Appendix I
Bird Strike Avoidance and Lighting Plan
Camden Bay, Alaska

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Bird Strike Avoidance and Lighting Plan
Revised Outer Continental Shelf Lease Exploration Plan
Camden Bay, Alaska

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ACRONYMS

°	degrees
BOEMRE	Bureau of Ocean Energy Management, Regulation and Enforcement
ESA	Endangered Species Act
ft	feet/foot
km	kilometer(s)
m	meter(s)
MBTA	Migratory Bird Treaty Act
mHz	megahertz
mi	mile(s)
MMS	Minerals Management Service
NMDGF	New Mexico Department of Game and Fish
OCS	Outer Continental Shelf
Plan	Bird Strike Avoidance and Lighting Plan
Shell	Shell Offshore Inc.
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
W	west

1.0 INTRODUCTION

1.1 Background

Lighted vessels and structures in open waters and on-ice pose a collision risk to many species of birds. Growing scientific evidence indicates some bird species are attracted to light sources, which may increase the risk of bird strikes. Most related studies conclude that increased darkness, coupled with inclement weather, increases attraction by birds to lighted vessels and structures. Birds drawn to light often become disoriented and collide with these structures, which may result in injury and death.

Shell Offshore Inc. (Shell) presents this *Bird Strike Avoidance and Lighting Plan, Camden Bay, Alaska* (Plan) to outline the Shell bird strike avoidance strategy for exploration drilling operations in Camden Bay for 2012 and beyond. The purpose-built conical drilling unit *Kulluk* or the Motor Vessel *Noble Discoverer* will be used to drill the wells (collectively, "drilling vessel"). Emphasis is on the prevention of bird strikes into the drilling vessel by threatened spectacled eiders (*Somateria fischeri*) and Steller's eiders (*Polysticta stelleri*) that inhabit the Beaufort Sea, including Camden Bay. Given that the planned exploration drilling is outside the area where a plan is required by the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) (formerly (Minerals Management Service [MMS]), the probability of bird strikes to the drilling vessel are considered to be low. This low probability of bird strikes will be further reduced by implementing lighting modifications as specified in this Plan. In addition, if a bird strike is observed, and the cause is believed to be lighting on the drilling vessel, then reporting the bird strike and the conditions under which it occurred will help in better understanding the risks of bird strikes associated with the drilling vessel.

1.2 Proposed Exploration Plan

Shell is planning to conduct an exploration drilling program on BOEMRE Alaska Outer Continental Shelf (OCS) leases located in the Beaufort Sea north of Point Thomson in Camden Bay (Figure 1.2-1). Shell plans to drill four wells to objective depth: two wells at Sivulliq (Sivulliq G and N) and two wells at Torpedo (Torpedo H and J). These exploration drilling activities will occur when migratory birds, including spectacled and Steller's eiders, may be present.

The drilling vessel will be attended by support vessels that will be used for ice management, anchor handling, oil spill response, refueling, resupply, and servicing of the drilling operations.

The drilling vessel, ice management, and support vessels will transit through the Bering Strait and the Chukchi Sea, arriving on location near Camden Bay on or after July 10. Exploration drilling activities at the Sivulliq or Torpedo prospects are planned to begin on or about July 10 and end on or before October 31 with a suspension of all exploration drilling operations beginning August 25 for the Nuiqsut (Cross Island) and Kaktovik subsistence bowhead whale hunts. The drilling vessel and support vessels will leave the Camden Bay project area and will return to resume activities after the Nuiqsut (Cross Island) and Kaktovik subsistence bowhead whale hunts conclude. Activities may extend to October 31 depending on ice and weather.

Further information on Shell's exploration plan is detailed in the "Revised Outer Continental Shelf Lease Exploration Plan, Camden Bay, Alaska."

