Revised Chukchi Sea Exploration Plan Errata

(In response to a request for additional information from the Bureau of Ocean Energy Management dated October 28, 2011.)

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Shell Exploration & Production

November 4, 2011

U.S Department of the Interior
Bureau of Ocean Energy Management
Alaska Region
Attn: David Johnston
3801 Centerpoint Drive, Suite 500
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Shell
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RE: Responses to requests for additional information, dated October 28, 2011, for the revised Chukchi Sea exploration plan

Dear Mr. Johnston:

On October 28, 2011 Shell Gulf of Mexico Inc. (Shell) received a second request for additional information (RFAI) regarding the revised Chukchi Sea exploration plan (a RFAI was received by Shell on August 17, 2011; Shell responded to these RFAI on September 12, 2011).

To facilitate the agency's continuing review of the revised Chukchi exploration plan, Shell hereby submits responses to 15 of the 17 RFAIs. Responses to RFAI's Nos. 2 and 4 through 17 are attached. Responses to the remaining RFAIs (Nos. 1 and 3) will be delivered to the agency shortly.

If there are any questions or comments, please contact me at (907) 646-7112 or at Susan.Childs@shell.com or Pauline Ruddy at (907) 771-7243 or e-mail Pauline.Ruddy@shell.com.

Sincerely,

Susan Childs

Susan Childs
AK Venture Support Integrator, Manager

Attachments: Table of Responses to RFAI and RFAI documents

Cc:
Project File
Administrative File

	BOEM AKR 30 CFR 550.231 - 15-day Review of the Shell Gulf of Mexico Inc. Revised Chukchi Sea Exploration Plan-2nd Round of RFAIs					
Topic	**RFAI**	**Section**	**Page**	**Comment**	**Response**	**Attachment**
Air Quality	1	Exploration Plan (EP) Section 7.0	7-1	Please provide the following additonal information pertaining to the air emissions and air quality. The EP is sufficient in providing the filing and approval status of permits (in this case the air permit) that must be obtained to conduct the EP activities [30 CFR 550.213(a)]. However, CAA permitting captures only offshore stationary source emissions. The scope of NEPA analysis is larger. This section is missing data that reflects total emissions generated from all sources, regardless of whether the sources are stationary or mobile, including aircraft, marine vessels (including all propulsion engines), onshore mobile vehicles, and onshore stationary sources (if any). Therefore, the required information to account for total projected emissions, how emissions were calculated, and how impacts were modeled, is not complete. This comment applies throughout the EP and EIA. Please revise all air quality tables to include items for offshore stationary sources, offshore mobile sources, aircraft, and onshore mobile sources and onshore stationary sources (if any). This would not be limited to sources evaluated in the air permit.		
	2	EP 7.0 a)	7-3, 4	Please provide the following documents: Discoverer_EI_20110602_D.xlx Discoverer_EI_20110923_BOEMRE.xlx The EP states that these spreadsheets were provided to BOEM. However, they were not included with the EP or provided under separate cover.	See the BOEMRE Tables tag at the bottom of the page in the attached excel spreadsheet document (CD Attachment RFAI 2 and 4). The reference to file Discoverer_EI_20110923_BOEMRE.xlx (Table 7.a-2 Footnote 8; Table 7.a-3 Footnote 9; Table 7.a-4 Footnote 4) is replaced by reference to file Discoverer_EI_20110602_D.xls. Note: In Table 7.a-2, the NOx value for the OSR workboats is incorrect. The vaue should be 10 lb/hr, not 210 lb/hr.	Yes
	3	Environmental Impact Assessment (EIA) Section 3.1.3	3-6	Please provide data on emission sources and inventories of emission sources onshore, particularly at Barrow, Wainwright, and Point Lay.		
	4	EIA 2.8	2-21	In regard to Table 2.8-1, please: Provide the source of the data presented Confirm whether the emissions estimated in Table 2.8-1 are for one drilling year. Provide additional data to reflect the entire multi year project, including direct and indirect emissions.	Table 2.8.1 is a summary of Table 7.a-3. The source of the data is listed as "Discoverer_EI_20110923_BOEMRE.xlx" and is provide here as noted in RFAI 2 (CD Attachment RFAI 2 and 4). The emissions estimated in Table 2.8-1 in the EIA are for one drilling year. See Table 7.a-4 in the EP for emissions for the Duration of Exploration Drilling Activities.	Yes
	5	EIA 4.1.1	4-2	Please clarify the assumptions used in calculating "maximum" emissions (e.g., was modeling done without applying BACT controls?)	Impacts were modeled using "maximum allowable" emissions, which include BACT controls. "Maximum allowable" emissions are those calculated including all BACT controls and Owner Requested Restrictions for emission units and vessel use.	No
	6	EP 7.0 a)	7-2	This section states "The emissions for the associated vessels are estimated at 150 percent of expected use." Please provide an explanation for this method - if the emissions are calculated as potential to emit (PTE), it is unclear where the 150 percent applies.	Shell has used very conservative assumptions in calculating it's air emissions and fully expects that actual air emissions will be well below those presented in Section 7 of the EP. Regarding this conservatism, Shell has chosen to have a 50 percent margin of uncertainty in its emission allowance over expected associated vessel use to account for widely varying ice and other unknown conditions.	No
	7	EP 7.0 a)	7-3	In all tables showing emission totals, please provide emissions from both the transport (Tr) and dynamic-positioning (DP) modes.	The seasonal resupply emissions from both transport (Tr) and dynamic positioning (DP) are included in Table 7.a-3. Hourly emissions for Resupply transport are not provide in Table 7.a-2 because OSV transport and OSV dynamic-positioning activities cannot occur simultaneously. Therefore, since DP mode emissions are greater (based on 4,800 gal/event) these emissions are shown to represent the maximum hourly emissions from the Resupply vessel.	No

