed by snow and ice. No additional containment is required.	
(vii) Spill Recovery Procedures	**Day 1:** Task Force 1: On the pad, vacuum trucks remove liquid condensate by direct suction. Where it is safe to do so, remaining condensate is mixed with snow with a loader. The mixture is temporarily stored in a lined containment area. **Days 2 Through 15:** Task Forces focus on recovering condensate that previously fell to the west of the well during the first 2 hours of Day 1. Recovery of contaminated snow covering creek and lake environments is addressed first. • Task Force 1 (TF-1) recovers oiled snow from safe areas extending out approximately 1 mile. Task Force 2 (TF-2) mobilizes on Day 3 after completion of the ice road. Two dump trucks are mobilized to Point Thomson from Prudhoe Bay by Rolligon. The dump trucks are deployed on Day 1, Hour 2, and arrive at Point Thomson on Day 3. • TF-2 manually recovers lightly misted snow extending from approximately 1 mile west of the well to 3 miles west of the well. TF-2 consists of two recovery teams that transport recovered snow by snow machine to the constructed ice road where the snow is loaded into dump trucks. The objective of TF-2 is to manually recover, as practicable, the lightly misted condensate. The Unified Command determines it is not practical to recover condensate beyond 3 miles without damage to the ground surface.	R-3, R-6 R-6 (2) R-2, R-1, R-1A (2)
(viii) Lightering Procedures	Not applicable.	Not applicable.
(ix) Transfer and Storage of Recovered Oil/Water; Volume-Estimating Procedure	Oiled snow is loaded into lined dump trucks for transport to containment cells located at the Duck Island Gravel Mine. Liquid levels in snow storage areas are monitored by operations personnel. As oiled snow melts in the containment cells later in the spring, oily liquids are hauled to an approved facility for recycling by vacuum truck. Recovered liquid oil is transported via vacuum truck directly to an approved facility for oil recovery. Stored liquids are sampled to determine oil content, gauged with ullage tape, manifested, and logged with the assistance of the Waste Management Team.	D-5 D-1
(x) Plans, Procedures, and Locations for Temporary Storage and Disposal	Temporary storage facilities are established on the pad for interim storage of contaminated snow, ice, and oily wastes as necessary. • Contaminated snow is hauled to the off-site, lined storage cell for melting and processing. The oiled snow is allowed to melt in the spring. Liquids are pumped off and transported to a processing facility. • Non-liquid oily wastes are classified and disposed of according to classification. • Non-oily wastes are classified and disposed of accordingly. • Oiled gravel is excavated and treated under a contaminated soil and stockpiled under a treatment plan approved by ADEC. • Condensate liquids are hauled to the storage impoundment in Prudhoe Bay for further processing on a non-emergency basis.	D-1 D-5 D-2 D-3 D-4
(xi) Wildlife Protection Plan	The wildlife protection strategy is submitted to Unified Command. Polar bear monitors are mobilized to the site. Hazing is employed as necessary. The Wildlife Stabilization Center in Deadhorse is put on standby. No oiled animals are encountered.	W-1 W-2B W-5

Table 1-22 (Continued)
Point Thomson Gas Condensate Blowout During Winter
Response Strategy

ADEC REQUIREMENT	RESPONSE STRATEGY	ACS TECHNICAL MANUAL TACTIC
(xii) Shoreline Cleanup Plan	A shoreline monitoring and cleanup plan is submitted to Unified Command before break-up in case oiled shorelines are discovered after break-up. At break-up, SCAT monitors the tundra and adjacent shorelines for oiling according to the plan and find none. On-shore and pad-oiled areas are cleaned up to ADEC's satisfaction by Day 30 – the shortest possible time consistent with minimizing damage to the environment.	SH-1

1.7 NON-MECHANICAL RESPONSE OPTIONS [18 AAC 75.425(e)(1)(G)]

ExxonMobil will mechanically contain and clean up oil spills to the maximum extent practicable. ExxonMobil will request approval for in situ burning from the FOSC and State On-Scene Coordinator (SOSC) when mechanical response methods prove ineffective or when in situ burning can be used as a tool to minimize environmental damage. The term in situ burning applies to burning oil that has reached surfaces and excludes ignition of blowout oil plumes and burning of collected waste oil. Guidelines for in situ burning are detailed in the *ACS Technical Manual,* Volume 1, "B" tactics.

1.7.1 Obtaining Permits and Approvals

Burning will not occur without approval of state and federal agencies. The ExxonMobil Incident Commander will discuss the option of in situ burning with the FOSC and the SOSC. ExxonMobil and ACS will follow the Alaska Regional Response Team (ARRT) *In Situ Burning Guidelines for Alaska* and complete the "Application for In Situ Burning."

1.7.2 Decision Criteria for Use

In situ burning of spilled oil would be considered under conditions such as the following:

- Mechanical recovery is impractical or ineffective,
- Shorelines are threatened,
- Burning would augment the oil elimination capacity of mechanical recovery,
- Present and forecast wind conditions will carry the smoke plume away from populated areas, or
- A successful test burn has been conducted.

1.7.3 Implementation Procedures

If the Incident Commander decides to use in situ burning and obtains the necessary authorization, ACS would carry out the response. See *ACS Technical Manual,* Volume 1, "B" tactics for a description of implementation and equipment.

1.7.4 Required Equipment and Personnel

ACS maintains the equipment and personnel for in situ burning.

1.8 FACILITY DIAGRAMS [18 AAC 75.425(e)(1)(H)]

Diagrams of the Point Thomson facility are provided in Part 3 of this ODPCP and in the ACS *Technical Manual,* Volume 2, Map Atlas, Sheets 103 and 104.

1.9 WELL BLOWOUT CONTROL [18 AAC 75.425(e)(1)(I)]

As described in Part 5, the RPS volume for Point Thomson is based on the maximum anticipated flow rate that would result from an unconstrained oil well blowout from the Brookian formation. This type of an event would be extremely rare and, while not impossible, would be highly unlikely to occur. In addition, if a Brookian oil well blowout were to occur, there are numerous factors that would likely limit the actual flow rate to something less than that used for the RPS volume. ADEC regulations (18 AAC 75.434) require, however, that the RPS volume for an exploration or production facility be based on the potential flow rate from a well at that facility and, as described in Part 5, the Point Thomson RPS volume was set equal to the maximum anticipated flow rate from a Brookian well.

ExxonMobil employs state-of-the-art drilling practices and procedures that minimize the potential for a loss of well control. Section 2.1.2 outlines the preventive and recovery measures used to minimize the potential for loss of well control and associated spill potential during drilling operations. If an uncontrolled flow occurs at the surface, procedures would be employed to protect personnel, stop the spill, protect the environment, and protect the equipment. ExxonMobil well control and emergency response procedures are provided in ExxonMobil's well control blowout contingency plan.

If well control is lost and there is an uncontrolled flow from the wellbore at the surface, detailed plans will be made to regain control. A thorough evaluation of the situation is necessary to determine the best course of action, although several courses of action will be initiated to allow for contingencies. ExxonMobil considers surface intervention methods such as well capping the Best Available Technology versus relief well drilling for well source control. However, as required in regulation 18 AAC 75.445(d)(2), ExxonMobil has provisions in place for drilling a relief well as a last option for control. Numerous well control planning and response actions will be initiated concurrently.

Several surface options are available and would be attempted prior to initiating a relief well. Well control may be regained by removal of some of the blowout preventer (BOP) stack and installation of a master valve. Another method for regaining control is diversion of the flow to allow installation of additional remotely operated well control equipment to the existing stack or on the wellhead. Specialized personnel and required heavy equipment for well control are available on the North Slope through drilling contractors and drilling support providers, which can be mobilized within 24 to 48 hours of notification.

It is possible that mechanical methods will not be required to regain well control. Loss of surface control may cause a pressure drop in the wellbore. As reservoir formations flow, equalizing pressure of the reservoir, the bridging that results causes a decrease in surface flow or causes the flow to stop.

1.9.1 Well Capping

The North Slope operators maintain and have available on the North Slope the major equipment items to initiate well capping. Typical equipment used in well capping efforts is listed in Table 1-23. Equipment not located on the North Slope can be mobilized in 24 hours. Heavy-lift helicopters can be mobilized from Oregon, the Pacific Northwest, or Canada and arrive at Point Thomson within 24 to 48 hours.

ExxonMobil maintains contracts with well control firms to assist in the intervention and resolution of well control emergencies. Such services include, but are not limited to, firefighting equipment and services, specialty blowout control equipment and services, directional drilling services, high-pressure pumping services, and specialty fluids, chemicals, and additives. Providers of such services include, but are not limited to, Boots & Coots International Well Control, Cudd Well Control, Wild Well Control, Safety Boss, Halliburton Energy Services, Anadrill Schlumberger, Baker Hughes INTEQ, Dowell Schlumberger, Baroid, and MI Drilling Fluids. The approved contractor will be notified immediately in the event of any well control situation that has the potential to escalate.

Table 1-23
Typical Well Capping Equipment List

COMPONENT	USAGE	LOCATION	AVAILABILITY
6,000 gallons per minute (gpm) Fire Pumps	Fire and heat suppression.	North Slope	<18 hours
Athey Wagons	Tractorized booms for manipulation of tools in and around blowout well.	North Slope	<18 hours
Bulldozer	Power for Athey wagons and backup for heavy equipment, rig-moving. Can also be used for constructing berms to aid in spill containment.	Point Thomson	<8 hours
Backhoe	Drainage ditch, berm construction.	Point Thomson	<8 hours
85-100-ton Crane	Heavy equipment lifting capability. If well blowout is ignited, may be needed to facilitate rig move.	North Slope	<8 hours
50-75-ton Crane	Smaller, mobile units for spotting support equipment.	North Slope	<8 hours
500-ton Drilling Block	Block-and-tackle system for moving or dragging heavy equipment.	North Slope	<18 hours
Drilling Line	Component of block-and-tackle system if rig-moving system is inoperable.	Point Thomson	<8 hours
20-inch and 30-inch Casing	Used to construct Venturi tubes to divert blowing wellbore fluids (ignited and unignited).	Point Thomson	<8 hours
Miscellaneous Equipment	High-pressure Chicksan, flexible hoses, valves, containment boom, absorbent, and hand tools.	North Slope	<18 hours
Kill Pumps	Backup to rig pumps.	North Slope	<24 hours
Junk Shot Manifold	Manifold system constructed to pump small leak-sealing materials into well.	North Slope	<18 hours
Hot Tap Tool	Manifold used to gain safe access to pressurized tubulars at surface.	North Slope	<18 hours
Crimping Tool	Sized device used to pinch tubulars closed to seal off internal flow.	Houston, Texas	<24 hours
Abrasive Cutter	High-pressure cutting tool used to sever leaking BOPs, and rig structures.	Duncan, Oklahoma or Houston, Texas	<24 hours
Capping Stack	Various high-pressure BOP stacks (to replace leaking, damaged, or severed primary BOPs).	Houston, Texas	<24 hours

1.9.2 Blowout Well Ignition

As described in Sections 1.1.3 and 1.6.3, voluntary ignition is ExxonMobil's preferred method of addressing a gas condensate blowout. The decision to ignite a blowout will be made only after assessing the probability of implementing successful surface control, reviewing potential safety hazards, addressing pertinent environmental considerations, and obtaining necessary agency approvals. In an instance where ignition is implemented, preparations to kill the well would be performed while combustion is taking place. Once well kill preparations are in place, the fire would be put out and the kill operations would commence.

1.9.3 Permits

In the event of a well blowout, federal, state, and NSB permits would be required to support the response effort (e.g., ice and gravel staging pads, temporary storage areas, and temporary water uses).

Federal approval would be required in the form of a Section 404/10 permit from the U.S. Army Corps of Engineers (USACE) for placement of gravel (fill) in waters of the United States (nearshore coastal waters and adjacent wetlands). The USACE has issued Nationwide Permit #20, which authorizes placement of fill needed for cleanup of spilled oil. A request for this authorization would require approval from the NARRT. These requests would typically be approved very rapidly assuming the NARRT and Unified Command are in agreement with the overall cleanup and response strategy for the specific spill event.

In addition, as part of overall North Slope oil spill preparedness, ACS holds a series of permits authorizing a variety of cleanup-related activities, including bird and mammal hazing and mammal stabilization. Key existing permits include Emergency Oil Spill Response permits from NSB, ADNR Division of Land, and Alaska Department of Fish & Game.

PART 2 PREVENTION PLAN [18 AAC 75.425(e)(2)]

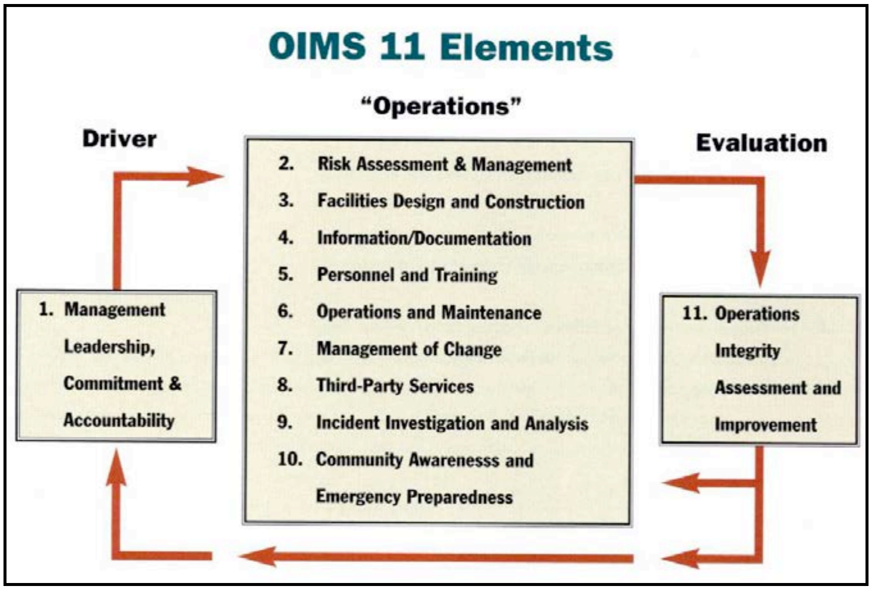
2.1 PREVENTION, INSPECTION, AND MAINTENANCE PROGRAMS [18 AAC 75.425(e)(2)(A)]

This prevention plan includes a description of oil discharge prevention measures and procedures that will be employed during the Point Thomson Drilling Program and shows how the applicable requirements of 18 AAC 75.005 through 18 AAC 75.085 are met.

Important components of oil spill prevention include personnel training, equipment maintenance, and routine surveillance. ExxonMobil and contractor personnel at Point Thomson receive training in a variety of areas including general North Slope procedures, spill prevention, environmental awareness, job-specific safety training, and site-specific orientation. Through the initial and annual training detailed below, personnel are trained in oil spill notification protocols, oil spill source control, and Hazardous Waste Operations and Emergency Response (HAZWOPER). The level of emergency response training is based on the duties and functions of each responder and complies with the regulatory requirements for employee training. The distribution and use of the *ExxonMobil Upstream Safety Manual* further supplement the routine training program.

Point Thomson uses ExxonMobil's Operations Integrity Management System (OIMS) to drive continuous improvement in environmental performance. The OIMS framework consists of 11 elements as shown in Figure 2-1. The system uses direct input from technical specialists and field operations personnel, along with information developed through routine hazard loss and incident investigations, to minimize the potential for recurrence of incidents. ExxonMobil developed OIMS to better manage safety, health, and environmental risk. Comprehensive risk assessments will be used to identify risks and mitigate the consequences of incidents by providing essential information for decision-making. The implementation of appropriate safety and occupational health programs are also covered by OIMS.

Figure 2-1
Operational Integrity Management System Elements



2.1.1 Prevention Training Programs [18 AAC 75.425(e)(2)(A)(ii) and 18 AAC 75.020]

ExxonMobil's prevention training program for personnel involved with inspection, maintenance, or operation of oil storage and transfer equipment conforms to the requirements of 18 AAC 75.020 as follows:

1. Describes each position and the training and level of knowledge;
2. Lists licenses, certifications, or other prerequisites for each position;
3. Lists training objectives and how those objectives will be met;
4. Employees acknowledge completion of the training by signing a training roster that lists the course and program content; and
5. Computerized training records will be maintained and available for Alaska Department of Environmental Conservation (ADEC) review for up to five years.

Additional training described below will be provided, depending on the job classification, to ensure safety and promote spill prevention.

The North Slope Training Cooperative (NSTC) Unescorted Program is a one-day training seminar that is mandatory for all personnel working on the North Slope. It consists of a series of training videos and lectures covering the following topics:

- *Alaska Safety Handbook*,
- Camps and Facilities Safety Orientation,
- Environmental Excellence,
- Hazard Communication (HAZCOM),
- HAZWOPER Awareness,
- Personal Protective Equipment (PPE), and
- Hydrogen Sulfide.

The NSTC program includes a review of the *North Slope Environmental Field Handbook*, which is made available to everyone working in the North Slope oil fields. The handbook provides a general overview of state and federal environmental regulations and programs and summarizes procedures developed by North Slope operators to comply with these regulations. The handbook covers programs specific to air, land, water, wildlife, spills, and waste management.

Upon arrival at the drill site, personnel will be provided a site orientation that includes familiarization with the Point Thomson emergency response and evacuation plans.

Safety and environmental communications and bulletins will be regularly distributed or posted to ensure that specific safety and environmental issues are properly communicated to all personnel. In addition, most supervisors will discuss the communications and bulletins with their crew during safety meetings.

All personnel associated with fuel delivery, transfer, and handling will be knowledgeable of the fuel transfer guidelines discussed in Section 2.1.6 and contained in Attachment B of the *North Slope Environmental Field Handbook* as it relates to fuel transfer and handling, drum labeling, secondary containment, and the use of liners and drip trays. Drilling personnel are also required to be knowledgeable of, and to adhere to, the specific fuel storage and transfer guidelines that may be provided in the Nabors 27E drilling rig Spill Prevention Control and Countermeasure (SPCC) Plan. The SPCC Plan for the drilling rig will be kept on site during drilling activities. Oil-handling personnel receive training and an annual briefing in spill prevention topics.

Waste management training will familiarize appropriate Point Thomson drill site personnel with the regulatory classification and disposal requirements for industrial wastes. The training covers, transportation requirements and a description of each waste disposal facility on the North Slope. The course is mandatory for personnel who sign waste manifests.

Service company employees will receive instruction to promote safe conduct on the job, including a briefing by responsible supervisors prior to beginning work on the drill site. Upon arrival in the operating areas, personnel will be instructed in safety and health responsibilities including rules, procedures, injury reporting, and PPE.

Training records for ExxonMobil employees will be available through ExxonMobil's Anchorage office. These records will be reviewed annually by ExxonMobil, retained for at least five years [18 AAC 75.020(e)] and will be provided to ADEC upon request. Contractors will maintain their own training records.

The training programs and operational procedures will serve to provide assurance that the likelihood of future spills caused by operator error or procedural deficiencies will be mitigated to the fullest extent.

2.1.2 Blowout Prevention

Blowout prevention while drilling and operating wells relies on a number of interrelated processes and procedures as described in this section. Drilling and completion fluids will provide primary well control during drilling and workover operations. The fluids are designed to exert hydrostatic pressure on the wellbore. The pressure being exerted will exceed the pore pressures within the subsurface formations, preventing undesired fluid flow into the wellbore. Surface-mounted blowout prevention equipment (BOPE), as described later in this section, will provide secondary well control during drilling or workover operations. In the event that primary well control is lost, the BOPE will be used to contain the influx of formation fluid and then safely circulate it out of the wellbore.

The tree, associated valves, and control systems will provide well control during well testing and subsequent production operations. These systems will provide several layers of redundancy to ensure pressure containment is maintained and blowouts are prevented.

Well Control Training

ExxonMobil requires certified well control training for drilling supervisors, operations superintendents, drilling engineers, contractor rig drillers, tool pushers, assistant drillers, derrickmen, and other appropriate personnel through an operations training program with a professional organization and in accordance with Alaska Oil and Gas Conservation Commission (AOGCC) regulations at 20 AAC 25. The curricula consists of training in blowout prevention technology and well control and Training to Reduce Unexpected Events (TRUE); successful completion results in participant certification.

TRUE involves a multifunctional team made up of rig contractor, service company, and operator personnel prior to commencing operations, which focuses on increasing knowledge and awareness to prevent and deal with potential hazards at Point Thomson. The training is based specifically on Point Thomson wells, and its goal is to provide site-specific solutions to potential problems before they occur. Potential hazards are defined by the team, including well control and lost returns; action plans are developed to identify roles and responsibilities, warning signs, how to react to an event, and lines of communication. Special emphasis is placed on abnormal pressure detection and well control. The training establishes a team concept and a team approach to identifying and solving problems.

Well Control Planning

Well control begins during the well planning phase. ExxonMobil has developed an Integrated Pore Pressure Prediction (IP3) Team consisting of reservoir engineers, geologists, drilling engineers, and computer modelers. The IP3 Team has analyzed seismic data, well data from exploration wells, and geologic models to predict pore pressure and fracture gradients, and to develop a detailed understanding of the reservoir (Figure 2-2). The use of advanced technology enables accurate prediction of formation behavior as wells are drilled, and allows the engineer to plan a well that minimizes the risk of a well control incident. In addition, bottom-hole pressure data from other wells in the area and seismic data have been reviewed to ascertain the expected bottom-hole pressure at the proposed well location.

Engineers use the bottom-hole pressure predictions to design a drilling mud program with sufficient hydrostatic head to overbalance the formation pressures from surface to total well depth. Other factors influencing the mud weight design are shale conditions, fractures, lost circulation zones, under-pressured formations, and stuck-pipe prevention. The well casing program is designed to allow for containment and circulation of formation fluid influx out of the wellbore without fracturing open formations.

Planning is done in accordance with AOGCC requirements. The operator policies and recommended practices are, at a minimum, equivalent to AOGCC regulations.

Well Control During Drilling

Inspection of Well Control Equipment

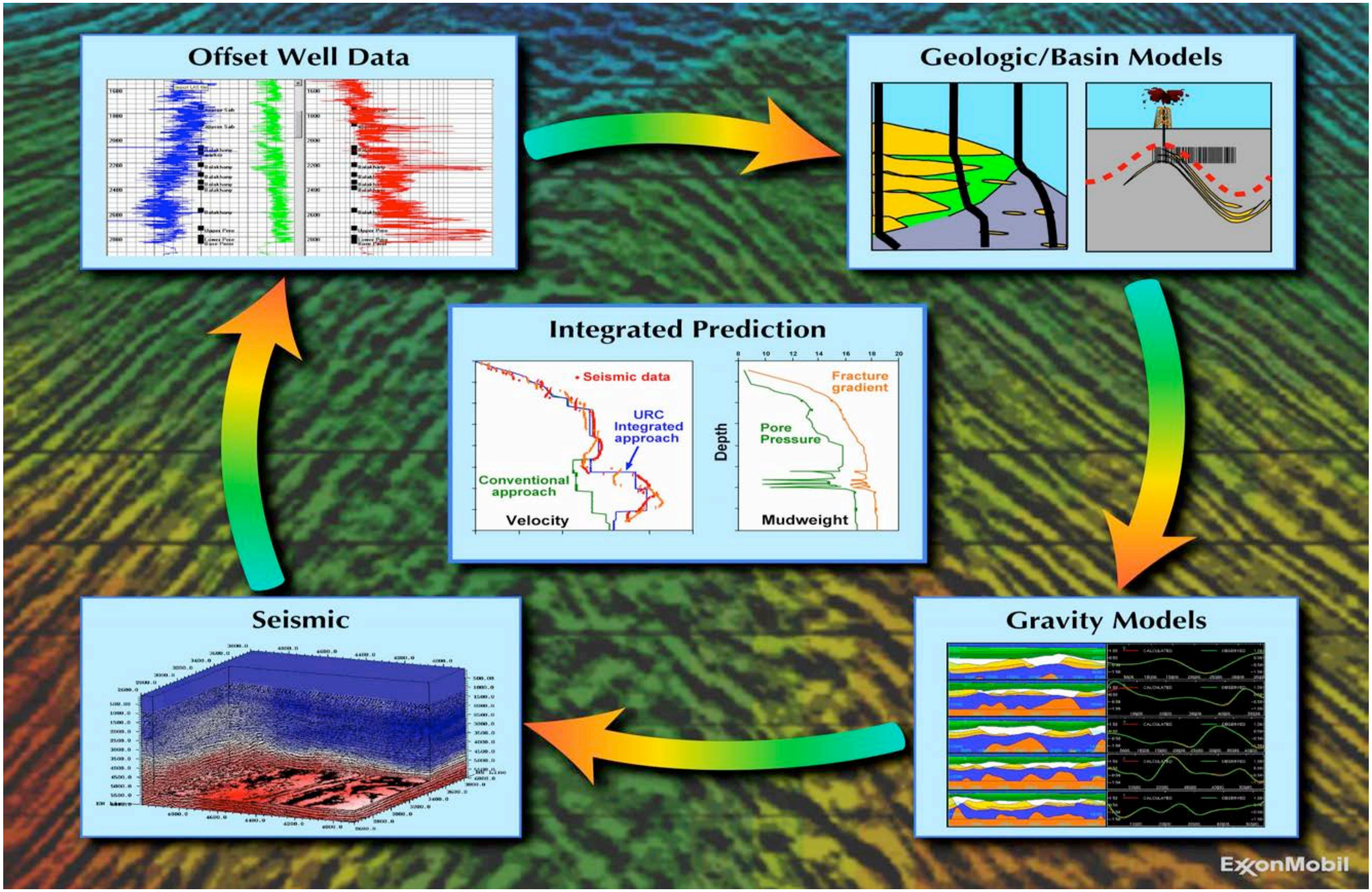
Prior to acceptance of the Nabors 27E drilling rig, there will be a comprehensive inspection and testing program performed on the drilling rig, including the following:

- Test BOPE to the full rated working pressure (10,000 pounds per square inch [psi]).
- Test choke manifold equipment to the full rated working pressure.
- Test the blowout preventer (BOP) accumulator unit to confirm that closing times meet American Petroleum Institute (API) standards and meet or exceed AOGCC requirements.
- Verify pre-charge pressure and total volume of the accumulator bottles.
- Install new ring gaskets and seals between each BOP component.
- Test pressure integrity of the high-pressure mud system.
- Inspect drill string and bottom-hole assembly (BHA) components to the most stringent “T.H. Hill DS-1 Category 5 level.”[1]

After successful completion of testing and qualification of the rig’s BOPE, the rig will be accepted for drilling service at Point Thomson. Routine functional and pressure testing during future drilling operations will be conducted in compliance with ExxonMobil and AOGCC requirements.

[1] “T.H. Hill DS-1 Category 5 level” refers to an inspection and qualification document written by T.H. Hill Associates, Inc., that is considered industry standard for drill string and BHA inspections and quality control of the drill string equipment.

Figure 2-2
Technology Integration with IP3 Team



Methods to Avoid Intersecting Nearby Wells

During drilling operations, there may be a remote chance of intersecting nearby wells. The Point Thomson wells are planned to have a minimum of 40-foot well spacing and any potential intersections would occur at shallow depths. Since there will only be one well drilling or testing operation occurring at a time and any potential wellbores encountered would be plugged at depths below the intersection point, such an intersection would not result in a well control event.

Extensive "anti-collision" drilling practices are implemented by the operator and contract directional drilling staff. In the planning stages, survey tool accuracy, downhole equipment types, and directional uncertainties will be converted into a graphical representation with appropriate "close approach" tolerance lines (i.e., drill vs. no drill). Potential zones of near-well interference will be documented and incorporated into the final directional drilling plan. If close approach issues are expected or arise while drilling, Qualitative Risk Assessments will be combined with more rigorous and frequent directional surveying.

Well Control During Surface Hole Drilling

During surface hole drilling, a shallow gas blowout can occur when a small, high-pressure volume of trapped gas is encountered. This causes a rapid unloading of the wellbore fluids and gas at the surface in a very short time. A diverter, installed at the wellhead, will be used to divert the shallow gas kick away from the drilling rig. ExxonMobil will employ this method during surface-hole drilling unless a waiver is received from AOGCC indicating that diverter use is not necessary. A shallow gas blowout will not contain liquid hydrocarbons.

Well Control While Drilling Below the Surface Hole

The surface-mounted BOPE to be used by ExxonMobil exceeds the standards as defined in AOGCC regulation 20 AAC 25.035. The BOPE will be installed after the surface casing is run and cemented. The surface casing is the first string of casing after drilling out from underneath the conductor or structural casing. The surface casing will be set over all potential areas of subsurface drinking water and at a depth that will allow for sufficient formation strength to provide an anchor for the BOPE.

During drilling operations below the surface-hole, the full BOP stack will be necessary because of potential for an influx from the hydrocarbon zones. Should an influx occur, the BOP will be used to close in the well and provide a barrier against release of formation fluids to the atmosphere.

The Point Thomson BOPE consists of:

- A minimum of four, 13 5/8-inch, 10,000 psi working pressure ram-type preventers;
- One, 13 5/8-inch annular preventer (rated to 10,000 psi);
- Choke and kill lines that provide circulating paths from/to the choke manifold;
- A two-choke manifold that allows for safe circulation of well influx out of the wellbore; and
- A hydraulic control system with accumulator backup closing capability as defined in AOGCC regulation 20 AAC 25.035, as a minimum.

Once installed, the BOPE will be tested according to AOGCC requirements. AOGCC field inspectors may witness these pressure tests. The AOGCC may allow for an extension past the weekly duration depending on ongoing operations.

While most North Slope drilling operations use four preventers, a fifth preventer was incorporated into the BOP stack arrangement in order to manage the risk at Point Thomson. A BOP stack with four sets of rams and one annular preventer will be used to drill below surface casing, providing one more preventer than required by AOGCC regulations. The rams and annular preventer will all be rated to 10,000 psi working pressure. This arrangement allows two preventers to close on the casing and liners, and in the case of liners, permits two ram-type and one annular preventer to be used on the drill-pipe running-string without having to stop and change out rams. The extra ram will also provide added redundancy.

Well Control Monitoring and Procedures

Automatic and manual monitoring equipment will be installed to detect abnormal variation in the mud system volumes and drilling parameters. If an influx of formation fluid into the wellbore occurs, the BOPE will be used to immediately shut in the well.

Each well will be drilled according to a location-specific, detailed well plan. While drilling, the well will constantly be monitored for pressure control. The mud weight (the primary well control mechanism) will be monitored and adjusted to meet actual wellbore requirements. Too low of a mud weight could under-balance the well, and may result in an influx of formation fluids. Too high of a mud weight may result in lost circulation to a weak formation, which could then lead to a drop in fluid level and an under-balanced condition. A range of mud weights will be used as the well is drilled to provide the proper well control for the formation conditions encountered.

If an influx of formation fluid (kick) occurs, secondary well control methods will be employed. Constant monitoring of the total fluid circulating volume and other drilling parameters will ensure that a kick is quickly detected. The well annulus will be shut-in using the BOPE. The drill pipe will be shut-in by a downhole check valve near the bit and a surface-mounted valve. This will contain the influx and any associated build-up of surface pressure. It will also prevent further influx of formation fluid into the wellbore. Surface pressures will be allowed to stabilize and will then be measured. The pressure readings will enable the calculation of the new kill-weight mud density needed to regain primary well control. A standard well-kill procedure will be implemented to circulate the kill-weight mud and safely remove formation fluids from the hole. Mud-gas separators and degassers will be used to remove gas from the mud as it is circulated out of the hole. After this procedure is completed, the kill effectiveness will be confirmed and the well will be opened up and the fluid levels monitored. Drilling operations will resume when conditions are normal.

BOP drills will be performed on a frequent basis to ensure the well can be shut-in quickly and properly. Certified training of Point Thomson personnel will include hands-on simulator practice at recognizing kicks, well shut-in, and circulating the kicks out of the wellbore.

Backup systems and procedures will be available for surface control of a kick if the initial secondary control efforts fail to provide the required control. Surface pressures in the annulus and drill pipe provide the required information to determine downhole activity. The well is circulated with kill-weight mud. If it is necessary to bleed off annulus pressure, the choke can be adjusted to control formation fluids. Another technique employed for an underground blowout situation (uncontrolled flow of formation fluids from one formation into another) is the dynamic kill procedure. This entails pumping the kill fluid at a high rate to sufficiently overcome the flowing zone and stop the flow. Depending on the situation, other variations of these basic techniques may be used. Although extremely rare, a kick that cannot be killed by normal procedures sometimes occurs. In this case, the use of more detailed procedures is required.

Bottom-Hole Pressure Measurements

ExxonMobil will measure bottom-hole pressure while drilling, with computer-assisted analysis of drilling fluids circulation using a professional organization standard or recommended practice. ExxonMobil will use state-of-the-art technology to enhance drilling performance and mitigate risk. Several of the technologies are known as logging while drilling (LWD) and pressure while drilling (PWD). The LWD system enhances early detection of over-pressured intervals or possible lost circulation zones. The PWD system directly monitors bottom-hole pressures, enabling the operator to maintain sufficient overbalance without compromising the formation integrity. Early detection of overpressure and maintaining sufficient overbalance while drilling will minimize any chance of incurring a well control event.

Overbalanced Drilling Confirmation Technique

The “10/10/10 Test” developed by ExxonMobil is an analytical technique to help evaluate whether an overbalanced situation exists in the wellbore. This technique may be applied at any point in the well, but will be most valuable when performed in the shale intervals overlying the productive zone (Thomson Sand). At this point in the well, one necessary component for a kick is missing – the permeable formation. Testing using the 10/10/10 Test can provide accurate and early diagnostics of the formation pressure before the potential kick interval is reached.

The 10/10/10 Test involves circulating the well for 10 minutes to establish background gas, discontinuing mud circulation for 10 minutes to reduce equivalent circulating density, and circulating the wellbore for an additional 10 minutes. Mud is then circulated from the bottom of the well, without further drilling, to the surface. Gas concentrations are measured, and an evaluation is done to determine whether the overbalance is sufficient.

Computer-aided Management of Inspection, Maintenance, and Repair

ExxonMobil will use a computerized preventive maintenance program to help manage inspection, maintenance, and repair of the drilling rig and associated equipment. The drilling contractor’s preventive maintenance program will be reviewed, a gap analysis will be performed, and an agreed-upon computer-aided system will be followed. The contractor will have the responsibility to maintain the program, while the operator closely monitors the inspection, maintenance, and repair program.

2.1.3 Substance Abuse Programs [18 AAC 75.425(e)(2)(A)(ii) and 18 AAC 75.007(e)]

ExxonMobil is committed to a safe, healthy, and productive workplace for all employees. ExxonMobil recognizes that alcohol, drug, or other substance abuse by employees will impair their ability to perform properly and will have serious adverse effects on the safety, efficiency, and productivity of other employees and the company as a whole. The misuse of legitimate drugs, or the use, possession, distribution or sale of illicit or unprescribed controlled drugs on company business or premises, is strictly prohibited and is grounds for termination. Possession, use, distribution, or sale of alcoholic beverages on company premises is not allowed without prior approval of appropriate senior management. Being unfit for work because of use of drugs or alcohol is strictly prohibited and is grounds for termination of employment. While this policy refers specifically to alcohol and drugs, it is intended to apply to inhalants and all other forms of substance abuse.

ExxonMobil recognizes alcohol or drug dependency as a treatable condition. Employees who suspect they have alcohol or drug dependencies are encouraged to seek advice and to follow appropriate treatment promptly before it results in job performance problems. The Employee Health Advisory Program or medical professional staff will advise and assist in securing treatment. Those employees who follow approved treatment will receive disability benefits in accordance with the provisions of established benefit plans and medical insurance coverage consistent with existing plans.

No employee with alcohol or drug dependency will be terminated due to the request for help in overcoming that dependency or because of involvement in a rehabilitation effort. However, an employee who has had or is found to have a substance abuse problem will not be permitted to work in designated positions identified by management as being critical to the safety and wellbeing of employees, the public, or ExxonMobil. Any employee returning from rehabilitation will be required to participate in a company-approved aftercare program. If an employee violates provisions of the employee Alcohol and Drug Use policy, appropriate disciplinary action will be taken. Such action cannot be avoided by a request at that time for treatment or rehabilitation. If an employee suffering from alcohol or drug dependency refuses rehabilitation or fails to respond to treatment or fails to meet satisfactory standards of effective work performance, appropriate disciplinary action, up to and including termination, will be taken. This policy does not require and should not result in any special regulations, privileges, or exemptions from normal job performance requirements.

ExxonMobil may conduct unannounced searches for drugs and alcohol on company-owned or controlled property. ExxonMobil may also require employees to submit to medical evaluation or alcohol and drug testing where cause exists to suspect alcohol or drug use, including workplace incidents. Unannounced, periodic, or random testing will be conducted when an employee meets any one of the following conditions:

- Employee has had a substance abuse problem;
- Employee is working in a designated position identified by management as a position where testing is required by law; or
- Employee holds a specified executive position.

A positive test result or refusal to submit to a drug or alcohol test is grounds for disciplinary action, including termination.

In addition to the above policy, it is a requirement of ExxonMobil that all applicants accepting offers of regular employment must pass a drug test.

Contractor and vendor personnel are also covered by paragraph one and the search provisions of paragraph four of this policy. Those who violate the policy will be removed from company premises and may be denied future entry.

All contract companies with employees assigned to the Point Thomson drill site will have similar substance abuse programs.

