July 30, 2007

Via Electronic Mail

Mr. P. Michael Payne
Chief – Permits, Conservation and Education Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3225
Email: PR1.ALASKAEIS@noaa.gov

Houston Office

Subject: Seismic Surveys in the Beaufort and Chukchi Seas, Alaska – Draft Programmatic Environmental Impact Statement (OCS EIS/EA MMS 2007-001)

International Association of Geophysical Contractors ("IAGC") has reviewed the Federal Register Notice requesting public comment on the February 2007 *Draft Programmatic Environmental Impact Statement* ("DPEIS") *for Seismic Surveys in the Beaufort and Chukchi Seas, Alaska* and appreciates the opportunity to provide you, National Marine Fisheries Service ("NMFS"), and the Minerals Management Service ("MMS") the following comments.

IAGC is the international trade association representing the industry that provides geophysical services (geophysical data acquisition, processing and interpretation, geophysical information ownership and licensing, associated services and product providers) to the oil and gas industry. IAGC member companies play an integral role in the successful exploration and development of offshore hydrocarbon resources through the acquisition and processing of seismic data.

IAGC's members include the companies that will acquire the seismic data proposed for the 2007 Arctic Ocean OCS seismic survey season, as well as the companies that acquired past and will acquire future Chukchi Sea and Beaufort Sea OCS seismic surveys. IAGC has long been engaged on behalf of our members in this very issue: the potential impact of E&P sounds on marine life, and particularly on marine mammals.

IAGC participated in the development of, and strongly supports the comments of similar caption on this same subject submitted separately to NMFS and MMS by Industry, including the Alaska Oil and Gas Association ("AOGA"), the American Petroleum Institute ("API"), and the National Ocean Industries Association ("NOIA"). In addition to those Industry comments, and not wishing to detract from them, we wish to make the following additional comments.

The DPEIS demonstrates that NMFS and MMS are taking the requisite hard look at the potential environmental consequences of the proposed action and a range of

alternatives that considers the specific data presented in the DPEIS. However, we believe that the DPEIS has chosen a worst case analysis of the speculative impacts of seismic acquisition on marine mammals and subsistence hunting which are not supported by long term data collected on one of the most studied whale populations in our oceans today. Summarized in the six points below are some specific and urgent concerns.

SUMMARY

1. **Twelve concurrent seismic surveys will not be conducted annually in the Beaufort Sea and Chukchi Sea in the years 2007-2011.**
   MMS and NMFS assume that six simultaneous seismic surveys will occur in each of the Beaufort and Chukchi Seas for a total of twelve concurrent surveys every year for the next five years (DPEIS at I-5). According to Industry experience, this level of effort is not likely and not feasible for several reasons:
   (a) Industry experience in the Beaufort and Chukchi Seas in 2006 and market knowledge of the realistic level of effort for succeeding 6 years does not support DPEIS numbers.
   (b) Technical (e.g. sonic interference, availability of seismic crews) and local conditions (e.g. weather, ice conditions, subsistence hunting, and mitigation measures) will inhibit industry's ability to conduct 12 concurrent surveys.
   (c) High resolution surveys should not be included with the towed streamer seismic operations in the analysis of effects. Therefore the number of surveys considered for potential impact should be reduced by the number of high resolution surveys estimated each year.
   (d) According to our members, most likely there will not be any more non-exclusive surveys in the areas during the period covered by the DPEIS, therefore, non-exclusive surveys should be eliminated from the 12 survey estimate. Accordingly, the 12 concurrent seismic surveys estimate should be reduced.
   (e) The high costs and risks associated with exploration in the Arctic OCS will encourage E&P companies to combine efforts, which will eliminate surveys or reduce their size.
   (f) The DPEIS states that the Proposed Action includes seismic surveying in the Beaufort and Chukchi Sea OCS "resulting from the annual issuance of *up to* six (6) MMS seismic survey-related geophysical exploration permits or ancillary activity notices in the Chukchi Sea and six (6) seismic survey-related geophysical exploration permits or ancillary activity notices in the Beaufort Sea. Surveys would likely operate concurrently in both planning areas." (DPEIS I-5) However, the DPEIS analysis seems to use the highest possible number of surveys estimated each year. The analysis should not use the highest and most unlikely number of seismic surveys estimated but instead should use a likely average.

   (Please refer to the attachment for additional information regarding point 1.)

2. **The proposed 120 dB and 160 dB exclusion zones are not supported scientifically and are not feasible to implement.**

The imposition of an exclusion zone or other restrictions premised upon anything less than the 180 and 190 decibel ("dB") isopleths (AOGA's comments explain in detail why the imposition of an exclusion zone or other restrictions premised upon the 120 and 160 decibel dB isopleths are scientifically unsupportable and not implementable) are unacceptable. We are most concerned that NMFS and MMS have introduced scientifically unsupportable conclusions as well as proposed alternatives and restrictions that will make it very difficult or impossible to implement the proposed seismic surveys. IAGC would also note that in so doing, NMFS and MMS have gone beyond the requirements of NEPA by proposing alternatives, premised on a 120 dB exclusion zone, that are not implementable. By simply raising the possibility of such an unsupportable alternative in this draft, MMS sets precedent that in the future could impact the management of seismic acquisition operations in other areas of the U.S. and worldwide.