	BOEM AKR 30 CFR 550.231 - 15-day Review of the Shell Gulf of Mexico Inc. Revised Chukchi Sea Exploration Plan-2nd Round of RFAIs					
Topic	**RFAI**	**Section**	**Page**	**Comment**	**Response**	**Attachment**
	8	EP 1.0	1-2	Please describe any increase in emissions that may occur in the event that a well is started, temporarily abandoned, and later finished in the same drilling season. Have such operations been built into the air quality analysis that captures emissions from such an event? If not, please incorporate into all relevant tables and sections.	There is no increase in emissions that may occur in the event that a well is started, temporarily abandoned, and later finished in the same drilling season. All such operations have been included into the 120 days of a drilling season.	No
	9	EIA 3.1.3	3-8	Please clarify the meaning of the word "Period" in the second row of Table 3.1.3-2 (i.e., whether these are the maximum values recorded during the quarter, the 2nd highest, etc.). Also, please clarify whether the values relect the highest concentration of each quarter, or something else.	"Period" in Table 3.1.3-2 first column, refers to the monitoring period, i.e. 1st quarter 2009, 2nd quarter 2009. In addition, these values are noted as period averages.	No
Economy	10	EIA 4.1.11	4-125	Please provide separate discussions of anticipated economic impacts (employment, income, and revenues) from exploration activities alone. Current discussion of potential impacts that may occur over a 50-year timeframe is not sufficient to gauge direct impacts from the proposed action.	The primary purpose of exploration drilling is to make new discoveries that result in oil and gas development and production. As such, the potential economic benefits from development and production over a 50-year period described in this section are, in fact, anticipated effects resulting from the exploration activities described in the EP. This discussion is appropriately titled "*Indirect* Impact on [Employment/Local Government Revenue/State Government Revenue/Federal Government Revenue] from the Proposed Exploration Drilling Program" (emphasis added). A separate discussion of anticipated *direct* economic impacts from the proposed exploration drilling program is provided in the immediately preceding section titled "Direct Impact on Employment from the Proposed Exploration Drilling Program." In this section Shell discusses hiring North Slope residents for the Subsistence Advisor (SA) Program (one SA per village), the communications and Call Center program (one or two residents from each village), and the marine Mammal Observer (MMO) program. The following additional information may be added to this MMO section: Nearly 140 MMO positions annually are expected to support the exploration activities described in the EP. In addition, Shell's exploration activities will require a mobilization of drillships and support vessels that generates significant new employment and economic activity in Alaska and throughout the United States. For example, preparations alone for planned and approved drilling activity in 2010 generated hundreds of millions of dollars of direct spending by Shell and hundreds of new jobs despite cancellation prior to full mobilization. Currently, approximately 400 people and over 60 contractors are working to upgrade the Kulluk for the exploration activities proposed in this exploration plan. Approximately 600 people are working to build a new ice-class anchor handling vessel destined for use in the exploration activities proposed in this exploration plan. A study by Northern Economics and the Institute of Social and Economic Research at the University of Alaska estimated nearly 1,000 new jobs would be created in the first two years of exploration in the Chukchi Sea along with nearly $2 million of new revenue for the North Slope Borough in the third year (mostly from property tax) (NEI, 2011). These estimates of economic benefits increase in subsequent years of exploration, reaching over 5,000 new jobs annually by the fourth year of exploration activity, approximately 10,000 new jobs annually by the time the development phase begins, over $14 million of new revenue for the North Slope Borough from exploration activities alone, and over $1.3 billion in wages for direct employment in Alaska for exploration activities alone.	No
Water	11	EP Table 6.a-1-6	6-2	Please provide the time unit over which these rates are determined. If it is per operating season, state the number of days used to define the season. This comment applies to all 6 tables on projected wastes and discharge/disposal on the following pages.	The Projected Generated Wastes, Disposal, and Ocean Discharges tables 6.a-1 through -6 pertain to the individual six proposed drill sites: Burger A, F, J, R, S, and V. It is anticipated that each well will take 32 days to drill.	No
	12	EP 6.0 c)	6-16	This section estimates 54 bbl of BOP fluid discharged per well. Please describe how this estimate would change in the event that a well takes multiple seasons to drill (if at all).	In the event that the drilling of a well is stopped and resumed during a second drilling season, one additional BOP test would need to be done. This test would be done when the BOP is connected at the beginning of the 2nd drilling season.	No