2.1.4 Medical Monitoring [18 AAC 425(e)(2)(A)(ii) and 18 AAC 75.007(e)]

Upon beginning work, new ExxonMobil employees will receive an entrance physical to establish baseline health conditions and to determine their fitness for duty. Ongoing health assessments will be conducted as required by the type of work performed according to the requirements of the federal Occupational Safety and Health Administration (OSHA), the Alaska Occupational Safety and Health Section, and/or specific company requirements. Emergency response personnel will be scheduled for exams biennially unless the examiner determines a need for a more frequent examination. At a minimum, these medical examinations will include a physical, baseline electrocardiogram, vision screening, and blood work.

All contract companies with employees assigned to the Point Thomson drill site will have similar medical monitoring programs.

2.1.5 Security Programs [18 AAC 75.425(e)(2)(A)(iii) and 18 AAC 75.007(f)]

ExxonMobil's security procedures will control site access and provide a method for monitoring personnel movements. Site access to Point Thomson is naturally limited due to its remote location and because it will not be connected to other North Slope areas or communities by a permanent road. There is some use of the nearby offshore and onshore areas for subsistence use, and local residents may occasionally pass by the Point Thomson drill sites. The public will be excluded from being within 230 meters of the drilling pad edge when the drilling rig is operating under the ADEC air quality control Minor General Permit for Oil and Gas Drilling Rigs, MG-1. ExxonMobil understands the need to provide safe havens during emergencies and for public access and pass-through and will provide assistance and access as necessary without compromising site control and safety issues.

During winter when access to the drill site is available by ice road, security guards will be placed at the Endicott entrance of the ice road to control access. Security plans include coordination with local and state police agencies when some unusual security concern or event is experienced.

Operations and maintenance personnel will be on site during all active operating periods and whenever substantial quantities of fuel are stored on location to maintain security. On-site personnel will be responsible for controlling direct site access. Visitors wishing to access the site should have advance approval prior to arrival, will be required to sign-in upon arrival, and will be required to attend a safety briefing.

While regulatory agency personnel carrying photo identification may access the drill site at any time, they must contact the on-site Drilling Supervisor when they first reach the drill site for a safety briefing. All visitors must comply with all applicable safety regulations. Regulatory agency personnel wishing to visit the site should contact the ExxonMobil Regulatory Manager at (907) 564-3617.

2.1.6 Fuel Transfer Procedures [18 AAC 75.025]

All fuel transfers will be in accordance with ExxonMobil's fuel transfer guidelines contained in Appendix A. The Best Management Practice (BMP) for spill prevention established by ExxonMobil drew upon the guidelines and operating procedures applicable to North Slope exploration drilling operations developed by other operators. At Point Thomson, fuel transfers are conducted with drilling rig-related fueling operations, in activities related to exploration support (e.g., rig camp fuel and vehicle fueling), and in flow testing.

Proper use of surface liners and drip pans is also described in Appendix A, which is consistent with North Slope Unified Operating Procedures (UOP) for surface liners and drip pans. The UOP mandates the use of liners for vacuum trucks, fuel trucks, sewage trucks, and fluid transfers within facilities.

Visual monitoring is the primary method to determine fluid levels in tanks during loading and to detect leaks or spills during fuel transfers. All fuel transfers will be continuously staffed and visually monitored. Typically, diesel tanks will be filled via transfer of fuel from trucks using a fuel hose. Personnel involved in fluid transfers at Point Thomson will be specifically trained in accordance with fluid transfer guidelines described in 18 AAC 75.007 through 18 AAC 75.027, and contained in Appendix A. For transfers between trucks and tanks, manual shutoff valves will be readily available to the truck operator to stop transfers. Personnel involved in the transfer will have radios and will be able to communicate quickly if a transfer needs to be stopped.

Effective communication and planning will be key factors in preventing spills. Pre-job safety meetings will provide employees with information on their role in the overall scope of the work, review guidelines, and stress the importance of avoiding spills.

For drilling rig-related fuel transfers, the procedures outlined in the Nabors 27E drilling rig's SPCC Plan will also be followed. Fuel flow diagrams, fuel transfer procedures, valving details, and safety precautions for the drilling rig will be listed in the SPCC Plan. A copy of the rig's SPCC Plan will be kept on site during drilling activities.

For transfers to and from areas not protected by secondary containment, the operator shall ensure all valves and flanges are checked and in the correct operating positions, and appropriate drip pans and liners are used. All piping and hoses will also be inspected for damage or defects before and at least once during each transfer.

The diesel storage tanks may be filled in the summer open-water season by transfer from a barge. Such transfers will comply with the requirements of 18 AAC 75.025 and will be covered by a U.S. Coast Guard Facility Operations Plan (Title 33 of the Code of Federal Regulations [CFR], Part 154, Subpart D).

2.1.7 Operating Requirements for an Exploration and Production Facility [18 AAC 75.045]

General Facility Requirements

Flow Tests [18 AAC 75.045(a)]

Liquid hydrocarbons produced during a formation flow test or other drilling operations will be collected and stored in a manner that contains and safely disposes of the liquid hydrocarbons and prevents them from entering state land or waters. Flow test liquid hydrocarbons will be temporarily stored in fuel or other temporary storage tanks. Liquids will then be disposed of by re-injection into the producing formation, injection into a disposal well or annulus, or will be transported to processing facilities. Well flow testing and drilling operations will be staffed 24 hours a day. Drill site personnel will continuously inspect tank levels, piping, valves, glands, wellheads, pumps, and all other machinery for leaks or spills.

Wellhead Sumps [18 AAC 75.045(d)]

Wellhead sumps will be designed and installed to be sufficiently impermeable. The sump is made of welded steel, with the walls welded to the bottom; the sump bottom is welded to the conductor pipe which passes through the center of the sump. A high-density polyethylene (HDPE) liner will be lapped over the drilling rig floor and the sump walls and bottom. Any fluids released from the drilling rig will drain to the impermeable wellhead sump, which will be pumped out as necessary.

Oil Storage Tanks [18 AAC 75.045(f)]

Oil storage tanks will meet the applicable requirements of 18 AAC 75.066 and 18 AAC 75.075. Information pertaining to oil storage tanks is located in Sections 2.1.9, 2.1.10, and in Appendix B of this plan.

Piping [18 AAC 75.045(g)]

Facility piping will meet the applicable requirements of 18 AAC 75.047 and 18 AAC 75.080. Information pertaining to facility piping is found in Section 2.1.8 of this plan.

2.1.8 Facility Oil Piping [18 AAC 75.080]

Limited above-ground facility oil piping associated with the manifolding fuel storage tanks will be installed at the Point Thomson drill site and temporary facility piping will also be used to connect wells with oil storage tanks during flow tests. All facility piping will comply with the requirements of 18 AAC 75.080.

Facility oil piping placed in service after December 30, 2008, will be designed and constructed in accordance with one of the following standards, as appropriate: American Society of Mechanical Engineers (ASME) B31.3-2004, ASME B31.4-2002, ASME B31.8-2003, or another equivalent standard approved by the ADEC.

Facility oil piping shall consist of corrosion-resistant material approved by the ADEC, or protected from corrosion with protective coating and cathodic protection. Support for all aboveground facility oil piping will be consistent with the requirements of Paragraph 321 of *Process Piping* (ASME B31.3-2004) and consistent with the requirements of 18 AAC 75.080.

The maintenance and inspection program used for facility piping will be consistent with the requirements of the American Petroleum Institute's (API) *Piping Inspection Code, Inspection Repair, Alteration, and Rerating of Ins-service Piping Systems*, Second Edition, October 1998, Addendum 1, February 2000, Addendum 2, December 2001, and Addendum 3, August 2003 (API 570), or another equivalent program approved by ADEC.

Aboveground piping will be protected by physical barriers to prevent damage from vehicles and visually checked for leaks or damage during routine operations or at least monthly.

2.1.9 Oil Storage Tanks [18 AAC 75.066]

Tanks with capacities of 10,000 gallons or more will conform to state regulations and requirements provided in 18 AAC 75.066. Inspections and maintenance will be conducted in accordance with 18 AAC 75.066. Information about the tanks will be kept in records and maintained on site by the Drilling Supervisor or in the Anchorage office. Records are available upon request.

Appendix B contains a list of oil storage tanks with capacities greater than 10,000 gallons, which are subject to ADEC regulations. Appendix C, the Nabors 27E drilling rig SPCC Plan, lists tanks associated with the rig.

There will be 30 diesel fuel storage tanks with a maximum capacity of 16,800 gallons each at Point Thomson. These tanks will be used to store and dispense diesel fuel for construction, drilling, and operational requirements. The diesel tanks will be sized to meet the fuel needs when the ice road and barge routes cannot be used to deliver fuel. The diesel tanks are designed to meet the requirements 18 AAC 75.066(b)(2). The tanks will not have leak detection systems and will be inspected for leaks on a daily basis. The inventory of portable tanks may vary over time, as facility needs change.

Tanks placed in service after December 30, 2008, will be equipped with fixed spill containment at each fill connection to capture leaks when a transfer hose or pipe is disconnected. In addition, overfill prevention devices will be tested before each transfer operation or monthly, whichever is less frequent.

2.1.10 Secondary Containment Areas [18 AAC 75.075]

Oil Storage Tanks

Appendix B includes secondary containment area descriptions, including volume and the year the tank is anticipated to be constructed and installed. Appendix B also identifies tank loading/unloading areas and describes secondary containment in these areas.

Oil storage tanks will be located within a secondary containment area with the capacity of 110 percent of the capacity of the largest tank. These secondary containment areas will be constructed of bermed/diked retaining walls and will be lined with impermeable materials resistant to damage and weather conditions. These areas will be kept free of debris, including excess accumulated rainwater and snow accumulation during winter season; they will be visually inspected by facility personnel as required by 18 AAC 75.075(c). If the rainwater or snow is to be discharged to the lands or waters of the state, including the gravel pad, the containment areas will be inspected for spills or sheens before any removal or discharge occurs. Any such discharges will be in accordance with the permit requirements listed in 18 AAC 75.075(d), including keeping a written record of each removal event and keeping records of drainage operations for five years. All water or snow removal operations, regardless of whether the material is discharged or placed into a tank, will be recorded on a fluid transfer checklist or a North Slope manifest. Fluid transfer checklists and North Slope manifests will be kept on file on site and in the Anchorage office.

Loading/Unloading Areas

The tank truck loading/unloading area (TTLA) associated with the fuel storage at Point Thomson Central Pad has a secondary containment system large enough to hold the maximum capacity of the tank trucks utilizing the area. The area is curbed; lined with sufficiently impermeable materials; and maintained free of debris, vegetation, excessive accumulation of water, snow, and ice or other conditions that could interfere with the system. The area is designed to prevent premature vehicle movement and is inspected before transfers, or at least monthly.

2.2 DISCHARGE HISTORY [18 AAC 75.425(e)(2)(B)]

The discharge history of the Nabors 27E drilling rig is included in the SPCC Plan (Appendix C). Although there were some oil spills associated with the former exploratory drilling at the existing Point Thomson gravel pads, the discharge history is outdated, has little relevance to the planned drilling, and would not be useful to include in this plan. The Nabors 27E drilling rig and all associated equipment will be new to the area.

As described in Section 2.1.1, OIMS ensures continuous improvement in environmental performance. When or if a discharge does occur, the cause, effect, and corrective and preventive measures will be recorded, analyzed, and used to identify improvements. From such analysis, actions such as updating or improving training or maintenance programs will be implemented to prevent future spills.

2.3 POTENTIAL DISCHARGE ANALYSIS [18 AAC 75.425(e)(2)(C)]

Table 2-1 identifies potential spill sources, the types of failures that may occur, estimates of spill sizes, and appropriate secondary containment measures.

Table 2-1
Analyses of Potential Discharges

TYPE	CAUSE	PRODUCT	SIZE	DURATION	ACTIONS TAKEN TO PREVENT POTENTIAL DISCHARGE
Equipment / vehicle leaks	Hose ruptures, gasket leaks, etc.	Hydraulic	<10 gallons	Varies	Equipment maintenance, use of drip pans and liners
Diesel transfer from barge to diesel tank	Hose rupture	Diesel	440 to 880 gallons	1 to 2 minutes	Transfer procedures in place; hose watch; containment boom pre-deployed around barge
Diesel tank	Tank rupture	Diesel	4,900 barrels	Instant	Engineering design; tank inspection program; secondary containment
Oil well blowout	Uncontrolled flow from wellbore	Brookian crude	up to 85,000 barrels	15 days	Well planning, personnel training, drilling practices and procedures; BOPE
Gas condensate well blowout	Uncontrolled flow from wellbore	Thomson Sand gas condensate	1,416 barrels	15 days	Well planning, personnel training, BOPE, drilling practices and procedures, voluntary ignition plan, procedures and approval in place

2.4 CONDITIONS INCREASING RISK OF DISCHARGE [18 AAC 75.425(e)(2)(D)]

Conditions specific to Point Thomson drilling operations that potentially increase the risk of discharge, and actions taken to eliminate or minimize identified risks, are summarized below.

- **Fuel Transfers:** Transfers will be required to refuel the drilling rig, camp, and on-site equipment. Spills from these activities will be prevented or minimized by providing and following strict procedures, personnel training, and secondary containment devices (Attachment A).
- **High-Pressure Drilling Operations:** Drilling into the high-pressure Thomson Sand gas reservoir requires specialized equipment, materials, procedures, and training as outlined in this plan and the Application for Permit to Drill that was submitted to the AOGCC.
- **Low Temperature:** Low temperature could cause some materials to embrittle or to contract differentially, increasing the risk of equipment failure. Fluids in pipes and tanks could freeze or become gelatinous, potentially rupturing pipes or tanks, and reducing the ability to pump fluids. Valves or other equipment could ice over or otherwise freeze, which would not allow them to operate as necessary to prevent discharges. North Slope facilities are specifically engineered to accommodate Arctic conditions.
- **Weather Conditions:** Icy roads, whiteout conditions, and prolonged periods of cold weather present obvious hazards to field operations. ExxonMobil's strict enforcement of vehicle safety, speed limits, and the posting of warning signs assist in minimizing the potential for vehicular accidents that may result in a spill. In addition, Point Thomson drilling facilities are engineered for Arctic conditions.

2.5 DISCHARGE DETECTION [18 AAC 75.425(e)(2)(E)]

2.5.1 Drilling Operations

The Nabors 27E drilling rig will have a system of controls, monitors, and procedures to assist in the early detection of potential discharges. For both downhole and surface operations, these detection systems will include automated monitoring devices and standard operating procedures (SOPs) governing the handling and containment of fluids.

During downhole operations, much of the discharge detection effort will center on well control with an emphasis on detecting wellbore influx (kicks) early. The primary control to prevent a discharge associated with a kick is the density of the drilling fluid in the wellbore. The fluid density and other critical parameters will be monitored closely 24 hours a day by drilling fluid specialists and trained members of the rig crew. The well control equipment will include several independent kick detection devices. The SOP dictates that these systems are monitored 24 hours a day by rig crew members trained in well control to further ensure the timely recognition of and defense against potential spill events.

Kick detection systems will use automated equipment, and visual and/or manual detection in combination with policies and procedures governing the handling and containment of fluids. Drilling rig pit systems will be equipped with pit volume totalizers that constantly monitor pit-volume gain and loss. Unexpected gain or loss of drilling fluid will immediately alert rig personnel, who will initiate countermeasures to ensure well control is maintained.

All rig surface support systems will be inspected twice during each 24-hour day for fuel or oil discharges and/or potential leaks. Fluid transfers associated with drilling operations will be carefully planned and monitored using ExxonMobil fluid transfer guidelines. Strict adherence to these procedures will ensure immediate detection of spills associated with fluid transfer operations and significantly reduce the probability of occurrence.

2.5.2 Overfill Protection for Storage Tanks

Shop-fabricated diesel storage tanks will not be equipped with automatic level and control devices. These tanks will be monitored through routine visual surveillance. As described in Appendix A, fuel transfers will be continuously staffed to ensure prompt detection and corrective action if any spills or leaks do occur.

The drilling rig day tank will be equipped with an automatic level detection device that will send an alert to the rig personnel.

2.5.3 Inspections

Detection of liquid hydrocarbon discharge from tanks, drill site equipment, and facilities in general will rely on visual inspections (surveillance). Visual field inspection forms will be completed by designated personnel on a daily basis and by other groups, as dictated by their activities and corresponding procedures. As required by 18 AAC 75.020, these inspection logs will be retained in the ExxonMobil Anchorage office for five years.

Routine visual inspections of the drill site will ensure the timely detection of potential discharges. The North Slope operators, in a continuing effort to enhance field-wide BMPs, have developed field inspection guidelines. Table 2-2 outlines the specific regulatory requirements for visual surveillance and the groups responsible for performing these surveillances. The ACS Spill Technician is available to help with reporting and/or cleanup activities.

ExxonMobil facility operators will regularly conduct inspections as required by 18 AAC 75.075 and 18 AAC 75.066(f) and (h), and they will be trained to look for the following:

- General liner use;
- Fuel tanks (location, liner use, secondary containment);
- Barrels (location, leaders, or lying down);
- Overturned containers;
- Loads secured;
- Leaking equipment;
- Spills or spots;
- Off-road vehicle travel;
- Animal situations; and
- Equipment refueling.

All personnel will support the visual inspection process and will contact ExxonMobil's on-site Drilling Supervisor when they observe a leak or spill. All personnel will be responsible for conducting visual inspections of their work areas and to report spills and leaks to the on-site Drilling Supervisor. Environmental staff at Point Thomson will support and verify spill response and cleanup efforts.

2.6 WAIVERS [18 AAC 75.015]

ExxonMobil is not requesting waivers.

Table 2-2
Visual Surveillance Schedule

INSPECTION	RESPONSIBLE POSITION	REGULATING AGENCY	INSPECTION REQUIREMENTS	FREQUENCY REQUIREMENT	REGULATORY CITATION	RECORDKEEPING
Oil Storage Tanks	ACS Technician	EPA	Visual inspection of tanks, piping, and drain valves	Regular	40 CFR 112.8(c)(6), 112.8(d)(4), 112.9(d)(1), and Appendix F, Section 1.8.1.1	Weekly reading sheet filed in Document Control
Oil Storage Tanks	ACS Technician	ADEC	Visual inspection of tanks, piping, and drain valves	Monthly	18 AAC 75.066(f)	Visual field inspection form
Secondary Containment Areas for Oil Storage Tanks	ACS Technician	ADEC	Visual inspection for oil leaks or spills	Weekly	18 AAC 75.075(c)	Visual field inspection form
		EPA	Visual inspection	Regular	40 CFR 112, Appendix F, Section 1.8.1.3	Visual field inspection form, maintain records for five years

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PART 3 SUPPLEMENTAL INFORMATION [18 AAC 75.425(e)(3)]

3.1 FACILITY DESCRIPTION AND OPERATIONAL OVERVIEW [18 AAC 75.425(e)(3)(A)]

3.1.1 Facility Description and Operational Overview

ExxonMobil, as Operator and on behalf of the Point Thomson leaseholders, plans to conduct a multi-well drilling program in the Point Thomson area as described in the Plan of Operations submitted to the State of Alaska on July 10, 2008, and supplemented on February 10, 2009. The wells will be drilled from the Point Thomson Central Pad (existing gravel pad used for the Point Thomson Unit No. 3 well), East Pad (existing gravel pad used for the N. Staines River No. 1 well), and West Pad (ice pad located west of the Central Pad Figure 3-1]). The first two wells will be drilled from the Central Pad; the sequence of subsequent wells, both at the Central Pad and at other locations, will depend on the results of prior wells and logistical and permitting considerations. Current planning includes up to six wells to be drilled at the Central Pad, up to two wells at the West Pad, and one well at the East Pad. The wells are scheduled to be drilled primarily during winter drilling seasons; although, some drilling above threshold depths will occur during other times of the year.

Although year-round drilling in the Point Thomson area has occurred historically and is feasible, it is not proposed for this drilling program. The proposed wells are expected to require 70 to 90 days each (including time for coring and wireline logging as part of the base plan) to develop. Additional time would be required if testing is conducted. Initial drilling began in May 2009. The North Slope Borough (NSB) and Alaska Department of Environmental Conservation (ADEC) have imposed seasonal drilling restrictions, which limit drilling below threshold depths (hydrocarbon zones) to November 1 through April 15. In the initial drilling season, the wells will not encounter the threshold depths. The wells will not penetrate hydrocarbon-bearing formations until drilling resumes in the second winter drilling season. Drilling in subsequent years is expected to occur during the period from about November 1 through early May, consistent with the NSB and ADEC restrictions.

Primary access to the drill sites will occur via a 48-mile ice road to be built from the Endicott causeway to the vicinity of the Central Pad (Figure 3-2). To prevent obstruction of water flow and interference with fish migration in nearby waterways, the ice road will be slotted prior to break-up at each river draining into the Beaufort Sea. Within this part of the ODPCP, diagrams of the drill sites are included (Figures 3-3, 3-4, and 3-5).

Barges and other vessels, off-road vehicles, and aircraft also may be used. An airstrip will be constructed for winter use on sea ice and will be up to 150 feet wide and 5,000 feet long. Regular flights will use Twin Otters, Beechcraft 1900, and similar-sized aircraft. The airstrip will handle an aircraft the size of a Hercules C-130, and will be used for well control response equipment, emergency evacuation or for medical evacuation, if required. The airstrip facility will include communication and instrumentation for navigational aid.

3.1.2 Bulk Storage Containers [18 AAC 75.425(e)(3)(A)(i) and (ii)]

Diesel is the only refined petroleum product expected to be stored on site in large quantities. Diesel for on-site use will be stored in welded steel container(s) within lined secondary containment with at least 110 percent capacity of the single largest tank, plus additional capacity for precipitation (Appendix B). All tanks with a capacity of 10,000 gallons or greater will be maintained in compliance with applicable provisions of 18 AAC 75.065, 18 AAC 75.066, and 18 AAC 75.075, including requirements for tank inspections. Appendix B contains pertinent information on the tanks to be located at the drill site. Initially, the total capacity will be less than 200,000 gallons. This volume may be increased to as much as 1,600,000 gallons. Appendix B will be updated to reflect changes in tanks. In addition, up to 600,000 gallons of mineral oil (used to make oil base mud), oil base mud, or oil based mud and cuttings waste may be stored on the Central Pad.

The tanks to be used to support ExxonMobil's drilling operations are shop-fabricated tanks that have at each tank fill connection, a fixed overfill spill containment system designed to prevent a discharge when a transfer hose or pipe is detached from the tank fill pipe or that is able to divert the discharge into a secondary containment dike. Overfill-protection devices are not required for these portable tanks by the referenced regulations, nor are they required by the relevant American Petroleum Institute (API) construction standards. The strict adherence to staffing, communications, and emergency shutdown requirements provides a reliable and effective means of preventing tank overfill. Fuel transfer procedures, described in Sections 2.1.6 and 3.1.3 would be implemented to protect against tank overfill.

3.1.3 Transfer Procedures [18 AAC 75.425(e)(3)(A)(vi)]

Transfer operations will occur on the gravel or ice drill pads. In addition, there will be fuel transfers from barges to the bulk fuel tanks. During barge fuel transfers, containment boom will be deployed around the barge and ACS vessels will be in the area to facilitate these efforts. The fluid transfer guidelines provided in Appendix A describe practices for safe, responsible transfers of diesel and will be used for Point Thomson operations. Barge transfer procedures are provided in Part 2, Section A.7 of the Crowley Marine Services Alaska Oil Barge Operations ODPCP.

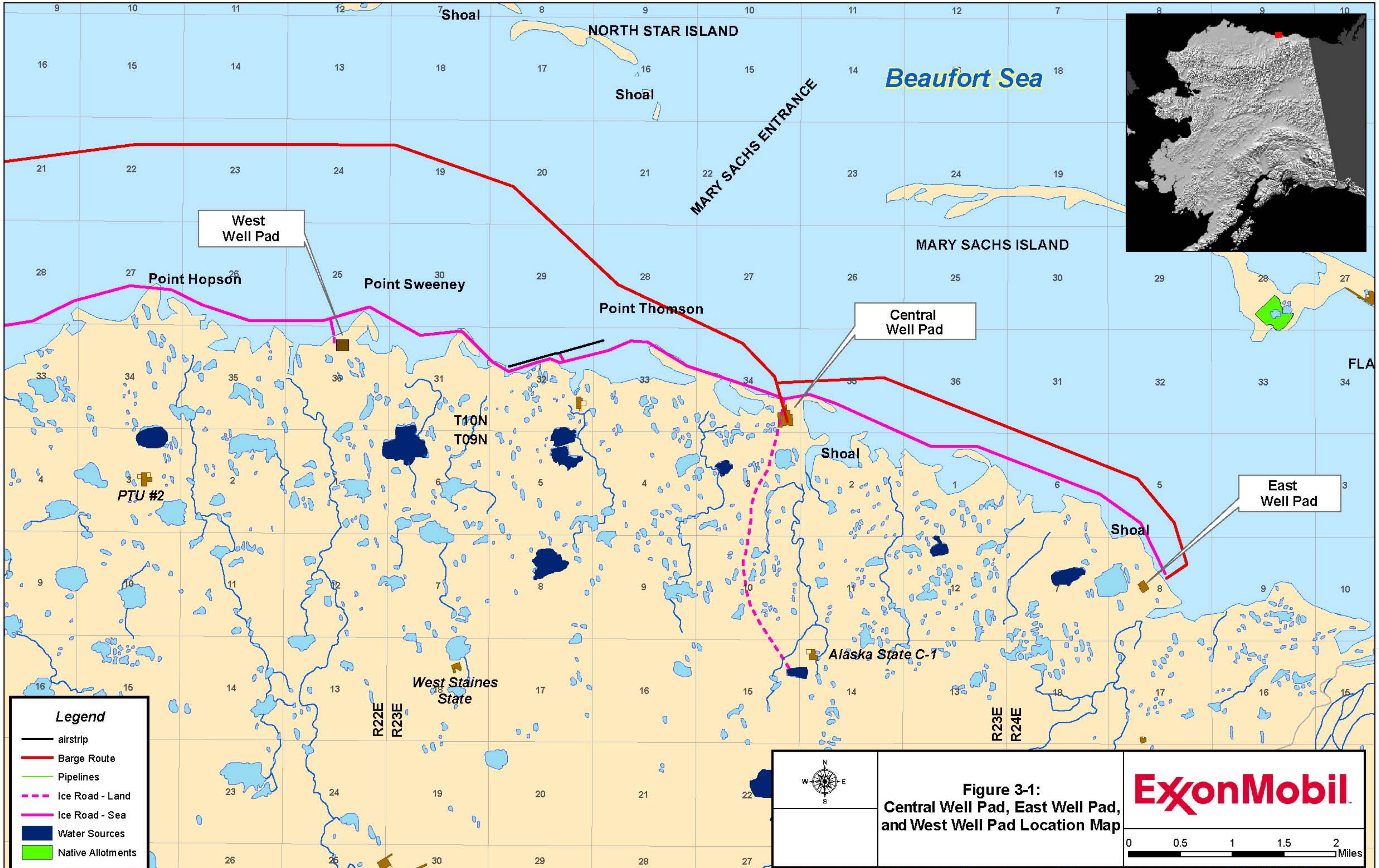
Proper use of surface liners and drip pans is also described in Appendix A, which is consistent with the North Slope Unified Operating Procedure. The "Surface Liner/Drip Pan Use Procedure" will be used at Point Thomson.

3.2 RECEIVING ENVIRONMENT [18 AAC 75.425(e)(3)(B)]

Onshore winter drilling activity on the North Slope occurs when water surfaces are frozen and no open water exists. Stream flow is nonexistent or at least not measurable through most of the winter. Grounded, landfast ice will be present in the lagoon areas north and east of the drill sites.

3.2.1 Potential Routes of Discharges [18 AAC 75.425(e)(3)(B)(i)]

For winter drilling operations, open water is not expected. All water body surfaces will be frozen. Storage of diesel fuel will occur throughout the year. A release from the diesel fuel farm would have the potential to impact small ponds adjacent to the gravel pad. The ponds do not drain directly to the Beaufort Sea. The fuel farm is located approximately 500 feet from the nearest marine shoreline.


Beaufort Sea
NORTH STAR ISLAND
Shoal
MARY SACHS ENTRANCE
MARY SACHS ISLAND
West Well Pad
Point Hopson
Point Sweeney
Point Thomson
Central Well Pad
East Well Pad
T10N
T09N
PTU #2
Alaska State C-1
West Staines State
R22E
R23E
R24E
FLA
Legend
airstrip
Barge Route
Pipelines
Ice Road - Land
Ice Road - Sea
Water Sources
Native Allotments
Figure 3-1:
Central Well Pad, East Well Pad, and West Well Pad Location Map
ExxonMobil
0 0.5 1 1.5 2 Miles

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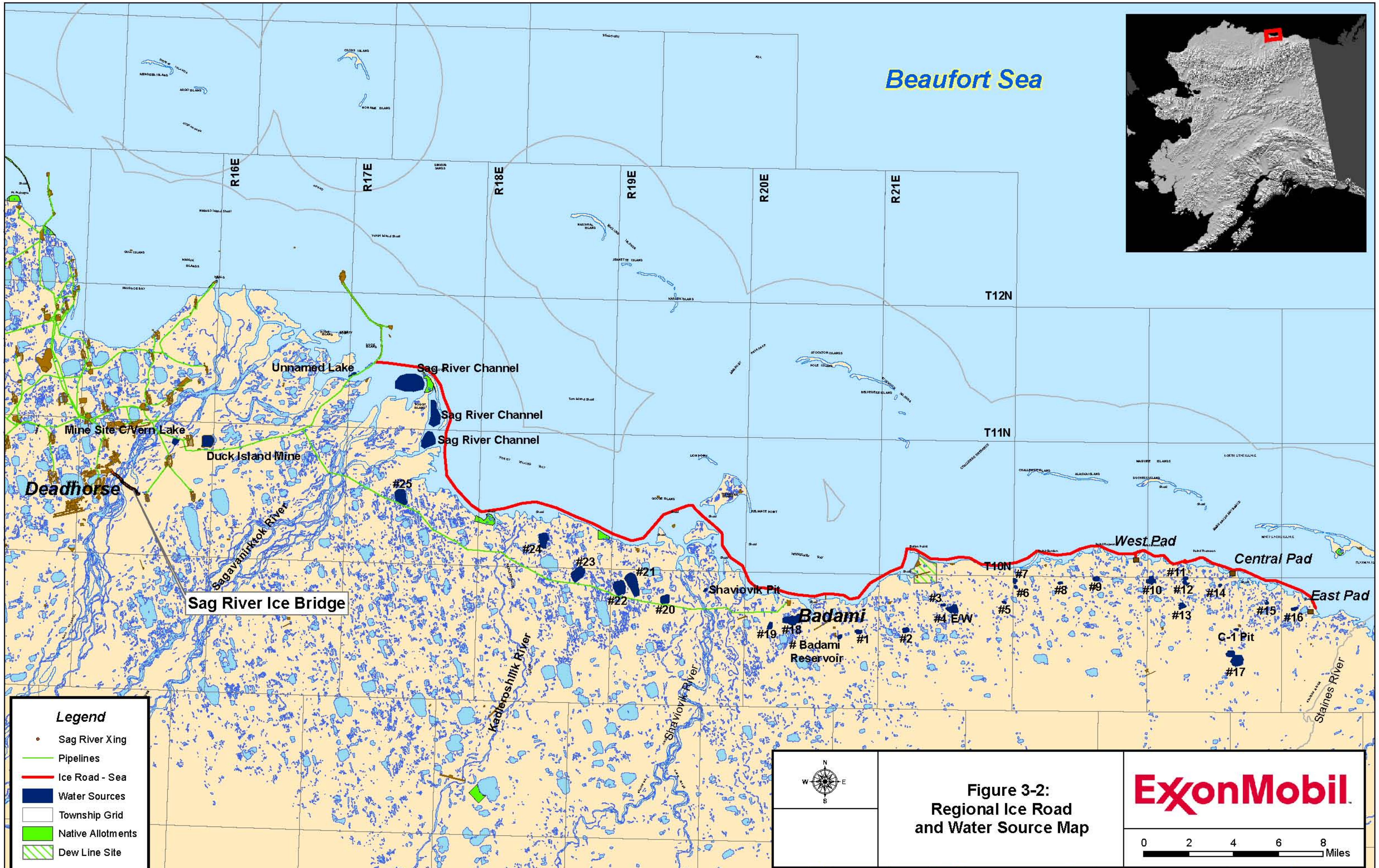
Beaufort Sea
R16E
R17E
R18E
R19E
R20E
R21E
T12N
T11N
T10N
Unnamed Lake
Sag River Channel
Sag River Channel
Sag River Channel
Mine Site C/Vern Lake
Duck Island Mine
Deadhorse
#25
#24
#23
#21
#22
#20
Sagavanirktok River
Sag River Ice Bridge
Shaviovik Pit
Badami
#19
#18
Badami
Reservoir
#1
#2
#3
#4 E/W
#5
#6
#7
#8
#9
#10
#11
#12
#13
#14
#15
#16
#17
C-1 Pit
West Pad
Central Pad
East Pad
Kadleroshilik River
Shaviovik River
Staines River
Legend
Sag River Xing
Pipelines
Ice Road - Sea
Water Sources
Township Grid
Native Allotments
Dew Line Site
Figure 3-2:
Regional Ice Road
and Water Source Map
ExxonMobil
0
2
4
6
8
Miles

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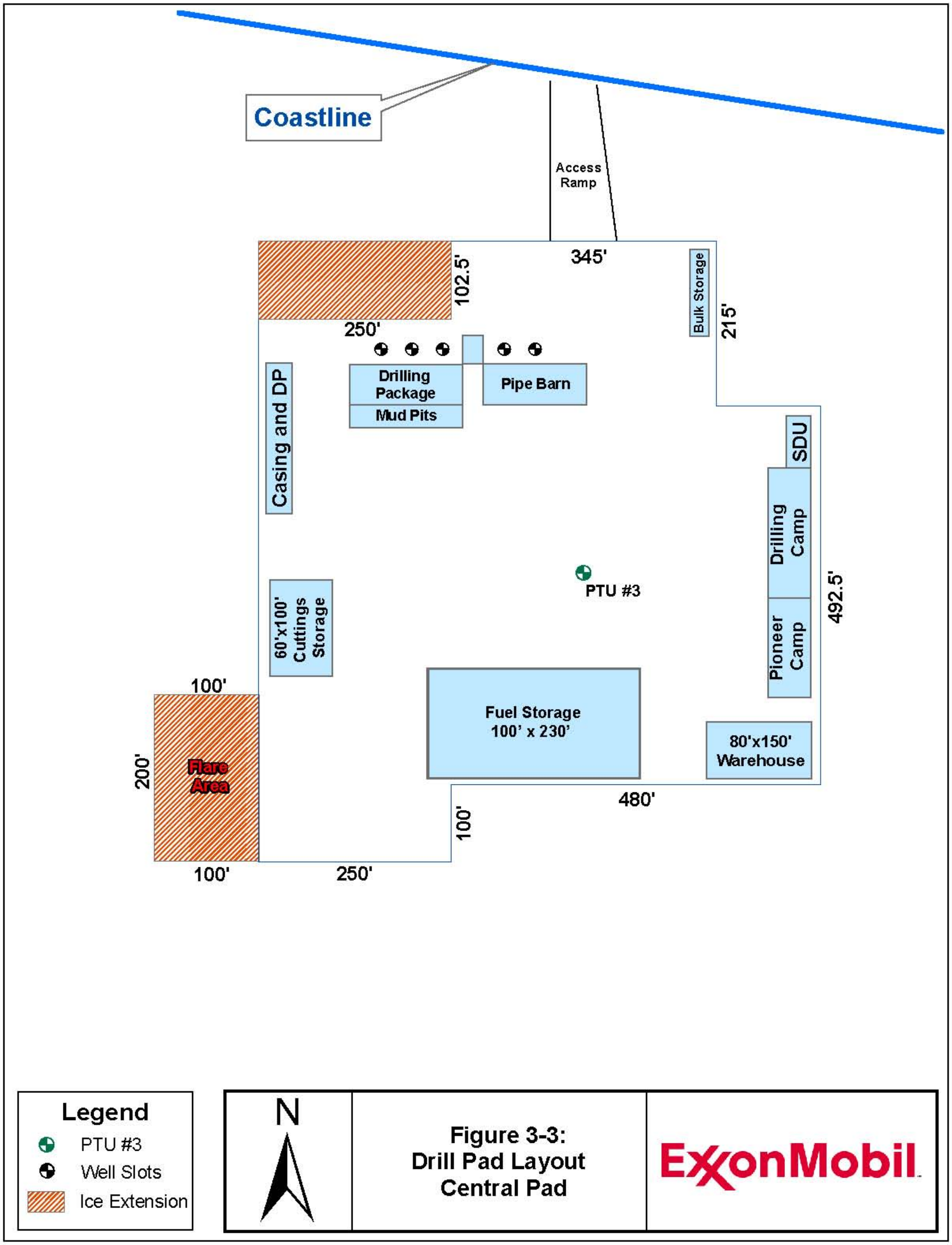