In addition, MMS regulations (30 CFR Part 251) state that geological and geophysical activities cannot create or cause hazardous or unsafe conditions (DPEIS I-2). Therefore, any mitigation and monitoring measures imposed on seismic surveys by NMFS and MMS must not result in hazardous or unsafe conditions. The mandate for large-scale manned aerial flights in the Beaufort and Chukchi Seas as proposed in the DPEIS to visually monitor the 120 dB and 160 dB exclusion zones for the presence of marine mammals places human personnel at extreme risk for serious injury or fatality. Manned aerial surveys are an impracticable mitigation and monitoring measure and clearly violate MMS regulations with regard to avoiding hazardous or unsafe conditions.

3. **Passive acoustic monitoring ("PAM") as a proposed method for monitoring the proposed 120 dB and 160 dB exclusion zones is not feasible to implement.**

PAM is not a viable monitoring technology for the large exclusion zones associated with the 120 dB and 160 dB isopleths as suggested in some sections of the DPEIS (III-164). Indeed, NMFS and MMS recognize the limitations of PAM technology as demonstrated by the statement in the DPEIS (IV-9) referring to the use of PAM during the 2006 open water season "Questions were then raised regarding the effectiveness of this monitoring technology...Until the time that information is received, it is difficult to assess the feasibility and effectiveness of using PAM for Arctic open water surveys..." Industry experience suggests that current PAM detection ranges are limited to several kilometers. PAM systems are not yet able to reliably detect marine mammals tens of kilometers away. Given that PAM is not yet in widespread use (it is still fairly rare globally), finding sufficient trained operators for this work will likely be problematic. At this time, PAM is not a viable monitoring method for monitoring the 120 dB and 160 dB exclusion zones and is not feasible to implement.
(Please refer to the attachment for additional information regarding point 3.)

4. **Bowhead whales do not routinely deflect 20 km from seismic operations.**

The DPEIS includes several statements that bowhead whales are rarely observed within 20 kilometers of active seismic operations (III-114-115). However, this

statement is contradicted by the available scientific literature. Bowhead whales have been observed near operating seismic vessels (Reeves, et al. 1984; Richardson et al 1986, 1987; Brueggeman et al. 1990) and near controlled experiments with single airguns and airgun arrays (Richardson et al. 1986; Ljungblad et al. 1988). A study conducted in the Canadian Beaufort Sea in 2001 documented whales in close proximity to a seismic vessel acquiring modern 3D data very similar to the programs our members could envision collecting in the Beaufort and Chukchi Sea Planning Areas. The seismic vessel reported sighting 280 bowhead whales. Some whales approached as close as 600 meters, with a mean radial distance of 1,957 m when the airguns were operating and a mean radial distance of 1,368 m when the airguns were not operating. In contrast to the U.S. Beaufort Sea where ice conditions and Conflict Avoidance Agreements ("CAA") restrict the simultaneous occurrence of seismic operations and whale migrations, in the Canadian Beaufort Sea seismic surveying and bowhead whale presence coincide for at least 50% of the open water season in historically ice-free waters (note Environment Canada ice coverage history for the last 8 years and personal reference from Steve Carter). These studies clearly demonstrate that bowheads commonly occur well within 20 km of active seismic operations. It appears that all of the research studies are not given the same consideration in the DPEIS analysis as a single study by Richardson in 1999.
(Please refer to the attachment for additional information regarding point 4.)

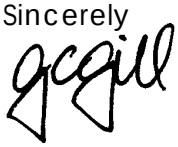
5. It is improbable that foreseeable seismic surveys will have any discernable adverse impacts to the health, status, habitat, survival or recovery of a marine mammal population.

There is no evidence that a single bowhead whale death, injury or other detectable adverse impact, nor a population level adverse impact, has ever been documented, or is "expected," "probable," or "likely" from the maximum levels (12 concurrent surveys) of seismic activity. In the opinion of our members, this maximum estimate of 12 concurrent surveys should be revised to a maximum of 4 concurrent surveys that would transpire in the combined Chukchi and Beaufort Planning Areas. Further details of the number of crews that the market will support are explained in the following attachment. The DPEIS states "no injuries to marine mammals have been documented from seismic surveys" (II-20). In addition, the DPEIS concludes that no unmitigable adverse impact on the bowhead subsistence hunt caused by seismic activity has ever been documented, or is "expected," "probable," or "likely" from unrealistically high levels of seismic survey activity. ("There is no documented evidence that noise from previous OCS operations has hindered the overall migration of bowhead whales" III-130). The DPEIS affirmatively concludes that the cumulative effects of past and present "noise and disturbance causing factors combined (e.g., oil and gas activities, shipping, subsistence hunting, and research activities), habitat alteration activities and pollution (from local or distant sources) have not "had any long-lasting physiological, or other adverse effect(s) on the [BCB Seas] population" (III-201). In fact, according to the DPEIS (III-74), all available information indicates that the Bering-Chukchi-Beaufort (BCB) population of bowhead whales has continued to increase over the same timeframe that oil and gas activities have occurred.
(Please refer to AOGA's letter for additional information.)

6. **Oil and gas is important to our country, and seismic surveys are critical to finding and producing oil and gas. There is a positive environmental aspect of seismic surveys which is not taken into account in the DPEIS, and which should be.**
   (Please refer to the attachment for additional information regarding point 6.)

IAGC appreciates the opportunity to provide comments on the *Draft Programmatic Environmental Impact Statement for Seismic Surveys in the Beaufort and Chukchi Seas, Alaska*. If you have any questions or need additional information, please contact me.

