IEc

ECONOMIC ANALYSIS OF CRITICAL HABITAT DESIGNATION FOR THE POLAR BEAR IN THE UNITED STATES

Final Report | October 14, 2010

prepared for:

U.S. Fish and Wildlife Service

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EXECUTIVE SUMMARY

1. The purpose of this report is to identify and analyze the potential economic impacts associated with the designation of critical habitat for the polar bear (*Ursus maritimus*) in the United States. This report was prepared by Industrial Economics, Incorporated (IEc) with technical assistance from Northern Economics, Incorporated (NEI), under contract to the U.S. Fish and Wildlife Service (Service).

2. The polar bears were listed as a threatened species on May 15, 2008.[1] At that time, critical habitat was considered to be prudent, but not determinable. On December 16, 2008, the Service issued a special rule for the polar bear under section 4(d) of the Endangered Species Act (ESA).[2] That special rule provides measures that are necessary and advisable to provide for the conservation of the polar bear as a threatened species. On October 29, 2009, the Service proposed critical habitat for the polar bear, made up of approximately 187,166 square miles (approximately 484,764 square kilometers) of land and sea ice habitat.[3]

3. This final economic analysis analyzes the proposed designation as described in the proposed rule. This analysis does not reflect changes to the proposed critical habitat designation made in the final rule. Consequently, description of the habitat designation in the final rule may differ from maps and figures presented in this analysis.[4]

4. This analysis describes existing regulations and policies that provide baseline protection to the polar bear and its habitat even absent critical habitat designation: for example, Federal ESA listing and Marine Mammal Protection Act (MMPA) regulations. It then monetizes the incremental economic impacts forecast to result from this designation. These incremental economic impacts are those not expected to occur absent the designation of critical habitat for the polar bear. This information is intended to assist the Secretary of the U.S. Department of the Interior (DOI) in determining whether the benefits of excluding particular areas from the designation outweigh the benefits of including those areas in the designation.[5]

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[1] 73 FR 28212.

[2] 73 FR 76249.

[3] 74 FR 56058. The Proposed Rule published on October 29, 2009 described 200,541 square miles of proposed critical habitat. Since then, the Service has refined the boundaries. This economic analysis reflects the revised geographic scope of 187,166 square miles.

[4] For a detailed discussion of public comments on the draft economic analysis and associated responses, refer to the responses to public comment section of the final rule.

[5] 16 U.S.C. §1533(b)(2).

5. This summary first characterizes the proposed critical habitat area. Next, it summarizes the key issues and conclusions of the report and describes the economic activities subject to the analysis. This summary concludes with a description of the organization of the report.

CHARACTERIZATION OF THE PROPOSED CRITICAL HABITAT AREA

6. The proposed habitat is divided into three units: (1) sea-ice habitat (94.8 percent of the total proposed critical habitat), (2) terrestrial denning habitat (3.0 percent), and (3) barrier island habitat (2.2 percent) (Exhibit ES-). Unit 1, sea-ice habitat, runs from the mean high tide line to the 300-m depth contour and is limited to waters under U.S. jurisdiction (both Federal and state waters). Unit 1 is used by the polar bear for feeding, breeding, denning, and movements that are essential for their conservation. Unit 2, terrestrial denning habitat, consists of land located along the northern coast of Alaska. Unit 3, barrier island habitat, includes the barrier islands themselves and associated spits, and the water, ice, and terrestrial habitat within one mile of the islands. Unit 3 is used for denning, refuge from human disturbance, and movements along the coast to access maternal den and optimal feeding habitat.

7. More than 99 percent of the proposed critical habitat is Federal or State-owned. Specifically, approximately 91 percent of the proposed critical habitat area occupies Federal lands and waters, including portions of the National Petroleum Reserve-Alaska (NPR-A) and Arctic National Wildlife Refuge (ANWR). Another 8.2 percent of the proposed habitat area is owned by the State of Alaska; this is primarily coastal waters. The remaining 0.6 percent is private land owned by Alaska Natives. While there are no privately-owned lands other than the Alaskan Native-owned lands within proposed critical habitat, businesses do lease lands for the purposes of oil and gas exploration and development activities.

8. The vast majority (95 percent) of the proposed critical habitat is in the marine environment. Only five percent of the proposed critical habitat is terrestrial, and these areas are remote and support limited infrastructure. The boroughs and Census areas containing proposed critical habitat are sparsely populated, averaging less than 0.5 people per square mile. Approximately three-quarters of the population of these areas are Alaska Natives, primarily Iñupiat Eskimo.

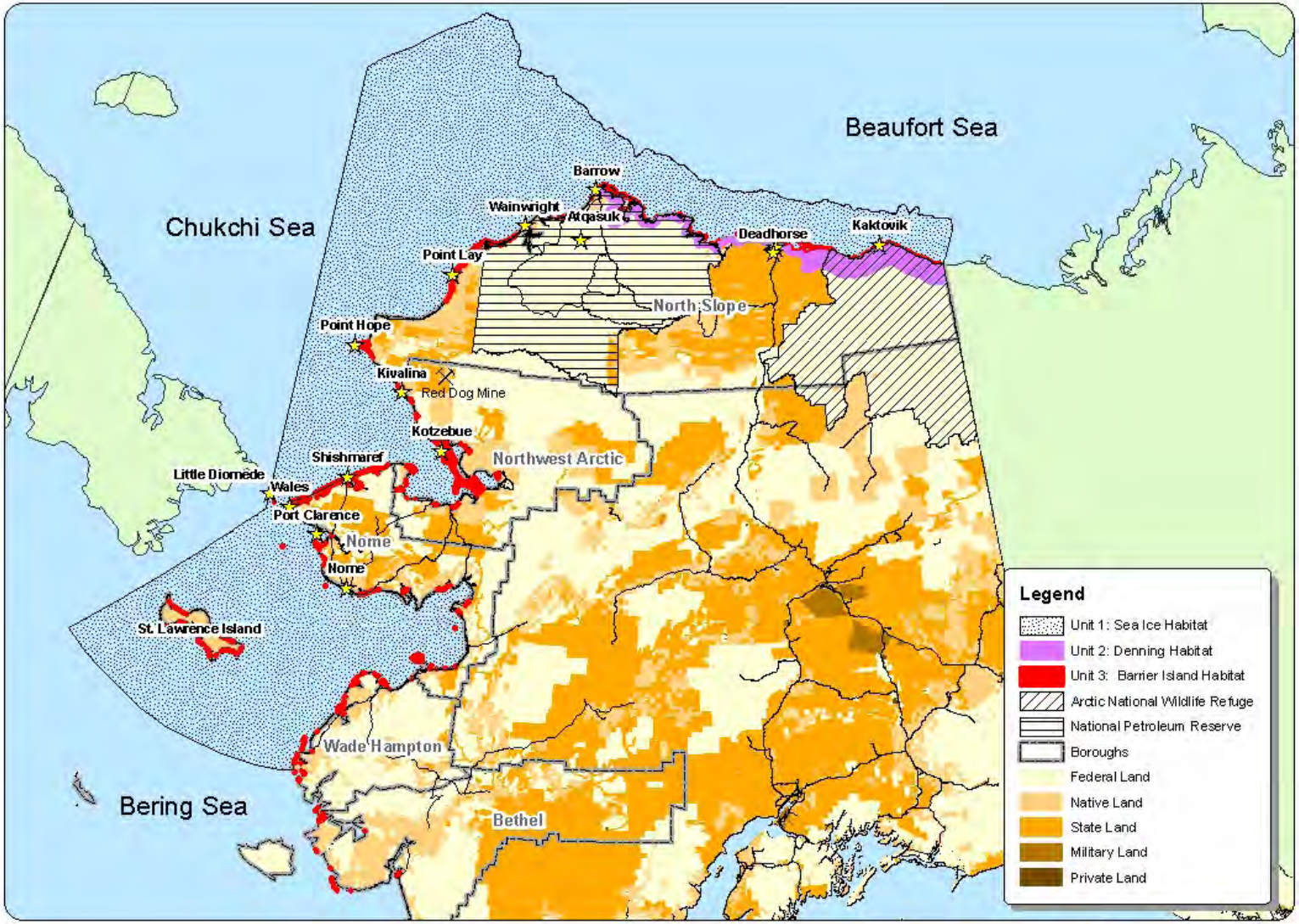
9. The predominant economic activity occurring within the proposed critical habitat region is oil and gas exploration and development. More than 90 percent of the estimated future oil and gas production in the State of Alaska is forecast to stem from the development of the North Slope.[6] The U.S. Minerals Management Service (MMS) mean resource estimates in the Arctic Outer Continental Shelf (OCS), including areas of the Beaufort, Chukchi and Hope Basin, amount to 23.75 billion barrels of undiscovered oil and 108.19 trillion cubic feet of undiscovered gas. Applying market price forecasts from the Energy

[6] Northern Economics, 2009. Economic Analysis of Future Offshore Oil and Gas Development: Beaufort Sea, Chukchi Sea, and North Aleutian Basin. Prepared for Shell Exploration & Production, Inc., 2009.

Information Administration (EIA), the gross value of these resources is approximately $3 trillion. Of this, MMS estimates about 50 percent ($1.5 trillion dollars) represents potential revenue to the State and Federal government for leasing, taxes and royalties; the remaining 50 percent would be operational costs to develop the resources.[7]

[7] Information from Rance Wall, P.E., Alaska Region, Minerals Management Service, provided to U.S. FWS via email on January 19, 2010.

EXHIBIT ES-1 PROPOSED CRITICAL HABITAT FOR THE POLAR BEAR IN ALASKA



Source:
1. US Fish and Wildlife Service, Field Office
2. Environmental Systems Research Institute, Inc. (ESRI), Redlands, California, USA

KEY ISSUES AND CONCLUSIONS

10. The following points summarize the conclusions of this report:

- *Critical habitat designation is not expected to result in changes to polar bear conservation requirements.* Given the level of protection currently afforded the polar bear by existing regulations, the Service does not anticipate that the critical habitat designation will result in polar bear conservation measures above and beyond those already required.[8] The regulatory baseline includes both the Federal ESA threatened status of the species, as well as the existing MMPA Incidental Take Regulations (ITRs) governing polar bear conservation for oil and gas development activities. Specifically, the Service anticipates that continued implementation of the ITRs, along with polar bear conservation measures recommended through section 7 consultation to avoid jeopardy to the species, will sufficiently avoid potential destruction or adverse modification of critical habitat. Thus, designation of critical habitat will not result in additional polar bear conservation measures, and thus economic impacts are forecast to be limited to additional administrative costs.

  In order for critical habitat to result in additional conservation, three conditions would need to be satisfied: 1) the ITRs would need to be discontinued, which would occur if the Service is unable to determine that oil and gas activities have a "negligible impact" on the polar bears; 2) the Service would need to determine that a project or activity subject to a section 7 consultation would limit the ability of the critical habitat area to perform its necessary support functions (e.g., feeding, denning, breeding, and resting); and 3) such projects or activities would have to be found to not jeopardize the species.

  First, the Service anticipates continued renewal of the ITRs for the foreseeable future. In the case that the ITRs are not renewed, however, the Service anticipates that the polar bear conservation measures currently being implemented under the ITRs would be recommended via section 7 consultation to avoid jeopardy to the species. Critical habitat is therefore not expected to result in additional regulation, and thus, forecast costs are limited to additional administrative costs of consultation. Second, the scale of this critical habitat designation makes it difficult to foresee any proposed activity potentially limiting the ability of the area to provide polar bear support functions. Finally, the Service believes all potential habitat threats may also affect the behavior of the polar bears (e.g., the ability of the bear to use a particularly denning area) and, therefore, these activities would be subject to regulation due to the Federal listing status of the species.

  For all of these reasons, the Service is unable to foresee a scenario in which the designation of critical habitat results in changes to polar bear conservation

[8] U.S. Fish and Wildlife Service, "Incremental Effects of Critical Habitat Designation for the Polar Bear," November 2, 2009 (see Appendix C).

requirements. Should the population and range of the species and the landscape of the critical habitat area change over time, however, the specific regulations that could drive polar bear conservation may change.[9]

- *Despite of the Service's belief that incremental impacts are not expected, the potential for indirect impacts of critical habitat is a major source of concern to landowners, industry, and stakeholders.* The greatest source of uncertainty in this analysis is the potential for indirect economic impacts of critical habitat designation. While the Service believes that critical habitat will not result in additional regulation, industry, landowners, Alaska Native Regional Corporations, and other stakeholders are concerned that adverse economic impacts will occur. Specifically, stakeholders fear that the existence of critical habitat may be used in litigation to delay or stop oil and gas activities in the region. Regardless of the outcome of such litigation, concern exists that regulatory uncertainty may affect investment decisions in the region, placing the critical habitat region at a competitive disadvantage to other oil and gas producing regions. As oil and gas development is the predominant economic activity in this remote region of Alaska, reductions in these activities are likely to result in regional employment effects. Approximately three-quarters of the population of the North Slope are Alaska Natives, whose economic independence is linked to this industry. In addition, any limitation on regional oil and gas development will reduce potential revenues to the State of Alaska and other landowners, including all land-owning Alaska Native Regional Corporations.

  Section 3.2.2 of this report discusses the potential for indirect economic impacts of the critical habitat designation. While information limitations (i.e., probability and length of litigation delays) preclude the monetization of such impacts, information on their potential order-of-magnitude and geographic distribution across the proposed critical habitat is provided in Chapter 3.

- *Critical habitat designation for the polar bear will not be used by the Service as a vehicle to regulate climate change.* The Service describes reductions in sea ice due to climate change as a primary threat to the polar bear and its habitat. The Service states in the proposed rule, however, "While we recognize that climate change will negatively affect optimal sea-ice habitat for the polar bears, the underlying causes of climate change are complex global issues that are beyond the scope of the [ESA]."[10] A detailed discussion of the reasons for this is provided in the Service's Special Rule for the polar bear.[11] As such, this report does not include a discussion of issues related to climate change.

- *Alaska Native subsistence activities are not regulated by critical habitat designation.* Subsistence harvest of polar bears is an economic and culturally

[9] Personal communication with U.S. Fish and Wildlife Service, December 17, 2009.

[10] 74 FR 56070.

[11] 73 FR 76251.

significant activity for Alaska Natives, including hunting polar bear for meat, the creation and sale of Native handicrafts, and use in traditional ceremonies. Subsistence activities are exempt from regulation under both ESA (under section 10(e), provided the take does not materially and negatively affect the species) and the MMPA (under section 101(b)). These activities are therefore not anticipated to be affected by the designation of critical habitat for the polar bears.

- *No economic benefit of critical habitat designation.* As discussed in Chapter 7 of this report, the Service does not anticipate that the designation of critical habitat will result in additional conservation requirements for the polar bear. Absent any changes in polar bear conservation measures, no economic benefits of critical habitat designation are expected. While this rule is not anticipated to result in economic benefits of additional polar bear conservation, the Service is under statutory obligation to designate critical habitat to the maximum extent prudent and determinable.

Summary of Results

11. Exhibit ES-1 summarizes the forecast incremental impacts of critical habitat designation for the polar bear. As described above, all forecast impacts are added administrative costs of considering adverse modification as part of future section 7 consultation. Activities subject to these additional administrative costs include: oil and gas exploration, development, and production; construction and development of infrastructure; transportation projects; and U.S. Coast Guard (USCG) activities. As the proposed critical habitat units are large in scale, Chapters 3 (oil and gas activities) and 4 (construction and development activities) provide information on the distribution of projects subject to consultation within the proposed units, where possible.

12. In the low-end scenario, approximately 63 percent ($427,000 assuming a seven percent discount rate) of the administrative costs described in Exhibit ES-2 is associated with consultations on construction and development projects, such as residential and commercial infrastructure, wind energy developments, transportation projects, and mining. In the high-end scenario, administrative costs for construction and development projects only represent 35 percent over the total costs. Forecast development projects may be associated with regional growth associated with the growing oil and gas industry. At the low end, another 29 percent ($193,000) is associated with consultations on oil and gas development, including construction of gas pipelines, review of lease sale plans, new developments, and five-year reviews of existing ITRs. At the high end, costs associated with consultations on oil and gas projects increase to 60 percent of the total costs ($726,000). This increase is due to the range in third party administrative costs for oil and gas projects. The remaining present value impacts ($56,900) are associated with consultations on USCG activities across Unit 1 and U.S. Air Force (USAF) activities across Unit 2. While oil and gas activities are the most prevalent economic activities in the region, fewer consultations are forecast to occur for oil and gas activities than for other construction and development projects. This is because oil and gas activities are managed according to area-specific plans and regulations (such as the ITRs). Thus, a

single consultation occurs for review of a plan or program covering multiple projects. Although administrative costs of programmatic consultations for oil and gas activities are expected to be greater than consultations for other types of activities, the greater number of forecast consultations for other activities results in greater associated impacts in the low-end scenario. In the high end scenario, the analysis assumes a third party administrative cost of $37,500 per formal or programmatic consolation. This cost estimate relies on information provided by stakeholders and reflects the complex nature of consultations for oil and gas projects in Alaska (see Exhibit 1-2). According to the high-end scenario, oil and gas activities experience the greatest incremental impacts of the designation.

13. Exhibit ES-2 highlights that approximately 41 to 70 percent, depending on the scenario, of the forecast incremental impacts occur in Units 2 and 3. This in spite of the fact that Units 2 and 3 account for only about five percent of the total area proposed for critical habitat (Exhibit ES-1). Forecast activities in sea ice habitat (Unit 1) are generally covered by large-scale plans and regulations (e.g., the ITRs) and therefore subject to less frequent consultation.

EXHIBIT ES-2 SUMMARY OF FORECAST INCREMENTAL IMPACTS (2010-2039)

PROPOSED UNIT	3% DISCOUNT RATE		7% DISCOUNT RATE	
	PRESENT VALUE IMPACTS	ANNUALIZED IMPACTS	PRESENT VALUE IMPACTS	ANNUALIZED IMPACTS
Unit 1. Beaufort Sea Portion	$104,000 - $417,000	$5,310 - $21,300	$66,200 - $258,000	$5,330 - $20,800
Unit 1. Chukchi Sea Portion	$89,600 - $315,000	$4,570 - $16,100	$55,100 - $186,000	$4,440 - $15,000
Unit 1. Bering Sea Portion	$9,070	$463	$5,960	$480
Unit 2. Terrestrial Denning Habitat	$305,000 - $330,000	$15,500 - $16,800	$193,000 - $208,000	$15,500 - $16,800
Unit 3. Barrier Island Habitat	$442,000 - $457,000	$22,600 - $23,300	$278,000 - $283,000	$22,400 - $22,800
Multiple Units*	$131,000 - $436,000	$6,680 - $22,300	$79,100 - $269,000	$6,380 - $21,700
Total Impacts	**$1,080,000 - $1,960,000**	**$55,100 - $100,000**	**$677,000 - $1,210,000**	**$54,500 - $97,500**

1. Impact estimates reflect a 30-year time horizon.
2. Estimates are rounded and may not sum due to rounding.

* Multiple forecast oil and gas consultations cover projects or activities that span multiple units of critical habitat. Absent reliable information regarding how these costs may be distributed across the units, costs of these consultations are grouped in a separate category, "Multiple Units." Where reasonable, this analysis makes simplifying assumptions regarding the unit most relevant to a potential consultation. For example, review of the Chukchi Sea ITRs is expected to affect Unit 1 in the Chukchi Sea for the purposes of reporting impacts. However, this consultation may in fact include some activities in adjacent terrestrial denning and barrier island habitat areas.

ACTIVITIES SUBJECT TO THIS ANALYSIS

14. Review of the proposed rule, the rule listing the species as threatened, existing management documents, the consultation history, and public comments received on the proposed rule identified the following economic activities as potential conservation threats to the polar bear and its habitat. The predominant risk factors associated with these activities are oil spills and potential pollution issues. Additionally, these activities may result in displacement of the bears or their prey. Chapters 3 through 6 of this report forecast the potential distribution of each of these activities across the proposed critical habitat area, describe baseline conservation measures that avoid or minimize their effect on the polar bears, and monetize incremental impacts of critical habitat designation.

- **Oil and gas exploration, development, and production:** Chapter 3 addresses oil and gas exploration, development, and production activities both onshore and offshore in the North Slope, as well as development of pipelines and other associated infrastructure. Chapter 3 discusses the baseline regulations covering these activities and monetizes incremental administrative costs of consultation. Consistent with stakeholder concerns, Chapter 3 also describes but does not monetize potential indirect impacts of critical habitat designation.
- **Construction and development:** Chapter 4 addresses other construction and development projects, including wind energy projects, commercial and residential developments, transportation projects, and mining. Incremental impacts of critical habitat are forecast to be limited to additional administrative costs of consultation on these activities.
- **Commercial shipping and marine transportation:** Chapter 5 addresses Arctic shipping and transportation, especially use of the Northern Sea Route. Absent a reliable forecast of future shipping and marine transportation levels, this analysis does not monetize potential impacts of critical habitat designation. However, the impact of polar bear critical habitat on these activities is expected to be limited due to the strength of the regulatory baseline regarding oil spill planning and response.
- **Military Activities:** The USCG engages in a variety of safety and law enforcement activities in the region. The USAF maintains two Integrated Natural Resource Management Plans (INRMPs) for radar sites in the Arctic and receives an annual intentional polar bear take authorization from the Service. Incremental impacts of critical habitat are forecast to be limited to additional administrative costs of consultation on: USCG activities, five-year updates to INRMPs, and annual review of intentional polar bear take authorizations for the USAF.

Oil and Gas Exploration, Development, and Production

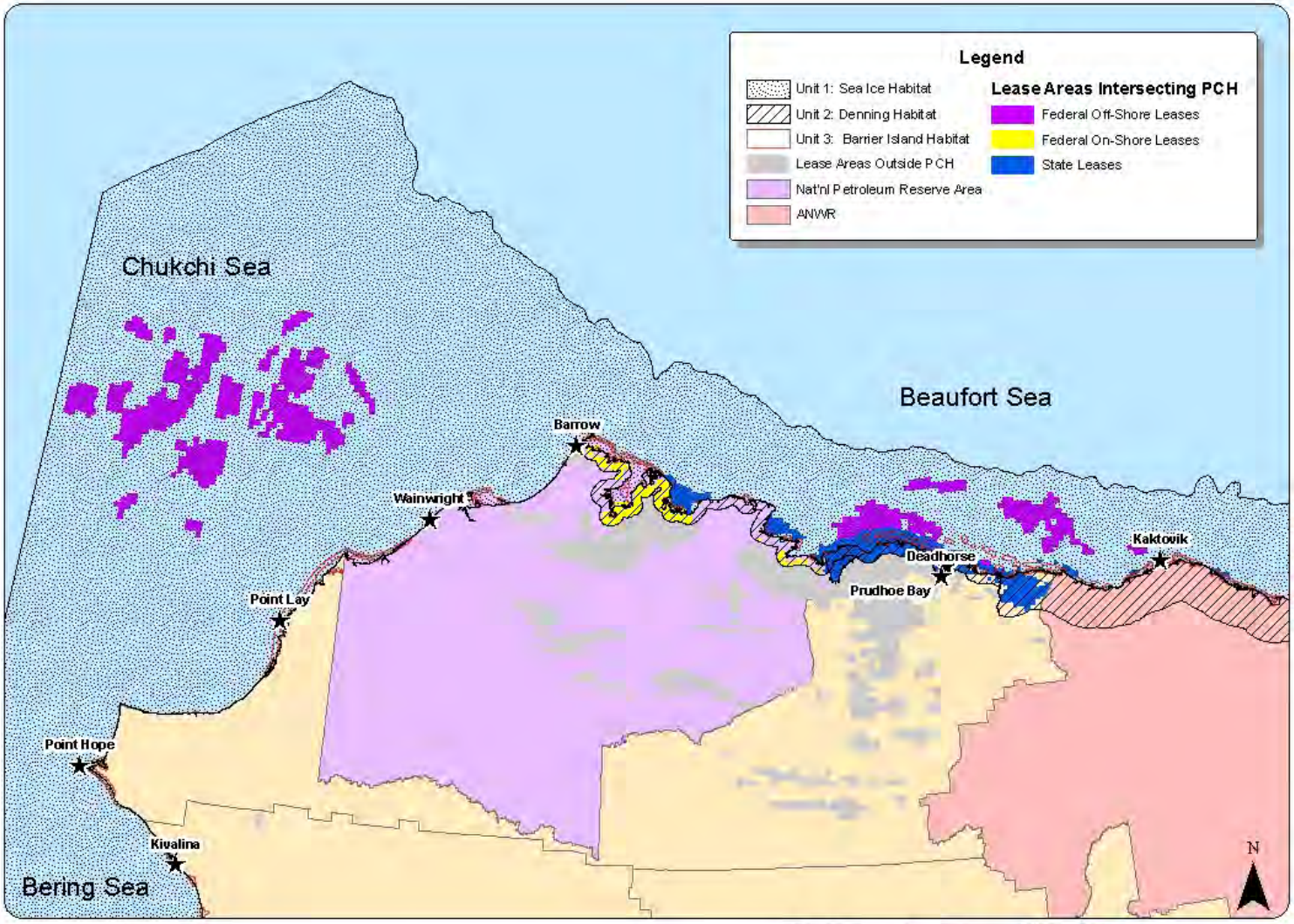
15. As noted above, oil and gas development activities are the predominant economic activity occurring within the proposed critical habitat area. These activities are subject to a substantial regulatory baseline, most significantly through the MMPA ITRs. Specifically, the ITRs direct the oil and gas industry to implement polar bear conservation measures, such as avoiding polar bear dens by one mile and minimizing

attraction of bears to project sites, with or without the designation of polar bear critical habitat. Chapter 3 describes potential costs to the oil and gas industry of complying with these baseline regulations.

16. The focus of this analysis is on the potential incremental impacts of critical habitat designation. Chapter 3 reports the total forecast incremental administrative costs of section 7 consultation regarding oil and gas activities and provides discussion on the potential for the rule to generate indirect impacts, for example, associated with project delays. While potential indirect effects of critical habitat designation are uncertain, this analysis provides information on the distribution of forecast oil and gas development activities. This information highlights those areas within the proposed critical habitat units where indirect impacts of the rule would be concentrated (Exhibit ES-3).

17. Most of the exploration wells that have been drilled in the proposed critical habitat region have been on state lands between ANWR and the NPR-A, along a geologic feature named the Barrow Arch, which is in proximity to the Beaufort Sea coastline in that area. A number of exploration wells have been drilled in the NPR-A, particularly in the eastern portion, nearest to the large discoveries on state lands. No exploration wells have been drilled in ANWR. The western portion of the proposed critical habitat area, between the NPR-A and the Chukchi Sea has seen very limited exploration activity. Exhibit ES-3 maps the distribution of existing Federal and state oil and gas leases within the proposed critical habitat area. Of note, this map highlights all active, pending, and proposed leases, and not only the lease areas that are currently producing. Chapter 3 provides information on estimated production within these areas. As evidenced by this map, areas available for exploration and development are concentrated in regions across the critical habitat, and not evenly distributed across the units. In particular, future activity is forecast to be concentrated in the Beaufort and Chukchi Sea regions, including onshore areas. Future exploration activity is most likely to occur adjacent to these existing lease areas.

EXHIBIT ES-3 EXISTING FEDERAL AND STATE OIL AND GAS LEASES WITHIN PROPOSED CRITICAL HABITAT



Sources:
1. US Fish and Wildlife Service, Field Office; 2. U.S. Minerals Management Service; 3. U.S. Bureau of Land Management; 4. Alaska Dept. of Natural Resources; and, 5. Environmental Systems Research Institute, Inc. (ESRI)

Construction and Development Activities

18. Where as oil and gas development activities are forecast to occur in all three units of proposed critical habitat, construction and development activities are forecast to be concentrated in Units 2 and 3. Baseline conservation measures recommended via section 7 consultation due to the listing are likely to include: avoidance of activities within one mile of known polar bear dens; development of field operating procedures and protocols for avoiding bears; and personnel designation and training in appropriate polar bear management activities. As described above, the Service expects that conservation afforded the polar bear through this baseline also avoids the potential for adverse modification of critical habitat.

19. In addition to the direct incremental impacts quantified in this report, similar to oil and gas activities, stakeholders have expressed a concern that regulatory uncertainty may result in delays to projects or limit economic development of the region. Whether and to what extent projects may be delayed or avoided is subject to significant uncertainty. This analysis therefore recognizes the potential for such indirect impacts of the regulation, but is unable to monetize specific costs. Chapter 4 does, however, highlight the potential distribution of forecast projects, which are primarily expected to occur adjacent to existing communities and villages across Units 2 and 3.

Commercial Shipping and Marine Transportation

20. In the future, commercial shipping and marine transportation may increase within proposed critical habitat areas due to reduced amounts of sea ice opening new shipping lanes and extending the Arctic navigation season. Increased activity could lead to more oil spills or additional icebreaking activities in the proposed critical habitat areas. Forecasts of future shipping and marine transportation levels are, however, considered highly speculative.

21. Regardless of future shipping and marine transportation levels, the impact of polar bear critical habitat on these activities is expected to be limited because: 1) polar bears utilize sea ice habitat when sea ice is present (primarily in the winter months) while marine shipping and transportation occurs when sea ice is more limited (primarily in the summer months); and 2) oil spill planning and response is subject to a strong regulatory baseline even absent polar bear conservation concerns.

22. In addition, the designation of critical habitat for the polar bear is not expected to alter potential future icebreaking activities. As described in Chapter 5, icebreaking activities currently occurring in the proposed critical habitat region are limited to USCG search and rescue missions and research efforts. Past section 7 consultation with the USCG regarding effects of icebreaking activities on the polar bears stated that, as long as the USCG followed the protocols in their polar bear interaction plan, adverse effects to polar bears would likely be avoided.[12] Impacts of implementing the polar bear interaction

[12] Email from Service to Dean Amundson, USCG, Chief, Civil Engineering Division, February 7, 2009.

plans are baseline, and the Service does not expect to request additional conservation measures for future icebreaking activities following the designation of critical habitat.

ORGANIZATION OF THE REPORT

23. This report is organized as follows:

- Chapter 1 – Framework for the Analysis
- Chapter 2 - Background
- Chapter 3 – Oil and Gas Exploration Development and Production
- Chapter 4 – Construction and Development
- Chapter 5 – Commercial Shipping and Marine Transportation
- Chapter 6 – Other Activities
- Chapter 7 – Economic Benefits

24. In addition, the report includes three appendices. Appendix A considers potential impacts on small entities and the energy industry. Appendix B provides information on the sensitivity of the economic impact estimates to alternative discount rate assumptions. Appendix C contains a memorandum developed by the Service describing potential regulatory changes associated with critical habitat designation for the polar bear.

CHAPTER 1 | FRAMEWORK FOR THE ANALYSIS

1. The purpose of this report is to estimate the economic impacts of critical habitat designation for the polar bear. This analysis examines the impacts of restricting or modifying specific land uses or activities for the benefit of the species and its habitat within the proposed critical habitat area. This analysis employs "without critical habitat" and "with critical habitat" scenarios. The "without critical habitat" scenario represents the baseline for the analysis, considering protections already accorded the polar bear; for example, under the Federal listing and other Federal, State, and local regulations. The "with critical habitat" scenario describes the incremental impacts associated specifically with the designation of critical habitat for the species. The incremental conservation efforts and associated impacts are those not expected to occur absent the designation of critical habitat for the polar bear.

2. This final economic analysis analyzes the proposed designation as described in the proposed rule. This analysis does not reflect changes to the proposed critical habitat designation made in the final rule. Consequently, description of the habitat designation in the final rule may differ from maps and figures presented in this analysis.[1]

3. This information is intended to assist the Secretary of the U.S. Department of the Interior (DOI) in determining whether the benefits of excluding particular areas from the designation outweigh the benefits of including those areas in the designation.[2] In addition, this information allows the U.S. Fish and Wildlife Service (Service) to address the requirements of Executive Orders 12866 and 13211, and the Regulatory Flexibility Act (RFA), as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA).[3]

4. This chapter describes the framework for this analysis. First, it describes the case law that led to the selection of the framework applied in this report. It then describes in economic terms the general categories of economic effects that are the focus of regulatory impact analysis, including a discussion of both efficiency and distributional effects. Next, this chapter defines the analytic framework used to measure these impacts in the

[1] For a detailed discussion of public comments on the draft economic analysis and associated responses, refer to the responses to public comment section of the final rule.

[2] 16 U.S.C. §1533(b)(2).

[3] Executive Order 12866, Regulatory Planning and Review, September 30, 1993 (as amended by Executive Order 13258 (2002) and Executive Order 13422 (2007)); Executive Order 13211, Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use, May 18, 2001; 5. U.S.C. §§601 *et seq*; and Pub Law No. 104-121.

context of critical habitat regulation and the consideration of benefits. It concludes with a presentation of the information sources relied upon in the analysis.

1.1 BACKGROUND

5. The U.S. Office of Management and Budget's (OMB) guidelines for conducting economic analysis of regulations direct Federal agencies to measure the costs of a regulatory action against a baseline, which it defines as the "best assessment of the way the world would look absent the proposed action."[4] In other words, the baseline includes the existing regulatory and socio-economic burden imposed on landowners, managers, or other resource users potentially affected by the designation of critical habitat. Impacts that are incremental to that baseline (i.e., occurring over and above existing constraints) are attributable to the proposed regulation. Significant debate has occurred regarding whether assessing the impacts of the Service's proposed regulations using this baseline approach is appropriate in the context of critical habitat designations.

6. In 2001, the U.S. Tenth Circuit Court of Appeals instructed the Service to conduct a full analysis of all of the economic impacts of proposed critical habitat, regardless of whether those impacts are attributable co-extensively to other causes.[5] Specifically, the court stated,

> "The statutory language is plain in requiring some kind of consideration of economic impact in the CHD [critical habitat designation] phase. Although 50 C.F.R. 402.02 is not at issue here, the regulation's definition of the jeopardy standard as fully encompassing the adverse modification standard renders any purported economic analysis done utilizing the baseline approach virtually meaningless. We are compelled by the canons of statutory interpretation to give some effect to the congressional directive that economic impacts be considered at the time of critical habitat designation…. Because economic analysis done using the FWS's [Fish and Wildlife Service's] baseline model is rendered essentially without meaning by 50 C.F.R. § 402.02, we conclude Congress intended that the FWS conduct a full analysis of all of the economic impacts of a critical habitat designation, regardless of whether those impacts are attributable co-extensively to other causes. Thus, we hold the baseline approach to economic analysis is not in accord with the language or intent of the ESA [Endangered Species Act]."[6]

7. Since that decision, however, courts in other cases have held that an incremental analysis of impacts stemming solely from the critical habitat rulemaking is proper.[7] For example,

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[4] OMB, "Circular A-4," September 17, 2003, available at http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf.

[5] *New Mexico Cattle Growers Assn v. United States Fish and Wildlife Service*, 248 F.3d 1277 (10th Cir. 2001).

[6] *Ibid.*

[7] *Cape Hatteras Access Preservation Alliance v. Department of Interior*, 344 F. Supp. 2d 108 (D.D.C.); *Center for Biological Diversity v. United States Bureau of Land Management*, 422 F. Supp. 2d 1115 (N.D. Cal. 2006).

in the March 2006 ruling that the August 2004 critical habitat rule for the Peirson's milk-vetch was arbitrary and capricious, the United States District Court for the Northern District of California stated,

> "The Court is not persuaded by the reasoning of *New Mexico Cattle Growers*, and instead agrees with the reasoning and holding of *Cape Hatteras Access Preservation Alliance v. U.S. Dep't of the Interior*, 344 F. Supp 2d 108 (D.D.C. 2004). That case also involved a challenge to the Service's baseline approach and the court held that the baseline approach was both consistent with the language and purpose of the ESA and that it was a reasonable method for assessing the actual costs of a particular critical habitat designation *Id* at 130. 'To find the true cost of a designation, the world with the designation must be compared to the world without it.'"[8]

8. In order to address the divergent opinions of the courts and provide the most complete information to decision-makers, this economic analysis:

   a. Describes the baseline protections afforded the polar bear absent critical habitat designation; and

   b. Monetizes the potential incremental impacts precipitated specifically by the designation of critical habitat for the species.

9. Incremental effects of critical habitat designation are determined using the Service's December 9, 2004 interim guidance on "Application of the 'Destruction or Adverse Modification' Standard Under Section 7(a)(2) of the Endangered Species Act" and information from the Service regarding what potential consultations and project modifications may be imposed as a result of critical habitat designation over and above those associated with the listing.[9,10] Specifically, in *Gifford Pinchot Task Force v. United States Fish and Wildlife Service*, the Ninth Circuit invalidated the Service's regulation defining destruction or adverse modification of critical habitat, and the Service no longer relies on this regulatory definition when analyzing whether an action is likely to destroy or adversely modify critical habitat.[11] Under the statutory provisions of the Endangered Species Act (ESA), the Service determines destruction or adverse modification on the basis of whether, with implementation of the proposed Federal action, the affected critical habitat would remain functional to serve its intended conservation role for the species. A

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[8] *Center for Biological Diversity et al, Plaintiffs, v. United States Bureau of Land Management et. al, Defendants and American Sand Association, et al, Defendant Intervenors*. Order re: Cross Motions for Summary Judgment, Case 3:03-cv-02509 Document 174 Filed 03/14/2006, pages 44-45.

[9] Director, U.S. Fish and Wildlife Service, Memorandum to Regional Directors and Manager of the California-Nevada Operations Office, Subject: Application of the "Destruction or Adverse Modification" Standard under Section 7(a)(2) of the Endangered Species Act, dated December 9, 2004.

[10] U.S. Fish and Wildlife Service to Industrial Economics, Inc., November 2, 2009, "Incremental Effects of Critical Habitat Designation for the Polar Bear."

[11] *Gifford Pinchot Task Force v. United States Fish and Wildlife Service*, No. 03-35279 (9th Circuit 2004).

detailed description of the methodology used to define baseline and incremental impacts is provided later in this Chapter.

1.2 CATEGORIES OF POTENTIAL ECONOMIC EFFECTS OF SPECIES CONSERVATION

10. This economic analysis considers both the economic efficiency and distributional effects that may result from efforts to protect the polar bear and its habitat (hereinafter referred to collectively as "polar bear conservation efforts"). Economic efficiency effects generally reflect "opportunity costs" associated with the commitment of resources required to accomplish species and habitat conservation. For example, if the set of activities that may take place on a parcel of land is limited as a result of the designation or the presence of the species, and thus the market value of the land is reduced, this reduction in value represents one measure of opportunity cost or change in economic efficiency. Similarly, the costs incurred by a Federal action agency to consult with the Service under section 7 represent opportunity costs of polar bear conservation efforts.

11. This analysis also addresses the distribution of impacts associated with the designation, including an assessment of any local or regional impacts of habitat conservation and the potential effects of conservation efforts on small entities and the energy industry. This information may be used by decision-makers to assess whether the effects of species conservation efforts unduly burden a particular group or economic sector. For example, while conservation efforts may have a small impact relative to the national economy, individuals employed in a particular sector of the regional economy may experience relatively greater impacts. The differences between economic efficiency effects and distributional effects, as well as their application in this analysis, are discussed in greater detail below.

1.2.1 EFFICIENCY EFFECTS

12. At the guidance of OMB and in compliance with Executive Order 12866 "Regulatory Planning and Review," Federal agencies measure changes in economic efficiency in order to understand how society, as a whole, will be affected by a regulatory action. In the context of regulations that protect polar bear habitat, these efficiency effects represent the opportunity cost of resources used or benefits foregone by society as a result of the regulations. Economists generally characterize opportunity costs in terms of changes in producer and consumer surpluses in affected markets.[12]

13. In some instances, compliance costs may provide a reasonable approximation for the efficiency effects associated with a regulatory action. For example, a Federal land manager may enter into a consultation with the Service to ensure that a particular activity will not adversely modify critical habitat. The effort required for the consultation is an economic opportunity cost because the landowner or manager's time and effort would

[12] For additional information on the definition of "surplus" and an explanation of consumer and producer surplus in the context of regulatory analysis, see: Gramlich, Edward M., A Guide to Benefit-Cost Analysis (2nd Ed.), Prospect Heights, Illinois: Waveland Press, Inc., 1990; and U.S. Environmental Protection Agency, Guidelines for Preparing Economic Analyses, EPA 240-R-00-003, September 2000, available at http://yosemite.epa.gov/ee/epa/eed.nsf/webpages/Guidelines.html.

have been spent in an alternative activity had the parcel not been included in the designation. When compliance activity is not expected to significantly affect markets -- that is, not result in a shift in the quantity of a good or service provided at a given price, or in the quantity of a good or service demanded given a change in price -- the measurement of compliance costs can provide a reasonable estimate of the change in economic efficiency.

14. Where habitat protection measures are expected to significantly impact a market, it may be necessary to estimate changes in producer and consumer surpluses. For example, protection measures that reduce or preclude the development of large areas of land may shift the price and quantity of housing supplied in a region. In this case, changes in economic efficiency (i.e., social welfare) can be measured by considering changes in producer and consumer surplus in the market.

1.2.2 DISTRIBUTIONAL AND REGIONAL ECONOMIC EFFECTS

15. Measurements of changes in economic efficiency focus on the net impact of conservation efforts, without consideration of how certain economic sectors or groups of people are affected. Thus, a discussion of efficiency effects alone may miss important distributional considerations. OMB encourages Federal agencies to consider distributional effects separately from efficiency effects.[13] This analysis considers several types of distributional effects, including impacts on small entities; impacts on energy supply, distribution, and use; and regional economic impacts. It is important to note that these are fundamentally different measures of economic impact than efficiency effects, and thus cannot be added to or compared with estimates of changes in economic efficiency.

Impacts on Small Entities and Energy Supply, Distribution, and Use

16. This analysis considers how small entities, including small businesses, organizations, and governments, as defined by the Regulatory Flexibility Act, might be affected by future species conservation efforts.[14] In addition, in response to Executive Order 13211 "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use," this analysis considers the future impacts of conservation efforts on the energy industry and its customers.[15]

Regional Economic Effects

17. Regional economic impact analysis can provide an assessment of the potential localized effects of conservation efforts. Specifically, regional economic impact analysis produces a quantitative estimate of the potential magnitude of the initial change in the regional economy resulting from a regulatory action. Regional economic impacts are commonly measured using regional input/output models. These models rely on multipliers that

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[13] U.S. Office of Management and Budget, "Circular A-4," September 17, 2003, available at http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf.

[14] 5 U.S.C. §§601 *et seq*.

[15] Executive Order 13211, Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use, May 18, 2001.

represent the relationship between a change in one sector of the economy (e.g., expenditures by recreators) and the effect of that change on economic output, income, or employment in other local industries (e.g., suppliers of goods and services to recreators). These economic data provide a quantitative estimate of the magnitude of shifts of jobs and revenues in the local economy.

18. The use of regional input/output models in an analysis of the impacts of species and habitat conservation efforts can overstate the long-term impacts of a regulatory change. Most importantly, these models provide a static view of the economy of a region. That is, they measure the initial impact of a regulatory change on an economy but do not consider long-term adjustments that the economy will make in response to this change. For example, these models provide estimates of the number of jobs lost as a result of a regulatory change, but do not consider re-employment of these individuals over time or other adaptive responses by impacted businesses. In addition, the flow of goods and services across the regional boundaries defined in the model may change as a result of the regulation, compensating for a potential decrease in economic activity within the region.

19. Despite these and other limitations, in certain circumstances regional economic impact analysis may provide useful information about the scale and scope of localized impacts. It is important to remember that measures of regional economic effects generally reflect shifts in resource use rather than efficiency losses. Thus, these types of distributional effects are reported separately from efficiency effects (i.e., not summed). In addition, measures of regional economic impact cannot be compared with estimates of efficiency effects, but should be considered as distinct measures of impact.

20. Incremental impacts associated with polar bear critical habitat forecast in this report are entirely related to expected administrative costs of section 7 consultations. This analysis does not anticipate that critical habitat designation will change the type or level of economic activity occurring within critical habitat. Thus,, broader regional economic impacts are not anticipated.

1.3 ANALYTIC FRAMEWORK AND SCOPE OF THE ANALYSIS

21. This analysis: 1) identifies those economic activities most likely to threaten the polar bear and its habitat; 2) describes the baseline regulation protection for the species; and 3) monetizes the incremental economic impacts to avoid or minimize adverse modification of the proposed critical habitat area. This section provides a description of the methodology used to separately identify baseline protections from the incremental impacts stemming from the proposed designation of critical habitat for the polar bear. This evaluation of impacts in a "with critical habitat designation" versus a "without critical habitat designation" framework effectively measures the net change in economic activity associated with the proposed rulemaking.

1.3.1 IDENTIFYING BASELINE IMPACTS

22. The baseline for this analysis is the existing state of regulation, prior to the designation of critical habitat, which provides protection to the species under ESA, as well as under

other Federal, State and local laws and guidelines. This "without critical habitat designation" scenario also considers a wide range of additional factors beyond the compliance costs of regulations that provide protection to the listed species. As recommended by OMB, the baseline incorporates, as appropriate, trends in market conditions, implementation of other regulations and policies by the Service and other government entities, and trends in other factors that have the potential to affect economic costs and benefits, such as the rate of regional economic growth in potentially affected industries.

23. Baseline protections include sections 7, 9, and 10 of ESA, and economic impacts resulting from these protections to the extent that they are expected to occur absent the designation of critical habitat for the species. This analysis describes these baseline regulations, and where possible, provides examples of the potential magnitude of the costs of these baseline protections. The primary focus, however, is not on baseline costs, since these will not be affected by the proposed regulation. Instead, the focus of this analysis is on monetizing the incremental impacts forecast to result from the proposed critical habitat designation.

- Section 7 of ESA, absent critical habitat designation, requires Federal agencies to consult with the Service to ensure that any action authorized, funded, or carried out will not likely jeopardize the continued existence of any endangered or threatened species. Consultations under the jeopardy standard result in administrative costs, as well as impacts of project modifications resulting from consideration of this standard.
- Section 9 defines the actions that are prohibited by ESA. In particular, it prohibits the "take" of endangered wildlife, where "take" means to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."[16] The economic impacts associated with this section manifest themselves in sections 7 and 10.
- Under section 10(a)(1)(B) of ESA, an entity (e.g., a landowner or local government) may develop a Habitat Conservation Plan (HCP) for a listed animal species in order to meet the conditions for issuance of an incidental take permit in connection with a land or water use activity or project.[17] The requirements posed by the HCP may have economic impacts associated with the goal of ensuring that the effects of incidental take are adequately avoided or minimized. The development and implementation of HCPs is considered a baseline protection for the species and habitat unless the HCP is determined to be precipitated by the designation of critical habitat, or the designation influences stipulated conservation efforts under HCPs.

[16] 16 U.S.C. 1532.

[17] U.S. Fish and Wildlife Service, "Endangered Species and Habitat Conservation Planning," August 6, 2002, accessed at http://endangered.fws.gov/hcp/.

Enforcement actions taken in response to violations of ESA are not included in this analysis.

24. The protection of listed species and habitat is not limited to ESA. Other Federal agencies, as well as State and local governments, may also seek to protect the natural resources under their jurisdiction. If compliance with the Clean Water Act or State environmental quality laws, for example, protects habitat for the species, such protective efforts are considered to be baseline protections and costs associated with these efforts are categorized accordingly. Of particular relevance to this report, the Marine Mammal Protection Act (MMPA) provides strong baseline protections for the polar bear, as described in more detail in Chapter 2.

25. Of note, however, is that such efforts may not be considered baseline in the case that they would not have been triggered absent the designation of critical habitat. In these cases, they are considered incremental impacts and are discussed below.

1.3.2 IDENTIFYING INCREMENTAL IMPACTS

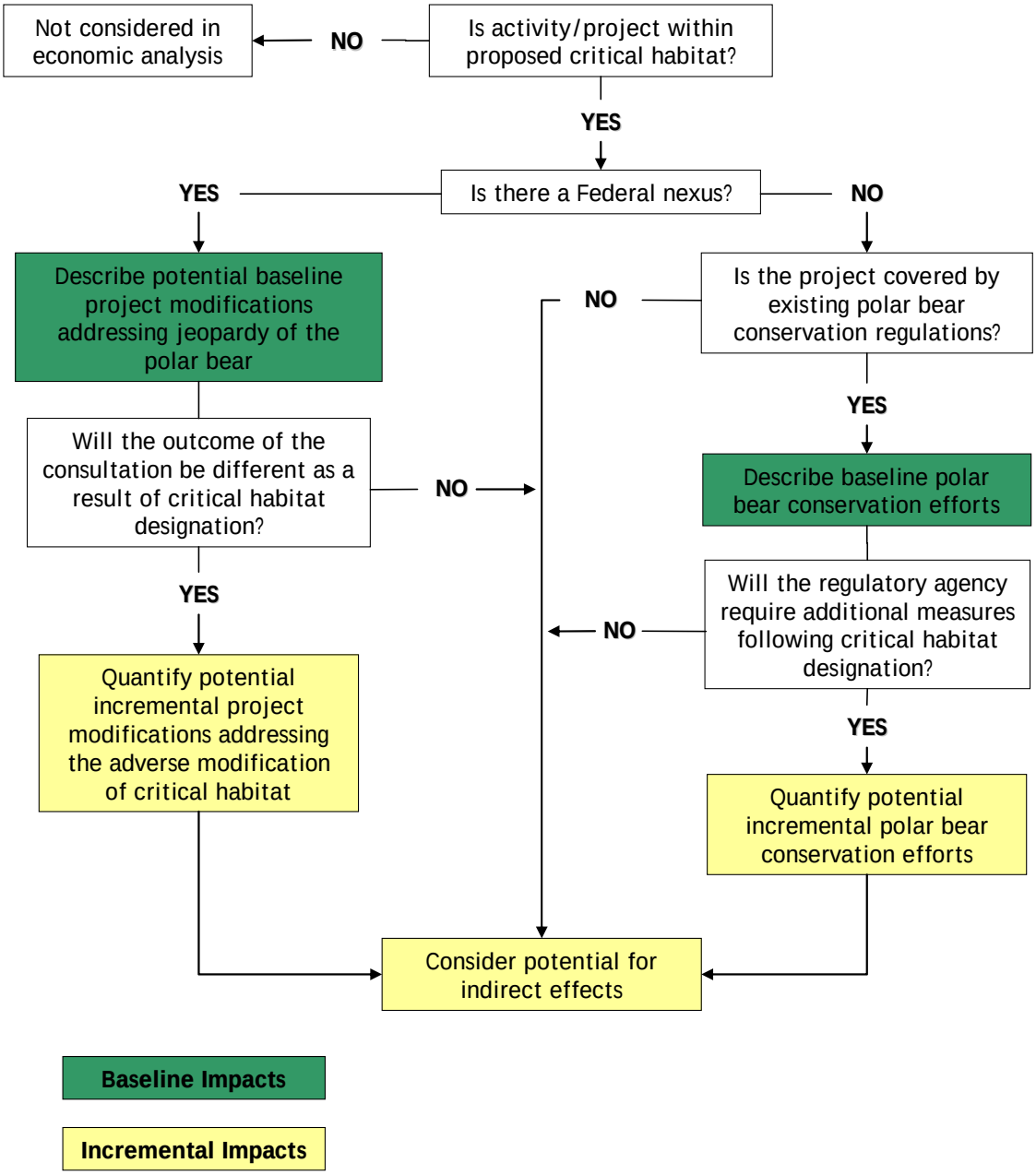
26. This analysis quantifies the potential incremental impacts of this rulemaking. The focus of the incremental analysis is to determine the impacts on land uses and activities from the designation of critical habitat that are above and beyond those impacts due to existing required or voluntary conservation efforts being undertaken due to other Federal, State, and local regulations or guidelines.

27. When critical habitat is designated, section 7 requires Federal agencies to ensure that their actions will not result in the destruction or adverse modification of critical habitat (in addition to considering whether the actions are likely to jeopardize the continued existence of the species). The added administrative costs of including consideration of critical habitat in section 7 consultations, and the additional impacts of implementing project modifications resulting from the protection of critical habitat are the direct compliance costs of designating critical habitat. These costs are not in the baseline and are considered incremental impacts of the rulemaking.

