

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
SEATTLE, WASHINGTON**

**RESPONSE TO COMMENTS
FOR
OUTER CONTINENTAL SHELF
PREVENTION OF SIGNIFICANT DETERIORATION
PERMIT NO. R10OCS/PSD-AK-09-01**

**SHELL GULF OF MEXICO INC.
FRONTIER DISCOVERER DRILLSHIP
CHUKCHI SEA EXPLORATION DRILLING PROGRAM**

Date of Final Permit: March 31, 2010

ABBREVIATIONS AND ACRONYMS

ADEC.....	Alaska Department of Environmental Conservation
ASTM.....	American Society of Testing and Materials
BACT.....	Best Available Control Technology
CAA.....	Clean Air Act
CCV.....	Closed Crankcase Ventilation
CDPF.....	Catalytic Diesel Particulate Filter
C.F.R.....	Code of Federal Regulations
CO.....	Carbon monoxide
EA.....	Environmental Assessment
EAB.....	Environmental Appeals Board
EIS.....	Environmental Impact Statement
EPA.....	United States Environmental Protection Agency
EO.....	Executive Order
Discoverer.....	Frontier Discoverer Drillship
Gr/dscf.....	Grains per dry standard cubic foot
HAP.....	Hazardous Air Pollutants
H ₂ S.....	Hydrogen Sulfide
hp.....	Horsepower
HPU.....	Hydraulic Power Units
IC.....	Internal Combustion
kW.....	KiloWatts
kW-e.....	KiloWatts electric
lbs.....	Pounds
MLC.....	Mud line cellars
MMBtu.....	Million British thermal units
MMS.....	Minerals Management Service
NA.....	Not applicable
NAAQS.....	National Ambient Air Quality Standards
NEPA.....	National Environmental Policy Act
NESHAP.....	National Emission Standards for Hazardous Air Pollutants
NO ₂	Nitrogen Dioxide
NOx.....	Oxides of nitrogen
NOI.....	Notice of Intent
NPDES.....	National Pollutant Elimination Discharge System
NSPS.....	New Source Performance Standards
NSR.....	New Source Review
OCS.....	Outer continental shelf
OCSLA.....	Outer Continental Shelf Lands Act
ORL.....	Owner requested limit
OxyCat.....	Oxidation catalyst control
Part 55.....	40 C.F.R. Part 55
PM.....	Particulate matter
PM _{2.5}	PM with an aerodynamic diameter less than 2.5 microns
PM ₁₀	PM with an aerodynamic diameter less than 10 microns
ppm.....	Parts per million
ppmv.....	Parts per million by volume
PSD.....	Prevention of Significant Deterioration
PTE.....	Potential to Emit
Rpm.....	Revolutions per minute
SCR.....	Selected Catalytic Reduction
SER.....	Significant emission rate
SO ₂	Sulfur dioxide
Shell.....	Shell Gulf of Mexico Inc.
SSBOP.....	Subsea blowout preventer
tpy.....	Tons per year
VOC.....	Volatile organic compound
wt%.....	Weight percent

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I. INTRODUCTION

Shell Gulf of Mexico Inc. (Shell) has applied for a permit to authorize air emissions from the mobilization and operation of the Frontier Discoverer drillship (Discoverer) and its associated fleet at various drill sites in the Chukchi Sea outer continental shelf (OCS) off the North Slope of Alaska in connection with an exploratory oil and gas drilling program (exploration drilling program). Under Environmental Protection Agency (EPA) air quality regulations, 40 C.F.R. Part 55, an OCS source that is a major stationary source and which proposes to locate on the OCS is required to obtain a Prevention of Significant Deterioration (PSD) permit pursuant to the requirements of 40 C.F.R. § 52.21 before beginning construction.

In accordance with 40 C.F.R. Part 124, EPA initially proposed a draft OCS/PSD permit for Shell's exploration drilling program in the Chukchi Sea for public comment on August 20, 2009 (August 2009 proposed permit), with an extended public comment period running through October 20, 2009. During the week of September 21, 2009, EPA conducted: government-to-government consultation as requested by two affected Native Villages, the Inupiat Community of the Arctic Slope and the Native Village of Point Hope; informational meetings in Barrow, Wainwright and Point Hope; and public hearings in Barrow and Anchorage, Alaska. After reviewing the comments received on the August 2009 proposed permit, EPA decided to issue a new modified proposed permit and initiate a new public comment period.