1.3 Endangered Species Act, Migratory Bird Treaty Act, and Lease Stipulation

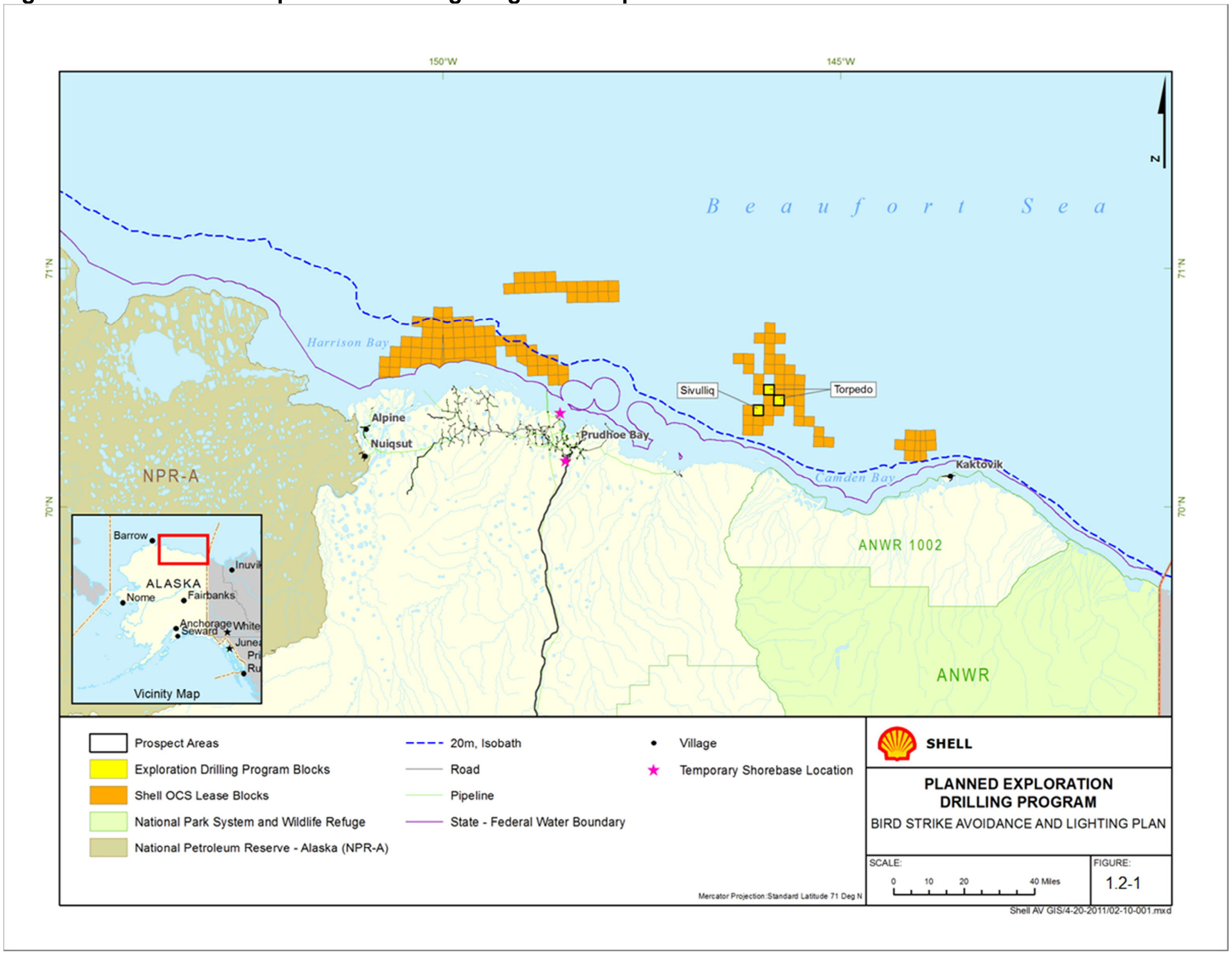
The exploration activities planned are subject to the Endangered Species Act (ESA) and Migratory Bird Treaty Act (MBTA). Lease Stipulation No. 7 for the Beaufort Sea Lease Sales 195 and 202 (*Lighting of Lease Structures to Minimize Effects to Spectacled and Steller's Eiders*) is required for exploration drilling operations within the Beaufort Sea between 146 degrees (^{o}) west (W) and 156^{o} W longitude. The Plan represents a practical approach using existing lighting technology and methods to reduce bird strike risk to both threatened eider species and other migratory birds in the project area.

1.3.1 Endangered Species Act

The purpose of the ESA is to conserve "the ecosystems upon which endangered and threatened species depend" and to conserve and recover listed species (ESA 1973). Under the law, species may be listed as either "endangered" or "threatened." Endangered means a species is in danger of extinction throughout all or a significant portion of its range. Threatened means a species is likely to become endangered within the foreseeable future. All species of plants and animals, except pest insects, are eligible for listing as endangered or threatened (U.S. Fish & Wildlife Service (USFWS 2006). The law requires federal agencies, in this case BOEMRE, to consult with the USFWS and the National Marine Fisheries Service (for whales and seals) to ensure that the actions they authorize would not jeopardize listed species.

Section 7 of the ESA requires federal agencies to ensure that their actions do not jeopardize the continued existence of listed species. To comply with Section 7, the consulting federal agency or its designated non-federal representative must review the proposed project for potential impacts to protected species. The two species listed under the ESA that this Plan is intended to help avoid strikes of the drilling vessel are the Steller's eider and the spectacled eider.

Figure 1.2-1 Planned Exploration Drilling Program Prospects



Steller's Eider

The Alaska-breeding population of Steller's eider was federally designated as threatened in 1997 and is an Alaska Species of Special Concern. Historically, Steller's eiders nested throughout the coastal areas of western and northern Alaska (USFWS 2005b). Today, the Alaska-breeding population is primarily confined to the Arctic Coastal Plain, in low densities and is extremely scarce in western Alaska (USFWS 2005b). The Steller's eider may have abandoned much of the eastern North Slope in recent decades, but still occur in low densities from Wainwright as far east as Prudhoe Bay (USFWS 2003). The threatened Alaska breeding population is thought to be in the hundreds or low thousands on the Arctic Coastal Plain and in the dozens on the Yukon-Kuskokwim Delta (USFWS 2005b). The Russian Atlantic population is thought to be 30,000-50,000 individuals, and the Russian Pacific population 50,000-100,000 individuals (USFWS 2005b).

