**Alaska Oil and Gas Association**

AOGA

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*Marilyn Crockett, Deputy Director*

January 5, 2006

Mr. Craig Perham
U. S. Fish and Wildlife Service
1101 E. Tudor Road
Anchorage, Alaska 99503-6199

Dear Mr. Perham:

This letter is intended to provide updated information relative to the anticipated level of oil and gas industry activity in the Chukchi Sea. Please consider this as an update to the original AOGA petition, dated August 4, 2005, calling for the promulgation of regulations governing incidental take of polar bear and walrus during oil and gas operations in the North Slope, Beaufort and Chukchi Seas areas. This information is intended to supplement information provided to you separately by Shell and ConocoPhillips.

Near-term

In addition to information provided by Shell and ConocoPhillips, one additional company, TGS-NOPEC Geophysical Company, has a geophysical permit application pending with the Minerals Management Service to conduct to conduct a 7425.075 mile 2D Streamer Cable survey. The operations will be conducted during the open water season beginning in June/July 2007, with an estimated completion date of November 15, 2007. The proposed location of this activity is depicted on the attached map. 2D seismic and gravity operations will be employed utilizing marine streamer from Sercel, Sercel & gun source and a navigation system from Concepts. Explosives will not be used.

Long-term

As you know, there are no leases currently held in this area. Therefore, the timing of exploration and development activities resulting from the next lease sale, tentatively scheduled for November, 2007, is impossible to predict with any certainty.

However, MMS issued a Draft Environmental Impact Statement (DEIS) for the Chukchi Sea Lease Sale 193 in October, 2006. The DEIS provides a "reasonably foreseeable" projection of exploration and development that could occur pursuant to the sale. This projection is displayed in a table format in Table IV.A.-2a and Table IV.A.-2b of the DEIS, and a copy is attached. While this table projects development and production activities well beyond the five-year period of the requested regulations, it does describe seismic and exploration drilling that could occur within this timeframe.

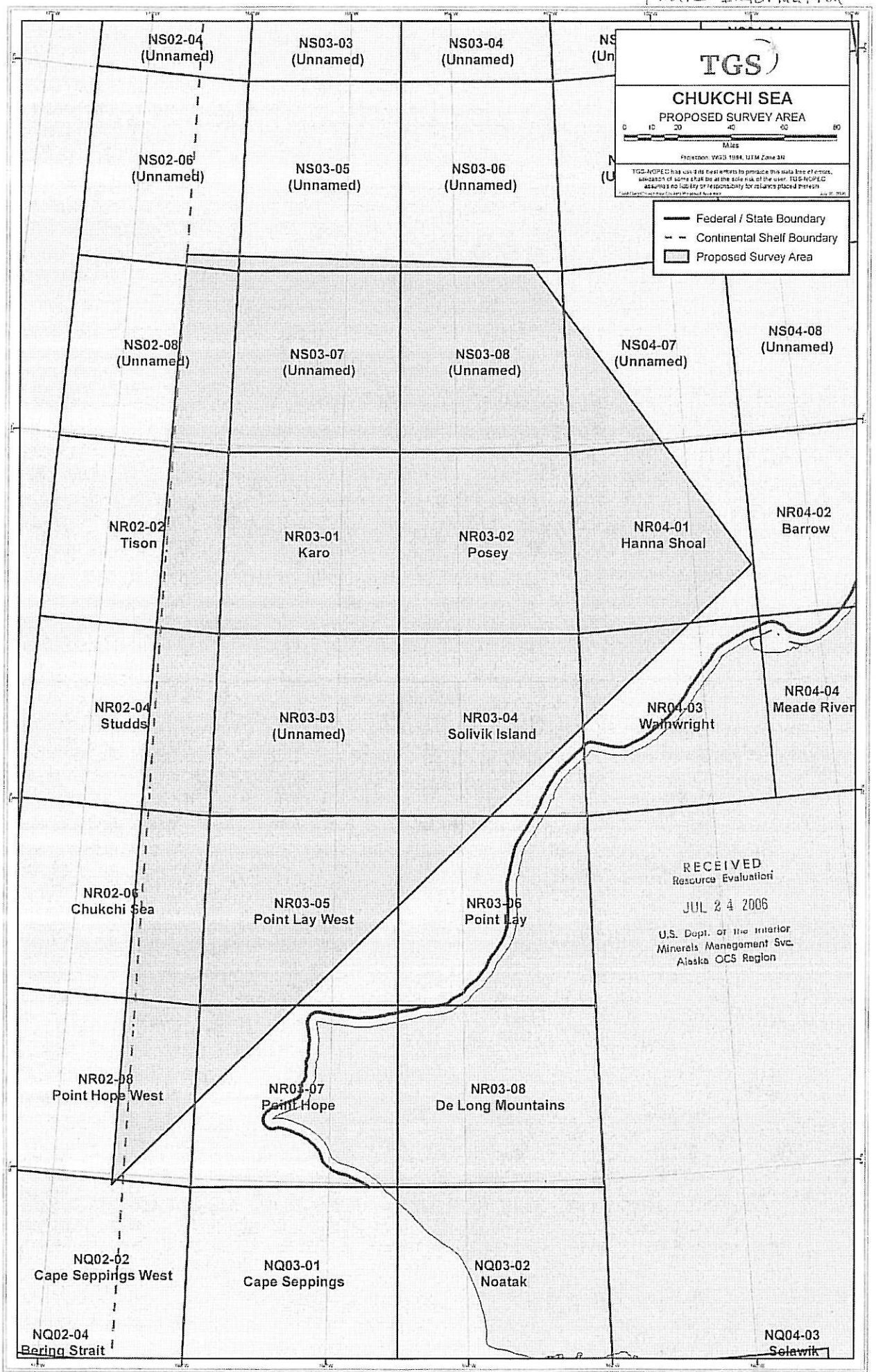
Pages IV-6-IV-12 (attached) of the DEIS includes a thorough description of the reasonably foreseeable activities and is consistent with the information previously provided in the original AOGA petition and information submitted by Shell and ConocoPhillips.