28. Exhibit 1-1 depicts the decision analysis regarding whether an impact should be considered incremental. The following sections describe this decision tree in detail.

29. Incremental impacts may be the direct compliance costs associated with additional effort for consultations, reinitiated consultations, new consultations occurring specifically because of the designation, and additional project modifications that would not have been required under the jeopardy standard. Additionally, incremental impacts may include indirect impacts resulting from reaction to the potential designation of critical habitat (e.g., implementing polar bear conservation in an effort to avoid designation of critical habitat), triggering of additional requirements under State or local laws intended to protect sensitive habitat, and uncertainty and perceptional effects on markets.

EXHIBIT 1-1. IDENTIFYING INCREMENTAL IMPACTS OF CRITICAL HABITAT DESIGNATION



Direct Impacts

30. The direct, incremental impacts of critical habitat designation stem from the consideration of the potential for destruction or adverse modification of critical habitat during section 7 consultations. The two categories of direct, incremental impacts of critical habitat designation are: 1) the administrative costs of conducting section 7 consultation; and 2) implementation of any project modifications requested by the Service through section 7 consultation to avoid or minimize potential destruction or adverse modification of critical habitat.

31. Section 7(a)(2) of ESA requires Federal agencies (Action agencies) to consult with the Service whenever activities that they undertake, authorize, permit, or fund may affect a listed species or designated critical habitat. In some cases, consultations will involve the Service and another Federal agency only, such as the U.S. Army Corps of Engineers. Often, they will also include a third party involved in projects that involve a permitted entity, such as the recipient of a Clean Water Act section 404 permit.

32. During a consultation, the Service, the Action agency, and the entity applying for Federal funding or permitting (if applicable) communicate in an effort to minimize potential adverse effects to the species and/or to the proposed critical habitat. Communication between these parties may occur via written letters, phone calls, in-person meetings, or any combination of these. The duration and complexity of these interactions depends on a number of variables, including the type of consultation, the species, the activity of concern, and the potential effects to the species and designated critical habitat associated with the proposed activity, the Federal agency, and whether there is a private applicant involved.

33. Section 7 consultations with the Service may be either informal or formal. *Informal consultation*s consist of discussions between the Service, the Action agency, and the applicant concerning an action that may affect a listed species or its designated critical habitat, and are designed to identify and resolve potential concerns at an early stage in the planning process. By contrast, a *formal consultation* is required if the Action agency determines that its proposed action may or will adversely affect the listed species or designated critical habitat in ways that cannot be resolved through informal consultation. The formal consultation process results in the Service's determination in its Biological Opinion of whether the action is likely to jeopardize a species or adversely modify critical habitat, and recommendations to minimize those impacts. Regardless of the type of consultation or proposed project, section 7 consultations can require substantial administrative effort on the part of all participants.

<u>Administrative Section 7 Consultation Costs</u>

34. Parties involved in section 7 consultations include the Service, a Federal "action agency," and in some cases, a private entity involved in the project or land use activity. The action agency (i.e., the Federal nexus necessitating the consultation) serves as the liaison with the Service. While consultations are required for activities that involve a Federal nexus and may affect a species regardless of whether critical habitat is designated, the designation may increase the effort for consultations in the case that the project or activity

in question may adversely modify critical habitat. Administrative efforts for consultation may therefore result in both baseline and incremental impacts.

35. In general, three different scenarios associated with the designation of critical habitat may trigger incremental administrative consultation costs:

    1. **Additional effort to address adverse modification in a new consultation -** New consultations taking place after critical habitat designation may require additional effort to address critical habitat issues above and beyond the listing issues. In this case, only the additional administrative effort required to consider critical habitat is considered an incremental impact of the designation.

    2. **Re-initiation of consultation to address adverse modification -** Consultations that have already been completed on a project or activity may require re-initiation to address critical habitat. In this case, the costs of re-initiating the consultation, including all associated administrative and project modification costs are considered incremental impacts of the designation.

    3. **Incremental consultation resulting entirely from critical habitat designation -** Critical habitat designation may trigger additional consultations that may not occur absent the designation (e.g., for an activity for which adverse modification may be an issue, while jeopardy is not, or consultations resulting from the new information about the potential presence of the species provided by the designation). Such consultations may, for example, be triggered in critical habitat areas that are not occupied by the species. All associated administrative and project modification costs of incremental consultations are considered incremental impacts of the designation.

36. The Service does not anticipate activities that are not a conservation threat to the polar bear under the listing to be a conservation threat to the critical habitat.[30] That is, anticipated future consultations would already have been expected to occur under the baseline, but those consultations will be expected to additionally consider adverse modification following critical habitat designation. As such, only the first two categories of consultation type above are considered relevant to this analysis. The administrative cost estimates take into consideration the level of effort of the Service, the Action agency, and the applicant (where relevant), as well as the varying complexity of the consultations.

37. Estimates of the level of Service effort for individual consultations for the polar bear were provided by the Alaska Marine Mammals Management Office. Low-end estimates of the level of Action agency and third party effort for individual consultations were developed from a review and analysis of historical section 7 files from a number of Service field

[30] U.S. Fish and Wildlife Service to Industrial Economics, Inc., November 2, 2009, "Incremental Effects of Critical Habitat Designation for the Polar Bear."

offices around the country. These consultations were conducted for both listings and critical habitat designations. High-end estimates of level of third party effort for individual formal and programmatic consultations are relevant to future consultations on oil and gas activities. These high-end cost estimates are based on public comments received on the draft version of this analysis.[31]

38. Review of consultation records and discussions with Service field offices resulted in an estimated range of administrative costs of consultation. The average of the range of costs in each category is applied in this analysis. Exhibit 1-2 provides estimated consultation costs associated with the incremental effort anticipated to consider critical habitat as part of forecast consultations. The following sections describe the specific assumptions and administrative cost estimates for each activity type analyzed in this report.

[31] Letter from the State of Alaska, Department of Fish and Game to U.S. Fish and Wildlife Service, "Additional Comments on the Proposed Designation of Critical Habitat for the Polar Bear (*Ursus maritimus*) in the United States," July 6, 2010; Letter from the Alaska Oil and Gas Association to U.S. Fish and Wildlife Service, "Supplemental Comments of the Alaska Oil and Gas Association and the American Petroleum Institute – Proposed Rule to Designate Critical Habitat for the Polar Bear (FWS-R7-ES-2009-0042)," July 6, 2010; Letter from Helene E. Harding, Vice President North Slope Operations and Development, ConocoPhillips Alaska, Inc. to U.S. Fish and Wildlife Service, "Supplemental Comments of ConocoPhillips Alaska, Inc. on the Proposed Rule to Designate Critical Habitat for the Polar Bear *(Ursus maritumus*) (FWS-R7-ES-2009-0042)," July 6, 2010; Letter from Steven Findlay, Vice President Regulatory Affairs, Denali to U.S. Fish and Wildlife Service, "Supplemental Comments of Denali – The Alaska Gas Pipeline LLC on the Proposed Rule to Designate Critical Habitat for the Polar Bear (FWS-R7-ES-2009-0042)," July 6, 2010; Letter from Resource Development Council to U.S. Fish and Wildlife Service, "Comments of the Resource Development Council – Proposed Rule to Designate Critical Habitat for the Polar Bear (FWS-R7-ES-2009-0042)," July 1, 2010.

EXHIBIT 1-2. INCREMENTAL ADMINISTRATIVE COSTS PER CONSULTATION ($2009)

CONSULTATION TYPE	SERVICE	FEDERAL AGENCY	THIRD PARTY	BIOLOGICAL ASSESSMENT	TOTAL COSTS
RE-INITIATION OF CONSULTATION TO ADDRESS ADVERSE MODIFICATION					
Technical Assistance	$62	n/a	$525	n/a	$587
Informal	$62	$1,550	$1,030	$1,000	$3,640
Formal	$1,950	$3,080	$1,750 - $37,500	$2,400	$9,180 - $44,926
Programmatic	$11,700	$6,830	$1,750 - $37,500	$2,800	$23,055 - $58,805
ADDITIONAL EFFORT TO ADDRESS ADVERSE MODIFICATION IN A NEW CONSULTATION					
Technical Assistance	$62	n/a	$263	n/a	$325
Informal	$62	$775	$513	$500	$1,850
Formal	$1,950	$1,540	$875 - $37,500	$1,200	$5,560 - $42,186
Programmatic	$11,700	$3,410	$875 - $37,500	$1,400	$17,360 - $53,985

Notes:

1. Estimates are rounded to three significant digits and may not sum due to rounding. Estimates reflect average hourly time required by staff. Hourly rates based on Federal Government Schedule Rates, Office of Personnel Management, 2009.
2. The Service's Fairbanks Field Office provided estimates of administrative efforts (in hours) for polar bears by consultation type. Email communications from the Service, Fairbanks Field Office to IEc on February 26, 2010.
3. To date all large scale projects or plans requiring programmatic consultation have been related to oil and gas activities. The majority of future consultation efforts related to oil and gas are forecast to be programmatic. Other activities potentially subject to future consultation (other construction and development projects) are more relevant to the other categories of consultation: technical assistance, informal and formal consultations.
4. Levels of Federal Action Agency and low-end third party consultation efforts were developed as part of an IEc review of consultation records from several Service field offices across the country conducted in 2002.
5. High-end costs of third party formal and programmatic consultation effort are relevant only to consultations regarding oil and gas activities. These estimates were provided by stakeholders during the public comment period on the draft version of this analysis.

Section 7 Project Modification Impacts

39. Section 7 consultation considering critical habitat may also result in additional project modification recommendations specifically addressing potential destruction or adverse modification of critical habitat. For forecast consultations considering jeopardy and adverse modification, and for re-initiations of past consultations to consider critical habitat, the economic impacts of project modifications undertaken to avoid or minimize adverse modification are considered incremental impacts of critical habitat designation. For consultations that are forecast to occur specifically because of the designation (incremental consultations), impacts of all associated project modifications are assumed to be incremental impacts of the designation. This is summarized below.

1. **Additional effort to address adverse modification in a new consultation -** Only project modifications above and beyond what would be requested to avoid or minimize jeopardy are considered incremental.
2. **Re-initiation of consultation to address adverse modification -** Only project modifications above and beyond what was requested to avoid or minimize jeopardy are considered incremental.
3. **Incremental consultation resulting entirely from critical habitat designation -** Impacts of all project modifications are considered incremental. This analysis does not anticipate any additional consultations to result from the designation of critical habitat for the polar bear and thus there are no incremental costs forecast to result entirely from the designation.

Indirect Impacts

40. The designation of critical habitat may, under certain circumstances, affect actions that do not have a Federal nexus and thus are not subject to the provisions of section 7 under ESA. Indirect impacts are those unintended changes in economic behavior that may occur outside of ESA, through other Federal, State, or local actions, and that are caused by the designation of critical habitat. This section identifies common types of indirect impacts that may be associated with the designation of critical habitat. Importantly, these types of impacts are not always considered incremental. In the case that these types of conservation efforts and economic effects are expected to occur regardless of critical habitat designation, they are appropriately considered to be part of the baseline of this analysis.

Habitat Conservation Plans

41. Under section 10 of ESA, landowners seeking an incidental take permit must develop an HCP to counterbalance the potential harmful effects that an otherwise lawful activity may have on a species. As such, the purpose of the habitat conservation planning process is to ensure that the effects of incidental take are adequately avoided or minimized. Thus, HCPs are developed to ensure compliance with section 9 of ESA and to meet the requirements of section 10 of ESA.

42. Application for an incidental take permit and completion of an HCP are not required or necessarily recommended by a critical habitat designation. However, in certain situations the new information provided by the proposed critical habitat rule may prompt a landowner to apply for an incidental take permit. For example, a landowner may have been previously unaware of the potential presence of the species on his or her property, and expeditious completion of an HCP may offer the landowner regulatory relief in the form of exclusion from the final critical habitat designation. In this case, the effort involved in creating the HCP and undertaking associated conservation efforts are considered an incremental effect of designation. No specific plans to prepare new HCPs in response to this proposed designation were identified.

Other State and Local Laws

43. Under certain circumstances, critical habitat designation may provide new information to a community about the sensitive ecological nature of a geographic region, potentially triggering additional economic impacts under other State or local laws. In cases where these impacts would not have been triggered absent critical habitat designation, they are considered indirect, incremental impacts of the designation.

Additional Indirect Impacts

44. In addition to the indirect effects of compliance with other laws or triggered by the designation, project proponents, land managers and landowners may face additional indirect impacts, including the following:

- **Time Delays -** Both public and private entities may experience incremental time delays for projects and other activities due to requirements associated with the need to reinitiate the section 7 consultation process and/or compliance with other laws triggered by the designation. To the extent that delays result from the designation, they are considered indirect, incremental impacts of the designation.
- **Regulatory Uncertainty -** The Service conducts each section 7 consultation on a case-by-case basis and issues a biological opinion on formal consultations based on species-specific and site-specific information. As a result, government agencies and affiliated private parties who consult with the Service under section 7 may face uncertainty concerning whether project modifications will be recommended by the Service and what the nature of these modifications will be. This uncertainty may diminish as consultations are completed and additional information becomes available on the effects of critical habitat on specific activities. Where information suggests that this type of regulatory uncertainty stemming from the designation may affect a project or economic behavior, associated impacts are considered indirect, incremental impacts of the designation.
- **Stigma -** In some cases, the public may perceive that critical habitat designation may result in limitations on private property uses above and beyond those associated with anticipated project modifications and regulatory uncertainty described above. Public attitudes about the limits or restrictions that critical habitat may impose can cause real economic effects to property owners, regardless of whether such limits are actually imposed. All else equal, a property that is designated as critical habitat may have a lower market value than an identical property that is not within the boundaries of critical habitat due to perceived limitations or restrictions. As the public becomes aware of the true regulatory burden imposed by critical habitat, the impact of the designation on property markets may decrease. To the extent that potential stigma effects on markets are probable and identifiable, these impacts are considered indirect, incremental impacts of the designation.

1.3.3 BENEFITS

45. Under Executive Order 12866, OMB directs Federal agencies to provide an assessment of both the social costs and benefits of proposed regulatory actions.[32] OMB's Circular A-4 distinguishes two types of economic benefits: *direct benefits and ancillary benefits*. Ancillary benefits are defined as favorable impacts of a rulemaking that are typically unrelated, or secondary, to the statutory purpose of the rulemaking.[33]

46. In the context of critical habitat, the primary purpose of the rulemaking (i.e., the direct benefit) is the potential to enhance conservation of the species. The published economics literature has documented that social welfare benefits can result from the conservation and recovery of endangered and threatened species. In its guidance for implementing Executive Order 12866, OMB acknowledges that it may not be feasible to monetize, or even quantify, the benefits of environmental regulations due to either an absence of defensible, relevant studies or a lack of resources on the implementing agency's part to conduct new research.[34] *Rather than rely on economic measures, the Service believes that the direct benefits of the proposed rule are best expressed in biological terms that can be weighed against the expected cost impacts of the rulemaking.*

47. Critical habitat designation may also generate ancillary benefits. Critical habitat aids in the conservation of species specifically by protecting the primary constituent elements on which the species depends. To this end, critical habitat designation can result in maintenance of particular environmental conditions that may generate other social benefits aside from the preservation of the species. That is, management actions undertaken to conserve a species or habitat may have coincident, positive social welfare implications, such as increased recreational opportunities in a region. While they are not the primary purpose of critical habitat, these ancillary benefits may result in gains in employment, output, or income that may offset the direct, negative impacts to a region's economy resulting from actions to conserve a species or its habitat.

48. The potential ancillary benefits of critical habitat designation are described qualitatively in Chapter 7. This chapter also summarizes available literature describing potential benefits of conservation of the polar bear and its habitat.

1.3.4 GEOGRAPHIC SCOPE OF THE ANALYSIS

49. Economic impacts of polar bear conservation are considered across the entire area proposed for critical habitat designation. Where possible, results are presented for each of the three units of proposed critical habitat, as described in Chapter 2. This analysis provides more detailed information on the geographic location of the affected projects within the three critical habitat units where information is available to do so.

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[32] Executive Order 12866, Regulatory Planning and Review, September 30, 1993.

[33] U.S. Office of Management and Budget, "Circular A-4," September 17, 2003, available at http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf.

[34] *Ibid.*

1.3.5 ANALYTIC TIME FRAME

50. Ideally, the time frame of this analysis would be based on the expected time period over which the critical habitat regulation is expected to be in place. Specifically, the analysis would forecast impacts of implementing this rule through species recovery (i.e., when the rule is no longer required). However, absent specific information on the expected time frame for recovery of the polar bear, this analysis forecasts impacts over a "reasonably foreseeable" time frame. This time frame may vary by category of economic activity, depending on available information regarding activities that are currently authorized, permitted, or funded, or for which proposed plans are currently available. This information may be found, for example, in local government land use plans or Federal agency planning documents.

51. Based on available data, this analysis considers economic impacts to activities from 2010 (expected year of final critical habitat designation) though 2039. This time horizon pertains to the forecast of impacts to oil and gas exploration, development, and production, and associated construction projects, as these are the primary activities occurring within the proposed critical habitat area. While oil and gas activities in the polar bear critical habitat area will likely continue past 2039, the nature of these activities beyond this time become increasingly speculative. A scenario to 2039 captures the peak level of activity as discussed in Chapter 3.

1.4 INFORMATION SOURCES

52. The primary sources of information for this report are communications with, and data provided by, personnel from the Service, Federal, State, and local governments and other stakeholders. In addition, this analysis relies upon the Service's section 7 consultation records, and existing management plans that consider the polar bear. The complete list of contacted stakeholders is within the reference section at the end of this document.

CHAPTER 2 | INTRODUCTION AND BACKGROUND

53. Under the provisions of the Endangered Species Act (ESA), the U.S. Fish and Wildlife Service (Service) proposes to designate critical habitat for the polar bear (*Ursus maritimus*) in the United States. Polar bears were listed as a threatened species on May 15, 2008.[35] At that time, critical habitat was considered to be prudent, but not determinable, and therefore was not designated at the time of listing. On December 16, 2008, the Service issued a special rule for the polar bear under section 4(d) of the Act.[36] The special rule provides measures that are necessary and advisable to provide for the conservation of the polar bear.

54. On October 29, 2009, the Service proposed critical habitat for the polar bear, identifying approximately 187,166 square miles (approximately 484,764 square kilometers) as proposed for critical habitat designation.[37] The proposed habitat is divided into three units: (1) sea-ice habitat (94.8 percent of the total proposed critical habitat), (2) terrestrial denning habitat (3.0 percent), and (3) barrier island habitat (2.2 percent) (Exhibit 2-1). Unit 1, sea-ice habitat, runs from the mean high tide line to the 300-m depth contour and is limited to waters under U.S. jurisdiction. Unit 1 is used by the polar bear for feeding, breeding, denning, and movements that are essential for their conservation. Unit 2, terrestrial denning habitat, consists of land located along the northern coast of Alaska. Unit 3, barrier island habitat, includes the barrier islands themselves and associated spits, and the water, ice, and terrestrial habitat within one mile of the islands. Unit 3 is used for denning, refuge from human disturbance, and movements along the coast to access maternal den and optimal feeding habitat.

55. As described more fully in Chapter 1, this analysis relies on the best available data to estimate the incremental economic impacts of designating these units as critical habitat for the polar bear. This chapter begins with an overview of the proposed designation, including discussion of landownership and regional Alaska Native communities (Section 2.1). Section 2.2 describes the economic activities that may be conservation threats to the polar bear and its habitat within the proposed critical habitat area. This section also clarifies the activities that are not expected to be affected by critical habitat and are therefore not addressed in this report. Section 2.3 discusses the potential for critical habitat designation for the polar bear to result in incremental economic impacts. The chapter concludes with an overview of the remainder of this report.

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[35] 73 FR 28212.

[36] 73 FR 76249.

[37] 74 FR 56058.

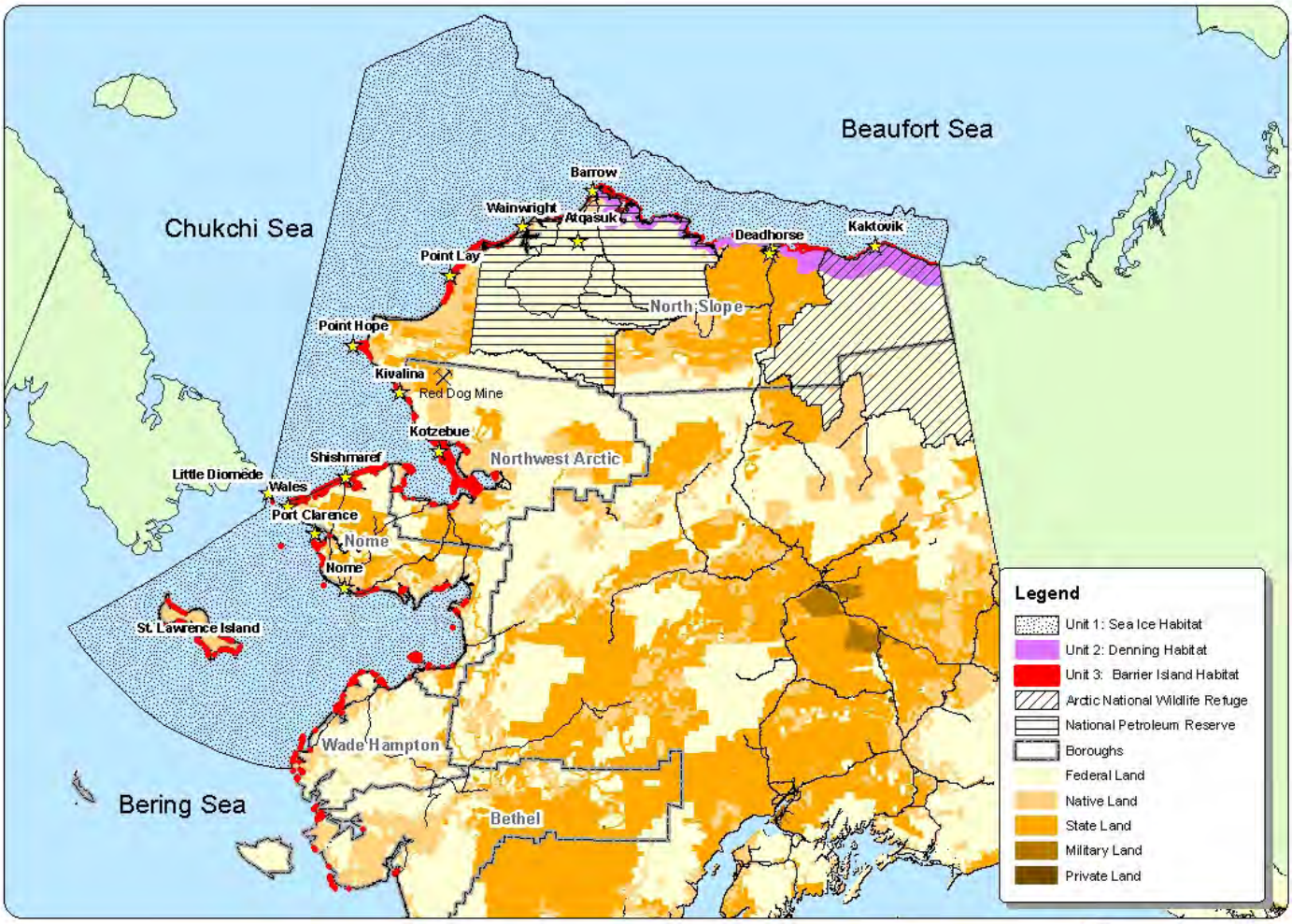
2.1 OVERVIEW OF PROPOSED CRITICAL HABITAT AREA

56. Polar bears occur throughout the ice-covered waters of the circumpolar Arctic. In the U.S., polar bears occur in Alaska, including adjacent Federal, State, and Territorial waters. These are the areas proposed by the Service as critical habitat for the polar bears. More than 99 percent of the proposed critical habitat is Federal or State-owned. Specifically, approximately 91 percent of the proposed critical habitat area occupies Federal lands and waters. Another 8.2 percent of the proposed habitat area is owned by the State of Alaska. The remaining 0.6 percent is private land owned by Alaska Natives (see Exhibits 2-1 and 2-2).

57. The vast majority (95 percent) of the proposed critical habitat is in the marine environment. Only five percent of the proposed critical habitat is terrestrial, and these areas are remote and support limited infrastructure. The waters of Unit 1 and barrier islands of Unit 3 are primarily within or adjacent to two boroughs within the State of Alaska: the North Slope Borough, the Northwest Arctic Borough, and one census area (Nome). Small portions of barrier island habitat also fall within the Wade Hampton Census Area and Bethel Census Area. The terrestrial denning habitat of Unit 2 is contained entirely within the North Slope Borough.

- **North Slope Borough.** This largest borough in Alaska encompasses 89,000 square miles in northern Alaska. The population of the entire area in 2008 was approximately 6,706 (averaging 0.07 people per square mile), approximately half of whom live in the City of Barrow. Approximately 70 percent of the borough's residents are Alaska Natives, primarily Iñupiat Eskimo. The population of this borough is growing at a rate of about one percent per year. The North Slope supports the majority of Alaska's oil production facilities (e.g., Prudhoe Bay). Because of the extent of oil and gas exploration and development in the borough, a number of non-resident workers are employed here. Outside of this industry, the area does not support much residential and commercial development. In 2008, only seven building permits were requested, all for single family residences, across the entire borough (of which proposed critical habitat accounts for about seven percent). Public spending on infrastructure is a component of economic activity in this borough. Subsistence activities play an important part in the region's economy and cultural tradition. Median family income in 2006 was approximately $78,400.

EXHIBIT 2-1 MAP OF PROPOSED CRITICAL HABITAT FOR THE POLAR BEAR



Source:
1. US Fish and Wildlife Service, Field Office
2. Environmental Systems Research Institute, Inc. (ESRI), Redlands, California, USA

EXHIBIT 2-2 SUMMARY OF LAND OWNERSHIP IN PROPOSED CRITICAL HABITAT

UNIT	LANDOWNERSHIP				
	FEDERAL (PERCENT)	STATE (PERCENT)	PRIVATE (PERCENT)	ALASKA NATIVE, PRIVATE (PERCENT)	TOTAL (SQ. MILES)
1: Sea-ice Habitat	92.1%	7.9%	0.0%	0.0%	179,314
2: Terrestrial Denning Habitat	74.0%	20.0%	0.0%	6.0%	5,668
3: Barrier Island Habitat	17.7%	64.2%	0.0%	18.1%	4,088
Total	**91.0%**	**8.2%**	**0.0%**	**0.6%**	**187,166**

Notes:
(1) The total acreage reported is less than the sum of the three units because Unit 3 slightly overlaps Units 1 and 2. Additionally, totals may not sum to 100 percent due to rounding error.
(2) State and Native selected lands were considered as Federal land.
Source: 74 FR 56058.

- **Northwest Arctic Borough.** The Northwest Arctic Borough is Alaska's second largest borough at approximately 36,000 square miles. Total population in 2008 was 7,407 (averaging 0.2 people per square mile), approximately 42 percent of whom live in Kotzebue. Selawik City (population 841) is the only other community with more than 500 residents. This borough's population is also growing at a rate of about one percent per year. There were no building permits requested across the entire borough in 2008. Approximately 81 percent of residents are Alaska Natives, a majority of which are Iñupiat Eskimo. Proposed critical habitat is proposed in about three percent of the total area of this borough. The Red Dog Mine, which is located in this borough but outside of the proposed critical habitat area, is the world's largest zinc concentrate producer. The mine accounts for 28 percent of total wages in the borough. Again, subsistence activities play an important economic and cultural role in the region. Public spending on infrastructure is also a component of economic activity in this borough. Median family income in 2006 was approximately $55,300.
- **Nome Census Area (Unorganized Borough).** The Nome Census Area encompasses 23,000 square miles, including St. Lawrence and Diomede Islands in the Bering Sea. Gold mining, the original industry of Nome, still provides some jobs. The population in 2008 was 9,499 (averaging 0.4 people per square mile). Approximately 76 percent of the population is Alaska Natives. The population is growing at approximately one percent per year. In 2008, only four building permits were requested, all for single family residences, across the entire borough (of which proposed critical habitat accounts for less than for percent). Major industries include transportation, trade, finance, and services, and tourism.

Communities on St. Lawrence and Diomede Islands rely primarily on subsistence harvesting of marine mammals and fish. Public spending on infrastructure is a component of economic activity. Median family income in 2006 was approximately $54,200.[38]

58. The Alaska Native Claim Settlement Act of 1971 (ANCSA) extinguished Native claims to land in exchange for 40 million acres of land, both surface and subsurface rights, and $962.5 million. Congress directed the creation of 12 Regional Corporations and approximately 220 Village Corporations to manage these assets.[39] Small portions of the proposed critical habitat fall inside the boundaries of the land owned by four Regional Corporations: the Arctic Slope Regional Corporation (ASRC), the Bering Straits Native Corporation, the Calista Regional Corporation, and the Northwest Arctic Native Association (NANA) Regional Corporation.

59. In providing land and mineral rights to Native Regional Corporations, one purpose of ANSCA was to provide Alaskan Natives with a means of economic independence. As such, the economic livelihood of these Corporations and the Native communities they support is inextricably tied to their use of the land and its natural resources, including oil, gas, and coal. The Regional Corporations manage these resources to provide economic opportunity and services to the local villages. The ASRC in particular has expressed concern that critical habitat designation for the polar bear on their lands may limit their access to these resources, resulting in job losses and diminished services to residents of the North Slope Borough.[40] The following discussion provides socioeconomic characteristics of the four Regional Corporations.

Socioeconomic Profile of the ANCSA Regional Corporations

60. Approximately 32 Alaskan communities located along the coast of the Beaufort Sea, the Chukchi Sea, and the Bering Sea occupy land in or near the proposed critical habitat for polar bears. A Native village is located in each of these communities; six of these Native villages belong to the ASRC, 16 to the Bering Straits Regional Corporation, six to the Calista Regional Corporation, and four to the NANA Regional Corporation. Exhibit 2-3 provides information on the populations of these Regional Corporations, along with statistics regarding labor force and income.

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[38] Alaska Department of Labor and Workforce Development, accessed at http://laborstats.alaska.gov/?PAGEID=67&SUBID=114 on February 3, 2010; and the U.S. Census Bureau, State and County QuickFacts, accessed at http://quickfacts.census.gov/qfd/states/ on February 3, 2010; and information provided by Scott Goldsmith, Institute of Social and Economic Research, University of Alaska, Anchorage, on March 2, 2010.

[39] 43 U.S.C. § 1606.

[40] Arctic Slope Regional Corporation and North Slope Borough letter to U.S. Fish and Wildlife Service. December 28, 2009. "Comments on Proposed Designation of Critical Habitat for the Polar Bears, 74 Fed. Reg. 56,058 (Oct. 29, 2009) [FWS-R7-ES-2009-0042]."

EXHIBIT 2-3 SOCIOECONOMICS INDICATORS OF ANCSA REGIONAL CORPORATIONS

ANCSA Regional Corporation	Total Population (2000)	Population in Labor Force and Unemployed (2000)	Population not in Labor Force (2000)	Median Household Income (1999)	Population below Poverty Line (1999)
Arctic Slope Alaska Native Regional Corporation					
Alaska Native	5,062	21.82%	21.91%	$51,667	11.09%
All Population	7,385	10.77%	18.38%	$63,173	9.06%
Bering Straits Alaska Native Regional Corporation					
Alaska Native	6,840	23.9%	30.48%	$30,317	21.97%
All Population	9,196	9.84%	26.44%	$41,250	17.43%
Calista Alaska Native Regional Corporation					
Alaska Native	19,468	20.8%	26.23%	$29,038	25.18%
All Population	23,034	10.51%	23.96%	$34,155	22.35%
NANA Alaska Native Regional Corporation					
Alaska Native	5,914	19.9%	26.02%	$36,648	19.17%
All Population	7,208	9.86%	23.00%	$45,976	17.37%
State of Alaska					
	626,932	8.56%	20.97%	51,571	9.40%

Source: (1) 2000 US Census; (2) Alaska Community Database from the State of Alaska Department of Commerce Division of Community and Regional Affairs

61. The unemployment rate in the four Regional Corporations is slightly higher than the state average of 8.56 percent. With respect specifically to the Alaska Native population of these Corporations, however, the unemployment rate is more than twice the state average. Employment opportunities in this region are very limited. Alaska Natives are generally employed by the villages, local schools, and local stores. Government services, including medical and Bureau of Land Management (BLM) firefighting services, also provide employment. The transport industry offers work in airports, and commercial shipping. Additionally, a few fish processing plants are located in Native communities. All four regional corporations have subsidiary companies that provide employment opportunities to Alaska Natives. These companies offer engineering and consulting services, civil construction, oil and gas support services, petroleum refining and distribution, aerospace engineering services, communications, venture capital management, tourism and facilities management. Their profits are redistributed in dividends to their Alaska Natives shareholders. These dividends represent an important source of income for some Alaskan Natives. The ASRC shareholder distribution is the greatest, with average shareholders received $5,712 in dividends in 2009.[41]

[41] Arctic Slope Regional Corporation website, http://www.asrc.com/_pdf/_press/ASRCFallDividend-2009.pdf and http://www.asrc.com/_pdf/_press/ASRCSpringDividend-2009.pdf.

62. While only four Regional Corporations own land overlapping proposed critical habitat, it is important to note that all 12 land-owning Alaska Native Regional Corporations have a stake in the production associated with these lands due to ANSCA Section 7(i) revenue sharing. The funds from this account benefit village corporations and shareholders.[42]

2.2 ECONOMIC ACTIVITIES CONSIDERED IN THIS ANALYSIS

63. This report considers activities that may adversely affect the polar bear and its habitat. Critical habitat designation is not, however, expected to affect the following activities and, as such, they are not subject to this analysis:

- **Climate Change Related Activities.** The Service describes reductions in sea ice due to climate change as a primary threat to the polar bear and its habitat. The Service states in the proposed rule, however, "While we recognize that climate change will negatively affect optimal sea-ice habitat for the polar bears, the underlying cause of climate change are complex global issues that are beyond the scope of the Act."[43] A detailed discussion of this conclusion is provided in the Service's Special Rule for the polar bear.[44] As such, this report does not include a discussion of issues related to climate change.
- **Alaska Native Subsistence Activities.** Subsistence harvest of polar bears is an economic and culturally significant activity for many Alaska Natives. Subsistence hunting is exempt under section 10(e) of the ESA, which allows for taking and importation of listed species if such taking is primarily for subsistence purposes. Subsistence hunting is also exempt under section 101(b) of the Marine Mammal Protection Act (MMPA), which allows for take of polar bears for subsistence harvest, and the creation and sale of authentic native articles of handicrafts or clothing by Alaska Natives. As subsistence activities are exempt from regulation under ESA and MMPA, these activities are not anticipated to be affected by the designation of critical habitat for the polar bears.
- **Field Research and Photography.** The unique character and natural beauty of the proposed critical habitat area are the subject of continuous scientific and artistic research, some of which is related to the polar bear. While the Service has provided guidelines to researchers for safety and to minimize the effects of their activities on the polar bears, these activities are generally not destructive of habitat and are not expected to be affected by critical habitat designation for the polar bears.

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[42] Letter from State of Alaska, Department of Fish and Game to U.S. Fish and Wildlife Service, "Additional Comments on the Proposed Designation of Critical Habitat for the Polar Bear (*Ursus maritimus*) in the United States," July 6, 2010.

[43] 74 FR 56070.

[44] 73 FR 76251.

Review of the proposed rule, the rule listing the species as threatened, existing management documents, the consultation history, and public comments received on the proposed rule identified the following economic activities as being potential conservation threats to the polar bear and its habitat.

- **Oil and gas exploration, development, and production:** Chapter 3 addresses oil and gas exploration, development, and production activities both onshore and offshore in the North Slope, as well as development of pipelines and other associated infrastructure.
- **Construction and development:** Chapter 4 addresses other construction and development projects, including residential and commercial development, road and other pubic utility construction projects, and gravel mining activities.
- **Commercial shipping and marine transportation:** Chapter 5 addresses Arctic shipping and transportation, especially use of the Northern Sea Route.
- Chapter 6 of this report includes information on military and Homeland Security operations, including U.S. Coast Guard safety and rescue activities.

64. The predominant risk factor associated with these activities are oil spills and potential pollution issues. Additionally, these activities may result in displacement of the bears or their prey. Chapters 3 through 6 of this report forecast the potential distribution of each of these activities across the proposed critical habitat area, and describe conservation measures that avoid or minimize their effect on the polar bears and their critical habitat.

2.3 EFFECTS OF CRITICAL HABITAT ON ECONOMIC ACTIVITIES

65. For each of the above activities, the Service has not been able to identify a case in which the consideration of adverse modification would change the polar bear conservation measures requested. That is, the Service does not expect to recommend any additional polar bear conservation following the critical habitat designation above and beyond what it may already recommend because of the status of the polar bear as a threatened species under the ESA.[45]

2.3.1 POTENTIAL DIRECT IMPACTS OF CRITICAL HABITAT DESIGNATION

66. To inform this economic analysis, the Service provided a memorandum describing their expected approach to conservation for the polar bear following critical habitat designation. Specifically, this memorandum provides information on how the Service intends to address projects that might lead to adverse modification of critical habitat as distinct from projects that pose jeopardy to the species. The Service's memorandum is provided as Appendix C of this report. In the memorandum, the Service states with regard to the MMPA and listing protections that,

[45] Fish and Wildlife Service, "Incremental Effects of Critical Habitat Designation for the Polar Bear," November 2, 2009 (see Appendix C).

> "on the basis of how conservation measures are being implemented for the polar bear under the MMPA and ESA, we do not expect that designation of critical habitat will result in additional significant conservation actions…"[46]

67. That is, given the high level of protection currently afforded the polar bear, the Service does not anticipate that the critical habitat designation will result in polar bear conservation measures above and beyond than those already required. The Service does note that, were critical habitat to be designated, consultation on individual development projects that have ongoing Federal discretion would have to be reinitiated. As a result, additional administrative costs associated with reinitiation of the consultation process are expected.

68. In regards to oil and gas activities, for example, the Service states that they are required, under section 7 of the Act, to re-initiate intra-Service consultation on existing incidental take regulations (ITRs) under MMPA that was completed following the listing of the polar bear to address the designation of critical habitat.[47] For Federally permitted activities that are not currently authorized under MMPA (i.e., where ITRs do not exist), the Service recommended a programmatic section 7 consultation. Specifically, the Service has suggested "a programmatic consultation with [the Department of Transportation (DOT)] on activities that may affect polar bears or their habitat resulting from commercial shipping."[48] Similarly, the Service recommends that they "work with the Coast Guard to help [them] expeditiously complete section 7 consultation to cover all Coast Guard actions in the area of the polar bear and other listed species in the Arctic. Programmatic approaches would be most efficient."[49] As the Service has indicated in their incremental effects memorandum, the designation of critical habitat is not expected to result in additional significant conservation measures. Therefore, the only incremental costs resulting from these consultations will be additional administrative costs related to addressing adverse modification of the critical habitat.

69. The Service does "not anticipate that critical habitat designation [will] result in more protective measures than those already required,"[50] due to the regulatory baseline: in particular, the existing ITRs covering oil and gas activities. This analysis therefore considers a future scenario in which the ITRs are not renewed and therefore do not direct polar bear conservation measures for oil and gas activities. If the Service is unable to

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[46] *Ibid*.

[47] Email communication from the Fish and Wildlife Service to the Office of Management and Budget, "ACOE Comments: Polar Bear CH," October 15, 2009.

[48] Email communication from the Fish and Wildlife Service to the Office of Management and Budget, "DOT Comments: DOI/FWS Proposed Rule: Polar Bear Critical Habitat," October 15, 2009.

[49] Email communication from the Fish and Wildlife Service to the Office of Management and Budget, "DHS Comments: DOI/FWS Proposed Rule: Polar Bear Critical Habitat," October 14, 2009.

[50] Fish and Wildlife Service, "Incremental Effects of Critical Habitat Designation for the Polar Bear," November 2, 2009 (see Appendix C).

determine that oil and gas activities have a "negligible impact" on the polar bear stocks, the ITRs would not be renewed. Section 7 consultation under the ESA would still be required, however, to ensure that these activities both avoid jeopardizing the continued existence of the species and destroying or adversely modifying critical habitat. In this case, the Service anticipates that the polar bear conservation measures currently being implemented under the ITRs would be recommended via section 7 consultation to avoid jeopardy to the species. This is because the threats associated with the activities all affect the bear's behavior. In addition, in order for reasonable and prudent alternative(s) to be made specifically to avoid adverse modification, the Service would need to determine that the critical habitat area could no longer provide the necessary functions to support the bear (e.g., areas for denning, feeding, and breeding). Because of the scale of the proposed critical habitat area, the Service does not foresee this occurring. For these reasons, in the case that the ITRs are not renewed, the Service anticipates that polar bear conservation measures would be recommended to avoid jeopardy to the species. In this scenario, as well, critical habitat is not expected to result in additional regulation and costs are limited to additional administrative costs of consultation. As the population and range of the species changes over time, however, which specific regulations may drive polar bear conservation becomes less certain.[51]

2.3.2 POTENTIAL INDIRECT IMPACTS OF CRITICAL HABITAT DESIGNATION

70. While the Service believes that critical habitat will not result in additional regulation, industry, landowners, Alaskan Native Regional Corporations, and other stakeholders are concerned that adverse economic impacts will occur. Specifically, communication with stakeholders and public comments received on the proposed rule and draft economic analysis indicate concern that critical habitat may be used in litigation to delay or stop oil and gas activities in the region. Such regulatory uncertainty could result in industry avoiding critical habitat, thereby reducing potential revenues to the State of Alaska and other landowners, such as the Native Regional Corporations who depend on access to their lands for employment and income.

71. Further, oil and gas development activities are the predominant economic activities in these remote regions of Alaska. The populations of these areas rely on the economic opportunities provided by the regional presence of the oil and gas industry. The regional population is approximately three-quarters Alaskan Natives who are already subject to higher unemployment and poverty rates than the state average (Exhibit 2-3). Thus, project delays or decreased levels of economic activity in the region may affect this already burdened community. The potential for critical habitat to result in these types of indirect impacts is discussed in more detail in Section 3.2.2 of this analysis.

[51] Personal communication with U.S. Fish and Wildlife Service, December 17, 2009.

2.4 ORGANIZATION OF THE REPORT

72. The remainder of this report proceeds in five additional chapters.

- Chapter 3 – Oil and Gas Exploration, Development, and Production
- Chapter 4 – Construction and Development
- Chapter 5 – Commercial Shipping and Marine Transportation
- Chapter 6 – Other Activities
- Chapter 7 – Economic Benefits

73. In addition, the report includes three appendices. Appendix A considers potential impacts on small entities and the energy industry. Appendix B provides information on the sensitivity of the economic impact estimates to alternative discount rate assumptions. Appendix C contains a memorandum developed by the Service describing potential regulatory changes associated with critical habitat designation for the polar bear.

CHAPTER 3 | OIL AND GAS EXPLORATION, DEVELOPMENT, AND PRODUCTION

74. Exploration, development, and production of oil and gas, as well as associated pipeline and infrastructure development, are the dominant economic activities occurring within the area proposed for polar bear critical habitat. These activities are the primary drivers of the economy of the North Slope of Alaska and important sources of income and employment for Alaska Natives. As such, this analysis focuses on describing the effects of polar bear conservation on these activities.

75. The proposed critical habitat rule notes that, historically, oil and gas activities have had a minimal impact on polar bears.[52] This is primarily due to the extent of existing regulations and policies covering these activities that require conservation measures to avoid impacts to polar bears; these regulations and policies will exist regardless of the designation of critical habitat. This chapter first describes the baseline conservation afforded the polar bear through existing regulations. It also provides information on the order-of-magnitude of potential costs to the oil and gas industry of complying with these baseline regulations. However, the focus of this chapter is on providing the U.S. Fish and Wildlife Service (Service) with information regarding potential incremental impacts of critical habitat designation, including a description of current oil and gas activity, illustrating its areal extent, and a possible scenario of oil and gas activity in this region thirty years into the future.

[52] 74 FR 56071.

KEY ISSUES AND CONCLUSIONS:

- Oil and gas development activities are subject to a substantial regulatory baseline, most significantly through Marine Mammal Protection Act Incidental Take Regulations (Section 3.1). The Service expects that conservation afforded the polar bear through these regulations minimizes the potential for adverse modification of critical habitat.
- In the case that these Incidental Take Regulations are not renewed in the future, the Service expects that polar bear conservation measures that would be recommended via section 7 consultation due to the listing (i.e., to avoid jeopardizing the continued existence of the species) would be sufficiently protective of critical habitat (would avoid destruction or adverse modification of critical habitat).
- As such, the Service can not foresee a scenario in which the designation of critical habitat would result in any additional polar bear conservation measures. Direct incremental impacts of critical habitat are therefore limited to administrative costs of consultation, totaling **$193,000 to $726,000** (present value at seven percent) over the next 30 years.
- Greater than 90 percent of the estimated oil and gas production potential of the State of Alaska is associated with development of the North Slope. The U.S. Minerals Management Service mean resource estimates in the Arctic Outer Continental Shelf (not limited to the proposed critical habitat area), including areas of the Beaufort, Chukchi and Hope Basin, amount to 23.75 billion barrels of undiscovered oil and 108.19 trillion cubic feet of undiscovered gas. Applying market price forecasts from the Energy Information Administration, the gross value of these resources is approximately $3 trillion.
- The potential for critical habitat to result in indirect impacts to oil and gas activities is a real concern to industry and stakeholders. For example, companies may perceive additional risk of operating within critical habitat regardless of whether the Service changes the way it regulates these activities. Third party lawsuits may argue for additional regulation in critical habitat, which in turn may cause project delays resulting in economic costs to oil and gas companies.
- In the case that regional oil and gas activities are delayed or reduced, regional economies and businesses that benefit economically from oil and gas industry operations may be affected (e.g., the State of Alaska, Alaska Native residents of the North Slope, and various Alaska Native Regional Corporations). While the potential for such indirect impacts to result from critical habitat designation is uncertain, this chapter details the concern of the oil and gas industry and offers examples of potential economic costs. Exhibits 3-4 and 3-5 provide information on the potential impacts of delays on oil and gas projects.
- This chapter provides the Service information on the potential scope and scale of future oil and gas development within the proposed critical habitat area. While this analysis does not anticipate direct economic costs of critical habitat designation to these activities (beyond administrative costs of section 7 consultation), this information offers the Service information regarding areas within the proposed critical habitat area that may be sensitive to any indirect impacts of designation.

3.1 BASELINE POLAR BEAR CONSERVATION

76. This section describes conservation measures currently being undertaken by the oil and gas industry in Alaska to avoid adversely affecting polar bears and their habitat under existing regulations. From the perspective of environmental permitting, development of petroleum resources on the Alaska North Slope requires input from numerous Federal, state, and local government agencies. In many cases, these agencies have regulatory authority over certain aspects of oil and gas exploration and development (e.g., Minerals Management Service [MMS], Bureau of Land Management [BLM], Alaska Department of Natural Resources [ADNR], Alaska Oil and Gas Commission [AOGCC]), while in other cases agencies serve in an advisory capacity (Alaska Coastal Management Program [ACMP]). In recent years, petroleum resource development has expanded from state-owned lands to lands and waters administered by agencies of the Federal government,

resulting in the involvement of additional agencies such as the BLM and MMS. As such, these activities are subject to a strong baseline of polar bear conservation due to the existence of multiple regulations and guidelines regarding conservation of species and habitats.

- **Marine Mammal Protection Act.** Section 101(a)(5) of the Marine Mammal Protection Act (MMPA) allows for the incidental take of a small number of marine mammals for a specific activity in a specific geographic region. If the Service determines that total taking from the specified activity will have a "negligible impact" on the species or stock, specific regulations, called Incidental Take Regulations (ITRs) may be issued that establish permissible methods of taking to avoid or minimize adverse effects of the activity on the species. Once the ITRs are established, the Service issues individual Letters of Authorization (LOAs) for specific projects under the activity. Since 1991, the oil and gas industry in Alaska has sought and obtained MMPA authorization for non-lethal take of small numbers of polar bears. Specifically, the Service issued ITRs for the polar bears for oil and gas activities in the Chukchi Sea for the 12 periods from 1991 through 1996 and 2007 through 2012.[53] Between 1996 and 2007 there was a relative lack of interest in exploring the Chukchi Sea area and so ITRs were not requested. This is likely because early discoveries did not merit further effort given oil prices and other available opportunities during this period. For oil and gas activities in the Beaufort Sea, ITRs have been issued from 1993 to the present.[54]

  The ITRs are reviewed for renewal on a five year schedule. Following the listing of polar bear under the Endangered Species Act (ESA), the Service conducted programmatic consultations on the MMPA ITRs for the Beaufort and Chukchi Seas and determined that oil and gas activities conducted according to the ITR/LOA process were not likely to jeopardize the continued existence of the polar bear.[55] The Service also determined that the LOA process provides sufficient protection for the polar bear to serve as adequate consultation under the ESA. Accordingly, a company has met its obligations under the ESA listing of the polar bear as long as they obtain and follow the requirements of an LOA.

- **State of Alaska Permits**. Lessees must obtain approval of a detailed plan of operations from the Director of the ADNR Division of Oil and Gas before conducting exploration, development, or production activities. A plan of operations identifies the sites for planned activities and the specific measures,

[53] 16 56 FR 27443, June 14, 1991; and 73 FR 33212, June 11, 2008.

[54] 58 FR 60402, November 16, 1993; 60 FR 42805, August 17, 1995; 64 FR 4328, January 28, 1999; 65 FR 5275, February 3, 2000; 65 FR 16828, March 30, 2000; 68 FR 66744, November 28, 2003; and 71 FR 43926, August 2, 2006.

[55] U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office. Programmatic Biological Opinion for Polar Bears (*Ursus maritimus*) on Beaufort Sea Incidental Take Regulations. June 23, 2008; and U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office. Programmatic Biological Opinion for Polar Bears (*Ursus maritimus*) on Chukchi Sea Incidental Take Regulations. June 3, 2008.

design criteria, construction methods, and operational standards to be employed to comply with environmental restrictions. To mitigate the potential adverse social and environmental effects of specific lease-related activities, the Division of Oil and Gas developed mitigation measures and will condition plans of operation, exploration, or development and other permits based on the mitigation measures. In its 2009 Best Interest Finding on the Beaufort Sea Areawide Oil and Gas Development, the ADNR described that lessees are required to prepare and implement a human-bear interaction plan, which should include measures to minimize attraction of bears to facility sites, provide for proper disposal of toxic materials, document and communicate bear sightings, educate employees, and consult with the Service to determine locations of known polar bear dens. In addition, operations must avoid known dens by one mile and report any new dens.[56]

- **Minerals Management Service lease sales.** MMS has responsibility for oil and gas activities on the Outer Continental Shelf (OCS), including selling leases for these activities in the Beaufort and Chukchi Sea Program Areas. MMS developed an Environmental Impact Statement (EIS) under the National Environmental Policy Act (NEPA), and participated in Section 7 consultation with the Service regarding these lease sales.[57] In that consultation, the Service concluded that, as long as activities obtain and follow the requirements of a LOA under the existing ITRs, these actions would not jeopardize the continued existence of the polar bear.
- **Bureau of Land Management NPR-A management.** In the Final Integrated Activity Plans for each planning area, the BLM describes the multi-use management of the Northwest National Petroleum Reserve-Alaska (NPR-A). The activity plans describe operating procedures regarding polar bears, including development of polar bear interaction plans, minimizing attraction of polar bears to project sites, educating personnel, proper storage of toxics, monitoring and reporting of polar bear sightings, and prohibiting cross-country use of heavy equipment and seismic activities within one mile of known or observed polar bear dens.[58]

77. Each of these programs directs the oil and gas industry and other stakeholders regarding the incorporation of polar bear conservation in their activity planning. These existing regulations and programs, therefore, provide baseline protection to the polar bears and are expected to continue to provide this level of protection regardless of whether critical habitat is ultimately designated. Specifically, this analysis anticipates that the oil and gas

[56]Alaska Department of Natural Resources, Division of Oil and Gas. Beaufort Sea Areawide Oil and Gas Lease Sale: Final Finding of the Director. November 9, 2009.