Sincerely



Chip Gill
President

Cc: Marilyn Crockett – AOGA
Kim Harb - NOIA
Richard Ranger - API

Attachment
Additional Information on IAGC Comments

1. **Twelve concurrent seismic surveys will not be conducted annually in the Beaufort Sea and Chukchi Sea in the years 2007-2011.** The DPEIS analyses of impact are based upon "...annual issuance of up to six (6) MMS seismic survey related geophysical exploration permits or ancillary activity notices in the Chukchi Sea and six (6) seismic survey-related geophysical exploration permits or ancillary activity notices in the Beaufort Sea" (I-5). IAGC believes NMFS and MMS should review their estimated number of permits based on more realistic market conditions. When all the factors such as probable lease activity, historical ice conditions, and restrictions on acquisition time periods as exist in the current CAAs are considered, the very maximum number of seismic crews that could be operating concurrently in the entire Beaufort and Chukchi Sea Planning Areas should be 4 vessels per open water season. The estimates detailed below assume a reasonable mitigation effort such as Alternative 6 in the DPEIS. IAGC members contend that with any alternative more restrictive than Alternative 6, a maximum number of 2 crews might operate in the combined Beaufort and Chukchi Planning Areas during one open water season.
   a) *Industry experience* in the Beaufort and Chukchi Seas in 2006 and *market knowledge* of expected level of effort for the succeeding 6 years do not support DPEIS numbers.
      i. The 2007 open water season has already been determined, with one 3D seismic crew operating in the Beaufort and Chukchi Seas and one high-resolution survey planned for the Beaufort Sea.
      ii. According to our members, the global demand for seismic surveys is extremely high, and the capacity of industry to meet this demand is extremely tight. As a consequence, most seismic contractors currently have a 12-18 month backlog of commitments for their marine seismic equipment. This is well known by the E&P companies, who now have to procure these services far enough in advance to account for this backlog. These factors provide market knowledge about the 2008 and 2009 field season, and support IAGC's estimated level of activity shown on Table 1 for these years. Planning, applying for and receiving permits, and other logistical considerations provide both additional insights into the number of seismic surveys likely for 2008 and 2009, and all but eliminate the possibility of a total of 12 concurrent seismic surveys to occur in one open water season. In addition, the long transit time (40-45 days one-way) for a vessel operating in the Alaska OCS versus the short (60-75 days) data acquisition time frame does not produce favorable market conditions.
      iii. Based on Industry experience, an estimate for a combined Beaufort and Chukchi Seas total seismic crew level effort for the next 6 years is described in Table 1:

Year / Type	Chukchi Sea		Beaufort Sea		U.S. Arctic	
	Crew Seasons	Total Crews	Crew Seasons	Total Crews	Total Crews by Type	Total Crews
2007 streamer	0.5	1	0.5	1	1	1
2007 OBC					0	
2008 streamer	0.5	1	0.5	1	1	3
2008 OBC			2	2	2	
2009 streamer	2.5	3	0.5	0.5	3	4
2009 OBC			1	1	1	
2010 streamer	2	3	1	2	3	4
2010 OBC			1	1	1	
2011 streamer	1.5	2	0.5	1	2	3
2011 OBC			1	1	1	
2012 streamer	1.5	2	0.5	1	2	3
2012 OBC					1	

Table 1. The market expectation for number of seismic crews operating separately in the Beaufort and Chukchi Sea Planning Areas with total crews for both planning areas found in the Total Crews U.S. Arctic column.

For example, the 2007 seismic crew level is known and the above table indicates that the total number of seismic crews working in U.S. Arctic waters will be one crew. That single crew is expected to operate in the Chukchi Sea for half (0.5) of the available 2007 open water season and is scheduled to operate in the Beaufort Sea for the other half of the open water season. This partial season occupation of a Planning Area is applied to each year. For instance, 2008 has 2 OBC crews projected to operate in the Beaufort Sea for the entire open water season, therefore counting for 2 crew seasons in the Beaufort Sea. The *average* number of 2D/3D seismic and OBC crews operating in the Arctic (Arctic area includes the Beaufort and Chukchi Sea Planning Areas) will be *3* crews through the period from 2007 through 2012. However, currently unforeseen demand could put a maximum of 4 crews (any combination of 2D/3D vessels and OBC crews) into either the Chukchi or the Beaufort Seas.

iv. Expected OBC seismic acquisition will most probably be in waters too shallow for streamer acquisition. One of these OBC surveys, if it proceeds in 2008 or 2009, will be in relatively close proximity to Cross Island where subsistence hunting occurs during late August and most of the month of September. Therefore any potential impact would be further reduced by a Conflict Avoidance Agreement ("CAA") that would effectively stop all seismic surveying by the end of August. Furthermore this potential shallow water OBC survey in proximity to Cross Island should take place inside the barrier islands, which as the DPEIS notes rarely see any bowhead migration. The expected trend from E&P companies will be towards the smaller size of the source arrays such as that used in the last E&P company's shallow OBC survey conducted in 2001, 440 cubic inches (personal conversation Steve Carter, WesternGeco). The size of the arrays will be smaller than offshore streamer arrays because the near shore producing geologic section is shallower than in offshore Beaufort or Chukchi Planning Areas and by nature shallow OBC vessels and water depths can not support larger streamer type airgun arrays.