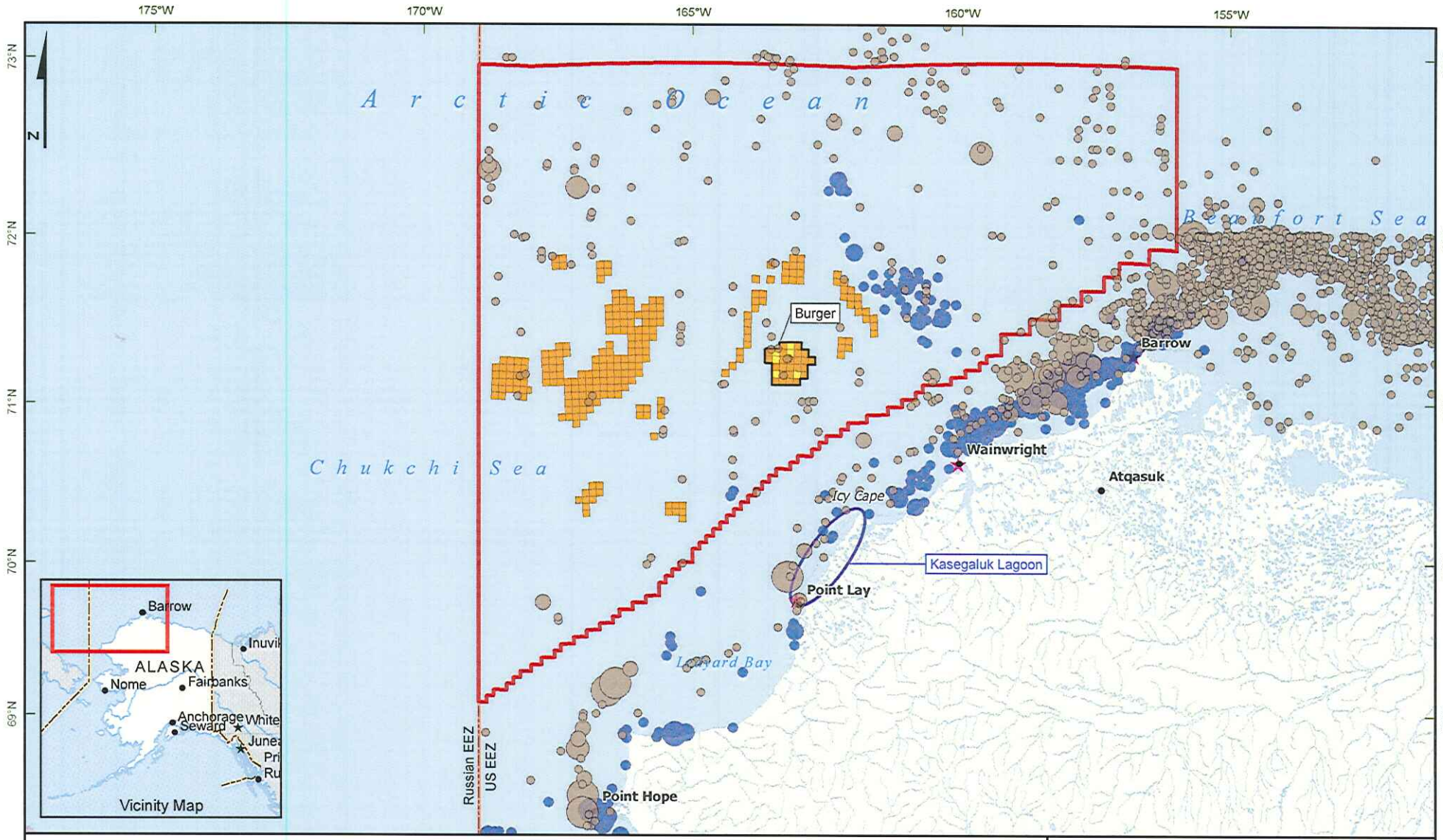
	BOEM AKR 30 CFR 550.231 - 15-day Review of the Shell Gulf of Mexico Inc. Revised Chukchi Sea Exploration Plan-2nd Round of RFAIs					
Topic	**RFAI**	**Section**	**Page**	**Comment**	**Response**	**Attachment**
Quality	13	EP 6.0 d), g)	6-17	Please provide the expected average salinity (and dissolved ion concentrations) of the brine water discharge, as well as modeling information for brine water discharge.	When in use, the flow rate through the desalinator is 108 gallons of seawater per minute. Of this 108 gallons, 29.3 are extracted as freshwater and the remaining 78.7 gallons is returned to the ocean through a disposal caisson. This amounts to approximately 37% increase in salinity and other ion concentrations. However, there are many other discharges that are disposed of through the disposal caisson (sanitary waste, domestic waste, drilling fluids, deck drainage, uncontaminated bilge and ballast water) so the increased salintiy due to desalination (estimated at 3,875 bbl per well) is heavily diluted by mixing with the other discharges (total estimated at 17,078 bbl per well) before entering the ocean.	No
Fish	14	EIA 3.5.1	3-33	Please identify the types of demersal fish assemblages associated with the designations "I" through "VI" referenced in Figure 3.5.1.2.	As is labeled in the legend for Figure 3.5.1-2, see Table 3.5.1-2 for the demersal fish species within each assemblage.	No
Proposed Action	15	EIA 2.2	2-5	Please provide an estimate for the number of trips that the shallow water landing craft may make from the drill site to Wainwright and return.	Wainwright will be used on a contingency basis when travel to or from Barrow and the drillship is not possible. In addition, the landing craft, if used out of Wainwright, will not transit to the drillship. It will transit to an offshore supply vessel and offload its cargo. On a contingency basis, it is estimated that there may be 10 transits to an offshore supply vessel.	No
Marine Mammals	16	EIA 3.7.3	3-79	Please clarify apparent inconsistency between the figure caption (which references beluga whales and gray whales) and the legend (which references beluga whales and ringed seals)	The figure 3.7.3-1 incorrectly listed the ringed seal in the legend. The blue dots in the figure represent the total number counted in sightings for gray whales. The figure has been corrected and is attached (Attachment RFAI 16).	Yes
Sound	17	EIA 3.7	3-72	Please provide a reference for the underwater acoustic monitoring conducted from 2007-2009.	See attached document for reference list (Attachment RFAI 17).	Yes