[57]U.S. Fish and Wildlife Service consultation with the Minerals Management Service. Final Biological Opinion for Beaufort and Chukchi Sea Program Area Lease Sales and Associated Seismic Surveys and Exploratory Drilling. September 3, 2009.

[58]U.S. Department of the Interior, Bureau of Land Management and Minerals Management Service. Northwest National Petroleum Reserve-Alaska: Final Integrated Activity Plan/Environmental Impact Statement. November 2003.

industry will continue to implement the following conservation measures to comply with existing regulations with or without the designation of polar bear critical habitat:

1. Develop applications for LOAs, monitoring, recordkeeping, and reporting activities conducted during oil and gas operations
2. Develop polar bear interaction plans, and coordination with Alaska Natives to minimize effects of operations on subsistence hunting;
3. Minimize attraction of bears to facility sites, including garbage and good waste;
4. Organize layout of buildings and work areas to minimize interactions between humans and bears, such as including the use of electric fencing;
5. Warn personnel of bears near or on facilities and the proper actions to take;
6. If authorized, deter bears from the drill site;
7. Provide contingencies in the event bears do not leave the site;
8. Provide for proper storage and disposal of materials that may be toxic to bears;
9. Document and communicate the sighting of bears onsite or in the immediate area to all shift employees;
10. Before commencement of any activities, lessees shall consult with the Service to identify locations of known polar bear den sites
11. Operations must avoid known polar bear dens by one mile.[59]

78. Through past section 7 consultations regarding the polar bear, the Service has reviewed and learned from a number of offshore oil development projects in the Beaufort Sea region including Northstar and Liberty development projects. In all cases, the Service concluded the proposed projects, as managed according to the existing ITRs, were not likely to jeopardize the continued existence of the polar bear. The Service came to similar conclusions in the NPR-A Integrated Activity Plan. As a result, following conservation for polar bears outlined in these ITRs, oil and gas exploration and development projects have regularly occurred in polar bear habitat in arctic Alaska.[60]

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[59] List is from Alaska Department of Natural Resources, Division of Oil and Gas. Beaufort Sea Areawide Oil and Gas Lease Sale: Final Finding of the Director. November 9, 2009. Similar lists of conservation actions are provided in the existing ITRs and past Biological Opinions.

[60] U.S. Fish and Wildlife Service, June 3, 2008, Programmatic Biological Opinion for Polar Bears (*Ursus maritimus*) on Chukchi Sea Incidental Take Regulations; U.S. Fish and Wildlife Service, June 23, 2008, Programmatic Biological Opinion for Polar Bears (*Ursus maritimus*) on Beaufort Sea Incidental Take Regulations; U.S. Fish and Wildlife Service, May 2008, Final Programmatic Biological Opinion for the Bureau of Land Management Summer Activities in 2008 in Undeveloped Areas of the National Petroleum Reserve-Alaska; U.S. Fish and Wildlife Service, September 2009, Final Biological Opinion for Beaufort and Chukchi Sea Program Area Lease Sales and Associated Seismic Surveys and Exploratory Drilling; U.S. Fish and Wildlife Service, September 2009, Final Amended Biological Opinion for BP Exploration (Alaska) Inc.'s Northstar and Liberty Development Projects.

79. As described above, in order to operate in the areas that fall under the existing ITRs, oil and gas interests must first request and receive a LOA issued by the Service. For activities with a strong likelihood of bear encounters, applicants may also request and receive a letter of "Authorization to Take, by Harassment, Polar Bears", the purpose of which is to lay out the specific means by which the operator can discourage bears from lingering around work sites and protect workers in the event of a bear encounter. Broadly defined, a "take" is essentially any encounter with a polar bear in which the bear becomes aware of the person. Both LOAs and hazing/harassment letters contain detailed descriptions of what the authorization entails, and what steps the holder must follow to be in compliance.

80. Exhibit 3-1 lists the oil and gas companies that have received incidental take LOAs from Service since 2006.[61] This list represents the oil and gas industry stakeholders that have borne administrative costs of compliance with existing polar bear regulations, as well as the costs of compliance with the conservation measures described above to avoid impacts to polar bears. As these companies are expected to continue to be the primary players in the regional oil and gas industry, this analysis anticipates that this list represents those that will bear future baseline costs of polar bear conservation.

81. Northern Economics, Incorporated (NEI) contacted oil companies on this list in order to estimate costs of compliance with the baseline polar bear conservation requirements described above. One company responded with quantitative information, indicating that MMPA compliance costs have ranged from $10 million in 2007 to $1 million in 2009 (an average of $4.3 million per year for three years).[62] These costs were related to marine mammal observers during drilling, seismic surveys, and data gathering activities. The firm also indicated that the estimates above do not include costs of $2.2 million per year for aerial surveys conducted in 2007 and 2008 that were related to complying with an Incidental Harassment Authorization permit for marine mammals, which included polar bears but which was not specific to polar bears. These costs of marine mammal observers and surveys are not solely related to polar bear conservation, but conservation of marine mammals in general. While impacts incurred to comply with baseline polar bear conservation regulations vary by company depending on their levels of activity, these costs provide a sense of the potential order of magnitude of costs of compliance with MMPA.

[61] U.S. Fish and Wildlife Service; Marine Mammals Management; Incidental Take Regulation. Accessed on December 14, 2009 at http://alaska.fws.gov/fisheries/mmm/itr.htm.

[62] This company requested not to be identified.

EXHIBIT 3-1 OIL AND GAS RELATED COMPANIES THAT HAVE RECEIVED INCIDENTAL TAKE LETTERS OF AUTHORIZATION SINCE 2006

COMPANY	2006	2007	2008	2009	ALL LOAS
Alyeska				1	1
Anadarko	1	2		1	4
ASRC Energy Services	1		1		2
BP Exploration	1	1	2	3	7
Brooks Range Petroleum Corp.	1	2	1	3	7
Conoco Phillips	8	1	3	4	16
Denali Pipeline			1		1
ENI			1	1	2
ExxonMobil			1	1	2
FEX	1				1
Kerr McGeee	1				1
Marsh Creek				2	2
Petroleum Geo-Services Onshore			1		1
Pioneer Natural Resources	1	1	1		3
Savant	1	1		1	3
Shell	1	3	4	3	11
Ukpeagvik Inupiat Corp. (UIC)	1	1			2
Ultra Star				1	1
Veritas	1		1	2	4
All LOA's	**19**	**12**	**17**	**23**	**71**

Source: U.S. Fish and Wildlife Service: 71 FR 78220; 73 FR 61158; 74 FR 64710.

82. Since 2006, there have been several news articles related to activities and mitigation measures undertaken by oil companies and their contractors operating on Alaska's North Slope to comply with polar bear LOAs issued by the Service. While the information in these news articles does not provide a comprehensive listing of the costs incurred by oil and gas companies in avoiding polar bears and mitigation, it does provide additional perspective on the potential magnitude of the costs and the level of commitment of the companies in complying with the regulations.

83. In December 2009, Petroleum News reported that ExxonMobil rerouted an ice road servicing its Point Thomson project to avoid a polar bear den. Specifically, "a nine-mile bypass had to be built when a denning polar bear was discovered. It cost an additional $10 million to build the bypass to maintain a one-mile radius distance from the bear."[63]

[63] Nelson, Kristen, "Logistics key to Point Thomson Project." Petroleum News. Vol. 14, No. 49. December 06, 2009. Access on the Internet at http://www.petroleumnews.com/pnads/401509928.shtml, on January 8, 2010.

An additional news story from October 2008 summarized the information and training of employees and contract workers, the use of infrared sensing equipment to detect polar bear dens, and the actions that are taken in the event a polar bear is sighted. Specifically, BP provides information and training for its personnel and contractors and has produced a guide to the various North Slope animals, with information about what to do in the event of an animal encounter. As part of the wildlife training for BP employees and contractors working on the North Slope, BP provides bear hazing training for environmental and security personnel. All work on the North Slope is done under the terms of LOAs from the Service and requires a polar bear interaction plan.[64]

84. In compliance with the baseline regulations, BP does not allow activities within one mile of a bear den. To avoid operating within that one mile limit, BP conducts a survey for bear dens prior to any North Slope activity such as a seismic survey or ice road construction. The survey covers the area where the activity will take place plus a one mile buffer zone. Once a potential bear den habitat has been mapped, BP flies an aircraft around a route that traverses possible den locations. An infrared remote sensor mounted on the aircraft enables observers to spot the warmth from bears occupying dens. Although the surveys cannot guarantee to find every bear den, it is very unusual to encounter a den unexpectedly once a project on the ground has started. However, if a den were to be encountered during an operation such as ice road construction, all activities have to cease. At that point the BP environmental studies team would work with the Service to decide on an appropriate action. Actions could involve relocating the operation or stopping the operation altogether. Though the aerial infrared surveys have proved successful in predetermining where dens are located, BP is funding some research into the relative effectiveness of other detection techniques, such as the use of handheld infrared detectors on the ground.

3.2 INCREMENTAL IMPACTS OF CRITICAL HABITAT DESIGNATION FOR POLAR BEAR

85. This section provides a summary of the additional costs that oil and gas stakeholders (private companies and regulatory agencies) operating on the Alaska's North Slope may incur if critical habitat for polar bears is formally designated. These incremental costs are above and beyond the costs they already incur in complying with Service LOAs issued under the MMPA, as described above.

3.2.1 DIRECT INCREMENTAL COSTS OF SECTION 7 CONSULTATION

86. As noted above, the Service has considered polar bear conservation required under the MMPA to minimize the take of polar bears sufficiently protective of the polar bears to avoid jeopardizing the continued existence of the species (as required by the ESA). Specifically, the Service states,

> "Under section 7 of the ESA, the Service has completed programmatic biological opinions on effects to the polar bear of existing ITRs for year-

[64] Bailey, Alan. Watching for polar bears on North Slope. Petroleum News. Vol. 13, No. 40. October 5, 2008. Access from the internet on January 8, 2010 at http://www.petroleumnews.com/pnads/838279608.shtml.

> round oil and gas exploration, development, and production activities in the Beaufort Sea and adjacent northern coast of Alaska, as well as for proposed ITRs for year-round oil and gas exploration activities in the Chukchi Sea and adjacent western coast of Alaska. We determined that the ITRs would not jeopardize the species, because of the conservation measures that are required under the MMPA to minimize take of polar bears. No additional conservation measures were identified during the ESA consultation process."[65]

87. Furthermore, the Service believes that the more stringent requirements of the MMPA will result in a lack of incremental conservation measures for oil and gas activities following critical habitat designation as follows:

> "At this time, on the basis of how conservation measures are being implemented for the polar bear under the MMPA and ESA, we do not expect that designation of critical habitat will result in additional significant conservation actions for the categories described above."[66]

88. This analysis considers two possible scenarios to in identifying potential direct incremental impacts of critical habitat designation. The first assumes that the MMPA ITRs are continually renewed. That is, it assumes that the Service is able to determine that oil and gas activities operating according to the ITRs result in a negligible impact on the species or stock. In the case that the ITRs are renewed, the conservation measures described above are undertaken due to the MMPA and are therefore considered part of the baseline of this analysis.

89. An alternative scenario considers the possibility that the Service is unable to determine that oil and gas activities have a negligible impact on the species or stock, and therefore the ITRs are not renewed. Under this scenario, the Service believes that the polar bear conservation measures described above would be recommended via section 7 consultation on the listing to avoid jeopardizing the continued existence of the species. The Service is unable to envision a scenario in which the designation of critical habitat, and not the listing of the species, results in recommendations for additional conservation. Thus, this scenario as well indicates that polar bear habitat conservation is accomplished in the baseline, regardless of critical habitat designation.

90. The direct incremental impacts of the critical habitat designation are therefore limited to the administrative costs of conducting section 7 consultation (new and reinitiated). The level of effort for these section 7 consultation costs will vary depending on the specifics of the activity related to oil and gas exploration, development and production. This analysis forecasts that the following consultations will occur on oil and gas activities considering polar bear critical habitat over the next 30 years (2010-2039). While oil and gas activities will continue past 2039, this time frame captures the peak level of activity

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[65] Fish and Wildlife Service, "Incremental Effects of Critical Habitat Designation for the Polar Bear," November 2, 2009 (see Appendix A).

[66] *Ibid*.

in the Beaufort Sea and Chukchi Sea. The oil and gas development scenarios are described more fully in Exhibit 3-11. Of note, while the forecast number and type of consultations relies on the best available information, the scope and scale of oil and gas activities in the future is highly uncertain and, thus, the forecast frequency of consultation in likewise uncertain.

- **Review of the Chukchi Sea ITRs:** Programmatic consultation is expected for review and renewal of the ITRs every five years; the first of these consultations is expected with the existing ITR regulatory duration ends in 2012. Costs of these consultations are assigned to Unit 1 in the Chukchi Sea, although some activities may occur within Units 2 and 3.
- **Review of the Beaufort Sea ITRs:** Programmatic consultation is expected for review and renewal of the ITRs every five years; the first of these consultations is expected with the existing ITR regulatory duration ends in 2011. Costs of these consultations are assigned to Unit 1 in the Beaufort Sea, although some activities may occur within Units 2 and 3.
- **Development of natural gas pipeline:** Programmatic consultation is expected to occur on this project, which is forecast to be developed by 2019. The consultation is assumed to occur in 2015 for the purposes of estimating impacts. As this project potentially spans all units proposed for critical habitat, costs of this consultation are assigned to "Multiple Units" category in Exhibit 3-2.
- **Development of an oil pipeline across the NPR-A:** Programmatic consultation is expected to occur on a pipeline across the NPR-A to tie into the existing Trans Alaska Pipeline System (TAPS). This project is expected to be developed by 2029. The consultation is assumed to occur in 2025 for the purposes of estimating impacts. As this project potentially spans more than one unit proposed for critical habitat, costs of this consultation are assigned to "Multiple Units" category in Exhibit 3-2.
- **MMS five-year program lease sales:** Programmatic consultation is expected for MMS five year program lease sales every five years beginning in 2013. As these consultations potentially spans more than one unit proposed for critical habitat, costs of this consultation are assigned to "Multiple Units" category in Exhibit 3-2.
- **Oil and gas field developments:** This analysis assumes the Service will engage in formal consultation for new developments that are covered by the ITRs and programmatic consultation for new developments not currently covered by the ITRs. Specific developments forecast over the timeframe of this analysis covered by the ITRs are: Point Thomson oil fields (multiple units, 2011); Sourdough prospect development (Unit 2, 2022); Cape Simpson onshore oil development (multiple units, 2027); and Cape Simpson nearshore oil development (multiple units, 2029). New development for Point Lay area onshore gas development and pipeline (Unit 3, 2039) is expected to be subject to programmatic consultation.

- **Beaufort platform and seabed pipeline projects:** Formal consultation is associated with these infrastructure projects. Seven separate project are forecast (in 2019, 2021, 2022, 2024, 2026, 2027, and 2029). Costs of these consultations are assigned to Unit 1 in the Beaufort Sea.
- **Chukchi platform and seabed pipeline projects:** Formal consultation is associated with these infrastructure developments. Four separate projects are forecast (in 2022, 2024, 2031, and 2038). Costs of these consultations are assigned to Unit 1 in the Chukchi Sea.
- **BLM Integrated Activity Plan for the NPR-A**: This analysis assumes BLM renews its Integrated Activity Plan in 15 year increments (in 2020 and again in 2035), resulting in programmatic consultation each time. As this project potentially spans more than one unit proposed for critical habitat, costs of this consultation are assigned to "Multiple Units" category in Exhibit 3-2.
- **Onshore gas pipeline from Chukchi to the Alaska Gas Pipeline:** Programmatic consultation is anticipated in approximately 2038 for an onshore gas pipeline from the Chukchi Sea to the Alaska Gas Pipeline. As this project potentially spans more than one unit proposed for critical habitat, costs of this consultation are assigned to "Multiple Units" category in Exhibit 3-2.

91. Employing the model of administrative costs of consultation for the polar bear provided in Chapter 1 (Exhibit 1-2), this analysis estimates administrative effort specifically associated with considering critical habitat during formal consultation will be about $5,600 to $42,000 per consultation. Administrative costs to consider adverse modification as part of a programmatic consultation are estimated to be approximately $17,000 to $54,000. Importantly, this is not reflective of the full administrative cost of the consultation, only that time spent specifically considering potential adverse modification of critical habitat associated with the ITRs. As a result, total direct incremental impacts are forecast to be $193,000 to $726,000 over the next 30 years (present value assuming a seven percent discount rate), or an annualized cost of $15,600 to $58,500. Exhibit 3-2 describes the estimated costs by proposed critical habitat unit.

EXHIBIT 3-2 ESTIMATED INCREMENTAL IMPACTS TO OIL AND GAS ACTIVITIES (2010-2039)

PROPOSED UNIT	7% DISCOUNT RATE	
	PRESENT VALUE IMPACTS	ANNUALIZED IMPACTS
Unit 1. Beaufort Sea Portion	$60,200 - $252,000	$4,850 - $20,300
Unit 1. Chukchi Sea Portion	$49,100 - $180,000	$3,960 - $14,500
Unit 1. Bering Sea Portion	$0	$0
Unit 2. Terrestrial Denning Habitat	$2,310 - $17,500	$186 - $1,410
Unit 3. Barrier Island Habitat	$2,280 - $7,090	$184 - $572
Multiple Units*	$79,100 - $269,000	$6,380 - $21,700
Total Impacts	**$193,000 - $726,000**	**$15,600 - $58,500**

1. Impact estimates reflect a 30-year time horizon.
2. Estimates are rounded to three significant digits and may not sum to totals reported due to rounding.

* Multiple forecast oil and gas consultations cover projects or activities that span multiple units of critical habitat. Absent reliable information regarding how these costs may be distributed across the units, costs of these consultations are grouped in a separate category, "Multiple Units." Where reasonable, this analysis makes simplifying assumptions regarding the unit most relevant to a potential consultation. For example, review of the Chukchi Sea ITRs is expected to affect Unit 1 in the Chukchi Sea for the purposes of reporting impacts. However, this consultation may in fact include some activities in adjacent terrestrial denning and barrier island habitat areas.

3.2.2 POTENTIAL INDIRECT INCREMENTAL IMPACTS OF CRITICAL HABITAT DESIGNATION

92. While the Service believes that critical habitat will not result in additional conservation measures for the polar bear, concern exists on the part of the regulated community, landowners, Alaska Native communities, and other stakeholders that unforeseen adverse effects will occur, regardless of the position taken by the Service. Such impacts are referred to as "indirect" impacts as they represent potential unintended consequences of the regulation. The information contained in this section derives from both discussions with industry and regulatory agencies, as well as from information gleaned from the Federal Register public comment process on the proposed rule to designate critical habitat for the polar bear and on the draft version of this economic analysis.[67] Specifically, communication with stakeholders and public comments received on the proposed rule and draft economic analysis indicate concern that critical habitat:

- May be used in litigation to further delay lease sales and projects.

[67] FWS-R7-ES-2009-0042.

- Could result in industry avoiding critical habitat, thereby reducing potential revenues to the State of Alaska and other landowners, such as the Arctic Slope Regional Corporation (ASRC).
- Will result in additional costs to avoid high use critical habitat areas rather than specific denning sites.
- Will increase regulatory uncertainty and increase the length of time for the Service to review projects because there will now be three parallel tracks that must be addressed (MMPA, ESA jeopardy standard, and ESA adverse modification standard) rather than two.
- Could result in adverse publicity (stigma effects) if environmental groups estimate and report the extent of oil and gas activities occurring in critical habitat areas.

Industry Concerns Regarding Potential Critical Habitat Effects[68]

93. The indirect incremental costs to the oil and gas industry that may result from such effects are highly uncertain. In particular, oil and gas companies are concerned that threatened and actual litigation will delay and impede oil and gas activities. These potential delays may increase costs, and would be likely to result in less exploration and less development and production of domestic oil and gas resources in these areas.

94. Some industry representatives anticipate that the critical habitat designation will impact future economic activities on the North Slope. North Slope natural resources compete on a worldwide market. Given the already difficult climate and access to this region, additional economic burden on the North Slope increases costs and thus reduces the competitive position of its products.

95. In addition, one industry representative states that if development of hydrocarbon discoveries is prevented due to a polar bear critical habitat designation, they might lose leases and lease bonuses paid and sunk costs from past MMPA compliance related to seismic, drilling, studies and data gathering year-end through 2009. The company estimates these costs to be in the range of $3 billion to $3.2 billion.[69] If oil and gas development does proceed, but a planned new pipeline route is modified due to the polar bear critical habitat designation, the incremental cost of habitat designation could be in the range of $30 million to $800 million.

96. A second major area of concern for the oil and gas industry is the fear of negative effects of critical habitat designation on investment and development. Stakeholders indicate that the "chilling" or "stigma" effect of critical habitat designation might cause investors to

[68] Unless otherwise cited, the cost information described in this section stems from interviews with one oil and gas company operating in the region. This company, however, wishes not to be specifically cited.

[69] This cost information was communicated via interview with one oil and gas company operating in the region. The U.S. Minerals Management Service (MMS) documented $2.6 billion in Chukchi Sea leases, not including additional sunk costs included by the oil and gas company interviewed in the $3.2 billion estimate (http://www.mms.gov/alaska/latenews/newsrel/News%20Releases%202008/News%20Release%20-%20193%20results%20_2_.pdf).

opt out of activities out of concern for regulatory or litigation burdens and the cumulative impact of multiple ESA actions in the same location. It is the experience of some stakeholders that ESA listings and critical habitat designations adversely impact investment and commercial transactions. For example, ASRC's Western Arctic Coal fields abut the off-shore area that was designated by the Service in 2001 as critical habitat for the Steller's and Spectacled eider species. While economic considerations outside of polar bear critical habitat have complicated the development of this coal field, the ASRC asserts that the potential burden of critical habitat designation for the eiders on development and transportation of coal resources was central to discussions between ASRC and potential business partners regarding capacity to bring this coal to market.[70]

97. Concern exists that activities in critical habitat will be subject to greater scrutiny, including third-party lawsuits or citizen suit claims focusing on imposition of additional regulatory controls. Even if such suits are not successful, stakeholders fear project delays may result from these litigations and discourage investment in projects that involve critical habitat.

98. Historical precedent exists for third-party lawsuits to effect how the ESA has been implemented for other species. Steller sea lion critical habitat, for example, was designated in 1993, with little anticipated impact to commercial fisheries. The Bering Sea and Aleutian and Gulf of Alaska Pollock fisheries continued through 1998. In 1998, however, the National Marine Fisheries Service (NMFS) issued a biological opinion that found that the pollock fisheries were "likely to jeopardize the continued existence of the western population of Steller sea lions and adversely modify its critical habitat."[71] There followed several years of litigation and emergency orders, resulting in fisheries closures in Steller sea lion critical habitat.[72] It is unclear whether the same result would have occurred absent critical habitat designation for the Steller sea lion. NMFS is expected to release a new biological opinion in 2010; the specific conservation measures it will describe, and whether the pollock fisheries may re-open, are not known.

99. Finally, industry and other stakeholders are concerned that negative economic impacts of the proposed critical habitat designation may also result from the cumulative impact of multiple ESA actions in the same geographic location. The oil and gas industry is concerned that the North Slope is being painted as "off limits" for future development due to multiple species listings and critical habitats. The State of Alaska estimates, assuming taxes stay at current rates, that the State will lose roughly $14 in revenue per barrel of oil left in the ground as a result of the designation.[73]

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[70] Arctic Slope Regional Corporation and North Slope Borough, December 28, 2009, Comments on Proposed Designation of Critical Habitat for the Polar Bears, 74 Fed. Reg. 56,058 (Oct. 29, 2009) [FWS-R7-ES-2009-0042].

[71] NMFS Alaska Region. 1998. "ESA Section 7 Consultation - Biological Opinion: Authorization of BSAI Atka mackerel, and BSAI and GOA walleye pollock fisheries under the FMP between 1999 - 2002." December 3, 1998.

[72] NMFS Alaska Region. 2001. "Final SEIS for Steller Sea Lion Protection Measures." November 23, 2001.

[73] Letter from State of Alaska, Department of Fish and Game, to U.S. Fish and Wildlife Service, "Additional Comments on the Proposed Designation of Critical Habitat for the Polar Bear (*Ursus maritimum*) in the United States," July 6, 2010.

100. One firm interviewed during the development of this analysis indicated that their comments on additional costs resulting from designation of critical habitat for polar bears would generally mirror the comments developed in 2000 for British Petroleum and Phillips Petroleum by Dr. Scott Goldsmith related to the proposed designation of critical habitat for Spectacled and Steller's eiders.[74] That same company later provided a letter to NEI explicitly stating their concerns. Both Dr. Goldsmith's comment regarding critical habitat for the eiders and this company's letter regarding critical habitat for the polar bears identify several categories of potential costs associated with critical habitat designation. In addition to expecting additional administrative effort following critical habitat designation (e.g., more time dedicated to conducting studies and presenting information to the service to show that activities do not impact polar bear habitat), the company's letter describes the following potential impacts of critical habitat designation for the polar bears in Alaska:

- **Uncertainty.** Critical habitat adds an element of uncertainty to the determination of the cost of a project. This is because it is often not possible to know what the effects of critical habitat designation will be *a priori*. Although the Service position today may be that critical habitat will not impose additional costs on projects, that position might change in the future given new information, or changes might be forced upon the agency by the courts or other agents not under the control of the Service. Because of this uncertainty regarding future events and their effect on project costs, a risk premium must be added to project cost. The effect of this risk premium is to reduce the expected profitability of potential projects.
- **Loss of Production.** Risk of delay and uncertainty can affect project economics to the extent that the project is abandoned or down-scaled. The result is a loss of production that has two potential types of cost—loss of producer surplus and underutilization of productive inputs, primarily labor and capital.
- **Project slippage.** If the schedule for the development of a project slips as a result of a section 7 consultation, uncertainty regarding critical habitat, or a lawsuit, types of costs may result. First, the value of a project is maximized if its benefits are realized as soon as possible and its costs are postponed as long as possible. Any change in schedule that results in benefits being postponed or costs incurred sooner than necessary will reduce the present value of the project. Second, slippage can result in additional logistical costs that would not have been necessary if the project had progressed according to its anticipated schedule. Examples of logistical costs include the extra expense of warehousing supplies the use of which is delayed, or the expense of doing tasks simultaneously that would logically occur sequentially.

[74] Goldsmith, Scott. "A Preliminary Investigation of the Economic Effects of Critical Habitat Designation for the Spectacled Eider and Steller's Eider on Alaska's North Slope." Prepared for BP Exploration (Alaska) Inc. and Phillips Alaska, Inc. September 20, 2000. Accessed on the Internet on January 9, 2010 at http://www.iser.uaa.alaska.edu/Publications/steller_eider.pdf.

- **Litigation fees.** The company expects to incur litigation defense costs even in the case that projects are approved to move forward within the critical habitat area. For example, litigation costs may be associated with defending against challenges brought against the Service for approving exploration and development projects within critical habitat for the polar bears, similar to the Steller sea lion example above.
- **Post lease monitoring.** The company states that additional monitoring of polar bear to document use patterns of the habitat, and condition of habitat, may result in subsequent stipulations or project modifications not imposed at time leases are granted (e.g., due to new information regarding the habitat in the future).[75]

101. Information provided by the MMS in the development of this analysis describes similar scenarios, noting that difficult logistics, short seasonal operating periods, and regulatory or legal delays have resulted in no wells being drilled on 728 leases issued in four lease sales from 2003 to 2008. MMS states that additional regulations, such as critical habitat designation for the polar bears, could cause further delays in exploration efforts or cause investors to abandon investment opportunities. The letter describes that costs of delay may be substantial, citing estimates from Shell of monetary losses of $200 million when a legal injunction delayed their 2008 drilling program in the Beaufort Sea.[76]

102. In addition, a comment from Denali received during the public comment on the draft version of this analysis asserts that a one year delay in construction to the natural gas pipeline project could cost over a billion dollars.[77] Another comment estimates that, given the economic scale of the oil and gas projects, even minor delays could result in costs of hundred of millions of dollars.[78] ConocoPhillips estimates that a two-year delay in its western expansion plans at Alpine would result in erosion of project value of between nine and 23 percent. The comment further states that delays would also have ripple effects in the region, as delays in one project can result in similar delays at other

[75] ConocoPhillipa Alaska, Inc. letter to Northern Economics, Inc., January 21, 2010; and Goldsmith, Scott. "A Preliminary Investigation of the Economic Effects of Critical Habitat Designation for the Spectacled Eider and Steller's Eider on Alaska's North Slope." Prepared for BP Exploration (Alaska) Inc. and Phillips Alaska, Inc. September 20, 2000.

[76] Information from Rance Wall, P.E., Alaska Region, Minerals Management Service, provided to U.S. FWS via email on January 19, 2010.

[77] Letter from Steven Findlay, Vice President Regulatory Affairs and Chief Compliance Officer, Denali, to U.S. Fish and Wildlife Service, "Supplemental Comments of Denali – The Alaska Gas Pipeline LLC on the Proposed Rule to Designate Critical Habitat for the Polar Bear (FWS-R7-ES-2009-0042)," July 6, 2010.

[78] Letter from Kyle B. Isakower, Vice President, Regulatory and Economic Policy, Alaska Oil and Gas Association, to U.S. Fish and Wildlife Service, "Supplemental Comments of the Alaska Oil and Gas Association and the American Petroleum Institute – Proposed Rule to Designate Critical Habitat for the Polar Bear (FWS-R7-ES-2009-0042)," July 6, 2010.

projects.[79] Another comment states that each year of delays for construction projects on the North Slope would result in additional ten percent increase in construction costs.[80]

103. The following discussion describes how project delays may result in economic costs. Examples of the impacts of project delays on hypothetical oil and gas projects are provided in Exhibits 3-4 and 3-5.

Project Economics under Risk and Uncertainty

104. In an interview during the development of this analysis, one oil and gas firm indicated that the numerical analysis shown at the end of Dr. Goldsmith's comment regarding potential impacts of critical habitat designation for Spectacled and Steller's eiders provides a reasonable example of an approach to estimating the additional costs created by the designation of critical habitat. In his comment Dr Goldsmith develops a series of financial profiles of a hypothetical field on the North Slope. The example is based on a 1998 paper regarding development costs of the Northstar Oil Field[81] and uses costs and wellhead revenues applicable to the time his comment was written (September 2000). While costs and revenues have changed since 2000, the general conclusions behind the hypothetical profiles still hold. Specifically, Dr. Goldsmith concludes that increasing project costs and costs due to project delays can significantly reduce the expected profitability of an oil field, and potentially reduce the probability that it will be developed. If designation of critical habitat for polar bears leads to cost increases or project delays, it is possible that development of some projects on the North Slope that might otherwise move forward will be abandoned or downsized.

105. The hypothetical example developed by Dr. Goldsmith is reproduced in Exhibit 3-3. The example depicts a representative North Slope oil field with an optimal development scenario. In the example, development of the field occurs over a 7-year period and costs $449 million with the majority of costs ($286 million) coming in the fourth and fifth years. Production begins at the end of the fifth year with peak production and revenue ($304 million) occurring in the eighth year. Production then tapers off for the remaining 12 years of the field's life. Over the life of the hypothetical field under an optimal development scenario, the project generates an internal rate of return of 17.2 percent and a net present value of $21.19 million, assuming a 15 percent discount rate. Given the "rule of thumb" that an internal rate of return of 15 percent or more is required for projects on the North Slope to move forward, the hypothetical field would likely be developed, as long as project uncertainties and risks were within a normal range.

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[79] Letter from Helene E. Harding, Vice President, North Slope Operations and Development, ConocoPhillips, to U.S. Fish and Wildlife Service, "Supplemental Comments of ConocoPhillips Alaska, Inc on the Proposed Rule to Designate Critical Habitat for the Polar Bear (FWS-R7-ES-2009-0042)," July 6, 2010.

[80] Letter from North Slope Borough, Office of the Mayor, to U.S. Fish and Wildlife Service, "Designation of Critical Habitat for the Polar Bear in the United States, 75 Fed. Reg. 24545 (May 5, 2010) Docket No. FWS-R7-ES-2009-0042," July 6, 2010.

[81] Goldsmith, Scott. Northstar Oil Field: Economic Impact Analysis for British Petroleum Exploration (Alaska), Inc., February 1998.

EXHIBIT 3-3 HYPOTHETICAL FINANCIAL PROFILE OF A MID-SIZE FIELD WITH 150 MILLION BARRELS OF RECOVERABLE OIL

Net Present Value of Investment at 15% Discount Rate	$21.19 Million
Internal Rate of Return	17.2%

YEAR	DEVELOPMENT EXPENSE	PRODUCTION EXPENSE	WELLHEAD REVENUES	GROSS REVENUES	GOVERNMENT REVENUES	NET COMPANY PROFIT
	(MILLIONS OF $)					
1996	-19	0	0	-19	0	-19
1997	-31	0	0	-31	0	-31
1998	-52	0	0	-52	1	-53
1999	-180	0	0	-180	1	-181
2000	-106	-17	5	-118	5	-123
2001	-39	-20	264	205	89	116
2002	-22	-23	301	256	95	161
2003	0	-39	304	265	95	170
2004	0	-56	275	219	88	131
2005	0	-59	237	178	76	102
2006	0	-53	181	128	55	73
2007	0	-46	127	81	38	43
2008	0	-40	83	43	25	18
2009	0	-31	70	39	21	18
2010	0	-27	56	29	16	13
2011	0	-24	42	18	13	5
2012	0	-20	43	23	14	9
2013	0	-17	29	12	9	3
2014	0	-14	14	0	4	-4
2015	0	-10	9	-1	2	-3

Source: Table 6 in Goldsmith (2000).

106. Exhibit 3-4 shows the net present values (with a 15 percent discount rate) and internal rates of return (IRR) with the same hypothetical field, but with various cost increases, project delay and even a shut down after four years of production. These types of cost increases and delays are described by Goldsmith, but the numerical examples were not taken directly from that report. If development and production costs increase over all years of the project by one percent, then the net present value (NPV) at 15 percent drops to $17.5 million and the IRR drops to 16.8 percent—the project may still be developed with these results, but the project's ranking against other development options within the company will decline. If costs increase by 4.75 percent each year, then the discounted NPV falls to zero and the IRR is 15 percent. A project with an IRR of just 15 percent is unlikely to be developed. Other scenarios that are shown include a one year delay at the end of the fourth year of development as well as a two year delay—both of these delay

scenarios significantly reduce the project IRRs to rates well below the 15 percent rule of thumb. The final scenario shows the outcome if the project is shut down after only four years of production. In this case the, NPV of project losses exceed $75 million and the IRR is just 2.1 percent.

EXHIBIT 3-4 NET PRESENT VALUE AND RETURNS WITH OPTIMAL DEVELOPMENT AND WITH COST INCREASES, DELAYS OR SHUT-DOWN

SCENARIO	NET PRESENT VALUE WITH 15% DISCOUNT RATE	INTERNAL RATE OF RETURN
Optimal Development Scenario	$21.19	17.2%
Development & Production Costs Increase by 1 %	$17.54	16.8%
Development & Production Costs Increase by 4.75 %	($0.00)	15.0%
The Project is Delayed by 1 Year after the 4th Year	($5.32)	14.5%
The Project is Delayed by 2 Years after the 4th Year	($28.38)	12.5%
The Project is Shut Down after 4 years of Production	($75.03)	2.1%
Source: Optimal Development Scenario from Goldsmith 2000. Alternative scenarios developed by Northern Economics.		

107. Significant uncertainty exists regarding whether any of the scenarios described above would actually result from the designation of critical habitat for polar bears. These types of scenarios, however, may be considered as real possibilities by financial analysts who are helping to make the investment decisions for the oil companies. The financial analysts would assign a probability to each of the potential scenarios and then calculate a "risk-weighted" rate of return for the project by multiplying the probability that a given scenario will occur, by its unadjusted IRR. Assume for example, that each of the first three scenarios was assigned a 25 percent probability of occurring, and that the last three were each assigned an 8.33 percent probability. In this case, the risk-weighted rate of return would be 14.7 percent and the project would be unlikely to rank high on the company's list of development opportunities, and would probably not receive development funding.

108. Another example of quantified impacts of project delay on a hypothetical project is provided in Exhibit 3-5. This example was provided as part of a public comment from the State of Alaska and ASRC on the draft version of this analysis. To demonstrate that the indirect impacts of critical habitat designation can be quantified, the comment

provides examples of impacts to hypothetical projects using a series of assumptions regarding potential lengths of delay, production volumes, and production timing.[82]

109. The examples provided in Exhibit 3-4, and by the State and ASRC in Exhibit 3-5, provide information to the Service regarding the order of magnitude of potential project delays using examples that rely on layered assumptions. However, the actual numbers of projects that may experience delay or production losses due to critical habitat designation for the polar bear, and the specific length of that delay, remain significantly uncertain.

110. As noted above, this analysis does not quantify total potential indirect incremental impacts of polar bear critical habitat. Forecasting the potential length of project delays and changes in behavior resulting from regulatory uncertainty on the part of industry is considered too speculative for this analysis. Ideally, this analysis would review the history of oil and gas projects within critical habitat for the eiders since the designation was made final in order to determine whether such impacts as those described above have occurred. This type of retrospective analysis may inform the likelihood of potential similar impacts following critical habitat designation for the polar bears. The critical habitat for the eiders does not, however, intersect areas in which North Slope or Chukchi or Beaufort OCS oil and gas development activities are currently occurring or planned. Thus, this analysis relies on the above examples to provide perspective on the potential magnitude of project delay impacts should they result from critical habitat designation for the polar bear.

[82] Econ One Research, Inc. July 6, 2010. Initial Economic Analysis of Critical Habitat Designation for the Polar Bear in the United States. Prepared for: State of Alaska and the Arctic Slope Regional Corporation.

EXHIBIT 3-5 SUMMARY OF INDIRECT COSTS ESTIMATED BY THE STATE OF ALASKA AND ARCTIC SLOPE REGIONAL CORPORATION ANALYSIS

An economic analysis of critical habitat designation for the polar bear developed by Econ One Research, Inc. (2010) for the State of Alaska and the Arctic Slope Regional Corporation (ASRC) estimates the impacts of a delay in oil and gas development on hypothetical oil fields, and assesses potential regional economic impacts of reduced production.

The analysis considers three project delay assumptions: one year, three years, and five years. The assumed delays are applied to two hypothetical oil fields in the North Slope: a small field with 190 million barrel (mmbbl) reserves and a 15-year production plan, and a large field with 712 mmbbl reserves and a 20-year production plan. Delays in project initiation are anticipated to require additional resources (e.g., higher costs associated with general inflation during the delay period) and result in reduced project value (e.g., by delaying expected revenues from the project).

The analysis then makes assumptions regarding an "originally planned" production time table and a "delayed" production time table for the projects. Applying these production scenarios and the alternative assumptions regarding length of delay, the analysis estimates losses in net present value (NPV) of royalties to the State of Alaska and ASRC, property tax to the State and North Slope Borough (NSB), state production tax, and state income tax. The estimates do not include litigation costs, labor costs, or increased output costs. The following table summarizes present value impacts due to the three delay assumptions, as well as impacts of complete project abandonment.

DELAY ASSUMPTION	PRESENT VALUE LOSSES ($MILLIONS)	
	SMALL FIELD	LARGE FIELD
1-Year	$202.8	$577.87
3-Years	$602.48	$1,709.85
5-Years	$915.64	$2,562.12
Project Abandoned	$2,647.93	$7,204.24

In addition to delay costs, the analysis estimates regional economic impacts of a one percent, five percent, and a ten percent reduction in production from hypothetical oil fields. The analysis relies on the IMPLAN input-output model to estimate regional economic impacts of reductions from the 2009 levels of production within the proposed critical habitat area (113.4 mmbbls). Applying the weighted average Alaska North Slope west coast spot price in 2009 ($60.8/bbl), the estimated value of the oil produced in the proposed critical habitat area is estimated at $6.9 billion for 2009. The following table summarizes estimated regional economic impacts to the North Slope Borough and to the State of Alaska of one-year of assumed production reduction.

ASSUMED DECREASE IN PRODUCTION	NORTH SLOPE BOROUGH		STATE OF ALASKA	
	TOTAL OUTPUT ($MILLION)	TOTAL EMPLOYMENT	TOTAL OUTPUT ($MILLION)	TOTAL EMPLOYMENT
1%	$75.8	46	$98.8	214
5%	$378.9	232	$494.2	1,072
10%	$757.9	464	$988.4	2,143

3.3 SCOPE AND SCALE OF CURRENT OIL AND GAS ACTIVITIES

111. As described in Chapter 2, the proposed polar bear critical habitat extends south of the Chukchi Sea to the northern Bering Sea and includes Kotzebue Sound and Norton Sound. The Federal waters in this critical habitat area are managed as five separate planning areas by the U.S. Department of Interior, MMS. These planning areas (shown in Exhibit 3-6) are the Beaufort Sea, Chukchi Sea, Hope Basin (Kotzebue Sound and part of the Chukchi Sea), Norton Basin (Norton Sound and part of the Northern Bering Sea), and St. Matthew Hall (Northern Bering Sea).

EXHIBIT 3-6 ALASKA PLANNING AREAS FOR OIL AND GAS LEASE SALES

Source: Minerals Management Service. Alaska OCS Region. Planning Area Map. Accessed on December 28, 2009 at http://www.mms.gov/alaska/lease/hlease/PLANMAP.HTM.

112. The petroleum industry has not expressed interest in any of the latter three planning areas since initial exploration drilling in the 1980s. The MMS evaluation of the potential for economically recoverable reserves from the Hope Basin, the Norton Basin, and St. Matthew Hall concluded that limited probability exists of commercial oil or gas production in these areas.[83] One expert at MMS asserts that the estimated maximum volume of oil resources for each of these planning areas is not large enough to justify the

[83] Minerals Management Service. Alaska Federal Offshore Descriptions of Geologic Plays, 1995 National Resource Assessment. Accessed on December 28, 2009 at http://www.mms.gov/alaska/re/asmtdata/contents.htm.

capital costs to build production facilities in these remote locations.[84] Additionally, a recent study by Van Kooten for the Alaska Department of Transportation and Public Facilities corroborated the low probability of commercial discoveries in the Hope Basin and Norton Basin, and stated that there was low to very low probability of commercial oil and gas resources in the onshore areas in proximity to these basins.[85] Given this information, this analysis concludes that oil and gas production is not likely to occur in the foreseeable future in the portion of proposed critical habitat for the polar bear that intersects Hope Basin, Norton Basin, or St. Matthew Hall. The analysis of oil and gas activities in this report is therefore focused on the Beaufort and Chuckchi Seas.

113. Exhibit 3-7 shows the leases currently held by oil and gas companies on the North Slope and in Federal and state waters offshore of Alaska in the Beaufort and Chukchi Seas. The major oil and gas companies operating on the North Slope are BP Exploration (Alaska) Inc., ConocoPhillips Alaska, Inc., and ExxonMobil Alaska Production, Inc. There are nine other oil and gas companies that have or had operating activities on the North Slope or adjacent offshore waters in the past few years: Anadarko Petroleum, Inc., Brooks Range Petroleum Corporation, ENI, FEX, Kerr-McGee, Pioneer Natural Resources, Inc., Savant, Shell (various subsidiaries)[86], and Ultrastar Exploration LLC. There are a limited number of rotary drilling rigs available on the North Slope with only nine rigs reported active for the week of March 5, 2010, which would be the peak period for exploration activity.

114. Between March 1, 2009 and February 28, 2010 there were 143 wells drilled on the North Slope or in adjacent waters.[87] Most of the wells were development or service wells drilled at existing fields. Nine of the 143 wells were exploration wells, with three of the nine wells drilled outside of the critical habitat designation in the Brooks Range Foothills. Current oil production on the North Slope is approximately 670,000 barrels per day. At December 2009 Alaska North Slope West Coast prices of $84.25, the value of oil production is approximately $56 million per day or $20.6 billion per year.[88]

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[84] Personal communication between NEI and James D. Craig, Geologist, Alaska OCS Region, Minerals Management Service, November 2, 2009.

[85] Van Kooten, Gerry. PetroTechnical Resources Alaska. Evaluation of Hydrocarbon Potential: Western Alaska Access Planning Study. Appendix D in Volume II, Western Alaska Access Planning Study, DOWL/HKM, 2009. Prepared for the Alaska Department of Transportation and Public Facilities. Accessed at http://www.dowlprojects.com/westernakaccess/Media/westernakaccess/Volume%20II%20-%20WAAPS%20Appendices.pdf on December 29, 2009.

[86] Shell Exploration and Production Company (SEPCo) is not currently considered a major producer on the North Slope because they currently have no operating wells. They are however in the early stages of multi-billion dollar exploratory effort in the Chukchi Sea that if successful would put them in the category of a major producer.

[87] Alaska Oil and Gas Conservation Commission, 2010. Monthly Drilling Reports. Available at http://doa.alaska.gov/ogc/drilling/dindex.html. Accessed on March 10, 2010.

[88] Alaska Department of Revenue. Crude Oil Prices – Bloomberg. ANS West Coast Price for January 8, 2010. Accessed on January 11, 2010 at http://www.tax.alaska.gov/programs/oil/dailyoil/dailyoil.aspx.

115. The area shown in Exhibit 3-7 is the primary oil and gas production area in the state.[89] The following subsections describe the current oil and gas activity, if any, for the following areas within the proposed critical habitat area for the polar bear:

- State lands and waters;
- Federal lands and waters including the Arctic National Wildlife Refuge (ANWR) and the NPR-A;
- The Federal OCS region in the Beaufort and Chukchi Seas; and
- Other ownerships.

116. As shown in Exhibits 3-8 through 3-12, most of the exploration wells that have been drilled in the region have been on state lands between ANWR and the NPR-A, along a geologic feature named the Barrow Arch, which is in proximity to the Beaufort Sea coastline in that area. A number of exploration wells have been drilled in the NPR-A, particularly in the eastern portion, nearest to the large discoveries on state lands. No exploration wells have been drilled in ANWR although a stratigraphic test well was drilled on Native corporation lands in the vicinity of the City of Kaktovik within the boundaries of ANWR in the 1980s. The western portion of the proposed critical habitat area, between the NPR-A and the Chukchi Sea has seen very limited exploration activity.

117. Exhibit 3-7 provides the legend for Exhibits 3-8 through 3-12. Due to the large area and level of detail in Exhibit 3-8, it is broken into a series of four quadrant maps (Exhibits 3-9 through 3-12) that focus on different section of the North Slope, all of which employ the legend of map symbols from Exhibit 3-7.

118. Exhibit 3-13 highlights the overlap of existing Federal and state leases and proposed critical habitat for the polar bear, including on-shore, off-shore, active, proposed, and pending leases. The Beaufort Sea area of Unit 1 has thus far been the area within proposed critical habitat subject to the most oil and gas activity. Active, proposed, and pending leases overlap approximately: 7,200 square miles of Unit 1; 1,500 square miles of Unit 2; and 290 square miles of Unit 3.

[89] The only other area of current oil and gas activity is in Cook Inlet and surrounding lands in Southcentral Alaska. MMS is also proposing a lease sale in the North Aleutian Basin, which is in the southern Bering Sea. Cook Inlet and the North Aleutian Basin are outside of the area proposed for polar bear critical habitat.

EXHIBIT 3-7 LEGEND FOR MAPS OF LEASE AREAS AND OIL AND GAS EXPLORATION WELLS IN NORTHERN ALASKA (EXHIBITS 3-8 THROUGH 3-12)

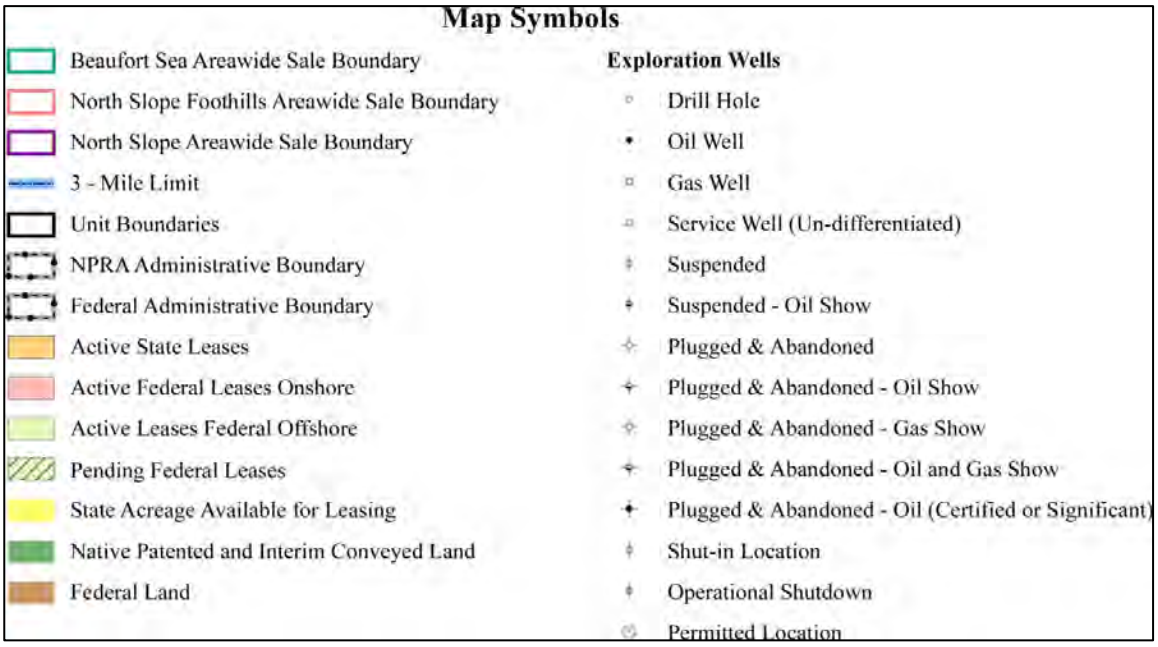
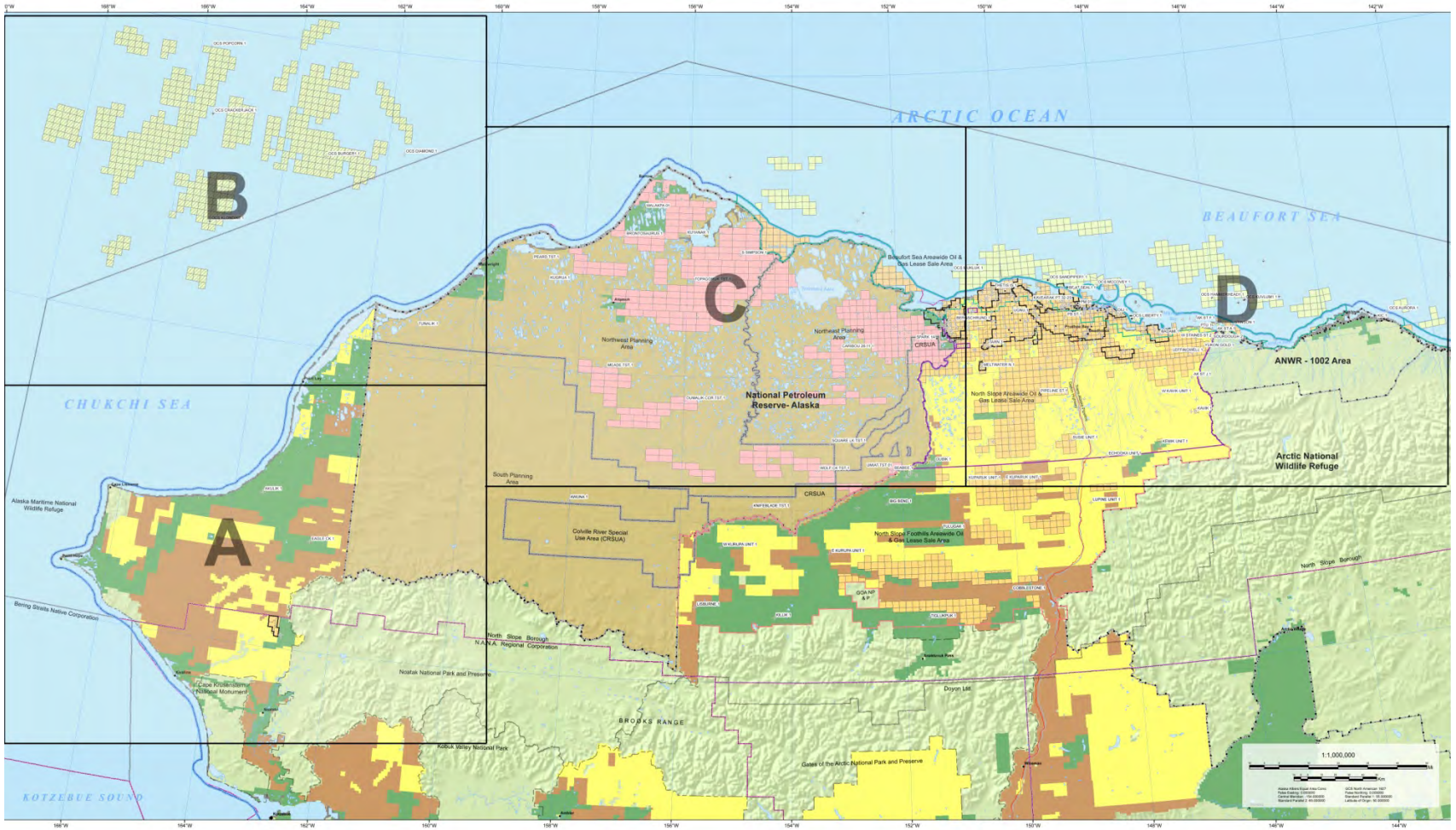


EXHIBIT 3-8 LOCATIONS OF LEASE AREAS AND OIL AND GAS EXPLORATION WELLS ON STATE AND FEDERAL LANDS (INCLUDING OFFSHORE AREAS) IN NORTHERN ALASKA[90]



[90] Source: Alaska Dept. of Natural Resources. Accessed on November 28, 2009 at http://www.dog.dnr.state.ak.us/oil/products/publications/northslope/northslope_tabbed_042209.html.