Figure 3-3:
Drill Pad Layout
Central Pad

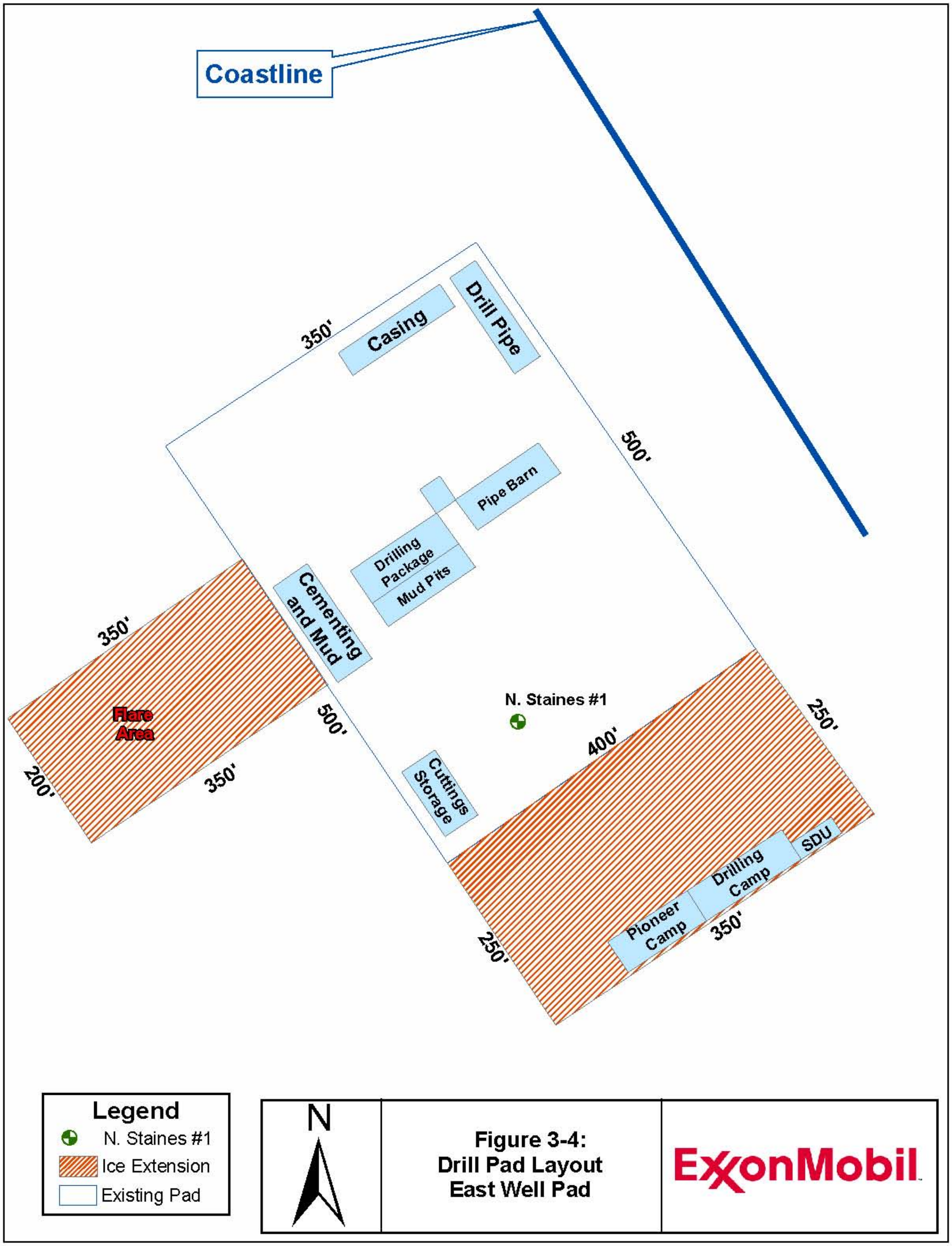

Figure 3-4:
Drill Pad Layout
East Well Pad

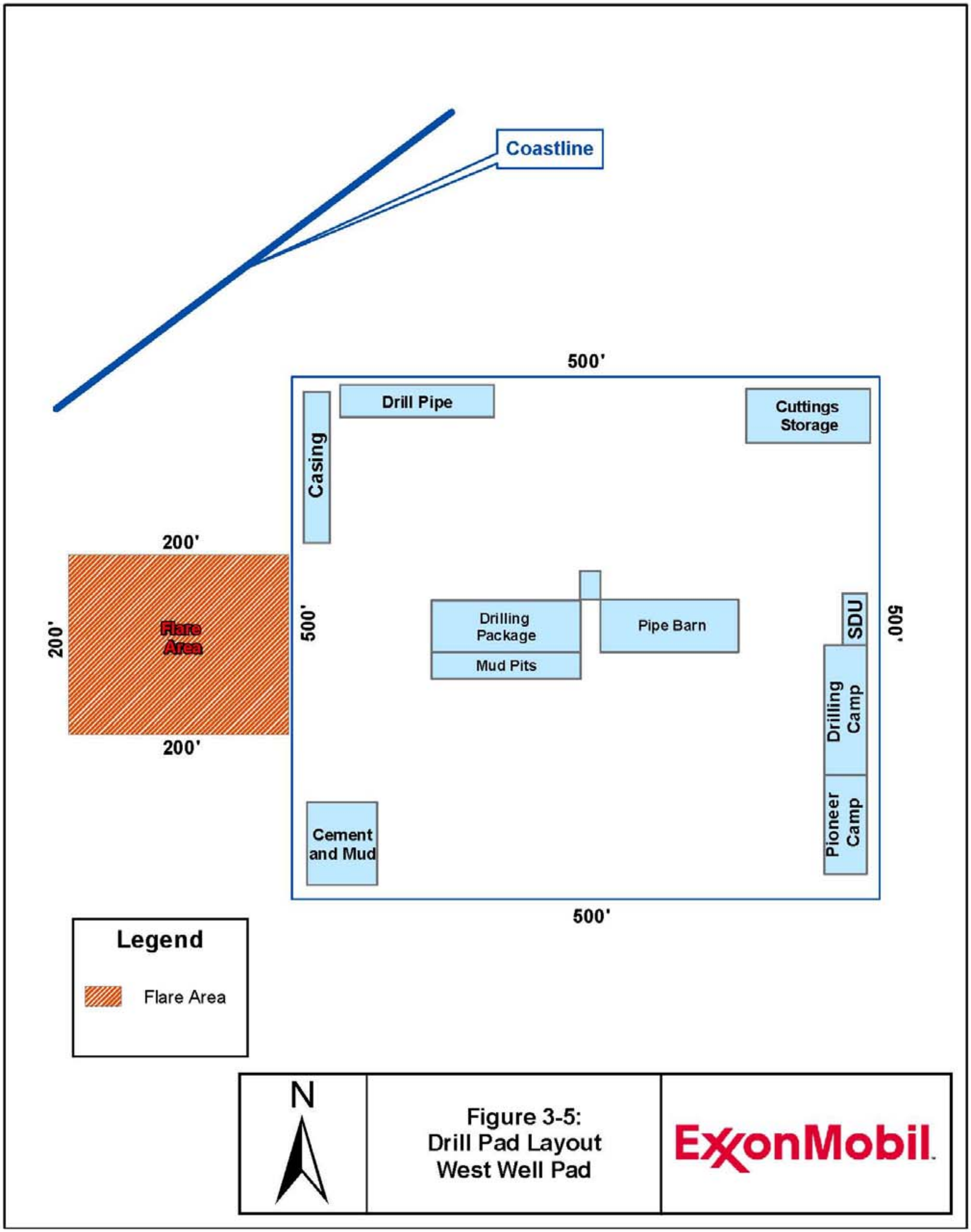

Figure 3-5:
Drill Pad Layout
West Well Pad

3.2.2 Estimate of Response Planning Standard Volume to Reach Open Water [18 AAC 75.425(e)(3)(B)(ii)]

For winter drilling operations, no portion of the Response Planning Standard (RPS) volume of spilled oil is expected to encounter open water. For the summer tank rupture scenario, approximately 15 percent (221 barrels) of the RPS is estimated to reach small freshwater ponds. The ponds do not drain directly to the Beaufort Sea; however, they do qualify as “open water” as defined in 18 AAC 75.990.

3.3 COMMAND SYSTEM [18 AAC 75.425(e)(3)(C)]

3.3.1 Incident Command System

The organization for oil spill response at Point Thomson will be an Incident Command System (ICS). It will provide clear definition of roles and lines of command with the flexibility for expansion or contraction of the organization as necessary. Personnel with roles in the ICS will comprise the Point Thomson Incident Management Team (IMT) and are listed in Section 1.2. The proposed IMT for Point Thomson is compatible with the state’s oil spill response structure outlined in the Federal/State/Tribal Unified Plan for Alaska.

In Tier I incidents, the Spill Response Team (SRT) will have the capabilities to effectively control the incident.

Tier II and III responses will be led by the Incident Commander. The IMT will be activated by the Incident Commander to support the field responders and to coordinate the collection and distribution of information.

Alaska Clean Seas (ACS) will be activated to stand by for spills that have the potential to be Tier II or III incidents until an assessment is performed. Once the assessment is complete, ACS will be either released or mobilized. For Tier II and III responses, ACS will provide labor and equipment resources from the North Slope Spill Response Team (NSSRT) via Mutual Aid, Village Response Teams, and auxiliary contractor teams to assist in spill containment and recovery. The North Slope operators coordinate with ACS to ensure that a reserve of trained staff is available for an extended spill response.

3.3.2 Unified Command

It is envisioned that a Unified Command will be established for Tier II and III events. The Unified Command members will be ExxonMobil’s Incident Commander, the Federal On-Scene Coordinator (FOSC), the State On-Scene Coordinator (SOSC), and the Local On-Scene Coordinator (LOSC), as outlined in the Alaska Regional Response Team (ARRT) *Unified Plan for Alaska*. Details of the management structure in a spill response are provided in the ACS *Technical Manual*. Volume 3, Section 2, of the ACS *Technical Manual* discusses the escalation of the IMT while Volume 3, Appendix B, contains a description of position responsibilities and checklists. Note that the proposed SRT fulfills functions of the Tactical Response Team discussed in ACS *Technical Manual*, Volume 3.

The Unified Command structure is established and superimposed at the top level of the IMT. The Unified Command provides overall direction by establishing strategic objectives and response priorities to be addressed by the IMT through the planning process. Moreover, it reviews and approves the tactical plans (i.e., Incident Action Plans) developed by the IMT to address the objectives and priorities. It also resolves conflicts as necessary. The responsibilities are typically exercised through periodic, highly focused Unified Command meetings.

This position at the top of the IMT also facilitates the integration of response resources. For the agency representatives, it allows them to determine the appropriate roles for agency personnel and to position their staff optimally within the IMT. For the Responsible Party, it ensures that members of the IMT have access to expertise without diluting their ability to manage response operations.

The role of the agency representatives in the Unified Command is to fulfill their legal responsibilities (i.e., to direct and/or monitor response operations), while allowing the Responsible Party to manage the emergency response operations.

3.4 REALISTIC MAXIMUM RESPONSE OPERATING LIMITATIONS [18 AAC 75.425(e)(3)(D)]

3.4.1 Adverse Weather Conditions [18 AAC 75.425(e)(3)(D)(i)]

The realistic maximum response operating limitations (RMROLs) are described in the ACS *Technical Manual,* Volume 1, Tactic L-7. Environmental conditions can limit response work. Some limitations are based on safety, and others are due to equipment effectiveness. The ACS *Technical Manual* lists the percentage of time some variables reduce effectiveness of response for planning purposes.

Weather can wield significant influence over oil spill cleanup operations. Although weather can impair work efficiency, planning and advance preparation can facilitate an effective response. For example, arctic clothing is required during the winter. The resulting bulk from the arctic clothing hampers worker movement, and even with arctic clothing, cleanup personnel may not be able to tolerate long periods of exposure to the cold. This can be overcome by planning for personnel limitations and providing adequate shelter and opportunities to get warm. To compensate for the lower productivity, additional personnel can be used. Cold weather also may cause or compound equipment failures. However, the use of equipment rated for arctic weather conditions, along with the proper equipment operating procedures, can minimize these effects.

On the other hand, oil spills are also affected by temperature. As temperature decreases, the viscosity of oil increases. Increased viscosity may enhance spill cleanup efforts by slowing the spread of oil. Oil may be recovered with greater efficiency at low temperatures because contaminated areas are smaller, and thicker oil facilitates rapid recovery. Wind may affect oil spill cleanup operations. Winds above 15 knots with 30-knot gusts are strong enough to make hoists and lifts unsafe, and whiteouts restrict visibility to a few feet – 10 to 20 feet above ground.

Phase 1, 2, and 3 weather conditions are described below:

- **Phase 1:** Caution - reduced visibility. Travel is permitted using extreme caution. Reduce speed and be certain all equipment (e.g., radio and lights) is operating properly. Arctic gear is required.
- **Phase 2:** Restricted - convoy-only travel. Travel is permitted in convoys of two or more vehicles only. Radio communication between vehicles in the convoy is required.
- **Phase 3:** Closed - critical or emergency travel only. Travel will be by heavy-equipment convoy only.

All non-standard operations require a pre-job safety meeting in which hazards are assessed. A risk assessment is done on those hazards and appropriate mitigation measures are identified to manage the hazards. The risk assessment will be led by the ExxonMobil on-site representative, with participation from the contractor toolpusher and any other appropriate personnel. The ExxonMobil on-site representative is responsible for making the final decision as to the level of risk.

The company representative should consider the following when doing a risk assessment:

- Safety and health of operation: type of operation, hazards and risks involved;
- Forecast for weather conditions: duration, area, severity, and crew change-out;
- Fuel and water levels to sustain operations;
- Support personnel, such as trucking companies, mud companies, tool services; and
- Availability of emergency equipment and medical evacuation capabilities.

3.4.2 Sea States, Tides, and Currents [18 AAC 75.425(e)(3)(D)(ii)]

See ACS *Technical Manual*, Volume 1, Tactic L-7.

3.4.3 Snow, Ice, and Debris [18 AAC 75.425(e)(3)(D)(iii)]

See ACS *Technical Manual*, Volume 1, Tactic L-7.

3.4.4 Hours of Daylight [18 AAC 75.425(e)(3)(D)(iv)]

See ACS *Technical Manual*, Volume 1, Tactic L-7.

3.4.5 Miscellaneous [18 AAC 75.425(e)(3)(D)(vi)]

See ACS *Technical Manual*, Volume 1, Tactic L-7.

3.5 LOGISTICAL SUPPORT [18 AAC 75.425(e)(3)(E)]

ExxonMobil will have a significant logistical support capability to support its ongoing drilling operations. The transportation equipment, coordination procedures, and maintenance procedures in place under normal operations will be capable of being ramped up to meet increased needs during a response operation. Furthermore, ExxonMobil will have contracts for additional logistical support to aid in a spill response through ACS and contracting companies.

3.6 RESPONSE EQUIPMENT [18 AAC 75.425(e)(3)(F)]

3.6.1 Equipment Lists

North Slope spill response equipment will be available for oil spill responses at Point Thomson through ACS as outlined in the ACS *Technical Manual,* Volume 1, Tactics L-4, L-6, L-8, L-9, and L-10. ACS equipment for Point Thomson will be warehoused in pre-staged containers at Central Pad. The location and status of ACS equipment is listed in the Master Equipment List maintained by ACS, which is available upon request. Spill response equipment for Point Thomson will include, at minimum, equipment listed in Table 3-1***.***

If fuel transfers are made from barges to the bulk fuel tanks, ACS vessels will deploy containment boom (which is carried on board the vessels) prior to fuel transfer.

3.6.2 Maintenance and Inspection of Response Equipment

Response equipment will be maintained so that it can be deployed rapidly and in condition for immediate use. The on-site response equipment will be routinely inspected and tested by ACS (ACS *Technical Manual*, Volume 1, Tactic L-6). In addition, ACS performs routine inspection and maintenance of its response equipment.

ACS has the following U.S. Coast Guard Oil Spill Removal Organization (OSRO) classifications:

- River/Canal – MM, W1, W2, and W3;
- Inland – MM, W1, W2, and W3;
- Open Ocean – MM, W1, and W2;
- Nearshore – MM, W1, and W2; and
- Offshore – MM, W1, and W2.

ACS has fulfilled the equipment maintenance and testing criteria that these classifications require.

3.6.3 Pre-Deployed Equipment

Pre-deployed boom will be used for fuel transfers from barges to the drill sites during open water. Pre-deployed equipment is not planned for other components of the Point Thomson winter drilling program.

3.7 NON-MECHANICAL RESPONSE INFORMATION [18 AAC 75.425(e)(3)(G)]

Non-mechanical response information is provided in the ACS *Technical Manual*, Volume 1, “B” Tactics.

3.8 RESPONSE CONTRACTOR INFORMATION [18 AAC 75.425(e)(3)(H)]

As described in Section 1.1.1, this Oil Discharge Prevention and Contingency Plan (ODPCP) provides for a tiered response effort depending on the size and nature of the spill event. ACS will be ExxonMobil’s primary response action contractor pursuant to 18 AAC 75.425(e)(3)(H). Through the North Slope Mutual Aid Agreement, ExxonMobil also will have access to the NSSRT.

Contact information for ACS is shown in Table 1-4. If additional Response Action Contractor resources are required, they will be accessed through Master Service Agreements maintained by ACS. A signed copy of ExxonMobil’s Statement of Contractual Terms with ACS for Point Thomson is included in Appendix C.

Table 3-1
ACS Spill Response Equipment

CONX-2809 CONEX, STORAGE CONTAINER, 20 X 8 Kit
Kit List

SEP 5 08 - 17:31 Page 1

Location Code	Temporary Location	Seal Number:	Date Last Inventoried:
DH-701-EP-CR3-A	Conx Row 3-A	1384063	JUN 19 08

Item#	Req'd	On Hand	Measure	Description
1		1	EA	5.0 GAL DIESEL CAN
2		1	PAIR	BOOT, XTRATUF, SZ 10. STEEL TOE
3		1	PAIR	BOOT, XTRATUF, SZ 11. STEEL TOE
4		1	PAIR	BOOT, XTRATUF, SZ 12. STEEL TOE
5		1	bx	BOOTIES, 3X (50/BOX)
6		3	ROLL	DUCT TAPE
7		2	EA	EXTENSION CORD, 50FT
8		1	EA	FLASHLIGHT WITH BATTERIES
9		2	gal	GAS, MIXED, CHAINSAW
10		6	PAIR	GLOVE, RUBBER, FIREBALL, ANSELL
11		12	PR	GLOVES, GREEN APE
12		6	EA	GOGGLES, SAFETY, WINTER, UVEX
13		2	EA	ICE CHIPPER
14		1	gal	OIL, TWO STROKE
15		2	BOX	OILY WASTE BAGS, BOX OF 100
16		4	ea	PIPE, PLASTIC, 4"X10'
17		2	EA	PITCH FORK
18		1	ROLL	POLY ROPE, 1/4" X 100'
19		1	EA	PROPANE GAS BOTTLE, 20#
20		3	EA	PUSH BROOM
21		6	EA	RAIN GEAR, 3 PIECE SUITE, XXXL
22		6	EA	RAIN SUIT, XL
23		3	PR	RUBBER BOOTS
24		6	PR	RUBBER GLOVES
25		2	ROLL	SAFETY TAPE, 100' ROLL "DO NOT ENTER"
26		3	EA	SHOVEL, ROUND POINT
27		3	EA	SHOVEL, SNOW
28		1	ea	SHOVEL, SNOW, BIG BLUE
29		3	EA	SHOVEL, SQUARE POINT
30		1	EA	SLEDGE HAMMER, #8
31		1	EA	SMALL FIRST AID KIT
32		4	BUNDLE	SORBENT 18" X 18" (WHITE)
33		5	BUNDLE	SORBENT BOOM, 8" X 40'
34		1	BUNDLE	SORBENT, 18" X 18" (YELLOW)
35		8	ROLL	SORBENT, 36" X 150'
36		6	PR	SPLASH GOGGLES
37		2	EA	SQUEEGE, 24" FLOOR
38		6	ea	STUD, WOOD, 2"X4"
39		2	BUNDLE	SURVEY STAKES, 50 PER BUNDLE
40		2	ROLL	SURVEYORS TAPE
41		2	ROLL	TIE WIRE, 100'
42		1	EA	TOOL BOX WITH ASSORTED HAND TOOLS

Table 3-1 (Continued)
ACS Spill Response Equipment

CONX-2809 CONEX, STORAGE CONTAINER, 20 X 8 Kit
Kit List

SEP 5 08 - 17:31 Page 2

Location Code	Temporary Location	Seal Number:	Date Last Inventoried:
DH-701-EP-CR3-A	Conx Row 3-A	1384063	JUN 19 08

Item#	Req'd	On Hand	Measure	Description
43		2	BOX	TYVEK SUIT, XXXL
44		2	EA	UTILITY KNIFE
45		2	ROLL	VISQUEEN 20' X 100'
46		1	EA	WEED BURNER
		134		**CONX-2809 CONEX, STORAGE CONTAINER, 20 X 8 Kit Totals**

Table 3-1 (Continued)
ACS Spill Response Equipment

CONX-2809 CONEX, STORAGE CONTAINER, 20 X 8
Equipment Package Report: Summary

SEP 5 08 - 17:32 Page 1

Package/Item #	Tag#	Equipment Description	Quantity	Size	Measure
	CONX-2809	**CONEX, STORAGE CONTAINER, 20 X 8 NOT REQUIRED, DRILLING**	1		
1	FLQ-0001	LIGHTS, 4 LIGHT STAND - 2,000 WATT HUBBELL CAT, QL500	1		EA
2	GNED-0207	GENERATOR, DIESEL, 2.0KW YANMAR, YDG 2000E-6EH	1	2	KW
3	HOSD-3009	HOSE, DISCHARGE, 3" GOODYEAR, 200' 3" DISCHARGE	1	200	ft
4	HOSS-3009	HOSE, SUCTION, 3" GOODYEAR, 60' 3" SUCTION	1	40	ft
4	PDED-0322	PUMP, DIAPHRAGM, DIESEL, 3" YANMAR, L4EE-15AYC	1	100	GPM
6	PTED-0207	PUMP, TRASH, DIESEL, 2" YANMAR, L48AE-D	1	220	GPM
		CONX-2809 CONEX, STORAGE CONTAINER, 20 X 8 Total Records = 7	**7**		

3.9 TRAINING AND DRILLS [18 AAC 75.425(e)(3)(I)]

3.9.1 Point Thomson Spill Response Team Training

ACS will have up to two technicians at the drill site at all times when actual drilling operations occur; these technicians will provide training to the SRT. Initial spill response training will include on-site winter response tactics using the equipment that will be stored on site by ACS.

3.9.2 North Slope Spill Response Team Training

The NSSRT consists of workers who volunteer as emergency spill response technicians. Each team member has initial Hazardous Waste Operations and Emergency Response (HAZWOPER) emergency response training and annual refresher training, which meets or exceeds the requirements in the HAZWOPER regulations at 29 CFR 1910.120(q). Annual requirements for HAZWOPER refreshers, medical physicals, and respiratory fit tests are tracked by ACS through monthly reports from the database (Section 3.9.4). The NSSRT training program is provided to responders from all production units on the North Slope. The NSSRT maintains a minimum of 115 responders designed to ensure response capability in compliance with all North Slope ODPCP response scenarios. Responders shall be provided with minimum training requirements as noted below.

- Current 24-hour HAZWOPER certification or 8-hour refresher;
- Hydrogen Sulfide Training; and
- North Slope Training Cooperative Academy.

The NSSRT training program offers weekly classes at each field. The classes emphasize hands-on experience, field exercises, and team-building drills. The courses are selected by the facility ACS Lead Technician with field management and use training consultants from ExxonMobil, ACS, and external sources. The ACS *Technical Manual,* Volume 1, Tactic A-4, lists typical NSSRT training courses as shown in Table 3-2. Because of operational time constraints, many of the courses are divided by subject area and taught in the 2- or 3-hour timeframe of an NSSRT meeting. Training and attendance are documented and available for review at the ACS Base in Deadhorse, Alaska. The yearly training schedule is also available at the facility and ACS Base. Current NSSRT training schedules are posted on the ACS website. Descriptions of the five responder categories, training requirements for each category, and a representative list of the various courses ACS provides to the NSSRT members are provided in the ACS *Technical Manual,* Volume 1, Tactic A-4.

3.9.3 Incident Management Team Training

ACS provides IMT training for its own personnel. Similar training will be provided for ExxonMobil North Slope IMT personnel. This training includes an introduction to the ICS, ICS position-specific training at section chief level, tabletop exercises, and deployment drills. As new training needs are identified, they are developed and incorporated into the training program. A description of the North Slope IMT training program is provided in the ACS *Technical Manual,* Tactic A-4.

Table 3-2
Typical North Slope Spill Response Team
Training Courses

CATEGORY	COURSE TITLE
COMMUNICATION	ICS Basic Radio Procedures
DECONTAMINATION	Decontamination Procedures
ENVIRONMENTAL	Environmental Awareness Wildlife Hazing
EQUIPMENT	Basic Hydraulics for Spill Responders Boom Construction and Design Fastanks and Bladders Skimmer Types and Application Snow Machines and ATV Operations 90+ Spill Response Equipment Proficiency Checks
MANAGEMENT	Incident Command System Management and Leadership During an Oil Spill Quarterly Drill and Exercises Staging Area Management
MISCELLANEOUS	Global Positioning System
RESPONSE TACTICS	In Situ Burning Nearshore Operations Winter Oil Spill Operations
	Winter Response Tactics
SAFETY/SURVIVAL	Arctic Cold Weather Survival
	Arctic Safety
	HAZWOPER
	Spill Site Safety
	Weather Port and Survival Equipment
VESSEL-RELATED	Arctic Cold Water Survival
	Airboat Operations
	Boat Safety and Handling
	Boom Deployment On Rivers
	Captain/Crewman Vessel Training
	Charting and Navigation
	Deckhand/Knot Tying
	River Response School
	Swiftwater Survival

3.9.4 Auxiliary Contract Response Team

ACS maintains and operates an ADEC-approved training and response program to ensure North Slope plan holders have the ability to provide the personnel required to support a long-term response. The program consists of contracts and agreements with numerous Response Action Contractors, OSROs, and the auxiliary contract response team, which includes village response teams. This provides assurance that a sufficient number of trained and qualified responders are available to respond to oil spills on the North Slope. Auxiliary contract response team members may attend the various courses ACS provides to the NSSRT members, as shown in ACS *Technical Manual,* Volume 1, Tactic A-4.

3.9.5 Recordkeeping

ExxonMobil will maintain a database as a record of the relevant courses taken by each ExxonMobil employee. Records will be kept for a minimum of five years or for the entire time that the employee is assigned responsibilities under this plan. The database will provide a brief description of the course and the date completed and will be available at the ExxonMobil office in Anchorage. ACS maintains a database as a record of the ACS courses taken by all NSSRT members, as well as auxiliary contract response team members and other persons that attend ACS training courses. These records are available for inspection at the ACS Base. Contractor companies will keep their own spill response training records.

3.9.6 Spill Response Exercise

ExxonMobil has adopted the National Preparedness for Response Exercise Program (NPREP) guidelines as the structure for the Point Thomson training program and procedures. The NPREP guidelines were developed to establish a workable exercise program that meets the intent of the Oil Pollution Act of 1990 (OPA 90) for spill response preparedness. Participation in the NPREP ensures the federal exercise requirements mandated by OPA 90 are met.

Internal Exercises

Internal exercises are those which will be conducted wholly within ExxonMobil and are designed to test the various components of this plan to ensure it is adequate for response to a spill. Internal exercises will include:

- **Quarterly Qualified Individual (QI) Notification Drills:** To ensure the QI is able to be reached on a 24-hour basis in a spill response emergency and carry out assigned duties.
- **Annual Spill Management Team Tabletop Exercises:** To ensure personnel are familiar with the contents of this plan, the ICS, crisis response procedures, mitigating measures, notification numbers and procedures, and individual roles in the response structure.
- **Annual Equipment Deployment Exercises:** To ensure internal and contractor-operated response equipment is fully functional and can be deployed in an efficient and productive manner.
- **Annual Unannounced Exercise for NPREP Requirements:** ExxonMobil Emergency Services is responsible for ensuring that an unannounced exercise meeting NPREP requirements occurs annually. The Planning Section Chief is responsible for documenting actions taken during an actual event for NPREP credit if it involves one of the following – use of emergency procedures to mitigate or prevent a discharge or threat of discharge, activation of the field IMT, or deployment of spill response equipment.
- **Triennial Exercise of Entire Plan including worst case discharge scenario**

With the exception of government-initiated unannounced exercises, the internal exercises will be self-evaluated and self-certified. Documentation, including a description of the exercise, objectives met, and results of evaluations, will be maintained for a minimum of three years. Exercise documentation will be in written form for each exercise, signed by the Point Thomson Environmental Specialist or Safety, Health and Environment (SHE) Lead, and available for review on request.

The Point Thomson SHE Lead, or designee, will be responsible for the scheduling, development, and evaluation of training programs and exercises, and for ensuring that regulatory requirements are met.

External Exercises

External exercises will test the plan and the interaction and coordination between ExxonMobil and the response community, such as the OSRO (ACS), state, federal, and local agencies, and local community representatives. ExxonMobil will depend on the NSSRT to respond to Tier II or III spills at Point Thomson. NSSRT participates in an annual external exercise referred to as the Mutual Aid Drill (MAD). In addition to actively participating in the MAD, federal, state, and local agencies are involved in the development and evaluation of the drill. Every year, equipment is deployed at the MAD exercise according to NPREP guidelines. The MAD exercise satisfies the NPREP requirements to exercise all aspects of the response plan at least every three years. The following are the components that are tested through the MAD exercise:

Organizational Design

- Notifications (includes training on 24-hour notifications and reporting to the National Response Center)
- Staff mobilization
- Ability to operate within the response management system described in the plan

Operational Response

- Discharge control
- Assessment of discharge
- Containment of discharge
- Recovery of spilled material
- Protection of economically and environmentally sensitive areas
- Disposal of recovered product

Response Support

- Communications
- Transportation
- Personnel support
- Equipment maintenance and support
- Procurement
- Documentation

3.10 PROTECTION OF ENVIRONMENTALLY SENSITIVE AREAS [18 AAC 75.425(e)(3)(J)]

Priority protection sites, sensitivities, surface water flow directions, wildlife protection strategies, and natural resources are described in the ACS *Technical Manual* (Volume 1, Tactics 1 through 6*),* and are subject to confirmation by the resource agencies. The ACS *Technical Manual* (Volume 2, Map Atlas, Maps 102 through 104) shows the locations of priority protection sites in the Point Thomson operating area.

In the event of a spill off the drill site, the IMT will develop incident-specific plans to protect environmentally sensitive areas and areas of public concern, as appropriate.

If any historic, prehistoric, or archaeological sites or materials are discovered during drilling or spill recovery operations, the Alaska Department of Natural Resources, Division of Parks and Outdoor Recreation, Office of History and Archaeology, shall be notified. ACS maintains a confidential list of recognized archeological or cultural site locations for spill response for agency notification and response purposes.

Mitigation of adverse impacts to subsistence areas and activities will be accomplished through ExxonMobil's *Subsistence Mitigation Program for Point Thomson Drilling Program* and stipulations outlined in the North Slope Borough Conditional Use Permit NSB 08-408. The *Subsistence Mitigation Program for Point Thomson Drilling Program* states that ExxonMobil will employ local residents as subsistence representatives during all phases of the Point Thomson Drilling Program. These individuals may fulfill several roles such as, marine mammal observer, on-board Inupiat communicator, polar bear monitor, and subsistence representative. NSB 08-408 contains specific requirements regarding barging activities, including a Conflict Avoidance Agreement (CAA). The CAA includes an agreement that the ExxonMobil barging route will maintain a 5-mile distance offshore when east of Bullen Point (to mitigate caribou disturbance), and that each tug or barge will have an on-board Inupiat communicator. ExxonMobil also has agreed to cease barging or other marine activities on or before August 25 in order to avoid impact during whaling seasons.

3.11 ADDITIONAL INFORMATION [18 AAC 75.425(e)(3)(K)]

This section includes additional information that supports other elements to this plan and is unique to this project.

3.11.1 Description of Point Thomson Reservoir

Point Thomson contains significant hydrocarbon accumulations. The primary reservoir is referred to as the Thomson Sand. It is a large over-pressured gas condensate reservoir approximately 12,750 feet below sea level (the term, "over-pressured," is applied to reservoirs that have pressures higher than water gradients) and ranges from approximately 25 feet to 350 feet in thickness. A total of 19 exploration wells have been drilled in and around the field, and data from numerous seismic surveys have been used to delineate this extensive resource. The Thomson Sand has a thin oil rim containing heavy and viscous oil.

The Thomson Sand is overlain by the shallower Brookian accumulations, some of which contain hydrocarbons in the form of oil. These hydrocarbon accumulations are discontinuous. Six of the 11 wells previously drilled through the Brookian formation showed oil flow potential.

3.11.2 Condensate Characteristics

Gas-condensate is present as gas in the formation. When pressure and temperature of gas are reduced in the wellbore and processing facilities, the condensate turns into a liquid state.

Thomson Sand gas-condensate is composed of predominantly shorter chain or lighter fraction hydrocarbons than Alaska North Slope crude oil. For example, approximately 72 percent of the hydrocarbons in Thomson Sand condensate are 17 carbons in length or shorter compared to 35 percent for Alaska North Slope crude.

Gas condensates generally have higher American Petroleum Institute (API) gravities than crude oils and lower pour points and viscosities. Condensate evaporates more readily than crude oil and does not form water-in-oil emulsions when heavily weathered. Central Pad condensate sampling analysis showed API gravities ranging from 38 to 40.6 percent and a gas-to-oil ratio (GOR) of about 13,000.

3.11.3 Modeling Blowout Consequences

ExxonMobil used two computer modeling programs, Second-Order Closure Integrated PUFF (SCIPUFF) Model and SCREEN3, to evaluate the impacts of an ignited condensate well blowout and to ensure U.S. Environmental Protection Agency (EPA) air quality standards are met. The SCIPUFF dispersion model was used to simulate the effects of a well blowout release. EPA's SCREEN3 model was used to determine if particulate matter emissions from a burning blowout at Point Thomson have the potential to exceed national standards (EPA, 1995a).

The blowout modeling programs predict flow of hydrocarbons from the subsurface reservoir into and up the wellbore that routes them to the surface. Because the flow rates and characteristics of blowouts change over time, the models calculate changes in pressures, flow rates, fluid densities, and wellbore contents. The simulation begins by specifying initial conditions in the reservoir and in the wellbore. Fluids in the reservoir are typically assumed to be at an equilibrium state with the mud in the wellbore. To initiate flow in simulated blowouts, the density of the drilling mud is set at an insufficient value to contain the reservoir pressure, thus causing a pressure imbalance that becomes the driving force for the formation to flow.

Well-established mathematical equations in the blowout simulator computer program describe how fluids in the reservoir move when they are subjected to differences in pressure. The flow rates of hydrocarbons through the reservoir depend on the properties of both rock and fluids. Important formation parameters include permeability and thickness. The relatively high permeability (measured in units of millidarcies) and thickness of the Thomson Sand formation produce high flow rates in both controlled and uncontrolled flow situations. Low viscosities of gas and condensate and the high initial reservoir pressure also contribute to high well productivity.

In addition to these fundamental elements of flow in the reservoir, the mathematical model considers factors such as turbulent flow and the amount of the reservoir encountered by the wellbore, e.g., the wellbore may be directionally drilled through the reservoir or may only partially penetrate a fraction of the entire reservoir thickness. As simulated time advances and more reservoir fluids are produced, pressures near and at the base of the wellbore decline. The model calculates the time-dependent bottom-hole pressure, which is an important quantity because it is the motive force pushing the fluids up the wellbore to the surface.

The flow of mud, condensate, and gas in the wellbore is an integral part of the blowout simulation. Equations that describe the movement of these fluids are solved repeatedly as the simulation steps forward in time, thereby continuously updating where the fluids are, how fast they are moving, and how pressures throughout the wellbore vary with time. The wellbore initially contains only mud; moreover, the pressure at the top of the well is due only to the atmosphere, and the bottom-hole pressure is due principally to the weight of the column of drilling mud. The flow of hydrocarbons from the reservoir eventually displaces all of the mud from the wellbore, and the fluid exiting the wellbore changes from exclusively mud to a mixture of gas and condensate. Under these circumstances, the simulated well is blowing out. The gas and condensate flow rates decline gradually over time as the reservoir is depleted, and pressures in the formation near the wellbore decrease.

The mathematical description of wellbore hydraulics is intricate. The simulation must account for physically diverse phenomena: gravity that counters the upward direction reservoir pressure that forces the fluids to flow, the interactions between the liquid and vapor phases, and pressure losses associated with friction and the acceleration of fluids to near-supersonic velocities as they flow up the wellbore. In addition, the conduit for flow is geometrically complicated. Typically, it will consist of an inclined annulus with either the borehole wall or steel casing on the outside and the varying diameters of the drill pipe on the inside. The rates and pressure of the fluids entering the wellbore must match the rates and pressures of the fluids exiting the formation, while the rates and pressure at the top of the wellbore must match the requirements for flow from an orifice to the atmosphere.

With these special-purpose blowout simulation methods, ExxonMobil determined the expected flow rates that could be encountered in the unlikely event of a Point Thomson blowout. The simulations used site-specific reservoir and fluid data and the specifications of the wellbores planned for Point Thomson.

3.11.4 Blowout Response Tactic – Voluntary Ignition

The significance of condensate characteristics in regard to spill response is that condensate ignites readily and the volume that could impact land and water is significantly reduced by evaporation to the atmosphere. The total volume of liquid condensate to recover is less than 1,500 barrels for a 15-day blowout. The following assumptions were used to calculate the total adjusted liquid condensate volume.

Simulated Rates

Liquid flow rate[1]	27,000	barrels per day (bopd)
Combustion efficiency	90	%
Un-combusted condensate in the form of soot	99	%
Evaporation from aerial droplets	25	%
Evaporation of condensate from water and land surface	40	%
Duration of blowout period per 18 AAC 75.425(e)(1)(I)	15	days

[1] ExxonMobil Modeled Case 1, annulus route, drill pipe in-hole.