RFAI 2 and 4

See included CD


Shell GOM Inc.
Revised Chukchi Sea EP
Nov. 4, 2011
RFAI Responses 2+4

RFAI 16



Beluga Whale

Total number counted in sighting:

- 1 - 25
- 26 - 50
- 51 - 75
- 76 - 100

Gray Whale

Total number counted in sighting:

- 1 - 5
- 6 - 10
- 11 or more

- Village
- Temporary Shorebase Location
- Prospect Area
- Exploration Drilling Program Block
- Shell OCS Lease Blocks
- Lease Sale 193 Area

Sighting data obtained from the Mineral Management Service Bowhead Whale Aerial Survey Project Historical Database, 1979 - 2010.
Mercator Projection:Standard Latitude 71 Deg N

SHELL

BELUGA WHALE AND GRAY WHALE SIGHTINGS 1979 - 2007

ENVIRONMENTAL IMPACT ANALYSIS
REVISED CHUKCHI SEA EXPLORATION PLAN

SCALE: 0 20 40 80 Miles

FIGURE: 3.7.3-1

Shell AV GIS/11-01-2011/01-07-023.mxd

RFAI 17

Delarue, J., B. Martin, X. Mouy, J. MacDonnell, D. Hannay, N.E. Chorney, and J. Vallarta. 2011. Chukchi Sea joint acoustic monitoring program. (Chapter 5) In: Funk., D.W. C.M. Reiser, D.S. Ireland, R. Rodrigues, and W.R. Koski (eds.). 2011. Joint Monitoring Program in the Chukchi and Beaufort seas, 2006-2010. LGL Alaska Draft Report P1213-1, Report from LGL Alaska Research Associates, Inc., LGL Ltd., Greeneridge Sciences, Inc., and JASCO Research, Ltd., for Shell Offshore, Inc. and Other Industry Contributors, and National Marine Fisheries Service, U.S. Fish and Wildlife Service. 600p. plus Appendices.

Martin, B., J. Delarue, X. Mouy, and D. Hannay. 2010. Chukchi Sea acoustic monitoring program. (Chapter 5) In: Funk, D. W., R. Rodrigues, D. S. Ireland, C. M. Reiser and W. R. Koski (eds.). 2011. Joint Monitoring Program in the Chukchi and Beaufort Seas, Open Water Seasons 2006–2009. LGL Alaska Rep. P1050-1. Rep. from LGL Alaska Research Associates Inc., Anchorage, AK, LGL Ltd., JASCO Research Ltd. and Greeneridge Sciences, Inc. for Shell Offshore Inc, Houston, TX, ConocoPhillips Alaska Inc., Anchorage, AK and Nat. Mar. Fish. Serv., Silver Spring, MD. and U.S. Fish and Wildlife Service. 499 p. plus appendices.

Martin, B., D. Hannay, C. Whitt, X. Mouy, and R. Bohan. 2010. Chukchi Sea acoustic monitoring program. (Chapter 5) In: Funk, D. W., D. S. Ireland, R. Rodrigues, and W. R. Koski (eds.). 2010. Joint Monitoring Program in the Chukchi and Beaufort Seas, Open Water Seasons 2006–2008. LGL Alaska Rep. P1050-1. Rep. from LGL Alaska Research Associates Inc., Anchorage, AK, LGL Ltd., JASCO Research Ltd. and Greeneridge Sciences, Inc. for Shell Offshore Inc, Houston, TX, ConocoPhillips Alaska Inc., Anchorage, AK and Nat. Mar. Fish. Serv., Silver Spring, MD. and U.S. Fish and Wildlife Service. 499 p. plus appendices.