EXHIBIT 3-9 LOCATIONS OF LEASE AREAS AND OIL AND GAS EXPLORATION WELLS ON STATE AND FEDERAL LANDS IN QUADRANT A

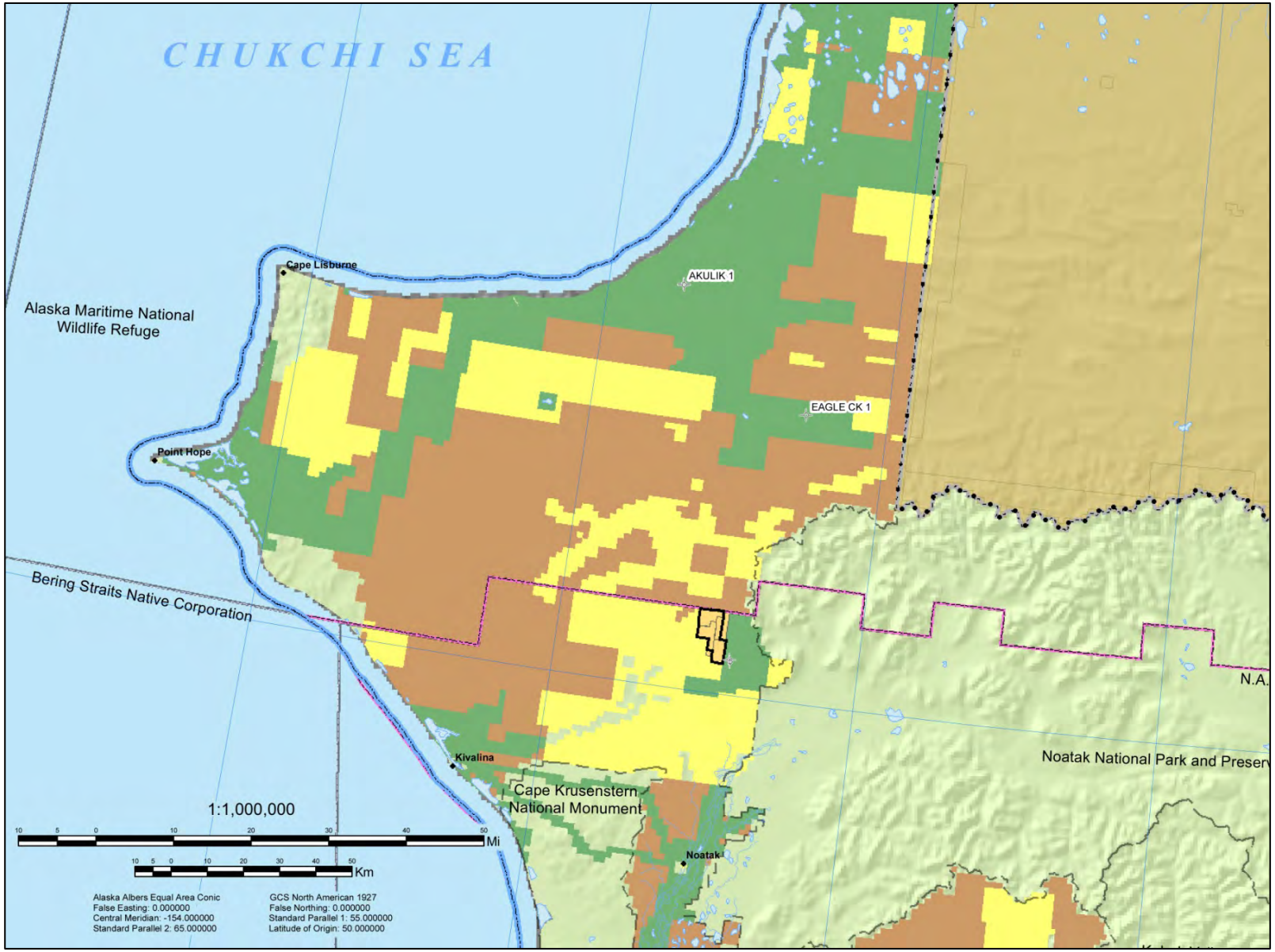


EXHIBIT 3-10 LOCATIONS OF LEASE AREAS AND OIL AND GAS EXPLORATION WELLS ON STATE AND FEDERAL LANDS IN QUADRANT B

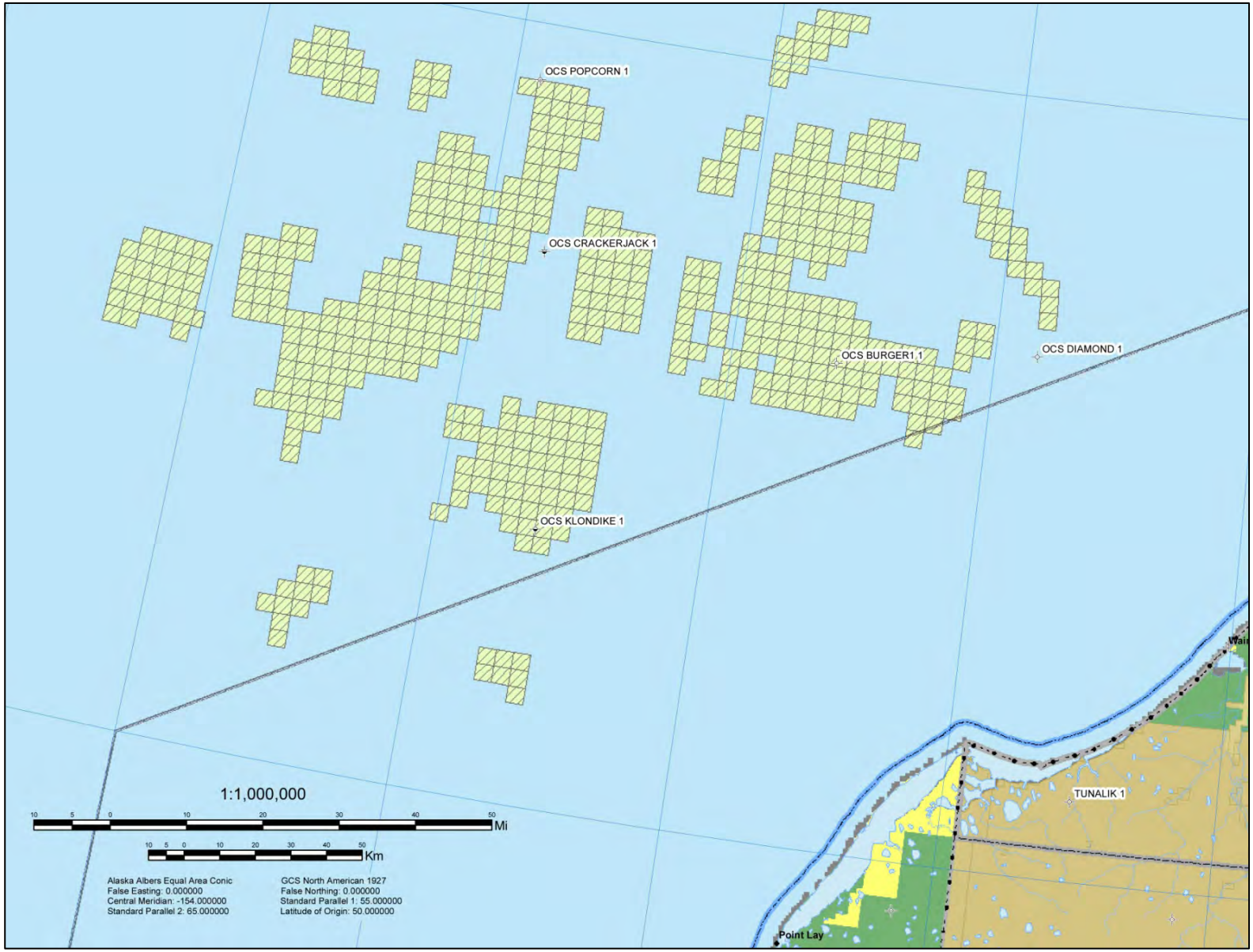


EXHIBIT 3-11 LOCATIONS OF LEASE AREAS AND OIL AND GAS EXPLORATION WELLS ON STATE AND FEDERAL LANDS IN QUADRANT C

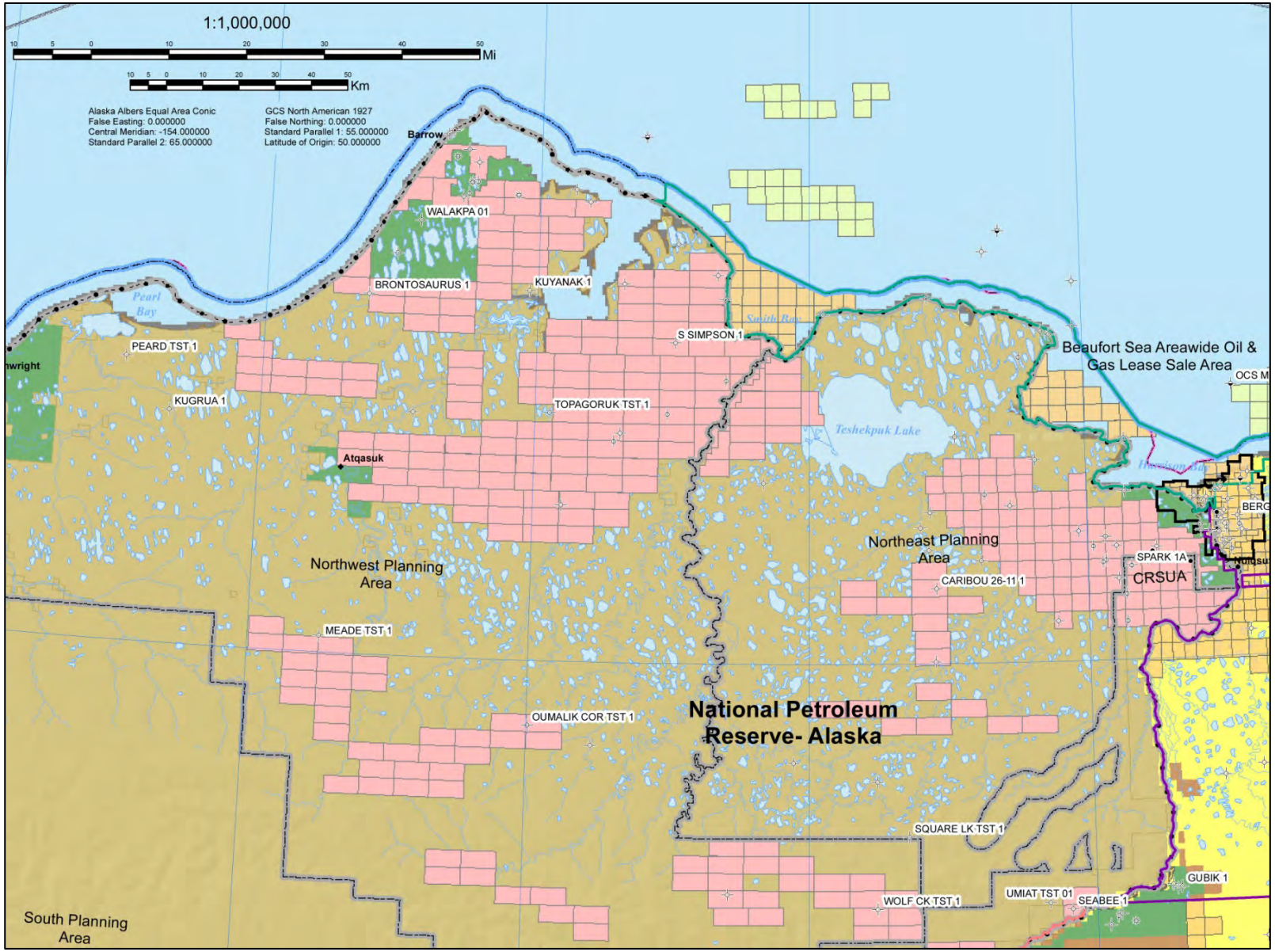


EXHIBIT 3-12 LOCATIONS OF LEASE AREAS AND OIL AND GAS EXPLORATION WELLS ON STATE AND FEDERAL LANDS IN QUADRANT D

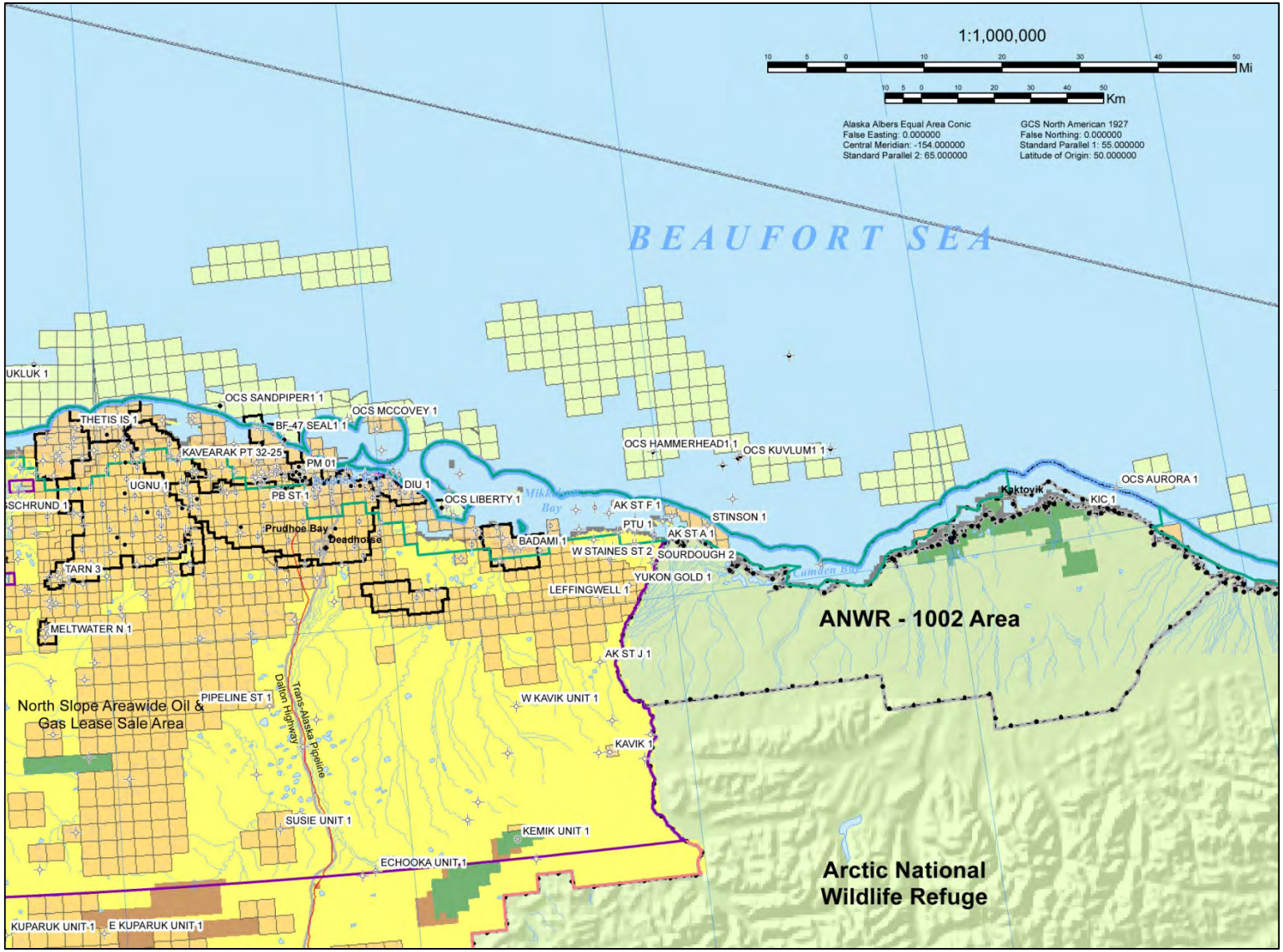
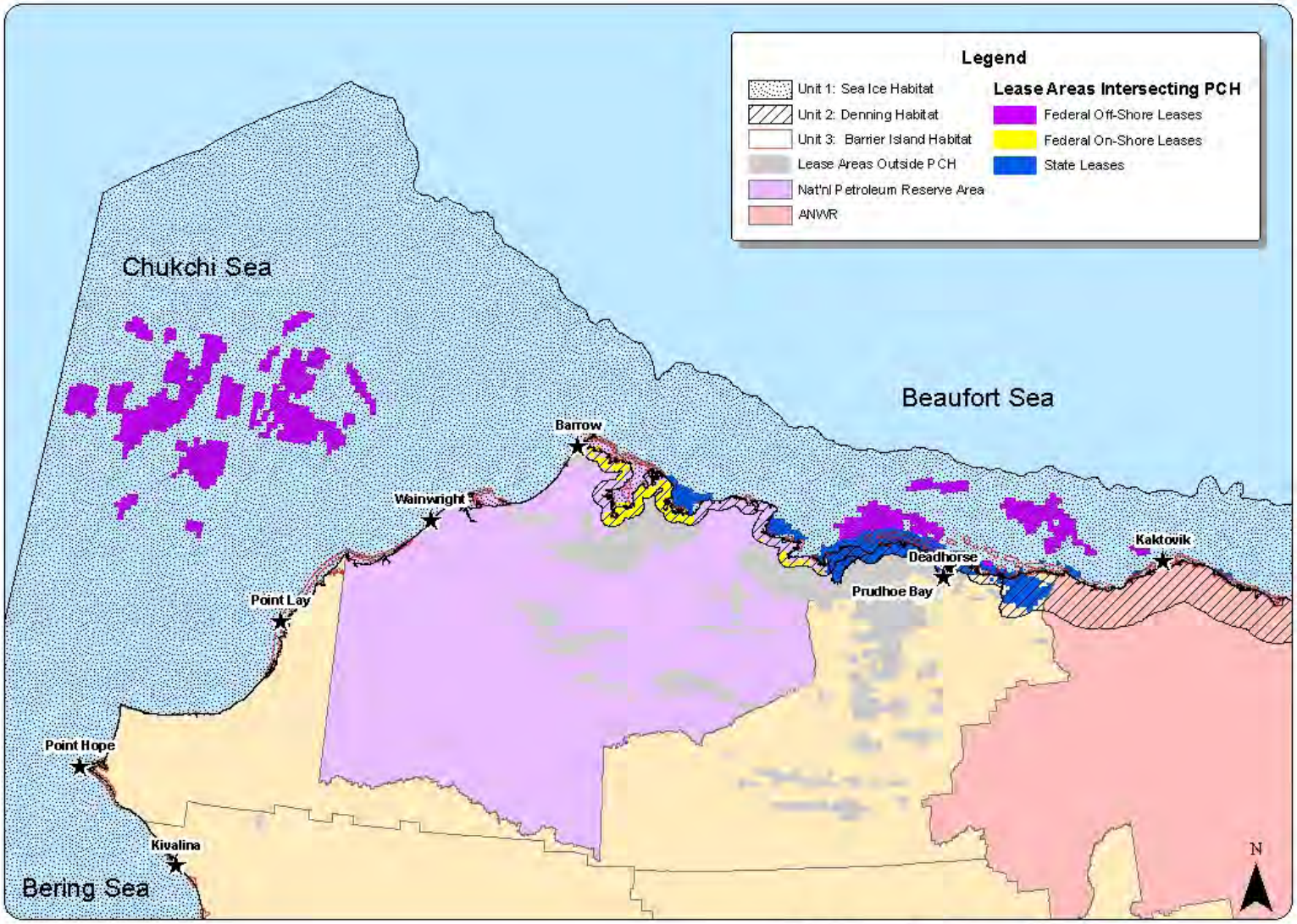


EXHIBIT 3-13 EXISTING FEDERAL AND STATE OIL AND GAS LEASES WITHIN PROPOSED CRITICAL HABITAT



Sources:
1. US Fish and Wildlife Service, Field Office; 2. U.S. Minerals Management Service; 3. U.S. Bureau of Land Management; 4. Alaska Dept. of Natural Resources; and, 5. Environmental Systems Research Institute, Inc. (ESRI)

3.3.1 STATE LANDS AND WATERS

Onshore Areas

119. The State of Alaska is the primary land owner (surface estate) in the area between ANWR and the NPR-A along the Beaufort Sea coast. The state also owns most of the minerals rights (subsurface estate) in the area. Other surface estate owners between ANWR and the NPR-A include ASRC, Kuukpik Village Corporation (the village corporation for Nuiqsut), the City of Nuiqsut, the North Slope Borough, the Federal government, and many Native residents with allotments.

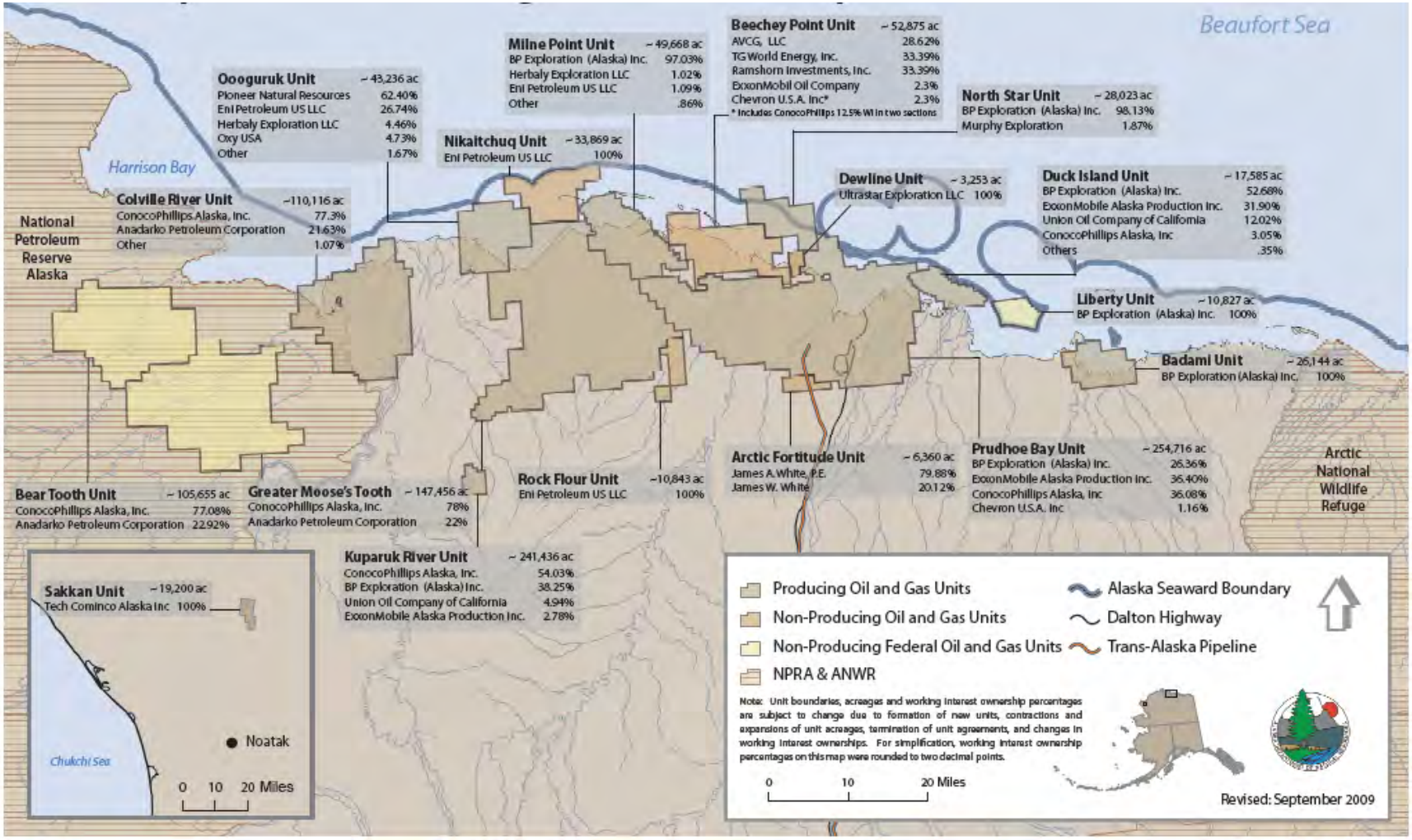
120. Initial production from state lands in the central North Slope was from the Prudhoe Bay and Kuparauk oil and gas units. The density of oil and gas related infrastructure on state lands is greatest in these units in part due to the large size of these reservoirs. Over time, production moved east and west of these areas, as well as into the marine environment further north. Increasing knowledge of Arctic drilling, production from permafrost, and other technological improvements, however, have resulted in much smaller production pads and, in some cases, eliminated the need for gravel roads to newer fields in the more recently producing oil and gas units.

121. Almost all current production in the central North Slope is from the state's subsurface estate, although ASRC has mineral rights in certain tracts in the Alpine oil field (Colville River oil and gas unit). In addition, a portion of the Colville oil and gas unit extends into the Federal NPR-A. The nine producing oil and gas units in the North Slope are highlighted in Exhibit 3-14.

122. As shown in Exhibit 3-14, BP, ConocoPhillips, and ExxonMobil combined have majority ownership interests in the Prudhoe Bay and Kuparuk River oil and gas units, and BP has majority ownership in the Milne Point, North Star, and Badami oil and gas units. ConocoPhillips has majority ownership in the Colville River oil and gas unit and several oil and gas units in the NPR-A that are not yet producing (Bear Tooth and Greater Moose's Tooth oil and gas units).

123. The state also owns lands that lie between the western boundary of the NPR-A and the Chukchi Sea, as shown in Exhibit 3-8. The ownership pattern in this area is more complex than in the central North Slope with a substantial portion of this area owned by ASRC and the village corporations for Point Lay and Point Hope, with BLM controlling the Federal lands in the area. A few exploration wells have been drilled in this region in the past, but there is presently little interest from the major oil and gas companies in exploration of this area.

EXHIBIT 3-14 NORTH SLOPE OIL AND GAS UNIT WORKING INTEREST OWNERSHIP



Source: Division of Oil and Gas, Alaska Department of Natural Resources. Accessed on December 30, 2009 at http://www.dog.dnr.state.ak.us/oil/products/maps/northslope/2009/NS_Unit_Ownership_0909.pdf.

124. In addition to the currently producing oil and gas units, additional future production is expected. Chevron just completed an unsuccessful exploration drilling in the White Hills, south of the Kuparuk oil and gas unit, and exploration is occurring in the Brooks Range foothills. BP is likely to start development drilling of the Liberty oil and gas unit, located in Federal waters from a new gravel pad located in state waters. ENI anticipates bringing its Nikaitchuq oil and gas unit into production in 2010. Additionally, ExxonMobil is moving to production from the Point Thomson gas field, located west of ANWR on the Beaufort Sea coast, in 2014.

125. Teck Resources Limited has been exploring for shale gas on Northwest Arctic Native Association (NANA) Regional Corporation and state lands in the vicinity of Teck's Red Dog Mine, located about 50 miles from the Chukchi Sea coast, southeast of the community of Kivalina. It is uncertain if this exploration activity will result in development of the shale gas resource, which would be used to replace diesel fuel at the mine.

Offshore Areas

126. As shown in the preceding exhibit, a growing part of oil and gas activity between ANWR and the NPR-A is occurring in the marine environment and primarily in state waters. Portions of the Prudhoe Bay, Milne Point, Badami, and Oooguruk Kuparuk oil and gas units are located seaward of the Beaufort Sea coastline. Among other producing oil and gas units, the Endicott oil and gas unit is almost entirely offshore and Northstar, which extends over both state and Federal leases, is entirely offshore. For oil and gas units that are not yet producing, the Nikaitchuq oil and gas unit is entirely marine except for some barrier islands that are within the oil and gas unit, and the Beechey Point oil and gas unit has about one-third of its acreage located offshore. A significant portion of the small Dewline oil and gas unit is also offshore. A substantial portion of the Point Thomson gas field is located seaward of the coastline.

3.3.2 FEDERAL LANDS AND WATERS

127. As noted above, the Federal government owns a small parcel of land at Bullen Point in the region between the western boundary of the NPR-A and the Chukchi Sea, and BLM manages Federal lands that are located between the NPR-A and the Chukchi Sea. However, the major land holdings of the Federal government are in the NPR-A and ANWR. The Federal government also controls the most prospective offshore areas in the waters off of Alaska. Each of these major areas is discussed below.

National Petroleum Reserve Alaska

128. Interest in the oil resources of northern Alaska began with reports in the early 1900s of surface oil seeps along the arctic coast east of Point Barrow. The NPR-A was established in 1923 as an emergency oil supply for the U.S. Navy and has experienced nearly 100 years of petroleum exploration activity. In 1976, the administration of the reserve was transferred to the BLM. The BLM has held five lease sales in the NPR-A (1999, 2002, 2004, 2006, and 2008) and currently administers more than 300 Federal oil and gas leases

(BLM Alaska, 2009).[91] Exhibit 3-15 shows the current leases in the NPR-A as well as those that are now expired or have been relinquished by companies. A number of the leases in the northeastern portion of the NPR-A have been incorporated into the Greater Moose's Tooth and Bear Tooth oil and gas units and are expected to begin producing oil later this decade.

Arctic National Wildlife Refuge

129. During World War II, the entire North Slope of Alaska—48.8 million acres—was withdrawn from entry under the public land laws and held for exclusive use by the U.S. government for military purposes. In 1952-53, government scientists conducted a survey of potential conservation areas in Alaska and issued a report that identified the northeast corner of Alaska as the best opportunity for protection.

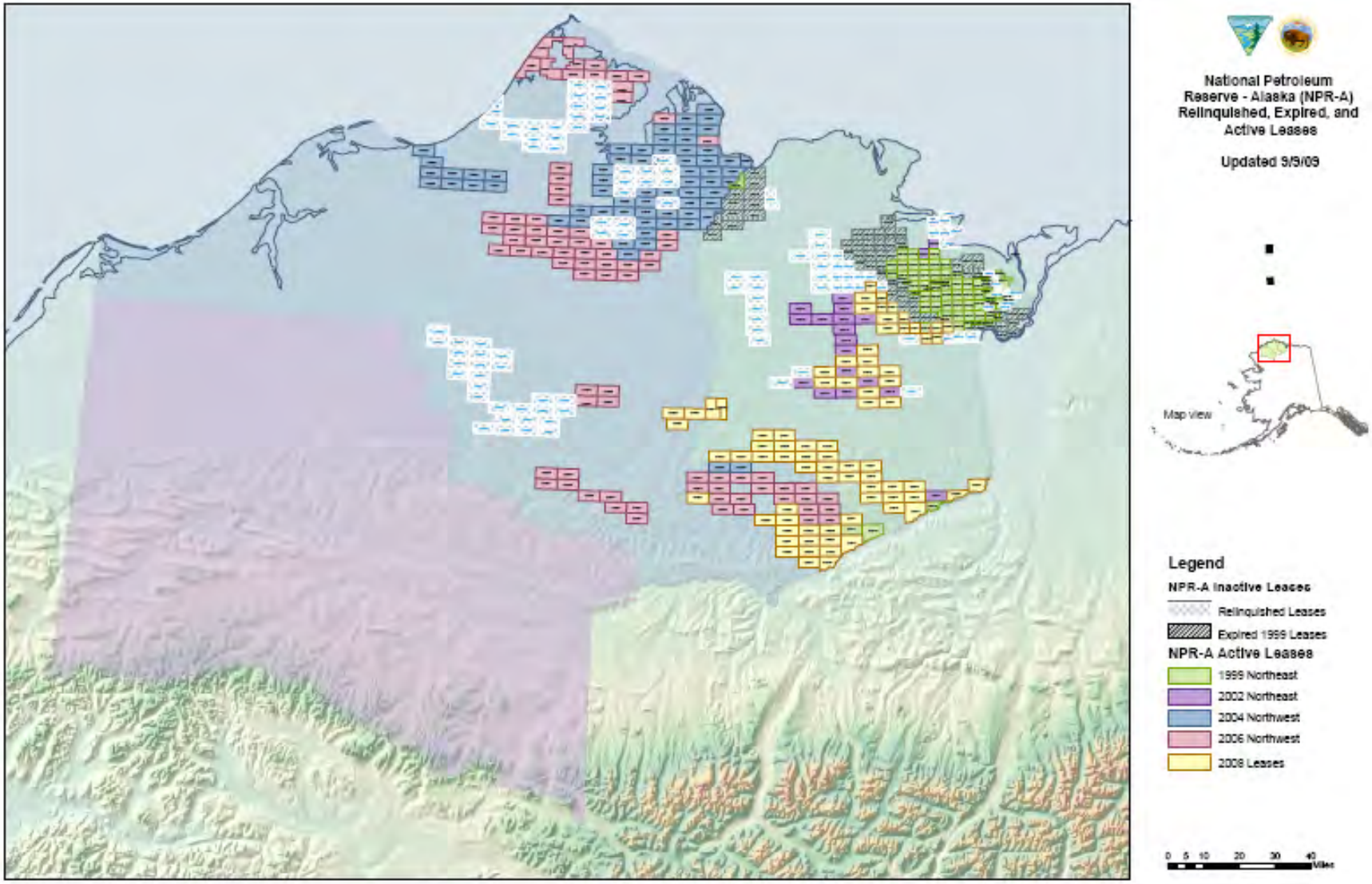
130. In 1957, Secretary of the Interior Seaton revoked the previous military withdrawal on 20 million acres of the North Slope of Alaska to make it available for commercial oil and gas leasing. This was in addition to the 23 million acre Naval Petroleum Reserve No. 4 (later renamed as National Petroleum Reserve-Alaska) established in 1923. In 1960, Secretary Seaton designated 8.9 million acres of coastal plain and mountains of northeast Alaska as the Arctic National Wildlife Range (later renamed as the Arctic National Wildlife Refuge) to protect its wildlife, wilderness and recreation values.

131. Oil reserves were thought to exist in the Arctic National Wildlife Range, particularly after the discovery of Prudhoe Bay in 1968. The future of the range was debated in Congress for years before passage of the Alaska National Interest Lands Conservation Act (ANILCA) in 1980. ANILCA doubled the size of the range, renamed it as a refuge, and designated most of the original range as wilderness.

132. The part of the original range that was not designated wilderness was addressed in Section 1002 of ANILCA, and is referred to as the "1002 Area." Section 1002 outlined additional information that would be needed before Congress could designate the area as wilderness, or permit oil and gas development. Section 1003 of ANILCA prohibited the leasing or other development leading to production of oil and gas from ANWR unless authorized by Congress.

[91] BLM Alaska. National Petroleum Reserve-Alaska. Accessed on December 30, 2009 at http://www.blm.gov/ak/st/en/prog/energy/oil_gas/npra.html.

EXHIBIT 3-15 CURRENT NPR-A LEASE MAP



Source: BLM Alaska. Current NPR-A Lease Map.

133. A land exchange completed in 1983 transferred the subsurface title of Kaktovik village corporation lands (Kaktovik Inupiat Corporation (KIC)) from the Federal government to ASRC. This enabled industry to drill an exploration well in 1985 within the refuge's boundary on those private lands. The well was later plugged and abandoned, and the results of the drilling program remain confidential.

134. A study describing the effects of oil and gas development, and the Interior Secretary's final report and recommendation to authorize an oil and gas leasing program was submitted to Congress in 1987. Congress did not act on the recommendation, first in 1989 following the *Exxon Valdez* oil spill, and again in 1991 when a provision to open the Arctic Refuge to development was dropped from the National Energy Policy Act. In 1995, Congress passed budget legislation that included a provision to allow drilling in ANWR but the bill was vetoed by President Clinton. More recent efforts to pass legislation authorizing a leasing program and open the 1002 Area to oil and gas exploration have also failed.

135. While lobbying efforts to open the 1002 area for leasing continue, it has now been more than 20 years since the recommendation was forwarded to Congress and the outlook for opening the 1002 area seems more unlikely than in the past. Maintaining ANWR as wilderness has broad appeal throughout the country as demonstrated in the last attempt to open the 1002 area, and it is anticipated that this support will continue for the foreseeable future. For this reason, oil and gas exploration within ANWR is not expected to occur during the study period and no evaluation of oil and gas activities within ANWR is undertaken in this report.

Beaufort Sea

136. As shown in Exhibit 3-8, a number of exploration wells have been drilled in OCS waters. However, only one of those efforts has moved to production. As noted previously in the discussion of state waters, the Northstar field, which has been producing since 2001, is a joint state and Federal oil and gas unit.

137. The undiscovered economically recoverable resources of the Beaufort Sea were estimated by MMS in 2006 as part of a nationwide effort to assess the oil and gas resources of the entire OCS. The results of this assessment for the Beaufort Sea are presented in Exhibit 3-16. Resource values are expressed in billion barrels of oil (Bbo), and trillions of cubic feet of gas (Tcf). Prices are in dollars per barrel ($/Bbl) and dollars per thousand cubic feet of gas ($/Mcf). As prices increase, the potential recoverable resources increase due to higher prices enabling industry to explore and produce in deeper water and extend infrastructure to more distant discoveries.

EXHIBIT 3-16 UNDISCOVERED ECONOMICALLY RECOVERABLE RESOURCES OF THE BEAUFORT SEA

$46/BBL $6.96/MCF		$60/BBL $9.07/MCF		$80/BBL $12.01/MCF	
OIL (BBO)	GAS (TCF)	OIL (BBO)	GAS (TCF)	OIL (BBO)	GAS (TCF)
MEAN ESTIMATE		MEAN ESTIMATE		MEAN ESTIMATE	
4.12	8.79	5.97	15.94	6.92	19.97

Source: Minerals Management Service. Planning Area Resources Addendum to Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nations' Outer Continental Shelf, 2006.

138. The development plan for BP's Liberty field was approved by MMS in early 2008 and the field is expected to be producing in 2011. This field will be developed by using ultra extended reach drilling from the existing Endicott Satellite Drilling Island to reach locations under Federal waters.[92] Although Liberty is located in Federal waters, the state will share in the lease revenues because the field is located within a three-mile band (8(g) zone) that extends from the three-nautical mile state-Federal demarcation line seaward to six-nautical miles offshore. Under the 8(g) provisions, Alaska receives a 27 percent share of OCS lease revenues from Liberty. Under current OCS revenue-sharing programs, the state and its political subdivisions also receive Coastal Impact Assistance Programs funds for impacted subdivisions but no other revenues are shared if a field is located beyond the 6-nautical mile boundary.

139. MMS also approved an exploration plan for Shell Offshore, Inc. in October 2009.[93] Shell has proposed to drill two wells in the Beaufort Sea during the open water season of July through October 2010: one at the Torpedo prospect and the other well at the Sivulliq prospect.

140. A number of seismic surveys have been conducted in the Beaufort Sea OCS over the years and additional surveys are expected to continue. MMS expects one seismic program using a seismic vessel with icebreaker support in October-November of 2010.[94]

Chukchi Sea

141. The undiscovered economically recoverable resources of the Chukchi Sea were also estimated by MMS in 2006. The results of this assessment for the Chukchi Sea are presented in Exhibit 3-17. The potential resources in the Chukchi Sea are much larger than those estimated for the Beaufort Sea, but with limited infrastructure in the region, large discoveries and high prices are needed to overcome the cost of development.

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[92] Goll, John. Regional Director, Alaska Outer Continental Shelf Region. Letter dated December 28, 2009 to U.S. Fish and Wildlife Service commenting on Proposed rule regarding the designation of proposed critical habitat for the polar bear in the United States.

[93] *Ibid.*

[94] *Ibid.*

EXHIBIT 3-17 UNDISCOVERED ECONOMICALLY RECOVERABLE RESOURCES OF THE CHUKCHI SEA

$46/BBL $6.96/MCF		$60/BBL $9.07/MCF		$80/BBL $12.01/MCF	
OIL (BBO)	GAS (TCFG)	OIL (BBO)	GAS (TCFG)	OIL (BBO)	GAS (TCFG)
MEAN ESTIMATE		MEAN ESTIMATE		MEAN ESTIMATE	
2.37	7.91	8.38	34.43	12	54.44

Source: Minerals Management Service. Planning Area Resources Addendum to Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nations' Outer Continental Shelf, 2006.

142. Fewer exploration wells have been drilled in the Chukchi Sea (see Exhibit 3-8) and no commercial discoveries have been made to date. However, MMS has approved an exploration plan for Shell Gulf of Mexico, Inc. to drill up to three exploration wells in the Chukchi Sea in the open water season of July into October of 2010.[95] The exploration plan and future activity, however, are the subject of ongoing litigation and the outcome is uncertain.

3.3.3 OTHER OWNERSHIP

143. The North Slope Borough controls the surface and subsurface rights on lands south of Barrow where two natural gas deposits were discovered in Federal government exploration programs in the NPR-A. The Walakpa field provides Barrow with natural gas that is used for heating and electric power in the community.

144. Trio Petroleum has leased land from NANA and plans to begin exploration drilling in late 2010 at up to four sites located onshore around Kotzebue Sound in the vicinity of Cape Espenberg, the Baldwin Peninsula, and the Kobuk River delta. While commercial discoveries that could be exported from the region are the goal, natural gas for local use would be a significant benefit for local communities. Union Oil of California drilled two exploration wells near Cape Espenberg and the Baldwin Peninsula in the vicinity of three of the planned wells and did not make a commercial discovery although small amounts of methane were noted in the two exploration wells.[96] A portion of the exploration being conducted by Teck Resources Limited for shale gas is also located on NANA lands.

3.3.4 CHANGES IN OIL AND GAS ACTIVITY OVER TIME

145. The feasibility of developing a field depends on both the field's characteristics and the logistical aspects. Many remote fields may be economically attractive but not feasible from a logistical standpoint due to their distance from existing facilities. The cost of constructing roads and pipelines to connect with existing infrastructure may be prohibitive, causing development of the field to be economically inefficient.

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[95] *Ibid.*

[96] Petroleum News. Remote basin exploration moves forward. Volume 14, No. 50, December 13, 2009.

146. Over time, the geographic extent of oil field development on the North Slope has gradually expanded. Development of outlying fields and extension of supporting infrastructure has allowed previously economically inefficient fields to become efficient from a logistical standpoint. Further, evolving technology has enabled development of fields that may have been economically inefficient with the technology available at the time of discovery. Sequential development and infrastructure sharing are key elements in developing smaller oil and gas deposits. Sharing of the processing facilities, operations base camp, airstrip, and other infrastructure reduces the costs to produce from smaller deposits and can make them economically efficient.[97] This pattern of development, with gradual expansion out from existing infrastructure, is likely to continue in the future for marginal fields.

147. In addition, the oil and gas industry has achieved substantial technological advances over the past 40 years. These advances have affected both exploration and development activities and expanded the industry's ability to access oil and gas resources while maintaining or reducing the affected surface area. The following bullets identify some of the more important technological advances:

- **3-D Seismic Data Acquisition and 4-D Visualization.** Development of 3-D seismic data acquisition and 4-D visualization in about 1980 has allowed the industry to improve the success rate of finding new fields by a factor of three or more over the last 40 years, as well as identify higher quality fields. Use of the technology involves taking measurements along grids that may cover hundreds of square kilometers. Onshore measurements are taken during the winter using vibrators, and the vehicles and supporting equipment and personnel are designed to have a low impact on the tundra. Offshore, measurements are taken during the open-water season using specialized seismic vessels. 4-D Visualization technology is able to show changes over time of re-recorded 3-D data, as well as integrate actual production and well log information into the time-lapsed images.
- **Ice Roads and Ice Pads.** Historically, exploration roads and pads were built using gravel or other materials, leading to tundra damage. As a way to reduce environmental damage, the industry has replaced more permanent gravel roads with ice roads that are laid each winter. Ice roads are now the primary means of accessing isolated drilling locations, and ice pads have been adopted for exploratory drilling sites.
- **Roadless Access.** Development of the Alpine field provides a model for roadless access. A winter ice road was constructed to the Alpine site, which was used to transport all equipment and personnel and to construct the pipeline from Alpine to Kuparuk to access existing pipeline infrastructure. Gravel was used only for the production pads and an airstrip, with no permanent roads linking the facility to other locations. The Alpine model will be used for future oil-field

[97] Nelson, Kristen. Conoco files new Alpine West application. Petroleum News, Vol. 14, No. 21 accessed on January 10, 2010 at http://www.petroleumnews.com/pnads/411029216.shtml.

development, with fewer and smaller pads and the use of ice roads for winter construction. However, use of ice roads requires sufficient water resources and therefore areas with a scarcity of water require either gravel roads or another means of access. Vehicles (e.g., air cushion vehicles) and equipment can be used to allow for cross-country travel without the use of gravel or ice roads. These low-impact vehicles allow access to more remote locations where ice roads would be cost-prohibitive or result in too large of a schedule delay.

- **Production Pad Size.** The size of production pads, the numbers of wells on those pads, and the total area covered have undergone substantial changes over the past 40 years. Though the rate of improvement has declined over time, technology has continued to result in reductions of pad size while improvements in horizontal drilling have increased the potential production area per pad.
- **Waste Disposal.** Until the 1980s, waste associated with wells was handled by storage in reserve pits, incineration, or other means. The pits were subject to seepage and spillage, and other handling methods had potential environmental effects. Starting in 1996, a reserve pit closure program was initiated, resulting in the closure of about 50 percent of the reserve pits in the state. Closure plans for all sites were submitted to the Alaska Department of Environmental Conservation in 2002. However, there are still a large number of reserve pits at remote locations that have not been closed and have the potential to cause contamination. Today, exploration wells and producing fields inject waste for subsurface disposal. Subsurface disposal is used because it is effective and prevents contamination of the surface environment. For existing reserve pits, a grind-and-inject program is used at many locations, in which drilling muds and cuttings from reserve pits are processed and injected to eliminate surface storage and its potential environmental risks.[98]
- **Extended Reach Horizontal Drilling.** Extended reach drilling uses directional and horizontal drilling techniques to achieve larger horizontal reaches and reach-to-total vertical depth ratios that exceed conventional drilling techniques. Directional drilling refers to the intentional drilling away from the vertical to access a particular section of the reservoir. Horizontal drilling achieves a greater reach from the vertical, allowing more contact with the reservoir over distance, which increases the production rate from the reservoir.[99] For example, wells that are presently being drilled to reach BP's Liberty field underground reservoir will reach as far as 40,000 feet laterally from the surface location of the rig,[100] essentially doubling the reach achieved in 1998.

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[98] National Research Council. Committee on the Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope. Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope. 2003.

[99] Alaska Department of Natural Resources. North Slope Areawide Oil and Gas Lease Sale Final Finding of the Director. July 15, 2008.

[100] Alaska Journal of Commerce. BP may employ 'super rig' for record reach at Liberty. October 30, 2005.

- **Sub-Sea Completions.** The development of sub-sea completion technology has enabled production from deep, remote, and marginal fields. It allows production outside the reach of directional drilling from existing platforms in places where construction of another platform is uneconomical, such as in marginal fields. Over the past 50 years, sub-sea completion has gone from a theoretical technology to a proven technique used in more than 1,100 wells.[101] Development of sub-sea completion technology has enabled production to move from shallow waters into deeper areas in a cost-effective manner. Initial application of sub-sea completion technology took place in the 1960s, though it was in the 1970s and early 1980s with improvements in the technology that activity increased significantly around the world. This was driven by rising oil prices, which drove development to deeper and deeper water.[102] Subsea completions are a way to develop and produce small deposits of oil or gas by connecting them to existing infrastructure. Subsea completions won't be undertaken until primary infrastructure is in place. Gas fields have a higher probability of subsea completions than oil since oil requires more well interventions for workovers, waterflood, and other maintenance.[103]
- **Gravel Islands to Other Ice-Resistant Platforms.** Gravel islands have been used in shallow water for offshore development in the Beaufort Sea for decades. While these structures are resistant to ice, the islands are expensive to construct and are limited to depths of about 50 feet. New technologies have enabled platforms to operate in an arctic environment in deeper waters. Doing so requires materials to be used that maintain strength at cold temperatures and are ice-resistant. In areas of multi-year ice, more massive gravity-based structures could be used in water depths to about 100 meters.[104] Such platforms will be very expensive, and it is anticipated that extended reach drilling and subsea completions will be employed to minimize the number of platforms that will be required to develop commercial discoveries.

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[101] Society of Petroleum Engineers. Frontiers of Technology – Subsea Completions. Journal of Petroleum Technology, Vol. 8. August 1999. Accessed January 7, 2010 from http://www.spe.org/spe-app/spe/jpt/1999/08/frontiers_subsea_completions.htm.

[102] *Ibid.*

[103] Miller, Brian. Shell Exploration & Production, Inc. Personal communication to Northern Economics staff, October 14, 2009.

[104] IMV Projects Atlantic. Arctic Offshore Technology Assessment of Exploration and Production Options for Cold Regions of the U.S. Outer Continental Shelf. Prepared for Minerals Management Service, January 2008.