For these reasons we believe the potential impact of OBC survey crews for the most likely shallow water OBC arrays should be reduced in any species impact or subsistence hunting analyses.

b) *Technical and local conditions* will inhibit industry's ability to conduct 12 concurrent surveys.
   i. Ice conditions, weather, remoteness of the area, subsistence hunting issues, open water availability, and the cost of implementing mitigation and monitoring requirements do not allow for 12 seismic crews to work concurrently in the Beaufort and Chukchi Seas.
      1. IAGC would summit from our operator's point of view that the season lengths indicated in DPEIS are perhaps overly optimistic. The short operating windows drastically limit the ability of multiple crews to operate simultaneously within the limited areas of interest and are further reduced by variable ice coverage over likely prospects by perhaps 50% of the operating seasons of the Beaufort and Chukchi Sea Planning Areas. For seismic acquisition to occur, the survey area with some safety margin of 10 to 20 km around a 3D survey should remain ice free. To work in truly open water conditions the crew may standby for weeks waiting for open prospects.
      2. In order to operate offshore Alaska, E&P companies and seismic contractors are required to reach agreement with subsistence whale hunters in the form of CAAs which further restricts the available operating window from approximately Prudhoe Bay east to the Canadian border. This translates into seismic vessel operations occurring during only the last two to three weeks of the operating season (generally the last week of September to October 12) for those current and previous lease holdings in the eastern half of the Beaufort Planning Area. Due to the variable chance of successful seismic data acquisition in the Beaufort Sea OCS and the short operating season created by CAA and other conditions, the likelihood of more than three seismic crews operating concurrently in the Beaufort is very minimal.
      3. The cost of implementing mitigation and monitoring requirements will further curtail activity in the planning areas due to our members not wishing to assume the risk to work in these areas at these costs.
   ii. Sonic interference due to seismic surveys operating in close proximity to each other result in poor or unusable data. Therefore, no more than 3 seismic source vessels (and most likely, only 2) would operate concurrently in the Chukchi Sea.
   iii. In the *Beaufort Sea*, the data acquisition season is typically late August through early October, with a probability of 50% that any of the currently held lease areas would not be ice-free for a portion of that timeframe. Due to the short season, the likelihood of more than three, or maximum of four, seismic crews operating in the Beaufort Sea is minimal.
      1. As per the DPEIS "The Beaufort Sea data-acquisition season, because of a later ice-free season, likely would begin in late July/early August and end in early October. Even during this time period, there is no assurance that any given location will be ice-free. The Beaufort Sea season is additionally constrained by the need to get the vessel out of the area before ice conditions trap the vessel in the area." From our contractors experience and historical ice information available, IAGC would suggest that for 3D

streamer surveys in areas offshore previously and currently under lease, the ice-free operating window for the Beaufort Sea is likely from late August until early October with a probability of 50% that any of the currently held lease areas would not be ice free for that season. In 2006 Shell was not able to reach any of its permitted program in the Beaufort Sea.

2. The late July or early August start of acquisition noted in the DPEIS will generally only apply to near shore areas in State of Alaska waters – within 3 miles of the shore or barrier islands. Some OBC activity or shallow streamer 2D activity has historically taken place in late July and through August; however these activities would be curtailed in advance of most all whale migration east of Prudhoe Bay through adherence to CAAs.
3. There are some currently leased blocks in the central Beaufort Sea area from offshore Prudhoe Bay to the western edge of Harrison Bay (Cape Halkett) that could allow seismic activity throughout the season. If operations of seismic vessels in the central Beaufort Sea are risked with the potential for 50% ice coverage, the most probable chance of being in the same space as whale migration that occurs in this area after September 1st, would be 25% of the operating season in any one year.
4. Based on historic leasing, lack of drilling success and current lease holdings in the western Beaufort Sea (Cape Halkett to Pt. Barrow), the likelihood of seismic vessels in this area is less than for the Central and Eastern Beaufort Sea. When the probable time for seismic vessels to operate in the western Beaufort Sea is reduced by the 50% chance of ice coverage and then further reduced by restrictions outlined in CAAs on the month of September during the thrust of the fall whale migration, the likelihood of any seismic vessels encountering bowhead whales in the western Beaufort Sea is reduced significantly.

c) High resolution surveys should not be included with the towed streamer seismic operations in the analysis of impacts because they typically use smaller airgun arrays than 2D or 3D surveys. We have separated 2D/3D vessel activity from ancillary activity notices (high-resolution crews). Therefore the projected estimate of seismic survey activity should be reduced by the number of high resolution surveys estimated each year.

i. IAGC anticipates that after a successful 2008 Chukchi lease sale, the maximum number of high resolution crews in the Arctic in 2009 would be three. Maximum number of surveys to be acquired by each crew due to standby for ice covering lease Exploration plan or Development Exploration Plan drill locations would be 7 per crew. WesternGeco (operating Western Geophysical) acquired a majority of the previous high resolution surveys conducted in the Beaufort and Chukchi Planning Areas and operated shallow resolution crews in the Beaufort and Chukchi Seas during the period from 1984 to 1990. During this period of relatively high oil and gas activity, WesternGeco never acquired more than 7 surveys per crew in any one open water season. In only one of those years did WesternGeco operate two high resolution crews. For these reasons we find the DPEIS estimate of 30 high resolution surveys annually in the Chukchi Planning Area and 12 high resolution surveys annually in the Beaufort Planning Area (I-6) unrealistic. IAGC would contend that the total *maximum* number of high resolution surveys to be collected would be 21 with a realistic *average* of just

under 11 surveys during any one open water season in the combined Chukchi and Beaufort Planning Areas.