Liquid Condensate Volume Calculation

Initial Liquid Condensate Volume, Day 1, Hour 0 to 2 Volume (before well ignition)	=	27,000 bopd x 2 hr to ignite / 24 hr per day x (1 - 0.25) x (1 - 0.40) after aerial and surface evaporation = 1013 bbl
Initial Liquid Condensate Volume, Day 1, Hour 2 to 24 (time of well ignition)	=	(27,000 bopd x 22 hr / 24 hr x 0.10 unburned x 0.01 liquid deposition) = 24.75 bbl
Adjusted Liquid Condensate Volume (Day 1)	**=**	**1,013 bbl + 24.75 bbl = 1,037.75 bbl**
Initial Liquid Condensate, Day 2 through 15	=	14 days x (27,000 bopd x 0.10 unburned x 0.01 liquid deposition) = 378 bbl
Day 1, (Hour 2 to 24 Volume) plus Day 2 through 15 Volume (after well ignition)	=	24.75 bbl + 378 bbl = 402.75 bbl
Total Adjusted Liquid Condensate Volume (Days 1 through 15)	=	**1.013 bbl + 402.75 bbl= 1,415.75 bbl** (Adjusted Liquid Condensate Volume = 1,416 bbl)

Additionally, Point Thomson condensate meets the requirements of ADEC regulations [18 AAC 75.434(g)] for planned voluntary ignition of a blowout as follows:

- The condensate has an API gravity greater than 35 percent,
- The condensate would be produced with a GOR greater than 2,000,
- Ignition of the condensate would result in combustion efficiency greater than 90 percent, and
- Modeling shows that national ambient air quality standards (EPA) will not be violated.

Voluntary ignition of a gas condensate blowout is ExxonMobil's preferred tactic for ensuring the safety of personnel and protection of the environment from the effects of liquid condensate spills at Point Thomson. The air pollutant of highest concern from burning oil or condensate is particulate matter, or soot resulting from combusted condensate. Using EPA's SCREEN3 model, ExxonMobil anticipates that any condensate blowout at Point Thomson will behave much like an industrial flare designed for efficient combustion.

Combustion of a Point Thomson blowout will be efficient due to the high velocity of the reservoir fluids exiting the well, leading to significant air entrainment. The estimated combustion efficiencies are expected to be 99 percent for the gaseous components and approximately 90 percent for the liquids. Soot emissions for air quality modeling were based on 10 percent unburned liquid forming soot and on light smoking of the gaseous fraction (approximately 310 grams of soot per million British Thermal Units [BTUs] fired, EPA's manual for emissions estimating BTU (EPA, 1995b). ExxonMobil used a conservative assumption that all unburned components of the smoke plume were particulates. Based on this assumption and with the results from the SCREEN3 model, the maximum ground-level concentration of PM-10 (particulate matter 10 microns in diameter) is predicted to be 65.6 micrograms per cubic meter ($\mu g/m^3$). This volume is well below the 24-hour average National Ambient Air Quality Standard of 150 $\mu g/m^3$.

ExxonMobil studied the gas-condensate plume from an unignited blowout at Point Thomson using the EPA-approved SCIPUFF computer model (Titan, 2003) to determine the amount and distribution of the liquid condensate that would fall to land and water. The following assumptions were used for the model:

- The predictions of droplet-size distribution used are conservative for Point Thomson well blowout cases because additional droplet break-up mechanisms of flashing and supersonic mechanical break-up were ignored. Supersonic break-up (as flow can exceed the speed of sound at discharge) may produce even smaller droplet sizes due to mechanical break-up, while flashing of liquids on discharge produce smaller drops than from only mechanical break-up.
- The predictions of deposition may be conservative for the Thomson Sand because the evaporative properties of a less volatile component (i.e., dodecane) were used that may over-estimate deposition for more volatile compounds (e.g., octane).
- The drill pipe is still in-hole (hole diameter is 8.5 inches, and the drill pipe outside diameter is 5 inches).
- Flow rates are 465 million standard cubic feet per day (mmscf/d) of gas and 27,000 barrels of condensate per day for 15 days.
- The condensate characteristics are presented in Table 3-3.

Table 3-3
Summary of Condensate Characterizations for Release to the Atmosphere (Mole Percent)

COMPONENT	PRODUCED GAS STREAM (%)	WELLHEAD LIQUID FOR BLOWOUT (290 PSIA @ 210°F (%)	LIQUID FLASHED TO 40 °F AND 14.65 PSIA (%)	
N_2	0.6	0.0	0.0	**Non-Persistent Components**
CO_2	4.4	0.5	0.1	
Methane	83.8	5.3	0.4	
Ethane	4.2	0.9	0.3	
Propane	1.7	0.8	0.6	
I-Butane	0.4	0.3	0.3	
N-Butane	0.6	0.7	0.7	
I-Pentane	0.2	0.5	0.5	
N-Pentane	0.3	0.6	0.6	
C_6	0.5	3.3	3.6	
C_7	0.4	6.0	6.4	
C_8	0.4	9.0	9.6	
C_9	0.3	7.8	8.3	
C_{12}	1.1	33.7	35.9	
C_{17}	0.7	20.4	21.8	
C_{27}	0.3	8.5	9.1	**More Persistent Components**
C_{42}	0.0	1.3	1.3	
C_{65}	0.0	0.3	0.3	
C_{86+}	0.0	0.1	0.1	
Total	**~100**	**~100**	**~100**	

psia = pounds per square inch absolute
ºF = degrees Fahrenheit
N_2 = Nitrogen
$C0_2$ = Carbon dioxide
$C_\#$ = Various organic compounds

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PART 4 BEST AVAILABLE TECHNOLOGY REVIEW [18 AAC 75.425(e)(4)]

This section discusses the requirements in 18 AAC 75.425(e)(4)(A), (B), and (C) to identify technologies not subject to response planning standards or performance standards in 18 AAC 75.445(k)(1) and (2); identify and analyze all available technologies using the applicable criteria in 18 AAC 75.445(k)(3); and provides a justification that the Point Thomson technology is the best available for the operation. The identified technologies to be reviewed are:

- Communications systems [18 AAC 75.425(e)(1)(D)];
- Source control procedures [18 AAC 75.425(e)(1)(F)(i)];
- Trajectory analysis [18 AAC 75.425(e)(1)(F)(iv)];
- Wildlife capture, treatment, and release programs [18 AAC 75.425(e)(1)(F)(xi)]; and
- Liquid level determinations for oil storage tanks [18 AAC 75.066(g)(1)(C) and 18 AAC 65.066(g)(1)(D)].

The above areas were reviewed with respect to best available technology (BAT), and each of these topics is addressed in the following sections. Additional information on BAT is also provided in the ACS *Technical Manual*, Volume I, Tactic L-11A.

4.1 COMMUNICATIONS [18 AAC 75.425(e)(1)(D)]

The communication systems for spill response at Point Thomson are described in Section 1.4 of this plan and in the ACS *Technical Manual,* Volume 1, Tactic L-5. Tactic L-11A of the ACS *Technical Manual,* Volume 1, provides a BAT review of the communications system.

4.2 SOURCE CONTROL [18 AAC 75.425(e)(1)(F)(i)]

BAT analysis of source control for a well blowout and failure of the piping and valves on a diesel tank is provided in the following subsections. ExxonMobil will use the services of a professional well control firm if well control is not immediately regained by conventional mechanical means or natural occurrences.

4.2.1 Well Blowout Source Control

ExxonMobil believes surface intervention constitutes BAT for source control of a blowout (Table 4-1). This technology is supplemented with the addition of voluntary well ignition in the event of an unrestricted gas condensate blowout. Voluntary ignition for Point Thomson gas condensate blowout will provide an effective means of discharge control of liquid hydrocarbons to the environment without violating air quality standards and will create a safer working environment for subsequent surface intervention operations to secure the well.

Surface intervention and relief well drilling are two methods used to regain control of a well blowout if the primary (full column of mud of sufficient density to overcome formation pressure) and secondary (blowout prevention equipment [BOPE]) barriers have failed to maintain control. Surface intervention includes reestablishing the primary barrier (circulating or bullheading fluids or performing a dynamic kill to restore a sufficient column of mud to overcome formation pressure) and/or installing or repairing the secondary BOPE barrier (by well capping or by restoring the integrity of existing BOPE).

Table 4-1
Best Available Technology Analysis
Well Blowout Source Control

BAT EVALUATION CRITERIA [18 AAC 75.445(k)(3)(A) – (H)]	EXISTING METHOD: SURFACE INTERVENTION (WELL CAPPING AND WELL IGNITION)	ALTERNATE METHOD: RELIEF WELL DRILLING
AVAILABILITY: Whether technology is best in use in other similar situations or is available for use by applicant	Surface intervention is in use globally. Surface intervention, well ignition, and well control equipment fit for this purpose is located on the North Slope and at Point Thomson. Additional equipment can be on location within 24 to 48 hours.	Relief well drilling equipment (rigs, downhole tools, etc.) is available though not widely used. Mobilization time could be substantial depending on time of year.
TRANSFERABILITY: Whether each technology is transferable to applicant's operations	Equipment is currently available on the North Slope, at Point Thomson, or on retainer via contract. Experienced well control specialists familiar with the technology and techniques are under contract to ExxonMobil.	Relief well drilling technology is mature. The tools and techniques have been perfected over time. ExxonMobil has experience in their application.
EFFECTIVENESS: Whether there is a reasonable expectation each technology will provide increased spill prevention or other environmental benefits	Excluding blowouts that stop flowing through natural causes (bridging, depletion, etc.), surface intervention is clearly effective since the technique is responsible for controlling most of the remaining blowouts. When surface intervention is supplemented with voluntary well ignition, the spill volumes and environmental impact are minimized. Voluntary ignition as a discharge control method is extremely effective when the well fluid is highly combustible such as a gas condensate.	Successful relief well drilling for blowout control has been thoroughly documented in the industry; however, this technique has only controlled the flow in 4 percent of all blowouts. (See description in surface intervention section.) Although a relief well is effective, it is the longest duration source control and pollution mitigation measure because new locations must be prepared, rigs mobilized, and the relief well drilled to intersect the original blowout well.
COST: The cost to the applicant of achieving BAT, including consideration of that cost relative to the remaining years of service of the technology in use by the applicant	Equipment fit for this purpose is already owned and/or under long-term contract. Surface intervention requires the maintenance of open-end contracts with trained specialists to implement well control/capping operations. Voluntary ignition of blowout fluids will significantly reduce cleanup costs. The cost for 15 days for surface intervention efforts is substantially less than the cost for relief well drilling.	Time and cost of permitting, on-site construction, well planning, and executing relief wells is estimated to be at least an order of magnitude larger than the cost of surface intervention.
AGE AND CONDITION: The age and condition of technology in use by the applicant	Surface intervention is established technology, which has been improved since its frequent application during the Iraq-Kuwait conflict in early the 1990s.	Relief well drilling technology is similar age to current methods used to drill/complete Point Thomson wells.
COMPATIBILITY: Whether each technology is compatible with existing operations and technologies in use by the applicant	Technology is compatible and applied at surface (no sensitivity to well type).	Technology is compatible though potentially sensitive to blowout well types (ERD, remote locations, etc.). Relative wellbore-location uncertainty on high-departure wells may result in problems intersecting the target wellbore.
FEASIBILITY: The practical feasibility of each technology in terms of engineering and other operational aspects	Method is feasible with all drilling operations. Applied at surface - no sensitivities to well type (extended reach drilling [ERD], remote locations, etc.). Prior proven success in onshore and offshore environments. Demonstrated high success rate in historical well control efforts.	The feasibility of this method is contingent upon geographical access near area of blowout. Lack of year-round access to some locations (offshore Beaufort Sea) limits this application.

**Table 4-1 Continued
Best Available Technology Analysis
Well Blowout Source Control**

BAT EVALUATION CRITERIA [18 AAC 75.445(k)(3)(A) – (H)]	EXISTING METHOD: SURFACE INTERVENTION (WELL CAPPING AND WELL IGNITION)	ALTERNATE METHOD: RELIEF WELL DRILLING
ENVIRONMENTAL IMPACTS: Whether other environmental impacts of each technology, such as air, land, water pollution, and energy requirements, offset any anticipated environmental benefits	Technology provides the best-proven opportunity to quickly reduce environmental impacts. Voluntary ignition of a blowout well (if applied) will substantially reduce the spilled liquid volume. The duration is significantly less than conventional alternative technologies.	The application of this technology may result in additional exposure and risk to the environment. This technology may result in an additional blowout resulting in an increase of an oil discharge volume. Relief wells may require additional gravel placement increasing the project's footprint. Mobilization and demobilization may cause additional impacts to the tundra and nearshore environment.

Relief well drilling involves drilling a second wellbore that intersects blowout wellbore near the vicinity of the formation that is flowing into the well. After the relief well is drilled, heavy mud pumped down the relief well is injected into the formation such that it will flow into the flowing well, thereby overbalancing the reservoir pressure in a similar manner to what occurs when a well is being drilled.

The nature and severity of the well control event dictates the surface intervention response. In the event of a small flow of oil, control methods could be as simple as sealing a leak or repairing an equipment component, and voluntary well ignition would not be necessary. In the event of substantial flow of gas condensate, voluntary ignition will be used for immediate source control and appropriate surface intervention methods would follow. Blowout ignition as planned here is a source control technique for spill prevention purposes rather than a means of cleaning up the gas condensate after it has reached the surface.

Relative to its alternatives, well ignition is expected to yield net environmental benefits, because igniting a blowout will minimize the amount of condensate that reaches the ground. The combusted condensate aerial plume will not contaminate the surface as an oil spill. Under the conditions of a blowout at Point Thomson, the smoke, including combustion gases and soot particulates, is expected to have no effect on public health or wildlife (see the public health effects in the Alaska Regional Response Team [ARRT] *In Situ Burning Guidelines for Alaska* in the *Federal/State/Tribal Unified Plan for Alaska*).

The justification for acceptance of surface intervention as BAT is provided in the following discussion.

Surface Intervention

Over the past decade, surface intervention techniques have been developed and proven to be both efficient and effective in regaining control of damaged wells and reducing the associated environmental impacts. Significant improvements in surface intervention techniques and procedures have been developed by a variety of well-control specialist companies around the world. Their use was instrumental in controlling the Kuwaiti oil well blowout fires and mitigating the associated environmental damage in the early 1990s.

Surface intervention operations are highly dependent on the nature of the well control situation. ExxonMobil has access to fixed-wing aircraft to mobilize specialized personnel and all equipment (e.g., capping stack, cutting tools) to Point Thomson.

ExxonMobil has access to an inventory of firefighting equipment permanently warehoused on the North Slope. The equipment includes two 6,000-gallon per minute (nominally rated) fire pumps, associated piping, lighting, and transfer pumps. Prior to drilling startup, a comprehensive list of required equipment, which includes equipment on the North Slope and elsewhere, will be prepared. This equipment represents a standard array of firefighting and well control equipment normally mobilized by well control specialists in a blowout event. Maintaining much of this equipment in-place on the North Slope significantly minimizes the time required to mobilize the required well control equipment in an actual blowout event. Other equipment for surface intervention operations will be on location at Point Thomson. If the response equipment is insufficient at any time during a well control event or blowout, ExxonMobil will mobilize additional resources as needed.

Surface intervention is both compatible and feasible with all drilling operations because the technology is applied at the surface. There are no sensitivities to well types (e.g., ERD, horizontal drilling) or location (e.g., remote, island). Surface intervention techniques have been applied both on land and at offshore locations to regain well control and have historically proven successful in regaining well control much faster than the more time-consuming alternative of drilling a relief well.

Drawing on a database of more than 1,000 blowouts from U.S. Outer Continental Shelf and onshore Texas wells, Skalle et al (SPE 53974) reports findings that indicates surface intervention is generally more successful in rapidly regaining well control than by drilling a relief well. Roughly 5 percent of the wells have missing data regarding the kill method. Surface intervention using the kill method represents 69 percent of the remaining blowouts. Bridging/depletion and relief wells were the mechanisms used in 27 and 4 percent of the well kills, respectively. If the data is restricted to only those wells in which either relief wells or surface intervention was the kill method used, 95 percent of the wells were controlled by surface intervention, and only 5 percent of the blowouts were controlled with relief wells. There can be no doubt that surface intervention techniques (e.g., blowout preventers, capping, mud, cement, and installation of equipment) are proven methods used in controlling the majority of well blowouts. A relief well is required only in rare cases in which the existing wellheads or casing cannot be accessed, or when the wellbore is blocked. However, ExxonMobil plans on pursuing a relief well in conjunction with surface intervention. It is worth noting that in Kuwait, where surface wellhead equipment had been severely damaged by explosives, no relief wells were attempted or necessary.

ExxonMobil maintains contracts with well control specialists who will assist in the intervention and resolution of well control emergencies.

In a well blowout event, surface intervention operations would commence with ExxonMobil's activation of well control specialists and mobilization of key personnel and equipment. Dynamic and surface well control methods would continue to be attempted if safe to do so. Once surface intervention is selected, safe re-entry to the wellhead area would be established and rig equipment moved to allow safe access. If the rig-moving system were unavailable or inactive, then bulldozers, block and tackle, and/or cranes would remove the rig from the wellhead area. Once safe access is regained, intervention operations would commence.

Data from the U.S. Department of the Interior, Minerals Management Service and SINTEF Civil and Environmental Engineering (Norway) indicate that surface intervention technologies provide the shortest duration and most effective option for regaining well control and minimizing environmental impacts once initial control measures have failed.

In summary, ExxonMobil believes surface intervention to be BAT because it is the most expedient and effective method for restoring well control. Voluntary ignition, in the case of a major gas condensate blowout, is the best means of discharge control to protect the environment and to create a safer working environment for the well control team.

Relief Well Drilling

Relief well drilling has historically been accepted as the blowout mitigation method that could be applied on the North Slope as the most positive means of controlling a blowout. Relief well drilling technology is compatible with North Slope drilling operations, although it is sensitive to both the well location and well types.

To drill a relief well, a drilling rig would be transported from elsewhere on the North Slope. Downhole and surface equipment (e.g., tubulars, wellheads) to support relief well drilling operations are available. Rig mobilization time would need to accommodate any modifications to the rig and in accessing tubulars and wellheads.

Methods for drilling a relief well are similar to the methods used to drill and complete other Point Thomson wells. Advances in directional drilling technology allow more precise wellbore placement and increase the likelihood of success of a relief well. Relief well success, however, will be sensitive to well locations and/or well types. For extended reach wells or remote locations with limited access, relief well drilling will be both challenging and time-consuming, thereby adding to the overall environmental impact and volume spilled during a blowout.

Relief well drilling to a Point Thomson blowout would be a time-consuming and costly process. If access to the blowout well's surface location is unavailable, alternative relief well locations must be found and/or constructed. After permitting, site construction, well planning, and rig mobilization, the relief well must still be drilled. At Point Thomson, the time needed to drill an onshore relief well is estimated in the 70- to 90-day range once a drilling rig is on location and ready to begin drilling. This lengthy timeline adds to the overall environmental impact (spill volume) of the blowout. Based on historical data (Scandpower Report 27.83.01), it is estimated that between 93 and 97 percent of blowouts would be under control by other means by the time the relief well drilling rig could be mobilized.

Relief wells take the longest time of any alternative to effectively regain well control. In addition to the longer blowout duration, the relief well itself introduces additional environmental risks. Some existing gravel pads will be retained for relief wells; however, if access to a site near the blowout well is limited, a new gravel or ice pad must be quickly constructed. If gravel is required, there will be an impact to the tundra where gravel is placed. During equipment mobilization and relief well drilling operations, additional risks of spills and tundra impacts are posed. During the drilling of the relief well itself, the risk of a second well control event is introduced.

Conclusion

ExxonMobil believes that surface intervention, supplemented by voluntary ignition when appropriate, constitutes BAT for well source control. Table 4-1 compares intervention with relief wells using the criteria specified in 18 AAC 75.443(k) and demonstrates surface intervention as BAT for a blowout. Historical evidence indicates that surface intervention has greater reliability and application for well control than relief well drilling. Surface intervention would result in significantly reduced blowout durations, with a corresponding lower volume of hydrocarbons released than would be required for relief well drilling.

4.2.2 Diesel Tank Source Control

Point Thomson diesel storage tanks are constructed and inspected according to 18 AAC 75.066 requirements, as applicable.

Fuel storage tank(s) associated with the Nabors 27E drilling rig are equipped with a manual shutdown valve(s). The valve is closed except during fuel transfers. The Point Thomson drill sites will be staffed 24 hours a day when operations are ongoing. Best management practices (BMPs) require two operators be present and in direct line of sight and in constant communication for the duration of the fuel transfer, with one person having the ability to shut down the fuel transfer in the event of an emergency. Because portable fuel storage tanks are not permanently fixed facilities, manual source control of the diesel tank emergency shutdown valve during fuel transfers is the most reliable, feasible, and cost-effective alternative of the two presented in Table 4-2.

Table 4-2
Best Available Technology Analysis
Diesel Tank Source Control

BAT EVALUATION CRITERIA [18 AAC 75.445(k)(3)(A) – (H)]	CURRENT METHOD: MANUAL GATE OR BALL VALVE CLOSURE	PROPOSED METHOD: AUTOMATIC VALVE CLOSURE
AVAILABILITY: Whether technology is best in use in other similar situations or is available for use by applicant	System is currently in use.	Technology is available, and it is commonly used in permanent facility piping systems.
TRANSFERABILITY: Whether each technology is transferable to applicant's operations	System is currently in use.	Transferable.
EFFECTIVENESS: Whether there is a reasonable expectation each technology will provide increased spill prevention or other environmental benefits	Effective because of ease of use, little maintenance, and work familiarity. Relies on strict administrative controls (procedures). Provides most reliable and efficient means of emergency shutdown.	Tank fill valves close automatically on high-level detection. Additional automation would afford little benefit given the existing filling procedures and requirement for continuous on-site presence of operator during fill operation.
COST: The cost to the applicant of achieving BAT, including consideration of that cost relative to the remaining years of service of the technology in use by the applicant	No change in cost. This is what is presently in place.	Automation of this valve would cost $15,000 to $20,000 over the base case. ExxonMobil requires the operator be at the fill site to oversee the fill operation.
AGE AND CONDITION: The age and condition of technology in use by the applicant	Old technology - age of equipment varies.	Method is more complex and current.
COMPATIBILITY: Whether each technology is compatible with existing operations and technologies in use by the applicant	Compatible and widely used. Requires no change.	Method is compatible.
FEASIBILITY: The practical feasibility of each technology in terms of engineering and other operational aspects	Feasible. Easy to use and maintain.	Method is feasible.
ENVIRONMENTAL IMPACTS: Whether other environmental impacts of each technology, such as air, land, water pollution, and energy requirements, offset any anticipated environmental benefits	There are no environmental impacts that would offset any anticipated benefit.	There are no offsetting environmental impacts.

4.3 TRAJECTORY ANALYSES [18 AAC 75.425(e)(1)(F)(iv)]

The BAT analysis for trajectory analyses and forecasts are described in Tactic L-11B in the ACS *Technical Manual,* Volume 1.

4.4 WILDLIFE CAPTURE, TREATMENT, AND RELEASE PROGRAMS [18 AAC 75.425(e)(1)(F)(xi)]

The BAT analysis for wildlife capture, treatment, and release programs are described in the ACS *Technical Manual,* Volume 1, Tactic L-11C, and the ARRT *Wildlife Protection Guidelines for Alaska* (Annex G of the Alaska Regional Response Team Unified Plan).

4.5 CATHODIC PROTECTION [18 AAC 75.065(h)(2), 18 AAC 75.065(i)(3), AND 18 AAC 75.065(j)(3)]

These provisions are not applicable, because there will be no field-constructed tanks at Point Thomson.

4.6 TANK LIQUID LEVEL DETERMINATION SYSTEM [18 AAC 75.066(g)(1)(C) AND 18 AAC 75.066(g)(1)(D)]

The shop-fabricated storage tanks that will be used at Point Thomson will adhere to the requirements of 18 AAC 75.066(g)(1) in addition to 18 AAC 75.025. Table 4-3 presents BAT analysis for liquid level determination on portable storage tanks. On portable and temporary tanks, the electronic types of liquid level indicators, which typically employ ultrasonic or microwave frequency transducers, are not BAT. Small, portable tanks that are mounted on motor vehicles are subject to vibrations and jolts from being transported on unimproved roads and from wind gusts. These conditions result in liquid level measurements that fluctuate constantly, particularly for the more sensitive devices such as microwave frequency.

Float-type devices are particularly prone to jamming under these conditions. While it is possible to tune associated controller outputs to mitigate the effects of vibration and jolts, such a state of tune would significantly decrease their accuracy and response times in terms of liquid level measurement and preclude their use as leak detection devices.

Small, temporary tanks on gravel pads or rigs are subject to similar vibrations and jolts. Accordingly, the use of sensitive liquid level devices on small, portable, temporary tanks results in liquid level measurement errors and frequent false alarms. Handling during loading, transportation, and unloading may also result in physical damage to the level determination device or electronic components.

In addition, should the liquid level indicating devices be used to control automatic shutoff valves or pump shutoff relays, unanticipated valve closures or pump shutdowns may occur, potentially resulting in a release of product. The inability of the devices to function accurately and reliably on small, portable and temporary tanks, and the significant cost of custom construction, installation, and maintenance preclude their use.

Flow-test tank fluids are typically composed of oil, water, associated emulsions, and suspended solids. The multiphase nature of these fluids adversely impacts the accuracy and reliability of a variety of level determination devices. For example, the accuracy of microwave frequency devices is compromised by variations in liquid dielectric constant and electrical conductivity. As a result, application in multiphase liquid contexts is contraindicated.

Alternatively, ultrasonic devices require contact with the process fluid; solids build-up or emulsion adherence to the sensor results in decreased accuracy and the need for frequent maintenance. Float-type devices are also subject to greatly reduced accuracy and reliability resulting from the solids content. The solids may cause float sticking and jamming. In addition, extreme cold weather results in pulleys that may not roll freely or may freeze up altogether, or associated cable systems that become inflexible. Any one or more of these effects renders the device unreliable.

Manufacturers of electronic devices indicate that temperatures lower than -30 degrees Fahrenheit (°F) compromise the reliability and response time of the electronic components of these devices. Comprehensive review of historical weather data for the subject North Slope locations indicate that extreme low temperatures range from -58 °F to -85 °F. Use of these devices in such extreme low temperatures is not recommended.

In summary, the application of electronic liquid level determination devices (in addition to manual gauging and direct observation) to portable and temporary tanks in remote Arctic environments is not desirable for the following reasons:

- Significant potential for physical damage or damage to associated electronic components as a result of loading, unloading, or transportation;
- Requirement for power source, i.e., a potential source of ignition;
- Need for frequent maintenance;
- Lack of warranty;
- Decreased accuracy;
- Decreased reliability; and
- Significant cost (e.g., device, power, installation, maintenance, and replacement).

As a consequence of these considerations, ExxonMobil proposes to use a BMP (Appendix A) for transfer procedures and visual inspection as BAT for liquid level determination in portable and temporary tanks.

Visual tank-liquid-level inspection consists of:

- Two personnel present during transfer, maintaining constant line-of-sight and communication;
- One person pumps while the other person constantly monitors tank levels throughout transfer; and
- Positive means of shutting off transfer.

This method provides the most reliable, feasible, and cost-effective alternative and is as good as, or better than the two alternative methods presented in Table 4-3.

Table 4-3
Best Available Technology Analysis
Tank Liquid Level Determination System

BAT EVALUATION CRITERIA [18 AAC 75.445(k)(3)(A) – (H)]	PROPOSED METHOD: VISUAL OBSERVATION [18 AAC 75.066(g)(1)(C)]	ALTERNATE METHOD: HIGH LIQUID LEVEL ALARM WITH SIGNALS [18 AAC 75.066(g)(1)(A)] BY MEANS OF A MICROPROCESSOR-BASED ELECTRONIC CONTROL SYSTEM	ALTERNATE METHOD: HIGH LIQUID LEVEL AUTOMATIC SHUTOFF DEVICE [18 AAC 75.066(g)(1)(B)] BY MEANS OF A FLOAT LEVEL GAUGE (VAREC) CONTROL SYSTEM
AVAILABILITY: Whether technology is best in use in other similar situations or is available for use by applicant	Proposed method.	Microprocessor-based programmable logic controllers are commonly used in electronic control systems in permanent installations; best available technology over 20 years.	Float-actuated level gauges, such as Varec devices, are widely used in the industry today in permanent installations.
TRANSFERABILITY: Whether each technology is transferable to applicant's operations	Transferable.	Transferable.	Transferable.
EFFECTIVENESS: Whether there is a reasonable expectation each technology will provide increased spill prevention or other environmental benefits	Highly effective with strict adherence to BMP and local procedure. Tank liquid levels will be determined from direct observation through the hatch using a flashlight, fuel strapping tape, etc.	Questionable effectiveness in this application due to control systems being exposed to weather with attendant maintenance and reliability issues.	Questionable effectiveness due to control systems being exposed to weather with attendant maintenance and reliability issues.
COST: The cost to the applicant of achieving BAT, including consideration of that cost relative to the remaining years of service of the technology in use by the applicant.	Not applicable.	The cost to install this technology on portable storage tanks would be significant.	Undetermined, but likely to be significant.
AGE AND CONDITION: The age and condition of technology in use by the applicant	Procedures relying on visual surveillance have been in use for many years.	Not applicable.	Float-actuated devices have been used in the industry for over 20 years.
COMPATIBILITY: Whether each technology is compatible with existing operations and technologies in use by the applicant	Compatible and widely used. Requires no change.	Compatible.	Compatible.
FEASIBILITY: The practical feasibility of each technology in terms of engineering and other operational aspects	Feasible and preferred due to simple and reliable potential for electronic or pneumatic systems to experience damage from rough handling.	Feasible but may have reliability problems.	Feasible but may have reliability problems.
ENVIRONMENTAL IMPACTS: Whether other environmental impacts of each technology, such as air, land, water pollution, and energy requirements offset any anticipated environmental benefits	None.	None.	None.

PART 5 RESPONSE PLANNING STANDARD [18 AAC 75.425(e)(5)]

5.1 RESPONSE PLANNING STANDARD [18 AAC 75.434]

The Point Thomson drilling operation has two response planning standards (RPS) as required by 18 AAC 75.434 described below. One will be for an exploration and production facility as per 18 AAC 75.434 and the other for an oil terminal facility as per 18 AAC 75.432.

5.1.1 Well Blowout [18 AAC 75.434(b)]

Alaska Department of Environmental Conservation (ADEC) regulation 18 AAC 75.434(b) specifies a default RPS volume for a well blowout at an exploration facility to be 5,500 barrels of oil per day (bopd) for a total of 15 days, unless relevant data support a lower or higher RPS volume.

For the Point Thomson drilling program, it has been estimated through modeling that the maximum flow rate from an oil well blowout (Brookian formation) could equal 5,700 bopd, which slightly exceeds the default exploration value of 5,500 bopd by 200 bopd. Based on this, the RPS volume has been set at 5,700 bopd for a total of 15 days, which equals 85,500 barrels of oil.

Estimated maximum daily flow rate	5,700 bopd
ADEC specified duration of 15 days	x 15 days
RPS volume	85,500 barrels of oil

While a Thomson Sand gas condensate well has the potential to discharge a greater volume of liquid hydrocarbons, as discussed in Section 1.6.3, ExxonMobil's strategy for addressing a gas condensate blowout is voluntary wellhead ignition. As further explained in Section 3.11.4**,** with wellhead ignition, the volume of liquid hydrocarbons available for response would be less than the oil well blowout described above. Information required in 18 AAC 75.434(g) for voluntary ignition of a well blowout has been provided to the ADEC and the Alaska Oil and Gas Conservation Commission.

The 1997 S.L. Ross model is used in the development of a blowout scenario found in Section 1.6.3 of this plan. According to the model, the oil is ejected from the well in an aerial plume, with 10 percent of the discharged oil assumed to be in the form of droplets (50 micrometers or less) that remain suspended in the air. For response planning standard volume calculation purposes, the 10 percent of discharged oil is re-distributed into the fallout area in order to respond to 100 percent of the RPS volume value.

5.1.2 Storage Tank [18 AAC 75.432]

There will be over 10,000 barrels of non-crude oil stored in tanks at the Point Thomson Central Pad drill site, which requires this facility be treated as an oil terminal facility (Alaska Statute 46.04.050(a) exempts facilities with less than 5,000 barrels of crude oil or 10,000 barrels of non-crude oil storage).

The largest oil storage tank on location will be equal to or less than 4,900 barrels. The tanks will be elevated above grade allowing for visual inspection of the tank bottom. The tank farm will have secondary containment, including an impervious liner underlying the entire tank farm.

The adjusted RPS volume for the largest fuel storage tank located at the drill site is 1,470 barrels. Per regulation 18 AAC 75.430(c), each prevention credit is calculated using the RPS value that results from the previous modification, as calculated below.

Initial RPS volume capacity of largest tank [18 AAC 75.432(b)]	4,900barrels
60% adjust for secondary containment	-2,940barrels
25% adjust for impervious containment underneath tanks	-490 barrels
Adjusted RPS volume	1,470barrels

APPENDIX A

BEST MANAGEMENT PRACTICES AND PROCEDURES

FLUID TRANSFER GUIDELINES

The following information on personnel safety and safe handling procedures for fluid transfer protocol follows the best management practices (BMP) of North Slope Operations as compiled from the *Alaska Safety Handbook* (2006). Information on the use of surface liners and drip pans is a jointly issued Unified Operating Procedure (UOP), summarized from the *North Slope Environmental Handbook* (May 2001).

FLAMMABLE AND COMBUSTIBLE FLUID TRANSFER STANDARD

Purpose/Scope

This Standard establishes minimum requirements to protect the safety and health of personnel when using vacuum and tanker trucks to transfer flammable and combustible fluids to or from non-permanent facilities.

Objectives

1. Vacuum trucks shall never be directly hooked up to pressurized lines or vessels. Tanks are not considered pressure vessels. Fluids discharged from pressurized sources are to be flowed into tanks rather than directly to the vacuum unit.
2. To ensure equipment used to transfer flammable and combustible fluids meets applicable safety requirements.
3. To ensure equipment layout adequately separates potential ignition sources from potential sources of flammable and combustible vapors or liquids, and provides for personnel egress.
4. To ensure all personnel involved in the transfer use appropriate precautions for handling flammable and combustible fluids.

Definitions

1. Flammable Fluids are fluids with a flash point below 100 degrees F.
2. Combustible fluids are fluids with a flash point at or above 100 degrees F.
3. Transfers are defined as movement of flammable or combustible fluids from:
   - Truck to truck,
   - Tank to truck, or
   - Truck to tank.
4. Non-permanent facilities include: vacuum trucks, solid waste handling trucks (Supersuckers or Guzzlers), tanker trucks, and mobile/temporary holding tanks.

Exceptions

The following operations are not covered by this Standard, but shall be accomplished by following established safe practices:

1. Equipment fueling.
2. Loading or unloading fluid at permanent facilities (e.g., bulk fuel loading dock, oily waste, recycle facilities, and fixed chemical tanks).
3. Pumping fluid into a well, flowline, or other permanent facility.
4. Routine use of drillsite or wellpad bleed tanks by Company Representative.

Responsibilities

Vehicle Contractor/Operator

1. Ensure contractor personnel are properly trained and understand the proper procedures for handling flammable and combustible fluids.
2. Ensure remote controls to shut down the fluid transfer are available for trucks with onboard pumping and vacuum equipment. These controls must be away from any vents or potential leak sources.
3. Ensure relief valve discharge piping and other atmospheric vents or drains (including the vacuum pump exhaust, compressor discharge, and vapor space vent valves) exhaust flammable vapors away from any potential sparking devices, other ignition sources, and the truck cab.
4. Ensure truck vents and fluid piping meet applicable Federal and State Regulations, and are designed to meet applicable NFPA and API guidelines.
5. Ensure bonding straps and grounded hoses are checked on a regular basis and maintained in good conductive condition.

Company Representative (or designee)

1. Conduct a pre-job, on-site safety discussion, spill prevention review, and job scope review, including the potential hazards of the work and emergency procedures, with all participants.
2. Establish a minimum of two emergency exit paths leading away from the transfer area for personnel egress. These exit paths must be a minimum unobstructed width of 5 feet, and in a non-downwind direction.
3. Ensure a minimum unobstructed pathway of 20 feet is maintained for fire and emergency vehicle access to the transfer area.
4. Review the wind direction relative to the trucks and equipment layout. Ensure the prevailing wind conditions are monitored so any potential sources of hydrocarbons are kept at least 25 feet downwind of any potential ignition source.
5. Ensure the inlet and/or outlet piping (truck connections) and truck mounted fluid pumping equipment is located at least 25 feet or more downwind from any potential ignition source on-site or on the back of the truck.
6. Ensure the trucks and/or tank(s) involved in the transfer are separated by at least 25 feet.
7. Review positions of fire extinguishing equipment and ensure the operator is trained in its proper use.
8. Ensure electrical bonding straps or grounded hoses are connected between all equipment involved in the transfer.

   Note: When venting at low ambient temperatures, there is potential for the vented gas to condense and possibly freeze off the vent and check valves. Ensure that when applicable, the operator monitors the condition and takes appropriate actions to mitigate the hazard.
9. Functionally check communication devices before transfer begins.
10. Ensure flammable and combustible fluids sucked into a solid-waste handling truck (Supersucker or Guzzler) are at least 40 degrees F below their flash point.
11. Ensure vapor pressure of well bore fluids are within Company operating parameters prior to any vacuum system transfers.
12. Complete a Unit Work Permit for any transfer that will not be continuously supervised by a Company Representative (or designee).