3.4 DEVELOPMENT SCENARIO FOR OIL AND GAS ACTIVITY

148. This section provides one possible future, or "scenario," of oil and gas activity in the proposed polar bear critical habitat designation area for the 2010 through 2039 time period. It should be recognized that this is only one possible description of the future; other scenarios could be envisioned. This information is included to provide the Service with information regarding the relative distribution of economic activity across the areas proposed for critical habitat designation and, therefore, a sense of the areas with the greatest level of resources at risk from potential additional regulation. The development scenario presented here is based on the following:

- A recent report prepared for Shell Exploration and Production, Inc. that describes a potential scenario for development in the OCS or Federal waters of the Beaufort Sea and the Chukchi Sea and which built upon earlier work by the Minerals Management Service.[105]
- Development scenarios described in environmental impact statements for the Northeast NPR-A and the Northwest NPR-A planning areas.[106]
- Best interest findings by the Alaska Department of Natural Resources for unleased state lands between ANWR and the NPR-A, and unleased waters of the Beaufort Sea.[107]
- A set of assumptions regarding future development for state lands and waters developed by Northern Economics for this analysis and reviewed for plausibility by the Oil and Gas Division of the Alaska Department of Natural Resources.[108]

149. The following sections describe a scenario for oil and gas exploration, development, and production on state lands and waters, in the Northeast and Northwest NPR-A, and in the OCS in the Beaufort and Chukchi Seas. The most prospective lands and waters for oil and gas production, given current understanding of the geology of the North Slope and the OCS and current technology, have already been leased and large blocks of leases in the central North Slope are producing. A number of state leases are located south of the existing production area and east along the Beaufort Sea coast and are not currently in production. In addition, there are state leases offshore the NPR-A that are also not in

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[105] Northern Economics, 2009. Economic Analysis of Future Offshore Oil and Gas Development: Beaufort Sea, Chukchi Sea, and North Aleutian Basin. Prepared for Shell Exploration & Production, Inc., 2009.

[106] Bureau of Land Management. Northwest National Petroleum Reserve – Alaska Final Integrated Activity Plan/Environmental Impact Statement, 2003. Accessed on December 30, 2009 at http://www.blm.gov/ak/st/en/prog/planning/npra_general/nw_npra/nw_npr-a_final_iap.html; Bureau of Land Management. Northeast National Petroleum Reserve – Alaska Final Supplemental Integrated Activity Plan/Environmental Impact Statement, 2008. Accessed on December 30, 2009 at http://www.blm.gov/ak/st/en/prog/planning/npra_general/ne_npra/northeast_npr-a_final.html.

[107] Alaska Department of Natural Resources. Proposed Beaufort Sea Areawide Oil and Gas Lease Sale Preliminary Finding of the Director April 2, 2009; Alaska Department of Natural Resources. North Slope Areawide Oil and Gas Lease Sale Final Finding of the Director. July 15, 2008.

[108] Banks, Kevin. Director, Division of Oil and Gas, Alaska Department of Natural Resources. Personal communication with Northern Economics staff. January 5, 2010.

production. There are no existing oil and gas leases on state lands or waters bordering the Chukchi Sea. With the exception of Liberty and Northstar, which is a joint state-Federal oil and gas unit, there are no producing leases in the OCS.

150. The following discussion describes a possible development scenario over three time periods: 2010-2019, 2020-2029, and 2030-2039. It is anticipated that oil and gas activities in the polar bear critical habitat area will continue past 2039, but as a time period gets farther distant it becomes more speculative. A scenario to 2039 captures the peak level of activity anticipated in the Beaufort Sea and Chukchi Sea OCS.[109] Exhibit 3-18 describes a time table for oil and gas development activity in the proposed polar bear critical habitat region from 2010 to 2039. The text following Exhibit 3-18 describes the development of associated infrastructure, including transportation facilities, pipelines, and staging facilities. Finally, this section describes the estimated oil and gas production volumes and employment effects in proposed critical habitat.

[109] Northern Economics, 2009. Economic Analysis of Future Offshore Oil and Gas Development: Beaufort Sea, Chukchi Sea, and North Aleutian Basin. Prepared for Shell Exploration & Production, Inc., 2009.

EXHIBIT 3-18 TIME LINE FOR OIL AND GAS DEVELOPMENT ACTIVITY

2010 to 2019

- Natural gas pipeline is built and operating by the end of this time period.
- In anticipation of the natural gas pipeline, industry increases production of oil reserves from Prudhoe Bay, and other fields with associated gas, to permit higher rates of gas production. Also, additional exploration for natural gas is anticipated south of the existing production areas. Much of this activity will be in the Brooks Range foothills, south of the polar bear habitat in the central North Slope.
- Production of oil and natural gas liquids (NGLs) begins from the Point Thomson field.
- Additional infill drilling to reach small pockets of oil that have not yet been produced is undertaken.
- Technological advancements lead to increased production of viscous or heavy oil from reservoir horizons in existing production areas, and from heavy oil discoveries in the White Hills located south of the Kuparuk River oil and gas unit.

2020-2029

- State leases in the Brooks Range foothills in proximity to the natural gas pipeline are developed and gas production from these leases begins.
- Presence of an oil and gas production facility at Point Thomson results in development of several known but smaller satellite fields in the vicinity of Point Thomson, and additional exploration in eastern part of the central North Slope in proximity to ANWR. This expectation is based on the experience with the Alpine field, which was discovered adjacent to the NPR-A in the Colville River delta where the availability of infrastructure made smaller discoveries economic to produce.
- Additional exploration and development in the Northeast NPR-A results in extension of oil and gas infrastructure northwest along the Beaufort Sea coast toward Barrow.
- Exploration and development of oil and gas resources in state waters offshore the NPR-A in the Beaufort Sea occur after onshore development in the NPR-A provides infrastructure in proximity to state offshore leases.
- Oil and gas production from other Beaufort Sea OCS leases begins, and oil production begins from Chukchi Sea leases.
- A total of seven platforms could be built in the Beaufort Sea OCS and two platforms in the Chukchi Sea OCS.
- Gas production from the Beaufort Sea OCS results in an expansion of capacity for the main natural gas pipeline completed in 2019.
- An oil pipeline is built across the NPR-A to tie into the existing Trans Alaska Pipeline System (TAPS), and other infrastructure is built on the Chukchi Sea coast to support OCS development and production. With the availability of infrastructure to support exploration in northwest Alaska, additional lease sales for state and Federal lands in the western NPR-A and other Federal/state/private lands along the Chukchi Sea coast are held, with additional oil exploration occurring as a result.

2030-2039

- Two additional platforms are built in the Chukchi Sea OCS and gas production from the Chukchi Sea OCS begins, with a natural gas pipeline built across the NPR-A to connect to the main natural gas pipeline.
- A second capacity expansion of the main natural gas pipeline occurs as a result of the Chukchi Sea OCS gas production.
- With the proximity of oil and gas pipelines crossing the NPR-A, Federal leases in the central NPR-A are further explored and developed during this period. Other Federal and state leases along the Chukchi Sea coast west of the NPR-A are explored and brought into production by connecting to the infrastructure built to support OCS production.
- Facilities at Prudhoe Bay, Kuparuk River, and other mature fields in the central North Slope are refurbished with new technology and used to produce heavy oil reserves in addition to continuing natural gas production.
- State leases in the Brooks Range foothills that are some distance from the main natural gas pipeline are brought into production as the gas transportation infrastructure continues incremental extension east and west as other fields are brought on line.

3.4.1 TRANSPORTATION FACILITIES

151. The initial development pattern on the central North Slope had each well pad connected by road, and each major field had roads to provide access to the Dalton Highway. This development pattern has changed significantly in the past decade. The Badami and Alpine fields are not road connected although an oil sales pipeline does connect back to the TAPS.

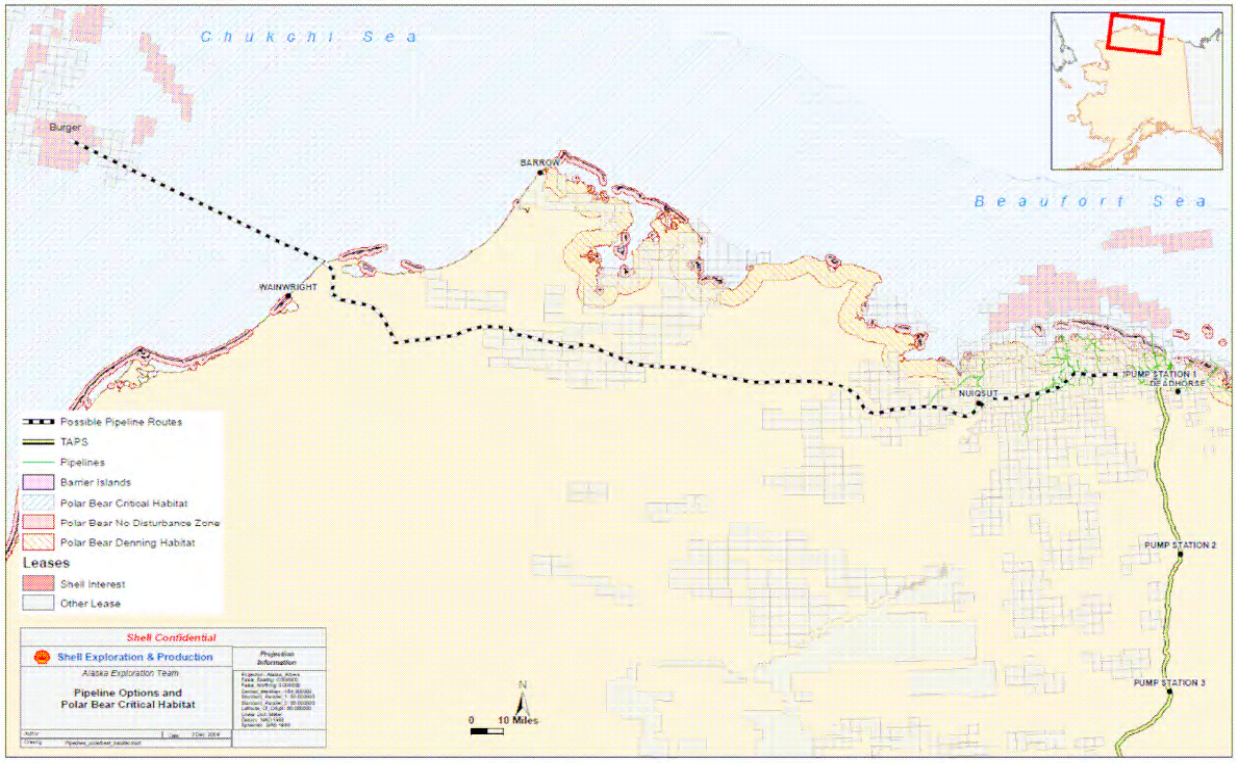
152. The current transportation method is to build ice roads or use low-pressure vehicles ("Rolligons") for winter exploration wells and if a commercial discovery is made, build ice roads to facilitate construction of a gravel pad and airstrip, and to bring in the equipment and facilities that are needed for production. Ice roads can be used from January to about May, and air transport is used during the other months of the year. Point Thomson is also proposed to be developed as a roadless project with an oil sale pipeline connecting to the Badami pipeline or possibly back to pump station 1 at Prudhoe Bay.

153. The Bureau of Land Management has noted the difficulty in finding gravel sources as industry moves further east or south in the NPR-A, and also stated that they anticipated "that development in the [Northeast NPR-A] planning area would generally not connect by road to areas outside of NPR-A."[110] Given the difficulty in finding gravel sources and the stated preference by the BLM, it is expected that gravel roads connecting central production facilities and satellite drilling pads would be the only roads permitted in the NPR-A.

154. As noted earlier, it is anticipated that pipelines would be built across the NPR-A to transport oil and gas from the Chukchi Sea OCS and other discoveries in northwest Alaska and the NPR-A to other export pipelines. Exhibit 3-19 shows one potential pipeline corridor from the Burger prospect in the Chukchi Sea to the coast and then across the NPR-A to pump station 1. Such a corridor would cross a number of existing leases in the NPR-A and possibly make some of the smaller discoveries in the NPR-A economic.

[110] Bureau of Land Management. Northeast National Petroleum Reserve – Alaska Final Supplemental Integrated Activity Plan/Environmental Impact Statement, 2008. Accessed on December 30, 2009 at http://www.blm.gov/ak/st/en/prog/planning/npra_general/ne_npra/northeast_npr-a_final.html.

EXHIBIT 3-19 POTENTIAL PIPELINE CORRIDOR FROM CHUKCHI SEA TO PRUDHOE BAY



Source: Shell Exploration and Production Company, 2009.
Note: This map is marked Shell Confidential but was submitted as part of the public comment process.

155. While OCS discoveries may be large enough to justify large pipelines across the NPR-A, most NPR-A discoveries to date have been small and are planned to connect back to the Alpine production facility and the pipeline from Alpine to the Kuparuk pipeline. The actual locations of new pipelines in the study area will depend on the location and sequence of commercial discoveries.

156. The BLM developed a potential scenario of possible future pipeline corridors based on their assessment of potential future discoveries (see Exhibit 3-20). These hypothetical pipeline corridors are only one possible scenario of future NPR-A infrastructure development.

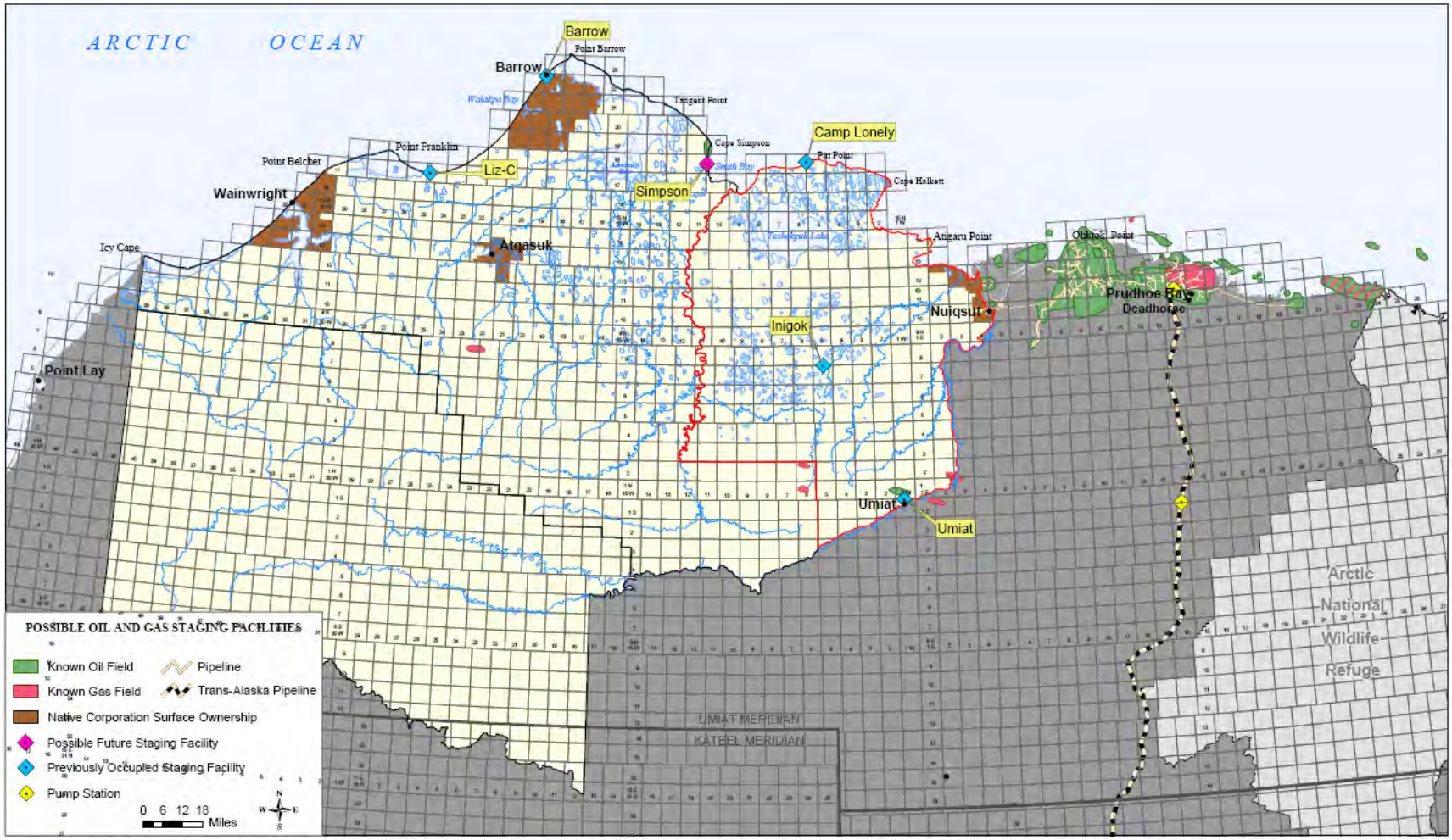
EXHIBIT 3-20 POTENTIAL PIPELINE CORRIDORS IN THE NPR-A

Source: Bureau of Land Management. Northeast National Petroleum Reserve – Alaska Final Supplemental Integrated Activity Plan/Environmental Impact Statement, 2008. Accessed on December 30, 2009 at http://www.blm.gov/ak/st/en/prog/planning/npra_general/ne_npra/northeast_npr-a_final.html.

157. The Alaska Department of Transportation and Public Facilities (ADOT&PF) has proposed to build a road from the Dalton Highway to Umiat on the eastern boundary of the NPR-A. This project would be south of the polar bear critical habitat, but if the project were built it could reduce the level of transport activity that would be further north in the critical habitat.

158. As exploration activities move farther from the central North Slope production areas, the cost of building ice roads becomes cost prohibitive and even transport by low-pressure vehicles becomes difficult and costly at long distances. It is likely that industry will use staging areas situated along the Beaufort Sea and Chukchi Sea coasts from which to reach NPR-A leases. Exhibit 3-21 shows potential staging facilities that were identified by the BLM. Ice roads or low-pressure vehicles could be used to reach many of the oil and gas leases in the western and interior portions of the NPR-A, at much lower cost than from the Prudhoe Bay area.

EXHIBIT 3-21 POSSIBLE OIL AND GAS STAGING FACILITIES

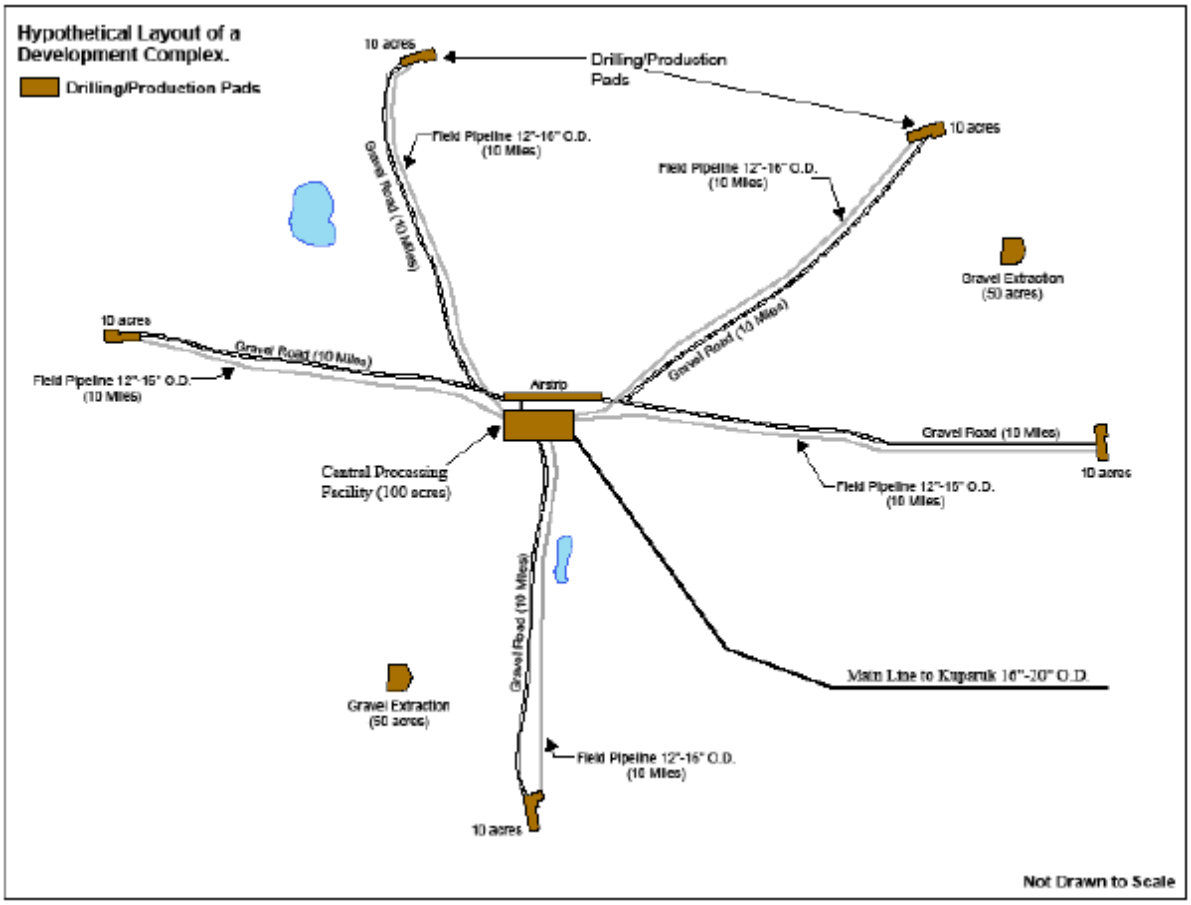


3.4.2 INTENSITY OF ACTIVITY AND DENSITY OF FACILITIES

159. As noted previously, the size of gravel pads used for drilling wells has decreased over time as technology has improved and as industry has sought to reduce its environmental footprint. The availability of 3-D and 4-D seismic surveys has enhanced the ability of industry to identify targets, and evolving understanding of the geology of the region, combined with directional and extended reach drilling have reduced the footprint and expense of developing smaller oil and gas deposits. In the early 1990s an Alpine sized field (450 to 500 million barrels), not too distant (34 miles) from the existing infrastructure was necessary to be economic. By the end of the 1990s companies were developing fields of 100 million barrels and even smaller.

160. Exhibit 3-22 shows a hypothetical layout of a central processing facility and five satellite fields as envisioned by the BLM. This layout is similar to the concept being employed at ConocoPhillips' Alpine field and its satellite fields. This concept does not have a gravel road connection back to Kuparuk or other areas with access to the national highway system. Winter surface travel via ice roads or low-pressure vehicles is used to transport drilling rigs, equipment, fuel, and other supplies. Air transport is used when surface travel is not allowed.

EXHIBIT 3-22 HYPOTHETICAL LAYOUT OF A CENTRAL PROCESSING FACILITY AND FIVE SATELLITE FIELDS



Source: Bureau of Land Management. Northeast National Petroleum Reserve – Alaska Final Supplemental Integrated Activity Plan/Environmental Impact Statement, 2008. Accessed on December 30, 2009 at http://www.blm.gov/ak/st/en/prog/planning/npra_general/ne_npra/northeast_npr-a_final.html.

161. As shown in Exhibit 3-23, the estimated total acreage of surface disturbance for this hypothetical development concept is 687 acres. The surface disturbance is about 0.3 percent of the land in a circle 20 miles in diameter, which is the approximate shape of the development concept displayed above. This percentage of surface disturbance is much less than in earlier developments on the North Slope.

EXHIBIT 3-23 ESTIMATED AREA OF SURFACE DISTURBANCE FOR HYPOTHETICAL OIL AND GAS FACILITIES

FACILITY	NUMBER OF FACILITIES/MILES/ACRES	TOTAL ACRES
Central production facilities (1 pad, road, airstrip)	1	100
Production pad (10 acres each)	5	50
Roads to satellite fields (7.5 acres per mile)	50 miles	376
Vertical support members (150 VSMs per mile)	50 miles	<1
Gravel extraction area	2	100
Staging area	1	50
Seawater treatment plant	1	10
Total		687

Source: Bureau of Land Management. Northeast National Petroleum Reserve – Alaska Final Supplemental Integrated Activity Plan/Environmental Impact Statement, 2008. Accessed on December 30, 2009 at http://www.blm.gov/ak/st/en/prog/planning/npra_general/ne_npra/northeast_npr-a_final.html.

3.4.3 PRODUCTION VOLUMES AND EMPLOYMENT

162. The MMS provides information on the potential value of the oil and gas resources in the Arctic OCS (not specifically within the proposed critical habitat area), stating:

> "We acknowledge the timing, location, and volumes from oil and gas production from fields that are undiscovered today cannot be accurately predicted. However, the high resource potential of the Arctic OCS is undeniable. The economic benefits associated with commercializing these resources are substantial to both the State of Alaska and the nation."

163. The MMS mean resource estimates in the Arctic Outer Continental Shelf, including areas of the Beaufort, Chukchi and Hope Basin, amount to 23.75 billion barrels of undiscovered oil and 108.19 trillion cubic feet of undiscovered gas. High end estimates, at lower probabilities, are more than double these mean estimates. Applying market price forecasts from the Energy Information Administration, the gross value of the mean resource estimates is approximately $3 trillion. Of this value, MMS estimates about half ($1.5 trillion) represents potential revenue to the State of Alaska and Federal government for leasing, taxes, and royalties (the remaining half represents spending on exploration and development, operations, and salaries). This estimate does not include potential multiplier effects on the State and National economies of this level of economic activity.[111]

[111] Information from Rance Wall, P.E., Alaska Region, Minerals Management Service, provided to U.S. FWS via email on January 19, 2010. The MMS mean resource estimates provided are for undiscovered oil and gas. This analysis focuses on the economically recoverable resources, and thus does not consider Hope Basin.

164. These mean resource estimates and associated values provide context for the oil and gas resources at risk from additional regulation within the entire Arctic OCS. They are not, however, specific to the proposed critical habitat area for the polar bears. The following discussion makes simplifying assumptions in order to estimate the economically recoverably resources within the proposed critical habitat area for the polar bears.

165. The BLM scenario for the Northeast NPR-A assumes that oil and gas production from the planning area does not commence until 2020 and reaches about 30 million barrels of oil annually by about 2023. By 2035, production reaches about 60 million barrels of oil per annum, dropping to 50 million barrels by 2039. According to the BLM, the large majority of the natural gas to be found in the planning area will be associated with oil. Therefore, it is anticipated that oil production will occur first with gas reinjected to maintain reservoir pressure. Only oil production estimates are provided in the Northeast NPR-A Supplemental IAP/EIS,[112] and there are no annual production estimates for the Northwest Planning Area.[113] However, the report for the Northeast planning area indicated that the Northeast contained about 54 percent (4.3 billion barrels of oil) of the combined (Northeast and Northwest) eight billion barrels of economically recoverable oil resources. This indicates that the Northwest region would have about 3.7 billion barrels of oil. Given the greater distance from infrastructure, production from the Northwest would likely be about ten years later than in the Northeast NPR-A. Consequently, the Northwest planning area might reach about 25 million barrels of production in 2033 and about 55 million barrels by 2039.

166. A recent report by NEI estimated future production and employment for the central North Slope, NPR-A, and the Beaufort Sea and Chukchi Sea OCS, plus the North Aleutian Basin. More than 90 percent of the total oil and gas production potential of the State of Alaska is associated with the development of the North Slope. The North Aleutian Basin has less than ten percent of the estimated oil and gas resources of the Beaufort Sea and Chukchi Sea OCS and most of the production and employment estimates presented in this report would be for the OCS areas that are within the polar bear proposed critical habitat area.[114] The production estimates in this report are described for onshore (central North Slope and NPR-A) and OCS, and are based on the abovementioned reports, as well as forecasts by the Alaska Department of Revenue, and previous scenarios developed by the MMS. The production volumes and direct employment estimates are shown in Exhibit 3-24. The oil and gas production is presented as millions of barrels of oil equivalent on an energy basis.

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[112] *Ibid.*

[113] *Ibid.*

[114] Source: Northern Economics, 2009. Economic Analysis of Future Offshore Oil and Gas Development: Beaufort Sea, Chukchi Sea, and North Aleutian Basin. Prepared for Shell Exploration & Production, Inc., 2009.

167. The volumetric estimates shown for barrier islands and denning habitat for the Beaufort Sea in Exhibit 3-24 were derived by first estimating the percent of each North Slope oil and gas unit that is within each habitat unit, as well as those known fields that are being developed (e.g., Point Thomson). Future production in these units is anticipated to decline.[115]

168. For estimating the portion of yet-to-be-discovered oil and gas resources which may be located within the barrier islands and denning habitat, GIS was used to estimate the square miles of the proposed critical habitat in the Central North Slope between ANWR and the NPRA. The estimated critical habitat areas are then estimated as percentages of the total land area of the central North Slope region for which USGS developed an oil and gas resource assessment in 2005.[116] Assuming that the USGS oil and gas resource estimates are uniformly distributed in the Central North Slope, future oil and gas production from the critical habitat units between ANWR and NPR-A is assumed to be equal to the percentage of the total central North Slope area that they currently occupy.

169. A similar approach was used for estimating oil and gas production in the Northeast NPR-A planning area and the Northwest NPR-A planning area, as well as lands located west of the NPR-A. The total area of the barrier island habitat in each planning area and that part of the study area west of the NPRA was calculated. The total land area for each planning area was taken from the relevant planning documents, and the total land area for lands west of the NPRA was also estimated using GIS. The amount of barrier island habitat as a percentage of total land in each planning area was then calculated. Assuming that the distribution of oil and gas resources is uniform across the landscape, future oil and gas production from the barrier island habitat was estimated using the percentage of the total land in each planning area that the habitat represents. Production from the western NPR-A or onshore areas west of the NPRA is not expected to occur until late in the study period, which accounts for the minor production from the barrier island habitat in the Chukchi Sea.

[115] *Ibid*.

[116] U.S. Geological Survey, 2005. Economic Analysis of Undiscovered Oil and Gas of the Central North Slope of Alaska, 2005.

EXHIBIT 3-24 OIL AND GAS PRODUCTION AND DIRECT EMPLOYMENT IN NORTH SLOPE OIL AND GAS INDUSTRY

PROPOSED CRITICAL HABITAT AREA	YEAR						
	2010	2015	2020	2025	2030	2035	2039
PRODUCTION PER DAY (MMBOE)							
Total Onshore*	**0.79**	**0.72**	**0.96**	**1.21**	**1.12**	**1.05**	**1.01**
Beaufort							
Barrier Islands CH	0.06	0.06	0.05	0.05	0.04	0.03	0.02
Denning habitat CH	0.53	0.54	0.51	0.45	0.34	0.27	0.22
Chukchi							
Barrier Islands CH	0	0	0	0.01	0.01	0.01	0.01
Denning habitat CH	0	0	0	0	0	0	0
Total OCS*	**0**	**0**	**0.12**	**1.21**	**1.58**	**1.26**	**1.09**
Beaufort Sea Ice CH	0	0	0.12	0.65	1.01	0.71	0.46
Chukchi Sea Ice CH	0	0	0	0.42	0.54	0.49	0.59
Total (Onshore and OCS)*	**0.79**	**0.72**	**1.08**	**2.42**	**2.7**	**2.31**	**2.1**
DIRECT JOBS (ANNUAL AVERAGE EMPLOYMENT)							
Total Onshore*	**7,680**	**10,120**	**8,440**	**8,460**	**7,440**	**6,720**	**6,250**
Beaufort							
Barrier Islands CH	540	780	470	320	240	180	140
Denning Habitat CH	5,200	7,550	4,520	3,120	2,280	1,710	1,390
Chukchi							
Barrier Islands CH	0	0	0	0	0	0	0
Denning habitat CH	0	0	0	0	0	0	0
Total OCS*	**1,330**	**3,870**	**10,520**	**9,860**	**11,430**	**11,900**	**12,700**
Beaufort Sea Ice CH	744	1,797	4,801	4,574	4,900	4,134	3,917
Beaufort Denning Habitat CH**	367	885	2,365	2,253	2,413	2,036	1,929
Chukchi Sea Ice CH	147	796	2,247	2,033	2,758	3,839	4,592
Chukchi Denning Habitat CH**	0	0	0	0	0	0	0
Total (Onshore and OCS)*	**9,010**	**13,990**	**18,960**	**18,320**	**18,870**	**18,620**	**18,950**

* The total onshore, OCS, and overall total rows include areas outside of the proposed critical habitat designation. Thus, the total production and employment in critical habitat (CH) may not sum to totals reported.

** Jobs in denning habitat described under the subheading "Total OCS" are OCS-related jobs that are located onshore in denning habitat.

Sources: Estimates by Northern Economics using data from Northern Economics, 2009. Economic Analysis of Future Offshore Oil and Gas Development: Beaufort Sea, Chukchi Sea, and North Aleutian Basin. Prepared for Shell Exploration & Production, Inc., 2009. Also, Alaska Department of Natural Resources, Division of Oil and Gas, 2009. Alaska Oil and Gas Report 2009.

170. Employment estimates in the Beaufort Sea onshore area are based on estimates of the percent of existing production facilities and other infrastructure, as well as fields being developed, that are located within each critical habitat designation, and that estimate is used to assign employment to each habitat unit. Over time production from these fields will decline and employment is also expected to decline. There is current employment that is located outside of the units and the number of those jobs located outside of the units is expected to increase over time as industry moves further away from existing production areas in search of new reserves.

171. In the Chukchi Sea there is no critical denning habitat so zero employment is estimated for that unit. While production from the barrier island habitat designation may occur late in the study period it is anticipated that facilities and thus employment would be located outside of that habitat and the resources would be accessed by extended reach drilling.

172. Employment in the sea ice habitat is direct employment on the offshore platforms, or on operating vessels that do not come ashore. All other employment is assigned to coastal facilities, even platform supply vessels and helicopters.

CHAPTER 4 | CONSTRUCTION AND DEVELOPMENT

173. This chapter addresses the potential impacts of polar bear critical habitat on all construction and development activities not directly related to oil and gas exploration and development (as discussed in Chapter 3), including: residential and commercial development, construction and maintenance of transportation infrastructure (roads, wind energy, bridges, ports, and airports), and mining. While the activities discussed in this chapter are not oil and gas projects, they may generally be associated with regional economic growth brought about by the expansion of oil and gas activities in the North Slope. These activities generally take place outside of Unit 1 (sea ice habitat), which accounts for approximately 95 of the total area proposed for critical habitat. As a result, the activities and associated economic impacts described in this chapter are limited to the five percent of proposed critical habitat that constitutes Unit 2 (terrestrial denning habitat) and Unit 3 (barrier island habitat). In fact, the projects forecast will account for small areas within these two units.

174. The proposed rule describes development and construction as potential threats in polar bear denning habitat as expanded infrastructure may force pregnant females into marginal denning locations. Additionally, the potential exists for noise and physical presence during development projects to disturb polar bears.[117] Project proponents currently consult with the U.S. Fish and Wildlife Service (Service) under section 7 of the Endangered Species Act (ESA), and comply with associated conservation measures to ensure their activities avoid jeopardizing the continued existence of the polar bears. The Service does not expect the designation of critical habitat to result in additional conservation measures for the polar bear beyond those currently being implemented.[118] Incremental impacts of critical habitat designation are therefore limited to additional administrative effort to consider adverse modification as part of section 7 consultation.

175. This chapter first describes the potential scope and scale of future construction and development activities. Where possible, the project location within the proposed critical habitat is identified. Next, the chapter qualitatively describes the baseline conservation measures afforded the polar bear absent the designation of critical habitat. Finally, this chapter quantifies the incremental administrative impacts to these activities specifically associated with critical habitat designation for the polar bear.

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[117] 74 FR 56058.

[118] FWS to Industrial Economics, Inc., November 2, 2009, "Incremental Effects of Critical Habitat Designation for the Polar Bear."

KEY ISSUES AND CONCLUSIONS:

- Future construction and development activities include wind energy projects, commercial and residential developments, transportation projects, and mining. These activities are forecast to occur in only five percent of the total proposed critical habitat area: Unit 2 (terrestrial denning habitat) and Unit 3 (barrier island habitat). In fact, the projects forecast are expected to account for small areas within these units.

- The forecast of construction and development activities subject to consultation considering the polar bear relies on past consultation rates for these activities, along with information on specific projects identified by stakeholders and in public comments submitted on the proposed rule.

- Conservation measures made via section 7 consultation due to the listing (i.e., to avoid jeopardy to the species) are likely to include: avoidance of activities within one mile of known polar bear dens; development of field operating procedures and protocols for avoiding bears; and personnel designation and training in appropriate polar bear management activities.

- The Service expects that conservation afforded the polar bear through this baseline also avoids the potential for adverse modification of critical habitat. As such, the Service can not foresee a scenario in which the designation of critical habitat would result in any additional conservation measures during section 7 consultation. Direct incremental impacts of critical habitat are therefore limited to administrative costs of consultation, totaling **$427,000** (present value at seven percent) over the next 30 years (Exhibit 4-4).

- In addition to these direct incremental impacts, stakeholders have expressed a concern that regulatory uncertainty and litigation due to the designation of critical habitat may result in delays to projects or limit economic development of the region. Whether and to what extent projects may be delayed or avoided is subject to significant uncertainty. This analysis therefore recognizes the potential for such indirect impacts of the regulation, but is unable to monetize specific costs.

- The landowners within the North Slope region, including multiple Alaskan Native communities and Regional Corporations, depend on access to the land and its natural resources. As described in Chapter 2, Alaska Native Regional Corporations manage the resources of their lands to provide jobs for village residents, and tax revenues for the villages and boroughs. This includes construction of infrastructure and roads to support access for industry to these regions.

4.1 SCOPE AND SCALE OF FUTURE CONSTRUCTION AND DEVELOPMENT OF INFRASTRUCTURE

176. To forecast potential future construction and development activities, this analysis relies on the consultation history for the polar bear, public comments received on the proposed rule, and communication with stakeholders and land managers to identify upcoming projects. The consultations that have been undertaken since the listing of the polar bear are used to forecast the nature and frequency of likely development activities occurring within the polar bear's range in Alaska.

177. Construction and development activities that have resulted in section 7 consultation regarding the polar bear fall into three general categories:

- Residential and commercial development;
- Construction and maintenance of infrastructure (roads, bridges, and airports); and
- Mining.

178. Exhibit 4-1 describes the extent of these activities over the two years since the polar bear listing (2008 and 2009) by unit.

EXHIBIT 4-1 PAST POLAR BEAR SECTION 7 CONSULTATIONS

UNIT	TYPE OF ACTIVITY	NUMBER OF CONSULTATIONS*
2: Terrestrial Denning Habitat	Residential/Commercial Development	5
	Construction and Maintenance of Infrastructure	7
	Mining	0
	Total	**12**
3: Barrier Island Habitat	Residential/Commercial Development	8
	Construction and Maintenance of Infrastructure	14
	Mining	2
	Total	**24**
	Grand Total	**36**

*These are all informal consultations with the exception of one formal consultation related to residential/commercial development in Unit 2 and one technical assistance effort related to infrastructure in Unit 2.

4.1.1 RESIDENTIAL AND COMMERCIAL DEVELOPMENT

179. Residential and commercial development projects within the proposed critical habitat are occurring in villages and towns along the coast of Alaska's North Slope and Seward Peninsula. Exhibit 4-2 depicts the villages and towns located in and around the proposed critical habitat, all of which are small and remote. The largest town located in the vicinity of the proposed critical habitat is Barrow, with an estimated population of 4,010 in

2008.[119] The City of Nome, also within the proximity of proposed critical habitat, is similarly sized, with a population of about 3,580.[120] Exhibit 4-2 also serves as a reference regarding the general locations of potential future projects discussed in the remainder of this chapter.

180. Exhibit 4-3 graphs population estimates and projections for the census areas and boroughs within the proposed designation. Populations within these census areas and boroughs have been growing at approximately one percent per year, on average. The Bethel census area, with approximately 17,000 residents in 34 communities, is the most populous remote rural area in the state. Because of its large size (41,087 square miles), however, population density is very low (0.4 persons per square mile).[121] Residential and commercial development projects have primarily occurred within the Nome Census Area and the North Slope Borough.

181. Past residential and commercial development activities that have required consultation with the Service include residential housing construction, construction of a community center, and weather station facility construction and maintenance. This analysis considers the geographic distribution of past construction and development activity to identify regions that may experience future development. In addition, the analysis considers specific, planned future development projects. In particular, information from the Arctic Slope Regional Corporation (ASRC), North Slope Borough (NSB), and Northwest Arctic Native Association (NANA) Regional Corporation point out that many Native Alaskan villages are located within or adjacent to the proposed critical habitat. As a result, these stakeholders express the concern that village growth may be affected by the designation.[122,123] NANA expresses concern about the fate of two specific community development projects – a wind energy development near Red Dog Mine Port and transmission line construction from the port to the Village of Kivalina (Exhibit 4-2).[124]

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[119] U.S. Census Bureau, Population Estimates, Incorporated Place and Minor Civil Division Population Dataset, accessed at http://www.census.gov/popest/datasets.html.

[120] Nome, Alaska, accessed at http://www.city-data.com/city/Nome-Alaska.html.

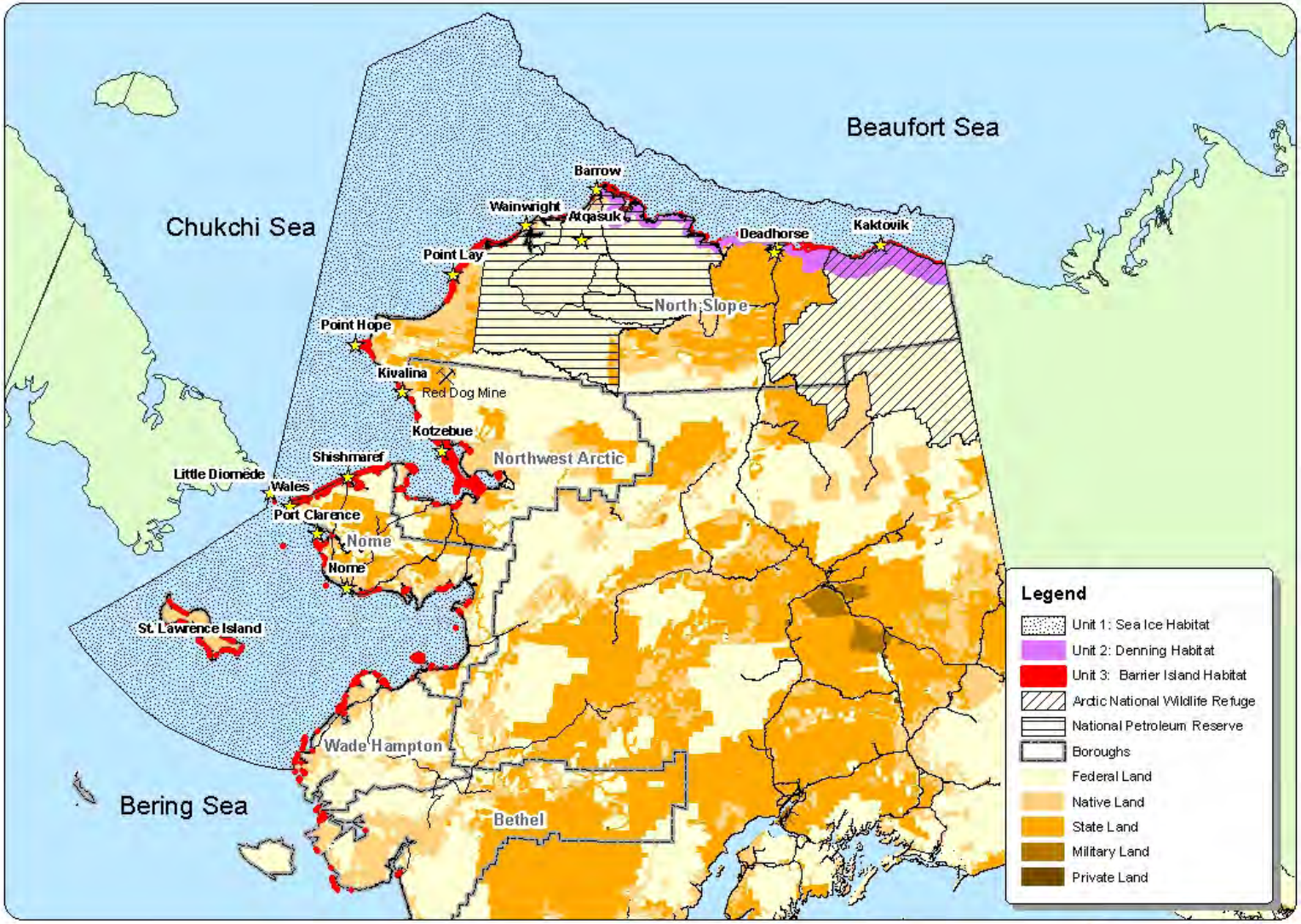
[121] Alaska Department of Labor and Workforce Development. September 2002. Alaska Economic Trends. "The Bethel Census Area." Accessed at http://laborstats.alaska.gov/admin/uploadedPublications/1954_sep02reg.pdf.

[122] Public comment from the Arctic Slope Regional Corporation and the North Slope Borough, December 28, 2009, Comments on Proposed Designation of Critical Habitat for the Polar Bears.

[123] Public comment from the NANA Regional Corporation, December 28, 2009, Comments on Proposed Rule to Designate Critical Habitat for the Polar Bear in the United States.

[124] *Ibid.*

EXHIBIT 4-2 COMMUNITIES WITHIN AND ADJACENT TO PROPOSED CRITICAL HABITAT

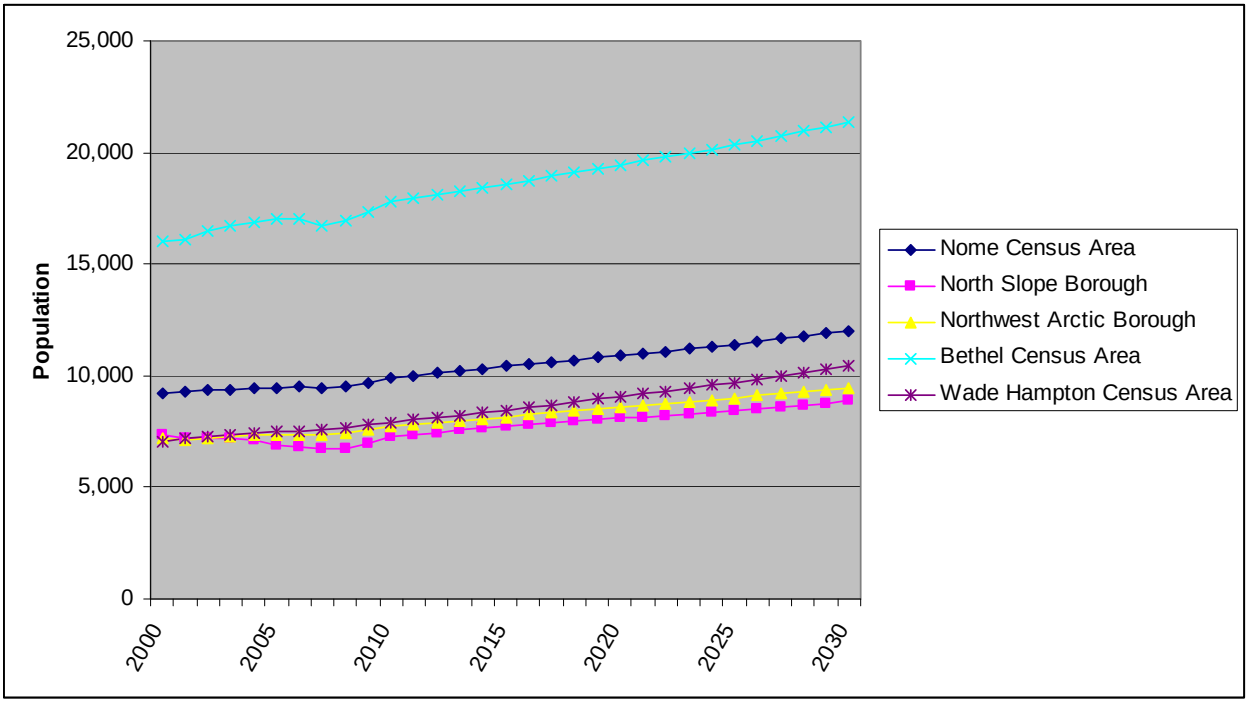


Source:
1. US Fish and Wildlife Service, Field Office
2. Environmental Systems Research Institute, Inc. (ESRI), Redlands, California, USA

Miles
0 2550 100 150 200

IEc

EXHIBIT 4-3 POPULATION GROWTH IN BOROUGHS WITHIN PROPOSED DESIGNATION, 2000-2030



Note: Population estimates given for 2000 – 2009, population projections given for 2010, 2015, 2020, 2025, and 2030. Data for years which were not projected were derived by linear interpolation.
Source: Alaska Department of Labor and Workforce Development, Research and Analysis Section, accessed at http://laborstats.alaska.gov/?PAGEID=67&SUBID=115.

182. In addition, some Native villages, including Shishmaref and Kivalina, located within the region of the proposed critical habitat that will ultimately need to be relocated due to coastal erosion. While these relocations may involve residential and commercial development within critical habitat for the polar bear, when and where these villages will be relocated, is uncertain.

4.1.2 INFRASTRUCTURE CONSTRUCTION

183. As is described in the section above, the census areas and boroughs located within the proposed critical habitat are expected to grow at a rate of approximately one percent per year next 20 years. Construction of new infrastructure will be necessary to support this growth. Developed areas, such as lands covered by buildings, pavement, and other structures, are not being proposed for critical habitat designation. Therefore, "Federal actions involving these lands would not trigger section 7 consultation with respect to critical habitat and the requirement of no adverse modification unless the specific action would affect the essential features in the adjacent critical habitat."[125] As such,

[125] 74 FR 56073.

maintenance construction and redevelopment of existing villages and roads are not expected to be affected by the designation of critical habitat.

184. This analysis focuses on new construction and development projects. For the most part, new development is expected to be adjacent to, or connecting (i.e., new roads), existing developments. Over the past two years, construction and maintenance of water, sewer, and power lines, roads, airports, and landfills have all been subject to section 7 consultations which considered the polar bear. Public comments in response to the proposed critical habitat rule indicate that road, port, and airport development and expansion are likely to occur in the future within the proposed critical habitat area. Specifically, a public comment by the ASRC and NSB stress the importance of infrastructure development to the economic viability of Alaskan communities along the North Slope. The comment highlights two known future road development projects within the proposed critical habitat area: the extension of Laura Madison Street in Barrow and a long-planned emergency evacuation road at Pt. Hope. The comment also mentions one known future air strip development project at the Village of Kaktovik (Exhibit 4-2).[126]

185. Public comments by both the Resource Development Council and the Alaska Gold Company mention the importance of coastal facilities in Northwest Alaska and on the Seward Peninsula: in particular, the Red Dog Mine Port and the Port of Nome.[127,128] The Alaska Gold Company mentions future new port development and expansion of the Port of Nome and Nome airport, but does not give any detail as to the extent or timeframe of this development.[129] In addition, public comment on the proposed critical habitat rule submitted by the ASRC and the NSB highlights two areas located south of Pt. Hope that are potential coal port site locations.[130] Further, the NSB is urging Congress to increase Coast Guard presence in the Arctic to monitor increased activity and provide emergency services in the region. Increased Coast Guard presence would require new ports, helicopter bases and support hangars.

4.1.3 MINING

186. The mining industry in Alaska includes exploration, mine development, and mineral production, as well as construction materials, such as sand, gravel, and rock.[131] In order to conduct mining activities in the State of Alaska, numerous state, Federal, and local

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[126] Public comment from the Arctic Slope Regional Corporation and the North Slope Borough, December 28, 2009, Comments on Proposed Designation of Critical Habitat for the Polar Bears.

[127] Public comment from the Resource Development Council, December 23, 2009, Comments of the Resource Development Council – Proposed Rule to Designate Critical Habitat for the Polar Bear."

[128] Public comment from the Alaska Gold Company, December 28, 2009, Comments of Alaska Gold Company on Proposed Rule to Designate Critical Habitat for the Polar Bear."

[129] *Ibid.*

[130] Public comment from the Arctic Slope Regional Corporation and the North Slope Borough, December 28, 2009, Comments on Proposed Designation of Critical Habitat for the Polar Bears.