Martin, B., D. Hannay, M. Laurinolli, C. Whitt, X. Mouy, and R. Bohan. 2009. Chukchi Sea acoustic monitoring program. (Chapter 5) In: Ireland D. S., D. W. Funk, R. Rodrigues, and W. R. Koski (eds.). 2008. Joint Monitoring Program in the Chukchi and Beaufort Seas, July-November 2007. LGL Alaska Rep. P971-1. Rep. from LGL Alaska Research Associates Inc., Anchorage, AK, LGL Ltd., and JASCO Research Ltd. and Greeneridge Sciences, Inc. for Shell Offshore Inc, Houston, TX, ConocoPhillips Alaska Inc., Anchorage, AK and Nat. Mar. Fish. Serv.,Silver Spring, MD. and U.S. Fish and Wildlife Service. 445 p. plus appendices.

Shell Exploration & Production

November 9, 2011

U.S Department of the Interior
Bureau of Ocean Energy Management
Alaska Outer Continental Shelf Region
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Internet http://www.shell.com

RE: 2nd Set of Responses to Requests for Additional Information, dated October 28, 2011, for the revised Chukchi Sea Exploration Plan

Dear Mr. Johnston:

On October 28, 2011 Shell Gulf of Mexico Inc. (Shell) received a second request for additional information (RFAI) from the Bureau of Ocean Energy Management (BOEM) containing 17 RFAIs regarding the revised Chukchi Sea Exploration Plan (EP). On November 4, 2011, Shell provided responses to 15 of 17 RFAIs. This letter responds to the remaining two RFAIs (#1 and #3), plus responds to BOEM's clarification request of these RFAIs also dated November 4, 2011.

In BOEM's clarification request of November 4, 2011, BOEM suggests that, in the context of communications between the agency and Shell, Shell and Air Sciences agreed to conduct air emission dispersion analysis modeling, and then submit same to BOEM. Shell apologizes if there was some confusion on this issue. Based on the assumptions below, the total non-OCS source emissions from the marine vessels are significantly less than the permitted OCS source emissions, and those emissions will be dispersed at lower concentrations over a wider area than the emissions evaluated for the permitted OCS source. Therefore, it is Shell's view that such modeling is not necessary to assess the impacts of any of the additional, de minimis air emissions from those sources that are the subject of this RFAI, nor does Shell believe that such analysis would add materially to the existing data set related to project air emissions or would alter the conclusion in the Environmental Impact Assessment (EIA) for the revised Chukchi Sea EP that there will be no significant environmental impacts resulting from project related air emissions.

Shell's response to BOEM RFAIs, #1 and #3 from October 28th follows the assumptions below. Our response should be used for the purpose of assessing air emissions beyond those specifically evaluated in the context of the permit review for the OCS source (e.g., EPA air permit review) and in the Chukchi EIA, and is based on the following assumptions:

Vessels

- Figure 2.3-1 of the revised Chukchi Sea Environmental Impact Analysis (EIA; or Figure 13.e-1 of the revised Chukchi Sea EP) shows the approximate marine vessel route proposed for mobilization and demobilization to the Burger Prospect.

- Marine vessels (see Table 2.2-4 of the revised Chukchi Sea EIA), other than the offshore supply vessels (OSVs), the oil spill response tanker (OST), and the shallow landing water craft, would complete only one round-trip traverse (approximately 300 miles per round-trip) of the marine vessel route shown in Figure 2.3-1, and remain stationary for the remainder of the drilling season.
- OSVs (there are two proposed; see Table 2.2-4 of the revised Chukchi Sea EIA) would conduct 17 round-trips, divided equally between the two OSVs.
- The OST will complete one round trip of the marine vessel route shown in the revised Chukchi Sea EIA (Figure 2.3-1), and in addition will transit beyond the Burger Prospect to a location more central between Shell's proposed Camden Bay and Chukchi Sea exploration drilling programs, outside of the Chukchi Sea Program area where it will remain for the exploration drilling season.

As described in Shell's Chukchi Sea EIA (Section 4.1.1 – Direct and Indirect Impacts, Air Quality) the emissions from the project OCS source (see Section 7; revised Chukchi Sea EP, and Section 2.8; Chukchi Sea EIA) will have a negligible effect on air quality due to the low quantity of emissions and the distance over which dispersion will occur. With regard to impacts to North Slope villages, any additional emissions from non-OCS sources, spread over a much greater area (over 300 miles of round-trip travel distances versus the OCS source diameter of 50 miles) will add a trivial impact to the OCS source impacts and the combined impacts will also be negligible.

Shell's response to the remainder of BOEM's clarification request letter on November 4th follows.

Aircraft

- Offshore Helicopter Transport
  - Assume use of the Sikorsky S-92 aircraft or Eurocopter EC-225 helicopter, as described in Table 13.a-3 of the revised Chukchi Sea EP and Table 2.2-4 of the Chukchi Sea EIA.
  - Assume taxi out time of 10 minutes, taxi in time of 7 minutes with no auxiliary power unit (APU).
  - Assume use of a gasoline fuel truck (10 minutes) only. The service truck will be the van assumed under Surface Vehicles.
  - Number of landing and take offs (LTOs) assumed is sufficient for estimating purposes.
  - Anticipated number of search and rescue training flights is 3-4 per week, with an estimated duration of 2.5 hours per flight.