In accordance with 40 C.F.R. Part 124, EPA published notice of the new modified proposed permit on January 8, 2010, with a public comment period running from January 8, 2010 through February 17, 2010. Overall, total emissions of all pollutants regulated under the January 2010 modified proposed permit were lower as compared to the August 2009 proposed permit, with substantial reductions of particulate matter and sulfur dioxide emissions. EPA held a public information meeting by teleconference on February 10, 2010 to answer questions about the modified proposed permit and a public hearing in Barrow, Alaska on February 16, 2010, with teleconference facilities for participating in the public hearing in Wainwright, Point Lay, Point Hope and Atkasuk. EPA made clear in the public notice and information sheet that EPA would not be responding to comments on the August 2009 proposed permit and that, to the extent a commenter believed that their comments provided during the comment period for the August 2009 proposed permit were not been addressed by the January 2010 modified proposed permit or modified Statement of Basis, the commenter should resubmit those specific un-addressed comments during the current comment period on the January 2010 modified proposed permit.

EPA received written comments on the January 2010 modified proposed permit from Shell (the applicant); the Alaska Eskimo Whaling Commission (AEWC), the Inupiat Community of the Arctic Slope (ICAS), and the North Slope Borough (NSB) in a combined comment letter (collectively, the "North Slope commenters"); the Northwest Arctic Borough; Alaska Wilderness League, Audubon Alaska, Center for Biological Diversity, Earthjustice, Natural Resources Defense Council, Northern Alaska Environmental Center, Ocean Conservancy, Oceana, Sierra Club, Pacific Environment,

and World Wildlife Fund in a combined comment letter (collectively, the “Conservation commenters”); the Center for Biological Diversity (CBD) in a separate comment letter; the U.S. Minerals Management Service (MMS); Conoco-Phillips Alaska, Inc. (CPAI); the Alaska Department of Environmental Conservation (ADEC) and several individual commenters. The North Slope commenters, the Conservation commenters, and CBD specifically incorporated by reference in their respective comments on the January 2010 proposed permit their respective previously submitted comments on the August 2009 proposed permit.

In addition to receiving written comments, EPA received numerous comments on this proposed permit decision as oral testimony during the public hearing held in Barrow, Alaska on February 16, 2010. This testimony was transcribed and has been included in the permit record.¹

This Response to Comments document summarizes the written and oral comments received by the EPA regarding this proposed permit decision, including those comments on the August 2009 proposed permit that were specifically incorporated by reference in comments on the January 2010 proposed permit. After EPA’s careful review and consideration, responses to these comments are presented herein.

II. RESPONSE TO COMMENTS

A. CATEGORY - COMMENTS OF GENERAL SUPPORT

A.1 Comment: Commenters urge EPA to issue the permit quickly to allow Shell to begin offshore operations in the Chukchi Sea. One such commenter asserts that emissions from the Discoverer will impose no burden on air quality for the relatively short period of operation that is being requested because of the wind patterns in the area and notes that other vessels are not similarly regulated. The commenter also explains that oil and gas exploration is important to the economy of the State of Alaska and the United States and will generate jobs in Alaska.

Response: EPA is proceeding with issuance of the final permit. EPA understands that some individuals support this project due to the expected benefits to the economy and the potential for additional oil and gas resources. We note, however, that the potential for economic benefits to Alaska or the United States does not affect the standards for issuing this Prevention of Significant Deterioration (PSD) permit to an Outer Continental Shelf (OCS) source (OCS/PSD permit).

¹ The recording of the hearing, written comments submitted on the August 2009 and January 2010 proposed permits, and selected other documents in the permit record can be found online at: <http://yosemite.epa.gov/R10/airpage.nsf/Permits/chukchiap>

With respect to the comment that this project is subject to permit and other requirements to which other vessels are not subject, Congress specifically directed EPA to regulate vessel-based exploratory and other drilling operations on the OCS as stationary sources while the vessels are engaged in activities authorized or regulated under the Outer Continental Shelf Lands Act (OSCLA). See Clean Air Act (CAA) Section 328(a)(4)(C) and (D).

Issues relating to the impact of the project on air quality are discussed in Section 5 of the Statement of Basis and EPA's response to Comments in Categories VV through GG below. EPA notes, however, that because Shell has not requested a permit of limited duration, it is not accurate to state that the permit is requested for a relatively short period of operation.