[131] Alaska Miners Association, Inc. "The Economic Benefits of Alaska's Mining Industry." January 2009, prepared by McDowell Group, Inc.

government permits and approvals are required. The permitting process differs for large mines and placer mines, but both require numerous permits. In particular, permits from the U.S. Army Corps of Engineers (USACE) under section 404 of the Clean Water Act or section 10 of the Rivers and Harbor Act as well as various permits from the U.S. Environmental Protection Agency (EPA) may be required.[132,133]

187. Other than gravel mines, there are currently no active mine sites located with in the proposed critical habitat for the polar bear.[134] Two projects related to gravel mining have required consultation over the last two years. New gravel sources may be needed in the future to support airports or other village infrastructure.[135] A number of stakeholders, including ASRC, NSB, and NANA, have expressed concern that extraction of their gravel resources may be interrupted due to habitat conflicts.[136,137]

188. Many stakeholders have mentioned other mineral occurrences and deposits that fall within the proposed designation, and expressed interest in future development of these resources. In their public comment on the proposed rule, the Alaska Gold Company states that gold has been mined from the beaches at Nome and offshore of Nome. Additionally, industrial mineral production occurs in the vicinity of proposed critical habitat, the best known being the Cape Nome quarry.[138] While currently mined areas are not included in the proposed designation, future mine development and expansion could be subject to section 7 consultation regarding critical habitat for the polar bear.

189. Potential also exists for future coal mining within the proposed designation. In particular, ASRC's Western Arctic Coal Field overlaps with the proposed critical habitat area in the vicinity of Point Lay (see Exhibit 4-2). This coal field is estimated to have three billion tons of low sulfur, low moisture, low ash coal. The ASRC has long range plans to develop this coal field.[139] The Western Arctic Coal Field has the potential to be a large-scale mining project, but the majority of the project area falls outside of the proposed critical habitat for the polar bear. Construction of a port to move the coal to market may,

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[132] Alaska Department of Natural Resources, Division of Mining, Land & Water, Large Mine Permitting, accessed at http://dnr.alaska.gov/mlw/mining/largemine/index.htm.

[133] Alaska Department of Natural Resources, Division of Mining, Land & Water, Placer Mine Permitting, accessed at http://dnr.alaska.gov/mlw/mining/placer.htm.

[134] Alaska Resource Data File, published by the U.S. Geological Survey, accessed February 2, 2010 accessed at http://dnr.alaska.gov/SpatialUtility/SUC?cmd=vmd&layerid=1191. This data file contains information on active and inactive mines, prospects, and mineral occurrences in Alaska. The data is compiled from published literature and from unpublished reports and data from industry, the U.S. Bureau of Mines, and the U.S. Geological Survey. Compilation of this database is an ongoing process and was last updated July 31, 2008.

[135] *Ibid.*

[136] *Ibid.*

[137] Public comment from the NANA Regional Corporation, December 28, 2009, Comments on Proposed Rule to Designate Critical Habitat for the Polar Bear in the United States.

[138] Public comment from the Alaska Gold Company, December 28, 2009, Comments of Alaska Gold Company on Proposed Rule to Designate Critical Habitat for the Polar Bear."

[139] Public comment from the Arctic Slope Regional Corporation and the North Slope Borough, December 28, 2009, Comments on Proposed Designation of Critical Habitat for the Polar Bears.

however, be located within the proposed critical habitat area and would therefore be subject to consultation regarding potential effects on the polar bear.

4.2 BASELINE IMPACTS

190. At this time there are no existing Incidental Take Regulations (ITRs) or Incidental Harassment Authorizations (IHAs) under the Marine Mammals Protection Act (MMPA) to cover the activities described in this chapter. However, many development activities require a permit from USACE under section 404 of the Clean Water Act in the case that they result in fill of wetlands or section 10 of the Rivers and Harbor Act. This Federal nexus currently necessitates consultation with the Service. In the case that critical habitat is designated, these consultations will also require that the projects avoid destroying or adversely modifying critical habitat.

191. The Service states that "community projects with a small footprint, or within the developed area of villages such as new housing, water and sanitation projects, or road upgrades will likely have little or no adverse effects to polar bears or proposed critical habitat."[140] For each of the past consultations on these types of projects, the Service has found that the project would not have an adverse effect on the polar bear.[141] The Service twice recommended, however, that the project applicant develop a polar bear – human interaction plan. Such a plan would provide a protocol for dealing with polar bear encounters. An effective plan provides general polar bear awareness and safety training, specialized training for polar bear monitors, an outline of actions to be taken if a bear is sighted, and reporting requirements.

192. A polar bear-human interaction plan was recommended by the Service for a geotechnical exploration project for gravel deposits near the Wainwright area. The Service's Marine Mammals Management Office concluded that, because the project area was close to the Village of Wainwright, and there was a lack of documented use of the area by denning bears, adverse effects to the polar bear were not likely to occur. However, the MMM suggested that the applicant (the Olgoonik Development Corporation) develop a polar bear – human interaction plan to cover this project and other project the Corporation is undertaking in the area.[142] The Service also requested an interaction plan for the construction of an equipment and materials staging area and cold storage building at the Deadhorse Airport. Again, the Service concluded that, given the lack of denning habitat in the immediate project area and the proximity of the project area to other development, the project was unlikely to affect denning bears. However, because non-denning polar

[140] Fish and Wildlife Service, "Incremental Effects of Critical Habitat Designation for the Polar Bear," November 2, 2009.

[141] The Service considered the polar bear in one formal consultation on the National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS) proposal to construct a Weather Service Office and Upper Air Inflation Shelter in Barrow, Alaska. The Service determined that the proposed project would not affect polar bears and thus no project modifications were recommended.

[142] Email communication from the Service to LCMF LLC, January 5, 2009, Wainwright Gravel Exploration.

bears are known to move through the area, it recommended that the applicant develop a polar bear – human interaction plan.[143]

193. The Service has stated that there is potential for larger development projects to affect the polar bear; for example, through disturbance and displacement of resting bears by construction activities.[144] If a project is determined to have an adverse impact on the bears, the Service will recommend conservation measures as part of the consultation process. These conservation measures are likely to be similar to those developed under MMPA for oil and gas activities (as discussed in Chapter 3) and include:

- Avoiding all activities within one mile of known polar bear dens;
- Developing field operating procedures and protocols for avoiding polar bears; and
- Ensuring that personnel are designated and trained in appropriate bear management activities like hazing.[145]

These measures would be recommended absent the designation of critical habitat. Costs associated with these conservation measures would therefore be part of the baseline of this analysis.

4.3 INCREMENTAL IMPACTS

194. The Service does not anticipate the designation of critical habitat to result in additional conservation measures for the polar bear during section 7 consultation. That is, the Service believes that the conservation measures it would recommend to avoid jeopardy to the species would also avoid the destruction or adverse modification of critical habitat.[146] More specifically, as long as the projects are complying with baseline conservation measures for the polar bears, the Service does not foresee a scenario in which a project, or group of projects, would affect the functional capacity of critical habitat in providing opportunities for denning, hunting and feeding, resting, and breeding areas for the polar bears.[147] USACE agrees with the Service's assessment and does not anticipate that the designation of critical habitat will change the outcome of their consultations with the Service.[148] However, consultations on individual development projects that have ongoing Federal discretion will have to be reinitiated to consider adverse modification. In addition, consultations on future development projects will have to consider adverse modification, resulting in some incremental administrative costs.

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[143] Written communication from the Service to the U.S. Army Corps of Engineers, November 18, 2009, Deadhorse Aviation Center, LLC.

[144] Fish and Wildlife Service, "Incremental Effects of Critical Habitat Designation for the Polar Bear," November 2, 2009.

[145] *Ibid.*

[146] *Ibid.*

[147] Personal communication with the FWS, December 17, 2009.

[148] Personal communication with Heather Boyer, USACE, February 2, 2005.

195. To estimate post-designation incremental costs, a forecast of the number of future consultations is needed. This analysis relies on the pre-designation consultation record as an indicator of the potential frequency of future construction and development projects requiring consultation. Based on the average number of development-related polar bear consultations that occurred between 2008 and 2009, this analysis assumes that on average 0.5 formal consultations, 17 informal consultations, and 0.5 technical assistances will occur per year between 2010 and 2039. Included in the future consultations are the following potential future construction and development projects described in Section 4-1:

- Wind energy development near Red Dog Mine Port;
- Transmission line construction from the Red Dog Mine Port to the Village of Kivalina;
- Extension of Laura Madison Street in Barrow;
- Emergency evacuation road construction at Pt. Hope;
- Air strip development at the Village of Kaktovik;
- Port development and expansion at Port of Nome and Nome airport;
- Coal port site construction south of Pt. Hope;
- Gravel mining activities; and
- Development of ASRC's Western Arctic Coal Field overlapping proposed critical habitat in the vicinity of Point Lay.

196. Exhibit 4-4 presents the incremental impacts associated with the administrative costs of consultation related to considering adverse modification as part of section 7 consultation.

EXHIBIT 4-4 INCREMENTAL IMPACTS TO DEVELOPMENT ACTIVITIES (2010 – 2039, 2009 DOLLARS, SEVEN PERCENT DISCOUNT RATE)

UNIT	PRESENT VALUE COST	ANNUALIZED COST
2: Terrestrial Denning Habitat	$151,000	$12,200
3: Barrier Island Habitat	$275,000	$22,200
Total	**$427,000**	**$34,400**

197. In addition to these direct incremental impacts, stakeholders expressed real concern that the designation of critical habitat will affect economic growth and development within the proposed designation. In particular, stakeholders fear that investors may opt out of activities in critical habitat out of concern for potential regulatory or litigation burdens.[149]

[149] Public comment from the Arctic Slope Regional Corporation and the North Slope Borough, December 28, 2009, Comments on Proposed Designation of Critical Habitat for the Polar Bears.

This in turn may negatively affect employment and economic opportunity for the residents of the North Slope.

198. As described in more detail in Chapter 3, in the case that regulatory uncertainty or litigation due to critical habitat result in project delays or avoidance, landowners and other stakeholders would bear additional economic costs of the designation.[150,151] For example, an economic analysis provided by the State of Alaska and ASRC estimates the potential impacts of delays to municipal capital improvement projects. Their analysis examined costs of delays to such projects as sewer upgrades, transportation projects, sea walls, and power plants in the villages of the North Slope Borough. The analysis estimates regional economic impacts to the Borough of a one year delay in these projects of $49.3 million in reduced total output, and 199 jobs lost. Statewide, the analysis estimates these project delays would results in losses of approximately $81 million in total output and 437 jobs.[152]

199. For all of the reasons described above, the potential does exist for these types of indirect effects of critical habitat; however, the extent to which projects may be subject to litigation and delay is significantly uncertain and a forecast of the economic impacts would be speculative. Adding to this uncertainty is the extent to which critical habitat for the polar bear -- above and beyond the listing of the polar bear, the presence of other sensitive species and habitats, and other environmental considerations -- may drive future litigation and project delays.

200. The landowners within the North Slope region, including multiple Alaskan Native communities and Regional Corporations, depend on access to the land and its natural resources. As described in Chapter 2, under the Alaska Native Claims Settlement Act (ANSCA), Alaska Native Regional Corporations manage the resources of their lands to provide jobs for village residents, as well as tax revenues for the villages and boroughs and dividends to their shareholders. As well as access to the resources (e.g., minerals) of these lands, construction of infrastructure and roads to facilitate access to these regions is important for the future economic stability of these villages.

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[150] *Ibid.*

[151] Public comment from the Alaska Gold Company, December 28, 2009, Comments of Alaska Gold Company on Proposed Rule to Designate Critical Habitat for the Polar Bear."

[152] Econ One Research, Inc. July 6, 2010. Initial Economic Analysis of Critical Habitat Designation for the Polar Bear in the United States. Prepared for: State of Alaska and the Arctic Slope Regional Corporation.

CHAPTER 5 | COMMERCIAL SHIPPING AND MARINE TRANSPORTATION

201. Commercial shipping and marine transportation activities in proposed critical habitat include oil and gas tankers, container ships, cargo ships, cruise ships, research vessels, icebreakers, and commercial fishing vessels. These vessels may travel to or from destinations within the Arctic (destinational traffic) or may use the Arctic as a passageway between the Atlantic and Pacific Oceans (non-destinational traffic). While the level of shipping activity is currently limited, the potential exists for increased activity in the future if changes in sea ice patterns opens new shipping lanes and results in a longer navigable season. Whether and to what extent marine transportation levels may change in the Arctic depends on a number of factors including: the extent of sea ice melt; global trade dynamics; infrastructure development; the safety of Arctic shipping lanes; the marine insurance industry; and ship technology. Given these uncertainties, forecasts of future shipping levels in the Arctic are highly speculative.[153]

202. According to the proposed rule, threats to the polar bear and its habitat associated with marine transport include the potential for oil spills, and noise and habitat disruption associated with icebreaking activities.[154] Changes to marine shipping and transportation activities to minimize these threats following the designation of critical habitat are expected to be minimal, given that polar bears utilize sea ice habitat only during the winter months, when sea ice is present, while marine shipping and transportation occurs during the summer months, when sea ice is absent. Further, as described in Section 5.2, oil spill planning and response is subject to a strong regulatory baseline; thus, critical habitat designation is not expected to result in significant incremental costs for oil spill response and planning. Section 5.3 describes the fact that only limited icebreaking activities currently occur in the proposed critical habitat area. While this may change in the future, no Federal nexus exists that would result in a section 7 consultation on icebreaking activities to consider effects on the polar bear critical habitat.

203. This analysis does not forecast incremental impacts of polar bear critical habitat on commercial shipping and marine transportation activities. First, there is a lack of information to reliably forecast: 1) the level of marine transportation and associated icebreaking activity that may occur; and 2) the extent to which changes in marine transport may result in increased oil spills. Second, even if reliable forecasts of activity were available, the U.S. Fish and Wildlife Service (Service) does not expect the

[153] *Arctic Marine Shipping Assessment 2009 Report*. Arctic Council, April 2009.

[154] 74 FR 56058

designation of critical habitat to result in additional conservation measures for the polar bear beyond those that would be recommended under the baseline, as described in Chapter 2 of this report.[155]

204. While this chapter does not quantify or monetize any impacts of critical habitat designation for the polar bear on marine transport activities, it describes potential future changes in these activities within the proposed critical habitat area. This chapter then describes the baseline regulations governing oil spill prevention and response and icebreaking activities that provide conservation for the polar bear.

KEY ISSUES AND CONCLUSIONS:

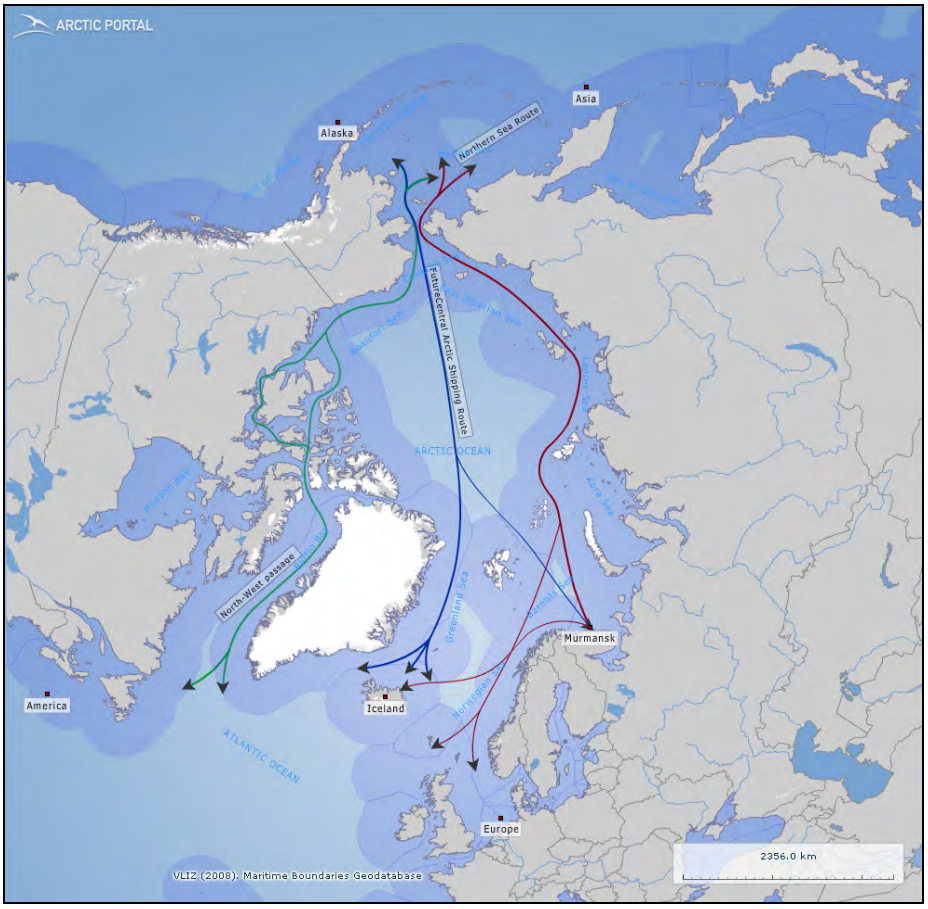
- In the future, commercial shipping and marine transportation may increase within proposed critical habitat areas due to reduced amounts of sea ice opening new shipping lanes and extending the Arctic navigation season. Increased activity could lead to more oil spills in the proposed critical habitat areas.
- Forecasts of future shipping and marine transportation levels are considered highly speculative.
- Regardless of future shipping and marine transportation levels, the impact of polar bear critical habitat on these activities is expected to be limited because: 1) polar bears utilize sea ice habitat in the winter and marine shipping and transportation occurs during the summer; and 2) oil spill planning and response is subject to a strong regulatory baseline even absent polar bear conservation concerns.

5.1 SCOPE AND SCALE OF COMMERCIAL SHIPPING AND MARINE TRANSPORTATION

205. Two major shipping lanes in the Arctic intersect proposed critical habitat for the polar bear. The Northwest Passage, which runs parallel to the Alaskan Coast through the Bering Strait up through the Canadian Arctic Archipelago, intersects a large portion of Unit 1 (Sea Ice Habitat) and to a lesser extent Unit 3 (Barrier Island Habitat). The Northern Sea Route, which refers to a segment of the Northeast Passage paralleling the Russian Coast through the Bering Strait and into the Bering Sea, intersects Unit 1 near St. Lawrence Island in the Bering Sea. Exhibit 5-1 presents the location of the Northwest Passage and the Northern Sea Route.

[155] U.S. FWS to Industrial Economics, Inc., November 2, 2009, "Incremental Effects of Critical Habitat Designation for the Polar Bear."

EXHIBIT 5-1 MAJOR ARCTIC SHIPPING ROUTES[156]



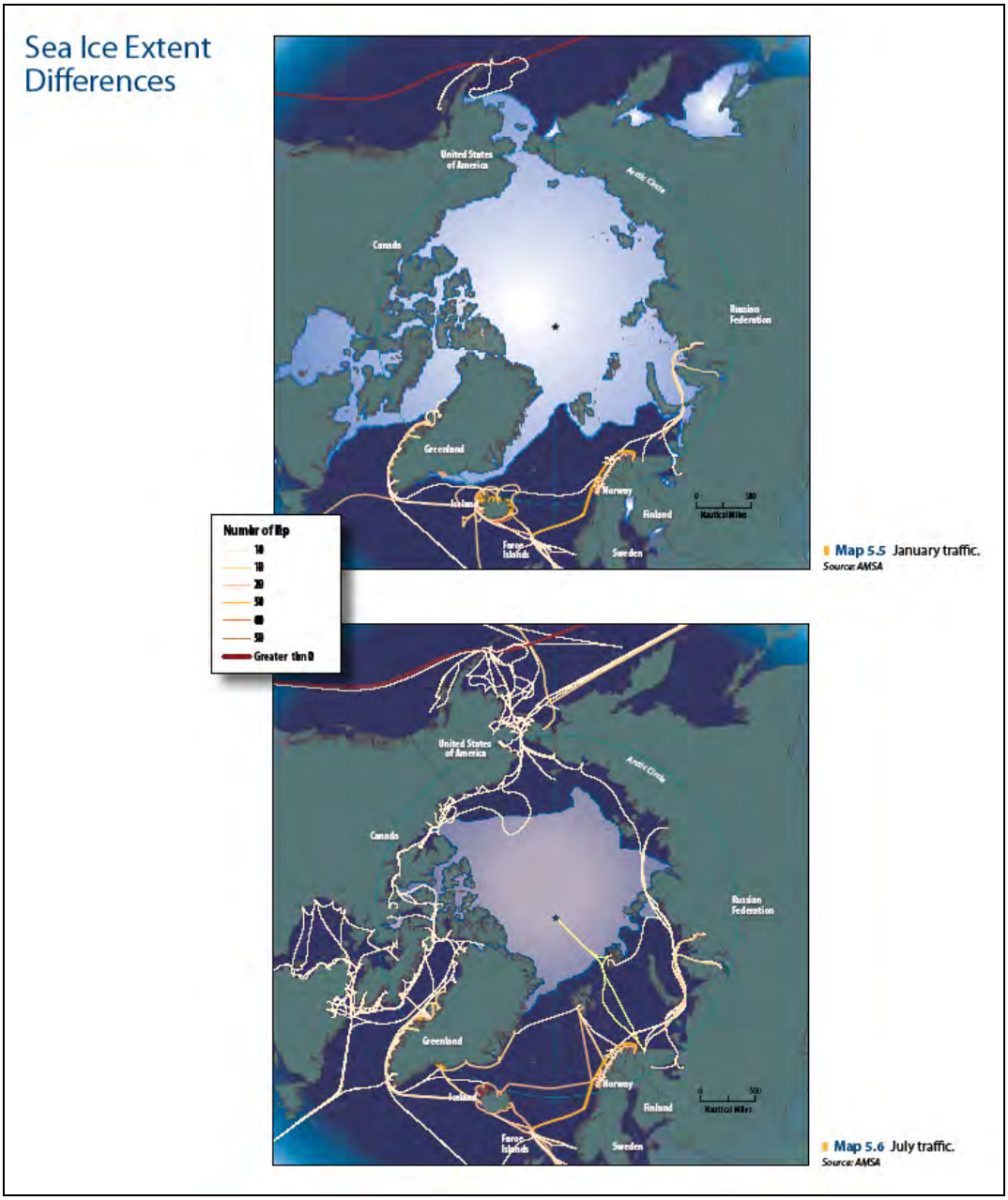
5.1.1 CURRENT COMMERCIAL SHIPPING/MARINE TRANSPORTATION LEVELS

206. Shipping levels in the Northwest Passage and Northern Sea Route are highly-dependent on the extent of sea ice cover. Within proposed critical habitat, commercial shipping and marine transportation cease when sea ice is present. When sea ice is absent (only along Arctic coastlines), commercial shipping and marine transportation levels increase dramatically. Given the dependence of shipping activities on the absence of sea ice, shipping levels are seasonally variable. Almost all activity occurs in the summer (June through September) and to a lesser extent fall (October and November) and spring (April and May). There is no commercial shipping or marine transportation in the winter (December through March) within proposed critical habitat. For example, the Arctic Marine Shipping Assessment (AMSA) reports that no vessel trips occurred in proposed critical habitat (or any portion of the Arctic Ocean, except along the coast between northern Norway and eastern Russia) during January of 2004, while one to ten vessel

[156] Arctic Portal. Interactive Data Maps. Accessed online at http://web.arcticportal.org/en/maps/intermap on December 20, 2009.

trips occurred along multiple routes intersecting proposed critical habitat along the Alaskan Coast during July of the same year (see Exhibit 5-2).[157]

EXHIBIT 5-2 DIFFERENCES IN VESSEL TRAFFIC IN THE ARCTIC BETWEEN WINTER AND SUMMER IN 2004[158]



[157] *Arctic Marine Shipping Assessment 2009 Report*. Current Marine Use and the AMSA Database. Pg 85. Arctic Council, April 2009.

[158] *Ibid.*

207. Current vessel traffic in the Northwest Passage and the Northern Sea Route includes several vessel types. The most prominent vessel type operating in the Arctic (outside of the Great Circle Route through the Aleutian Islands south of proposed critical habitat) is commercial fishing vessels. Specifically, the AMSA reports a total number of vessel days of between 25,001 and 50,000 for fishing vessels along the Alaskan Coast south of the Bering Strait in 2004 (data on vessel days north of the Bering Strait is unavailable).[159] The second most common vessel type in the Arctic is bulk carriers (i.e., oil and gas tankers and barges carrying various types of ore). The majority of bulk carrier traffic is along the Norwegian and Russian Coasts; however, some bulk carrier traffic does intersect proposed critical habitat en route to the Red Dog zinc mine, located in northern Alaska. Except for two areas, the Dudinka region in northern Russia and Deception Bay in Quebec, Canada, bulk carrier trips only occur in ice-free waters during the summer months. Because mining operations occur year-round, bulk carrier traffic is frequently very high in the summer in order to transport all of the ore mined during the year.[160]

208. Another common vessel type in the Northwest Passage and Northern Sea Route is cargo ships and barges resupplying Arctic communities. Similar to bulk carriers, summer traffic of marine resupply vessels is high, as Arctic communities are unable to receive supplies during the winter. In northern Alaska, resupply trips are carried out by barges pulled by tug boats.

209. Cruise ships and passenger vessels also make up a significant portion of vessel traffic in the Arctic. According to AMSA, "nearly all passenger vessel activity in the Arctic takes place in ice-free waters, in the summer season and the vast majority of it is for marine tourism purposes."[161] Along the North American Continent, almost all passenger vessel traffic occurs south of the Bering Strait or within the Canadian Arctic Archipelago east of proposed critical habitat. In 2004, AMSA reports that there were between one and ten passenger vessel trips in both the Bering Sea and the Canadian Arctic. Finally, icebreakers and research vessels are present at low levels in the Arctic.[162]

5.1.2 FORECAST FUTURE COMMERCIAL SHIPPING/MARINE TRANSPORTATION LEVELS

210. The proposed rule notes that sea ice in the Arctic has been declining over the past 50 years, particularly during the summer.[163] Climate models project longer periods with no sea ice due to earlier melting in the spring and later freezing in the fall. In particular, the proposed rule notes the potential for the navigation period in the Northern Sea Route to increase from 20 to 30 days to 90 to 100 days per year, thereby opening the Northern Sea Route to increased vessel traffic. Similarly, the AMSA and Arctic Marine Transport

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[159] "Vessel days" is the sum of the total number of days each vessel is present in a specific geographic area (e.g., if two vessels are present in an area, one for two days and the other for three days, total vessel days would equal five).

[160] *Arctic Marine Shipping Assessment 2009 Report*. Current Marine Use and the AMSA Database. Arctic Council, April 2009.

[161] *Ibid.*

[162] *Ibid.*

[163] 74 FR 56058

Workshop note that sea ice is likely to decline in the future, which may increase commercial shipping and marine transportation in the Arctic by increasing the amount of time during the year that vessels can operate in the Arctic.[164] Other factors which may lead to increased vessel traffic in the Arctic, in addition to reduced sea ice, include increased oil and gas development, Arctic community population growth and associated development, and increased demand for tourism.

211. No quantitative analyses of changes in shipping levels currently exist. Future shipping levels in the Northwest Passage and the Northern Sea Route depend on such uncertainties as the extent of sea ice melt, global trade dynamics, development of infrastructure along Arctic shipping lanes, the safety of Arctic shipping lanes, the marine insurance industry, and ship technology. Both the AMSA and the Arctic Marine Transport Workshop note that the greatest potential for increased shipping and marine transportion is the potential use of the Arctic as an alternative trade route connecting the Atlantic and Pacific Oceans.[165] The Northwest Passage is not considered a viable Arctic throughway given that the oldest and thickest sea ice in the Arctic is pushed into the western edge of the Canadian Arctic Archipelago, making the passage dangerous to navigate and delaying future reductions in sea ice.[166] As a result, future vessel traffic in the Northwest Passage is expected to be focused on destinations within the Arctic, rather than using the Passage as a throughway. Future shipping levels in the Northwest Passage are, therefore, expected to be less than in the Northern Sea Route.

212. In addition to uncertainty regarding future sea ice levels, the greatest limiting factor to establishing the Northern Sea Route as a viable alternative trade route is the lack of infrastructure along the route and a set of unified, multilateral marine transport regulations.[167] These factors are reflected in the future shipping scenarios described in both the AMSA and the Arctic Marine Transport Workshop. Specifically, the AMSA discusses four different future shipping forecasts through 2020, each defined by different economic and regulatory scenarios, as shown in Exhibit 5-3.

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[164] *Arctic Marine Shipping Assessment 2009 Report*. Scenarios, Futures and Regional Futures to 2020. Arctic Council, April 2009; and, *Arctic Marine Transport Workshop*. Institute of the North, U.S. Arctic Research Commission, and International Arctic Science Committee. September 2004. Held at Scott Polar Research Institute. Cambridge University. United Kingdom.

[165] *Ibid.*

[166] *Arctic Marine Shipping Assessment 2009 Report*. Scenarios, Futures and Regional Futures to 2020. Pg 93. Arctic Council, April 2009.

[167] *Arctic Marine Shipping Assessment 2009 Report*. Scenarios, Futures and Regional Futures to 2020. Arctic Council, April 2009; and, *Arctic Marine Transport Workshop*. Institute of the North, U.S. Arctic Research Commission, and International Arctic Science Committee. September 2004. Held at Scott Polar Research Institute. Cambridge University. United Kingdom.

EXHIBIT 5-3 AMSA FUTURE COMMERCIAL SHIPPING SCENARIOS

AMSA SCENARIO	DESCRIPTION	FUTURE SHIPPING LEVELS
Arctic Saga	High demand for Arctic natural resources and tourism accompanied by high levels of collaboration among Arctic nations leading to unified marine regulations and increased infrastructure.	Large increases in commercial shipping due to both increased destinational vessel traffic and the utilization of the Northern Sea Route as a viable alternative trade route.
Arctic Race	High demand for Arctic natural resources and tourism, but limited unified marine regulation leading to an unstable region with limited infrastructure.	Increased destinational commercial shipping due to increased demand for Arctic natural resources.
Polar Preserve	Limited demand for Arctic natural resources and tourism, but a large amount of cooperation among Arctic nations leading to unified marine regulation focused largely on the preservation of natural resources.	No increase in commercial shipping levels due to both a lack of demand for Arctic natural resources and significant regulations making the usage of the Arctic as an alternative trade route cost-prohibitive.
Polar Lows	Limited demand for Arctic natural resources and tourism and limited cooperation among Arctic nations preventing the development of a set of unified marine transport regulations.	No increase in commercial shipping due to under-utilization of Arctic natural resources.

Source: *Arctic Marine Shipping Assessment 2009 Report*. Scenarios, Futures and Regional Futures to 2020. Pg 95. Arctic Council, April 2009.

213. Similarly, the Arctic Marine Transport Workshop developed two future shipping scenarios, which depend largely on future levels of infrastructure and the development of unified marine transport regulations.[168] The Workshop described an incremental marine-investment scenario and a large-scale, major marine-investment scenario. Under the incremental scenario, vessel traffic in the Arctic would remain destinational and increases in shipping levels and infrastructure would be limited to increased utilization of Arctic natural resources and tourism. Under the large-scale investment scenario, the Northern Sea Route would be considered a viable alternative trade route, which would lead to investments in new polar vessel fleets, marine infrastructure, a revamped system of ports, and the development of a unified set of marine transport regulations, as well as a significant increase in vessel traffic. The Workshop concluded, however, that significant economic research is necessary to fully determine likely future shipping levels.

214. The broad range of future shipping scenarios described in the AMSA and the Arctic Marine Transport Workshop underscore the uncertainties regarding future shipping levels. The AMSA notes that while the reduction in sea ice will provide the opportunity for increased shipping levels, ultimately, it is economic factors, such as the feasibility of

[168] *Arctic Marine Transport Workshop*. Institute of the North, U.S. Arctic Research Commission, and International Arctic Science Committee. Pg 7. September 2004. Held at Scott Polar Research Institute. Cambridge University. United Kingdom.

utilizing the Northern Sea Route as an alternative connection between the Atlantic and Pacific Oceans that will determine future shipping levels.[169] In terms of this analysis, specific future shipping levels are less important than the potential for increased threats to the polar bear. Specifically, any increase in shipping will result in increased potential for oil spills and more frequent icebreaking activities. The following sections describe current oil spill prevention and response and icebreaking regulations and actions, and whether such regulations and actions may change following the designation of critical habitat.

5.2 OIL SPILL PREVENTION AND RESPONSE

215. Oil spills have the potential to harm polar bears in a variety of ways. Polar bears rely on a thick layer of fur to provide insulation in Arctic waters. Contact with oil may cause polar bear fur to mat, reducing its insulative quality and potentially causing hypothermia. Further, polar bears may ingest oil contaminated prey, potentially leading to thermoregulatory and metabolic stresses, behavioral changes, anorexia, anemia, dehydration, or death. Polar bears may also ingest oil while grooming, leading to similar effects as ingesting contaminated prey. Spilled oil may concentrate in openings within sea ice or may persist for long periods of time underneath sea ice, increasing the potential for polar bear exposure.[170]

216. To date, there have been relatively few oil spills caused by marine vessel travel in the areas proposed for critical habitat. Specifically, the AMSA reports that there were a total of 293 vessel incidents in the Arctic between 1995 and 2004.[171] Most of these incidents occurred along the Great Circle shipping route through the Aleutian Islands (south of proposed critical habitat), along the northern coast of Norway, around Iceland and the Faroe Islands, and in the Canadian Arctic Archipelago (east of proposed critical habitat). Within areas proposed for critical habitat, there were approximately six vessel incidents between 1995 and 2004, two caused by fires, two by machinery damage or failure, one caused by grounding, and one caused by damage to the vessel. In general, the pattern of past vessel incidents corresponds to areas of high vessel traffic. If vessel traffic increases in the Northwest Passage and the Northern Sea Route according to the future shipping scenarios described above, there may be increased risk of oil spills due to the increased number of vessels present in the Arctic. In particular, increased oil and gas development may increase oil and gas tanker traffic in the Arctic, which in turn will increase the potential for a large spill of persistent oil.

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[169] *Arctic Marine Shipping Assessment 2009 Report*. Scenarios, Futures and Regional Futures to 2020. Pgs 120-121. Arctic Council, April 2009.

[170] U.S. FWS. 1999. Oil Spill Response Plan for Polar Bears in Alaska. U.S. FWS. Marine Mammals Management. Anchorage, Alaska.

[171] *Arctic Marine Shipping Assessment 2009 Report*. Current Marine Use and the AMSA Database. Pgs 86-87. Arctic Council, April 2009.

217. Oil spill response in Alaska is regulated by the 1990 Oil Pollution Act (OPA), which requires the U.S. Coast Guard (USCG) and the Environmental Protection Agency (EPA) develop a statewide oil spill response plan, and by Alaska Statute 46.04, which requires the Alaska Department of Environmental Conservation (ADEC) to develop a statewide response plan and individual response plans for ten geographic subareas spanning the State of Alaska.[172,173] Proposed critical habitat for the polar bear intersects two subareas, namely, the North Slope and the Northwest Arctic subareas. Finally, Alaska Statute 46.04 requires that the oil industry develop oil discharge prevention and contingency plans. The Marine Mammals Protection Act (MMPA) requires the Service to complete contingency planning for response to the stranding and unusual mortality of protected marine mammals.[174] While oil spills are considered a cause of unusual mortality, the MMPA defers to the OPA and Alaska Statutes for oil spill response planning.

218. The level of response and specific response strategy following an oil spill depends on a number of factors including, but not limited to: weather; the type of oil spilled; the amount of oil spilled; the response equipment available to respond to a spill; and the location of the spill in relation to environmentally sensitive resources and areas with high human-use value.[175] In general, the goal of oil spill response is to utilize available response equipment in the most efficient and effective manner possible to limit the effects of spilled oil.

219. Oil spill response for polar bears, and for wildlife in general, can be broken into three phases.[176,177] Phase One is focused on eliminating the source of the spill, containing the spilled oil, and protecting environmentally sensitive areas, including areas occupied by polar bears. Most spill response efforts do not advance beyond Phase One. Phase Two involves efforts to herd or haze potentially affected wildlife away from the spill area. Phase Three, the most involved and most infrequently undertaken phase of oil spill response for wildlife, includes the capture and rehabilitation of wildlife affected by spilled oil.[178]

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[172] Oil Pollution Act of 1990 (33 U.S.C. 2701-2761). Accessed online at http://www.uscg.mil/NPFC/About_NPFC/opa.asp on March 20, 2009.

[173] Alaska Statute Title 46, Water, Air, Energy and Environmental Conservation. Accessed online at http://www.dec.state.ak.us/SPAR/statutes_regs.htm on March 20, 2009.

[174] U.S. FWS. 1999. Oil Spill Response Plan for Polar Bears in Alaska. U.S. FWS. Marine Mammals Management. Anchorage, Alaska.

[175] 18 AAC 75.4. Accessed online at http://www.dec.state.ak.us/SPAR/statutes_regs.htm on March 20, 2009.

[176] Alaska DEC. 1999. Alaska Federal/State Preparedness Plan for Response to Oil and Hazardous Substance Discharges/Releases (Unified Plan, Volume I). Alaska Department of Environmental Conservation, Prevention and Emergency Response Program. Anchorage, AK. Prepared in conjunction with the U.S. Coast Guard, Seventeenth District, Marine Safety Division; and, the U.S. Environmental Protection Agency, Alaska Operations Office.

[177] U.S. FWS. 1999. Oil Spill Response Plan for Polar Bears in Alaska. U.S. FWS. Marine Mammals Management. Anchorage, Alaska.

[178] Phase Three is particularly unlikely for polar bears. Most polar bears will die if oiled, thereby, limiting the chance of rehabilitation success (information provided by U.S. FWS to IEc on February 17, 2010).

220. Oil spill responders rely on delineated sensitive areas to identify where the potential for oil spill effects on wildlife are the greatest. These areas are then prioritized for protection during oil spill response. All critical habitat areas for threatened and endangered species are classified as "areas of major concern" under both the Northwest Arctic and North Slope subarea contingency plans.[179] All polar bear denning and feeding areas (all of Unit 1 and portions of Units 2 and 3) are already classified as "areas of major concern" in both subarea contingency plans. Therefore, the designation of critical habitat is not expected to increase "areas of major concern" within Arctic waters. To the extent that additional areas within the Arctic need to be classified as "areas of major concern" following the designation of critical habitat, updates to the geographic distribution of these areas will occur during regularly scheduled contingency plan revisions, and thus will impose negligible cost. That is, spill responders are required to attend to all areas affected by a spill, not only those "areas of major concern." Thus the "areas of major concern" label simply provides priorities to the responders regarding the ordering of their response and does not add additional responsibilities to the spill response.[180]

221. When a spill occurs in the vicinity of sensitive areas for the polar bear the species is considered during the development of a response strategy. Typically, the responsible party, the USCG, or the primary response action contractor will contact the Service to discuss potential impacts to the polar bear and other Service trust resources. This sometimes results in an emergency section 7 consultation, depending on the severity of the spill.[181,182] If necessary and practicable, the polar bear sensitive area may be protected by concentrating oil spill response equipment and efforts in these areas. Protection of sensitive areas occurs on a priority basis.[183] The areas with the greatest ecological or human-use value have the highest priority and, thus, are protected first. In extreme cases where a large amount of persistent oil has been spilled, polar bears may be hazed or captured to preempt oil spill impacts; or, affected polar bears may be captured and cleaned to minimize oil spill damages (i.e., phases two and three of oil spill response may be implemented).

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[179] Alaska DEC. 2001. Northwest Arctic Subarea Contingency Plan for Oil and Hazardous Substance Discharges/Releases: A Subarea Plan of the Unified Plan for the State of Alaska. Alaska Department of Environmental Conservation, Prevention and Emergency Response Program. Anchorage, AK; and, Alaska DEC. 2007. North Slope Subarea Contingency Plan for Oil and Hazardous Substance Discharges/Releases: A Subarea Plan of the Unified Plan for the State of Alaska. Alaska Department of Environmental Conservation, Prevention and Emergency Response Program. Anchorage, AK.

[180] Written communication with Samantha Smith, Environmental Program Specialist, Alaska Department of Environmental Conservation, Division of Spill Prevention and Response, Industry Preparedness Program, Marine Vessels Section on February 19, 2009.

[181] Primary response action contractors may be called on by responsible parties or by the USCG, if the responsible party is unknown, to respond to a spill.

[182] Personal communication with Contaminants Biologist, U.S. FWS on March 17, 2009.

[183] Personal communication with Doug Lentsch, Cook Inlet Spill Prevention and Response Inc. (CISPRI) on February 28, 2009 and Pete Pritchard, Response Supervisor, and Chris Burns, Preparedness Supervisor, Alaska Chadux Corporation on March 17, 2009.

222. In general, baseline costs associated with oil spill response in proposed critical habitat areas stem from the administrative cost of contacting or conducting emergency section 7 consultation with the Service following an oil spill. Additional baseline costs may be incurred if there is a significant spill in the vicinity of a polar bear sensitive area and Phase 2 and/or 3 conservation actions are both feasible and practicable. The potential for baseline costs associated with the implementation of conservation actions for the polar bear following a future oil spill is considered quite low due to the remote location of Arctic shipping routes in relation to oil spill response equipment and the presence of large amounts of sea ice making the implementation of conservation actions for the polar bear impractical and costly.

223. The designation of critical habitat for the polar bear is not expected to change oil spill response in the Northwest Passage and the Northern Sea Route. Specifically, Unit 1, which is intersected by both the Northwest Passage and the Northern Sea Route, is already considered an "area of major concern" due to its utilization by polar bears for denning and feeding. Thus, it would be prioritized in response to future oil spills even without the designation of critical habitat.[184] Potential conservation actions implemented for the polar bear during future oil spill response depend on available response equipment and are not expected to change following the designation of critical habitat, given that all available response equipment is already utilized to respond to a spill (i.e., critical habitat would only hold the potential to change the allocation of equipment).

224. The designation of critical habitat may result in additional administrative costs associated with addressing adverse modification of critical habitat as part of emergency consultations on future oil spills. Insufficient information exists to reliably forecast the frequency or location of regional oil spills and, therefore, any associated incremental administrative costs.

5.3 ICEBREAKING ACTIVITIES

225. The proposed rule identifies icebreaking activities as a threat to polar bears.[185] Icebreaking activities can create noise disturbances which cause marine mammals to avoid areas where these activities are occurring. Further, icebreaking activities may increase the risk of oil spills by increasing vessel traffic in ice-filled waters. Given that marine mammals have been found to concentrate in and around temporary breaks in the ice created by icebreakers, there may be greater environmental impact associated with an

[184] Alaska DEC. 2001. Northwest Arctic Subarea Contingency Plan for Oil and Hazardous Substance Discharges/Releases: A Subarea Plan of the Unified Plan for the State of Alaska. Alaska Department of Environmental Conservation, Prevention and Emergency Response Program. Anchorage, AK; and, Alaska DEC. 2007. North Slope Subarea Contingency Plan for Oil and Hazardous Substance Discharges/Releases: A Subarea Plan of the Unified Plan for the State of Alaska. Alaska Department of Environmental Conservation, Prevention and Emergency Response Program. Anchorage, AK.

[185] 74 FR 56058

oil spill involving an icebreaker or a vessel operating in a channel cleared by an icebreaker.[186]

226. Currently, Russian and Canadian icebreakers are used along the Northern Sea Route and within the Canadian Arctic Archipelago to clear passageways through the ice utilized by commercial shipping vessels.[187] Such icebreaking activities are limited primarily to the summer months. In some cases, commercial shipping vessels contract with private icebreakers to provide an escort through ice-filled waters. The U.S. does not currently engage in icebreaking activities for navigational purposes in the Arctic.[188] Rather, U.S. icebreaking activities are limited to search and rescue missions and research efforts conducted onboard the USCG Cutter Healy (WAGB-20). There are no current U.S. or State of Alaska regulations on icebreaking activities, mainly because icebreaking along the Alaskan Coast is minimal and usually carried out by the USCG.

227. Icebreaking activities may increase in the future, given increases in commercial shipping and marine transportation. In particular, the establishment of the Northern Sea Route as a viable alternative trade route connecting the Atlantic and Pacific Oceans is contingent on, among other factors, the establishment of a reliable government or private icebreaking fleet, which would be available to clear the entire Route and provide escorts to vessels operating along the Route.[189,190] Although there are no current regulations on icebreaking activities in the Arctic, such regulations may be incorporated into the International Maritime Organization (IMO) voluntary guidelines as part of unified, multilateral regulation on Arctic shipping. According to the U.S. Department of Transportation, IMO is currently considering the development of icebreaking guidelines.[191] Any U.S.-specific regulation would likely be similar to potential future IMO guidelines.

228. The designation of critical habitat for the polar bear is not expected to alter future icebreaking activities. As described further in Chapter 6 of this report, the USCG currently consults on its icebreaking activities in the Arctic. Past section 7 consultation with the USCG regarding effects of icebreaking activities on the polar bears stated that, as long as the USCG followed the protocols in their polar bear interaction plan, adverse effects to polar bears would likely be avoided.[192] Impacts of implementing the polar bear

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[186] U.S. FWS. 1999. Oil Spill Response Plan for Polar Bears in Alaska. U.S. FWS. Marine Mammals Management. Anchorage, Alaska.

[187] *Arctic Marine Shipping Assessment 2009 Report*. Current Marine Use and the AMSA Database. Arctic Council, April 2009.

[188] Committee on the Assessment of U.S. Coast Guard Polar Icebreaker Roles and Future Needs. *Polar Icebreaker Roles and U.S. Future Needs: A Preliminary Assessment*. Polar Research Board, Division of Earth and Life Sciences. Marine Board, Transportation Research Board. The National Academies Press. Washington, D.C.

[189] *Arctic Marine Shipping Assessment 2009 Report*. Scenarios, Futures and Regional Futures to 2020. Arctic Council, April 2009.

[190] *Arctic Marine Transport Workshop*. Institute of the North, U.S. Arctic Research Commission, and International Arctic Science Committee. September 2004. Held at Scott Polar Research Institute. Cambridge University. United Kingdom.

[191] Personal communication with the U.S. Department of Transportation, Office of Safety, Energy and Environment on December 16, 2009.

[192] Email from Service to Dean Amundson, USCG, Chief, Civil Engineering Division, February 7, 2009.

interaction plans are baseline, and the Service does not expect to request additional conservation measures for future icebreaking activities following the designation of critical habitat.

229. Further, outside of the USCG icebreaking activities, no Federal nexus exists to trigger a section 7 consultation related to potential future icebreaking activities because no Federal agency permits or funds icebreaking activities for commercial shipping and marine navigation in the Arctic.[193] To the extent that icebreaking regulations are developed in the future, and include specific measures for the polar bear, there may be future baseline impacts of polar bear conservation on these activities (e.g., additional polar bear interaction plans for non-USCG icebreaking activities). The Service is unable to imagine a scenario, however, in which critical habitat designation changes the polar bear conservation measures recommended.[194] In other words, any impacts to these activities would be expected to be baseline and would occur regardless of critical habitat designation for the polar bear.

[193] In the past, a single oil and gas drilling operation, utilizing private icebreaker support, required a Title V operating permit from the EPA due to the combined emissions levels of all the marine vessels supporting the operation, thereby, triggering section 7 consultation. No conservation measures for icebreaking activities resulted from the consultation. Insufficient data exists to reliably forecast future consultations on icebreaking activities related to oil and gas drilling operations in the Arctic. The Service expects that future icebreaking activities would be considers as part of programmatic consultation on the ITRs. If section 7 consultation were to occur on icebreaking activities, the Service does not expect to request any project modifications for polar bear or critical habitat (Information provided by the U.S. FWS Fairbanks Field Office to IEc via conference call on February 19, 2010 and via email to IEc on March 3, 2010).

[194] U.S. FWS to Industrial Economics, Inc., November 2, 2009, "Incremental Effects of Critical Habitat Designation for the Polar Bear."

CHAPTER 6 | OTHER ACTIVITIES

230. Other land and water use activities occurring within the proposed critical habitat area for the polar bear include military operations, field research and photography, and subsistence use activities. As with the other activities occurring within proposed critical habitat, the U.S. Fish and Wildlife Service (Service) does not anticipate the designation of critical habitat to result in changes that will alter or limit these activities:

- **Military operations.** The U.S. Air Force (USAF) lands within the proposed designation are being considered for exclusion from critical habitat, as they are covered by existing Integrated Natural Resource Management Plans (INRMPs). The Service has not as yet, however, reviewed the INRMPs to determine whether they are sufficiently protective of the polar bear and its habitat to warrant exclusion from critical habitat. The U.S. Coast Guard (USCG) engages in a variety of safety and law enforcement activities in the region. Both USAF and USCG activities are forecast to be subject to section 7 consultation in the future. Incremental impacts of critical habitat are forecast to be limited to additional administrative costs of consultation. Total present value impacts are estimated to be $56,900 (seven percent discount rate) over the next 30 years (Exhibit 6-1).
- **Field research and photography.** Scientific research and photography involving the polar bear require permits under the Marine Mammals Protection Act (MMPA). Issuance of these permits typically requires intra-agency section 7 consultation. As these activities are generally not habitat altering and are already required to comply with existing guidelines considering polar bear conservation, forecast incremental impacts are limited to additional administrative consultation costs. Given that there are no reliable data to forecast the number of research and photography permits that may be requested, this analysis does not forecast consultations for these activities. This is, however, anticipated to be a minor impact category.
- **Subsistence activities.** Alaska Native subsistence uses of the polar bear are exempt from Endangered Species Act (ESA) (under section 10(e)) and MMPA (under section 101(b)) regulation. Therefore these activities are not expected to be affect by the designation of critical habitat for the polar bear.

6.1 MILITARY OPERATIONS

231. This section describes USAF and USCG operations within proposed critical habitat. Further, it quantifies the incremental administrative costs of future section 7 consultations on military operations within critical habitat areas. The first two subsections describe military operations by each military branch. The final subsection presents incremental administrative costs of section 7 consultations involving both the USAF and the USCG.

6.1.1 USAF OPERATIONS

232. The USAF maintains nine active and three inactive short and long range radar sites within proposed critical habitat as part of the Alaska Radar System supporting the North American Aerospace Defense Command (NORAD).[195] These areas are being considered for exclusion from critical habitat by the Service under section 4(b)(2) of the Act. Two INRMPs exist for USAF lands in Alaska pursuant to the Sikes Act (16 USC 670a): one for the nine active long and short range radar sites; and, another for the three inactive radar sites.[196] The purpose of the INRMPs is to conserve USAF land and natural resources, help ensure compliance with environmental laws, and provide stewardship of the nation's public lands. Additionally, the USAF has developed a Polar Bear Interaction Management Plan (polar bear IMP) that defines radar site-specific protocols for dealing with a polar bear encounter.[197] The purpose of the polar bear IMP is to reduce human/polar bear interactions. Reducing such interactions will reduce the need to harass and intentionally take polar bears to prevent or limit human injury due to a bear attack. In general, measures included in the polar bear IMP focus on identifying polar bear attractants and limiting and/or isolating attractants, early detection of polar bears, ensuring effective warning and communication systems exist, and educating staff on appropriate and safe responses to polar bear encounters.

233. Given that the polar bear IMP defines specific polar bear interaction protocols for each radar site and that each of these sites is covered by an INRMP, the Service authorizes the intentional take of polar bears to limit or prevent human injury due to a bear attack to the USAF 611th Air Support Group Base Operations and Services Contractor at all active USAF radar sites within proposed critical habitat. Additionally, the 611th Engineering Squadron is issued its own intentional take authorization at select active and inactive radar sites where maintenance and remediation projects are occurring. Take authorizations are reissued by the Service on an annual basis through technical assistance

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[195] U.S. Department of Defense, Department of the Air Force. *Response to the Designation of Critical Habitat for the Polar Bear*. FWS-R7-ES-2009-0042; 92210-1117-0000-FY09-B4. Submitted by the Western Regional Environmental Office of the U.S. Air Force to the U.S. Fish and Wildlife Service, Division of Policy and Directives Management. December 23, 2009.