We very much appreciate consideration of our petition and your efforts to promulgate these regulations. If you require additional information, please let me know and I will do my best to secure it as quickly as possible.

Sincerely,

MARILYN CROCKETT
Deputy Director

Public Information





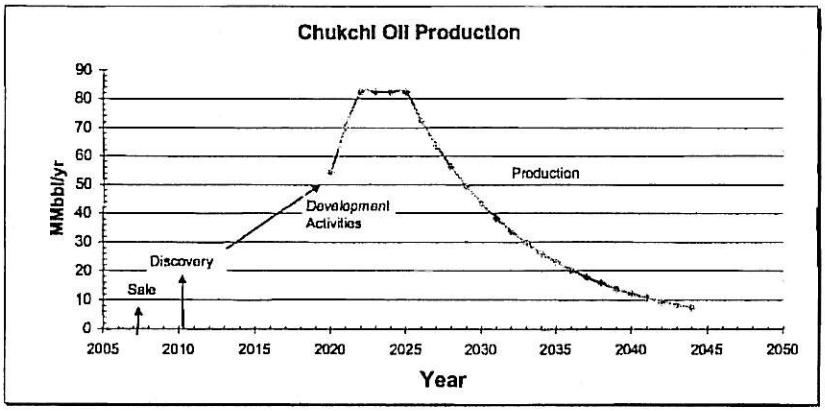

Gr 6 Permit 07-01

## Table IV.A-2a. Possible Timetable for Development

| Year | Seismic Surveys | Exploration Wells | Delineation Wells | Exploration Drilling Rigs | Production Platforms | On-Platform Wells | Subsea Wells | Service Wells | Production Drilling Rigs | In-Field Flowlines (miles) | Offshore Pipelines (miles) | New Shorebases | Annual Oil Production (MMbbl) | Daily Oil Production (bopd) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2006 | | | | | | | | | | | | | | |
| 2006 | 4 | | | | | | | | | | | | | |
| 2007 | 4 | | | | | | | | | | | | | |
| 2008 | 4 | | | | | | | | | | | | | |
| 2009 | 3 | 1 | | 1 | | | | | | | | | | |
| 2010 | 3 | 1 | | 1 | | | | | | | | | | |
| 2011 | 2 | | 2 | 1 | | | | | | | | | | |
| 2012 | 1 | | 2 | 1 | | | | | | | | | | |
| 2013 | 1 | | 2 | 1 | | | | | | | | | | |
| 2014 | 1 | 1 | | 1 | | | | | | | | | | |
| 2015 | 1 | 1 | | 1 | | | | | | | | 1 | | |
| 2016 | 1 | | | | | | | | | | 30 | | | |
| 2017 | | | | | | | | | | | 30 | | | |
| 2018 | | | | | | | | | | | 30 | | | |
| 2019 | | | | | | | 8 | | 2 | 5 | | | | |
| 2020 | | | | | 1 | 6 | 8 | 3 | 3 | 5 | | | 54.0 | 147,945 |
| 2021 | | | | | | 18 | 8 | 6 | 4 | 5 | | | 70.0 | 191,781 |
| 2022 | | | | | | 18 | 8 | 6 | 4 | 5 | | | 82.0 | 224,658 |
| 2023 | | | | | | 18 | 8 | 5 | 4 | 5 | | | 82.0 | 224,658 |
| 2024 | | | | | | 10 | 8 | 6 | 3 | 5 | | | 82.0 | 224,658 |
| 2025 | | | | | | 10 | | 4 | | | | | 82.0 | 224,658 |
| 2026 | | | | | | | | | | | | | 72.2 | 197,699 |
| 2027 | | | | | | | | | | | | | 63.5 | 173,975 |
| 2028 | | | | | | | | | | | | | 55.9 | 153,098 |
| 2029 | | | | | | | | | | | | | 49.2 | 134,725 |
| 2030 | | | | | | | | | | | | | 43.3 | 118,559 |
| 2031 | | | | | | | | | | | | | 38.1 | 104,332 |
| 2032 | | | | | | | | | | | | | 33.5 | 91,812 |
| 2033 | | | | | | | | | | | | | 29.5 | 80,795 |
| 2034 | | | | | | | | | | | | | 26.0 | 71,099 |
| 2035 | | | | | | | | | | | | | 22.8 | 62,567 |
| 2036 | | | | | | | | | | | | | 20.1 | 55,059 |
| 2037 | | | | | | | | | | | | | 17.7 | 48,452 |
| 2038 | | | | | | | | | | | | | 15.6 | 42,638 |