Special Considerations

1. Personnel safety must always be the first consideration in transferring flammable or combustible fluids. Environmental impacts due to fluid spills are of secondary importance to personnel protection.
2. The Fluid Transfer Guidelines contained in the North Slope Environmental Field Handbook for use of drip pans and/or surface liners should be followed for all fluid transfer operations.

NORTH SLOPE FLUID TRANSFER GUIDELINES

From the *North Slope Environmental Field Handbook* (February 2005).

Many spills occur during routine fueling, pumping, and other fluid transfer operations. Most of these spills can be avoided by paying attention and taking simple precautions. CPAI and BP have established field-wide fluid transfer guidelines, which are summarized below.

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

Surface Liner / Drip Pan Use Procedure

1.0 PURPOSE/ APPLICABILITY

The purpose of this procedure is to provide guidance regarding the proper use of portable surface liners and/or drip pans to provide secondary containment, maintain contaminant-free work sites and to employ proper spill prevention techniques during normal North Slope field operations. This is a unified procedure and each operating area may employ specific and more stringent spill prevention requirements applicable to their operating areas.

These procedures apply to all North Slope assigned (company and contract) personnel involved in field operations and maintenance. Also included are construction contractors, drilling rigs, and contractors servicing rigs. These procedures pertain to normal field operations, construction projects, drilling operations, temporary storage and/ or transfer of fluids, and the staging of equipment (operating or parked).

2.0 DEFINITIONS

A surface liner is any safe non-permeable portable container (drip pan, bucket, fold-a-tank, built in secondary containment system, etc.) designed to catch / hold fluids for the purpose of preventing unplanned releases to the environment.

Reasonable or appropriately sized surface liners are determined by operator discretion based on worst case release risk and probability factors.

Exceptions

Liner use practices do not apply to connections and other tank discharge points when it involves the pickup or delivery of potable or raw water. This exception does not exempt the mechanical integrity of the equipment being used for such projects, nor does the exemption apply to any other related product such as sewage or seawater.

3.0 GENERAL REQUIREMENTS

Not applicable.

4.0 RESPONSIBILITIES

Supervisors and project leads are responsible for ensuring all employees under their supervision adhere to this policy. It is the general responsibility of all employees, contractors, drilling contractors, service contractors, and construction contractors working within the North Slope Fields to adhere to the rules as set forth in this policy. Portable Surface liners and drip pans should be inspected periodically and replaced or repaired as necessary.

5.0 PROCEDURES

The following procedures pertain to operational requirements for all equipment and fluid transfers. The objective is that maximum and reasonable ground surface protection shall be provided when there is an increased potential for unplanned releases. Surface liners may be utilized to meet this requirement. Surface liners should be of adequate size and volume to catch and hold a potential release of probable size as determined reasonable by the equipment operator.

5.1 OFF PAD LOCATIONS WHERE HIGH POTENTIAL FOR TUNDRA DAMAGE EXISTS

Maximum protection of the tundra and surface waters is the primary objective and the highest priority. All equipment located off pad (operating or parked and running) will utilize surface liners under the radiator, engine, or other areas of potential spillage / leakage when stationary for an extended period of time (e.g. one hour or more). All parked, non-operating or non-running equipment located off pad will utilize liners as needed for the prevention of small spills and / or spotting of off-pad work sites. Equipment known to leak will be immediately removed from the job site or a means will be employed to contain any leakage until the equipment can be serviced (e.g. a permanently mounted drip liner). Such equipment service will be scheduled as soon as feasible. Appropriately sized liners are specifically required for the following circumstances:

- All support equipment (e.g. heaters, compressor, generators, etc.).
- Heavy and light duty parked equipment (e.g. dozers, loaders, cranes, trucks, etc.).
- During all fluid transfers utilizing vacuum trucks, fueling trucks, tank transfers, pumping operations, etc. This includes the transfer of all freeze-protection fluids, hydrotesting fluids, and seawater. Appropriately sized liners are required at all connection points from the beginning of hook-up through time of disconnection.
- Fluid containers (55 gallon drums, day fuel tanks, etc.) in support of any given operation.

Note: Overnight or long-term parking of vehicles and equipment off pad is to be avoided whenever possible.

5.2 ALL WELL PADS, FACILITIES, AND OTHER JOB SITES LOCATED ON GRAVEL PADS

Protection of the gravel pad must be provided by use of appropriately sized surface liners or drip pans during field operations (examples listed below). The primary objectives are good housekeeping practices, clean job sites, and spill prevention. All equipment leaking fluids will have liners placed under the appropriate areas whenever the unit is stationary until repairs can be completed. This is a temporary measure only and is not intended to be a practice in lieu of proper maintenance. Equipment known to leak (because of lack of maintenance) or where a known risk of unplanned releases exists during operations will be released from the job site if liners or drip pans are not available and placed in use. Examples include:

- Operation of well service equipment (wireline, slickline, chemical trucks, coil tubing units, etc.).
- Under all support equipment not equipped with adequately sized built-in containment systems (heaters, compressors, bleed tanks, etc.).
- Under all stationary heavy equipment (loaders, cranes, vac trucks, supersuckers, etc.).
- Liners are required at all connection points from the beginning of hook-up to the time of disconnect during all fluid transfers. This includes vac trucks, fuel trucks, tank transfers, and other pumping operations such as the transfer of freeze protection fluids, hydro-testing fluids and seawater. Liners are required at all swivel, manifold, tank, truck, and vessel connections. Hammer union type connections between two straight joints will typically not require a protective liner but operator discretion should be exercised.
- Under all drums used as primary containment for excess or waste fluids (pressure relief or temporary storage).

5.3 PARKING ALONG BULLRAILS AT ALL CAMPS AND FACILITIES

Appropriately sized surface liners or drip pans will be required regardless of whether the units are running or not for the following applications:

- Any vehicle dripping engine oil or other fluids. Note: This is a temporary measure, only applicable until maintenance can be scheduled and the vehicle repaired.
- All heavy equipment dripping engine oil or other fluids. Note: This is a temporary measure, only applicable until maintenance can be scheduled and the equipment repaired.
- Support equipment (heaters, compressors, light plants) dripping engine oil or other fluids. Note: This is a temporary measure, only applicable until maintenance can be scheduled and the unit repaired.

5.4 POINT THOMSON SITE SPECIFIC PROCEDURES

5.4.1 Fuel Pump Area

Liners are required during all fueling operations at the fuel pumps. Note: A marked drum will be placed at the fuel pumps for sorbent disposal.

5.4.2 Surface Liner Availability

- Surface liners of various sizes are available through the material operations warehouse. These liners will be charged directly to the individual department cost code.
- A supply of surface liners will be available at the fuel pumps to be used during fill-up operations.
- Environmental will maintain a supply of fold-a-tanks that can be used for containment purposes as needed. These containment units are available for checkout on a short-term basis. Specifications for common liners in stock at the warehouse are as follows:
    - An 18" x 18" surface liner is approximately 1.5 inches deep and is designed to hold one 18" x 18" sorbent pad. Primary use is for small drips (under engine, transmission, hydraulic connections) where total volume is expected to be less than 0.5 gal. Liner capacity is approximately two gallons and cannot be picked up when full of fluid.
    - A 4' x 5' surface liner is approximately 4" deep, typically has cleats and sandbags to hold liner in place, and a corrugated mat inside for operator safety. Liner is designed to be used during fluid transfers (vacuum truck to unit or tank to vacuum truck). Liner capacity is approximately 49 gallons and cannot be picked up or moved when full of liquid.
    - 1,500 and 3,000 gallon fold-a-tank containments are designed for jobs where larger releases are possible (pipeline repairs, valve replacements, etc.). These jobs must be coordinated through Environmental as special monitoring procedures may be required.

Revision Log

Revision Date	Prepared By	Approved By	Revision Details

APPENDIX B

POINT THOMSON REGULATED TANKS LIST

TABLE B-1
POINT THOMSON REGULATED (ADEC AND EPA) STATIONARY STORAGE DATA
TANKS GREATER THAN 10,000 GALLONS

Tank No. Tag	Skid/ Module	Description	Elevated or On-grade Installation	Fabrication Date	Design/ Construction Standard	Capacity (Gal)	Product Type	Lined Secondary Containment Description	Secondary Containment Capacity	Loading / Unloading Area Lined Secondary Containment Description and Capacity	Last Internal Inspection Date *	Last External Inspection Date *	Inflow Control Valve	Liquid Level Mechanism/ Overflow Protection	Measures Used to Prevent Premature Vehicular Movement	Leak Detection Systems and Procedures Description
NAD14E-05	Nabors Rig 27E	Double wall	Elevated	Prior to 1996	unknown	19,970	Diesel	Liner on pad, containment dike	unknown	NA	Last: 2006 Next: 2016	Last: 2006 Next: 2011	unknown	High level alarm , internal double wall overflow	NA	Visual
PTCP-1	NA	Single wall, vertical diesel fuel tank	NA	2009	API-650	203,596	Diesel	Insulated mat, felt, liner, felt, rig mat. Containment area 100ft x 230ft x 40inch wall. Containment walls made of banded interlocked wooden 10inch x 10inch timber design with external steel wall supports.	570,000 gal (dry)	20ft x 50ft x 30inch containment area (truck loading/unloading area) Insulated mat, felt, liner, felt, rig mat; capacity of 92,500 gallons	New 2009	New 2009	TBD	TBD	Wheel chocks, signs for fuel transfer operation	Daily (documented) external visual tank and piping system inspection
PTCP-2	NA	Single wall, vertical diesel fuel tank	NA	2009	API-650	203,596	Diesel	Insulated mat, felt, liner, felt, rig mat. Containment area 100ft x 230ft x 40inch wall. Containment walls made of banded interlocked wooden 10inch x 10inch timber design with external steel wall supports.	570,000 gal (dry)	20ft x 50ft x 30inch containment area (truck loading/unloading area) Insulated mat, felt, liner, felt, rig mat; capacity of 92,500 gallons	New 2009	New 2009	TBD	TBD	Wheel chocks, signs for fuel transfer operation	Daily (documented) external visual tank and piping system inspection
PTCP-3	NA	Single wall, vertical diesel fuel tank	NA	2009	API-650	203,596	Diesel	Insulated mat, felt, liner, felt, rig mat. Containment area 100ft x 230ft x 40inch wall. Containment walls made of banded interlocked wooden 10inch x 10inch timber design with external steel wall supports.	570,000 gal (dry)	20ft x 50ft x 30inch containment area (truck loading/unloading area) Insulated mat, felt, liner, felt, rig mat; capacity of 92,500 gallons	New 2009	New 2009	TBD	TBD	Wheel chocks, signs for fuel transfer operation	Daily (documented) external visual tank and piping system inspection
PTCP-4	NA	Single wall, vertical diesel fuel tank	NA	2009	API-650	203,596	Diesel	Insulated mat, felt, liner, felt, rig mat. Containment area 100ft x 230ft x 40inch wall. Containment walls made of banded interlocked wooden 10inch x 10inch timber design with external steel wall supports.	570,000 gal (dry)	20ft x 50ft x 30inch containment area (truck loading/unloading area) Insulated mat, felt, liner, felt, rig mat; capacity of 92,500 gallons	New 2009	New 2009	TBD	TBD	Wheel chocks, signs for fuel transfer operation	Daily (documented) external visual tank and piping system inspection
PTCP-5	NA	Single wall, vertical diesel fuel tank	NA	2009	API-650	203,596	Diesel	Insulated mat, felt, liner, felt, rig mat. Containment area 100ft x 230ft x 40inch wall. Containment walls made of banded interlocked wooden 10inch x 10inch timber design with external steel wall supports.	570,000 gal (dry)	20ft x 50ft x 30inch containment area (truck loading/unloading area) Insulated mat, felt, liner, felt, rig mat; capacity of 92,500 gallons	New 2009	New 2009	TBD	TBD	Wheel chocks, signs for fuel transfer operation	Daily (documented) external visual tank and piping system inspection
PTCP-6	NA	Single wall, vertical diesel fuel tank	NA	2009	API-650	203,596	Diesel	Insulated mat, felt, liner, felt, rig mat. Containment area 100ft x 230ft x 40inch wall. Containment walls made of banded interlocked wooden 10inch x 10inch timber design with external steel wall supports.	570,000 gal (dry)	20ft x 50ft x 30inch containment area (truck loading/unloading area) Insulated mat, felt, liner, felt, rig mat; capacity of 92,500 gallons	New 2009	New 2009	TBD	TBD	Wheel chocks, signs for fuel transfer operation	Daily (documented) external visual tank and piping system inspection
PTCP-7	NA	Single wall, vertical diesel fuel tank	NA	2009	API-650	203,596	Diesel	Insulated mat, felt, liner, felt, rig mat. Containment area 100ft x 230ft x 40inch wall. Containment walls made of banded interlocked wooden 10inch x 10inch timber design with external steel wall supports.	570,000 gal (dry)	20ft x 50ft x 30inch containment area (truck loading/unloading area) Insulated mat, felt, liner, felt, rig mat; capacity of 92,500 gallons	New 2009	New 2009	TBD	TBD	Wheel chocks, signs for fuel transfer operation	Daily (documented) external visual tank and piping system inspection
PTCP-8	NA	Single wall, vertical diesel fuel tank	NA	2009	API-650	203,596	Diesel	Insulated mat, felt, liner, felt, rig mat. Containment area 100ft x 230ft x 40inch wall. Containment walls made of banded interlocked wooden 10inch x 10inch timber design with external steel wall supports.	570,000 gal (dry)	20ft x 50ft x 30inch containment area (truck loading/unloading area) Insulated mat, felt, liner, felt, rig mat; capacity of 92,500 gallons	New 2009	New 2009	TBD	TBD	Wheel chocks, signs for fuel transfer operation	Daily (documented) external visual tank and piping system inspection

*No "next inspection date" has been indicated; tanks will be rented and operated by ExxonMobil for no more than two years, within the 5-year and 10-year inspection intervals required by STI.

TABLE B-1
POINT THOMSON REGULATED (ADEC AND EPA) STATIONARY STORAGE DATA
TANKS GREATER THAN 10,000 GALLONS

Tank No. Tag	Skid/ Module	Description	Elevated or On-grade Installation	Fabrication Date	Design/ Construction Standard	Capacity (Gal)	Product Type	Lined Secondary Containment Description	Secondary Containment Capacity	Loading / Unloading Area Lined Secondary Containment Description and Capacity	Last Internal Inspection Date *	Last External Inspection Date *	Inflow Control Valve	Liquid Level Mechanism/ Overflow Protection	Measures Used to Prevent Premature Vehicular Movement	Leak Detection Systems and Procedures Description
349	NA	Double wall	On Grade	2009	API-650	25,175	Mineral oil or mineral oil-based fluid	Insulated mat, felt liner, felt, rig mat. Containment area 79ft x 242.75ft x 12inch wall. Containment walls made of wooden 12inch x 12inch timbers.	91,308 gal	TBD	TBD	TBD	TBD	TBD	TBD	TBD
350	NA	Double wall	On Grade	2009	API-650	25,175	Mineral oil or mineral oil-based fluid	Insulated mat, felt liner, felt, rig mat. Containment area 79ft x 242.75ft x 12inch wall. Containment walls made of wooden 12inch x 12inch timbers.	91,308 gal	TBD	TBD	TBD	TBD	TBD	TBD	TBD
351	NA	Double wall	On Grade	2009	API-650	25,175	Mineral oil or mineral oil-based fluid	Insulated mat, felt liner, felt, rig mat. Containment area 79ft x 242.75ft x 12inch wall. Containment walls made of wooden 12inch x 12inch timbers.	91,308 gal	TBD	TBD	TBD	TBD	TBD	TBD	TBD
352	NA	Double wall	On Grade	2009	API-650	25,175	Mineral oil or mineral oil-based fluid	Insulated mat, felt liner, felt, rig mat. Containment area 79ft x 242.75ft x 12inch wall. Containment walls made of wooden 12inch x 12inch timbers.	91,308 gal	TBD	New 2009	New 2009	TBD	TBD	TBD	TBD
291	NA	Double wall	On Grade	2009	API-650	25,175	Mineral oil or mineral oil-based fluid	Insulated mat, felt liner, felt, rig mat. Containment area 79ft x 242.75ft x 12inch wall. Containment walls made of wooden 12inch x 12inch timbers.	91,308 gal	TBD	New 2009	New 2009	TBD	TBD	TBD	TBD
292	NA	Double wall	On Grade	2009	API-650	16,783	Mineral oil or mineral oil-based fluid	Insulated mat, felt liner, felt, rig mat. Containment area 79ft x 242.75ft x 12inch wall. Containment walls made of wooden 12inch x 12inch timbers.	91,308 gal	TBD	New 2009	New 2009	TBD	TBD	TBD	TBD
324	NA	Double wall	On Grade	2009	API-650	16,783	Mineral oil or mineral oil-based fluid	Insulated mat, felt liner, felt, rig mat. Containment area 79ft x 242.75ft x 12inch wall. Containment walls made of wooden 12inch x 12inch timbers.	91,308 gal	TBD	New 2009	New 2009	TBD	TBD	TBD	TBD
327	NA	Double wall	On Grade	2009	API-650	16,783	Mineral oil or mineral oil-based fluid	Insulated mat, felt liner, felt, rig mat. Containment area 79ft x 242.75ft x 12inch wall. Containment walls made of wooden 12inch x 12inch timbers.	91,308 gal	TBD	New 2009	New 2009	TBD	TBD	TBD	TBD
343	NA	Double wall	On Grade	2009	API-650	16,783	Mineral oil or mineral oil-based fluid	Insulated mat, felt liner, felt, rig mat. Containment area 79ft x 242.75ft x 12inch wall. Containment walls made of wooden 12inch x 12inch timbers.	91,308 gal	TBD	New 2009	New 2009	TBD	TBD	TBD	TBD
344	NA	Double wall	On Grade	2009	API-650	16,783	Mineral oil or mineral oil-based fluid	Insulated mat, felt liner, felt, rig mat. Containment area 79ft x 242.75ft x 12inch wall. Containment walls made of wooden 12inch x 12inch timbers.	91,308 gal	TBD	New 2009	New 2009	TBD	TBD	TBD	TBD
345	NA	Double wall	On Grade	2009	API-650	16,783	Mineral oil or mineral oil-based fluid	Insulated mat, felt liner, felt, rig mat. Containment area 79ft x 242.75ft x 12inch wall. Containment walls made of wooden 12inch x 12inch timbers.	91,308 gal	TBD	New 2009	New 2009	TBD	TBD	TBD	TBD
346	NA	Double wall	On Grade	2009	API-650	16,783	Mineral oil or mineral oil-based fluid	Insulated mat, felt liner, felt, rig mat. Containment area 79ft x 242.75ft x 12inch wall. Containment walls made of wooden 12inch x 12inch timbers.	91,308 gal	TBD	New 2009	New 2009	TBD	TBD	TBD	TBD

*No "next inspection date" has been indicated; tanks will be rented and operated by ExxonMobil for no more than two years, within the 5-year and 10-year inspection intervals required by STI.

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347	NA	Double wall	On Grade	2009	API-650	16,783	Mineral oil or mineral oil-based fluid	Insulated mat, felt liner, felt, rig mat. Containment area 79ft x 242.75ft x 12inch wall. Containment walls made of wooden 12inch x 12inch timbers.	91,308 gal	TBD	New 2009	New 2009	TBD	TBD	TBD	TBD
348	NA	Double wall	On Grade	2009	API-650	16,783	Mineral oil or mineral oil-based fluid	Insulated mat, felt liner, felt, rig mat. Containment area 79ft x 242.75ft x 12inch wall. Containment walls made of wooden 12inch x 12inch timbers.	91,308 gal	TBD	New 2009	New 2009	TBD	TBD	TBD	TBD
251	NA	Double wall	On Grade	2009	API-650	16,783	Mineral oil or mineral oil-based fluid	Insulated mat, felt liner, felt, rig mat. Containment area 79ft x 242.75ft x 12inch wall. Containment walls made of wooden 12inch x 12inch timbers.	91,308 gal	TBD	New 2009	New 2009	TBD	TBD	TBD	TBD
503	NA	Double wall	On Grade	2009	API-650	16,783	Mineral oil or mineral oil-based fluid	Insulated mat, felt liner, felt, rig mat. Containment area 79ft x 242.75ft x 12inch wall. Containment walls made of wooden 12inch x 12inch timbers.	91,308 gal	TBD	New 2009	New 2009	TBD	TBD	TBD	TBD
498	NA	Single wall	On Grade	2009	API-650	16,783	Mineral oil or mineral oil-based fluid	Insulated mat, felt liner, felt, rig mat. Containment area 79ft x 242.75ft x 12inch wall. Containment walls made of wooden 12inch x 12inch timbers.	91,308 gal	TBD	New 2009	New 2009	TBD	TBD	TBD	TBD
495	NA	Single wall	On Grade	2009	API-650	16,783	Mineral oil or mineral oil-based fluid	Insulated mat, felt liner, felt, rig mat. Containment area 79ft x 242.75ft x 12inch wall. Containment walls made of wooden 12inch x 12inch timbers.	91,308 gal	TBD	New 2009	New 2009	TBD	TBD	TBD	TBD
492	NA	Single wall	On Grade	2009	API-650	16,783	Mineral oil or mineral oil-based fluid	Insulated mat, felt liner, felt, rig mat. Containment area 79ft x 242.75ft x 12inch wall. Containment walls made of wooden 12inch x 12inch timbers.	91,308 gal	TBD	New 2009	New 2009	TBD	TBD	TBD	TBD
497	NA	Single wall	On Grade	2009	API-650	16,783	Mineral oil or mineral oil-based fluid	Insulated mat, felt liner, felt, rig mat. Containment area 79ft x 242.75ft x 12inch wall. Containment walls made of wooden 12inch x 12inch timbers.	91,308 gal	TBD	New 2009	New 2009	TBD	TBD	TBD	TBD
493	NA	Single wall	On Grade	2009	API-650	16,783	Mineral oil or mineral oil-based fluid	Insulated mat, felt liner, felt, rig mat. Containment area 79ft x 242.75ft x 12inch wall. Containment walls made of wooden 12inch x 12inch timbers.	91,308 gal	TBD	New 2009	New 2009	TBD	TBD	TBD	TBD
500	NA	Single wall	On Grade	2009	API-650	16,783	Mineral oil or mineral oil-based fluid	Insulated mat, felt liner, felt, rig mat. Containment area 79ft x 242.75ft x 12inch wall. Containment walls made of wooden 12inch x 12inch timbers.	91,308 gal	TBD	New 2009	New 2009	TBD	TBD	TBD	TBD
494	NA	Single wall	On Grade	2009	API-650	16,783	Mineral oil or mineral oil-based fluid	Insulated mat, felt liner, felt, rig mat. Containment area 79ft x 242.75ft x 12inch wall. Containment walls made of wooden 12inch x 12inch timbers.	91,308 gal	TBD	New 2009	New 2009	TBD	TBD	TBD	TBD

*No "next inspection date" has been indicated; tanks will be rented and operated by ExxonMobil for no more than two years, within the 5-year and 10-year inspection intervals required by STI.

Notes:
TBD: To Be Determined
NA : Not applicable
API: American Petroleum Institute

APPENDIX C

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

NABORS RIG 27-E

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

DRILLING RIG 27-E

MOBILE

ON THE NORTH SLOPE OF ALASKA

NABORS ALASKA DRILLING, INC.
2525 "C" STREET, SUITE 200
ANCHORAGE, ALASKA 99503-2639

Prepared by

EHS-ALASKA, INC.
ENGINEERING, HEALTH & SAFETY CONSULTANTS
11901 BUSINESS BLVD., SUITE 208
EAGLE RIVER, ALASKA 99577-7701
Ph. (907) 694-1383, Fax (907) 694-1382

MARCH 13, 2009

F O R E W O R D

The Spill Prevention Control and Countermeasure Plan (SPCC) as presented is implemented as specified and approved by management. The rig SPCC plan has an engineering certification under the provisions of 40 CFR, part 112 as attested in the plan.

The plan is intended to be rig specific, yet generic in nature in order to be adaptable to various operators and drill site requirements. Major modifications of the rig may require additional engineering certification.

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

NABORS ALASKA DRILLING, INC.

RIG 27-E

TABLE OF CONTENTS

(Refer also to Cross Reference Table on Next Page)

Revised Rule	Description of Rule	Section Where Data is Found
'112.7	General requirements for SPCC plans for all facilities and all oil types	SPCC Certification
'112.7	Cross Referencing location of requirements	This is it
'112.7	Discussion of additional facilities, procedures, methods, or equipment not yet fully operational	SPCC Certification
'112.7(a)	General Requirements: discussion of facility's conformance with rule requirements;	SPCC Certification
'112.7(a)	deviations from Plan requirements;	SPCC Certification
'112.7(a)	facility characteristics that must be described in the Plan	Section 2, Appendix A, Appendix C
'112.7(a)	spill reporting information in the Plan;	SPCC Certification & Section 8
'112.7(a)	emergency procedures.	Section 1, Section 5
'112.7(b)	Fault analysis.	Section 2
'112.7(c)	Secondary containment.	Section 2
'112.7(d)	Contingency planning.	Section 4
'112.7(e)	Inspections, tests, and records.	Section 9
'112.7(f)	Employee training and discharge prevention procedures.	Section 6
'112.7(g)	Security (excluding oil production facilities).	Section 3
'112.7(h)	Loading/unloading (excluding offshore facilities).	Not Applicable
'112.7(i)	Brittle fracture evaluation requirements.	Section 9
'112.7(j)	Conformance with State requirements.	Refer to Lease Operators Plan
'112.8	Requirements for onshore facilities (excluding production facilities).	Refer to specific requirements below
'112.8(a)	General and specific requirements.	" "
'112.8(b)	Facility drainage.	Section 2 & Refer to Lease Operators Plan
'112.8(c)	Bulk storage containers.	Section 2 & Section 9
'112.8(d)	Facility transfer operations, pumping, and facility process.	Section 3
'112.9	Requirements for onshore production facilities.	Not Applicable
'112.10	Requirements for onshore oil drilling and workover facilities.	Refer to specific requirements below
'112.10(a)	General and specific requirements.	Section 2
'112.10(b)	Mobile facilities.	Section 2, & Refer to Lease Operators Plan
'112.10(c)	Secondary containment - catchment basins or diversion structures.	Section 2
'112.10(d)	Blowout prevention (BOP).	Section 3.6
'112.11	Requirements for offshore oil drilling, production, or workover facilities.	Not Applicable

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

NABORS ALASKA DRILLING, INC.

PREFACE

This SPCC Plan has been prepared to provide Nabors Alaska Drilling, Inc. and its contractors with a comprehensive plan for containment and recovery of any spills that may occur at the drilling rig drill site on the Alaska North Slope. This plan has also been prepared for training in spill response techniques and emergency procedures.

This plan is designed for quick reference and easy use in the event of a spill. Section 1 summarizes the basic notification and spill response procedures, while Section 4 presents detailed instructions for these procedures. These sections form the core of this SPCC Plan. The remaining sections of the plan provide reference material, which will be useful in implementing the plan and in meeting the State and Federal regulatory requirements.

Nabors Alaska Drilling, Inc., operates Drilling Rig 27-E, as an independent contractor, under the terms and conditions of Daywork Contracts to perform oil and/or gas well drilling under the direct supervision of the Lease Operator. Drilling Rig 27-E is classified as an on-shore facility adjacent to navigable waters of the United States.

The United States Environmental Protection Agency published the Oil Pollution Prevention Regulations in the Federal Register on December 11, 1973 with revisions on July 17, 2002. These regulations, published as Title 40 of the Code of Federal Regulations, Part 112 (40 CFR 112), require the owners and operators of non-transportation related facilities to prepare and implement plans to prevent any discharge of oil into the waters of the United States. These plans are referred to as SPCC Plans.

This SPCC Plan follows the sequence outlined in 40 CFR 112 and includes a description of the installed spill prevention systems, proper operating procedures, preventive maintenance procedures, and spill containment and clean-up procedures. This SPCC Plan specifically addresses:

1. The practices for the prevention of spills,
2. The plan for spill containment, and
3. The plan for removal and disposal of spilled materials.

This SPCC Plan incorporates, by reference, the following documents of the Lease Operator, as required by 40 CFR 112 and 18 AAC 75.325 and 18 AAC 75.335:

1. Site Specific SPCC Plan and Facility Response Plan.
2. Accidental Discharge Contingency Plan.

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

NABORS ALASKA DRILLING, INC.

RIG 27-E

RECORD OF REVISIONS

This SPCC plan must be amended in accordance with the general requirements of 40 CFR 112 and when there is a change in facility design, construction, operation or maintenance that materially affects its potential for a discharge. Examples of changes that may require amendment of the Plan include, but are not limited to: commissioning or decommissioning containers, replacement, reconstruction or movement of containers or piping, changes in construction that may alter secondary containment structures, changes of product stored in the containers, or revisions of standard operation or maintenance procedures. An amendment must be prepared within 6 months and implemented as soon as possible, but not later than 6 months following preparation of the amendment. Refer also to Sections 9 and 10.

The Plan must also be amended whenever the facility has discharged more than 1000 U.S. gallons of oil in a single discharge or discharged more than 42 gallons of oil in each of two discharges within any rolling twelve month period. Refer to Section 10.

Date of Revision	Section	Pages	Description
March 13, 2009	All	All	Replaced existing to match new layout

SPCC PLAN CERTIFICATION (Continued)

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

NABORS ALASKA DRILLING, INC.

RIG 27-E

SPCC PLAN CERTIFICATION

C.1	NAME OF RIG:	Nabors Alaska Drilling, Inc. Rig 27-E
C.2	TYPE OF RIG:	Diesel Electric Drilling & Servicing Rig For Depths To 25,000 Feet.
C.3	LOCATION OF RIG:	North Slope Of Alaska, Mobile
C.4	NAME AND ADDRESS OF OPERATOR:	Nabors Alaska Drilling, Inc. 2525 "C" Street, Suite 200 Anchorage, Alaska 99503-2639

C.5 DESIGNATED NABORS PERSONNEL RESPONSIBLE FOR OIL SPILL PREVENTION AT RIG:

Name: Jimmy Henson ____________ Title: Tool Pusher (Rig Supervisor)

Name: Dave Hanson ______________ Title: Tool Pusher (Rig Supervisor)

Name:__________________________ Title: Tool Pusher (Rig Supervisor)

Name:__________________________ Title: Tool Pusher (Rig Supervisor)

C.6 FACILITIES NOT YET OPERATIONAL:

Rig 27-E has no additional facilities, procedures, methods or equipment that are not yet fully operational.

C.7 CONFORMANCE WITH 40 CFR 112:

This SPCC conforms to the requirements of 40 CFR 112, with the following exception: No diagram of connecting piping is included in this plan, as they are 3 dimensional in nature, and cover volumes of data. Refer to the piping diagrams available at the Facility.

C.8 SPCC PLAN APPROVAL:

Nabors Alaska Drilling, Inc. operates Rig 27-E as an independent contractor, within the terms of the contracts, to perform oil and/or gas well drilling operations under the contract to the Lease Operator. Spill Prevention Control and Countermeasure procedures outlined in this plan will be implemented by Nabors Alaska Drilling, Inc., as conditions warrant.

SPCC PLAN CERTIFICATION (Continued)

Nabors Alaska Drilling, Inc. intends to meet the requirements of the Environmental Protection Agency Oil Pollution Prevention Regulations, 40 CFR 112. However, the responsibility for actions required and other liabilities which are included in the Regulations are limited to those specified by the terms of the drilling contract between ourselves and our customers. The regulatory requirements applicable to the drilling operation will be met by this plan.

I hereby certify that the necessary personnel and equipment resources owned or operated by the facility owner or operator, are available to respond to a discharge within appropriate response times. This Spill Prevention Control and Countermeasure (SPCC) Plan is hereby approved and will be implemented as herein described.

FOR NABORS ALASKA DRILLING, INC.

Name: John Haynes Signature:

Title: HSE Manager Date: 3/13/09

C.9 ENGINEERING CERTIFICATION:

I hereby certify that I am familiar with the provisions of 40 CFR, Part 112, and that I or my Agent have inspected this facility. I attest that this SPCC Plan has been prepared in accordance with good engineering practices, including consideration of applicable industry standards and with the requirements of 40 CFR Part 112. I further attest that procedures for required inspections and testing have been established, and that the Plan is adequate for the facility. This certification does not relieve the owner or operator of this facility to fully implement this plan in accordance with 40 CFR Part 112. This certification includes the same limitations as those imposed under the management approval paragraph of this Plan.

SEAL:

Name: Robert A. French

Registration Number: ME-9128

State: Alaska

Date: March 13, 2009

C.10 SPCC PLAN AVAILABILITY:

A working copy of this SPCC Plan is to be maintained at the drill site by the Nabors Tool Pusher.

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

NABORS ALASKA DRILLING, INC.

RIG 27-E

SECTION 1

RESPONSE SUMMARY

In the event of a spill, including an oil spill, it is essential that immediate and decisive action be taken to contain and clean up the spill, insure personnel safety, minimize environmental hazards, and notify company and agency personnel. Following is a summary of the initial response actions for a spill:

1.1 ENSURE THE SAFETY OF ALL PERSONNEL:

A. Eliminate ignition sources if possible and safe to do so.

B. Consider moving personnel and equipment to upwind side of drill pad or off the pad via existing roads.

C. For a blowout, initiate well-control procedures.

D. For other spills, shut off sources of the spill (if possible) and alert personnel.

1.2 NOTIFY COMPANY MANAGEMENT AND GOVERNMENT REPRESENTATIVES:

A. Any individual detecting a spill shall immediately notify the Nabors Alaska Drilling Tool Pusher. Refer to Section 4.

B. The Tool Pusher, in coordination with the Lease Operator, will authorize immediate on-site containment efforts outlined below.

C. The Tool Pusher shall provide essential information to the Lease Operator and to the Nabors Alaska Drilling HSE Manager in Anchorage.

D. The Lease Operator shall notify others as necessary, including government agencies, cleanup cooperatives, contractors, and other logistical support organizations.

1.3 INITIATE IMMEDIATE ON-SITE RESPONSE TECHNIQUES:

A. For an operational spill, contain the spill on or near the drill site. Use on-site materials such as gravel, plastic sheets, absorbents, hand tools, etc.

B. For a blowout, evacuate the drill site as necessary. Use on-site equipment to contain and recover oil at or down gradient from the drill site.

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

NABORS ALASKA DRILLING, INC.

RIG 27-E

SECTION 2

POTENTIAL SOURCES OF SIGNIFICANT SPILLS

2.1 PREDICTION OF DIRECTION AND RATE OF FLOW:

This SPCC Plan contains an assessment of oil spill potential, spill movement, and impact considerations for a range of plausible spill types and volumes (excluding a major blow-out). This section also includes an analysis of the site-specific spill statistics and environmental conditions and how a spill could conceivably move within and/or threaten the natural resources surrounding the drill site. This SPCC Plan provides for the capacity to contain volumes of flow exceeding that possible for the storage tankage listed herein.

The flow of any spills on the drill site will be directed toward the reserve pit (if present) or limited to the confines of secondary containment structures as the need arises. Personnel responsible for oil spill containment at the drill site are prepared to construct flow barriers for any flow direction encountered on the drill site.

The prediction of direction of flow of any spills outside the confines of the drill site is beyond the scope of this SPCC Plan.

2.2 POTENTIAL SPILLS:

The preplanning, equipment purchase, personnel assignments and training are based on the assumption that a spill is possible and that a meaningful response must be achievable under a broad range of environmental conditions for both minor and major spills.

Nabors Alaska Drilling, Inc., has examined the potential spill sources for the drill site. The hydrocarbon storage and transfer equipment/facilities have been identified and evaluated for potential spillage. Information has been compiled on possible causes of spillage, on the volumes and types of oil and other fluids that could be released before control is implemented, and on the likelihood that spilled materials could enter the marine environment.

The results of this analysis indicated that there are three types of spillage that could conceivably result in the release of oil or other fluids to the environment. One is the potential spillage of fluid, (including arctic fuel) during the transfer from a tank truck to the storage tanks at the drill site. The second type of spills are those minor operational spills which may occur during the on-site transfer of fluid; the failure of items of equipment (piping, hoses, couplings, pump seals or casings, engine pans, etc.); or operational errors. The third type of spill is the uncontrolled release of oil during a well blow-out.

SECTION 2
POTENTIAL SOURCES OF SIGNIFICANT SPILLS (Continued)

In the first two cases, spill quantities are typically of a barrel or less, easily detected, and capable of being contained on the drill pad. In the case of fuel oil transfers to day tanks or slop tanks, there are individual manually operated gate valves located at each tank, and only one tank valve is ever opened at a time. All liquid hydrocarbon holding areas are bermed or cribbed and lined with impermeable material to prevent oil from spreading on or penetrating the drill pad. Transfers of fluids to and from tanks and to other facilities at the drill site are always supervised in accordance with Section 3, Spill Prevention Procedures. Such transfers involve flow rates on the order of 10 gpm; therefore, with typical detection and response times of less than 3 minutes, such spills represent potential losses of a barrel or less and would be contained within a small area on the drill pad.

In addition to the safeguards against these potential fuel oil spills, Nabors Alaska Drilling, Inc., has identified sources of spills from the storage and handling of other material such as hydraulic fluids, heat transfer fluids, and lubricating oils. There are many hydraulically operated systems associated with the handling and setting of drill pipe and casing, the processing of drilling muds and cuttings, and the operation of blowout prevention equipment (BOPE). Most operational-type spill sources involving fuel oil and hydraulic fluid are in areas where visual detection of a spill would account for a rapid response and elimination of the source. Readily available supplies of absorbent materials have been centrally located on the drill site for rapid accessibility.

Nabors Alaska Drilling, Inc., has trained rig crews and on-site equipment to control, contain, and clean up operational spills.