[196] U.S. Air Force. 2007. Integrated Natural Resources Management Plan: Alaska Radar System, Alaska Short and Long Range Radar Sites. 2007 Revision. U.S. Air Force, 611th Air Support Group, Alaska 611th Civil Engineer Squadron, Environmental Flight; and, U.S. Air Force. 2009. Integrated Natural Resources Management Plan: Inactive Sites, Alaska 611th Air Support Group. 2009 Revision. U.S. Air Force, 611th Air Support Group, Alaska 611th Civil Engineer Squadron, Environmental Flight.

[197] Ohms, H. 2008. Polar Bear Interaction Management Plan. May 2008. A final revised plan for the Department of Defense, U.S. Air Force contract number FA5000-06-FA019. Prepared for the 611th Air Support Group, 611th Civil Engineer Squadron, Environmental Flight, Elmendorf AFB, AK by Oasis Environmental Inc., Anchorage, AK.

and are contingent upon the USAF following the radar site-specific polar bear interaction measures described in the polar bear IMP.[198]

234. Review of the USAF INRMPs results in informal section 7 consultation on USAF operations on active and inactive radar sites.[199] Each INRMP is updated every five years. However, the USAF updates the INRMPs annually to account for changes in USAF operations and to provide a list of proposed future projects on the radar sites.[200] Annual updates are not subject to section 7 consultation, however. In the case that a proposed project may affect the polar bear, the USAF undertakes section 7 consultation with the Service on the project. Typically, such consultations are informal and do not result in project modifications. However, depending on the nature of the project and its potential effect on the polar bear, it is possible that formal consultation would be required and would result in project modification.[201] According to the Service, however, no conservation measures are expected to be recommended to avoid adverse modification of critical habitat that would not already be recommended due to the listing of the species.[202] Thus, any economic impacts resulting from potential future consultations would be expected to be in the baseline.

235. The USAF estimates that approximately three maintenance and restoration projects will require informal consultation per year across active and inactive radar sites within proposed critical habitat for the polar bear.[203] These consultations are in addition to the informal consultation on INRMP revisions forecast to occur every five years. The administrative costs of addressing adverse modification of polar bear critical habitat during future section 7 consultations are presented in Exhibit 6-1.

6.1.2 USCG OPERATIONS

236. The USCG engages in a variety of activities in proposed critical habitat including: search and rescue operations, oil spill/pollution response, law enforcement activity, icebreaking activity, the installation and maintenance of aids to navigation (e.g., buoys and beacons), and marine safety operations.[204] The main threat to the polar bear associated with each of

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[198] Personal communication with Gene Augustine, Biologist/Natural Resources Program Manager, U.S. Air Force 611th Air Support Group on January 13, 2010.

[199] U.S. Air Force. 2007. Integrated Natural Resources Management Plan: Alaska Radar System, Alaska Short and Long Range Radar Sites. 2007 Revision. U.S. Air Force, 611th Air Support Group, Alaska 611th Civil Engineer Squadron, Environmental Flight; and, U.S. Air Force. 2009. Integrated Natural Resources Management Plan: Inactive Sites, Alaska 611th Air Support Group. 2009 Revision. U.S. Air Force, 611th Air Support Group, Alaska 611th Civil Engineer Squadron, Environmental Flight.

[200] Personal communication with Gene Augustine, Biologist/Natural Resources Program Manager, U.S. Air Force 611th Air Support Group on January 13, 2010.

[201] Personal communication with Gene Augustine, Biologist/Natural Resources Program Manager, U.S. Air Force 611th Air Support Group on January 13, 2010.

[202] U.S. Fish and Wildlife Service Memorandum to Industrial Economics, Inc. November 2, 2009. *Incremental Effects of Critical Habitat Designation for the Polar Bear*.

[203] Personal communication with Gene Augustine, Biologist/Natural Resources Program Manager, U.S. Air Force 611th Air Support Group on January 13, 2010.

[204] Department of Homeland Security Comments: Department of the Interior, Fish and Wildlife Service Proposed Rule: Polar Bear Critical Habitat. October 13, 2009. Forwarded by the U.S. Fish and Wildlife Service on December 2, 2009.

these operations is the potential for human/polar bear interaction. The USCG is developing a polar bear interaction plan that would provide a protocol for dealing with polar bear encounters during USCG operations, limiting the need for harassment and intentional lethal take of a polar bear to prevent or limit human injury. However, the USCG has not completed this interaction plan and it is unclear when and if such a plan will be completed in the future.[205]

237. In its response to proposed critical habitat, the USCG has expressed interest in completing a programmatic section 7 consultation covering a range of operations.[206] The completion of such a programmatic consultation would likely require the finalization of a polar bear interaction plan. A programmatic consultation on USCG operations would likely make consultations on individual USCG operations unnecessary, although operation-specific consultations would likely still occur for irregular and non-generalizable operations (e.g., oil spill response and icebreaking operations). The Service and the USCG are currently involved in discussions regarding a programmatic consultation on USCG operations. However, it is unknown if and when such a programmatic consultation will occur or the specific USCG operations the consultation will cover. Until a programmatic consultation takes place, the USCG will continue to consult on individual operations (described below).[207]

238. Ultimately, the USCG would like to receive the same authorization granted the USAF by the Service, allowing for the intentional take of polar bears through harassment to limit or prevent human injury due to a bear attack. Such an authorization would be contingent upon the Service's review of the completed USCG polar bear interaction plan through technical assistance.[208]

239. In the past, the USCG has completed section 7 consultations for the polar bear on its summer operations (i.e., small boat and aviation activities and oil spill response and law enforcement training exercises), operation of the USCGC Healy icebreaker, and the installation and maintenance of aids to navigation. Such consultations are expected to continue in the future. Specifically, the USCG expects to conduct an informal consultation on its summer operations each year for the indefinite future. Further, the USCG expects to conduct an informal consultation on USCGC Healy operations, including National Science Foundation (NSF)-funded research missions and assisting vessels in distress, once every five years (last consultation on the USCGC Healy operation was in 2008). Finally, the USCG expects to conduct an informal consultation on the installation and maintenance of aids to navigation once every three years (the only

[205] Personal communication with Dean Amundson, Environmental Specialist, U.S. Coast Guard and Mike Dombkowski, Environmental Scientist, U.S. Coast Guard on January 13, 2009.

[206] Department of Homeland Security Comments: Department of the Interior, Fish and Wildlife Service Proposed Rule: Polar Bear Critical Habitat. October 13, 2009. Forwarded by the U.S. Fish and Wildlife Service on December 2, 2009.

[207] Personal communication with Dean Amundson, Environmental Specialist, U.S. Coast Guard and Mike Dombkowski, Environmental Scientist, U.S. Coast Guard on January 13, 2009.

[208] Personal communication with Mike Dombkowski, Environmental Scientist, U.S. Coast Guard on January 13, 2009; and the Service on February 19, 2010.

exception is in 2010, when three informal consultations are expected for the installation of new aids to navigation).[209]

240. In addition to known future consultations described above, additional section 7 consultations may be required if the USCG changes its current operations in response to future changes in oil and gas development, commercial shipping, and marine transportation in the region. Specifically, if oil and gas development and marine shipping levels increase significantly, leading to increased numbers of vessels in the Arctic, the USCG may need to improve marine safety infrastructure (e.g., aids to navigation and radio towers) and increase marine safety operations, which may require additional consultation. Likewise, USCG icebreaking activities may change from primarily research-based missions to search and rescue and navigational support missions to accommodate increased numbers of vessels in the Arctic. This could lead to increased need for consultation.[210]

241. While consultations are likely to occur, the designation of critical habitat for the polar bear is not expected to alter USCG operations. Specifically, the Service does not expect the designation of critical habitat to result in additional significant conservation measures for the polar bear beyond those already required to avoid jeopardy.[211] Further, the USCG does not anticipate voluntarily changing its ongoing operations due to the designation of critical habitat.[212] Given that USCG operations are not expected to change following the designation of critical habitat, forecast incremental impacts quantified in this section are limited to additional administrative costs required to address adverse modification during future section 7 consultations.

6.1.3 INCREMENTAL ADMINISTRATIVE COSTS

242. The present value of forecast incremental administrative costs of consultation regarding USAF and USCG activities in polar bear critical habitat from 2010 to 2039 is estimated to be $56,900 (applying a seven percent discount rate). These costs are described by unit of proposed critical habitat in Exhibit 6-1.

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[209] *Ibid.*

[210] *Ibid.*

[211] U.S. Fish and Wildlife Service Memorandum to Industrial Economics, Inc. November 2, 2009. *Incremental Effects of Critical Habitat Designation for the Polar Bear*.

[212] Personal communication with Dean Amundson, Environmental Specialist, U.S. Coast Guard and Mike Dombkowski, Environmental Scientist, U.S. Coast Guard on January 13, 2009.

EXHIBIT 6-1 INCREMENTAL ADMINISTRATIVE COSTS RELATED TO MILITARY OPERATIONS, BY SUBUNIT (SEVEN PERCENT DISCOUNT RATE, 2009 DOLLARS, 2010-2039)

UNIT (AREA WITHIN UNIT)	PRESENT VALUE IMPACTS	ANNUALIZED IMPACTS
Unit 1-Chukchi	$5,960	$480
Unit 1-Beaufort	$5,960	$480
Unit 1-Bering	$5,960	$480
Unit 2-USAF lands	$39,100	$3,150
Total	**$56,900**	**$4,590**

Note: Totals may not sum due to rounding.

Source:
Personal communication with Dean Amundson, Environmental Specialist, U.S. Coast Guard and Mike Dombkowski, Environmental Scientist, U.S. Coast Guard on January 13, 2009.

6.2 SCIENTIFIC RESEARCH, PHOTOGRAPHY, AND FIELD ACTIVITIES

243. Scientific research, commercial or educational photography, and other field activities occur within the proposed critical habitat region. Due to increased interest in studying the effects of climate change, these activities may increase in the future.[213] Research and field activities may be focused specifically on the polar bear or not.

244. Field activities that are not specifically related to the polar bears, such as vegetation studies, lake and stream monitoring, and habitat studies, may result in disturbance to the animals due to aircraft noise, physical presence of researchers, and maintenance and support of field camps.[214] If a proponent of a project determines that the activity would incidentally take polar bears, the proponent can request authorization for such taking under Section 101(a)(5)(A) or (D) of MMPA. These authorizations would likely require that researchers follow specific protocols; for example, maintaining appropriate field camp facilities or otherwise suspend operations in the event that a polar bear is observed in the area.[215] In the past, the Service has provided guidelines to researchers that, if followed, have precluded the need for specific authorization.[216]

245. Field activities specifically related to polar bears may have a more direct impact on the animals. Proponents of activities focused on polar bears (e.g., polar bear capture studies) must be permitted under Section 104(c) of MMPA. These permits require researchers

[213] Fish and Wildlife Service, "Incremental Effects of Critical Habitat Designation for the Polar Bear," November 2, 2009.

[214] *Ibid.*

[215] *Ibid.*

[216] *Ibid.*

and photographers to maintain specific protocols so that no more than a permitted number of polar bears are taken or disturbed.[217]

246. According to the existing Special 4(d) Rule for the polar bear, as long as an activity is authorized or exempted under MMPA, and the appropriate requirements of MMPA are met, the activity does not require any additional authorization under ESA.[218] However, the Service is required to conduct an ESA intra-Service section 7 consultation on the issuance of the MMPA permit. Since the listing of the polar bear there have been three section 7 consultations related to research and field activities. Two of these consultations did not result in any project modifications due to the polar bear, and the third resulted in the Service requesting a minor project modification.[219]

247. As with the other activities discussed in this analysis, the Service believes that "on the basis of how conservation measures are being implemented for the polar bear under the MMPA and ESA, we do not expect that designation of critical habitat will result in additional significant conservation actions."[220] Thus, forecast incremental impacts to field activities are limited to increased administrative costs required to address adverse modification as part of section 7 consultation. Although future consultations are likely to occur on these activities -- especially considering increased interest in climate change – reliable information is not available to quantify the number of future research projects that may require MMPA permits. As a result, this analysis does not monetize any incremental impacts to these activities. Since forecast incremental costs are solely administrative in nature, they are likely to be a relatively minor category of impact.

6.3 SUBSISTENCE ACTIVITIES

248. The proposed critical habitat for the polar bear falls inside the boundaries of land owned and managed by four Alaska Native Claim Settlement Act (ANCSA) Regional Corporations and some of their related Village Corporations. The Arctic Slope Regional Corporation, the Bering Straits Native Corporation, the Calista Regional Corporation, and the Northwest Arctic Native Association (NANA) Regional Corporation are the four ANSCA Regional Corporations that encompass land in the proposed critical habitat.

249. Subsistence activities are among the most highly valued aspects of the Alaska Native culture and an important part of the economy of these rural communities. Subsistence harvesting is the only major source of meat for many Alaska Natives. Creating clothing,

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[217] *Ibid.*

[218] 73 FR 76249.

[219] This was an informal consultation with the U.S. Geological Survey for an airborne coastal lidar survey. The Service requested that if a bear was seen, and it is possible to change flight paths, a half-mile buffer should be provided to the bear(s). U.S. Fish and Wildlife Service – Fairbanks Field Office, Section 7 Informal Consultation #2009-I-0116, with U.S. Geological Survey, May 5, 2009.

[220] Fish and Wildlife Service, "Incremental Effects of Critical Habitat Designation for the Polar Bear," November 2, 2009.

arts and crafts, home goods, and traditional ceremonies also hold cultural and economic value.[221]

250. Section 10(e) of the ESA provides an exemption for Alaska Natives for the taking and importation of listed species if such taking is primarily for subsistence purposes, provided the take does not materially and negatively affect the species. Subsistence hunting is also exempt under section 101(b) of the MMPA, which allows for take for subsistence harvest and the creation of sale of authentic native articles of handicrafts or clothing by Alaska Natives. Because subsistence hunting is exempt from regulation under ESA and MMPA, these activities are not anticipated to be affected by the designation of critical habitat for the polar bear.

[221] Alaska Department of Fish and Game, Division of Subsistence, http://www.subsistence.adfg.state.ak.us.

CHAPTER 7 | ECONOMIC BENEFITS

251. As discussed in the previous chapters of this report, the U.S. Fish and Wildlife Service (Service) does not anticipate that the designation of critical habitat will result in additional conservation requirements for the polar bear. *As a result, no incremental conservation measures are anticipated in this analysis and, as such, no incremental economic benefits are forecast from a designation of critical habitat.* Thus, the remainder of the discussion in this chapter is focuses on the potential baseline economic benefits of polar bear conservation to lend context to the cost analyses presented in the preceding chapters.

KEY ISSUES AND CONCLUSIONS:

- Critical habitat designation is not expected to result in additional conservation measures for the polar bear. Thus, the benefits of polar bear conservation reported in this chapter are all baseline benefits.
- The primary goal of listing the polar bear is to ensure its long-term conservation. Conservation and recovery of the polar bear may result in benefits, including use benefits (Alaska Native subsistence uses, hunting, wildlife-viewing), non-use benefits (existence values), and ancillary benefits (e.g., water quality improvements). This analysis does not quantify potential baseline economic benefits of polar bear conservation.
- This chapter summarizes available information on polar bear use values in Alaska, as well as in other parts of the world. For example, polar bear viewing trips in Kaktovik, Alaska have increased regional tourism income. In addition, Native communities in Canada have benefitted from tourism associated with non-residents participating in trophy hunts for polar bear. In addition, Arctic wildlife viewing, including polar bears, is the most significant tourist industry in Churchill, Manitoba.

7.1 BASELINE ECONOMIC BENEFITS OF POLAR BEAR CONSERVATION

252. Baseline polar bear conservation associated with the Marine Mammals Protection Act (MMPA) and the Endangered Species Act (ESA) listing status of the species is focused on: avoiding polar bears and denning areas (e.g., limiting construction within one mile of a den and limiting fly overs when bears are present); containment and storage of toxic waste; proper planning and response for oil spills, development of human-polar bear interaction plans; and documenting and reporting polar bear sightings. The extent to which these particular activities result in economic benefits, such as improved polar bear populations or ecosystem service benefits (e.g., quality and quantity of the services provided by the critical habitat area such as wildlife-viewing and water quality improvements), is highly uncertain. Thus, this chapter focuses on describing the types of

baseline economic benefits that may be associated with improved polar bear populations and habitat functioning, and how such benefits may be measured.

253. This chapter first describes general categories of economic benefit that may derive from the conservation of the species and habitat, and discusses the research methods that economists employ to quantify these benefits. Next, this chapter highlights those categories of benefit specifically relevant to the baseline polar bear conservation measures described in this report. Finally, this chapter describes the available literature that addresses the economic value of conservation of the polar bear and its habitat.

7.1.1 CATEGORIES OF BENEFIT RELATING TO SPECIES AND HABITAT CONSERVATION

254. The primary goal of listing a species is to ensure its long-term conservation. Various economic benefits, measured in terms of social welfare or regional economic performance, may also result from species and habitat conservation. The benefits of species and habitat conservation can be placed into two broad categories: (1) those associated with the primary goal of species conservation, and (2) those that derive from the habitat conservation measures to achieve this primary goal.

255. Because a purpose of the ESA is to provide for the conservation of endangered and threatened species, the benefits of actions taken under ESA are often measured in terms of the value placed by the public on species preservation (e.g., avoidance of extinction, and/or increase in a species' population). Such social welfare values for a species may reflect both use and non-use values for the species. Use values derive from a direct use for a species, such as commercial harvesting or recreational wildlife-viewing opportunities. Non-use values are not derived from direct use of the species, but instead reflect the utility the public derives from knowledge that a species continues to exist (e.g., existence or bequest values).

256. As a result of actions taken to preserve endangered and threatened species, such as habitat management, various other benefits may accrue to the public. Conservation measures for species and habitat may result in improved environmental quality, which in turn may have collateral human health or recreational use benefits. In addition, conservation measures undertaken for the benefit of a threatened or endangered species may enhance shared habitat for other wildlife. Such benefits may be a direct result of modifications to projects, or may be collateral to such actions. For example, a section 7 consultation may result in containing and disposing of toxic waste to avoid effects on polar bears. A reduction in the release of toxic pollutants may directly benefit water quality and may also provide collateral benefits of preserving habitat for other species occupying these areas.

257. Economists apply a variety of methodological approaches in estimating both use and non-use values for species and for habitat improvements, including stated preference and revealed preference methods. Stated preference techniques include the contingent valuation method and conjoint analysis or contingent ranking methods. In simplest terms, these methods employ survey techniques, asking respondents to state what they

would be willing to pay for a resource or for programs designed to protect that resource. A substantial literature has developed that describes the application of this technique to the valuation of natural resource assets.

258. More specific to use values for species or habitats, revealed preference techniques examine individuals' behavior in markets in response to changes in environmental or other amenities (i.e., people "reveal" their value by their behavior). For example, travel cost models are frequently applied to value access to recreational opportunities, as well as to value changes in the quality and characteristics of these opportunities. Basic travel cost models are rooted in the idea that the value of a recreation resource can be estimated by analyzing the travel and time costs incurred by individuals visiting the site. Another revealed preference technique is hedonic analysis, which is often employed to determine the effect of specific site characteristics on property values.

7.1.2 POTENTIAL BASELINE BENEFITS OF POLAR BEAR CONSERVATION

259. This section describes the categories of benefits resulting from baseline polar bear conservation measures within the proposed critical habitat area. Exhibit 7-1 summarizes potential benefits associated with the specific baseline polar bear conservation measures described in Chapters 3 through 6 of this report. The first column summarizes polar bear conservation measures, by activity. The second column identifies potential categories of benefits that may derive from implementation of these conservation measures. A description of these categories of benefit is provided below.

260. The categories of baseline benefit that may derive from the polar bear conservation measures described in this report include:

- **Avoided polar bear attacks on humans.** The MMPA and ESA provide benefits to human safety by describing how operations may be structured and managed to avoid attracting polar bears, and how to respond in the case that polar bears are present.
- **Improved water quality:** Ensuring proper disposal of toxic wastes, and accounting for planning and response to potential oil spill events may improve regional water quality. Water quality improvements may in turn have human health and human use benefits.

261. In addition to these categories of potential benefit, all of the baseline conservation measures described in Exhibit 7-1 are related to the broader conservation and recovery of the species. For example, monitoring and surveying for the species as part of an environmental impact study for a project is undertaken to better understand the effects of projects on species, and therefore inform the avoidance or minimization of those effects. All conservation measures, therefore, relate to the maintenance or enhancement of the use and non-use value (e.g., existence value) that the public may hold specifically for the polar bears. Specifically, potential use values for the polar bear include:

- **Subsistence activities:** As described in Chapter 6, subsistence activities, including polar bear hunting for meat, arts and crafts, and use in traditional ceremonies, are highly valued economic and cultural aspects of Alaska Native culture.

- **Hunting:** While intentional take of polar bears for hunting is not permitted in Alaska (outside of Alaska Native subsistence hunting), Canada does allow for some level of non-Native trophy hunting. These activities have provided welfare benefits to non-Native hunters, as well as an additional source of regional income in some Canadian territories (see Section 7.3).
- **Polar bear viewing:** The remote and inhospitable climate of the proposed critical habitat area in Alaska may limit the extent of tourism for activities such as wildlife-viewing. However, polar bear viewing is occurring in Kaktovik, Alaska and has provided opportunity for tourists and a source of regional income (see Section 7.3).

262. Many of the baseline conservation measures undertaken for the polar bear may also result in improvements to ecosystem health that are shared by other, coexisting species. The maintenance or enhancement of use and non-use values for these other species, or for biodiversity in general, may also result from these polar bear conservation measures.

EXHIBIT 7-1 BASELINE POLAR BEAR CONSERVATION MEASURES AND POTENTIAL ASSOCIATED BENEFITS

BASELINE CONSERVATION EFFORT	POTENTIAL ASSOCIATED BENEFITS
OIL AND GAS EXPLORATION, DEVELOPMENT AND PRODUCTION	
• Develop polar bear interaction plans, and coordination with Alaska Natives to minimize effects of operations on subsistence hunting. • Organize layout of buildings and work areas to minimize interactions between humans and bears, such as including the use of electric fencing. • Warn personnel of bears near or on facilities and the proper actions to take.	• Avoided polar bear attacks on humans. • Avoided direct take of polar bears. • Conservation of the polar bear.
• Minimize attraction of bears to facility sites, including garbage and good waste. • Provide for proper storage and disposal of materials that may be toxic to bears.	• Improved water quality. • Conservation of the polar bear.
• Operations must avoid known polar bear dens by one mile.	• Avoided polar bear attacks on humans. • Avoided direct take of polar bears. • Conservation of the polar bear.
• Ensure proper planning and response for potential oil spills.	• Improved water quality. • Conservation of the polar bear.
• Document and communicate the sighting of bears on site or in the immediate area to all shift employees.	• Improved information on the distribution of polar bears may focus conservation efforts thereby contributing to increased populations and, thus, use and non-use values for the species. • Conservation of the polar bear.
OTHER CONSTRUCTION AND DEVELOPMENT ACTIVITIES	
• Develop a polar bear – human interaction plan. • Develop field operating procedures and protocols for avoiding polar bears. • Ensure that personnel are designated and trained in appropriate bear management activities.	• Avoided polar bear attacks on humans. • Avoided direct take of polar bears. • Conservation of the polar bear.
• Avoid all activities within one mile of known polar bear dens.	• Avoided polar bear attacks on humans. • Avoided direct take of polar bears. • Conservation of the polar bear.
COMMERCIAL SHIPPING AND MARINE TRANSPORTATION	
• Ensure proper planning and response for potential oil spills.	• Improved water quality. • Conservation of the polar bear.

7.2 AVAILABLE LITERATURE VALUING POLAR BEAR POPULATIONS

263. A literature review was undertaken to identify research regarding the value categories identified above. Specifically, literature reviews focused on the use and non-use values for the polar bears, as well as valuation of the ecosystems in the North Slope that may benefit from polar bear conservation.

7.2.1 USE AND NON-USE VALUATION STUDIES

264. An ideal study for use in valuing the use and non-use values that may derive from critical habitat designation for the polar bear would be specific to the species, the policy question at hand (economic benefits of critical habitat designation), and the relevant population holding such values (e.g., citizens of Alaska or of the U.S.). No such study has been undertaken to date, however.

265. Absent primary research specific to the policy question, resource management decisions can often be informed by applying the results of existing valuation research to a new policy question – a process known to economists as benefit transfer. Benefit transfer involves the application of unit value estimates, functions, data, and/or models from existing studies to estimate the benefits associated with the resource under consideration. No existing studies are available for transfer to the current policy question in order to quantify the value the public would place on actions taken to enhance probability of recovery of polar bears.

266. The Office of Management and Budget (OMB) has written guidelines for conducting credible benefit transfers.[222] The important steps in the OMB guidance are: (1) specify the value to be estimated for the rulemaking; and (2) identify appropriate studies to conduct benefits transfer based on the following criteria:

- The selected studies should be based on adequate data, sound and defensible empirical methods and techniques.
- The selected studies should document parameter estimates of the valuation function.
- The study and policy contexts should have similar populations (e.g., demographic characteristics). The market size (e.g., target population) between the study site and the policy site should be similar.
- The good, and the magnitude of change in that good, should be similar in the study and policy contexts.
- The relevant characteristics of the study and policy contexts should be similar.
- The distribution of property rights should be similar so that the analysis uses the same welfare measure (i.e., If the property rights in the study context support the use of willingness-to-accept measures while the rights in the rulemaking context support the use of willingness-to-pay measures, benefits transfer is not appropriate).
- The availability of substitutes across study and policy contexts should be similar.

[222] U.S. Office of Management and Budget, "Circular A-4," September 17, 2003, available at http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf.

267. There are four types of benefit transfer studies: point estimate, benefit function, meta-analysis, and Bayesian techniques. The point estimate approach involves taking the mean value (or range of values) from the study case and applying it directly to the policy case. As it is rare that a policy case and study case will be identical, this approach is not generally preferable. If it is possible to choose between transferring a function or a point estimate, the entire demand function should be transferred rather than adopting a single point estimate.

Polar Bear Use Values

268. No studies exist that focus specifically on the use values of polar bears within the proposed critical habitat area in Alaska. Polar bear uses in Alaska include Alaska Native subsistence activities, as well as potential polar bear viewing by residents of the North Slope and tourists.

269. Existing information on potential use values does not support a benefit transfer based analysis associated with increased polar bear populations. First, insufficient biophysical information exists to support such an analysis. Appropriate allocation of benefits would require modeling changes in polar bear populations over time in response to the specific baseline conservation measures described in this analysis. The timing and extent to which the polar bear population would be expected to recover, and the extent to which this recovery would be associated with these conservation measures, are unknown. Absent this information, conducting a credible benefit transfer analysis that quantifies polar bear use values is not possible. The information in this discussion is therefore provided for context to the analysis.

270. Polar bear viewing is a growing activity in certain areas of the North Slope. While data are not available regarding specific activity levels (e.g., total numbers of trips or viewers), local guides indicate that interest in polar bear viewing trips is increasing.[223] Multiple regional businesses offer viewing tours based out of the Village of Kaktovik in the months of September and October. Participants generally fly from Anchorage or Fairbanks to the Kaktovik, where accommodations are provided in the village. Guided boat or plane tours depart from Kaktovik for polar bear viewing in multiple locations. The tours range from two to ten days and may include other activities in addition to polar bear viewing, such as Arctic wildlife and landscape photography, natural history tours, viewing of the northern lights, observation of Native Alaskan whale hunting and harvesting activities, or tours of oil and gas facilities. Participants may pay between $1,700 and $6,000 (not including travel to Anchorage or Fairbanks) depending on the length of the tour and other activities included.[224]

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[223] See, for example: USA Today, October 12, 2009, "Polar Bear Tourism Booms on Alaska's North Slope."

[224] Information gathered from local businesses, including Warbelow's Air Adventure (http://www.warbelows.com/polar_bear_tour.htm), Go North Alaska (http://www.gonorth-alaska.com/eisbaeren0.html), Alaska Photo Graphics (http://www.alaskaphotographics.com/northern_lights_photo_tour.shtml), and Circumpolar Expeditions (http://www.arctictravel.net/polarbeartour.html).

271. The existence of this industry in Kaktovik exemplifies that polar bears provide use values in terms of wildlife-viewing (both welfare and regional economic benefits) in Alaska. However, the lack of information on the extent and forecast interest in this activity precludes a comprehensive economic profile. More information is available regarding polar bear viewing in Churchill, Manitoba, Canada, which is widely known for its polar bear viewing opportunities. Recent research by Dawson et. al. describes that each year more than 3,000 people travel to the region for the purpose of viewing wildlife, particularly polar bears. These tourists are estimated to have contributed $2.1 million[225] to the regional economy in 2003.[226] As polar bear viewing is a more established activity in Churchill, it is currently unclear whether the level of activity in Kaktovik may be comparable in terms of participated and regional economic benefit.

272. Trophy hunting of polar bear is also permitted in in Canada. A recent study by Freeman and Wenzel describes that polar bear trophy hunting brings money into regions of the Canada that allow this activity: nine Nunavut and six Northwest Territories. Specifically, in 1970, Canada initiated a program which allows Natives to dedicate some portion of their annual hunting quota to allow non-Natives to participate in Native-guided trophy hunts. The trophy hunts are found to provide a greater source of revenues for the Native Inuit than sales of polar bear hides resulting from subsistence hunting. Specifically, in 2000, the nine Nunavut communities allocated a portion of their hunting quotas to non-resident hunters, generating an estimated $897,000[227], significantly more than all other tourist and visitor activities in the territory.[228] While this provides some information on potential use benefits in terms of regional income associated with polar bear hunting in other regions, Alaska does not allow for hunting of the polar bear by non-Natives and these estimates are not transferable to this analysis.

Polar Bear Option and Non-Use Values

273. While no studies exist attempting to estimate option or non-use values specifically of the polar bear, a 1983 study by Brookshire et. al, *Estimating Option Prices and Existence Values for Wildlife Resources*, considers the option price and existence values for grizzly bears in Wyoming.[229] The option price is based on a survey of individuals regarding their willingness-to-pay for the option to hunt grizzly bears in the future. The authors determine that this price relates to the probability of future supply (grizzly population

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[225] Converted from Canadian $2003 to U.S. $2009 using the Bank of Canada inflation calculator and currently converter accessed at http://www.bankofcanada.ca/en/rates/exchange.html.

[226] Dawson, Jackie D., Emma J. Stewart, and Scott Daniel. 2007. "Climate Change Vulnerability of the Polar Bear Viewing Industry in Churchill Manitoba, Canada." Proceedings from Tourism and Global Change in Polar Regions: An International Conference 29 November – 2 December 2007, Oulu, Finland.

[227] Converted from Canadian $2001 to U.S. $2009 using the Bank of Canada inflation calculator and currently converter accessed at http://www.bankofcanada.ca/en/rates/exchange.html.

[228] Freeman, M.M.R. and G.W. Wenzel. March 2006. "The Nature and Significance of Polar Bear Conservation Hunting in the Canadian Arctic." Arctic 59(1): 21-30.

[229] Brookshire, David S., Larry S. Eubanks, and Alan Randall. February 1983. "Estimating Option Prices and Existence Values for Wildlife Resources." Land Economics 59(1).

numbers) and demand (whether the survey responder anticipated using the option to hunt). In the case that the responder bid an option price but described that they did not expect to hunt or observe the grizzly bears in the future, the authors determined the bid was reflective of an existence value as opposed to an option price. Brookshire et. al. conclude that the mean option price for grizzly bears is about $40 per person in Wyoming; mean existence values range from $29 to $46 (depending on the time frame over which population effects are expected).[230]

274. Grizzly bears are not the same species as polar bears. Further, the relevance of surveys conducted in Wyoming to Alaskan residents or other U.S. residents that may hold option and existence values for the polar bears is uncertain. In addition, there are no plans to remove the prohibition on hunting polar bears in the U.S. by other than Alaska Natives. This analysis does not attempt to transfer these grizzly bear-related values to the polar bears but provides this information as context regarding option and non-use values that have been estimated for other bear species.

7.2.2 ECOSYSTEM SERVICE BENEFITS ASSOCIATED WITH POLAR BEAR HABITAT CONSERVATION

275. The marine, sea ice, and Arctic tundra ecosystems within the proposed critical habitat area provide opportunity for fishing, hunting, and wildlife viewing, as well as providing provisioning services, such as clean air, drinkable water, and food, to the residents of the North Slope. The extent to which the polar bear conservation measures described in this report contribute to the maintenance or improvement of these ecosystem services is highly uncertain. A dearth of literature exists regarding the potential values of the ecosystems of the North Slope.

7.2.3 DISCUSSION

276. As described above, the existing literature does not provide an adequate basis to quantify the specific baseline benefits of the polar conservation measures considered in this economic analysis. Even if the economics literature provided a more robust foundation of studies, implementation of a benefit transfer for purposes of this report is not possible. This is due to the fact that stated preference studies to value species conservation are typically designed to elicit the general benefits (in terms of a population's willingness to pay) of species protection or restoration, as opposed to the specific contribution of particular conservation measures to species restoration.

277. In addition, critical habitat decisions under section 4(b)(2) of ESA entail consideration of impacts on a unit by unit basis, based on a determination that the benefits of excluding a particular unit outweigh the benefits of including it in the designation. Absent information on how each individual unit contributes to the conservation and recovery of the species, it would be difficult to assign aggregate use and non-use values to individual units on the basis of a simple formula, such as the percentage of the study area that the

[230] Estimates converted from 1983 dollars to 2009 dollars using the GDP Deflator.

unit represents. Appropriate allocation of benefits to individual units would require modeling changes in polar bear populations over time in response to the designation of different combinations of units. As this level of detail regarding polar bear population dynamics is not available, aggregate benefits figures cannot be readily disaggregated and integrated into an analysis of the costs and benefits of designating particular units as critical habitat.

7.3 INCREMENTAL ECONOMIC BENEFITS OF POLAR BEAR CRITICAL HABITAT

278. As described above and in the previous chapters of this report, the Service does not anticipate that the designation of critical habitat will result in additional conservation requirements for the polar bear. Absent any changes in polar bear conservation measures, no economic benefits of critical habitat designation are expected. While this rule is not anticipated to result in economic benefits of additional polar bear conservation, the Service is under statutory obligation to designate critical habitat to the maximum extent prudent and determinable.

REFERENCES

5 U.S.C. §§601 *et seq*.

16 56 FR 27443, June 14, 1991

16 U.S.C. §1533(b)(2).

18 AAC 75.4. Accessed online at http://www.dec.state.ak.us/SPAR/statutes_regs.htm on March 20, 2009.

175 F. 3d 1027, 1044 (D.C. Cir. 1999).

43 U.S.C. § 1606.

58 FR 60402, November 16, 1993; 60 FR 42805, August 17, 1995

64 FR 4328, January 28, 1999

65 FR 16828, March 30, 2000

65 FR 5275, February 3, 2000

68 FR 66744, November 28, 2003

71 FR 43926, August 2, 2006.

73 FR 28212.

73 FR 33212, June 11, 2008.

73 FR 76249.

73 FR 76251.

74 FR 56058

74 FR 56070.

74 FR 56071.

74 FR 56073.

74 FR 56077.

773 F. 2d 327 (D.C. Cir. 1985).

Alaska DEC. 1999. Alaska Federal/State Preparedness Plan for Response to Oil and Hazardous Substance Discharges/Releases (Unified Plan, Volume I). Alaska Department of Environmental Conservation, Prevention and Emergency Response Program. Anchorage, AK. Prepared in conjunction with the U.S. Coast Guard, Seventeenth District, Marine Safety Division; and, the U.S. Environmental Protection Agency, Alaska Operations Office.

Alaska DEC. 2001. Northwest Arctic Subarea Contingency Plan for Oil and Hazardous Substance Discharges/Releases: A Subarea Plan of the Unified Plan for the State of Alaska. Alaska Department of Environmental Conservation, Prevention and Emergency Response Program. Anchorage, AK.

Alaska DEC. 2007. North Slope Subarea Contingency Plan for Oil and Hazardous Substance Discharges/Releases: A Subarea Plan of the Unified Plan for the State of Alaska. Alaska Department of Environmental Conservation, Prevention and Emergency Response Program. Anchorage, AK.

Alaska Department of Fish and Game, Division of Subsistence, http://www.subsistence.adfg.state.ak.us.

Alaska Department of Labor and Workforce Development, accessed at http://laborstats.alaska.gov/?PAGEID=67&SUBID=114 on February 3, 2010.

Alaska Department of Labor and Workforce Development, Research and Analysis Section, accessed at http://laborstats.alaska.gov/?PAGEID=67&SUBID=115.

Alaska Department of Labor and Workforce Development. September 2002. Alaska Economic Trends. "The Bethel Census Area." Accessed at http://laborstats.alaska.gov/admin/uploadedPublications/1954_sep02reg.pdf.

Alaska Department of Natural Resources, Division of Mining, Land & Water, Large Mine Permitting, accessed at http://dnr.alaska.gov/mlw/mining/largemine/index.htm.

Alaska Department of Natural Resources, Division of Mining, Land & Water, Placer Mine Permitting, accessed at http://dnr.alaska.gov/mlw/mining/placer.htm.

Alaska Department of Natural Resources, Division of Oil and Gas. Beaufort Sea Areawide Oil and Gas Lease Sale: Final Finding of the Director. November 9, 2009.

Alaska Department of Natural Resources. North Slope Areawide Oil and Gas Lease Sale Final Finding of the Director. July 15, 2008.

Alaska Department of Natural Resources. Proposed Beaufort Sea Areawide Oil and Gas Lease Sale Preliminary Finding of the Director April 2, 2009.

Alaska Department of Revenue. Crude Oil Prices – Bloomberg. ANS West Coast Price for January 8, 2010. Accessed on January 11, 2010 at http://www.tax.alaska.gov/programs/oil/dailyoil/dailyoil.aspx.

Alaska Department of Transportation and Public Facilities. Foothills West Transportation Access. Accessed on January 10, 2010 at http://foothillsroad.alaska.gov/.

Alaska Dept. of Natural Resources. Accessed on November 28, 2009 at http://www.dog.dnr.state.ak.us/oil/products/publications/northslope/northslope_tabbed_042209.html.

Alaska Journal of Commerce. BP may employ 'super rig' for record reach at Liberty. October 30, 2005.

Alaska Miners Association, Inc. "The Economic Benefits of Alaska's Mining Industry." January 2009, prepared by McDowell Group, Inc.

Alaska Oil and Gas Conservation Commission, 2010. Monthly Drilling Reports. Available at http://doa.alaska.gov/ogc/drilling/dindex.html. Accessed on March 10, 2010.

Alaska Resource Data File, published by the U.S. Geological Survey, accessed February 2, 2010 accessed at http://dnr.alaska.gov/SpatialUtility/SUC?cmd=vmd&layerid=1191.

Alaska Statute Title 46, Water, Air, Energy and Environmental Conservation. Accessed online at http://www.dec.state.ak.us/SPAR/statutes_regs.htm on March 20, 2009.

Arctic Marine Shipping Assessment 2009 Report. Current Marine Use and the AMSA Database. Arctic Council, April 2009.

Arctic Marine Shipping Assessment 2009 Report. Scenarios, Futures and Regional Futures to 2020. Arctic Council, April 2009.

Arctic Marine Transport Workshop. Institute of the North, U.S. Arctic Research Commission, and International Arctic Science Committee. September 2004. Held at Scott Polar Research Institute. Cambridge University. United Kingdom.

Arctic Portal. Interactive Data Maps. Accessed online at http://web.arcticportal.org/en/maps/intermap on December 20, 2009.

Arctic Slope Regional Corporation and North Slope Borough letter to U.S. Fish and Wildlife Service. December 28, 2009. "Comments on Proposed Designation of Critical Habitat for the Polar Bears, 74 Fed. Reg. 56,058 (Oct. 29, 2009) [FWS-R7-ES-2009-0042]."

Arctic Slope Regional Corporation website, http://www.asrc.com/_pdf/_press/ASRCFallDividend-2009.pdf and http://www.asrc.com/_pdf/_press/ASRCSpringDividend-2009.pdf.

Bailey, Alan. Watching for polar bears on North Slope. Petroleum News. Vol. 13, No. 40. October 5, 2008. Access from the internet on January 8, 2010 at http://www.petroleumnews.com/pnads/838279608.shtml.

Banks, Kevin. Director, Division of Oil and Gas, Alaska Department of Natural Resources. Personal communication with Northern Economics staff. January 5, 2010.

BLM Alaska. Current NPR-A Lease Map. Accessed on January 4, 2010 at http://www.blm.gov/pgdata/etc/medialib/blm/ak/aktest/energy/npra_maps.Par.95794.File.dat/Updated09102009_NPRALeases_exp_relq_ext_rewd.pdf.

BLM Alaska. National Petroleum Reserve-Alaska. Accessed on December 30, 2009 at http://www.blm.gov/ak/st/en/prog/energy/oil_gas/npra.html.

Brookshire, David S., Larry S. Eubanks, and Alan Randall. February 1983. "Estimating Option Prices and Existence Values for Wildlife Resources." Land Economics 59(1).

Bureau of Land Management. Northeast National Petroleum Reserve – Alaska Final Supplemental Integrated Activity Plan/Environmental Impact Statement, 2008. Accessed on December 30, 2009 at http://www.blm.gov/ak/st/en/prog/planning/npra_general/ne_npra/northeast_npr-a_final.html.

Bureau of Land Management. Northwest National Petroleum Reserve – Alaska Final Integrated Activity Plan/Environmental Impact Statement, 2003. Accessed on December 30, 2009 at http://www.blm.gov/ak/st/en/prog/planning/npra_general/nw_npra/nw_npr-a_final_iap.html

Cape Hatteras Access Preservation Alliance v. Department of Interior, 344 F. Supp. 2d 108 (D.D.C.); *Center for Biological Diversity v. United States Bureau of Land Management*, 422 F. Supp. 2d 1115 (N.D. Cal. 2006).

Center for Biological Diversity et al, Plaintiffs, v. United States Bureau of Land Management et. al, Defendants and American Sand Association, et al, Defendant Intervenors. Order re: Cross Motions for Summary Judgment, Case 3:03-cv-02509 Document 174 Filed 03/14/2006, pages 44-45.

City-data.com, "Nome, Alaska," accessed at http://www.city-data.com/city/Nome-Alaska.html.

Committee on the Assessment of U.S. Coast Guard Polar Icebreaker Roles and Future Needs. *Polar Icebreaker Roles and U.S. Future Needs: A Preliminary Assessment*. Polar Research Board, Division of Earth and Life Sciences. Marine Board, Transportation Research Board. The National Academies Press. Washington, D.C.

Craig, James D., 2009. Personal communication with Northern Economics staff.

Dawson, Jackie D., Emma J. Stewart, and Scott Daniel. 2007. "Climate Change Vulnerability of the Polar Bear Viewing Industry in Churchill Manitoba, Canada." Proceedings from Tourism and Global Change in Polar Regions: An International Conference 29 November – 2 December 2007, Oulu, Finland.

Department of Homeland Security Comments: Department of the Interior, Fish and Wildlife Service Proposed Rule: Polar Bear Critical Habitat. October 13, 2009. Forwarded by the U.S. Fish and Wildlife Service on December 2, 2009.

Director, U.S. Fish and Wildlife Service, Memorandum to Regional Directors and Manager of the California-Nevada Operations Office, Subject: Application of the "Destruction or Adverse Modification" Standard under Section 7(a)(2) of the Endangered Species Act, dated December 9, 2004.

Division of Oil and Gas, Alaska Department of Natural Resources. North Slope Areawide Oil and Gas Lease Sale, Final Finding of the Director. Accessed December 30, 2009 at http://www.dog.dnr.state.ak.us/oil/products/publications/northslope/nsaw08-ff_toc.html . July 15, 2008.

Division of Oil and Gas, Alaska Department of Natural Resources. North Slope Unit Ownership map dated 07/28/06. Accessed on December 30, 2009 at http://www.dog.dnr.state.ak.us/oil/products/maps/northslope/images/North_Slope_Unit_Ownership_072806.pdf.

Dun and Bradstreet Business Information, "Dun's Market Identifiers," downloaded February 5, 2010.

Email communication from the U.S. Fish and Wildlife Service to LCMF LLC, January 5, 2009, Wainwright Gravel Exploration.

Email communication from the U.S. Fish and Wildlife Service to the Office of Management and Budget, "ACOE Comments: Polar Bear CH," October 15, 2009.

Email communication from the U.S. Fish and Wildlife Service to the Office of Management and Budget, "DOT Comments: DOI/FWS Proposed Rule: Polar Bear Critical Habitat," October 15, 2009.

Email communication from the U.S. Fish and Wildlife Service to the Office of Management and Budget, "DHS Comments: DOI/FWS Proposed Rule: Polar Bear Critical Habitat," October 14, 2009.

Executive Order 12866, Regulatory Planning and Review, September 30, 1993 (as amended by Executive Order 13258 (2002) and Executive Order 13422 (2007)).

Executive Order 12866, Regulatory Planning and Review, September 30, 1993.

Executive Order 13211, Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use, May 18, 2001.

Fish and Wildlife Service, "Incremental Effects of Critical Habitat Designation for the Polar Bear," November 2, 2009.

Freeman, M.M.R. and G.W. Wenzel. March 2006. "The Nature and Significance of Polar Bear Conservation Hunting in the Canadian Arctic." Arctic 59(1): 21-30.

FWS to Industrial Economics, Inc., November 2, 2009, "Incremental Effects of Critical Habitat Designation for the Polar Bear."

FWS-R7-ES-2009-0042.

Gifford Pinchot Task Force v. United States Fish and Wildlife Service, No. 03-35279 (9th Circuit 2004).

Goldsmith, Scott. "A Preliminary Investigation of the Economic Effects of Critical Habitat Designation for the Spectacled Eider and Steller's Eider on Alaska's North Slope." Prepared for BP Exploration (Alaska) Inc. and Phillips Alaska, Inc. September 20, 2000. Accessed on the Internet on January 9, 2010 at http://www.iser.uaa.alaska.edu/Publications/steller_eider.pdf.

Goldsmith, Scott. Northstar Oil Field: Economic Impact Analysis for British Petroleum Exploration (Alaska), Inc., February 1998.

Goll, John. Regional Director, Alaska Outer Continental Shelf Region. Letter dated December 28, 2009 to U.S. Fish and Wildlife Service commenting on Proposed rule regarding the designation of proposed critical habitat for the polar bear in the United States.

Gramlich, Edward M., A Guide to Benefit-Cost Analysis (2nd Ed.), Prospect Heights, Illinois: Waveland Press, Inc., 1990.

IMV Projects Atlantic. Arctic Offshore Technology Assessment of Exploration and Production Options for Cold Regions of the U.S. Outer Continental Shelf. Prepared for Minerals Management Service, January 2008.

Memorandum For Heads of Executive Department Agencies, and Independent Regulatory Agencies, Guidance For Implementing E.O. 13211, M-01-27, Office of Management and Budget, July 13, 2001, http://www.whitehouse.gov/omb/memoranda/m01-27.html.

Milam, Ken. A Shift in Plays on North Slope. In Explorer, January 2004. Web site of the American Association of Petroleum Geologists. Accessed on January 10, 2010 at http://www.aapg.org/explorer/2004/01jan/alaska.cfm.

Miller, Brian. Shell Exploration & Production, Inc. Personal communication to Northern Economics staff, October 14, 2009.

Minerals Management Service. Alaska Federal Offshore Descriptions of Geologic Plays, 1995 National Resource Assessment. Accessed on December 28, 2009 at http://www.mms.gov/alaska/re/asmtdata/contents.htm.

Minerals Management Service. Alaska OCS Region. Planning Area Map. Accessed on December 28, 2009 at http://www.mms.gov/alaska/lease/hlease/PLANMAP.HTM.

Minerals Management Service. Planning Area Resources Addendum to Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nations' Outer Continental Shelf, 2006. Accessed on January 5, 2010 at http://www.mms.gov/revaldiv/PDFs/NA2006BrochurePlanningAreaInsert.pdf.

National Research Council. Committee on the Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope. Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope. 2003.

Nelson, Kristen, "Logistics key to Point Thomson Project." Petroleum News. Vol. 14, No. 49. December 06, 2009. Access on the Internet at http://www.petroleumnews.com/pnads/401509928.shtml, on January 8, 2010.

Nelson, Kristen. Conoco files new Alpine West application. Petroleum News, Vol. 14, No. 21 accessed on January 10, 2010 at http://www.petroleumnews.com/pnads/411029216.shtml.

New Mexico Cattle Growers Assn v. United States Fish and Wildlife Service, 248 F.3d 1277 (10th Cir. 2001).

Northern Economics, 2009. Economic Analysis of Future Offshore Oil and Gas Development: Beaufort Sea, Chukchi Sea, and North Aleutian Basin. Prepared for Shell Exploration & Production, Inc., 2009.

Ohms, H. 2008. Polar Bear Interaction Management Plan. May 2008. A final revised plan for the Department of Defense, U.S. Air Force contract number FA5000-06-FA019. Prepared for the 611th Air Support Group, 611th Civil Engineer Squadron, Environmental Flight, Elmendorf AFB, AK by Oasis Environmental Inc., Anchorage, AK.

Oil Pollution Act of 1990 (33 U.S.C. 2701-2761). Accessed online at http://www.uscg.mil/NPFC/About_NPFC/opa.asp on March 20, 2009.

Petroleum News. Remote basin exploration moves forward. Volume 14, No. 50, December 13, 2009.

Pub Law No. 104-121.

Public comment from the Alaska Gold Company, December 28, 2009, Comments of Alaska Gold Company on Proposed Rule to Designate Critical Habitat for the Polar Bear.

Public comment from the Arctic Slope Regional Corporation and the North Slope Borough, December 28, 2009, Comments on Proposed Designation of Critical Habitat for the Polar Bears.

Public comment from the NANA Regional Corporation, December 28, 2009, Comments on Proposed Rule to Designate Critical Habitat for the Polar Bear in the United States.

Public comment from the Resource Development Council, December 23, 2009, Comments of the Resource Development Council – Proposed Rule to Designate Critical Habitat for the Polar Bear.

Shell Exploration and Production Company. Comments on Proposed Critical Habitat for the Polar Bear, 74 Fed. Reg. 56058 (Oct. 29, 2009), RIN 1018-AW56. Public Comments submitted December 28,2009.

Shell in Alaska. Offshore 101. Accessed January 7, 2010 at http://www.shell.us/home/content/usa/aboutshell/strategy/major_projects/alaska/about/about_alaska_index.html.

Shell Offshore, Inc. 2010 Outer Continental Shelf Lease Exploration Plan Camden Bay, Alaska. June 2009. Submitted to Minerals Management Service. Accessed on January 4, 2009 at http://www.mms.gov/alaska/ref/ProjectHistory/Shell_BF/2009_final_EP_camden_bay.pdf.

Small Business Administration, Office of Advocacy. May 2003. A Guide for Government Agencies: How to Comply with the Regulatory Flexibility Act, pg. 20.

Small Business Administration, Table of Small Business Size Standards for NAICS 2007 (http://www.sba.gov/idc/groups/public/documents/sba_homepage/serv_sstd_tablepdf.pdf).

Society of Petroleum Engineers. Frontiers of Technology – Subsea Completions. Journal of Petroleum Technology, Vol. 8. August 1999. Accessed January 7, 2010 from http://www.spe.org/spe-app/spe/jpt/1999/08/frontiers_subsea_completions.htm.

USA Today. October 12, 2009. "Polar Bear Tourism Booms on Alaska's North Slope."