| 2039 | | | | | | | | | | | | | 13.7 | 37,521 |
| 2040 | | | | | | | | | | | | | 12.1 | 33,019 |
| 2041 | | | | | | | | | | | | | 10.6 | 29,067 |
| 2042 | | | | | | | | | | | | | 9.3 | 25,570 |
| 2043 | | | | | | | | | | | | | 8.2 | 22,501 |
| 2044 | | | | | | | | | | | | | 7.2 | 19,801 |
| 2045 | | | | | | | | | | | | | | |
| 2046 | | | | | | | | | | | | | | |
| 2047 | | | | | | | | | | | | | | |
| | 25 | 4 | 6 | 7 | 1 | 80 | 48 | 28 | 20 | 30 | 90 | | 1000 | |

notes: (1 mo/yr) (4 mo/yr) (30 inj wells) (rig/years)

## Table IV.A-2b. Possible Timetable for Production.



### IV.A.2. Exploration and Development Scenarios.

In this section, we describe scenarios for petroleum activities in the Chukchi Sea leasing area. Scenarios are conceptual views of the future and represent possible, though not necessarily probable, sets of activities. To develop the scenarios we consider the petroleum-resource potential of the area, the technology to explore and produce oil and gas from the offshore area, and industry trends in northern Alaska. The scenarios are generated using professional judgment, not rigorous statistical data, because the size and location of oil and gas pools are unknown at the present time and we have no direct knowledge of future industry strategies. The timing of exploration and development activities and volume of petroleum ultimately produced as a result of the next lease sale in the Chukchi OCS is impossible to predict with any certainty. However, the assumed scenario provides a common basis for the analysis of potential environmental impacts, should future activities occur similar to those postulated here.
Although all scenarios are hypothetical and, therefore, uncertain, they can be categorized as *reasonably foreseeable* and *speculative*. Reasonably foreseeable scenarios are viewed as extensions of current trends that are more likely to occur within a decade or two. For this EIS, we consider oil production from the Chukchi shelf as reasonably foreseeable, because the area has high oil-resource potential and there is existing transportation infrastructure to move oil from northern Alaska to distant markets. Conversely, we consider offshore gas production to be speculative for the current Chukchi leasing program, because although the area has a high potential for natural gas occurrence, there is no existing transportation infrastructure to move produced gas to markets.