Spectacled Eider

The spectacled eider was federally designated as threatened throughout its range in 1993 and is an Alaska Species of Special Concern. The breeding distribution of the spectacled eider includes the central coast of the Yukon-Kuskokwim Delta, the Arctic Coastal Plain of Alaska, and the Arctic Coastal Plain of Russia (USFWS 2005b). Spectacled eiders on the Arctic Coastal Plain of Alaska originally ranged to the Canadian border (USFWS 1996). The threatened spectacled eider population is estimated to be about 360,000 worldwide, which includes non-breeders (USFWS 2005b). The population may be in slow decline on the Arctic Coastal Plain of Alaska where 3,000-4,000 individuals nest today (USFWS 2005b). At least 40,000 pairs are thought to nest in Arctic Russia. Molting flocks of spectacled eiders gather in shallow waters off the coast in usually less than 120 feet (ft) [36.6 meters (m)] deep and travel along the coast up to 31 miles (mi) [50 kilometers (km)] offshore (USFWS 2005b).

1.3.2 Migratory Bird Treaty Act

Under the MBTA (16 USC 703), it is illegal for anyone to "take" migratory birds, their eggs, feathers or nests. "Take" includes by any means or in any manner any attempt at hunting, pursuing, wounding, killing, possessing or transporting any migratory bird, nest, egg, or part thereof. The MBTA does not distinguish between intentional and unintentional takes. In Alaska, some species of migratory birds may be taken, killed, or possessed during approved hunting seasons for those specified migratory species.

The USFWS has expressed concern over the potential of migratory waterfowl other than spectacled and Steller's eiders colliding with lighted drilling vessels in the eastern Beaufort Sea including the common eider (*Somateria mollissima*), king eider (*Somateria spectabilis*), long-tailed duck (*Clangula hyemalis*), and Pacific loon (*Gavia pacifica*).

The USFWS suggested at a meeting with Shell and the BOEMRE in January 2007 that seabirds and waterfowl may migrate offshore in the operational area of the drilling vessel. This risk is confirmed by documented information for many of these species on the migration routes to Alaska from Canada over waters of the Beaufort Sea. The mitigation measures proposed by

Shell for both threatened eider species will likely reduce the collision risk of other species covered under the MBTA.

1.3.3 Lease Stipulations

Lease Stipulation No. 7 for the Beaufort Sea Lease Sales 195 and 202 is intended to minimize the likelihood of spectacled and Steller's eiders striking the drilling vessel. Stipulation No. 7 dictates that a plan must be made to meet the following:

- Lessees must include a plan for recording and reporting bird strikes that occur during approved activities to the BOEMRE.
- Lessees are required to implement lighting requirements aimed at minimizing the radiation of light outward from exploration/delineation structures to minimize the likelihood that spectacled or Steller's eiders will strike those structures.

Within the Beaufort Sea Lease Sales 195 and 202, the requirements of Stipulation No. 7 apply to all new and existing OCS oil and gas leases issued between 156° W longitude and 146° W longitude for activities conducted between May 1 and October 31. Shell is submitting this Plan based on the stipulation requirements in order to further reduce the probability of strikes of the drilling vessel by spectacled and Steller's eiders.

1.4 Relative Risk Evaluation

The risk of bird collision is largely determined by the timing and location of exploration drilling activities as related to the presence of spectacled and Steller's eiders in the Beaufort Sea. Spectacled and Steller's eiders presence in the Beaufort Sea is mainly limited to nearshore waters, where spring migration occurs along the coastal open leads in the ice and where there are sheltered areas for molting.

Given the relatively low onshore densities of spectacled and Steller's eiders as far west as the project area (Figures 1.4-1 and 1.4-2), densities near the offshore drill sites are expected to be low. In addition, offshore exploration drilling operations in Camden Bay would begin in July, after the spring migration has ended, further decreasing the risk to eiders.

Spring migration in the Beaufort Sea occurs in May and June (MMS 2007, MMS 2008), including eider spring migration along the coast (MMS 2006), when many marine birds use the lead system as a migratory pathway to breeding grounds in northern Alaska and the Canadian Arctic (Richardson and Johnson 1981, Woodby and Divoky 1982). Eiders may also migrate overland during spring as they move to the eastern North Slope from the Chukchi Sea (Troy Ecological Research Associates 1999 *cited* in MMS 2003).