Year	Chukchi Sea		Beaufort Sea		Arctic
	Crew Seasons	Total Crews	Crew Seasons	Total Crews	Total Crews
2007	0	0	1	1	1
2008	1	1	1	1	1
2009	2	2	1	1	3
2010	1	1		0	1
2011	1	1	1	1	2
2012	1	1	1	1	1

Table 2. Projected estimate for number of high resolution crews operating in the Chukchi and Beaufort Seas in the years 2007-2012. These crews are limited to high-resolution surveys that would operate with small airgun arrays used for geohazard site clearance for drill locations.

ii. IAGC contends that the energy output from a very localized (drill location) high-resolution survey will have at most a minimal impact to marine mammals. High resolution surveys employ smaller airgun sources than 2D or 3D seismic surveys and therefore, the associated 180 dB / 190 dB exclusion zones are so small that the potential impact to marine mammals are expected be negligible. In Table 3, the mitigation radii for the 190 db, 180 db, and 160 dB calculations for a typical Beaufort Sea or Chukchi Sea airgun array of 3,147 cubic inches derived from empirical data measured during the Chukchi Sea 2006 season are displayed along with the same information for a 1,049 cubic inch array.

	3147 in^3 array	1049 in^3 array
190 dB	440 m	280 m
180 dB	1200 m	960 m
160 dB	8400 m	4700 m

Table 3. Mitigation radii for 190 dB, 180 dB, and 160 dB as measured from a 3147 in^3 array and a 1049 in^3 array (data courtesy of Shell and JASCO Research Ltd.).

JASCO modeled the output of three typical high resolution (shallow hazards) sources that may be utilized in the Beaufort Sea in 2007. Similar array sizes could be expected for high resolution surveys conducted in the Chukchi Sea. All array sizes utilized the same basic test location parameters for the Beaufort Sea modeling (Table 4).

Project:	Shell 2007 shallow hazards sound source verification modeling
Location:	2006 SSV test site
Latitude:	70.168
Longitude:	-142.204
Water depth:	40 m

ARRAY 1

Source:	1x6in^3 airgun array
Source depth:	2.00 m

SPL (90%RMS)	MAX RANGE (km)	95% RANGE (km)
190	0.021	0.021
180	0.070	0.068
170	0.150	0.146
160	0.447	0.424
150	1.012	0.971
140	2.108	1.879
130	4.420	4.003
120	8.757	7.911

ARRAY 2

Source:	3x6in^3 airgun array
Source depth:	2.00 m

SPL (90%RMS)	MAX RANGE (km)	95% RANGE (km)
190	0.047	0.047
180	0.136	0.125
170	0.387	0.306
160	0.901	0.783
150	1.942	1.812
140	3.798	3.511
130	7.754	7.072
120	17.104	13.665

ARRAY 3

Source:	2x10in^3 airgun array
Source depth:	2.25 m

SPL (90%RMS)	MAX RANGE (km)	95% RANGE (km)
190	0.036	0.035
180	0.124	0.117
170	0.313	0.303
160	0.776	0.750
150	1.700	1.501
140	3.359	2.915
130	7.078	5.955
120	13.808	11.662

Table 4. Comparison of 3 high resolution source arrays and the calculated ranges to various SPL (courtesy of Shell and JASCO).

Note that the energy output of the largest high resolution array, Array 3, at the maximum range distance for the 160 dB radii was .776 km compared to a typical Chukchi or Beaufort Sea streamer airgun source of 3,147 cubic inches with a 160 dB radii of 8.4 km from the source.

d) According to our members, most likely there will be relatively few *non-exclusive surveys* in the areas during the period covered by the DPEIS.
    i. No other permits (within MMS, NMFS or FWS) have been filed for 2007 non-exclusive surveys. As the practical deadline for successful processing of any such permit application has long since past, it is known that no non-exclusive survey will be conducted in 2007.
    ii. IAGC has informally polled its members who invest risk capital in non-exclusive surveys (representing all companies in the global marketplace who are realistically in a position to make such an investment) about the prospects for their investing in future non-exclusive surveys. We learned that IAGC members do not expect non-exclusive surveys in the Arctic OCS to be able to attract the finite investment capital available for nonexclusive surveys globally during the period covered by the DPEIS. Opportunities for investment in nonexclusive surveys in other parts of the world are expected to consistently be more financially and economically attractive. The following principle reasons for this assessment were given:
        1. With the 2006 field season experience, the issuance of the draft PEIS earlier this year, and in formal communications with MMS and NMFS personnel, there is improved clarity about the costs and risks of conducting nonexclusive surveys in US Arctic waters. This clarity indicates both will be significantly higher than for nonexclusive surveys in other parts of the world.
            a. Non-exclusive surveys in US Arctic waters will be significantly more expensive than surveys in other parts of the world. The various mitigations and stipulations will add significantly to the costs of such a nonexclusive survey. These costs are on top of the high known cost of mobilizing and demobilizing into and out of this remote area.
            b. The risks of not being able to complete a reasonably sized non-exclusive survey in a given field season in US Arctic waters are considerably higher than for comparably sized non-exclusive survey investments in other parts of the world. In addition to the known operational risks associated with local ice conditions (the possible presence of ice later at the beginning of the season, its earlier return late in the season, or both) and weather, these non-exclusive surveys will bear significant additional risk due to the various mitigations and stipulations which will be imposed on their operations.
        2. Signals from the marketplace are suggesting the opportunities to secure an acceptable return on investment in a non-exclusive survey are lower than hoped due to the limited E&P industry participation in the recent lease sales. For example, with limited E&P companies bidding on leases in the arctic OCS, projections for possible sales of non-exclusive surveys must be adjusted

downward. This necessary downward adjustment suggests there will be higher risk of not garnering sufficient sales of a nonexclusive survey in the US Arctic to enable the investor to recover its investment and secure an adequate return on that investment.