Natural gas has been produced in low quantities (0.7 billion cubic feet per year [Bcf/yr]) for local use in the village of Barrow since the mid-1940's and in high quantities (8 Bcf/day) from Prudhoe Bay area fields since 1969. Associated gas produced from North Slope oil fields has been reinjected to increase oil recovery and also used for fuel in facilities. It is estimated that approximately 35 trillion cubic feet (Tcf) of natural gas is contained in known accumulations and another 200 Tcf could occur in undiscovered pools throughout northern Alaska (U.S. Geological Survey, 2005). A discussion of the regional petroleum geology of the Chukchi Sea Planning Area can be found on the MMS Alaska Region website at http://www.mms.gov/alaska/re/reports/2006Asmt/ga.HTM.

Natural gas in northern Alaska is described as "stranded" until a gas-transportation system to outside markets is constructed. At the present time, a large-diameter gas pipeline seems to be the most likely project, with the earliest startup date in 2015. However, various plans to transport North Slope gas to market have been circulating for decades, and there still is no gas-transportation system. Until a future system is installed and has available capacity, it is unrealistic to assume that natural gas will be produced from the Chukchi Sea program area. Therefore, gas production is not included in the reasonably foreseeable scenario.

Future oil production from the Chukchi Sea will depend on many factors, including the access to prime areas for exploration and sustained high oil prices, which will attract industry investments to this remote, high-cost location. Offshore petroleum development

in the Chukchi OCS will face a number of logistical and regulatory hurdles. These hurdles could negatively impact industry activities to convert undiscovered resources to producing reserves. Although theoretically present and potentially viable, all of the estimated economic resources will not be developed in a foreseeable timeframe, because exploration effort is likely to target only the largest prospects. Marginal discoveries probably would not be developed, because the risk of economic failure is too high. This means that future production from this frontier area is unlikely to ever reach the full economic potential as estimated by petroleum-resource assessments (USDOI, MMS, 2005).

No permanent petroleum infrastructure exists in this remote area; therefore, a realistic scenario includes only the discovery, development, and production of the first offshore project. When the first project overcomes the cost, logistical, and regulatory hurdles, more projects are more likely to follow. If the challenges are not overcome, the area will remain undeveloped. As typical of many frontier areas, development usually starts with a relatively large project that supports the cost of initial infrastructure. Progressively smaller fields are developed after using this infrastructure, and the industrial footprint expands away from the core area.

A scenario that assumes any offshore oil development in the Chukchi OCS represents an abrupt increase in the level of activity compared to the past. There have been no lease sales and virtually no petroleum exploration in the Chukchi Sea since 1991. Four lease sales were held on different parts of the Chukchi shelf between 1988 and 1991, but only a small fraction of the tracts were leased by industry (483 leases, or approximately 5% of those offered). Five exploration wells drilled in 1989-1991 tested five large prospects, none of which resulted in commercial-size discoveries. There have been no active leases in the Chukchi Sea since 1998.

Future leasing and exploration interest in the Chukchi will be supported by high oil prices and advancements in exploration and production technology. High prices and new technology are both vital in overcoming the challenges of this difficult setting. The Chukchi OCS is viewed as one of the most petroleum-rich offshore provinces in the country, with geologic plays extending offshore from some of the largest oil and gas fields in North America on Alaska's North Slope. Our current petroleum assessment indicates that the mean recoverable oil resource is 12 billion barrels (Bbbl) with a 5% chance of 29 Bbbl. Most government and industry analysts agree that this province could hold large oil fields comparable to any frontier area in the world. It is reasonable to assume that exploration of this area could lead to significant oil discoveries. The uncertainty is whether offshore development will follow successful exploration. In a frontier area, this is not a solid assumption. However, for purposes of analysis we assume that one large oil field will be developed as a result of the next Chukchi lease sale.

#### IV.A.2.a. Chukchi Sea Sale 193 Scenario.

The following scenario assumes active leasing and exploration by industry followed by development that is unhindered by long regulatory delays. Estimates for infrastructure

are given in Table IV.A-1, and a possible schedule for the scenario is given in Table IV.A-2a.

The scale of future activities will be controlled largely by industry perceptions of the Chukchi program area relative to other worldwide exploration opportunities. Industry decisions primarily are influenced by their opinions regarding the petroleum potential, future market prices, and the regulatory regime. Individual companies could have widely varying views of these factors, and these views could change (positive or negative) through time. As stated previously, the scenario represents a possible set of circumstances, but the specific location and scale of offshore development will not be known for decades.