U.S. Air Force. 2007. Integrated Natural Resources Management Plan: Alaska Radar System, Alaska Short and Long Range Radar Sites. 2007 Revision. U.S. Air Force, 611th Air Support Group, Alaska 611th Civil Engineer Squadron, Environmental Flight.

U.S. Air Force. 2009. Integrated Natural Resources Management Plan: Inactive Sites, Alaska 611th Air Support Group. 2009 Revision. U.S. Air Force, 611th Air Support Group, Alaska 611th Civil Engineer Squadron, Environmental Flight.

U.S Fish and Wildlife Service. 2006. Final Biological Opinion for Pioneer Natural Resources Alaska Inc.'s Oooguruk Development Project.

U.S Fish and Wildlife Service. 2006. Final Biological Opinion for Kerr-McGee Oil and Gas Corporation Nikaitchuq Development Project.

U.S. Census Bureau, Population Estimates, Incorporated Place and Minor Civil Division Population Dataset, accessed at http://www.census.gov/popest/datasets.html.

U.S. Census Bureau, State and County QuickFacts, accessed at http://quickfacts.census.gov/qfd/states/ on February 3, 2010.

U.S. Department of Defense, Department of the Air Force. *Response to the Designation of Critical Habitat for the Polar Bear*. FWS-R7-ES-2009-0042; 92210-1117-0000-FY09-B4. Submitted by the Western Regional Environmental Office of the U.S. Air Force to the U.S. Fish and Wildlife Service, Division of Policy and Directives Management. December 23, 2009.

U.S. Department of the Interior, Bureau of Land Management and Minerals Management Service. Northwest National Petroleum Reserve-Alaska: Final Integrated Activity Plan/Environmental Impact Statement. November 2003.

U.S. Environmental Protection Agency, Guidelines for Preparing Economic Analyses, EPA 240-R-00-003, September 2000, available at http://yosemite.epa.gov/ee/epa/eed.nsf/webpages/Guidelines.html.

U.S. Fish and Wildlife Service – Fairbanks Field Office, Section 7 Informal Consultation #2009-I-0116, with U.S. Geological Survey, May 5, 2009.

U.S. Fish and Wildlife Service consultation with the Minerals Management Service. Final Biological Opinion for Beaufort and Chukchi Sea Program Area Lease Sales and Associated Seismic Surveys and Exploratory Drilling. September 3, 2009.

U.S. Fish and Wildlife Service Memorandum to Industrial Economics, Inc. November 2, 2009. *Incremental Effects of Critical Habitat Designation for the Polar Bear*.

U.S. Fish and Wildlife Service, "Endangered Species and Habitat Conservation Planning," August 6, 2002, accessed at http://endangered.fws.gov/hcp/.

U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office. Programmatic Biological Opinion for Polar Bears (*Ursus maritimus*) on Beaufort Sea Incidental Take Regulations. June 23, 2008.

U.S. Fish and Wildlife Service. 1999. Final Biological Opinion/Conference Report for the proposed Northstar development project, Alaska.

U.S. Fish and Wildlife Service. 2007. Final Biological Opinion for Minerals Management Service and their agents BP Exploration (Alaska) Inc. for Liberty Development Project.

U.S. Fish and Wildlife Service; Marine Mammals Management; Incidental Take Regulation. Accessed December 14, 2009 at http://alaska.fws.gov/fisheries/mmm/itr.htm.

U.S. FWS. 1999. Oil Spill Response Plan for Polar Bears in Alaska. U.S. FWS. Marine Mammals Management. Anchorage, Alaska.

U.S. Geological Survey, 2005. Economic Analysis of Undiscovered Oil and Gas of the Central North Slope of Alaska, 2005.

U.S. Office of Management and Budget, "Circular A-4," September 17, 2003, available at http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf.

Van Kooten, Gerry. PetroTechnical Resources Alaska. Evaluation of Hydrocarbon Potential: Western Alaska Access Planning Study. Appendix D in Volume II, Western Alaska Access Planning Study, DOWL/HKM, 2009. Prepared for the Alaska Department of Transportation and Public Facilities. Accessed at http://www.dowlprojects.com/westernakaccess/Media/westernakaccess/Volume%20II%20-%20WAAPS%20Appendices.pdf on December 29, 2009.

Written communication from the Service to the U.S. Army Corps of Engineers, November 18, 2009, Deadhorse Aviation Center, LLC.

Written communication with Samantha Smith, Environmental Program Specialist, Alaska Department of Environmental Conservation, Division of Spill Prevention and Response, Industry Preparedness Program, Marine Vessels Section on February 19, 2009.

Written communication from Rance Wall, P.E., Alaska Region, Minerals Management Service to U.S. FWS, on January 19, 2010.

Written communication from Scott Goldsmith, Institute of Social and Economic Research, University of Alaska, Anchorage to IEc, on March 2, 2010.

In addition this analysis relied on public comments received on the proposed rule and draft economic analysis, and personal communication with:

- Dean Amundson, Environmental Specialist, U.S. Coast Guard.
- Gene Augustine, Biologist/Natural Resources Program Manager, U.S. Air Force 611th Air Support Group on January 13, 2010.
- Heather Boyer, USACE, February 2, 2005.
- James D. Craig, Geologist, Alaska OCS Region, Minerals Management Service, November 2, 2009.
- Mike Dombkowski, Environmental Scientist, U.S. Coast Guard on January 13, 2009.
- Doug Lentsch, Cook Inlet Spill Prevention and Response Inc. (CISPRI) on February 28, 2009.
- Pete Pritchard, Response Supervisor, and Chris Burns, Preparedness Supervisor, Alaska Chadux Corporation on March 17, 2009.
- U.S. Department of Transportation, Office of Safety, Energy and Environment on December 16, 2009.
- U.S. Fish and Wildlife Service.

APPENDIX A | SMALL BUSINESS ANALYSIS AND ENERGY IMPACT ANALYSIS

1. This appendix considers the extent to which incremental impacts of critical habitat designation for the polar bear may be borne by small entities and the energy industry. The analysis presented in Section A.1 is conducted pursuant to the Regulatory Flexibility Act (RFA) as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996. Information for this analysis was gathered from the Small Business Administration (SBA), the U.S. Fish and Wildlife Service (Service), and from interviews with stakeholders contacted in the development of the economic analysis. The energy analysis in Section A.2 is conducted pursuant to Executive Order No. 13211.

2. The analyses of impacts to small entities and the energy industry rely on the estimated incremental impacts resulting from the proposed critical habitat designation. The incremental impacts of the rulemaking are most relevant for the small business and energy impacts analyses because they reflect costs that may be avoided or reduced based on decisions regarding the composition of the final rule. The only incremental impacts quantified in this analysis are administrative costs of consultation, as quantified by activity in Chapters 3, 4, and 6.

A.1 SUMMARY OF RESULTS

3. The only activities for which critical habitat designation may result in impacts to small businesses are oil and gas exploration and development, and other construction and development activities. The following bullets summarize the results of the small business screening analysis. Detail and discussion regarding these results is provided in Section A.1.

- **Oil and gas exploration, development, and production.** Critical habitat designation is not expected to result in additional polar bear conservation requirements for these activities. Forecast economic impacts are related solely to added administrative effort of conducting consultation regarding critical habitat for the polar bear. While this analysis expects that larger oil and gas companies operating in the region are likely to bear these administrative costs, some portion of the administrative costs may be borne by small businesses; however, the total impacts are limited ($13,000 to $558,000 over 30 years (seven percent discount rate), or an annualized impact of $1,050 to $45,000).
- **Construction and development activities.** Similar to oil and gas activities, the effects of critical habitat on construction and development activities is expected to be

limited to additional administrative costs of section 7 consultation. The specific third parties involved in future section 7 consultations for construction and development projects are unknown; however, third parties may include local governments, residential construction companies, heavy and civil engineering companies, specialty trade contractors, mining companies (not including oil and gas), utility companies, developers, and transportation companies. Based on regional business profiles (Exhibit A-1), these businesses are all likely to be small. Total present value impacts of critical habitat designation on these small businesses is expected to be $115,000 over 30 years (seven percent discount rate), an annualized impact of $9,290.

A.2 SBREFA ANALYSIS

4. When a Federal agency proposes regulations, the RFA requires the agency to prepare and make available for public comment an analysis that describes the effect of the rule on small entities (i.e., small businesses, small organizations, and small government jurisdictions as defined by the RFA).[1] No initial regulatory flexibility analysis is required if the head of an agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. SBREFA amended the RFA to require Federal agencies to provide a statement of the factual basis for certifying that a rule will not have significant economic impact on a substantial number of small entities. To assist in this process, this appendix provides a screening level analysis of the potential for polar bear critical habitat to affect small entities.

5. To ensure broad consideration of impacts on small entities, the Service has prepared this small business analysis without first making the threshold determination in the proposed rule regarding whether the proposed critical habitat designation could be certified as not having a significant economic impact on a substantial number of small entities. This small business analysis will therefore inform the Service's threshold determination.

A.2.1 REQUIREMENTS OF SBREFA ANALYSIS

6. This analysis is intended to improve the Service's understanding of the potential effects of the proposed rule on small entities and to identify opportunities to minimize these impacts in the final rulemaking. The Endangered Species Act (ESA) requires the Service to designate critical habitat for threatened and endangered species to the maximum extent prudent and determinable. Section 4(b)(2) of the ESA requires that the Service designate critical habitat "on the basis of the best scientific data available and after taking into consideration the economic impact, the impact on national security, and any other relevant impact, of specifying any particular areas as critical habitat." The Secretary's discretion is limited as (s)he may not exclude areas if so doing "will result in the extinction of the species."

7. Three types of small entities are defined in the RFA:

[1] 5 U.S.C. § 601 et seq.

- **Small Business -** Section 601(3) of the RFA defines a small business as having the same meaning as small business concern under section 3 of the Small Business Act. This includes any firm that is independently owned and operated and is not dominant in its field of operation. The SBA has developed size standards to carry out the purposes of the Small Business Act, and those size standards can be found in 13 CFR 121.201. The size standards are matched to NAICS industries. The SBA definition of a small business applies to a firm's parent company and all affiliates as a single entity.
- **Small Governmental Jurisdiction -** Section 601(5) defines small governmental jurisdictions as governments of cities, counties, towns, townships, villages, school districts, or special districts with a population of less than 50,000. Special districts may include those servicing irrigation, ports, parks and recreation, sanitation, drainage, soil and water conservation, road assessment, etc. When counties have populations greater than 50,000, those municipalities of fewer than 50,000 can be identified using population reports. Other types of small government entities are not as easily identified under this standard, as they are not typically classified by population.
- **Small Organization -** Section 601(4) defines a small organization as any not-for-profit enterprise that is independently owned and operated and not dominant in its field. Small organizations may include private hospitals, educational institutions, irrigation districts, public utilities, agricultural co-ops, etc.

8. The courts have held that the RFA/SBREFA requires Federal agencies to perform a regulatory flexibility analysis of forecast impacts to small entities that are directly regulated. In the case of *Mid-Tex Electric Cooperative, Inc., v. Federal Energy Regulatory Commission (FERC),* FERC proposed regulations affecting the manner in which generating utilities incorporated construction work in progress in their rates. The generating utilities that expected to be regulated were large businesses; however, their customers -- transmitting utilities such as electric cooperatives -- included numerous small entities. In this case, the court agreed that FERC simply authorized large electric generators to pass these costs through to their transmitting and retail utility customers, and FERC could therefore certify that small entities were not directly impacted within the definition of the RFA.[2]

9. Similarly, *American Trucking Associations, Inc. v. Environmental Protection Agency* (EPA) addressed a rulemaking in which EPA established a primary national ambient air quality standard for ozone and particulate matter.[3] The basis of EPA's RFA/SBREFA certification was that this standard did not directly regulate small entities; instead, small entities were indirectly regulated through the implementation of state plans that incorporated the standards. The court found that, while EPA imposed regulation on states, it did not have authority under this rule to impose regulations directly on small

[2] 773 F. 2d 327 (D.C. Cir. 1985).

[3] 175 F. 3d 1027, 1044 (D.C. Cir. 1999).

entities and therefore small entities were not directly impacted within the definition of the RFA.

10. The SBA in its guidance on how to comply with the RFA recognizes that consideration of indirectly affected small entities is not required by the RFA, but encourages agencies to perform a regulatory flexibility analysis even when the impacts of its regulation are indirect.[4] "If an agency can accomplish its statutory mission in a more cost-effective manner, the Office of Advocacy [of the SBA] believes that it is good public policy to do so. The only way an agency can determine this is if it does not certify regulations that it knows will have a significant impact on small entities even if the small entities are regulated by a delegation of authority from the Federal agency to some other governing body."[5]

11. The regulatory mechanism through which critical habitat protections are enforced is section 7 of the ESA, which directly regulates only those activities carried out, funded, or permitted by a Federal agency. By definition, Federal agencies are not considered small entities, although the activities they may fund or permit may be proposed or carried out by small entities. Given the SBA guidance described above, this analysis considers the extent to which this designation could potentially affect small entities, regardless of whether these entities would be directly regulated by the Service through the proposed rule or by a delegation of impact from the directly regulated entity.

A.2.2 DISCUSSION OF IMPACTS TO SMALL ENTITIES

12. This screening analysis focuses on small entities that may bear the incremental impacts of this rulemaking quantified in Chapters 3, 4, and 6 of this economic analysis. As detailed in these chapters, this analysis does not forecast any incremental impacts beyond additional administrative costs associated with considering adverse modification during future section 7 consultations. Small entities may participate in section 7 consultation regarding the polar bear as third parties (the primary consulting parties being the Service and the Federal action agency), and may spend additional time and effort considering potential critical habitat issues. These incremental administrative costs of consultation borne by third parties are the subject of this SBREFA analysis.[6]

13. Chapters 3, 4, and 6 of this analysis forecast consultations for: oil and gas exploration, development, and production; construction and development; and military operations; as follows.

- **Oil and Gas Exploration, Development, and Production.** Future consultations on oil and gas related activities are forecast to be triggered by the renewal of Incidental Take Regulations (ITRs) within the Chukchi and

[4] Small Business Administration, Office of Advocacy. May 2003. A Guide for Government Agencies: How to Comply with the Regulatory Flexibility Act, pg. 20.

[5] *Ibid.*, pg. 21.

[6] Incremental administrative costs of consultation that would be borne by the Federal action agency and the Service are not relevant to this screening analysis as these entities (Federal agencies) are not small.

Beaufort Seas every five years, Minerals Management Service (MMS) five-year lease sales, updates to the National Petroleum Reserve-Alaska (NPR-A) every five years, updates to the Bureau of Land Management (BLM) Integrated Activity Plan for the NPR-A every 15 years, oil and gas field development projects, and oil/natural gas pipeline construction projects. In total, 46 formal and programmatic consultations are forecast to occur during the 30-year timeframe for this analysis. Based on the past polar bear consultations regarding oil and gas activities, this analysis expects that third party participants in forecast consultations will primarily be large oil and gas companies operating in the region, such as Shell, ExxonMobil, Conoco Phillips, and British Petroleum. These companies exceed the 500-employee threshold for small crude petroleum and natural gas extraction, natural gas liquid extraction, and drilling oil and gas well businesses, as defined by the SBA.[7]

It is possible that a portion of these section 7 administrative costs may be passed on to the regional oil and gas support businesses. Exhibit A-1 highlights that regional oil and gas related businesses are likely classified as small.

- **Construction and Development.** Based on past section 7 consultations for the polar bear, 0.5 formal, 17 informal, and 0.5 technical assistances are forecast to occur, annually, triggered by construction and development projects within proposed critical habitat. The types of projects requiring section 7 consultations are expected to include wind energy development, utility line construction, road maintenance and construction, airport and seaport development and expansion, and mining (not including oil and gas). The specific third parties involved in future section 7 consultations for construction and development projects are unknown; however, third parties may include local governments, residential construction companies, heavy and civil engineering companies, specialty trade contractors, mining companies (not including oil and gas), utility companies, developers, and transportation companies.

  The Alaska boroughs and census areas that overlap the proposed critical habitat area are all considered small governments, with populations less than 50,000. In addition, Exhibit A-1 highlights that about 85 percent of related industry businesses in the proposed critical habitat region are small. As such, the third parties expected to bear some incremental costs of consultation are likely small.

- **Military Operations.** Chapter 6 describes incremental impacts to the U.S. Coast Guard (USCG) due to section 7 consultations for the polar bear on ongoing USCG operations within the Arctic. The USCG and the Service are

[7] Small business threshold based on SBA's Table of Small Business Size Standards for NAICS 2007 (http://www.sba.gov/idc/groups/public/documents/sba_homepage/serv_sstd_tablepdf.pdf).

forecast to incur all the incremental administrative costs of consultations forecast for military operations.

14. Exhibit A-1 describes the number of total businesses related to oil and gas activities, as well as other development and construction activities, within the two Alaska boroughs (North Slope Borough and Northwest Arctic Borough) and three census areas (Nome, Wade-Hampton, and Bethel) containing proposed critical habitat. This exhibit shows that the businesses operating in these regions are primarily classified as small. In addition, the boroughs and census areas themselves are classified as small governments, with less than 50,000 residents each. The discussion following Exhibit ES-1 provides information regarding the potential number of small entities affected, and the potential impacts expected to be borne by these small entities.

EXHIBIT A-1 TOTAL NUMBER OF BUSINESSES AND SMALL BUSINESSES IN ALASKA BOROUGHS AND CENSUS AREAS CONTAINING PROPOSED CRITICAL HABITAT

NAICS CODE	DESCRIPTION	SMALL BUSINESS THRESHOLD	TOTAL NUMBER OF ENTITIES	NUMBER OF SMALL ENTITIES
211	Oil and Gas Extraction	500 Employees	1	0
212221	Gold Ore Mining		6	5
213111	Drilling Oil and Gas Wells		1	0
213112	Support Activities for Oil and Gas Operations	$6.5 million (average annual revenues)	15	13
213114	Support Activities for Metal Mining		3	1
221119*	Other Electric Power Generation	Electric output < 4.0 million MWh; generation, transmission, and/or distribution of electric energy for sale	7	7
221210	Natural Gas Distribution	500 Employees	1	0
221310	Water Supply and Irrigation Systems	$6.5 million (average annual revenues)	3	3
236	Construction of Buildings	$31.0 million (average annual revenues)	30	29
237110	Water and Sewer Line and Related Structures Construction		3	3
237120	Oil and Gas Pipeline and Related Structures Construction		5	5
237210	Land Subdivision	$6.5 million (average annual revenues)	1	0
237310	Highway, Street, and Bridge Construction	$31.0 million (average annual revenues)	3	3
238	Specialty Trade Contractors	$13.0 million (average annual revenues)	32	31
486110	Pipeline Transportation of Crude Oil	1,500 Employees	3	0
488111	Air Traffic Control	$6.5 million (average annual revenues)	5	0
488119	Other Airport Operations		6	6
488190	Other Support Activities for Air Transportation		1	1
488210	Support Activities for Rail Transportation		1	1
488490	Other Support Activities for Road Transportation		2	2
488999	All Other Support Activities for Transportation		2	2
Total			**131**	**112**

Notes:
The geographic extent for the total number of entities and the number of small entities presented above is the boroughs and Census areas intersected by proposed critical habitat. This includes the: North Slope Borough, Northwest Arctic Borough, Nome Census Area, Wade Hampton Census Area, and Bethel Census Area.

Sources:
Small business threshold based on SBA's Table of Small Business Size Standards for NAICS 2007 (http://www.sba.gov/idc/groups/public/documents/sba_homepage/serv_sstd_tablepdf.pdf). Numbers of businesses are based on Dun and Bradstreet Business Information, "Dun's Market Identifiers," downloaded February 5, 2010.
* It is not possible to specify a size threshold for "Other Electric Power Generation" businesses in a Dun and Bradstreet search. All the businesses returned in the search are, therefore, assumed to be small based on the small business threshold defined above.

Potential Administrative Costs of Section 7 Consultation that May be Borne by Small Entities

Oil and Gas Exploration, Development, and Production

15. More than 90 percent of the total oil and gas production potential of the State of Alaska is associated with the potential development of the North Slope, a portion of which overlaps the proposed critical habitat area.[8] As described in Chapters 2 and 3 of this report, critical habitat is not expected to result in regulatory changes in polar bear conservation. The Service believes that the strength of the regulatory baseline, in particular the existing ITRs that govern oil and gas activities in the region, provide significant conservation protection to avoid potential adverse modification of critical habitat. As such, the Service does not anticipate requesting additional conservation measures for the polar bear following critical habitat designation.[9] As a result, the only incremental impacts forecast are associated with additional administrative effort in considering adverse modification as part of section 7 consultation. These incremental administrative costs will be borne by the Service, Federal action agency, and third parties, which may include oil and gas related businesses operating within the region.

16. Based on past consultations considering oil and gas activities, this analysis anticipates that third parties most likely to bear these costs are large operations, including Shell, ExxonMobil, Conoco Phillips, and British Petroleum. Even in the case that the third party administrative costs are passed on to small, regional industry-support businesses, the expected impact is low. Exhibit A-1 describes that a total of 18 oil and gas related small businesses are based in the proposed critical habitat region: 13 companies engaged in support activities for oil and gas operations and 5 companies engaged in oil and gas pipeline and related structures construction).

17. Applying the third party costs of addressing adverse modification during section 7 consultation (presented in Exhibit 1-2), the present value of forecast total incremental third party costs is $4,850 over 30 years, applying a seven percent discount rate ($391 annualized). This impact is low because oil and gas activities are generally covered by existing regional regulations (e.g., the ITRs) and thus individual activities occurring within these regions are not individually subject to consultation.

18. As detailed in Chapter 3, the greatest source of uncertainty in this analysis is the potential for indirect economic impacts of critical habitat designation. While the Service believes that critical habitat will not result in additional regulation, industry, landowners, Alaska Native Regional Corporations, and other stakeholders are concerned that unforeseen adverse economic impacts will occur, such as project delays or stoppages. As oil and gas development activities are the predominant economic activity in these remote regions of

[8] Northern Economics, 2009. Economic Analysis of Future Offshore Oil and Gas Development: Beaufort Sea, Chukchi Sea, and North Aleutian Basin. Prepared for Shell Exploration & Production, Inc., 2009.

[9] U.S. Fish and Wildlife Service, "Incremental Effects of Critical Habitat Designation for the Polar Bear," November 2, 2009 (see Appendix C).

Alaska, few substitute employment opportunities exist; the regional economy is inextricably linked to the oil and gas industry.

19. As described in Exhibit A-1, regional businesses and governments are small entities. While this analysis recognizes that some potential exists for indirect impacts of critical habitat, the lack of information regarding the potential for these types of indirect impacts precludes monetization. Section 3.2.2 of this analysis provides a detailed discussion of potential indirect impacts and includes examples of their potential magnitude (see Exhibits 3-4 and 3-5).

Construction and Development Activities

20. Chapter 4 of this report describes that the Service does not expect that critical habitat designation will result in additional conservation for the polar bear with respect to conservation and development activities.[10] As with oil and gas activities, however, incremental administrative costs of considering critical habitat as part of section 7 consultation are expected. In the case of construction and development activities, regional governments and businesses are expected to bear the third party administrative consultation costs. As highlighted in Exhibit A-1, it is likely that these regional businesses will be small. In addition, the boroughs and census areas containing proposed critical habitat are all considered small governments, with less than 50,000 residents each.

21. Applying the third party costs of addressing adverse modification during section 7 consultation (presented in Exhibit 1-2), the present value of forecast total incremental third party costs is $115,000, applying a seven percent discount rate ($9,290 annualized). Exhibit A-1 identifies 94 small businesses engaging in construction and development related activities in the areas proposed for critical habitat. In addition, five small governments (two boroughs and three census areas) may bear a portion of these administrative costs. The actual number of small entities affected is unknown as the forecast projects subject to consultation are not associated with any particular businesses or governments.

A.3 POTENTIAL IMPACTS TO THE ENERGY INDUSTRY

22. Pursuant to Executive Order No. 13211, "Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use," issued May 18, 2001, Federal agencies must prepare and submit a "Statement of Energy Effects" for all "significant energy actions." The purpose of this requirement is to ensure that all Federal agencies "appropriately weigh and consider the effects of the Federal Government's regulations on the supply, distribution, and use of energy."[11]

[10] *Ibid*.

[11] Memorandum For Heads of Executive Department Agencies, and Independent Regulatory Agencies, Guidance For Implementing E.O. 13211, M-01-27, Office of Management and Budget, July 13, 2001, http://www.whitehouse.gov/omb/memoranda/m01-27.html.

23. The Office of Management and Budget provides guidance for implementing this Executive Order, outlining nine outcomes that may constitute "a significant adverse effect" when compared with the regulatory action under consideration:

- Reductions in crude oil supply in excess of 10,000 barrels per day (bbls);
- Reductions in fuel production in excess of 4,000 barrels per day;
- Reductions in coal production in excess of 5 million tons per year;
- Reductions in natural gas production in excess of 25 million Mcf per year;
- Reductions in electricity production in excess of 1 billion kilowatts-hours per year or in excess of 500 megawatts of installed capacity;
- Increases in energy use required by the regulatory action that exceed the thresholds above;
- Increases in the cost of energy production in excess of one percent;
- Increases in the cost of energy distribution in excess of one percent; or
- Other similarly adverse outcomes.[12]

24. As described in Chapter 3 of this analysis, incremental impacts to oil and gas exploration, development, and production are limited to the additional administrative costs of addressing adverse modification of critical habitat in future section 7 consultations for the polar bear. The Service does not anticipate critical habitat designation to result in additional project modifications to oil and gas exploration, development, and production activities.[13] As such, critical habitat designation for the polar bear is not expected to significantly affect energy supply, distribution, or use.

25. Significant uncertainty exists, however, regarding the potential for indirect economic impacts of critical habitat designation. In the case that critical habitat is used as part of future litigation to delay or stop oil and gas activities in the region, impacts to the scope or timing of oil and gas production may occur. While this analysis recognizes that some potential exists for these types of indirect impacts of critical habitat, monetization is limited by the uncertainty regarding whether and to what extent these outcomes may occur. Section 3.2.2 of this analysis discusses the potential for indirect impacts on oil and gas development activities.

[12] *Ibid.*

[13] U.S. Fish and Wildlife Service, "Incremental Effects of Critical Habitat Designation for the Polar Bear," November 2, 2009 (see Appendix C).

APPENDIX B | SENSITIVITY OF RESULTS TO DISCOUNT RATE

1. This appendix summarizes the costs of polar bear conservation quantified in Chapters 3, 4, and 6 of this report. It first presents impacts assuming an alternative real discount rate of three percent (the main text of the report assumes a real discount rate of seven percent). This appendix then provides undiscounted incremental impacts by year and subunit for each economic activity in Exhibits B-5 through B-7.

B.1 PRESENT VALUE IMPACTS ASSUMING A THREE PERCENT DISCOUNT RATE

2. This analysis employs standard discounting techniques to calculate the present value of economic impacts that are expected to occur at different points in time. The present value estimates provided in the main body of the report are calculated using a real discount rate of seven percent. To test the sensitivity of the report's findings to use of an alternative discount rate, this appendix provides estimates of the present value of economic impacts assuming a three percent real discount rate. Consistent with the main analysis, the appendix focuses on quantified estimates of economic impacts to: oil and gas exploration, development, and production; construction and development; and, military operations; within the proposed critical habitat area.

3. Exhibit B-1 summarizes the distribution of estimated incremental economic impacts by subunit employing both a three percent and a seven percent real discount rate. As the exhibit indicates, the present value of estimated impacts is higher when a three percent rate is employed. This is to be expected, all else being equal, because the use of a lower discount rate will assign a higher present value to future costs. Exhibits B-2 through B-4 provide estimates of the present value impacts by economic activity as described in Chapters 3, 4, and 6 of this report, applying a three percent real discount rate.

EXHIBIT B-1 PRESENT AND ANNUALIZED VALUES OF COMBINED INCREMENTAL IMPACTS BY SUBUNIT APPLYING A THREE PERCENT AND A SEVEN PERCENT DISCOUNT RATE (2010-2039, 2009 DOLLARS)

PROPOSED UNIT	3% DISCOUNT RATE		7% DISCOUNT RATE	
	PRESENT VALUE IMPACTS	ANNUALIZED IMPACTS	PRESENT VALUE IMPACTS	ANNUALIZED IMPACTS
Unit 1. Beaufort Sea	$104,000 - $417,000	$5,310 - $21,300	$66,200 - $258,000	$5,330 - $20,800
Unit 1. Chukchi Sea	$89,600 - $315,000	$4,570 - $16,100	$55,100 - $186,000	$4,440 - $15,000
Unit 1. Bering Sea	$9,070	$463	$5,960	$480
Unit 2. Terrestrial Denning Habitat	$305,000 - $330,000	$15,500 - $16,800	$193,000 - $208,000	$15,500 - $16,800
Unit 3. Barrier Island Habitat	$442,000 - $457,000	$22,600 - $23,300	$278,000 - $283,000	$22,400 - $22,800
Multiple Units	$131,000 - $436,000	$6,680 - $22,300	$79,100 - $269,000	$6,380 - $21,700
Total Impacts	**$1,080,000 - $1,960,000**	**$55,100 - $100,000**	**$677,000 - $1,210,000**	**$54,500 - $97,500**

Notes:
1. Impact estimates reflect a 30-year time horizon.
2. Estimates are rounded to three significant digits and may not sum to totals reported due to rounding.

EXHIBIT B-2 PRESENT AND ANNUALIZED VALUES OF INCREMENTAL IMPACTS TO OIL AND GAS EXPLORATION, DEVELOPMENT, AND PRODUCTION (THREE PERCENT DISCOUNT RATE, 2010-2039, 2009 DOLLARS)

PROPOSED UNIT	PRESENT VALUE IMPACTS	ANNUALIZED IMPACTS
Unit 1. Beaufort Sea	$95,000 - $408,000	$4,850 - $20,800
Unit 1. Chukchi Sea	$80,500 - $306,000	$4,110 - $15,600
Unit 2. Terrestrial Denning Habitat	$3,790 - $28,700	$193 - $1,470
Unit 3. Barrier Island Habitat	$7,150 - $22,200	$365 - $1,130
Multiple Units	$131,000 - $436,000	$6,680 - $22,300
Total Impacts	**$317,000 - $1,200,000**	**$16,200 - $61,300**

Notes:
1. Impact estimates reflect a 30-year time horizon.
2. Estimates are rounded to three significant digits and may not sum to totals reported due to rounding.

EXHIBIT B-3 PRESENT AND ANNUALIZED VALUES OF INCREMENTAL IMPACTS TO CONSTRUCTION AND DEVELOPMENT (THREE PERCENT DISCOUNT RATE, 2010-2039, 2009 DOLLARS)

PROPOSED UNIT	PRESENT VALUE IMPACTS	ANNUALIZED IMPACTS
Unit 2. Terrestrial Denning Habitat	$239,000	$12,200
Unit 3. Barrier Island Habitat	$435,000	$22,200
Total	**$674,000**	**$34,400**

Notes:
1. Impact estimates reflect a 30-year time horizon.
2. Estimates are rounded to three significant digits and may not sum to totals reported due to rounding.

EXHIBIT B-4 PRESENT AND ANNUALIZED VALUES OF INCREMENTAL IMPACTS TO MILITARY OPERATIONS (THREE PERCENT DISCOUNT RATE, 2010-2039, 2009 DOLLARS)

PROPOSED UNIT	PRESENT VALUE IMPACTS	ANNUALIZED IMPACTS
Unit 1. Beaufort Sea	$9,070	$463
Unit 1. Chukchi Sea	$9,070	$463
Unit 1. Bering Sea	$9,070	$463
Unit 2. Terrestrial Denning Habitat	$61,900	$3,160
Total	**$89,200**	**$4,550**

Notes:
1. Impact estimates reflect a 30-year time horizon.
2. Estimates are rounded to three significant digits and may not sum to totals reported due to rounding.

B.2 UNDISCOUNTED IMPACTS BY ECONOMIC ACTIVITY

4. Exhibits B-5 through B-7 summarize the undiscounted incremental costs associated with polar bear conservation organized by economic activity and year. All incremental costs are due to the administrative costs of addressing the adverse modification of critical habitat during future section 7 consultations for the polar bear. Exhibit B-5 presents undiscounted incremental costs to oil and gas exploration, development, and production; Exhibit B-6 presents undiscounted costs to construction and development activities; finally, Exhibit B-7 presents undiscounted costs to military operations.

EXHIBIT B-5 UNDISCOUNTED INCREMENTAL ADMINISTRATIVE COSTS TO OIL AND GAS EXPLORATION, DEVELOPMENT, AND PRODUCTION (2010-2039, 2009 DOLLARS)

PROPOSED UNIT	ANNUAL IMPACT	FREQUENCY
Unit 1. Beaufort Sea	$17,400 - $54,000	2011, 2016, 2031, 2036
	$5,560 - $42,200	2019, 2022, 2024, 2028-2029
	$22,900 - $96,200	2021, 2026
Unit 1. Chukchi Sea	$17,400 - $54,000	2012, 2017, 2022, 2027, 2032, 2037
	$5,560 - $42,200	2023-2024, 2031, 2038
Unit 2. Terrestrial Denning Habitat	$5,560 - $42,200	2022
Unit 3. Barrier Island Habitat	$17,400 - $54,000	2039
Multiple Units	$5,560 - $42,200	2011, 2027, 2029
	$17,400 - $54,000	2013, 2015, 2018, 2020, 2023, 2025, 2028, 2033, 2035
	$34,700 - $108,000	2038

Notes:
1. Impacts are incurred annually for the years presented in the Frequency column.
2. Estimates are rounded to three significant digits.

EXHIBIT B-6 UNDISCOUNTED INCREMENTAL ADMINISTRATIVE COSTS TO CONSTRUCTION AND DEVELOPMENT ACTIVITIES (2010-2039, 2009 DOLLARS)

PROPOSED UNIT	ANNUAL IMPACT	FREQUENCY
Unit 2. Terrestrial Denning Habitat	$12,200	2010-2039
Unit 3. Barrier Island Habitat	$22,200	

Notes:
1. Impacts are incurred annually for the years presented in the Frequency column.
2. Estimates are rounded to three significant digits.

EXHIBIT B-7 UNDISCOUNTED INCREMENTAL ADMINISTRATIVE COSTS TO MILITARY OPERATIONS (2010-2039, 2009 DOLLARS)

PROPOSED UNIT	ANNUAL IMPACT	FREQUENCY
Unit 1. Beaufort Sea	$372	2011-2012, 2014-2017, 2019-2022, 2024-2027, 2029-2032, 2034-2037
	$651	2013, 2018, 2023, 2028, 2033, 2038
	$1,120	2010
Unit 1. Chukchi Sea	$372	2011-2012, 2014-2017, 2019-2022, 2024-2027, 2029-2032, 2034-2037
	$651	2013, 2018, 2023, 2028, 2033, 2038
	$1,120	2010
Unit 1. Bering Sea	$372	2011-2012, 2014-2017, 2019-2022, 2024-2027, 2029-2032, 2034-2037
	$651	2013, 2018, 2023, 2028, 2033, 2038
	$1,120	2010
Unit 2. Terrestrial Denning Habitat	$2,840	2010-2011, 2013, 2015-2016, 2018, 2020-2021, 2023, 2025-2026, 2028, 2030-2031, 2033, 2035-2036, 2038
	$3,670	2012, 2014, 2017, 2019, 2022, 2024, 2027, 2029, 2032, 2034, 2037, 2039

Notes:
1. Impacts are incurred annually for the years presented in the Frequency column.
2. Estimates are rounded to three significant digits.

APPENDIX C | INCREMENTAL EFFECTS MEMORANDUM TO IEC

November 2, 2009

Incremental Effects of Critical Habitat Designation for the Polar Bear

Background

On May 15, 2008 (73 FR 28212), the final rule listing the polar bear as a threatened species under the Endangered Species Act (ESA) was published in the Federal Register. The polar bear is also protected under the Marine Mammal Protection Act (MMPA). Both the ESA and MMPA prohibit "take" of polar bears. The term "take," as defined by the MMPA, means to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal (sec. 3(13)). Under the ESA, "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct. [ESA §3(19)]. Harm is further defined by the Fish and Wildlife Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Also, under the Marine Mammal Protection Act (MMPA), the polar bear is now considered a "depleted" species, as of the effective date of the final rule. As a depleted species, imports can only be authorized under the MMPA if the import enhances the survival of the species or is for scientific research.

Polar bears are evolutionarily adapted to life on the sea ice and depend on it for resting, breeding, denning, and hunting. Polar bears require sea ice as a platform for hunting and feeding on seals, seasonal and long-distance movements, travel to terrestrial maternal denning areas, resting, and mating. A majority of the polar bears in the U.S. population remain with the sea ice year-round and prefer the annual sea ice located over the continental shelf and areas near the southern ice edge for foraging. Unlike some other marine mammal species, polar bears generally do not occur at high densities in specific areas such as rookeries and haulout sites. However, some denning areas, referred to as core denning areas, have a history of higher use by polar bears.

In the United States, polar bears occur in Alaska and adjacent State, Territorial, and U.S. waters. In general, polar bears occupy the majority of the available habitat within northern Alaska. We did not propose any areas outside the geographical area presently occupied by the polar bear because in accordance with the regulations at 50 CFR 424.12(h), we do not designate critical habitat within foreign countries or in other areas outside of United States jurisdiction. We have determined that designating as critical habitat only occupied areas for polar bears is sufficient for the conservation of the species (Beaufort Sea and Chukchi Sea populations) in the United States. As such, within the United States, we are not proposing to designate as critical habitat any areas outside the geographical area occupied by polar bears.

In general terms, physical and biological features essential to the conservation of the polar bear include: (1) Annual and perennial marine sea-ice habitats that serve as a platform for hunting, feeding, traveling, resting, and (to a limited extent) denning; and (2) terrestrial habitats used by polar bears for denning and reproduction, as well as for

seasonal use in traveling or resting. We have determined that the primary constituent elements (PCEs) for polar bear proposed critical habitat are:
(i) Sea-ice habitat, which is sea ice over marine waters 300 m (984.2 ft) or less in depth that occur over the continental shelf.
(ii) Terrestrial denning habitat, which is topographic features, such as coastal bluffs and river banks, with the following suitable macrohabitat characteristics:

(A) Steep, stable slopes (range 15.5–50.0^{o}), with heights ranging from 1.3 to 34 m (4.3 to 111.6 ft), and with water or relatively level ground below the slope and relatively flat terrain above the slope;

(B) Unobstructed, undisturbed access between den sites and the coast; and

(C) The absence of disturbance from humans and human activities that might attract other bears or displace females and cubs from maternal dens or denning areas.
(iii) Barrier island habitat, which consists of the barrier islands along the Alaska coast and their associated spits, water, ice, and terrestrial habitat within 1.6 km (1 mi) of these islands.

We proposed units for designation because each of these units contains sufficient PCEs to support at least one of the species' life history functions. Some units contain all of these and support multiple life processes, while some units contain only a portion of PCEs, necessary to support the species' particular use of that habitat.

A jeopardy analysis under section 7 of the ESA for actions that may affect this species would evaluate the magnitude of the project's impacts relevant to the population across its range. Furthermore, the jeopardy analysis would focus on effects to the species' reproduction, numbers, or distribution. An adverse modification analysis under section 7 of the ESA would evaluate a project's impacts to the designated critical habitat for the species. Specifically, the analysis would evaluate the proposed project's impacts on features essential to the conservation of the species, and analyze impacts to the capability of designated critical habitat to maintain its conservation role and function for the species.

Polar bear distribution in most areas varies seasonally with the extent of sea-ice cover and availability of prey. Although the species is not migratory, it is more likely to use certain portions of the critical habitat units for particular phases of its life history (e.g., denning). Throughout the Polar Basin during the summer, polar bears generally concentrate along the edge of or in the adjacent persistent pack ice. In addition, as a marine mammal, the species is inextricably linked to its aquatic habitat. It is difficult to envision an impact to the critical habitat PCEs that would not also constitute an impact to the species. We are quite comprehensive in our consideration of potential impacts when we do a jeopardy analysis.

In the sections below, we have considered potential resource development on the North Slope of Alaska and in the Chukchi and Beaufort seas in an attempt to determine what conservation measures are forecast to occur due to the species being listed as a threatened species under the ESA and as a depleted species under the MMPA (baseline) and what

additional conservation measures are expected to result specifically from a designation of critical habitat (incremental).

Conservation Measures Forecast to Occur Regardless of Critical Habitat (Baseline)

Protection under the MMPA

Under the MMPA, activities that take a polar bear are prohibited. However, a project proponent could, if they determined their activities would incidentally take polar bears, request authorization for such taking under Section 101(a)(5)(A) or (D) of the MMPA. Under the provisions of Section 101(a)(5)(A) take of polar bears, including lethal take, may be authorized for up to 5 years, provided the Service finds that the total of such taking will have a negligible impact on such species or stock and will not have an unmitigable adverse impact on the availability of such species or stock for taking for subsistence uses. Prior to authorizing such takes the Service must prescribe regulations (Incidental Take Regulations; ITRs) that set forth:

> 1) Permissible methods of taking pursuant to such activity, and other means of effecting the least practicable adverse impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for subsistence uses; and,
> 2) Requirements pertaining to the monitoring and reporting of such taking.

The ITRs typically are developed for large-scale activities that cover a broad geographic area (e.g., year-round oil and gas exploration, development, and production activities in the Beaufort Sea and adjacent northern coast of Alaska). Letters of Authorization (LOAs) are issued under the ITRs for specific projects within the scope of the large-scale activities.

Alternatively, under Section 101(a)(5)(D) of the MMPA, and for activities that may incidentally take only by harassment, we may authorize for periods of not more than 1 year, such take provided we have determined that it will have a negligible impact on such species or stock, and will not have an unmitigable adverse impact on the availability of such species or stock for taking for subsistence. These documents are called Incidental Harassment Authorizations (IHAs).

Although ITRs, LOAs, and IHAs can cover a variety of activity types, relative to polar bears they have only been issued to cover oil and gas activities in Alaska and only for non-lethal take. Depending on the specific project, these LOAs and IHAs include conservation measures to avoid or minimize the likelihood that a project will cause take of a polar bear.

There are several categories of activities that will likely require future section 7 consultations. These include community development and growth; scientific research and field activities; on and offshore oil and gas exploration; ongoing oil development; and future oil and gas development. The following section describes (i) these activities.

(ii) on-the-ground impacts to polar bears, and (iii) anticipated conservation measures under the MMPA and ESA.

Community development and growth will likely continue across the North Slope villages. Community projects with a small footprint, or within the developed area of villages such as new housing, water and sanitation projects, or road upgrades will likely have little or no adverse effects to polar bears or proposed critical habitat. However, larger projects, like the Kaktovik airport relocation, which is a large project on a Barrier Island, might impact polar bears.

Potential impacts could include disturbance and displacement of resting bears by construction activities.

At this time, there are no existing ITRS or IHAs under the MMPA to cover community development and growth activities. However, we expect that most community development and growth activities across the North Slope would involve a Federal nexus (e.g., most would require a Corps of Engineers permit for development in wetlands), and would therefore trigger the requirement for consultation under section 7 of the ESA. As part of this consultation process, we would incorporate conservation measures that are similar to those developed under the MMPA. The proponent would be required to take certain actions to mitigate the occurrence of incidental takes, or in the event of a take, to report such takes. For example, proponents would be required to: (i) avoid all activities within 1 mile of known polar bear dens; (ii) develop field operating procedures and protocols for avoiding polar bears; and, (iii) ensure personnel are designated and trained in appropriate bear management activities like hazing

Scientific research, commercial or educational photography, and field activities such as archeological surveys are likely to continue, and given interest in climate change effects in the Arctic, may increase across the terrestrial and marine areas inhabited by polar bears. Some of these projects may adversely affect polar bears through disturbance.

Non-polar bear focused research such as vegetation studies, lake and stream monitoring, and nest plots studies may cause disturbance from aircraft noise, physical presence of researchers, and maintenance and support of field camps. Scientific research on polar bears – such as polar bear capture studies – would have direct implications.

As noted above, under the MMPA the taking of polar bears is already prohibited. Currently, there are no existing ITRs or IHAs to cover scientific research, commercial or educational photography, and other field activities. Proponents of research activities not focused on polar bears could, if they determined their activity would incidentally take a polar bear, request authorizations as described above. These authorizations would likely require that researchers follow specific protocols, e.g. maintaining appropriate field camp facilities or otherwise suspend research collection in the event that a polar bear is observed in the area. It should be noted that the Service has in the past provided guidelines to researchers that if followed have precluded the need for specific authorizations.

Research and commercial/educational photography which are focused on and take, e.g. either capture or disturb, polar bears must be permitted under Section 104(c) of the MMPA. These permits would likely require that researchers and photographers maintain specific protocols so that no more than permitted numbers of specific animals are taken or disturbed. While permits for photographic activities would only include activities that might disturb an animal or animals, activities authorized for research may include capture and/or collection.

The Service issued a special rule for the polar bear under section 4(d) of the ESA on December 16, 2008 (73 FR 76249). Under this special rule, as long as an activity is authorized or exempted under the MMPA, and the appropriate requirements of the MMPA are met, then the activity does not require any additional authorization under the ESA. The Service issues scientific research permits under the MMPA to cover polar bear research activities, including capture and/or collection. No additional ESA permit under section 10(a)(1)(A) is required. However, the Service conducts an ESA intra-Service consultation on the issuance of the MMPA permit. We would expect any conservation measures included in the intra-Service consultation to incorporate measures developed during the MMPA permitting process.

Exploration for oil and gas is ongoing both offshore in the Beaufort and Chukchi seas, and onshore on State lands and in National Petroleum Reserve-Alaska (NPR-A). These activities have been considered in section 7 consultations on MMS's Arctic Multi Sale (first step of an incremental step consultation), BLM's northern NPR-A integrated activity plan, and the Service's issuance of ITRs for the Beaufort and Chukchi seas under the MMPA. Exploration activities can adversely affect polar bears primarily through disturbance and displacement.

Potential disturbance can occur as vehicles/ships transit project areas while conducting activities, such as seismic surveys or standard traffic. Seismic surveys are generally conducted over large, remote areas. During the winter season, seismic activities occur on land and land fast ice. The presence of the activity has the potential to encounter and disturb mobile and denning bears. During the open water, or summer season, offshore seismic surveys are generally confined to open water areas and as such rarely encounter polar bears.

Although onshore exploratory drilling activities are discrete operations, they could impact polar bears through disturbance and displacement of mobile and denning bears. This would result from noise and physical presence if drill sites are located near dens and as vehicles transit back and forth to support the drilling activities.

The Service promulgates ITRs, as discussed above, that provide for the issuance of LOAs. These LOAs authorize the incidental non-lethal take of polar bears, and they impose mitigation measures to minimize negative effects of oil and gas activity on polar bears. While the specifics of a project may vary, please see the attached LOA dated July 15, 2008, for examples of the requirements and limitations placed on oil and gas related

activities. As described above, before the Service can issue ITRs and/or IHAs, we must determine that there will be a "negligible impact" on the species or stock. The Service, in cooperation with the oil and gas industry, has developed conservation measures for the polar bear that enable us to make this determination.

Under section 7 of the ESA, the Service has completed programmatic biological opinions on effects to the polar bear of existing ITRs for year-round oil and gas exploration, development, and production activities in the Beaufort Sea and adjacent northern coast of Alaska, as well as for proposed ITRs for year-round oil and gas exploration activities in the Chukchi Sea and adjacent western coast of Alaska. We determined that the ITRs would not jeopardize the species, because of the conservation measures that are required under the MMPA to minimize take of polar bears. No additional conservation measures were identified during the ESA consultation process.

Oil and gas development is an ongoing activity in the Beaufort Sea and adjacent coastal areas. Development activities have been authorized under the MMPA through the issuance of the Beaufort Sea ITRs and associated LOAs; and they have been reviewed pursuant to section 7 of the ESA during an intra-Service consultation on the issuance of the Beaufort Sea ITRs, the Northstar and Liberty projects, and in consultation with BLM on activities, including oil development, that may occur in northern NPR-A. While the incremental step Biological Opinion for MMS's Arctic Multi Sale did not authorize oil or gas development in the Outer Continental Shelf (OCS), MMS anticipated there was a 67% probability that development would occur in the Beaufort Sea OCS, and 27% probability for the Chukchi Sea OCS. These BOs require project proponents to ensure their projects are authorized under the MMPA; additional conservation measures for polar bears above those prescribed in MMPA authorization have not been imposed

Current land-based oil and gas development occurs primarily in the industrialized Prudhoe Bay area; however, during the 30-year lifespan of the oil fields, a network of drill platforms and pipelines has stretched both east and west of Pump Station #1. Full scale development requires construction and maintenance of drilling platforms and associated structures. In some cases, road and airstrips are needed to provide access. Potential impacts to polar bears from oil and gas development on land includes the disturbance and hazing of mobile bears, and on occasion, the disturbance of denning bears.

Potential impacts to polar bears from off-shore activities would be based primarily on operation/maintenance of the drill sites as vessels transit back and forth.

As discussed above, on and offshore development activities are authorized through the MMPA's ITRs and would require the type of mitigation measures described above.

An additional potential impact to polar bears from oil and gas activities involves the risk of oil spills. Oil spills could affect polar bears in two primary ways. Direct impacts to the animals may result from oiling of their fur, resulting in direct toxicity as polar bears ingest oil while grooming, and also physical "matting" of their fur that would negatively

affect their ability to thermoregulate. They may also ingest oil directly. These direct impacts could cause mortality of animals, or result in sub-lethal effects. In addition, oil spills could cause long-term indirect effects to polar bear habitat by affecting the prey base and rendering areas unsuitable.

Oil spills are prohibited by the Oil Pollution Act of 1990. Because they constitute an illegal, rather than an incidental, take they are not covered under ITRs or associated LOAs; however, the potential risk from an oil spill during the 5 year implementation period of the ITRs is evaluated as part of the NEPA assessment prior to issuing ITRs. To assess all impacts that may result from a development project and evaluate if the project could violate section 7(a)(2) of the ESA, the probability and resulting impacts of oil spills have been considered over the life of the project during section 7 consultations.

Conservation Actions Expected to Result Specifically from a Designation of Critical Habitat (Incremental)

At this time, on the basis of how conservation measures are being implemented for the polar bear under the MMPA and ESA, we do not expect that designation of critical habitat will result in additional significant conservation actions for the categories described above.

The MMPA provides significant conservation tools applied primarily through the ITRs and separate harassment/deterrence authorizations that result in effective mitigation. The value of such measures is the direct focus on polar bears that provided detailed assessment of potential effects on key life history events, such as maternal denning, and subsequent provision for design and implementation of appropriate mitigation measures. The limitations of ITRs are the 5 year term of a regulation and the scope (oil and gas activities). ESA Section 7 review fills in these limitations with the requirement to evaluate effects for the life of a project and also covers the relatively small amount of community development activity that is not covered by the ITRs. Therefore, given the protective standards of the MMPA (negligible impact to species and no impact to subsistence hunting), and additional standards (life of project and all activities) afforded by Sec 7(a)(2) that became effective with the listing of the polar bear as threatened, we do not anticipate that critical habitat designation would result in more protective measures than those already required.

Were critical habitat to be designated, consultation on individual development projects that have ongoing Federal discretion (e.g., Northstar and Liberty), along with the Beaufort Sea ITRs, Chukchi Sea ITRs, and lease sales such as the Arctic Multi Sale, Northern NPR-A, and others would have to be reinitiated. As a result, we would anticipate additional administrative costs associated with reinitiation of the consultation process.

In conclusion, we do not anticipate significant, incremental conservation measures to be taken in conjunction with the designation of critical habitat beyond the conservation measures associated with existing protections under the MMPA and the listing of the

species under the Act. However, we do anticipate some additional administrative costs in future consultations to document the consideration of an action on designated critical habitat. Also, because we are designating only areas that are occupied by the species, we also do not anticipate an increase in the number of future technical assistances nor section 7 consultations due to the designation of critical habitat.

Approved:

Regional Director

11/3/09

Date