e) The high costs and risks associated with exploration in the Arctic OCS will encourage E&P companies to combine efforts, which will eliminate surveys or reduce their size.
f) The DPEIS states that the Proposed Action includes seismic surveying in the Beaufort and Chukchi Sea OCS "resulting from the annual issuance of *up to* six (6) MMS seismic survey-related geophysical exploration permits or ancillary activity notices in the Chukchi Sea and six (6) seismic survey-related geophysical exploration permits or ancillary activity notices in the Beaufort Sea. Surveys would likely operate concurrently in both planning areas" (DPEIS I-5). However, the DPEIS analysis seems to use the highest possible number of surveys estimated each year. The analysis should not use the highest and most unlikely number of seismic surveys estimated but instead should use a likely average.
g) The area is unique and isolated enough so as to facilitate the development of a niche market for providing streamer seismic services to the E&P industry. This supports only a couple of contractors gaining advantage by establishing themselves as serving the niche market well. This dampens expectations for more competition among contractors, which reduces the likelihood of upward pressure on the numbers of surveys in a given year covered by the DPEIS.

3. Passive acoustic monitoring ("PAM") as a proposed method for monitoring the proposed 120 dB and 160 dB exclusion zones is not feasible to implement

PAM is not a viable monitoring technology for the large exclusion zones associated with the 120 dB and 160 dB isopleths as suggested in some sections of the DPEIS (DPEIS III-164). Indeed, NMFS and MMS recognize the limitations of PAM technology as demonstrated by the statement in the DPEIS (IV-9) referring to the use of PAM during the 2006 open water season "Questions were then raised regarding the effectiveness of this monitoring technology...Until the time that information is received, it is difficult to assess the feasibility and effectiveness of using PAM for Arctic open water surveys..."

Based on Industry experience and research conducted by academics (e.g. PAMGUARD), the following have been identified as commonly recognized limitations of current PAM systems:

- Not all cetaceans vocalize all of the time and therefore cannot be reliably detected with a passive system.
- The actual range of the animal is determined by either:
    - Estimates of vocalization level and sound transmission loss models. Errors in either can affect the observed or detected range of the animal.
    - Graphical position fix using 'successive' vocalization detections
- The majority of currently available systems are single streamer and have limited bearing resolution capabilities in the in-line direction (relative to streamer orientation).
- The current system capability for species recognition and auto-detection is limited and requires operator interpretation.

In recent years, recognizing the potential benefits offered by PAM technology, some Industry members have responded by introducing the use of PAM systems for seismic operations in various sensitive areas; for example offshore UK, Australia, Brazil, Canada, US and West Africa. These activities have raised the following issues related to the use of acoustic monitoring method with seismic surveys:

- Deployment platform (seismic/guard vessel). Past experience comes from deployments from both seismic and guard vessels.
    - Guard vessel
        - Fast and simple deployment/recovery.
        - Relatively low acoustic noise environment (compared to larger seismic vessel).
        - Guard vessels have other dedicated safety operational duties.
        - In order to minimize the significant risk to life and equipment from collision, guard vessels do not operate in close proximity to a seismic vessel during modern multi-streamer operations.
        - As guard vessels are commonly positioned some distance away from the source, they are not ideally located to monitor activity in a zone around the source.
    - Seismic vessel
        - Limited working space on back deck.
        - Slow, complicated deployment/recovery due to proximity to seismic equipment.
        - Interference with maintenance activities during line change.
        - No positional control of PAM hardware once deployed in-sea, which is problematic when in close proximity to expensive in-sea seismic equipment.
        - Relatively high acoustic noise environment (compared to smaller guard vessel).
- Communications between PAM, existing visual efforts and seismic operation are important for overall integration but are more difficult if PAM is deployed from a vessel other than the main seismic vessel.
- System detection range is dependent on acoustic background noise levels.
- As with visual monitoring methods, procedures are required in order to integrate the use of PAM systems with the overall seismic operation.

Although deploying a single PAM streamer is relatively straight forward, particularly during 2D seismic operations, it becomes more difficult to deploy a streamer that does not have positional control in close proximity to seismic streamers during 3D multi-streamer seismic operations. In these operations, without positional control there is significant increased risk of loss or damage to either the PAM system or seismic in-sea equipment. Should a PAM system be lost or damaged, it would not be available for a time during a survey. This raises regulatory and contractual issues should the use of PAM become a mandatory requirement.

PAM is not only a new technology; it is also an emerging commercial market. There are currently a number of PAM systems commercially available worldwide. The majority are based upon software/hardware systems that were used for the original trials several years ago. However, little or no standardization exists for either the software or hardware, which makes it difficult to establish a benchmark with which to measure the effectiveness of PAM systems. Availability of experienced PAM operators is also an issue; with a broad combination of skills being required in the fields of marine mammal biology, hardware/software engineering and seismic operations (particularly with regard to safety) in order to optimize the use of PAM with seismic operations.