Figure 1.4-1 Spectacled Eider Densities

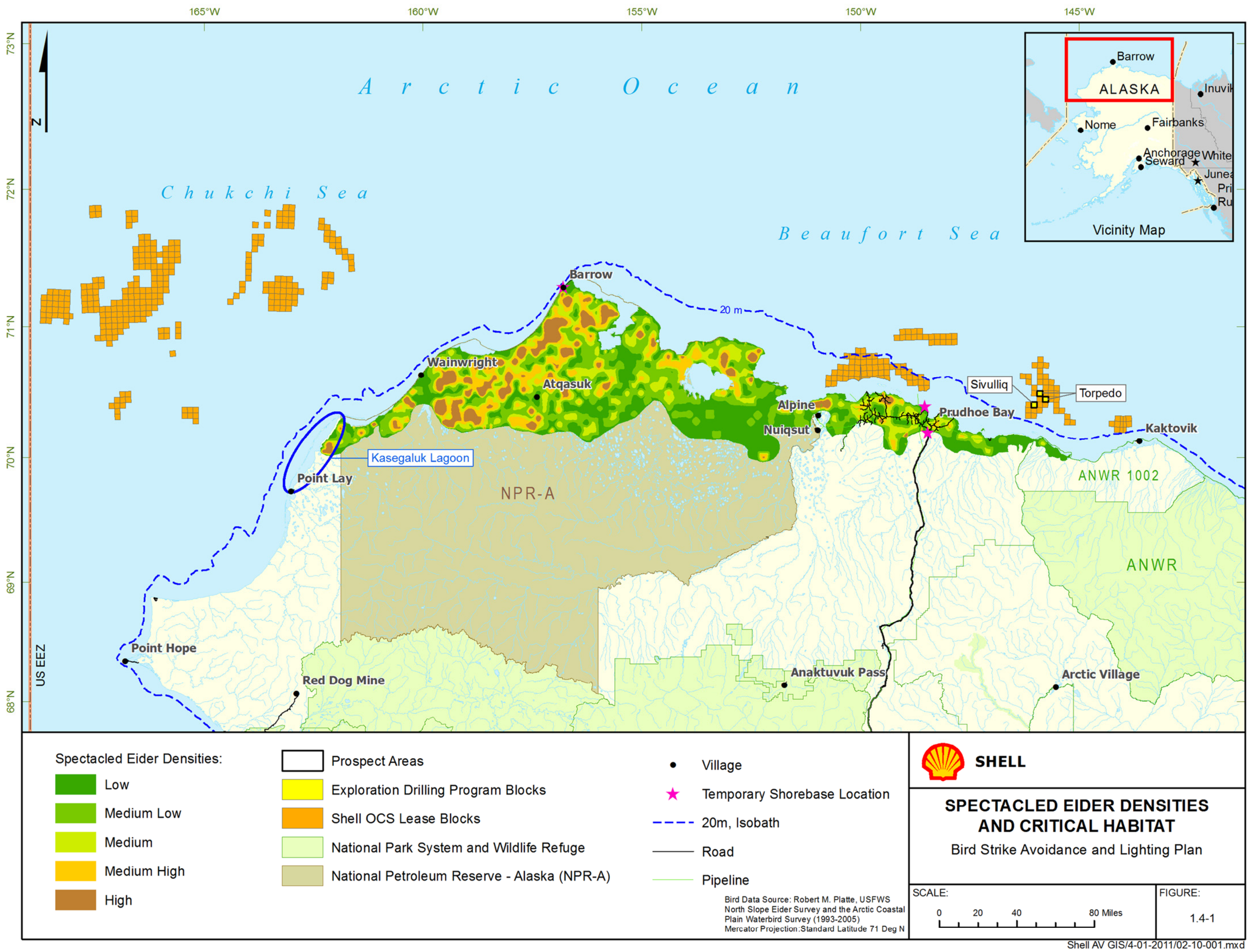
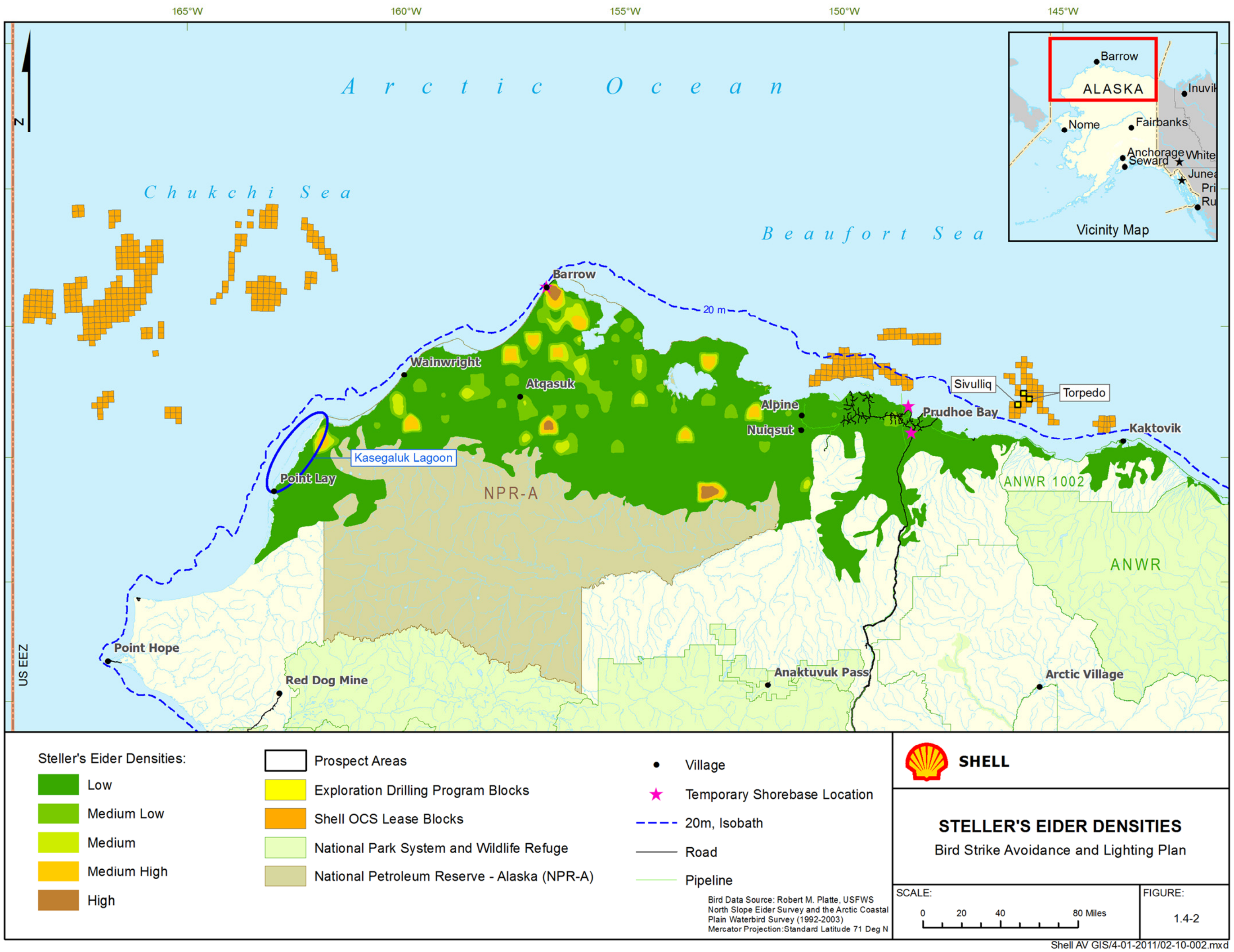