Personnel are also trained in the operation of well control and BOPE operating procedures to prevent blowouts. In the unlikely event of an uncontrolled blowout, Nabors Alaska Drilling, Inc. will take all steps necessary to safeguard human life and property and will cooperate fully with the Lease Operator in the implementation of its Spill Contingency Plan.

2.3 DRILL SITE COMPONENTS:

The design of the Drill Site, including the size, location and construction of the Pad, the presence or absence of reserve pits, are under the responsible control of the Lease Operator. As such, Nabors Alaska Drilling Inc. will comply with and modify the layout and installation of the components of the drill site as necessary to maintain the secondary containment features outlined in this SPCC Plan.

2.3.1 External Secondary Containment:

A "Herculite" impermeable membrane is installed beneath the fluid holding portions of the rig, including the pipe shed, utility modules, mud and solids control portions of the rig. Smaller "Herculite" lined containment areas may be created for the "Oil and Mud Dock", the shop, the main rig fuel tanks, smaller portable fuel tanks and other auxiliary

SECTION 2
POTENTIAL SOURCES OF SIGNIFICANT SPILLS (Continued)

tanks such as sewage holding tanks, if present. The "Herculite" liner is raised at the perimeter of the containment with moveable berms, typically constructed of wooden beams or similar materials. The lined dike area is constructed without the use of valves or other means of draining stormwater precipitation. Uncontaminated precipitation may be discharged. Contaminated precipitation will be removed by absorbent pads or by pumping to a holding tank for further treatment. The lined dike area must be sized sufficient to contain the capacity of the largest single container with sufficient freeboard to contain precipitation. The volume created by the "Herculite" liner is more than 50 percent larger than the volume of the largest tank within the lined area.

2.3.2 Secondary Containment within the rig modules:

The rig is made up of individual steel modules that are assembled together into complexes, or groups of modules that form functional units, such as the Pipe Shed, Utility Complex, Pit Modules, etc. The perimeter of the modules that have fluid holding tanks are typically fitted with "toe boards", metal dikes that combined with the steel floor and welded sleeves around any penetrations of the floors of the module, forms a secondary containment for minor leaks from operating equipment. Additionally, "toe boards" may be added around hydraulic or other equipment.

2.3.3 Secondary Containment for portable equipment:

The basin-like lower portion of the machinery enclosure is also used for secondary containment on smaller items such as portable welders and light boxes. Larger portable equipment, such as generators, auxiliary hydraulic power packs, and similar equipment, is typically installed within a module similar to a shipping "Conex", that has a sealed steel floor and "toe boards".

2.3.4 Secondary Containment for hose transfers and operating equipment:

Small "drip pans", moveable manufactured impermeable containers are placed beneath all pipe couplings and at hose connections during hose transfers into or out of fluid holding tanks. "Drip pans" are also place beneath operating equipment such as fork lifts, trucks, vans, and personnel vehicles when they are parked overnight, or for longer periods of time.

2.3.5 Optional Components:

Depending on the site-specific requirements of each drill site, optional components may be present at the drill site. Those components may typically include portable generators with light towers (Light Boxes), portable welders, portable hydraulic power packs, portable generators, portable wire spoolers, and portable fuel tanks. Other optional equipment may include additional similar components to those included in this SPCC Plan, such as having three main rig fuel tanks instead of two, or having additional cuttings boxes to be able to store materials on-site for longer periods between pick-ups by

SECTION 2
POTENTIAL SOURCES OF SIGNIFICANT SPILLS (Continued)

Service Trucks. For the smaller equipment, the fluid volumes are typically less than 55 gallons. As such, minor operational spills are typically contained within the frame or enclosure of the equipment as noted above. For equipment with larger fluid containers, such as portable fuel tanks, the equipment is typically stored within a lined, diked "Herculite" containment area. In general, the optional equipment will be placed, inspected and maintained in a manner similar to the other fluid storage containers of their type. Although the overall total of fluids and oil may increase or decrease, depending on the equipment actually on site, this does not change Nabors Alaska Drilling Inc.'s ability or obligation to respond to a spill.

2.4 RIG FIXED STORAGE:

Rig 27-E is equipped with a number of tanks and drums that contain fuel oil, lubricating oil, hydraulic fluid, glycol, miscellaneous effluents (slop), and drilling mud. These containers present the potential for spills as summarized in the following tables:

SECTION 2
POTENTIAL SOURCES OF SIGNIFICANT SPILLS (Continued)

TABLE 2-1

Tank	Description/Location	Volume	Contents	Construction	Secondary Containment	In Flow From	Out Flow To	Comments
Exterior Components								
1-1	Rig Fuel Storage	19,760 Gallons	Diesel Fuel	Single Wall Steel	Module / Liner on Pad	Service Truck	Rig Equipment	
1-70	Cuttings Bin	300 BBLs	Cuttings and Mud	Single Wall Steel	Module / Liner on Pad	Mud System	Service Truck	Working Volume 235.9 BBLS
1-71	Cuttings Bin	300 BBLs	Cuttings and Mud	Single Wall Steel	Module / Liner on Pad	Mud System	Service Truck	Working Volume 235.9 BBLS
Substructure, 1st. Level								
1-2	Module Jacking Hydraulic Power Pack	76 Gallons	Hyd. Oil	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-3	Module Jacking Hydraulic Power Pack	115 Gallons	Hyd. Oil	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-4	Drawworks Glycol Tank	1,460 Gallons	Glycol	Single Wall Steel	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-5	Test Pump	10 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-6	Test Pump Holding Tank	67 Gallons	Glycol	Single Wall Steel	Module / Liner on Pad	Stored Supplies	Well Test	
1-7	Casing Tongs Hydraulic Power Pack	240 Gallons	Hyd. Oil	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-8	Rig Jacking Hydraulic Power Pack	230 Gallons	Hyd. Oil	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-9	BOP Hydraulics	682 Gallons	Koomey Fluid	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Working Volume 550 Gallons

SECTION 2
POTENTIAL SOURCES OF SIGNIFICANT SPILLS (Continued)

Tank	Description/Location	Volume	Contents	Construction	Secondary Containment	In Flow From	Out Flow To	Comments
1-9A	BOP Pump Lubrication	2 @ 5 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
Power Module One, 1st Level								
1-10	D399 Generator Radiator	90 Gallons	Glycol	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-11	D399 Generator Radiator	90 Gallons	Glycol	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-12	D399 Generator Radiator	90 Gallons	Glycol	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-13	D399 Generator Radiator	90 Gallons	Glycol	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-14	D399 Generator Lubrication	110 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-15	D399 Generator Lubrication	110 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-16	D399 Generator Lubrication	110 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-17	D399 Generator Lubrication	110 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-18	Rig Internal Water Tank	408 BBLs	Water	Single wall Steel	Module / Liner on Pad	Service Truck	Rig Equipment	Working Volume 364 BBLS
1-19	Hydraulic Storage	334 Gallons	Hyd. Oil	Single wall Steel	Module / Liner on Pad	Service Truck	Rig Equipment	
1-20	Hydraulic Storage	334 Gallons	Hyd. Oil	Single wall Steel	Module / Liner on Pad	Service Truck	Rig Equipment	
1-21	Lube Oil Storage	334 Gallons	Lube Oils	Single wall Steel	Module / Liner on Pad	Service Truck	Rig Equipment	

SECTION 2

POTENTIAL SOURCES OF SIGNIFICANT SPILLS (Continued)

Tank	Description/Location	Volume	Contents	Construction	Secondary Containment	In Flow From	Out Flow To	Comments
1-22	Glycol Storage	334 Gallons	Glycol	Single wall Steel	Module / Liner on Pad	Service Truck	Rig Equipment	
1-23	Module Jacking Hydraulic Power Pack	70 Gallons	Hyd. Oil	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
Power Module Two, 1st Level								
1-24	D399 Generator Radiator	90 Gallons	Glycol	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-25	D399 Generator Radiator	90 Gallons	Glycol	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-26	D399 Generator Radiator	90 Gallons	Glycol	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-27	D399 Generator Radiator	90 Gallons	Glycol	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-28	D399 Generator Lubrication	110 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-29	D399 Generator Lubrication	110 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-30	D399 Generator Lubrication	110 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-31	D399 Generator Lubrication	110 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-32	Rig Internal Water Tank	408 BBLs	Water	Single wall Steel	Module / Liner on Pad	Service Truck	Rig Equipment	Working Volume 364 BBLS
1-33	Hydraulic Storage	334 Gallons	Hyd. Oil	Single wall Steel	Module / Liner on Pad	Service Truck	Rig Equipment	
1-34	Hydraulic Storage	334 Gallons	Hyd. Oil	Single wall Steel	Module / Liner on Pad	Service Truck	Rig Equipment	

SECTION 2
POTENTIAL SOURCES OF SIGNIFICANT SPILLS (Continued)

Tank	Description/Location	Volume	Contents	Construction	Secondary Containment	In Flow From	Out Flow To	Comments
1-35	Lube Oil Storage	334 Gallons	Lube Oils	Single wall Steel	Module / Liner on Pad	Service Truck	Rig Equipment	
1-36	Glycol Storage	334 Gallons	Glycol	Single wall Steel	Module / Liner on Pad	Service Truck	Rig Equipment	
1-37	Module Jacking Hydraulic Power Pack	70 Gallons	Hyd. Oil	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
Pump Room								
1-38	Mud Pump Lubrication	3 @ 155 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-39	Mud Pump Water Jacket Cooling	3 @ 227 Gallons	Water	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-40	Mud Pump Cooling Trough	3 @ 87 Gallons	Water	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-41	Pop-Off Tank	20 BBLs	Drilling Mud	Single wall Steel	Module / Liner on Pad	Mud Pumps	Mud System	Working Volume 18 BBLS
1-42	Module Jacking Hydraulic Power Pack	56 Gallons	Hyd. Oil	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-43	Cold Start Day Tank	411 Gallons	Diesel Fuel	Double wall Steel	Module / Liner on Pad	Rig Fuel 1-1	Cold Start, 1-44	110% Containment
1-44A	Cold Start Generator Lubrication	5 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-44B	Cold Start Generator Radiator	15 Gallons	Glycol	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
Mud Treatment Module – 1st Level								
1-45	Mud Pit	107 BBLs	Drilling Mud	Single wall Steel	Module / Liner on Pad	Stored Supplies	Mud System	Working Volume 96.1 BBLs

SECTION 2
POTENTIAL SOURCES OF SIGNIFICANT SPILLS (Continued)

Tank	Description/Location	Volume	Contents	Construction	Secondary Containment	In Flow From	Out Flow To	Comments
1-46	Mud Pit	107 BBLs	Drilling Mud	Single wall Steel	Module / Liner on Pad	Stored Supplies	Mud System	Working Volume 96.1 BBLs
1-47	Mud Pit	107 BBLs	Drilling Mud	Single wall Steel	Module / Liner on Pad	Stored Supplies	Mud System	Working Volume 96.1 BBLs
1-48	Mud Pit	107 BBLs	Drilling Mud	Single wall Steel	Module / Liner on Pad	Stored Supplies	Mud System	Working Volume 96.1 BBLs
1-49	Mud Pit	382 BBLs	Drilling Mud	Single wall Steel	Module / Liner on Pad	Stored Supplies	Mud System	Working Volume 345.6 BBLs
1-50	Mud Pit	185 BBLs	Drilling Mud	Single wall Steel	Module / Liner on Pad	Stored Supplies	Mud System	Working Volume 166.8 BBLs
1-51	Mud Pit	185 BBLs	Drilling Mud	Single wall Steel	Module / Liner on Pad	Stored Supplies	Mud System	Working Volume 166.8 BBLs
1-52	Mud Pit	90 BBLs	Drilling Mud	Single wall Steel	Module / Liner on Pad	Stored Supplies	Mud System	Working Volume 81 BBLs
1-53	Mud Pit	210 BBLs	Drilling Mud	Single wall Steel	Module / Liner on Pad	Stored Supplies	Mud System	Working Volume 189.9 BBLs
1-54	Mud Pit	91 BBLs	Drilling Mud	Single wall Steel	Module / Liner on Pad	Stored Supplies	Mud System	Working Volume 81 BBLs
1-55	Module Jacking Hydraulic Power Pack	55 Gallons	Hyd. Oil	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-56A	Cold Start Generator Lubrication	5 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System

SECTION 2
POTENTIAL SOURCES OF SIGNIFICANT SPILLS (Continued)

Tank	Description/Location	Volume	Contents	Construction	Secondary Containment	In Flow From	Out Flow To	Comments
1-56B	Cold Start Generator Radiator	15 Gallons	Glycol	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-57	Cold Start Generator Day Tank	367 Gallons	Diesel Fuel	Single wall Steel	Module / Liner on Pad	Rig Fuel 1-1	Cold Start, 1-57	
1-78	Trip Tank	68 BBLs	Drilling Mud	Steel Equipment	Module / Liner on Pad	Mud System	Mud System	Working Volume 60.2 BBLs
1-79	Trip Tank	68 BBLs	Drilling Mud	Single wall Steel	Module / Liner on Pad	Mud System	Mud System	Working Volume 60.2 BBLs
Pipe Shed								
1-58	Pipe Skate Hydraulic Power Pack	213 Gallons	Hyd. Oil	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-59	Pipe Shed Door & Jacking Hydraulic Power Pack	39 Gallons	Hyd. Oil	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-60	Pipe Shed Door & Jacking Hydraulic Power Pack	39 Gallons	Hyd. Oil	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-61	Tioga Heater Day Tank							No tank in present Tioga
Auxiliary Mud Pits								
1-62	Mud Pit	325 BBLs	Drilling Mud	Single wall Steel	Module / Liner on Pad	Mud System	Mud System	Working Volume 298.4 BBLs
1-63	Mud Pit	325 BBLs	Drilling Mud	Single wall Steel	Module / Liner on Pad	Mud System	Mud System	Working Volume 298.4 BBLs
1-64	Mud Pit	325 BBLs	Drilling Mud	Single wall Steel	Module / Liner on Pad	Mud System	Mud System	Working Volume 298.4 BBLs

SECTION 2

POTENTIAL SOURCES OF SIGNIFICANT SPILLS (Continued)

Tank	Description/Location	Volume	Contents	Construction	Secondary Containment	In Flow From	Out Flow To	Comments
1-65	Mud Pit	325 BBLs	Drilling Mud	Single wall Steel	Module / Liner on Pad	Mud System	Mud System	Working Volume 298.4 BBLs
1-66	Mud Pit	325 BBLs	Drilling Mud	Single wall Steel	Module / Liner on Pad	Mud System	Mud System	Working Volume 298.4 BBLs
1-67	Mud Pit	325 BBLs	Drilling Mud	Single wall Steel	Module / Liner on Pad	Mud System	Mud System	Working Volume 298.4 BBLs
1-68	Mud Pit	325 BBLs	Drilling Mud	Single wall Steel	Module / Liner on Pad	Mud System	Mud System	Working Volume 298.4 BBLs
1-69	Mud Pit	325 BBLs	Drilling Mud	Single wall Steel	Module / Liner on Pad	Mud System	Mud System	Working Volume 298.4 BBLs
1-80	Module Jacking Hydraulic Power Pack	2 @ 115 Gallons	Hyd. Oil	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-81	Cold Start Generator Day Tank	2 @ 459 Gallons	Diesel Fuel	Double Wall Steel	Module / Liner on Pad	Service Truck	Generators	Closed System
1-82A	Module Jacking Hydraulic Power Pack	2 @ 10 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-82B	Module Jacking Hydraulic Power Pack	2 @ 20 Gallons	Glycol	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
Welding and Engine Shop								
1-72	Day Tanks	2 @ 359 Gallons	Diesel Fuel	Single wall Steel	Module / Liner on Pad	Service Truck	Heaters	
1-73	Air Compressor Lubrication	2 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System

SECTION 2
POTENTIAL SOURCES OF SIGNIFICANT SPILLS (Continued)

Tank	Description/Location	Volume	Contents	Construction	Secondary Containment	In Flow From	Out Flow To	Comments
1-74	Parts Washer	119 Gallons	Cleaning Solvents	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
1-75	Lube Oil Stored Supplies	Varies, typ. 55 Gallons	Lube Oils	Single wall Steel	Module / Liner on Pad	Stored Supplies	Various Equipment	
1-76	Used Lube Oil	Varies, typ. 55 Gallons	Lube Oils	Single wall Steel	Module / Liner on Pad	Various Equipment	Service Truck	
1-77	Glycol Stored Supplies	Varies, typ. 55 Gallons	Glycol	Single wall Steel	Module / Liner on Pad	Stored Supplies	Various Equipment	
Substructure, 2nd Level								
2-1	Moving Generator Day Tank	232 Gallons	Diesel Fuel	Steel Equipment	Module / Liner on Pad	Rig Fuel	Moving Generator	
2-2	Drawworks Lubrication	84 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
2-3	Moving Generator Radiator	20 Gallons	Glycol	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
2-4	Moving Generator Lubrication	10 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
2-5	CanRig Hydraulic Power Pack	81 Gallons	Hyd. Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
2-6	Number not used							
Power Module One, 2nd Level								
2-7	Boiler Feedwater Tank	5475 Gallons	Boiler Water	Single wall Steel	Module / Liner on Pad	1-18	Boilers	Working Volume 5000 Gallons

SECTION 2
POTENTIAL SOURCES OF SIGNIFICANT SPILLS (Continued)

Tank	Description/Location	Volume	Contents	Construction	Secondary Containment	In Flow From	Out Flow To	Comments
2-8	Boiler Blowdown Tank	2220 Gallons	Boiler Water	Single wall Steel	Module / Liner on Pad	Boilers	Service Truck	Working Volume 2000 Gallons
2-9	Rig Day Tank	8230 Gallons	Diesel Fuel	Single wall Steel	Module / Liner on Pad	Service Truck	Boilers and Generators	Working Volume 6216 Gallons
2-10	Air Compressor lubrication	10 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
2-11	Air Compressor lubrication	10 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
2-12	Moving Generator Lubrication, Cat. 3306	8 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
2-13	Moving Generator Radiator	20 Gallons	Glycol	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
Power Module Two, 2nd Level								
2-14	Glycol Blowdown Tank	60 Gallons	Glycol	Single wall Steel	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
2-15	Boiler Feedwater Tank	5475 Gallons	Boiler Water	Single wall Steel	Module / Liner on Pad	1-32	Boilers	Working Volume 5000 Gallons
2-16	Boiler Blowdown Tank	2220 Gallons	Boiler Water	Single wall Steel	Module / Liner on Pad	Boilers	Service Truck	Working Volume 2000 Gallons
2-17	Rig Day Tank	8230 Gallons	Diesel Fuel	Single wall Steel	Module / Liner on Pad	Service Truck	Boilers and Generators	Working Volume 6216 Gallons
2-18	Air Compressor lubrication	10 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System

SECTION 2
POTENTIAL SOURCES OF SIGNIFICANT SPILLS (Continued)

Tank	Description/Location	Volume	Contents	Construction	Secondary Containment	In Flow From	Out Flow To	Comments
2-19	Air Compressor lubrication	10 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
2-20	Moving Generator Lubrication, Cat. 3306	8 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
2-21	Moving Generator Radiator	20 Gallons	Glycol	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
Mud Treatment Module, 2nd Level								
2-22	Mud Pit Agitator Lubrication	16 @ 1 Gallon	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
2-23	Vacuum Tank	265 Gallons	Slops	Steel Equipment	Module / Liner on Pad	Various	Service Truck	
2-24	Vacuum Pump	1 Gallon	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
2-25	Cuttings Conveyor Drive Gear Box	1 Gallon	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
2-26	Cuttings Conveyor Drive Gear Box	1 Gallon	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
Reserve Pit Module, 2nd Level								
2-27	Mud Pit Agitator Lubrication	16 @ 1 Gallon	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
Substructure, 3rd Level								
3-1	Rotary Table Lubrication	15 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
3-2	Top Drive Lubrication	23 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
3-3	Iron Roughneck	3 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System

SECTION 2
POTENTIAL SOURCES OF SIGNIFICANT SPILLS (Continued)

Tank	Description/Location	Volume	Contents	Construction	Secondary Containment	In Flow From	Out Flow To	Comments
3-4	Swivel	5 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
3-5	Air & Hydraulic Tugger	1 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
3-6	Air & Hydraulic Tugger	1 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
3-7	Air & Hydraulic Man-Rider	1 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
3-8	Air & Hydraulic Man-Rider	1 Gallons	Lube Oils	Steel Equipment	Module / Liner on Pad	Stored Supplies	Service Truck	Closed System
Lease Operator Controlled								
Slop Tank	?? Bbls	Wash water	Lease Operator	Controlled				
Auxiliary Water Tank	?? Bbls	Water	Lease Operator	Controlled				
Cementing Equipment	?? Bbls	Cement	Lease Operator	Controlled				

*Working volume is based on high level alarm approximately 1 foot below the top of the tank.

SECTION 2
POTENTIAL SOURCES OF SIGNIFICANT SPILLS (Continued)

2.5 DESCRIPTIONS OF TYPICAL FLUID CONTAINERS:

The following descriptions of typical fluid containers are supplemental to the information in the above tables. These descriptions are "generic" in nature and some of the containers listed may not be used. Refer to the Rig Layout drawings in Appendix A for locations.

2.5.1 Rig Fuel Tank (External):

These fuel storage tanks are installed within Herculite or steel containment dikes. They provide primary fuel storage capacity for the rig. They are filled by transferring fuel from a service truck.

The potential for structure failure of the steel fuel tank is unlikely during rig operations. This tank is inspected and repaired (if needed) during rig moves. The tank is not a pressure vessel and has relief vents. A spill from this tank could result from overfilling of the tank or rupture of one of the lines. An impermeable pad is placed under all connections during transfer operations.

2.5.2 Rig Water Tank and Potable Water Tank:

The steel water storage tanks are installed within individual modules and provide water for the rig.

The potential for structure failure of the steel water tank is unlikely during rig operations. These tanks are inspected and repaired (if needed) during rig moves. The tanks are not pressure vessels and have relief vents. The water tanks contain no oil and, under these conditions, are not controlled by EPA regulations, 40 CFR 112. The water system will be managed at all times in a manner consistent with all environmental regulations. A spill from these tanks could result from overfilling of the tank or rupture of one of the lines.

2.5.3 Cooling Radiators, Glycol:

Propylene glycol, as a heat transfer fluid is used for engine cooling at the generators and portable components, such as welders or hydraulic power pack.

Spills of glycol could result from overfilling, catastrophic equipment failure or pipe system failure; however, the steel subfloor under the equipment will catch and contain spills. Containers having less than 55 gallons of capacity are not included here.

2.5.4 Equipment lubrication:

Lubricating oils are used for equipment lubrication including chain and gear drives, as well as the sumps (oil pans) of the diesel engines, as well as smaller pumps or auger

SECTION 2
POTENTIAL SOURCES OF SIGNIFICANT SPILLS (Continued)

drives, which may have an oil-filled gear box. Containers having less than 55 gallons of capacity are not included here.

Spills of these materials could result from overfilling, equipment or sump failure or from a spill during lubricant transfer; however, the steel subfloor under the equipment will catch and contain spills.

2.5.5 Boiler Feed Water Tank:

These steel water storage tanks installed within a steel module provides feed water for the rig boilers. They are filled by transferring water from the fresh water tank and adding boiler treatment chemicals.

The potential for structure failure of the steel feed tank is unlikely during rig operations. This tank is inspected and repaired (if needed) during rig moves. The tank is not a pressure vessel and has relief vents. The water tank contains no oil and, under these conditions, is not controlled by EPA regulations, 40 CFR 112. Spills of boiler water are required to be reported in accordance with this SPCC plan for compliance with DEC and lease permits. The boiler water system will be managed at all times in a manner consistent with all environmental regulations. A spill from this tank could result from overfilling of the tank or rupture of one of the lines.

2.5.6 Fuel Day Tanks:

These steel fuel storage tanks are installed both exterior, and interior to the rig and rig support equipment. Most fuel day tanks are a singe wall tank installed within a module that provides fuel storage capacity for the generators or heaters. The smaller “Cold Start Generator’s” often had a “Belly Tank” welded into the skids of the generator support frame. External fuel day tanks were often mounted inside of an open-top steel containment “skirt” to catch minor spills, but typically do not exceed the tank capacity.

The potential for structural failure of the steel fuel tanks are unlikely during rig operations. The tanks are inspected and repaired (if needed) during rig moves. The tanks are not pressure vessels and have relief vents. The tanks are filled under manual control from the rig fuel tank. A spill from these tanks could result from overfilling of the tanks or rupture of one of the lines.

2.5.7 Maintenance Stores (Lubrication, Glycol, Hydraulic, Paints):

Maintenance supplies of lubricating oils, greases, propylene or ethylene glycol mixtures, hydraulic fluids and paints are stored within the rig or support equipment. Maintenance stores are typically in 55 gallon drums or in fabricated steel storage tanks (“Totes”).

A spill could occur from the rupture of the drum or during transfer from storage into the system, however, the steel subfloor under the equipment will catch and contain spills.

SECTION 2
POTENTIAL SOURCES OF SIGNIFICANT SPILLS (Continued)

2.5.8 Hydraulic Power Packs:

Hydraulic fluid is maintained for use in module jacking, equipment handling, testing equipment, and for hydraulically driven equipment as shown on the rig layout drawings.

Spills of hydraulic fluid could result from a reservoir failure or from the failure of a hydraulic pump, high pressure piping, or seal.

2.5.9 Drawworks Cooling Tanks and Radiators, Glycol:

Propylene glycol, as a heat transfer fluid is circulated through a tank or through radiators to cool the Drawworks

Spills of glycol could result from overfilling, catastrophic equipment failure or pipe system failure, however, the steel subfloor under the equipment will catch and contain spills.

2.5.10 BOPE:

Hydraulic fluid and Koomey fluids are maintained in the accumulator and Koomey bottles located as shown on the rig layout drawings.

Spills of hydraulic and Koomey fluid could result from a reservoir failure or from the failure of a hydraulic pump, high pressure piping, or seal.

2.5.11 Mud Tanks:

The potential for structural failure of steel mud tanks is unlikely during rig operations. Mud tanks are not pressure vessels. These tanks are inspected and repaired (if needed) during rig moves.

The drilling fluid may contain oil and is controlled by the EPA Regulations, 40 CFR 112. The mud system will be managed at all times in a manner consistent with all environmental regulations.

A spill from this system could result from overfilling of tanks or pressure rupture of mud transfer lines. Secondary containment for the drilling fluids storage system includes the steel subfloor under the equipment, the lining under the rig, and the wellhead cellar.

2.5.12 Temporary Stores (Oil and Mud Docks):

Larger bulk quantities of maintenance supplies of lubricating oils, propylene glycol mixtures, mud components, mud treatment chemicals, and hydraulic fluids are stored adjacent to the drill site (typically on a flatbed trailer) within a bermed impermeable liner. Maintenance stores are typically in 55 gallon drums or in “Totes” of 360 gallons.

SECTION 2
POTENTIAL SOURCES OF SIGNIFICANT SPILLS (Continued)

A spill could occur from the rupture of the drum or during transfer from storage into the system. Since rupture is most likely during movement, secondary containment is not predictable, but should be caught within the steel floor of the module or the impermeable membrane under the rig.

2.5.13 Wash Down Holding Tanks:

These tanks are of steel construction, and contain water and other fluids for and resulting from washing down of the drill piping as it is removed from the hole, and from rig washing. The tanks are installed within steel modules.

A spill from these tanks could result from overfilling or rupture of the tank or during transfer. The impermeable membrane under the rig will catch and retain minor operational spills.

2.5.14 Injection Holding Tank:

This tank is typically of steel construction, adjacent to, and similar to the mud pits, and contains fluids as allowed by permit, prior to injection down the well. The tank is installed within a steel module.

A spill from the tank could result from overfilling or rupture of the tank or during transfer. The impermeable membrane under the rig will catch and retain minor operational spills.

2.5.15 Test Pump Holding Tanks:

This tank is of typically of steel construction and contains diesel fuel or glycol prior to injection into the drill hole annulus. The tank is installed within a steel module.

A spill from this tank could result from overfilling or rupture of the tank or pipe system failure. The steel subfloor under the equipment and the impermeable membrane under the rig will catch and retain operational spills.

2.5.16 Portable Fuel Tanks:

These steel fuel storage tanks are optional components that may be used for fuel transfers to vehicles, or from aircraft to the main rig fuel tanks. The tanks are stored within Herculite or steel containment dikes. They are filled by transferring fuel from the main rig fuel tanks or from a service truck.

The potential for structure failure of the steel fuel tank is unlikely during routine operations. This tank is inspected and repaired (if needed) during rig moves. The tank is not a pressure vessel and has relief vents. A spill from this tank could result from

SECTION 2
POTENTIAL SOURCES OF SIGNIFICANT SPILLS (Continued)

overfilling of the tank or rupture of one of the lines. An impermeable pad is placed under all connections during transfer operations.

2.5.17 Cuttings Boxes:

These steel cuttings storage tanks are optional components that may be used to allow on-site storage of cuttings. The tanks are installed within the Herculite lining under the rig. They are filled by auger from the solids control module, and hauled away for disposal.

The potential for structure failure of the steel cuttings tank is unlikely during routine operations. This tank is inspected and repaired (if needed) during rig moves. The tank is an open top vessel. A spill from this tank could result from overfilling of the tank.

2.5.18 Lease Operator's External Components:

These components may include the Cuttings boxes, "tiger tanks", and cementing equipment.

These components are provided and maintained by the Lease Operator or the Lease Operator's subcontractors. The components are included in the daily inspection by the Nabors Tool Pusher.

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

NABORS ALASKA DRILLING, INC.

RIG 27-E

SECTION 3

SPILL PREVENTION PROCEDURES

3.1 POLICY:

It is the intent of Nabors Alaska Drilling, Inc., that no pollution of any type results from its operations. To implement this intent, Nabors Alaska Drilling, Inc., has established a set of operating policies and procedures which have substantially reduced the probability of a spill occurring and which have also increased the responsive clean-up actions should a spill occur.

This policy includes the following features:

3.1.1 Facilities are designed and installed for maximum safety and reliability,

3.1.2 Operation and Maintenance (O&M) procedures are implemented to maximize the safe and reliable operation of each facility and to minimize the risk of failure, accidents or spills,

3.1.3 All operating personnel are specifically trained in spill prevention and response,

3.1.4 All facilities are inspected daily, and

3.1.5 Inspection and training records are complete and accurate.

3.2 DAILY INSPECTION AND RECORDS:

Daily inspections of the drilling complex, as described in Section 9, will be made each tour by the rig crews. These inspections will follow the written procedures contained in this plan and as required by the Nabors Tool Pusher to meet existing operating conditions.

When the daily inspections are made of the drilling complex by the Nabors Motorman and/or Spill Champion, a record of this inspection is to be kept by making the following entry on the Motor Report or Spill Champion Report for each tour: "SPCC Rig Inspection Complete." By signing the Motor Report or Spill Champion Report, the Motorman and/or Spill Champion affirms that the inspections have been completed.

SECTION 3
SPILL PREVENTION PROCEDURES (Continued)

3.3 PERSONNEL TRAINING AND RECORDS:

All Nabors Alaska Drilling operating personnel will receive periodic training covering oil spill prevention and control procedures. Regularly scheduled training shall be provided as required by 40 CFR 112 and Section 6 of this Plan.

The Nabors Tool Pusher is responsible for the on-site coordination and execution of SPCC training with the Lease Operator's Drilling Supervisor and all other contractor and service company personnel. The Nabors Tool Pusher will record the completion of each SPCC training session on his morning report.

3.4 SPILL PREVENTION MEASURES:

Drilling operation procedures are specifically prepared and implemented to prevent the release of oils, drilling fluids and other pollutants. The design of the drilling rig and the drill pad, together with these operating procedures, are intended to significantly reduce the probability of any spill and to significantly increase the speed of spill containment and recovery. The following specifications apply to the fuel and mud storage and transfer equipment and to the drilling rig:

3.4.1 All fuel storage tanks are of steel construction and are atmospheric vessels with permanently installed vents. Refer to fluid transfer procedures in paragraph 3.5.

3.4.2 The day tanks for the diesel engines and heaters are located at the rig or the support equipment. These tanks are provided with drip pans at all pipe couplings and the tank vents are piped back to their respective storage tank to further reduce the probability of potential spills resulting from tank overfilling.

3.4.3 The fuel transfer connections on each tank are equipped with manually operated valves so that no unattended or unmonitored operation can occur.

3.4.4 The fuel tanks have no automatic fluid-level control devices that are unprotected from the weather. Arctic conditions frequently cause the failure of automatic control equipment. The tank fuel levels are monitored and controlled manually through “sight glasses” of fuel resistant flexible tubing mounted to within 6 inches of the top of the tank.

3.4.5 Fuel is transferred to and from the tanks through flexible arctic-grade fuel-handling hoses. Fuel lines and couplings are inspected during each fuel transfer operation. Expansion, contraction and vibration are not transferred through these flexible connections. All lines have “no-drip” quick-connect couplings or unions where practical.

3.4.6 Block valves are located on the storage tanks. Pumps for transferring fuel from the storage tanks to the rig are located within the rig.

SECTION 3
SPILL PREVENTION PROCEDURES (Continued)

3.4.7 A remote shut-off valve is installed at the rig day tank. This valve is operable from outside the rig to stop the flow in the event of a line or coupling failure.

3.4.8 Drip pans are provided under all day tanks, fuel line valves, couplings, fuel transfer pumps, engines, and burners.

3.4.9 All liquid mud is transferred through steel, high-pressure steel braided, or other appropriate hoses specifically designed for this application.

3.4.10 All liquid mud storage tanks are of steel construction and are atmospheric tanks with open tops. The fluid level is controlled manually in each tank by a full time Pit Watch.

3.4.11 Lubricating products are transported to the drill site in drums or "Totes". Drum handling procedures are utilized to minimize the risk of injury or damage. Drums are stored at central point(s) to isolate the effect of any leakage or spillage.

3.5 FLUID TRANSFER PROCEDURES:

Fuel and other fluids will be transported to the drill site by truck from Deadhorse via existing gravel and ice roads. The person responsible for the individual system at the drill site will be the operator-in-charge during fluid transfer operations and will assign a hose watch during fluid transfer. The operator-in-charge will also insure that all equipment, storage tanks, and transfer lines at the drill site are operational before any transfer begins. He will insure that drip pans are in place at all valves and couplings.

In addition, all fluid transfer from the storage tanks at the drill site will be subject to the following procedures:

3.5.1 Fluid transfer Permit will be filled out.

3.5.2 Verify that all valves are closed before unrolling hoses.

3.5.3 Connect hose between transfer systems. Tie or couple to secure in place.

3.5.4 Place drip pans under any coupling not in a protected area.

3.5.5 Open valves and begin transfer of fluid. Watch for any leaks and supervise the transfer of fluid at all times. No fluid transfer is to be left unsupervised.

3.5.6 When the transfer is complete, shut off the pump(s) and close all necessary valves.

SECTION 3
SPILL PREVENTION PROCEDURES (Continued)

3.5.7 Disconnect the hose, drain any fluid into a drip pan, and roll-up and store the hose. Insure that all transfer valves are left in the closed position and that all transfer hoses and lines remain intact after such transfer.

3.5.8 Pick up the drip pans and deposit any collected fluid in a waste storage drum.

3.5.9 If any fluid was spilled, notify the Tool Pusher. Pick up all minor spills using absorbent materials, or other means.

3.6 BLOWOUT PREVENTION PROGRAM AND EQUIPMENT:

The primary method of well control involves the use of hydrostatic pressure exerted by the column of drilling mud of sufficient density to prevent the undesired flow of formation fluids into the well bore. In the event primary control is lost, surface blowout prevention equipment is used for secondary well control. The casing blowout protection equipment is designed so that any anticipated formation pressure can be contained at the surface. A description of this equipment is provided in the Alaska Oil and Gas Conservation Commission Permit to Drill for the drill site.

All blowout prevention equipment and testing procedures meet the specifications of the American Petroleum Institute Recommended Practice #53. This equipment is tested weekly and prior to drilling out the shoe of each casing string.

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

NABORS ALASKA DRILLING, INC.

RIG 27-E

SECTION 4

SPILL CONTINGENCY PLAN

4.1 RESPONSIBILITY AND AUTHORITY:

This Spill Contingency Plan, constitutes an assignment of responsibility for action and authorizes these actions to be taken in the case of any spill, including any oil spill. The included Spill Action Procedure Chart, Figure 4-1, summarize these assignments.

The actions assigned and authorized by this Plan will be implemented if a spill occurs on any drill site associated with the rig during the term of the contract between Nabors Alaska Drilling and the Lease Operator.

Any and all individuals, contractors, support personnel, service personnel and employees associated with rig operations are responsible for and authorized to take the following actions in case of any spill:

4.1.1 Protect and preserve human life.

4.1.2 Protect equipment.

4.1.3 If the spill is in progress, and if you know how to safely stop it, stop it.

4.1.4 Report the event to their co-workers and immediate on-site supervisor or foreman, as well as Driller or Toolpusher.

4.1.5 Immediately contain the spill to the extent of their capacity.

4.1.6 The Tool Pusher shall provide essential information to the Lease Operator and Nabors Alaska Drilling HSE Manager in Anchorage, who will notify others as necessary.

4.2 ADMINISTRATIVE RESPONSIBILITY:

4.2.1 The Nabors Tool Pusher and the Lease Operator are authorized to implement the actions necessary to detect, contain, and clean up spills of any size occurring on any drill site associated with rig operations, and the immediate vicinity thereof.