The scenario assumed for environmental analysis involves the discovery, development, and production of the first offshore oil field in the Chukchi Sea. Ultimately recoverable oil resources from this field are assumed to be 1 Bbbl, as lower oil volumes are not likely to be economic. If oil prices drop below $30.00 per barrel (they were above $50.00 when this scenario was written), exploration in the Chukchi OCS is expected to be minimal and oil discoveries may not be developed. The "exploration only" scenario represents the status quo in this area, where discoveries are too small or costly for commercial development. As previously discussed, offshore natural gas discoveries are not likely to be developed until a gas transportation system from the North Slope to outside markets is operational and has capacity to accept additional gas supplies from new fields. Other gas transportation strategies (liquefied natural gas [LNG]) were not considered to be as feasible or economically attractive as an overland pipeline system to U.S. markets.

**Changes in Potential for Development for the Alternatives.** Petroleum-resource assessments of the Chukchi Sea Sale 193 area give a broad view of the potential for future commercial development. The assessments are based on geologic and engineering analysis assuming that the entire area is open to leasing; industry will completely explore the area in a very short timeframe (<20 years); regulations will not inhibit industry activities; and all economically viable resources will be developed, even if they are only marginally profitable. These obviously are unrealistic assumptions and, therefore, future development is more likely to be at a lesser scale and over a longer time period than suggested by economically recoverable resource estimates. This is why we used the concept for discovery/development of the first offshore oil field (1 Bbbl) for purposes of environmental analysis. A more realistic prediction would be for a continuation of exploration activities only in this frontier area. However, a thorough NEPA analysis requires consideration of the potential for impacts associated with offshore development, should it occur.

As part of the analysis, we must analyze the potential impacts associated with different leasing alternatives. Generally, these alternatives constitute leasing restrictions in different parts of the program area. It is not possible to accurately define where the first commercial development will occur because the locations cannot be determined without drilling (after leasing), and we cannot predict industry strategies to lease and drill specific tracts. In a typical frontier area a simple concept often holds true—area equals

opportunity. Removing areas from leasing will eliminate the chance that commercial development will occur in that particular area. In one sense, deferring an area could redirect exploration effort into remaining open areas. However, considering the area as a whole, restricting access limits the opportunities for successful exploration, which could lead to commercial development.

Table IV.A-3 lists scaling factors described as the Opportunity Index. The opportunity index represents our estimate of the chance that commercial fields will be leased, drilled, discovered, and developed in these areas—assuming that 1 commercial development will occur as a result of Sale 193. As previously discussed, there is a rather low probability for commercial success in any frontier area, particularly a challenging area such as the Chukchi Sea. A realistic probability for commercial success is likely to be less than 10%. This analysis reflects the current data and knowledge of MMS. Industry groups could have a much different view of the oil potential in various parts of the Chukchi Sea. These estimates do not include the effects of restrictions to activities in the deferral areas (transportation, pipelines, etc.) other than not offering tracts in these areas in Sale 193.

For purposes of environmental impact analysis, we assume that a 1-Bbbl oil field would be developed as a result of the sale. Alternative I (Proposed Action) includes the entire program area and is assigned an opportunity index of 1.0 (100% chance to discover the hypothetical oil field) (Table IV.A-2b). Alternative II (No sale) has an opportunity for commercial success of zero because none of the area is available for leasing and exploration. Alternatives III and IV show the effects of deferral corridors along the coast to protect biological resources and subsistence uses. Alternative III includes the widest coastal deferral and reduces the opportunity by 36%.

#### IV.A.2.b. Exploration Activities.

### IV.A.2.b(1) Marine Streamer 3D and 2D Seismic Surveys.

The oil and gas industry conducts marine seismic surveys to locate geological structures potentially capable of containing petroleum accumulations. Airguns are the typical acoustic (sound) source for 2-dimensional and 3-dimensional (2D and 3D) seismic surveys. An outgoing sound signal is created by the venting of high-pressure air from the airguns into the water to produce an air-filled cavity (a bubble) that expands and contracts. The size of individual airguns can range from tens to several hundred cubic inches ($in^3$). A group of airguns is usually deployed in an array to produce a more downward-focused sound signal. Airgun array volumes for both 2D and 3D seismic surveys are expected to range from 1,800-4,000 $in^3$, but may range up to 6,000 $in^3$. The airguns are fired at short, regular intervals, so the arrays emit pulsed rather than continuous sound. While most of the energy is focused downward and the short duration of each pulse limits the total energy into the water column, the sound can propagate horizontally for several kilometers (Greene and Richardson, 1988; Hall et al., 1994).