- Fixed-Wing Aircraft
  - Assume taxi out time of 10 minutes, taxi in time of 7 minutes with no APU.
  - Assume use of a gasoline fuel truck (10 minutes) only. The service truck will be the van assumed under Surface Vehicles.
  - There are no aircraft flights associated with sound source surveys.
  - There are no "marine mammal strike prevention" flights. Marine mammal observer (MMO) flights are planned daily in a de Havilland Twin Otter (DHC-6) aircraft daily along a saw-tooth pattern along the Chukchi Sea coastline. However, none of these flights will reach the boundary of the Chukchi Sea

Program area shown in Figure 1, Volume I of the 2011 Final Supplemental Environmental Impact Statement for the Chukchi Sea Lease Sale 193 Planning Area.

- None of the US Coast Guard (USCG) flights referenced in the section entitled Aircraft on page 3-173 of the EIA would be conducted in support of Shell's proposed activities. Available information on the USCG flights was provided in the subject section of the EIA to give the reader an idea of other uses of the Chukchi Sea as is routine done in NEPA style documents. Based on BOEM's clarification letter (e.g., boundary of Chukchi Sea Program area), Shell assumes that emissions from these fixed-wing flights are not required.

Surface Vehicles

- Assumptions in BOEM's clarification letter on equipment, frequency and distance of vehicle trips are sufficient for estimating purposes; however, considering safety of road conditions and the brevity of trips, Shell driving policies will not allow for a vehicle speed as rapid as 35 miles per hour as estimated in BOEM's letter.

If there are any questions or comments, please contact me at (907) 646-7112 or at Susan.Childs@shell.com or Pauline Ruddy at (907) 771-7243 or e-mail Pauline.Ruddy@shell.com.

Sincerely,

Susan Childs
AK Venture Support Integrator, Manager

Shell Exploration & Production

November 14, 2011

U.S Department of the Interior
Bureau of Ocean Energy Management
Alaska Continental Shelf Region
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RE: 3rd Set of Responses to Requests for Additional Information, dated October 28, 2011, for the revised Chukchi Sea Exploration Plan

Dear Mr. Johnston:

On October 28, 2011 Shell Gulf of Mexico Inc. (Shell) received a second request for additional information (RFAI) from the Bureau of Ocean Energy Management (BOEM) containing 17 RFAIs regarding the revised Chukchi Sea Exploration Plan (EP). On November 4, 2011, Shell provided responses to 15 of 17 RFAIs. Also on November 4th, Shell received from BOEM a clarification request on the content of our pending responses to the remaining two RFAIs (#1 and #3). On November 9, 2011 Shell responded to RFAI's #1 and #3, plus responded to BOEM's November 4th clarification request. Shell received a second request for clarification on November 10, 2011 regarding the same RFAIs (#1 and #3), for which we have prepared the following response (*i.e.*, 3rd set of responses to October 28th RFAIs).

Economy. Please see Attachment 1 to this letter, in which Shell addresses the content of the expansion of this RFAI as described in BOEM's November 10th letter. Shell's response fully addresses the content of the expanded RFAI. However, as noted in attached, Shell will not provide estimated annual income ranges for the positions that will be filled as a part of its exploration program, as that information is confidential.

Sound. Shell provides the outstanding references/reports plus appendices on the enclosed CD. Shell has responded fully to this request, and notes that agency representatives with the former Minerals Management Service/BOEM have been contributing review participants of the Joint Monitoring Program Draft/Final Comprehensive Reports since Shell began contributing its activities to these reports in 2006. Last, the 2006-2007 Joint Monitoring Program Final Comprehensive Report is available on the National Marine Fisheries Service, Office of Protected Services website http://www.nmfs.noaa.gov/pr/pdfs/permits/arctic_seismic_report.pdf.

Air Quality. Please see Attachment 2 to this letter for the Chukchi Sea non-OCS vessel emissions inventory calculations. This attachment should be used for the purpose of assessing air emissions beyond those specifically evaluated in the context of the permit review for the OCS source (*e.g.*, EPA air permit review) and in the Chukchi Environmental Impact Analysis. The assumptions used for vessel emissions are the same as those in Shell's previous correspondence with BOEM on November 9th. When utilizing the emissions data provided in Attachment 2, it is

important to note that the emissions from vessels operating more than 25 miles from the *Discoverer* during drilling operations will be dispersed over a large area because the vessels are expected to be moving during the activities in question, with the result that the impact of these emissions at any one location would be negligible. To the extent that any of the vessels would be stationary for any extended period of time outside the 25 mile area, they would be anchored and not using their propulsion engines, minimizing emissions and emissions impacts.

Based on conversations with BOEM following receipt of its November 10th letter, Shell will be finished shortly with printing final copies of the revised Chukchi Sea EP and is prepared to deliver to BOEM.

If there are any questions or comments, please contact me at (907) 646-7112 or at Susan.Childs@shell.com or Pauline Ruddy at (907) 771-7243 or e-mail Pauline.Ruddy@shell.com.