4.2.2 The Nabors Tool Pusher will not commit equipment and/or personnel beyond the immediate vicinity of the drill site for spill containment and countermeasures unless so doing will not jeopardize current on-site operations, and/or such action is authorized by the Lease Operator.

SECTION 4
SPILL CONTINGENCY PLAN (Continued)

4.3 WELL CONTROL:

The Nabors rig crews will immediately shut in the well whenever there is an indication that a formation influx has occurred. The Nabors Tool Pusher and the Lease Operator will direct subsequent well control operations.

4.3.1 The Lease Operator will exercise overall ultimate direction of all well control operations, coordinating with the Nabors Drilling Superintendent. All required equipment, personnel and materials will be mobilized under their direction.

4.4 EMERGENCY PROCEDURES:

The following procedures are followed for emergency operations on the drill site:

4.4.1 The Nabors Tool Pusher shall designate "Briefing Areas" where all personnel will meet in case of emergency and where emergency equipment will be kept.

4.4.2 The site is equipped with an operating portable radio system.

4.4.3 A list of current emergency telephone numbers and a map of the local area are maintained by the Nabors Tool Pusher.

4.5 SPECIFIC SPILL COUNTERMEASURES TO BE EXECUTED:

The actions listed below are authorized to be implemented by the Nabors Tool Pusher:

4.5.1 Utilize any and all equipment available on site.

4.5.2 Mobilize personnel, materials, and equipment, which are known to be resources of Nabors Alaska Drilling located on the North Slope of Alaska.

4.5.3 Execute any action deemed necessary for the preservation of human life.

4.5.4 Take all actions necessary to stop the spill.

4.5.5 Deploy containment booms and use absorbent materials to absorb and contain the spill.

4.5.6 Construct any berms, dams, ditches, or other flow controls which will provide immediate containment.

(CAUTION: Large oil spills on sea ice should be allowed to spread on the surface. Dams confining deep pools of oil will tend to drive oil under the ice and complicate recovery.)

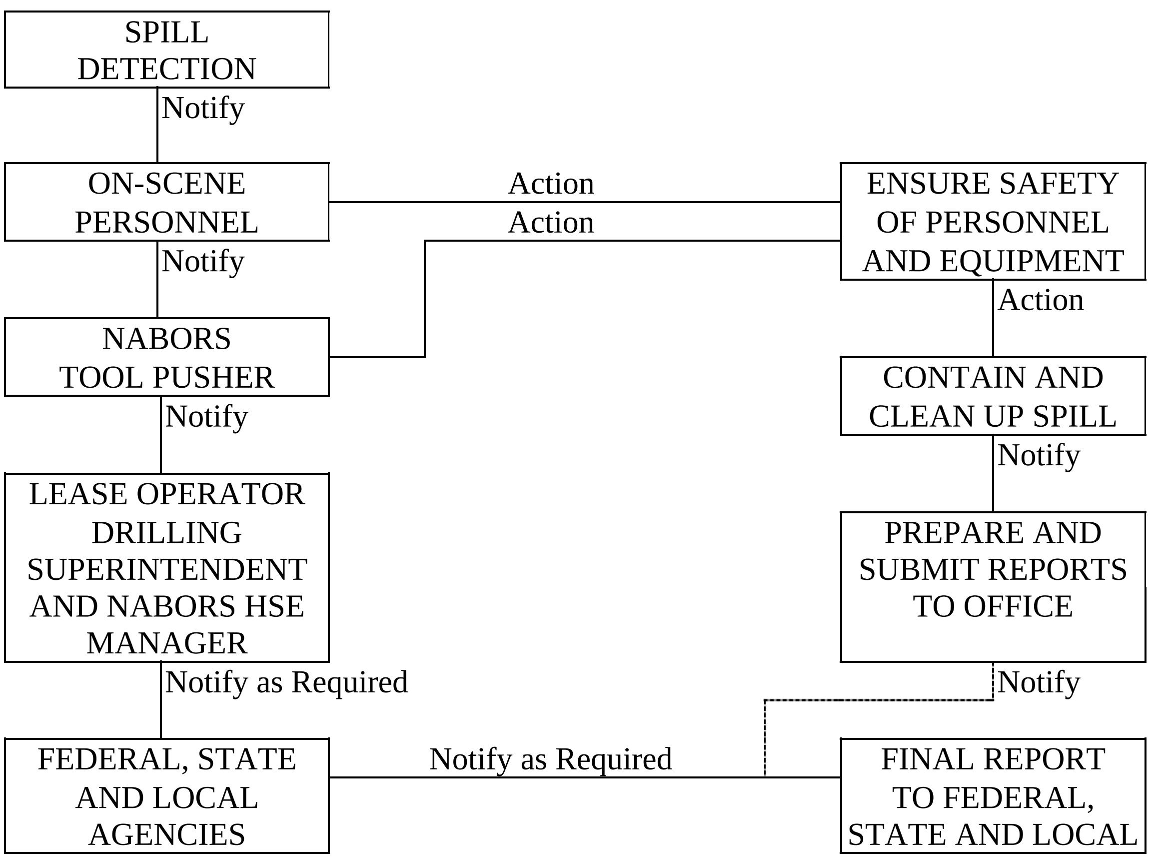
SECTION 4
SPILL CONTINGENCY PLAN (Continued)

4.5.7 All unsalvageable spill materials and/or waste materials shall be disposed of as described in Section 7.

4.5.8 Collect all contaminated materials (gravel, soil, snow, absorbents, etc.) for disposal as specified in Section 7.

4.5.9 Repair and/or modify any equipment as required to stop any leaks or spills.

FIGURE 4-1 SPILL ACTION PROCEDURE CHART



SEE EMS MANUAL CHAPTER ON SPILL RESPONSE FOR MORE INFORMATION

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

NABORS ALASKA DRILLING, INC.

RIG 27-E

SECTION 5

SPILL RESPONSE

5.1 ORGANIZATION:

Nabors Alaska Drilling's response organization for conducting spill cleanup operations, including oil spill cleanup operations, consists of the on-site spill response personnel supported by the Lease Operator's Spill Response Team. The on-site spill response personnel are led by the Nabors Tool Pusher. These personnel will handle minor operational spills at the drill site and will begin initial containment and recovery operations for larger spills until the Lease Operator's Spill Response Team is mobilized.

5.2 RESPONSIBILITY:

Overall responsibility for spill prevention and spill cleanup for Nabors Alaska Drilling facilities in Alaska rests with:

David Hebert, General Manager	(907) 263-6000 (office – 24-hour coverage)
Nabors Alaska Drilling, Inc.	(907) 696-8999 (home)
2525 "C" Street, Suite 200	(907) 563-3734 (facsimile)
Anchorage, Alaska 99503-2639	

Mr. Hebert has delegated responsibility for spill response to:

John Haynes	(907) 263-6000 (office – 24-hour coverage)
HSE Manager	(907) 345-2984 (home)
	(907) 563-3734 (facsimile)

Mr. Haynes and members of the Lease Operator's Response Team would assume control of a major spill operation; however, the Nabors Tool Pusher at the drill site will manage cleanup of all minor operational spills and will implement initial actions in the event of a major spill until the Lease Operator's Spill Response Team is activated.

5.3 ON-SITE SPILL RESPONSE PERSONNEL:

The on-site spill response personnel will consist of, as a minimum, the Nabors Tool Pusher, forklift operator and the motorman. All operating personnel are trained in basic spill response (Section 6) and will handle minor and moderate spills on the drill site, as well as the initial response to major spills. For any spill, backup support will be provided as needed by the Lease Operator's Response Team and by the resources at Deadhorse, Alaska.

SECTION 5
OIL SPILL RESPONSE (Continued)

As supervisory head of the on-site spill response personnel, the Nabors Tool Pusher is responsible for the day-to-day spill prevention efforts at the drill site as well as blowout prevention and all other pollution control. The Nabors Tool Pusher has the authority to obtain additional labor crews, equipment, and materials from Deadhorse to contain and clean up a spill not requiring activation of the Lease Operator's Spill Response Team.

Members of the drilling and roustabout crew, under direction of the Nabors Tool Pusher, are assigned spill response duties. All crew personnel are given periodic instruction in pollution control including the following:

1. Spill prevention and good safety, maintenance, and housekeeping practices.
2. Pollution detection methods under different climatic conditions.
3. How to distinguish an emergency situation from minor spills that do not constitute an emergency.
4. Control and containment methods for oil spills under different climatic conditions.
5. Cleanup and proper disposal procedures.

The on-site spill response personnel will investigate and handle all minor spills, both on location and along transportation routes between Deadhorse and the location. Those personnel who have been trained to the appropriate standard under 29 CFR 1910.120 will also be able to initiate immediate containment and recovery actions for moderate to large spills while the Lease Operator's Spill Response Team is being mobilized. Most minor operational spills of fluids, oil or diesel fuel will be collected manually and disposed of as described in this Plan.

5.4 MATERIALS AND EQUIPMENT:

On-site spill response personnel are trained and equipped to handle any spill that can be contained on the drill site and are also equipped to support the Lease Operator's Spill Response Team in the event of a major spill. On-site spill response equipment consists of the following safety supplies as well as the following spill control supplies and equipment. This support equipment is located at designated locations at the drill site.

5.4.1 Spill Control Countermeasure Equipment and Materials:

Materials and equipment available at the Drill Site are listed in Appendix D hereto. Additional equipment and supplies are available from suppliers in the Deadhorse area as listed in Appendix B, North Slope Supplies & Services.

SECTION 5
OIL SPILL RESPONSE (Continued)

5.4.2 Safety Equipment:

Personnel protective equipment is available to protect all personnel working on spill control, containment, and clean-up operations.

5.4.3 Equipment Available in Area:

Refer to the list of Equipment and Spill Cleanup Materials on Site in Appendix D.

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

NABORS ALASKA DRILLING, INC.

RIG 27-E

SECTION 6

TRAINING

6.1 TRAINING REQUIREMENTS:

Nabors Alaska Drilling will hold regularly scheduled training and refresher programs at each drill site to familiarize on-site personnel with spill control equipment, Nabors Fluid Transfer Procedures and operational procedures.

All drilling crew members will participate in the on-site spill response in this contingency plan and will participate in these training programs. Participation in each training program will be recorded in the personnel records, and the records will be made available to responsible agency personnel upon request.

Spill prevention and control training for the drilling crews will cover basic contingency planning, fate and behavior of oil, and spill response techniques and equipment, as well as the operation and deployment of the spill response equipment stored on the drill site.

For spills that create emergency situations, specific training requirements described at 29 CFR 1910.120 for response, containment and cleanup apply. These requirements, and in particular training provided by Nabors about how to identify an emergency situation, are more fully described in the *SPILL RESPONSE, CLEANUP AND REPORTING PROCEDURE* chapter of the Nabors EMS Manual.

In addition to the spill prevention and response training, selected Nabors personnel will be trained and qualified as appropriate in accordance with the current provisions of the MMS Outer Continental Shelf Standard "Training and Qualifications of Personnel in Well-Control Equipment and Techniques for Drilling on Offshore Locations" (MMS-OCS-T 1, with revisions). Nabors will maintain records of all personnel who receive this MMS training, and these records will be provided upon request.

6.2 SPILL PREVENTION TRAINING:

Training in spill prevention requirements, fluid transfer procedures, operational procedures, and policies will specifically include the following:

6.2.1 The operation and maintenance of all equipment utilized on the drill site that stores, transfers, or consumes fuel, lubricating oils, or hydraulic fluids. Manufacturer's equipment manuals, films, and other training aids will be used as applicable.

SECTION 6
TRAINING (Continued)

6.2.2 The construction of the drill site. This includes the construction and maintenance of the impermeable diking around moveable external components and the impermeable membrane under the rig.

6.2.3 The minimum inspection procedures are included in this SPCC Plan. Additional specific instructions shall be provided to the Spill Champion and Motorman regarding the execution of the inspections and reporting the results, as well as special instructions required for abnormal operating conditions. (See Section 9 for Inspection Procedures.)

6.2.4 Familiarization of all drill site personnel with the utilization of all special oil spill containment and clean-up materials and equipment. Utilize manufacturer's literature and training aids for this purpose.

6.2.5 Familiarization of drill site personnel who operate support equipment with their work assignments during an oil spill containment and cleanup operation.

6.2.6 The review of this SPCC plan with all drill site personnel as required by Environmental Protection Agency Regulation 40 CFR 112.

6.2.7 An explanation of site security procedures to all personnel.

6.2.8 A review of the following excerpts from the "Federal Water Pollution Control Act of 1972" with all drill site personnel:

> "The Congress hereby declares that it is the policy of the United States that there should be no discharges of oil or hazardous substances into or upon the navigable waters of the United States, adjoining shorelines, or into or upon the waters of the contiguous zone…." (Section 311 (b) (1) of the Act)

> "Any person in charge of a vessel or an onshore facility or an offshore facility shall, as soon as he has knowledge of any discharge of oil or a hazardous substance from such vessel or facility in violation of paragraph (3) of this subsection, immediately notify the appropriate agency of the United States Government of such discharge." (Section 311 (b) (5) of the Act)

(NOTE: "Navigable waters" have been defined in such a manner that virtually all lakes, streams, ocean, wet lands, and sea shorelines are included in the meaning of the section quoted above.)

6.2.9 A review of the following excerpts from the Environmental Protection Agency Regulations 40 CFR 110 with all drill site personnel:

> "Sheen means an iridescent appearance on the surface of the water." (40 CFR 110.1)

SECTION 6
TRAINING (Continued)

> "Sludge means an aggregate of oil or oil and other matter of any kind in any form other than dredged spoil having a combined specific gravity equivalent to or greater than water." (40 CFR 110.1)

> "For purposes of section 311(b)(4) of the Act, discharges of oil in such quantities that the Administrator has determined may be harmful to the public health or welfare or the environment of the United States include discharges of oil that: a) Violate applicable water quality standards; or b) Cause a film or sheen upon or discoloration of the surface of the water or adjoining shorelines or cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines." (40 CFR 110.3)

(NOTE: Simply stated, causing a sheen on any water surface or sludge in any waters is a violation of federal regulations.)

6.2.10 A review of the following excerpts from Title 46 of the Alaska Statutes with all drill site personnel:

> "A person may not discharge, cause to be discharged, or permit the discharge of petroleum, acid, coal or oil tar, lampblack, anilines, asphalt, bitumen, or residuary product of petroleum, into, or upon the waters or land of the state...". (Part of AS 46.03.740)

> "A person who violates or causes or permits to be violated a provision of this chapter. . . is liable, in a civil action, to the state for a sum to be assessed by the court of not less than $500 nor more than $100,000 for the initial violation, nor more than $5,000 for each day after that on which the violation continues. . ." (Part of AS 46.03.760(a))

6.2.11 The instructions to all drill site personnel that the policy of the Lease Operator and Nabors is: "Any and all personnel will report any and all spills to their immediate supervisor". This policy is to be implemented by:

1. Each individual who knows of a spill shall immediately report the spill to his/her supervisor.

2. The Supervisor will immediately report any and all spills to the Nabors Tool Pusher.

3. The Nabors Tool Pusher will report all spill incidents to the Lease Operator's Drilling Foreman and to the Nabors Drilling Superintendent and Nabors HSE Manager as outlined in Section 8.

SECTION 6
TRAINING (Continued)

6.2.12 BOPE Training:

1. BOPE training exercises shall be conducted as specified by the Lease Operator. These exercises meet all state, and federal requirements.

2. A list of personnel who have received special additional well control/blowout prevention training is maintained at the offices of Nabors Alaska Drilling.

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

NABORS ALASKA DRILLING, INC.

RIG 27-E

SECTION 7

CONTAINMENT AND DISPOSAL

7.1 PRIMARY CONTAINMENT:

The following specifications apply to the fuel and mud storage and transfer equipment included in the inventory. The fluid transfer procedure is included as part of the SPCC plan.

7.1.1 All fuel storage tanks are of steel construction. All fuel storage tanks are atmospheric vessels, with permanently installed vents. Vents in the rig day tanks are piped back to the rig fuel tank to prevent spills caused by overfilling.

7.1.2 The fuel discharge connection on each tank is equipped with manually operating valves.

7.1.3 The fuel storage tanks have no automatic fluid level control devices. These tanks are installed, either inside the rig or unprotected from the weather. The tank fuel levels are observed and controlled manually.

7.1.4 Fuel is transferred to and from the storage tanks through Schedule 80 steel pipe lines and/or steel flex arctic grade fuel handling hoses. Expansion, contraction, and vibration are not transferred through these flexible sections. All lines have threaded connections; including "No-Drip" quick connect couplings and/or unions. All threaded connections are accessible for inspection and repair, if required. All fuel transfer lines meet or exceed the maximum fuel transfer pressure of 100 psi, with a 2:1 design margin.

7.1.5 The routing of all hazardous materials transfer lines will be visibly marked. The placement of these lines will provide maximum protection from damage from external sources.

7.1.6 All liquid mud storage is transferred through steel lines and/or high pressure steel braided hoses, specifically designed for this application.

7.2 SECONDARY CONTAINMENT AND DIVERSIONARY STRUCTURES:

7.2.1 Secondary containment or diversionary structures and equipment to prevent spills from reaching navigable waters are practicable except for the case of a blowout. Typical secondary containment includes structural pans and dikes surrounding equipment (engines, burners, etc.). Secondary containment also includes the impermeable membrane under the rig, the drill pad and the reserve pit (if present). Additional

SECTION 7
CONTAINMENT AND DISPOSAL (Continued)

containment and diversionary structures will be constructed if they are required using the construction equipment kept at the drill site. The equipment, materials, and manpower on site is adequate for the initiation of spill containment prior to mobilization of an Oil Spill Removal Organization (if necessary) of any spill volume up to the largest tank capacity on the drill site.

7.2.2 The Nabors Tool Pusher will immediately utilize the on-site equipment, materials, and manpower for control and clean up of any spills occurring on the drill site or campsite.

7.2.3 Construction equipment and liquid pumping and transport equipment is kept operational at the drill site. This support equipment is available (see Appendix D) for the maintenance and repair of all secondary containment structures and for the recovery and cleanup of oil spills.

7.2.4 Absorbent materials are available on the drill site, as listed in Appendix D. These materials are available for oil spill control and clean up.

7.3 CASING AND BLOWOUT PREVENTION EQUIPMENT:

7.3.1 The well casing and blowout prevention programs are designed by the Lease Operator. The casing programs are designed to provide the capability of controlling any wellhead pressure that is expected to be encountered. Each well program is designed utilizing the most current data available regarding subsurface conditions in accordance with the requirements of the State of Alaska Oil and Gas Conservation Commission or the United States Minerals Management Service as applicable.

7.3.2 Casing and BOPE of higher pressure rating will be utilized any time the need develops.

7.3.3 The blowout prevention equipment listed in the rig inventory meets the known requirements for well control as established by the Alaska Oil and Gas Conservation Commission, or the United States Minerals Management Service as applicable.

7.3.4 Testing of all blowout prevention equipment will be regularly conducted in accordance with the testing procedures and frequency specified by the Alaska Oil and Gas Conservation Commission, or the United States Minerals Management Service as applicable.

SECTION 7
CONTAINMENT AND DISPOSAL (Continued)

7.4 DISPOSITION OF OILY EFFLUENT:

Disposition of oily waste materials from the secondary containment will be according to the following procedures: (Note: Alaska Department of Environmental Conservation regulations state that prior approval by ADEC is required for the ultimate disposal of a hazardous substance [including oil] and for soil, cleanup materials, or other substances contaminated with a hazardous substance. This approval may be granted orally by the ADEC Regional Supervisor or his designee [18 ACC 75.130(a)]).

7.4.1 All recyclable oily waste will be picked up with a vacuum truck and hauled to a Prudhoe Bay Unit production facility for recovery.

7.4.2 All mud spills will either be picked up and recycled in the Mud Pits, or disposed of in an approved manner in accordance with ADEC regulations.

7.4.3 All non-recyclable oily waste will be disposed of in an approved manner in accordance with ADEC regulations.

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

NABORS ALASKA DRILLING, INC.

RIG 27-E

SECTION 8

SPILL REPORTING PROCEDURES

8.1 POLICY:

The policy of Nabors Alaska Drilling, Inc., is that "Any and all spills will be reported" as described in the following instructions. The only exception to this requirement is that spills of potable water do not need to be reported. Refer to the Spill Response, Cleanup and Reporting Procedure chapter of the Nabors EMS Manual.

8.2 DEFINITIONS:

8.2.1 Oil Spill:

An oil spill is defined as the spilling, leaking, pumping, pouring, emitting, emptying or dumping of oil of any kind, including petroleum products, fuel oil, sludge, oil refuse and oil mixed with other wastes, on land or water. Spills of hazardous substances (excluding petroleum or any fraction thereof) are not covered by this SPCC Plan.

8.2.2 Water:

Water, for the purposes of this SPCC Plan, includes water bodies such as the Beaufort Sea, bays, lakes, inlets, sounds, canals, streams, rivers, and tundra designated as wetlands by the Environmental Protection Agency or the U. S. Corps of Engineers. Intermittent rivers, streams, and lakes, even though dry at the time, are considered to be water. Also, ice roads and frozen lakes, rivers, water bodies, and tundra wetlands are considered to be water.

8.3 INITIAL SPILL REPORTING:

Any and all spills will be reported by any and all personnel having knowledge of such spills to their supervisor and the Nabors Tool Pusher as soon as possible. Notifications to the Nabors Tool Pusher must be made verbally between the parties involved, voice mail messages are not acceptable. Nabors rig crew members will inform their driller of such events. Other drill site personnel will notify their immediate supervisor, the Nabors Tool Pusher, or the Lease Operator. This applies to all miscellaneous individual service and/or support personnel, either permanent or transient. The Nabors Tool Pusher will evaluate the reported spill and make all reports as specified by the following reporting procedure.

SECTION 8
SPILL REPORTING PROCEDURES (Continued)

8.3.1 Initial Oil Spill Reporting Procedure: Nabors Tool Pusher

The Nabors Tool Pusher reports the spill to the Lease Operator, the Nabors Drilling Superintendent and the Nabors HSE Manager.

The Nabors Alaska Drilling Spill Report, Form EMS11, is used for this purpose. The Form shall be immediately completed to the greatest extent possible based on information available at the time, and the report shall be phoned in to the Nabors HSE Manager at (907) 263-6000, and faxed at (907) 563-3734. A good faith estimate of total volume spilled must be included on this initial report, even if only a guess is possible. Submission of Form EMS11 as described herein should occur as soon as possible and is to be followed immediately by telephone contact with the HSE Manager or Drilling Superintendent. Form EMS11 can be found in the back of the Nabors Alaska Drilling EMS Manual.

8.3.2 The Lease Operator is responsible for making all spill reports to regulatory authorities.

8.3.3 The Nabors Tool Pusher will record on the morning report the making of spill reports. This record shall include the name of the individual receiving the report, the time of day the report was received, and a summary of the verbal instructions given or received.

8.4 SUBSEQUENT SPILL REPORTING:

8.4.1 Additional information as may be required for a written oil spill report will be provided by the Nabors Tool Pusher on-site and sent to the Nabors HSE manager in Anchorage.

8.4.2 Once clean up and disposal are complete, the Nabors Tool Pusher will fill in any missing information on the initial spill report Form EMS11 and send it to the HSE manager in Anchorage.

8.4.3 The final written reports submitted to the regulatory authorities will be prepared and submitted by Anchorage personnel as required by regulation.

A graphical depiction of spill reporting is provided at FIGURE 4-1: SPILL ACTION PROCEDURE CHART. If the Nabors HSE Manager cannot be reached to make the initial spill report, the Nabors Tool Pusher shall follow Table 8-1 on the following page for the names and telephone numbers of the agencies to be notified.

SECTION 8
SPILL REPORTING PROCEDURES (Continued)

TABLE 8-1
OIL SPILL REPORTING GUIDELINES
NORTH SLOPE, ALASKA, FEDERAL LEASE TRACTS

SPILL LOCATION	SPILL QUANTITY	TIMING OF REPORT	AGENCIES TO BE NOTIFIED
Land (Gravel Pad)	Under 10 Gallons	Monthly Within 12 hours	DEC & O&GCC USCG
Land (Gravel Pad)	10-55 Gallons	Within 48 hours Within 12 hours	DEC & O&GCC USCG
Land (Gravel Pad)	Over 55 Gallons	Immediate Within 12 hours Within 24 hours	DEC & O&GCC USCG NSB
Impermeable Secondary Containment Area	Over 55 Gallons	Within 48 hours	DEC & OGCC
Water and/or Tundra	Under 1/2 Pint (Under 100 sq. ft. Sheen)	Immediate Immediate Within 12 hours	DEC & OGCC EPA & USCG USMMS
Water and/or Tundra	1/2 Pint to 55 Gallons (100 to 1000 sq. ft. Sheen)	Immediate Immediate Within 12 hours	DEC & O&GCC EPA & USCG USMMS
Water and/or Tundra	Over 6.3 Bbls. (Over 265 Gallons)	Immediate Immediate Immediate	DEC & O&GCC EPA & USCG USMMS

ABBREVIATION	AGENCY NAME	PHONE NUMBER
DEC	ALASKA DEPT. OF ENVIRON. CONSERVATION	800-478-9300 (24 hr. Hotline)
EPA	U. S. ENVIRONMENTAL PROTECTION AGENCY National Spill Response Center	800-424-8802 (24 hr. Hotline)
NSB	NORTH SLOPE BOROUGH	852-2611 (Ext. 390)
O&GCC	ALASKA OIL & GAS CONSERVATION COMM. (Only report spills from the reservoir)	279-1433 (Anchorage)
USCG	UNITED STATES COAST GUARD	271-6700
USMMS	MINERALS MANAGEMENT SERVICE	271-6065 (Anchorage)

* Depending on land ownership, notification to additional landowners will be identified by the Lease Operator.

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

NABORS ALASKA DRILLING, INC.

RIG 27-E

SECTION 9

INSPECTION PROCEDURES

9.1 PURPOSE:

Thorough inspections of the mobile drilling rig are an integral part of the spill prevention procedures described in this SPCC Plan. These inspections shall be completed during each tour. These routine inspections are separate from the periodic integrity testing required for bulk storage containers, refer to paragraph 9.6 for additional information on periodic integrity testing. Where adequate fixed lighting is not present for inspections, utilize flashlights, which are listed for use in Hazardous Locations to assist in the inspection. Any oil or fluids other than rain or snow discovered in any secondary containment structure shall be promptly removed.

9.2 INSPECTION OF FUEL AND BOPE SYSTEMS:

The procedures listed below are the minimum inspection requirements for the fuel and BOPE systems located on the drilling complex. This inspection shall be conducted during each tour.

9.2.1 The Motorman shall inspect all engine fuel day tanks and associated fuel lines and valves for freedom of fuel flow and leaks (Daily).

9.2.2 The Motorman shall check fuel supply lines from bulk storage tanks for leakage. Insure that supply lines laid for miscellaneous use such as BOPE accumulator, hot air heaters, boilers, etc., are intact and all control valves are functional and in the correct operating position. Insure that no ice blockage exists from accumulated water (Daily).

9.2.3 The Motorman shall inspect all bulk storage fuel tanks. Insure that all vents are open, all bottom valves are functional and in the correct operating position. Gauge each tank and report fuel volumes as directed. Bottom tank valves will be left closed at all times fuel is not being transferred. Bottom tank valves which are not connected to piping shall be blanked off by blind flanges or bull plugs at all times (Daily).

9.2.4 The Motorman shall inspect blowout prevention equipment, including kill-line and choke manifolds, with the associated relief lines to reserve pit (if present) for fluid flow and presence of frozen fluids. Verify that the position of each valve in the system is in accordance with BOPE operating procedures (Daily).

SECTION 9
INSPECTION PROCEDURES (Continued)

9.2.5 The Motorman shall report results of this inspection to driller. Driller will give instructions, as required, to the rig crew for correcting noted discrepancies. Driller will immediately report all abnormal conditions to the Nabors Tool Pusher.

9.2.6 Record the completion of this inspection procedure on the Daily Motor Report each tour.

9.3 INSPECTION OF WATER STORAGE, HYDRAULIC AND DRILLING FLUIDS SYSTEM:

The procedures listed below are the minimum inspection requirements for the water systems, hydraulic and drilling fluids system located on the drilling complex. This inspection shall be conducted during each tour. Secure assistance from Pit Watch and/or Derrick Man as required.

9.3.1 The Spill Champion shall inspect water storage tank(s), insure that valves and lines are intact and that overflow or top vent is open. Report supply and availability of water as directed (Daily).

9.3.2 The Spill Champion shall check each water supply line along entire length for leaks, control valve positions and to insure lines are open (not frozen) (Daily).

9.3.3 Inspect hydraulic systems including exterior of rig for leaks. Verify that there is no fluid flow below snow, or ice (Daily).

9.3.4 Check drilling nipple, flow line, and shale shaker box for leaks and flow stoppages. Check the shale shaker screen and back side of shale shaker, including by-pass and overflow, for proper functioning and fluid flow (Daily).

9.3.5 Inspect outside of mud tanks including bottoms for leaks. Verify that there is no drilling fluid flow below drifted cutting, snow, or ice. Verify that all discharge jets and tank flow lines are free of leaks (Daily).

9.3.6 Check mud pumps, pump suction lines, pressure safety valve relief lines, and high pressure mud lines in substructure to the rig floor, cement units, and mud hoppers for leaks and/or freeze-up (Daily).

9.3.7 Check equipment on top of each mud tank for proper operation. Mud bypass troughs and lines should be clear to prevent overflow. Degasser inlet and discharge lines and associated control valves should be open for flow and unfrozen. Desilter and desander inlet, discharge and under flow lines should be unblocked with control valves free. Check for excessive fluid under flow. Check mud hopper(s) for proper operation (Daily).

SECTION 9
INSPECTION PROCEDURES (Continued)

9.3.8 The Spill Champion shall report results of this inspection to driller. Driller will give instructions, as required, to the rig crew for correcting noted discrepancies. Driller will immediately report all abnormal conditions to the Nabors Tool Pusher.

9.3.9 Record the completion of this inspection procedure on the Spill Champion report each tour.

9.4 SITE SURVEILLANCE:

The procedures listed below are the minimum site surveillance requirements for the drilling complex. This inspection shall be conducted during each tour, or as noted, by the Spill Champion.

9.4.1 Visual observation of condition of tankage, lines and pumps (Daily).

9.4.2 Correct positioning of flow line valves (Installation).

9.4.3 Operation of relief valves (Weekly).

9.4.4 Fluid levels in drip pans, secondary containment structures, containment pits, etc. (Daily).

9.4.5 Condition of drains (ensure clean and unfrozen) (Daily).

9.4.6 General condition and cleanliness of rig (Daily).

9.4.7 Condition of spill removal equipment and material (Daily).

9.4.8 If we are discharging from sewage treatment facilities, observation of discharge site for unusual conditions. (Daily).

9.4.9 Snow removal status (Daily).

9.4.10 Outer edges of drill site to ensure there is no seepage from pad (Daily).

9.4.11 Verify Spill Cleanup Materials Inventory listed in Appendix D (End of tour).

9.5 RETENTION OF RECORDS:

Spill Champion reports are to be retained for a period of five years.

9.6 INTEGRITY TESTING:

Periodic Integrity Testing shall be performed by Qualified Tank Inspectors certified as either an American Petroleum Institute (API) Certified Aboveground Storage Tank Inspector, or a Steel Tank Institute (STI) Certified Aboveground Storage Tank Inspector.

SECTION 9
INSPECTION PROCEDURES (Continued)

Inspections and testing for smaller shop fabricated tanks shall comply with “Standard for Inspection of In-Service Shop Fabricated Aboveground Storage Tanks for Storage of Combustible and Flammable Liquids – SP001-03” copyrighted by the Steel Tank Institute. Inspections and testing for larger tanks that were constructed in accordance with API 650 or API 653 shall be conducted in accordance with API 653 requirements. Refer to those documents for further definitions and requirements.

9.6.1 Take a tank out of service within 24 hours if a leak is found in a tank at any time. Repair or replace the tank. Consult the tank manufacturer prior to making any alterations or repairs to a tank. Field constructed aboveground containers must be evaluated if there has been a discharge or failure due to brittle fracture or other catastrophe.

9.6.2 Check the primary tank for the presence of water at the lowest possible point(s) inside the tank (Monthly).

9.6.3 Inspect the interstice of a double wall tank for the presence of fluid (Monthly).

9.6.4 Perform a walk-around inspection to identify and repair areas of damage to the tank or its coating. Clean the exterior if necessary. Inspect and clean normal operating vents and emergency vents as applicable (Quarterly).

9.6.5 Perform a walk-around inspection checking for proper drainage around the tank areas, including within a “spill-tainer” skirting surrounding a tank. Check for and remove standing water in accordance with proper waste treatment and disposal criteria. Standing water shall not be drained directly to the ground if there is any evidence of a sheen or other sign of oil contamination. Any contaminated water shall be collected and treated prior to disposal (Quarterly). Remove standing water within a “spill-tainer” skirting surrounding a tank prior to the onset of freezing weather.

9.6.6 Inspect tank supports for damage or deterioration, misuse or corrosion. Observe the conditions of the anchor bolts to determine if there has been distortion or cracking around the bolts (Yearly).

9.6.7 Inspect the tank every 10 years, after material repairs, (or at a shorter period if evidence of corrosion is found) in accordance with ST001-03, including video camera inspection, pressure testing and/or ultrasonic testing to determine the wall thickness of the tank and tank bottom.

9.6.8 Maintain records of integrity testing for a period of at least five years, these records may be kept per usual and customary business practices and need not create redundant records.

9.6.9 55 Gallon Drums are not required to be inspected and tested, but shall be taken out of service if there is any indication of corrosion or leakage.

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

NABORS ALASKA DRILLING, INC.

RIG 27-E

SECTION 10

REVISIONS AND AMENDMENTS TO PLAN

10.1 REQUIRED NOTIFICATION OF SPCC PLAN TO REGIONAL ADMINISTRATOR:

This SPCC plan must be amended in accordance with the requirements of 40 CFR 112.4 whenever the facility has discharged more than 1000 U.S. gallons of oil in a single discharge or discharged more than 42 gallons of oil in each of two discharges within any twelve month period. The period is not a calendar year, but a rolling twelve month period. “Discharge” includes any release of oil beyond its original container, and is distinct from a “Spill” to navigable waters, in that it includes a release of oil that is entirely held by secondary containment. Spills of fluids other than oil, as defined by 40 CFR 112, do not trigger these amendment requirements. The following information shall be submitted to the Regional Administrator within 60 days of the time the facility becomes subject to Section 112.4: Name of Facility; Name of Responsible Person; Location of Facility; Maximum storage or handling capacity of the Facility and normal daily throughput; Corrective action and countermeasures taken, including a description of equipment repairs and replacements; An adequate description of the facility, including maps, flow diagrams and topographical maps as necessary; The cause of such discharge as described in 112.1(b), including a failure analysis of the system or subsystem in which the failure occurred; Additional preventive measures taken or contemplated to minimize the possibility of recurrence; Such other information as the Regional Administrator may reasonably require pertinent to the Plan or discharge. The Regional Administrator may require an amendment to the SPCC based on the review of the SPCC plan and the information provided above. Refer to the full text of the requirements in 40 CFR 112.4.

10.2 RECORD OF PREVIOUS SPILLS:

Rig 27-E has experienced 12 significant spill events as of March 13, 2009 since the last SPCC Plan revision. Of those spills, none involved spills of more than 42 gallons of fluids outside of secondary containment. A spill of 25 gallons of diesel and water from a Gas-Buster occurred on June 3, 2006. A spill of 45 gallons of drilling mud occurred on June 3, 2006. A spill of 40 gallons of glycol occurred on June 7, 2006. A spill of 26 gallons of hydraulic fluid occurred on January 13, 2008. The full records of all reported spills, if any, are maintained at the offices of Nabors Alaska Drilling, Inc., whose address is listed under Item 1.4 above.

10.3 AMENDMENT OF PLAN BY OWNER OR OPERATOR:

This SPCC plan must be amended in accordance with the requirements of 40 CFR 112.5 and when there is a change in facility design, construction, operation or maintenance that

SECTION 10
REVISIONS AND AMENDMENTS TO PLAN (Continued)

materially affects its potential for a discharge. Examples of changes that may require amendment of the Plan include, but are not limited to: commissioning or decommissioning containers, replacement, reconstruction or movement of containers or piping, changes in construction that may alter secondary containment structures, changes of product stored in the containers (a change in fluid density), or revisions of standard operation or maintenance procedures (including transfer procedures).

An amendment must be prepared within 6 months and implemented as soon as possible, but not later than 6 months following preparation of the amendment.

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

NABORS ALASKA DRILLING, INC.