Figure 1.4-2 Steller's Eider Densities



Molting flocks of spectacled eiders gather in shallow waters (usually less than 120 ft (36.6 m deep) and travel along the coast up to 31 mi (50 km) offshore (USFWS 2005a). The male leaves for offshore molting areas soon after eggs are laid, usually by the end of June (USFWS 2005a). Females with failed nests leave to molt at sea by mid-August while successful females stay with their young on the nesting grounds until late August to early September, when they start their southward migration (USFWS 2005a).

The Alaska breeding population of the smallest of the four eider species, the Steller's eider, is primarily confined to the Arctic Coastal Plain of Alaska's North Slope, with a distinguished concentration around Barrow (USFWS 2005a). There are few concentrations of Steller's eider on the eastern North Slope and the eastern Beaufort Sea. After nesting, they move into nearshore marine waters of southwest and south-central Alaska and molt in the fall in the Kuskokwim shoals and lagoons on the north side of the Alaska Peninsula (USFWS 2005a).

Documented sightings of Steller's eiders offshore in the Beaufort Sea are few. In the Beaufort Sea, only three were seen during offshore aerial surveys in 1999-2000 (Fischer and Larned 2004). Telemetry studies have shown Steller's eiders leaving the Arctic Coastal Plain nesting areas near Barrow on June 23 for the coastal marine waters between Wainwright and Dease Inlet between Cape Lisburne and Point Lay (MMS 2006). Eight individuals were tracked from Barrow across the Chukchi Sea to Siberia and back to Alaska (MMS 2006). On the North Slope, no habitat has been designated as critical for the spectacled or Steller's eider (USFWS 2005a).

In addition to the timing and location of exploration drilling operations posing a low risk to bird strikes, the high number of daylight hours during the months of July and August also reduces the relative risk of bird strikes.

2.0 REVIEW OF MITIGATION MEASURES

A literature review of existing mitigation measures used in Alaska and the lower 48 states was conducted to assess the efficacy of existing mitigation to reduce the probability of bird strikes. These studies were evaluated to determine what mitigation measures would be appropriate for use during Shell's exploration drilling program in Camden Bay.

None of the studies reviewed is specific to either the spectacled or Steller's eider. Most of the work to date deals with documenting bird collisions with communication towers in the lower 48 states or seabirds with fishing vessels in the Aleutian Islands of Alaska. Light sources, especially from taller structures exceeding 200 ft (60 m) and during periods of low visibility, are implicated in many bird collisions. Continuing research will help identify additional, effective mitigation for eiders and other bird species.

2.1 Low Reflecting Finishes

Painting vessels a dark color would decrease ambient reflected light, thus reducing light output beyond the deck. The amount of light reduced by such an action is unknown. Another option is to paint alternating and contrasting colors, which may allow a vessel to be more easily seen by birds. No studies evaluating the effects of low reflecting finishes are available for review, therefore the efficacy of these measures is unknown.