The cost related to the use of a typical PAM system and one operator is currently in the order of $1430-1640/day or greater (mobilization/demobilization costs are additional). Seismic vessels are in operation 24 hours a day, therefore PAM will be required to be in operation prior to the start of airguns at various times throughout the day (night-time operation of PAM is often quoted as a significant advantage over conventional day-time visual monitoring). At least two trained PAM operators are required, increasing the daily cost to over $2500. With a typical seismic survey lasting between 30-90 days, the cost related to PAM will be $75,000+ or greater when mobilization/demobilization and possible delays due to weather are also considered.

There are no 'true' 3D acoustic detection systems commercially available today. Although PAM streamers are able to detect sounds from all directions by using non-directional hydrophones, current available systems provide a vector range estimate to a detection and are not able to distinguish between horizontal or vertical position. There are many unknowns related to the range estimates provided by current PAM software systems. Providing these errors associated with a given range/bearing to the operator may aid the interpretation of true or false detections.

PAM software tools are currently available as separate freeware and proprietary modules, which provide various levels of integration between detection and logging systems. Industry is proactively supporting research initiatives for the development of standardized freeware software (PAMGUARD) that is capable of interfacing with all currently available systems with software support available for operating problems. This will allow research to focus on enhancing the software capabilities to recognize and track animal movement rather than developing interfaces to the individual systems and to allow standardized operator training. A 3D detection methodology is also being developed with ongoing industry financial and technical support.

Whilst stationary PAM systems may have lower noise levels than a towed system, there are a number of issues, which may make their implementation problematic/expensive:

- Do stationary PAM systems involve the use of surface buoys/transmitters, which may be a hazard to shipping?
- If the objective is to determine the presence of marine mammals in the vicinity of the source array, then range limitations may impair the system's detection ability when the vessel is some distance from the PAM receiver(s).

- Multiple receiver locations are possible but this increases both complexity of the system and cost.

4. Bowhead whales do not routinely deflect 20 km from seismic operations

The categorical statement in the DPEIS that bowhead whales routinely deflect by 20 kilometers is derived from a singular study accomplished in 1999 and "traditional knowledge indicate that during the fall migration, most bowhead whales avoid an area around a seismic vessel operating in nearshore waters by a radius of about 20-30 km and may begin avoidance at greater distances" (II-16). In many instances, the DPEIS states that it is difficult to ascertain why the bowhead whales react at any given time,"Response is variable, even to a particular noise source, and the reasons for this variability are not fully understood" (II-16).

Below is an excerpt from the 2001 report Marine Mammals and Acoustical Monitoring of Anderson, Exploration Limited's Open-water Seismic Program in the Southeastern Beaufort Sea by LGL Environmental Research Associates and JASCO Research Ltd.

> "In total there were 280 bowheads observed from the Geco Snapper. Sighting rates during daylight hours were higher when no guns were operating than during periods with airgun operations. Considering the 4-week period (23 August - 19 September) when bowheads were most abundant in the study area, the bowhead sighting rate during "no guns" periods (0.85 bowheads/h) was about twice as high as that recorded during line seismic periods (0.40 bowheads/h) or all seismic operations combined (0.44 bowheads/h). Average sighting distances from the vessel were significantly ($P < 0.001$) lower during no guns (mean radial distance 1368 m) vs. line seismic periods (mean radial distance 1957 m). The observed difference in sighting rates and the significant difference in sighting distances suggests that bowheads did avoid close approach to the area of seismic operations. However, the still substantial number of sightings during seismic periods and the relatively small (600 m) but significant difference in sighting distances suggests that the avoidance was localized and relatively small in nature. At a minimum, the distance by which bowheads avoided seismic operations was on the order of 600 m greater than the average distance by which they avoided general vessel operations. The lower sighting rates recorded during seismic operations suggest that some bowheads avoided the seismic operations by larger distances and thereby stayed out of visual range of the marine mammal observers on the Snapper."

Furthermore, contrary to the information provided in the DPEIS, the study indicates that some whales actually swam towards the seismic vessel. On page 4-29 of the report, Movement Type With vs. Without Seismic:

> "We expected that, if whales were negatively influenced by seismic activity, they would tend to "swim away" or "flee" from the vessel, and that this effect would be most pronounced closer to the vessel (within 1000 m). In fact, a higher percentage of bowheads swam away from the vessel during non-seismic periods (60.9% of 133) than during periods when airguns were firing (50.4% of 129), considering all distances combined (Fig. 4.8A). The same trend was observed beyond the 1000 m radius (Fig. 4.8B,C) but the opposite trend was observed

within the safety radius. However, relatively few (n = 7) bowheads were observed within the safety radius when the airguns were active. Only one bowhead was classified as milling and no bowheads were seen "fleeing". Overall, more whales were observed "swimming towards" and "swimming parallel" to the vessel during periods of seismic vs. non-seismic periods."

"Overall, there was no indication that the likelihood for a bowhead to "swim away" was higher during seismic operations insofar as could be determined by visual observations from the seismic vessel. Overall, a higher percentage of bowheads were observed swimming away from the vessel during non-seismic periods than during periods when the array was firing. These results do not support the hypothesis that a higher proportion of bowheads exposed to airgun operations would move away from the vessel vs. bowheads sighted during periods with no airguns operating."

During previous acquisition in the Beaufort Sea where seismic companies operated under area-wide closures and worked with the subsistence hunters, the chances for a seismic vessel to encounter whales may not have been as great as in the 2001 study, but there are some historical accounts of whale sightings from seismic companies.

Historical experience from Western Geophysical – Steve Carter
On observations from vessels:

"During the years when seismic crews operated under stipulations that allowed acquisition until whales where sighted within 7 miles of the seismic vessels, there were multiple sightings from operating seismic vessels. These sightings, although not frequent, did indicate that some whales were seen within 20 kilometers of an operating seismic vessel. These records of whale encounters were submitted to the MMS."