Sincerely,

Susan Childs
AK Venture Support Integrator, Manager

Attachments/Enclosure
Attachment 1 – Shell Economy Response
Attachment 2 – Chukchi Sea Non-OCS Vessel Emissions
Enclosure – Chukchi Sea RFAI References CD

Attachment 1

Shell Response

The model developed by Northern Economics (2009) for its analysis of the economic impacts of future oil and gas exploration and development activities in the Chukchi Sea indicates an estimated 1,355 total new direct full-time and seasonal jobs in Alaska will be created in the first season of exploration drilling operations (2011) with approximately $54 million in new payroll, and an estimated 1,307 total new direct full-time and seasonal jobs in Alaska will be created in a second season of exploration operations (2012) with approximately $52 million in new payroll. A copy of the spreadsheet resulting from the model, and indicating how these estimates were derived, is attached (Attachment 1a). These estimates are based on the same kinds of exploration activities as proposed in the revised Chukchi Sea Exploration Plan and can be considered a representative estimation of anticipated impacts from the activities in the plan. These estimates of the number of jobs that might be created include only direct jobs, not indirect or induced jobs. The estimated new revenues for the North Slope Borough from these exploration drilling scenarios for the Chukchi Sea are approximately $1.7 million in the first year and $1.6 million in the second year (Attachment 1a).

Although Shell's proposed exploration drilling program has potential benefits to the greater U.S. economy, the Study Area for the Environmental Impact Analysis was established in Chapter 3 as the Chukchi Sea Lease Sale 193 Area and adjacent Alaska coastal waters and coastline, with particular focus on the Chukchi Sea villages of Barrow, Wainwright, Point Lay, and Point Hope. Socioeconomic resources and conditions were described in detail only for these four villages and to a lesser degree for the North Slope Borough and for the Northwest Arctic Borough. Therefore, analysis of potential project effects on socioeconomics is restricted to these areas. Estimates of the amount of direct employment that might occur on the North Slope as a result of Shell's exploration drilling program are provided below in Table 1. These opportunities for employment can be compared to employment rates provided in Section 3.11.3 of Shell's EIA.

Table 1. Estimated number of North Slope jobs that may be created annually by Shell's exploration drilling program, and the number of jobs that may be filled by North Slope residents.

Job Type	Total Number of Jobs	Jobs Filled by NSB Residents		Employment
		Percent of Total Jobs	Number of Jobs	
MMO	140	40	56	full time / seasonal
Subsistence Advisor	10	100	10	full time / seasonal
Community Liaison	6	100	4	part time / year-round
Communication and Call Centers	20	100	20	full time / seasonal
Village OSR Responders	30	100	30	full time / seasonal
Contingency Responders	170	30	51	full time / seasonal
Shorebase Staff	30	75	23	full time / seasonal
All	486	--	196	--

Note: Annual income ranges for the individual positions identified in Table 1 will not be provided, as that information is confidential.

Literature Cited

Northern Economics. 2009. Economic analysis of future offshore oil and gas development: Beaufort Sea, Chukchi Sea, and North Aleutian Basin. Report prepared by Northern Economics,

Anchorage, AK in association with the Institute of Social and Economic Research, University of Alaska, Anchorage, for Shell Exploration and Production, Anchorage, AK. 136 pp.

Attachment 1a
Northern Economics Exploration Data v1

Direct Impacts of Exploration Activities

Area/Item

Chukchi Sea	2008	2009	2010	2011	2012	2013	2014
Total Full-time and Seasonal Jobs in Alaska	243	231	233	1,355	1,307	1,259	1,259
Total Annual Average Employment in Alaska	95	95	112	580	561	543	543
Property Tax Revenues							
Local (NSB)	$ -	$ -	$ 1,850,000	$ 1,726,667	$ 1,603,333	$ 1,480,000	$ 1,356,667
State	$ -	$ -	$ 150,000	$ 140,000	$ 130,000	$ 120,000	$ 110,000

Beaufort Sea	2008	2009	2010	2011	2012	2013	2014
Total Full-time and Seasonal Jobs in Alaska	65	2,219	1,155	2,022	1,823	2,784	2,011
Total Annual Average Employment in Alaska	18	650	340	572	530	773	566
Property Tax Revenues							
Local (NSB)	$ -	$ 1,850,000	$ 1,726,667	$ 1,603,333	$ 1,480,000	$ 1,356,667	$ 1,233,333
State	$ -	$ 150,000	$ 140,000	$ 130,000	$ 120,000	$ 110,000	$ 100,000

ADOLWD Wages and Salaries in 2007: Oil and Gas Extraction and Mining Support Activities	**$ 93,180**						
Estimated Wages and Salaries	2008	2009	2010	2011	2012	2013	2014
Chukchi Sea	$ 8,827,894	$ 8,827,894	$ 10,426,018	$ 54,002,974	$ 52,279,231	$ 50,555,488	$ 50,555,488
Beaufort Sea	$ 1,709,909	$ 60,539,850	$ 31,687,737	$ 53,278,541	$ 49,393,200	$ 72,019,012	$ 52,754,894

1 Numbers cited in the paragraph write-up come from columns E and F (2011 and 2012), which are the first two years of exploratory drilling in the NE scenarios. Rows are 5, 6, 9 and 24.

2 The attached data describe exploration activity results from the 2009 study of statewide impacts (NEI, 2009). In this report, the exploration activities for the Beaufort Sea scenario are shown on page 15 and on page 27 for the Chukchi Sea scenario.