2.2 Minimum Vessel Light

Birds can be disoriented by and attracted to artificial lights, potentially resulting in injury and mortality if a collision occurs. Organizations working on reducing bird mortality, such as BirdLife International, include in their general recommendations minimizing vessel light use (without compromising vessel worker safety) to reduce bird strikes. In some situations this has proven effective: for a lighthouse, narrowing and decreasing light intensity resulted in a drastically lower bird mortality rate from an average of 200.6 birds to 18.5 birds per season during spring and 392.5 to 9.6 during fall (Jones and Francis 2003). Minimization of light can include shading and directing lights towards the deck, avoid using unnecessary lights, and using minimal light output through the replacement of high intensity lights.

2.3 Light Color

It is likely that any light visible to humans is visible to birds, and thus constitutes a potential attractant (Verheijen 1985). Different colors of light (wavelengths) have been considered as mitigation to reduce bird strikes. Research in the North Sea has indicated that white light caused attraction, red light caused disorientation, and that green and blue light caused a weak response (Marquenie 2007). In this study white lights were replaced with specially designed lights that exclude the red spectrum (the modified light appears green) (Marquenie 2007). Green lights resulted in two to ten times fewer birds circling offshore platforms when only a limited number of light sources were replaced with green lights. Therefore, the results likely underestimate the effect if all external lights were replaced with green lights (Marquenie 2007).

2.4 Anti-Collision Lighting

The effects of anti-collision lighting systems at Northstar Island off the North Slope of Alaska were studied for four years for both eiders and “non-eiders” (e.g., gulls, loons, terns, geese) (Day et al. 2005). Analyses of the data revealed various responses by eiders to the anti-collision lights. In general, while anti-collision lighting was being used at the island, studies showed a net movement of eiders away from the island and a reduction in eider flight speed at night. Day et al. (2005) concluded the anti-collision lights caused eiders to avoid Northstar Island, but the avoidance response was not dramatic. The anti-collision lights did affect eider behavior, such that they knew where the island was thereby enhancing their ability to avoid flying into structures on the island.

However, the results of the anti-collision lights used at Northstar Island were not overwhelming and did not appear to deter “non-eiders.” The following summarizes the lighting system used at Northstar Island (Day et al. 2005):

- 14 white strobe lights (Honeywell Flashguard 2000B strobe lights) mounted on tall masts approximately 45 ft (14 m) above the ocean’s surface around Northstar Island.
- Each strobe light set to flash at the rate of 40 flashes per minute.

- The strobe lights do not flash in pattern or synchrony.
- The strobe lights emit white light (all wavelengths) at 20,000 candlepower during the day and 2,000 candlepower during the night.
- Photocell controls the switching between the two modes.

Anti-collision lights may vary by wavelength, flashing rate, flashing synchrony, and intensity. Some evidence exists that passerines may better avoid white lights over red (Manville 2005). White strobe lights are considered less likely to attract night-migrating birds than non-flashing white and red lights (NMDGF 2001). However, the appropriate light wavelength is unknown for best deterring eiders and a continued search for a lighting system that is more effective than the one used at Northstar Island is recommended by Day et al. (2005).

2.5 Radar Assessment

The use of radar can allow real-time detection of flocks of migrating seabirds, and could potentially be used by an on-board avian specialist to predict collisions. In 2005, a German team investigated the avian avoidance response to offshore wind turbines using a Furuno FR2125 radar system (Desholm and Kahlert 2005). The species involved in that analysis were primarily common eider and geese. According to Gauthreaux and Livingston (2006), the VERTRAD/TI radar system can be used "to estimate the potential risk of migrating birds colliding with man-made obstacles of various heights". Another system (BIRDRAD) can "detect the departure of migrants from different types of habitat within a few kilometers of the radar" (Gauthreaux and Belser 2005). This system uses a "high resolution, marine surveillance radar (Furuno 2155 BB) with a 50 kilowatt transceiver that transmits at 3 centimeters (1.18 inches) (X-band, 9415 megahertz [MHz] +/- 30 MHz) wavelength." The same paper discusses use of WSR-88D Doppler Weather Surveillance Radar, using characteristics of bird echoes to study bird movements.

Although Doppler radar does not appear as effective in real-time analysis of bird populations, "a variety of radars, from low-powered airport surveillance radars and mobile marine surveillance radars to high-powered weather radars and military tracking radars, have been used to further our understandings of bird migration and to address conservation concerns. Site-specific information on migrant passage rates and flight characteristics is generally collected by using mobile radars or other techniques (e.g., thermal imaging, acoustical monitoring)" (Ruth et al. 2005).

The use of radar is likely best used to better understand migration patterns, number of birds, and effectiveness of mitigation measures.

3.0 PROPOSED MITIGATION

Based upon the mitigation measures reviewed in Section 2.0, Shell has determined appropriate mitigation measures for use during Shell's exploration drilling program in Camden Bay. The mitigation proposed by Shell is based on what is currently and technically feasible, and proven effective, in reducing the prospect of bird strikes, while fully considering the lighting requirements needed to maintain a safe work environment. Additional mitigation may be considered as more information becomes available regarding the effectiveness of new mitigation to reduce the risk of bird strikes.