On whale habitation of the same space as seismic surveys:

"In 1987 Western Geophysical was the operator of the Oil Whalers Cooperative Agreement between the seismic companies/oil industry and the whaling communities of the Beaufort Sea Coast. Under MMS permit number 87-17 Western Geophysical acquired data on behalf of Union directly adjacent to the east, west and north sides of Cross Island in late September and early October. As this was prime hunting time for the village of Nuiqsut, Western Geophysical requested permission from the whaling captains to work around Cross Island. Thomas Napageak gave permission to acquire seismic data in the evening hours but to cease operations during the day. After the second or third nighttime period, the *Arctic Star* stopped operations just before daylight. The weather was clam and the whaling crews of Nuiqsut successfully took a bowhead whale within 5 hours from the last seismic shot. At the request of Thomas Napageak and after WG secured permission from Arco, the whale was towed to the West Dock. This is recounted from Steve Carter of WesternGeco but the dates and times could be checked from the written records of the Oil Whalers Communication Center and crossed checked with the observer logs from the acquisition lines from the MMS data base of 2D program acquired in the Arctic."

When multiple observations for many years of study are combined with historical knowledge, it seems difficult to accept the categorical statement that bowhead whales are routinely deflected 20 kilometers from seismic operations and will not habitat the same spot for 12 to 24 hours when there have clearly been occasions when the opposite of those DPEIS statements have been observed.

6. Oil and gas is important to our country, and seismic surveys are critical to finding and producing oil and gas. There is a positive environmental aspect of seismic surveys which is not taken into account in the DPEIS, and which should be.

The demand for hydrocarbons worldwide is rising at a faster rate than hydrocarbons are being found and produced. MMS recognized this fact in its 2005 Request for Comments to its draft 5 Year Leasing Plan for 2007 - 2012, noting that upwards of a 60% increase in worldwide oil production will be needed to meet growing energy demand over the next 25 years, and natural gas demand is expected to double. The U.S. faces competition for energy supplies from growing nations such as China and India. This ever-tightening supply and demand balance only leads to upward pressure on the price of oil and gas, which we are already experiencing, with prices currently flirting with all time highs relative to the last 30 years.

The cost of energy is a basic need for American families. Lower energy bills will leave more money available in the family budget for food, clothing, housing, education, etc. Affordable energy is critical to our country's economy and to the human condition.

And with political and religious conflicts in hydrocarbon producing countries and regions, there is no assurance of the ability or desire to export hydrocarbons to the U.S. We do not see alternative energy solutions readily available. Unless supply can be increased, prices will continue to rise and our economic security will continue to be vulnerable.

Geophysical and sub-surface data such as seismic data, well log data, and gravity/magnetic data are the primary tools used in oil and gas exploration and, as such, are critical to the successful discovery and efficient development and production of hydrocarbons.

Seismic data is one of the very first tools used in the exploration process and, without modern seismic data, exploration for new hydrocarbon prospects would be far less likely to occur.

The technology of seismic data acquisition and its processing has made huge advances over the last ten years. These advances allow us today to use the data to create high resolution images of the subsurface to great depths. As a result of these and other technical advances, the industry is far more successful in finding hydrocarbons than ever before. (See Figure 1)

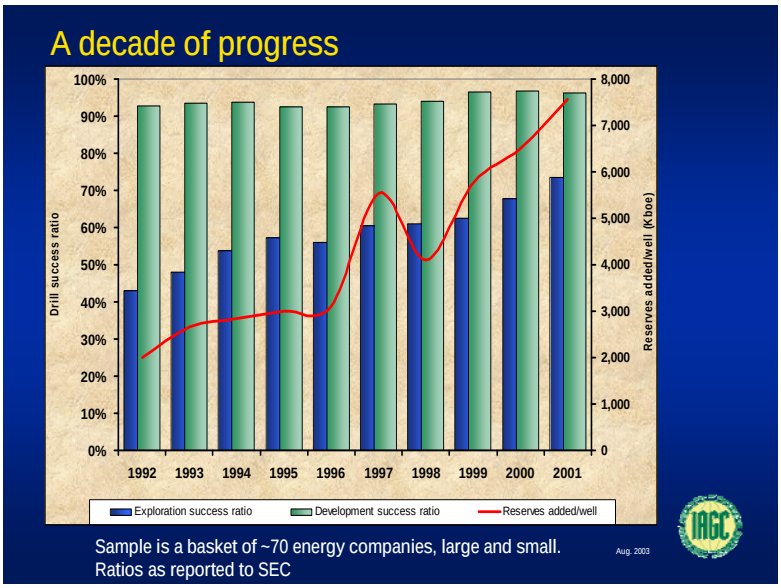


Figure 1.

And there are environmental benefits to the use of seismic data in oil and gas exploration and production. Seismic imaging has always condemned far more area as not being prospective (for oil and gas accumulation). With today's modern imaging capabilities, explorationists have a much greater ability to discern probable accumulations, thereby being much more able to avoid drilling a dry hole than ever before (i.e. to avoid undertaking the drilling operation in the first place). And with modern data, the likelihood of finding meaningful oil and gas accumulations and the ability to get the maximum possible amount of it out of the ground (the benefits) are far greater. Therefore the environmental cost of the E&P operation provides far greater benefit. These environmental benefits should be taken into account in the DPEIS.