Marine-streamer 3D seismic surveys vary markedly from typical 2D seismic surveys, because the survey lines are closer spaced and are more concentrated in a particular area. The specifications of a 3D survey depend on client needs, the subsurface geology, water

depth, and geological target. A 3D source array typically consists of two to three subarrays of six to nine airguns each, and is about 12.5-18 meters (m) long and 16-36 m wide. The size of the source-array size can vary during the seismic survey to optimize the resolution of the geophysical data collected at any particular site. The energy output of the array is determined more by the number of guns than by the total array volume (Fontana, 2003, pers. commun.). Vessels usually tow up to three source arrays, depending on the survey-design specifications. Most operations use a single source vessel; however, in a few instances, more than one source vessel is used. The vessels conducting these surveys generally are 70-90 m long. The sound-source level (zero-to-peak) associated with typical 3D seismic surveys ranges between 233 and 240 decibels re 1 microPascal at 1 meter (dB re 1 µPa at 1 m). Marine 3D surveys are acquired at typical vessel speeds of 4.5 knots (kn) (8.3 km/hour). A source array is activated approximately every 10-15 seconds, depending on vessel speed. The timing between outgoing sound signals can vary for different surveys to achieve the desired "shot point" spacing to meet the geological objectives of the survey; typical spacing is either 25 or 37.5 m.

The receiving arrays could include multiple (4-16) streamer-receiver cables towed behind the source array. Streamer cables contain numerous hydrophone elements at fixed distances within each cable. Each streamer can be 3-8 km long with an overall array width of up to 1,500 m between outermost streamer cables. Biodegradable liquid paraffin is used to fill the streamer and provide buoyancy. Solid/gel streamer cables also are used.

The wide extent of this towed equipment limits both the turning speed and the area a vessel covers with a single pass over a geologic target. It is, therefore, common practice to acquire data using an offset racetrack pattern, whereby the each acquisition line is several kilometers away from and traversed in the opposite direction of the track line just completed. Acquiring a single track line may take several hours, depending on the size of the survey area. The vessel then takes 2-3 hours to turn around at the end of the track line and starts acquiring data along the next track line. Adjacent transit lines for a modern 3D survey generally are spaced several hundred meters apart and are parallel to each other across the survey area.

Seismic surveys are conducted day and night when ocean conditions are favorable, and one survey effort may continue for weeks or months, depending on the size of the survey. Data-acquisition is affected by the arrays towed by the survey vessel and weather conditions. Typically, data are only collected between 25% and 30% of the time (or 6-8 hours a day) because of equipment or weather problems. In addition to downtime due to weather, sea conditions, turning between lines, equipment maintenance, surveys could be suspended for biological reasons (proximity to protected species). Individual surveys could last 20-30 days (with downtime) to cover a 200 square mile ($mi^2$) area.

Marine-streamer 2D surveys use similar geophysical-survey techniques as 3D surveys, but both the mode of operation and general vessel type used are different. The 2D surveys provide a less-detailed subsurface image because the survey lines are spaced farther apart, but they cover wider areas to image geologic structure on more of a regional

basis. Large prospects are easily identified on 2D seismic data, but detailed images of the prospective areas within a large prospect can only be seen using 3D data.

The 2D seismic-survey vessels generally are smaller than modern 3D-survey vessels, although larger 3D-survey vessels are able to conduct 2D surveys. The 2D source array typically consists of three or more subarrays of six to eight airgun sources each. The sound-source level (zero-to-peak) associated with 2D marine seismic surveys are the same as 3D marine seismic surveys (233-240 dB re 1 µPa at 1 m). Typically, a single hydrophone streamer cable approximately 8-12 km long is towed behind the survey vessel. The 2D surveys acquire data along single track lines that are spread more widely apart (usually several miles) than are track lines for 3D surveys (usually several hundred meters).

Marine seismic vessels are designed to operate for several months without refueling or resupply. A guard or chase boat probably would be used for safety considerations, general support, maintenance, and resupply of the main vessel, but it would not be directly involved with the collection of seismic data. Helicopters also may be used, when available, for vessel support and crew changes.