It is important to note that, given the location of Shell's exploration drilling program at and beyond the eastern boundary of the area stipulated (156^{o} – 146^{o} W), the probability of a bird strike into the drilling vessel are considered to be low. Implementing the mitigation measures as specified in this Plan will further reduce this low probability of bird strikes.

Shell has prepared this Plan to reduce the chance of bird strikes of the drilling vessel, especially strikes by spectacled and Steller's eiders. The major elements of the Plan are provided below:

- Installing shading and directing light inward and downward to living and work structures to minimize light radiating from the drilling vessel.
- Where applicable, replacing some lights with "ClearSky" light technology to reduce the amount of red light output.
- Conducting an assessment of the movements of bird flocks in the proximity of the drilling vessel using the radar equipment available aboard the drilling vessel.

3.1 Minimum Vessel Lighting

Much of the drilling vessel lighting will be directed inward and downward, where practical, to minimize escaping light. Additionally, some lights will be fitted with shading that will direct lights to working areas and prevent light from entering to areas where lights are not needed for safety and operations. When practical, lights will be turned off when not in use.

Shell is planning to reduce or shade light output from the following locations on the drilling vessel:

- Derrick lights, deck lighting, doorway and stairway lighting, and pipe rack lighting – lights will be shaded to direct light downward and inward and/or the wattage reduced.
- Crane boom lights – lights will remain unshielded for safety during crane operations.
- Heliport lighting – lights will be dimmed or shut off when not in use.
- Escape pod lighting – lights will be dimmed when not in use.

- Navigation and clearance lights – no changes will be made due to safety concerns.
- Lights from windows – shades will be used during darkness.

3.2 Light Color

ClearSky lighting emits fluorescent light with a unique light spectrum without the long-wavelength (red) components. This technology is produced by Philips Lighting. Studies indicate that removing the long wavelength components of the spectrum reduces the visual and orientation impact on birds (Marquenie 2007).

Where applicable, all floodlights, and external incandescent and fluorescent lights on the drilling vessel will be replaced with ClearSky lights. This should reduce the conditions that create greater probability of bird strikes and still provide a safe working environment.

3.3 Radar Assessment

The type of radar equipment available aboard the drilling vessel has been found to be suitable for detecting birds and will be used to conduct an assessment of the movements of bird flocks in the proximity of the drilling vessel. One aspect of the assessment will be to monitor and compare bird movements during periods of good and poor visibility. Radar will be used to perform bird movement monitoring since visual observations may not be possible during periods of poor visibility such as at night or during foggy conditions.

Visual observations will be conducted simultaneously with radar observations, particularly in the initial stages of the study during periods of good visibility. Comparison of radar and visual observations will be used to help determine numbers of individuals in flocks and possibly species group (based on flight patterns). Visual observations will supplement radar data by more accurately determining species and obtaining better estimates of individuals in flocks.

Shell will conduct the radar assessment in two to four hour sampling sessions throughout the course of the field season as time and availability of personnel permit. The number of sampling sessions will depend on the number of avian observers available to collect data. Sampling sessions will be stratified to include all portions of the diurnal cycle as equally as possible.

Some of the data collected by radar observations will be the same as those collected by visual avian observers, although species, number, sex, and height above water may not be determined by radar. For each observation of a bird flock, radar avian observers will record the date and time, the species type if possible (e.g., eider or goose), flock size, compass direction of the birds in relation to the drilling vessel, direction of flight, initial distance of the birds from the drilling vessel, the closest point of approach of the flock to the drilling vessel, whether ClearSky lights were on or off, and notes on any avoidance behavior displayed by the flock. The data from the radar assessment will be analyzed to determine:

- Whether migrating bird flocks pass closer to the drilling vessel during periods of poor or good visibility.
- Whether birds deflect their flight patterns to avoid the drilling vessel.
- Whether deflections of flight patterns occur at further distances during periods of good or poor visibility.
- The effects of ClearSky lighting as anti-collision mitigation.

4.0 BIRD STRIKE MONITORING

A bird strike monitoring program will be developed and implemented as part of Shell's exploration drilling program during the drilling period. This plan will record and report bird strikes and conditions under which they occur (e.g., vessel lighting configuration) to better understand the factors that may contribute to or mitigate the risk of bird strikes, and what methods are available to reduce the risk of bird strikes. Although the bird strike monitoring plan will be developed at a later date, an example see the Daily Bird Sighting Form, and Avian Collision Form which have been attached as Appendices A and B, respectively.

The overall objective of bird strike monitoring is to provide the USFWS with data for risk assessment of bird strikes related to operational activities, weather conditions, and response of eiders and other migratory birds to drilling vessel lighting. Bird strike monitoring will be used to expand the knowledge on the risks of bird strikes in Camden Bay and to determine the effectiveness of mitigation measures. If bird strikes are determined to be a serious risk to birds despite the proposed mitigation measures presented in this document, Shell may evaluate and plan for additional mitigation measures to implement for future offshore activities.