RIG 27-E

APPENDIX A

DRILL SITE LAYOUT DRAWINGS

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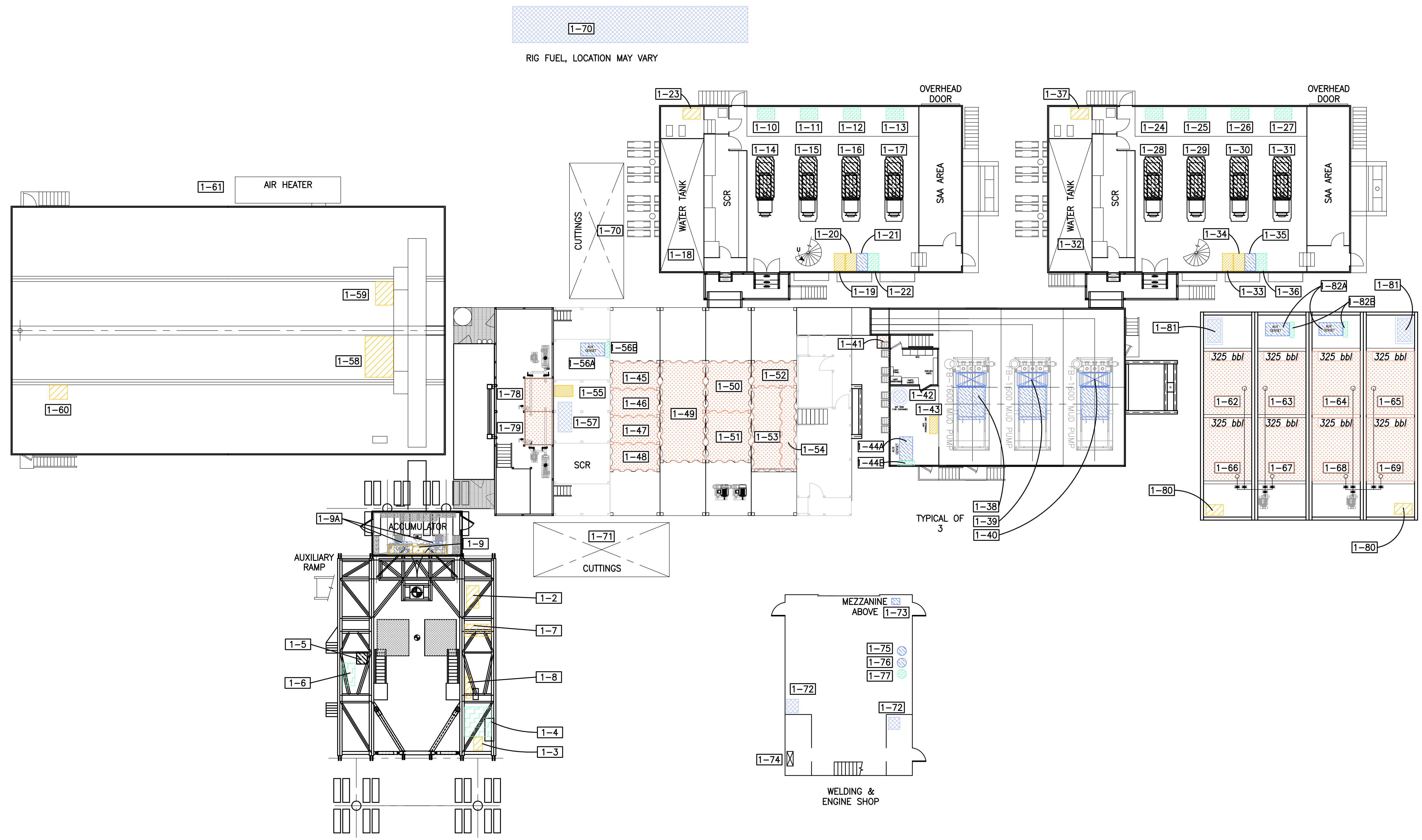
STORAGE TANK SCHEDULE		
TANK #	DESCRIPTION	CAPACITY
MISCELLANEOUS		
1-1	RIG FUEL STORAGE	19,760 GALS. DIESEL
1-70	CUTTINGS BIN	300 BBLS CUTTINGS & MUD
1-71	CUTTINGS BIN	300 BBLS CUTTINGS & MUD
SUBSTRUCTURE, 1st. LEVEL		
1-2	MODULE JACKING HYDRL.	76 GALS. HYDRL. FLUID
1-3	MODULE JACKING HYDRL.	115 GALS. HYDRL. FLUID
1-4	DRAWWORKS GLYCOL TANK	1,460 GALS. GLYCOL
1-5	TEST PUMP	10 GALS. LUBE OIL
1-6	TEST PUMP TANK	67 GALS. GLYCOL
1-7	CASING TONG HYDRL.	240 GALS. HYDRL. FLUID
1-8	RIG JACKING HPU	230 GALS. HYDRL. FLUID
1-9	BOP HYDRL.	682 GALS. KOOMEY FLUID
1-9A	BOP PUMP LUBRICATION	2 @ 5 GALS. LUBE OIL
UTILITIES ONE – 1st. LEVEL		
1-10	D399 GEN. RADIATOR	90 GALS. GLYCOL
1-11	D399 GEN. RADIATOR	90 GALS. GLYCOL
1-12	D399 GEN. RADIATOR	90 GALS. GLYCOL
1-13	D399 GEN. RADIATOR	90 GALS. GLYCOL
1-14	D399 GEN. LUBRICATION	110 GALS. LUBE OIL
1-15	D399 GEN. LUBRICATION	110 GALS. LUBE OIL
1-16	D399 GEN. LUBRICATION	110 GALS. LUBE OIL
1-17	D399 GEN. LUBRICATION	110 GALS. LUBE OIL
1-18	RIG INTERNAL WATER TANK	408 BBLS WATER
1-19	HYDRAULIC STORAGE	334 GALS. HYDRL. FLUID
1-20	HYDRAULIC STORAGE	334 GALS. HYDRL. FLUID
1-21	LUBE OIL STORAGE	334 GALS. LUBE OIL
1-22	GLYCOL STORAGE	334 GALS. GLYCOL
1-23	JACKING HPU	70 GALS. HYDRL. FLUID
UTILITIES TWO – 1st. LEVEL		
1-24	D399 GEN. RADIATORS	90 GALS. GLYCOL
1-25	D399 GEN. RADIATORS	90 GALS. GLYCOL
1-26	D399 GEN. RADIATORS	90 GALS. GLYCOL
1-27	D399 GEN. RADIATORS	90 GALS. GLYCOL
1-28	D399 GEN. LUBRICATION	110 GALS. LUBE OIL
1-29	D399 GEN. LUBRICATION	110 GALS. LUBE OIL
1-30	D399 GEN. LUBRICATION	110 GALS. LUBE OIL
1-31	D399 GEN. LUBRICATION	110 GALS. LUBE OIL
1-32	RIG INTERNAL WATER TANK	408 BBLS WATER
1-33	HYDRAULIC STORAGE	334 GALS. HYDRL. FLUID
1-34	HYDRAULIC STORAGE	334 GALS. HYDRL. FLUID
1-35	LUBE OIL STORAGE	334 GALS. LUBE OIL
1-36	GLYCOL STORAGE	334 GALS. GLYCOL
1-37	JACKING HPU	70 GALS. HYDRL. FLUID
PUMP ROOM		
1-38	MUD PUMP LUBRICATION	3 @ 155 GALS. LUBE OIL
1-39	MUD PUMP WATER JACKET COOLING	3 @ 227 GALS. WATER
1-40	MUD PUMP COOLING WATER TROUGH	3 @ 87 GALS. WATER
1-41	POP-OFF TANK	20 BBLS DRILLING MUD
1-42	JACKING HPU	56 GALS. HYDRL. FLUID
1-43	DAY TANK	411 GALS. DIESEL
1-44A	COLD START GEN. LUBRICATION	5 GALS. LUBE OIL
1-44B	COLD START GEN. RADIATOR	15 GALS. GLYCOL
MUD TREATMENT – 1st. LEVEL		
1-45	MUD PIT	107 BBLS DRILLING MUD
1-46	MUD PIT	107 BBLS DRILLING MUD
1-47	MUD PIT	107 BBLS DRILLING MUD
1-48	MUD PIT	107 BBLS DRILLING MUD
1-49	MUD PIT	382 BBLS DRILLING MUD
1-50	MUD PIT	185 BBLS DRILLING MUD
1-51	MUD PIT	185 BBLS DRILLING MUD
1-52	MUD PIT	90 BBLS DRILLING MUD
1-53	MUD PIT	210 BBLS DRILLING MUD
1-54	MUD PIT	91 BBLS DRILLING MUD
1-55	JACKING HPU	55 GALS. HYDRL. FLUID
1-56A	COLD START GEN. LUBRICATION	5 GALS. LUBE OILS
1-56B	COLD START GEN. RADIATOR	15 GALS. GLYCOL
1-57	DAY TANK	367 GALS. DIESEL
1-78	TRIP TANK	68 BBLS DRILLING MUD
1-79	TRIP TANK	68 BBLS DRILLING MUD
PIPE SHED		
1-58	PIPE SKATE HYDRL.	213 GALS. HYDRL. FLUID
1-59	PIPE SHED DR. & JACKING HYDRL.	39 GALS. HYDRL. FLUID
1-60	PIPE SHED DR. & JACKING HYDRL.	39 GALS. HYDRL. FLUID
1-61	TIOGA HEATER DAY TANK	NO DAY TANK PRESENTLY
AUXILIARY MUD PITS		
1-62	MUD PIT	325 BBLS DRILLING MUD
1-63	MUD PIT	325 BBLS DRILLING MUD
1-64	MUD PIT	325 BBLS DRILLING MUD
1-65	MUD PIT	325 BBLS DRILLING MUD
1-66	MUD PIT	325 BBLS DRILLING MUD
1-67	MUD PIT	325 BBLS DRILLING MUD
1-68	MUD PIT	325 BBLS DRILLING MUD
1-69	MUD PIT	325 BBLS DRILLING MUD
1-80	JACKING HPU	2 @ 115 GALS. HYDRL. FLUID
1-81	COLD START GEN. DAY TANK	2 @ 459 GALS. DIESEL
1-82A	COLD START GEN. LUBRICATION	2 @ 10 GALS. LUBE OILS
1-82B	COLD START GEN. RADIATOR	2 @ 20 GALS. GLYCOL
WELDING & ENGINE SHOP		
1-72	DAY TANKS	2 @ 359 GALS. DIESEL
1-73	AIR COMPRESSOR LUBRICATION	2 GALS. LUBE OIL
1-74	PARTS WASHER	119 GALS. SOLVENTS
1-75	LUBE OIL STORES	VARIES, TYP. 55 GALS.
1-76	USED LUBE OIL	VARIES, TYP. 55 GALS.
1-77	GLYCOL STORES	VARIES, TYP. 55 GALS.

FUEL TANK | HYDRAULIC TANK | GLYCOL TANK | LUBE OIL TANK | MUD TANK



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ExxonMobil

DATE	REV. NO.	DWN. BY	APPR. BY	DESCRIPTION
3/09	E	FCW	RAF	SPCC REVISIONS

Nabors Alaska
A NABORS INDUSTRIES Company

Nabors Alaska Drilling Inc.
2525 C Street Suite 200
Anchorage, Alaska 99503-2639
907-263-6000

PROJECT: NABORS ALASKA RIG 27E

TITLE: EXXON MOBIL POINT THOMSON PROPOSAL STORAGE TANK SCHEDULE – LEVEL 1

DRAWN BY	CHECKED BY	APPROVED BY	REV.
ROB CUPPLES	MJG	MJG	F
SCALE	DATE	DWG. NO.	SHT.
NTS	OCT 2008		1 of 1

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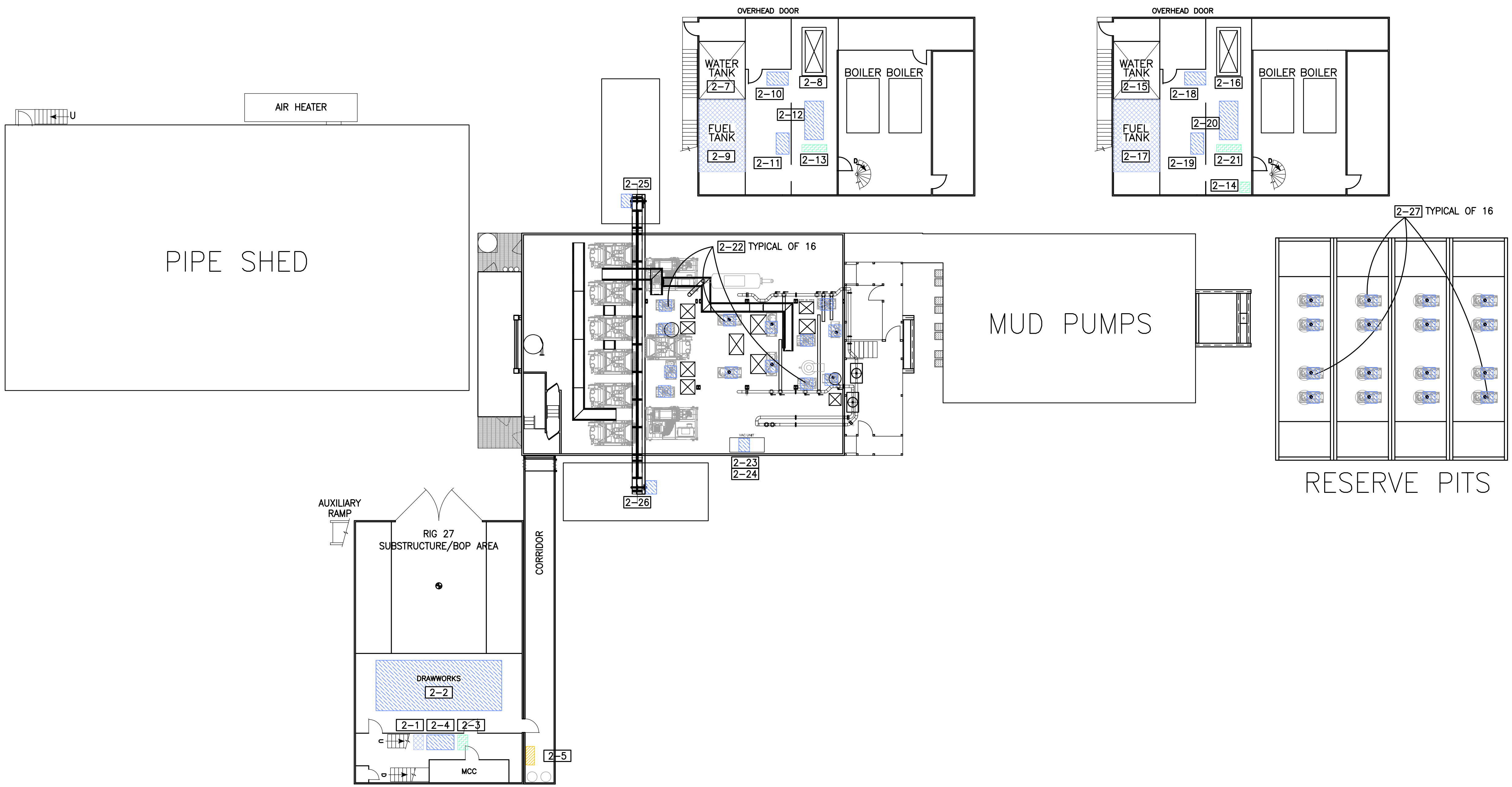
STORAGE TANK SCHEDULE

TANK #	DESCRIPTION	CAPACITY
SUBSTRUCTURE, 2nd. LEVEL		
2-1	MOVING GEN. DAY TANK	232 GALS. DIESEL
2-2	DRAWWORKS LUBRICATION	84 GALS. LUBE OIL
2-3	MOVING GEN. COOLING RADIATOR	20 GALS. GLYCOL
2-4	MOVING GEN. LUBRICATION	10 GALS. LUBE OIL
2-5	CANRIG HYDRAULIC UNIT	81 GALS. HYDRAULIC OIL
2-6	NOT USED	NOT USED
UTILITIES - ONE, 2nd. LEVEL		
2-7	BOILER FEED WATER TANK	5475 GALS. BOILER WATER
2-8	BOILER BLOWDOWN TANK	2220 GALS. BOILER WATER
2-9	RIG DAY TANK	8230 GALS. DIESEL
2-10	AIR COMPRESSOR LUBRICATION	10 GALS. LUBE OIL
2-11	AIR COMPRESSOR LUBRICATION	10 GALS. LUBE OIL
2-12	MOVING GENERATOR LUBRICATION	8 GALS. LUBE OIL
2-13	MOVING GENERATOR RADIATOR	20 GALS. GLYCOL
UTILITIES - TWO, 2nd. LEVEL		
2-14	GLYCOL BLOWDOWN TANK	60 GALS. GLYCOL
2-15	BOILER FEED WATER TANK	5475 GALS. BOILER WATER
2-16	BOILER BLOWDOWN TANK	2220 GALS. BOILER WATER
2-17	RIG DAY TANK	8230 GALS. DIESEL
2-18	AIR COMPRESSOR LUBRICATION	10 GALS. LUBE OIL
2-19	AIR COMPRESSOR LUBRICATION	10 GALS. LUBE OIL
2-20	MOVING GENERATOR LUBRICATION	8 GALS. LUBE OIL
2-21	MOVING GENERATOR RADIATOR	20 GALS. GLYCOL
MUD TREATMENT MODULE, 2nd. LEVEL		
2-22	MUD PIT AGITATORS	1 GAL. LUBE OIL (QTY 16)
2-23	VACUUM TANK	265 GALS. SLOPS
2-24	VACUUM PUMP	1 GAL. LUBE OIL
2-25	CUTTINGS CONVEYOR DRIVE	1 GAL. LUBE OIL
2-26	CUTTINGS CONVEYOR DRIVE	1 GAL. LUBE OIL
RESERVE PITS MODULE, 2nd. LEVEL		
2-27	MUD PIT AGITATORS	1 GAL. LUBE OIL (QTY 16)



FUEL TANK | HYDRAULIC TANK | GLYCOL TANK | LUBE OIL TANK | MUD TANK

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ExxonMobil

DATE	REV. NO.	DWN. BY	APPR. BY	DESCRIPTION
3/09	E	FCW	RAF	SPCC REVISIONS

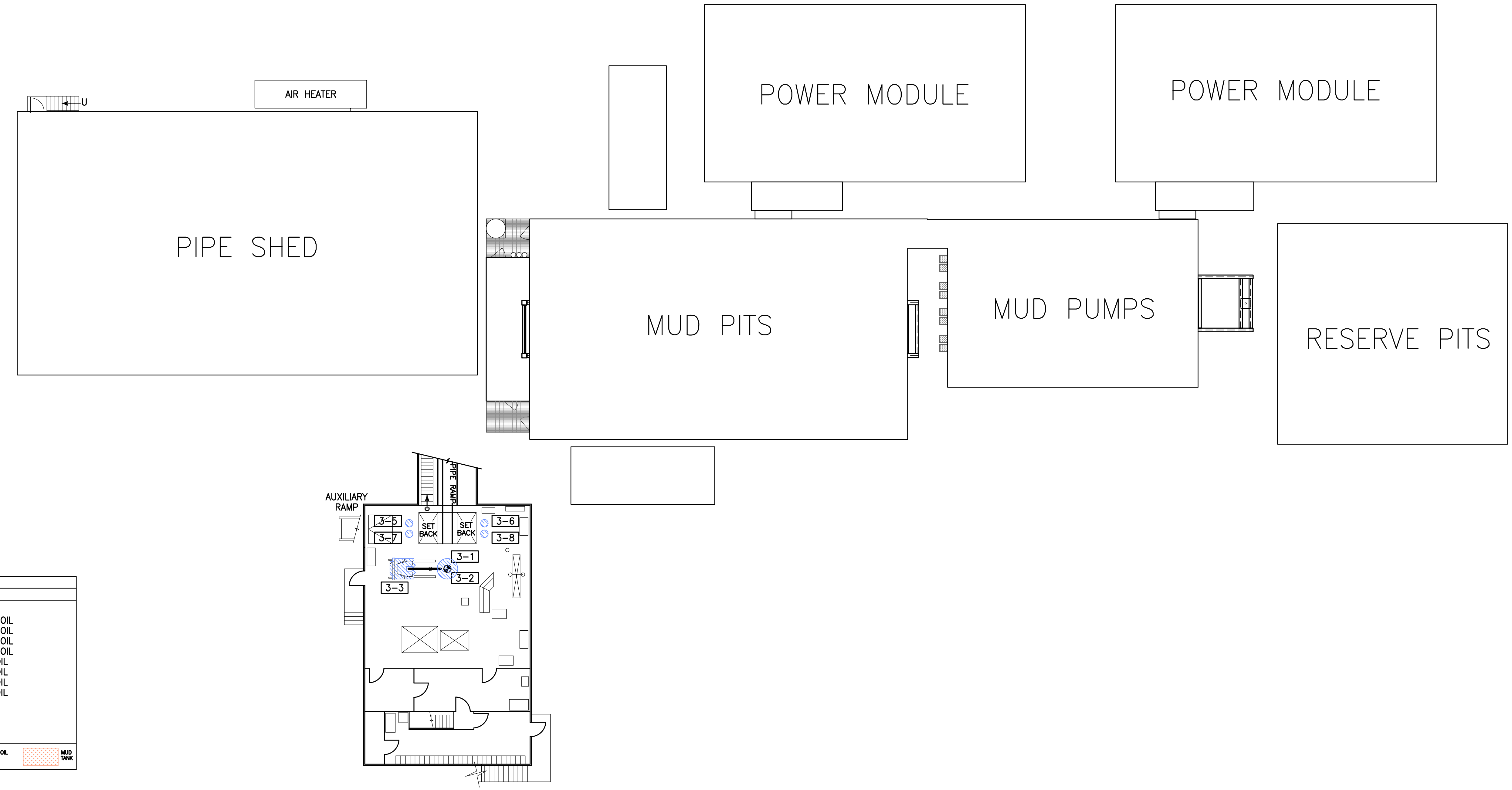
Nabors Alaska
A NABORS INDUSTRIES Company

Nabors Alaska Drilling Inc.
2525 C Street Suite 200
Anchorage, Alaska 99503-2639
907-263-6000

PROJECT: NABORS ALASKA RIG 27E

TITLE: EXXON MOBIL POINT THOMSON PROPOSAL
SPCC PLAN - LEVEL 2

DRAWN BY	CHECKED BY	APPROVED BY	REV.
ROB CUPPLES	MJG	MJG	F
SCALE: NTS	DATE: OCT 2008	DWG. NO.	SHT. 1 of 1



STORAGE TANK SCHEDULE		
TANK #	DESCRIPTION	CAPACITY
SUBSTRUCTURE, 2nd. LEVEL		
3-1	ROTARY TABLE	15 GALS. LUBE OIL
3-2	TOP DRIVE LUBRICATION	23 GALS. LUBE OIL
3-3	IRON ROUGHNECK	3 GALS. LUBE OIL
3-4	SWIVEL	5 GALS. LUBE OIL
3-5	AIR & HYDRAULIC TUGGER	1 GAL. LUBE OIL
3-6	AIR & HYDRAULIC TUGGER	1 GAL. LUBE OIL
3-7	AIR & HYDRAULIC MANRIDER	1 GAL. LUBE OIL
3-8	AIR & HYDRAULIC MANRIDER	1 GAL. LUBE OIL

FUEL TANK | HYDRAULIC TANK | GLYCOL TANK | LUBE OIL TANK | MUD TANK

ExxonMobil

DATE	REV. NO.	DWN. BY	APPR. BY	DESCRIPTION
3/09	E	FCW	RAF	SPCC REVISIONS

Nabors Alaska
A NABORS INDUSTRIES Company
Nabors Alaska Drilling Inc.
2525 C Street Suite 200
Anchorage, Alaska 99503-2639
907-263-6000

PROJECT: NABORS ALASKA RIG 27E

TITLE: EXXON MOBIL POINT THOMSON PROPOSAL
SPCC PLAN – LEVEL 3

DRAWN BY	CHECKED BY	APPROVED BY	REV.
ROB CUPPLES	MJG	MJG	F
SCALE: NTS	DATE: OCT 2008	DWG. NO.	SHT. 1 of 1

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

NABORS ALASKA DRILLING, INC.

RIG 27-E

APPENDIX B

NORTH SLOPE AREA SUPPLIES & SERVICES

The following equipment and supplies, located in the Deadhorse Area, may be used in an emergency:

1. High Pressure Pumps, Cement and Bulk Handling Equipment
   - A. Dowell/Schlumberger, Inc. (ask for cell leader) — 659-2434
   - B. Halliburton Services (ask for zonal isolation supervisor) — 659-2805
2. Mud and Weight Materials
   - A. NL BAROID Drilling Fluids — 659-2422
   - B. M-I Drilling Fluids/LLC — 659-2694
3. Oil Field Trucks, Floats, Tank Trucks, Vacuum Trucks, etc.
   - A. Peak Oil Field Service Co., Inc. (ask for dispatcher) — 670-5506
   - B. VECO (main number) (ask for superintendent) — 659-3308
     VECO (alternate) — 659-3321
4. Construction Equipment - Dozers, Forklifts, Scrapers, Dump Trucks, Front End Loaders, Water Trucks, Belly Dumps, etc.
   - A. Alaska Interstate Construction — 659-2475
   - B. Peak Oil Field Service Co., Inc. (ask for dispatcher) — 670-5506
   - C. VECO (main number) (ask for superintendent) — 659-3308
     VECO (alternate) — 659-3321
5. Helicopter and Air Transportation
   - A. ERA Helicopters — 659-2465
   - B. Evergreen Helicopters of Alaska (transfers to Prudhoe) — (907) 257-1500
6. Lease operators have stockpiles of materials and equipment that they will make available for emergencies.
   - A. BP-EOA — 659-5800
   - B. Phillips (Kuparuk) — 659-7494 (emergency-ext. 911)
7. North Slope stockpile of various oil spill containment and cleanup equipment
   - A. Alaska Clean Seas (ACS) — 659-2405
8. Incinerator
   - A. North Slope Borough — 659-2635
     659-2377 (after 7 PM)

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

NABORS ALASKA DRILLING, INC.

RIG 27-E

APPENDIX C

MAJOR COMPONENTS INVENTORY

Refer to the Operations Maintenance information and piping schematic drawings for Rig 27-E on file at the rig and at Nabors Alaska Drilling, Incorporated.

APPENDIX C

MAJOR COMPONENTS INVENTORY (Continued)

SAFETY EQUIPMENT

RIG 27-E

See the Safety Equipment Inventory maintained on file at the rig and at Nabors Alaska Drilling, Incorporated.

APPENDIX C
MAJOR COMPONENTS INVENTORY (Continued)

DESCRIPTION OF RIG 27-E

Nabors Alaska Rig 27-E is designed in accordance with concepts field proven on the North Slope of Alaska. The rig and support equipment is unitized into six complexes. Each complex is a self-contained trailerized package comprised of modular units, which is capable of further separation into 8 foot wide segments as may be required for movement across the Sag River Bridge. The rig and support modules are mounted on wheeled trailer frames, allowing for quick movement at the drill site. Additional skidded loads include: generator shed, engine and welding shop, electric shop, parts shed, double-walled 23,000-gallon rig fuel tank.

The modules with major fluid holding equipment or tanks typically have small sealed sumps in the steel floor of the module, covered with a non-skid grating. These sumps provide holding capacity for small operational spills, and are cleaned out with a vacuum system, portable pumps, or using absorbent pads. Some of the particular features of Rig 27-E are: Automatic pipe handler; jacket water waste heat recovery system; integral substructure mounted bridge crane for BOP handling; unitization of mast-substructure, drawworks, bridge crane, blow-out-preventors, and winterizing as a single unit, to allow movement with the mast in the up-right position. Detailed descriptions of each complex are as follows:

Substructure and Rig Floor:

This is a 3 level rig floor and substructure complex. The complex has one level of support equipment which straddles the well head. The lower level includes the hydraulic power packs for the module, the test pump and the drawworks cooling glycol tank. The second level includes the drawworks and the module moving generator along with a hydraulic tank for the CanRig Unit. The rig floor is located on the third level.

Mud Treatment Module:

The Mud Module is a completely new, 2 level complex. The mud tanks are located at the lower level. The second level includes the solids control equipment and a mud laboratory. The mud system is complete with tandem double high speed shakers, Degasser, mud cleaners and centrifuges. Centrifugal pumps provide independent operation of each piece of mud processing equipment. This mud system utilized features which have been field proven in recent systems built for operation in Canada and Alaska. The second level also contains a vacuum tank for cleanup of minor operational spills, and general cleaning. Dual cuttings boxes allow for continuous operations while one is being emptied.

Reserve Pit Module:

The Reserve Pit Module is a completely new complex allowing for additional storage of drilling mud. The mud tanks are located at the lower level. The Reserve Pit Module travels in 2 pieces, with a Jacking hydraulic power pack, cold start generator, and fuel day tank in each of the trailer units.

APPENDIX C
MAJOR COMPONENTS INVENTORY (Continued)

Dual Power Modules:

The Dual Power Modules are two level structures which includes the rig power center along with the Boilers at the upper level. They are nearly identical structures, with the second Power Module originally associated with Rig 22-E. The lower level of each Power Module contains four Caterpillar D-399 diesel engines directly connected to generators. The lower level also each contain a rig water tank and the engine radiators. The second level each contain two rig boilers, a rig fuel oil day tank, a boiler water feed tank and a boiler blowdown tank. Between the 2 Power Modules, there are 8 main generators, and 4 boilers.

Pipe Shed Module:

The Pipe Shed Module is a one level structure. The module is built onto two trailer units and have the hydraulic power packs in the below floor grates. The pipe shed is served by a “Tioga” air heater mounted on a skid. Another optional “Tioga” heater is used as conditions warrant.

Mud Pump Module:

The Mud Pump Module is a one level structure. The module is built into a trailer unit and has a hydraulic power pack and Cummings QSB7-G3 NR3 cold start generator. The Pump Module contains two Continental Emsco FB-1600 mud pumps along with one Continental Emsco FA-1600 mud pump.

Engine & Welding Shop

The Engine & Welding Shop is a two level structure. The shop is skidded and located on-grade. The shop has two fuel oil day tanks located inside of the shop to hold the fuel oil for the shop unit heaters. The shop also stores maintenance quantities of lubrication products, hydraulic fluid, glycol and paints.

Shop and Workshop:

The workshop is a 30' x 40' skidded structure for rig support equipment. It has an external fuel tank and oil fired heaters. The shop contains maintenance supplies of lubrication oils, greases, hydraulic fluids, and glycols.

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

NABORS ALASKA DRILLING, INC.

RIG 27-E

APPENDIX D

EQUIPMENT AND SPILL CLEANUP MATERIALS ON SITE

The following Equipment will be kept operational at the drill site, but may be used for other routine tasks in addition to use during spill cleanup:

1. 1 Forklift with fork-type snow bucket (Cat 966 or equivalent).

The following spill cleanup materials will be kept securely stored on site, and are intended for use in a spill, not for daily use. Additional materials for minor operational drips will be kept as necessary at the rig and support equipment.

Quantity	**Description**
5	Rolls sorbent 36” x 150’ or equivalent (A)
2	Bundles sorbent pad 18” x 18” or equivalent (A)
4	Bundles of sorbent boom, 8” x 40’ x 4 booms/bundle(A)
4	Bundles of sorbent boom, 5” x 10’ x 4 booms/bundle(A)
2	Boxes of oily waste bags (A)
2	Pairs of rubber boots, size 9 (A)
2	Pairs of rubber boots, size 10 (A)
2	Pairs of rubber boots, size 11 (A)
2	Pairs of rubber boots, size 12 (A)
12	Disposable organic vapor respirators
12	Clear lens chemical goggle
12	Pairs of rubber chemical gloves
24	Pair Tyvek or equivalent disposable coverall
12	High visibility vests
6	Rain suits (A)
4	Square shovels (Non-sparking) (A)
2	Snow shovels (Non-sparking) (A)
2	Rakes
2	Pitchforks
2	Ice-Chippers
2	36” curved-tip squeegee w/ handle
6	5 gallon buckets
2	55 gal ½ drums (A)
2	Boxes Black Trash Can Liners (A)
2	Cases of duct tape (A)

(A) – The Lease Operator provides at least the quantity shown of this material in their spill container.

APPENDIX D

STATEMENT OF CONTRACTUAL TERMS

STATEMENT OF CONTRACTUAL TERMS

AS REQUIRED UNDER AS46.04.30, AS 46.04.035, and 18 AAC 75.445(l) (1) in fulfillment of requirement for registration of primary response action contractors and for approval of an Oil Discharge Prevention and Contingency Plan

PLAN TITLE: Oil Discharge Prevention and Contingency Plan; Point Thomson Drilling Program; North Slope, Alaska

PLAN HOLDER: Exxon Mobil Corporation

This statement is a certification to the Alaska Department of Environmental Conservation summarizing the contract between Exxon Mobil Corporation, the oil discharge prevention and contingency plan holder (hereinafter "PLAN HOLDER"), and Alaska Clean Seas, the oil spill primary response action contractor or a holder of an approved oil discharge prevention and contingency plan under contract (hereinafter "CONTRACTOR"), executed on December 5, 2008, and the original of which is located at 4720 Business Park Blvd, Suite G42, Anchorage, AK 99503, as evidence of the PLAN HOLDER's access to the containment, control and/or cleanup resources required under standards at AS 46.04.030 and 18 AAC 75.400 -- 18 AAC 75.495.

The PLAN HOLDER and the CONTRACTOR attest to the Department that the provisions of this written contract clearly obligate the CONTRACTOR TO:

(A) provide the response and equipment listed for the CONTRACTOR in the contingency plan;

(B) respond if a discharge occurs;

(C) notify the PLAN HOLDER immediately if the CONTRACTOR cannot carry out the response actions specified in this contract or the contingency plan;

(D) give written notice at least 30 days before terminating this contract with the PLAN HOLDER;

(E) respond to a Department-conducted discharge exercise required of the PLAN HOLDER: and

(F) continuously maintain in a state of readiness, in accordance with industry standards, the equipment and other spill response resources to be provided by the CONTRACTOR under the contingency plan.

STATEMENT OF CONTRACTUAL TERMS

I hereby certify that, as representative of the PLAN HOLDER, I have the authority to legally bind the PLAN HOLDER in this matter. I am aware that false statements, representation, or certifications may be punishable as civil or criminal violations of law.

[signature] December 5, 2008

Signature Date

Title: Attorney in Fact

For: Exxon Mobil Corporation
PLAN HOLDER

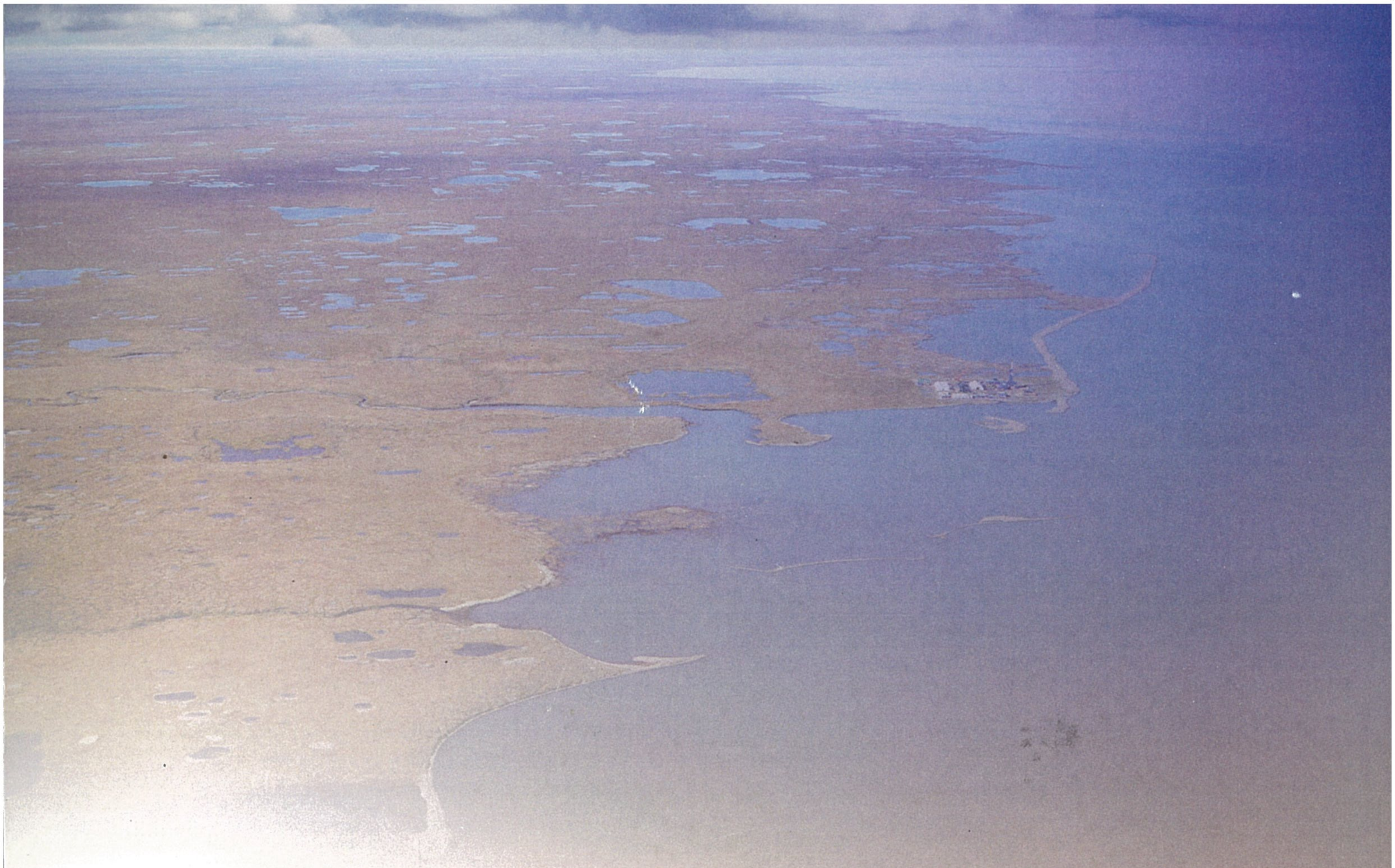
I hereby certify that, as representative of the CONTRACTOR, I have authority to legally bind the CONTRACTOR in this matter. I am aware that false statements, representation, or certifications may be punishable as civil or criminal violations of law.

[signature] 12-19-08

Signature Date

Title: President + General Manager

For: Alaska Clean Seas
CONTRACTOR



US Army Corps
of Engineers