Marine-streamer surveys require a largely ice-free environment to allow effective operation and maneuvering of the airgun arrays and long streamers. In the Arctic, the timing and areas of the surveys will be dictated by ice conditions. The data-acquisition season in the Chukchi Sea could start sometime in June and end sometime in early November. Even during the short summer season, there are periodic incursions of sea ice, so there is no guarantee that any given location will be ice free throughout the survey.

Marine seismic-exploration work is expected to begin before the sale to identify prospective tracts for bidding. This work is likely to include 3D seismic surveys but will not include exploration drilling. Approximately 100,000 line-miles of 2D seismic surveys already have been collected in the Chukchi Sea program area, so we assume that additional geophysical surveys will be 3D surveys focusing on specific leasing targets. The 3D surveys are likely to continue during the early phase of exploration when wells are drilled; however, the number of surveys should decrease over time as data is collected over the prime prospects and these prospects are tested by drilling (see Table IV.A-2a). We assume that up to four surveys could be conducted during each summer open-water season (June to November). Seismic surveys in the Chukchi OCS probably will be coordinated with surveys in the Beaufort OCS to use the same vessels. Typical 3D-survey operations will consist of a large seismic vessel that tows the airgun and receiving cable arrays and a smaller support boat.

#### IV.A.2.b(2) High-Resolution Site-Clearance Surveys.

A high-resolution seismic survey usually is conducted by the oil and gas industry to provide the required permit information to MMS about the site of proposed exploration and development activities. High-resolution surveys locate shallow hazards; obtain engineering data for placement of structures (e.g., proposed platform locations and

pipeline routes); and detect geohazards, archaeological resources, and certain types of benthic communities.

A typical operation consists of a vessel towing an acoustic source (airgun) about 25 m behind the ship and a 600-m streamer cable with a tail buoy. The source array usually is a single array composed of one or more airguns. A 2D high-resolution site-clearance survey usually has a single airgun, while a 3D high-resolution site survey usually tows an array of airguns. The ships travel at 3-3.5 kn (5.6-6.5 km/hour), and the source is activated every 7-8 seconds (or about every 12.5 m). All vessel operations are designed to be ultra-quiet, as the higher frequencies used in high-resolution work are easily masked by the vessel noise.

Typical surveys cover one OCS block at a time. The MMS regulations require information be gathered on a 300- by 900m grid, which amounts to about 129 line-kilometers of data per lease block. If there is a high probability of archeological resources, the north-south lines are 50 m apart and the 900 m remains the same. Including line turns, the time to survey a lease block is approximately 36 hours. Airgun volumes for high-resolution surveys typically are 90-150 $in^3$, and the output of a 90-$in^3$ airgun ranges from 229-233 dB high-resolution re 1μPa at 1m. Airgun pressures typically are 2,000 psi (pounds per square inch), although they can be used at 3,000 psi for higher signal strength to collect data from deep in the subsurface.

**IV.A.2.b(3) Drilling Operations.**

Based on mapping of the subsurface structures using 2D and 3D seismic data, several well locations will be proposed. Prior to drilling deep test wells, high-resolution site clearance seismic surveys and geotechnical studies will examine the proposed exploration drilling locations for geologic hazards, archeological features, and biological populations. Site clearance and studies required for exploration will be conducted during the open water season before the drill rig is mobilized to the site.

Considering water depth and the remoteness of this area, drilling operations are likely to employ drillships with ice-breaker support vessels. Water depths greater than 100 feet and possible pack-ice incursions during the open water season will preclude the use of bottom-founded platforms as exploration drilling rigs. Using drillships allows the operator to temporarily move off the drill site, if sea or ice conditions require it, and the suspended well is controlled by so-called blowout-prevention equipment installed on wellheads on the seabed. Drilling operations are expected to range between 30 and 90 days at different well sites, depending on the depth to the target formation, difficulties during drilling, and logging/testing operations. Considering the relatively short open-water season in the Chukchi (June-November), we estimate that up to four wells could be started by one rig each drilling season. However, it is more likely that only one to two wells could be drilled, tested, and abandoned during a single season, leaving work on the other wells to the next summer season. A total of 5 exploration wells have been drilled on the Chukchi shelf, and we estimate that 7-14 additional wells will be needed to discover and delineate the first commercial field.