3 Labor income was not reported in that study. The attached data provides an estimate of annual wages and salaries associated with the direct jobs only. We simply took the average annual wage and salary for the oil and gas extraction sector and the oilfield support services sector from the AK Department of Labor data for 2007 and multiplied this wage rate by the annual average employment.

4 The attached data gives the estimated property tax revenues (local and state government) associated with the on-shore exploration shorebase which was in the scenario for both the Beaufort and Chukchi.

5 There are other government revenues from 2009 to 2019 (before production) but these are the lease revenues - rental payments for the 8(g) acreage. These are not necessarily tied to exploration activities and so are not included in the attached data.

6 All the $ values in the attached data are expressed in fixed 2007 dollars.

Air Sciences Inc.	PROJECT TITLE: Shell Offshore, Inc.	BY: R. Steen		
ENGINEERING CALCULATIONS	PROJECT NO: 180-20-4	PAGE: 1	OF: 1	SHEET: VesselEmis
	SUBJECT: Chukchi Sea Non-OCS Vessel Emissions	DATE: November 9, 2011		

Total Fuel Burn Chukchi Sea

	Mobilization					Anchor Handling/Towing			Resupply			
Vessel Name	Assumed Transit Speed (knots)	Program Area Boundary to Drilling Site (approximate	Fuel Burn (gallons/day)	Days to Site	Fuel Burn to Site (gal/season)	Days	Fuel Burn (gallons/day)	AH/Towing Fuel Burn (gal/season)	Resupply Trips	Resupply RT Transit Days (@ 9 knots)	Fuel Burn (gallons/day)	Resupply Fuel Burn (gal/season)
Anchor Handler	9	150	1,183	0.7	822	9	1,420	12,781	NA			
Ice Management Vessel	9	150	1,376	0.7	956	3	688	1,720	NA			
OSV	9	150	3,936	0.7	2,733	3	4,723	11,808	8.5	1.5	3,936	50,184
OSV	9	150	3,936	0.7	2,733	3	4,723	11,808	8.5	1.5	3,936	50,184
Nanuq	9	150	5,800	0.7	4,028	NA			NA			
Shallow Water Landing Craft	9	150	1,500	0.7	1,042	NA			NA			
OST	9	150	8,400	0.7	5,833	NA			NA			
OSR Barge and Tug	9	150	3,408	0.7	2,367	NA			NA			
Containment Barge & Tug	9	150	3,408	0.7	2,367	NA			NA			
Discoverer	9	150	8,400	0.7	5,833	NA			NA			
Total					28,713			38,117				100,368

	During Drilling-Not Resupply			Demobilization					Total		
Vessel Name	Days	Fuel Burn (gallons/day)	Fuel Burn (gal/season)	Assumed Transit Speed (knots)	NM from Drilling Site to Prog Area Boundary (approximate	Fuel Burn (gallons/day)	Days to Program Area Boundary	Fuel Burn from Site (gal/season)	IM/AH Total Fuel Burn (gal/season)	Other Vessels Total Fuel Burn (gal/season)	Total Fuel Burn (gal/season)
Anchor Handler	0		0	9	150	1,183	0.7	822	14,424		14,424
Ice Management Vessel	54	688	37,153	9	150	1,376	0.7	956	40,784		40,784
OSV				9	150	3,936	0.7	2,733		67,459	67,459
OSV				9	150	3,936	0.7	2,733		67,459	67,459
Nanuq				9	150	5,800	0.7	4,028		8,056	8,056
Shallow Water Landing Craft				9	150	1,500	0.7	1,042		2,083	2,083
OST	2	8,400	12,600	9	150	8,400	0.7	5,833		24,267	24,267
OSR Barge and Tug	100	1,704	170,400	9	150	3,408	0.7	2,367		175,133	175,133
Containment Barge & Tug	100	1,704	170,400	9	150	3,408	0.7	2,367		175,133	175,133
Discoverer				9	150	8,400	0.7	5,833		11,667	11,667
Total			390,553					28,713	55,209	531,256	586,465

Notes:
Anchor Handling (AH) assumed to be within 25-mile radius for entire season
Ice Management (IM) assumed to be within 25-mile radius for 46 days so 54 days remain of a 100-day season (best estimate)
AH is assumed to take 3 days per well.
Shallow water landing craft will most likely already be on the North Slope.
The Discoverer will propel itself to the drilling location.
Barge & tug combinations emissions assumed at 50% power during drilling and outside 25-mile radius
OST traverses the program area twice per season (300 NM).
Emission factors provided below are from the EPA permit application

Values in blue are input, values in black are calculated

Emissions

	Emission Factors		Emissions		
	IM/AH	other vessels	IM/AH	other vessels	Total
Pollutant	lb/gallon	lb/gallon	ton/season	ton/season	ton/season
NOx	0.05	0.59	1.38	156.72	158
PM	0.008	0.041	0.22	10.89	11
SO_2	0.00021	0.00021	0.01	0.06	0
CO	0.023	0.1046	0.63	27.78	28
VOC	0.004	0.0188	0.11	4.99	5
CO_2e	22.5	22.5	621.1	5,976.63	6,598

Conversion	
2000	lb/ton