All mortalities and injuries from strike events of a spectacled or Steller's eider will be reported to the USFWS and/or BOEMRE within three days, or as soon as practical. Other pertinent information that may help better understand the risk of bird strikes will be sent to the USFWS after the drilling period.

Upon determination that a bird strike has occurred, the following data will be collected:

- Description of event
- Bird species, if can be determined
- Weather conditions
- Date and time
- Description of vessel lighting conditions
- Vessel location and operational status
- Photographs, if available

Avian monitoring will be performed by Marine Mammal Observers or other designated individuals aboard the drilling vessel that have been trained in bird identification (i.e., avian observers), sampling protocols, and the reporting of bird strikes to the USFWS and BOEMRE. Monitoring will be conducted during daylight hours from several vantage points on each vessel using binoculars and scopes. The avian observers will have an adequate understanding of bird identification, especially of eiders in flight. The daily tasks performed by the avian observers will include recording weather conditions, bird counts with species identification, observations of general bird flight directions, estimates of bird distances from vessels, strike events, data entry, and daily summary report writing. The avian observers will have equipment such as a bird identification guide, binoculars, a flashlight, and a camera to help with data collection.

Placards will be posted in common areas to inform all personnel to report dead or injured birds to the observer. This will increase awareness and the likelihood that data will be recorded. Shell will consult with the USFWS to determine the proper handling of dead or injured birds in the event of a bird strike.

Shell will make every effort to record all bird strikes. However, eiders often fly low and fast over water, which suggests that they may strike the hull of the drilling vessel and fall into the water unobserved. In addition, darkness and inclement weather can make visual observations difficult.

Average daylight in Camden Bay is constant to nearly constant during July (24 hours) and August (more than 21 hours) when molting eiders are most likely present near exploration drilling activities. This timing of activities will allow the eiders greater likelihood to see the drilling vessel and avoid striking it. Average daylight incrementally decreases during September (approximately 15.5 hours) and October (approximately 11.2 hours) during which time eiders will least likely be present at the locations of planned exploration drilling. Due to fewer expected numbers of eiders in the area later in the drilling season (i.e., September and October), the risk of bird strike occurrence will diminish. Avian monitoring will continue even as daylight hours diminish and waterfowl populations are expected to diminish in the area of exploration drilling.

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Attachment A
Daily Bird Sighting Form

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Daily Bird Sighting Form

Date (dd/mm/yy)	Time (military)	Observer's Initials
/ /		

Species Code	Number of Birds	Sex M=Male F=Female U= Unknown	Observation/ How did bird avoid vessel?

Species Code	
Spectacled Eider	SPEI
Steller's Eider	STEI
Common Eider	COEI
King Eider	KIEI
Long-tailed Duck	LTDU
Brant	BLBR
White-winged Scoter	WWSC
Surf Scoter	SUSC
Red- breasted Merganser	RBME
Lesser Scaup	LESC
Greater Scaup	GRSC
Pacific Loon	PALO
Common Loon	COLO
Red- throated Loon	RTLO
Northern Pintail	NOPI
Green-winged Teal	GWTE
Mallard	MALL
Tundra Swan	TUSW
Greater White-fronted Goose	GWFG
Snow Goose	SNGO
Canada Goose	CAGO
Long-tailed Jaeger	LTJA
Pomarine Jaeger	POJA
Parisitic Jaeger	PAJA
Glaucous Gull	GLGU
Sabine's Gull	SAGU
Black-legged Kittiwake	BLKI
Arctic Tern	ARTE

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Attachment B
Avian Collision Form

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AVIAN COLLISION FORM

Avian Observer (Name or Initials)		Vessel Name	

Collision Observations

Casualty ID*	Date/Time (dd/mm/yy /military)	Injury Status[1]	Species	Sex[2] (M, F, U) Age[3] (A, J, U)	Cause of Strike	Injury Description (broken wing, etc.)		Photo ID[4]	Observer Comments
		D W U			☐ Window ☐ Structure ☐ Light ☐ Other______				
		D W U			☐ Window ☐ Structure ☐ Light ☐ Other______				
		D W U			☐ Window ☐ Structure ☐ Light ☐ Other______				
		D W U			☐ Window ☐ Structure ☐ Light ☐ Other______				
		D W U			☐ Window ☐ Structure ☐ Light ☐ Other______				
		D W U			☐ Window ☐ Structure ☐ Light ☐ Other______				

*For each new casualty, create a unique ID value for each casualty observed. Always start the ID with date (e.g. "020104DUCK" for injured duck found Feb. 1, 2004). Include additional information in the ID as needed (e.g. "020104DUCK3" for 3rd injured duck found Feb. 1, 2004). "DUCK" refers to 4-letter species code.

[1] D = dead, W = wounded, U = unknown

[2] M = male, F = female, U = unknown

[3] A = adult, J = juvenile, U = unknown

[4] Name digital photo starting with CASUALTY ID and adding chronological number starting with 001

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