B CATEGORY - COMMENTS OF GENERAL OPPOSITION

B.1 Comment: Commenters urge EPA not to issue the permit due to concerns with the ramifications from Shell's project. These commenters state that the purpose and need for the overall action as proposed were outweighed by the significance of its potential and disproportionate impact on North Slope communities. While the commenters express appreciation that the January 2010 modified proposed permit generally permits less pollution than the August 2009 proposed permit, these commenters continue to believe the proposed permit does not adequately protect the clean air and, even as revised, allows Shell to degrade significantly the air quality of the Chukchi Sea region. The commenters state that emissions allowed by the latest proposed permit would still be substantial enough to risk noncompliance with applicable National Ambient Air Quality Standards (NAAQS) and PSD increment limits, and would allow major black carbon emissions in the Arctic. The commenters continue that there are demonstrated and required means for the considerable reduction of air emissions associated with this action and that these means should be implemented, to assure compliance with federal law, and most importantly to avoid unnecessary impacts to the health and welfare of the Arctic communities.

Response: After thorough review and careful consideration of the comments requesting that the permit be denied, EPA is proceeding to issue this permit allowing Shell to conduct exploratory drilling in the Chukchi Sea because the permit complies with the requirements of CAA Section 328 (governing air pollution from OCS sources), EPA's OCS regulations at 40 C.F.R. Part 55 (OCS regulations), and the PSD regulations at 40 C.F.R. § 52.21 (PSD regulations). As discussed in response to Comments A.1 above, the purpose and need for the project do not affect the standards for issuing this OCS/PSD permit.

EPA has conducted an extensive analysis of the air quality impacts of the project. We have determined that the permit will not cause or contribute to a violation of currently applicable NAAQS or PSD increments. See Section 5 of the Statement of Basis and EPA's response to Comments for Categories VV through GG below regarding the impact

of the project on NAAQS, PSD increments, and local communities. See the response to Comments in Category HH below regarding black carbon emissions.

C CATEGORY - GENERAL COMMENTS OF QUALIFIED SUPPORT

C.1 Comment: One commenter supports several changes EPA has made in the current version of the permit to address practical implementation problems identified by Shell and other commenters on the August 2009 proposed permit but continues to believe that the proposed permit still contravenes the CAA in several respects. The commenter supports the expeditious issuance of this permit but believes that EPA must correct these issues before doing so.

Response: As discussed in the response to Comments in Category B above, EPA believes that the permit is consistent with Clean Air Act requirements and is proceeding with issuance of the final permit.

C.2 Comment: Commenters express appreciation for the emission reductions in the January 2010 modified proposed permit as compared to the August 2009 proposed permit, including the requirement to use of ultra-low sulfur diesel and efforts to reduce emissions of CO₂², NO_x, VOC and PM. The commenter continues that these changes did not fully address all of the commenters' concerns.

Response: EPA appreciates support for the additional emission reductions. As discussed in the response to Comments in Category B above, EPA believes that the permit is consistent with Clean Air Act requirements and is proceeding with issuance of the final permit.

D CATEGORY - PERMIT APPLICATION

D.1 Comment: Commenters note that Shell's application has been amended and supplemented numerous times since it was originally submitted in December 2008, which the commenters believe makes the application very cumbersome for the public to review. The commenters assert that this has required the public to wade through thousands of pages of proposals, corrections, and correspondence between EPA and Shell to determine how Shell proposed to modify its operations and to locate technical support data. The commenters point to Shell's September 17, 2009 submission of additional corrections and supplements to its application and proposal to submit additional data at a later undetermined date as evidence that Shell has not yet submitted a complete, final permit application ripe for public review and comment. The commenters also note that EPA had asked Shell in connection with Shell's application for an OCS/PSD permit to operate in

² From the context of the comment, EPA assumes the commenter intended to refer to CO, rather than CO₂.

the Beaufort Sea, to submit a revised application for its Beaufort operations that included the relevant portions of the information that Shell submitted for the Chukchi Sea and that Shell had never submitted a final permit application for the Chukchi Sea that embodies all of the revisions Shell agreed to make. The commenters conclude by saying that Shell must be required to submit a final complete application for the public to review and comment on, just as EPA asked Shell to do in connection with Shell's Beaufort application and that EPA must then prepare a new draft permit and revised statement of basis and provide 60 days for the public to comment.

Response: This comment relates to the permit that was proposed for public comment in August 2009. Since that time, Shell has submitted additional permit application materials. As requested by the commenters, EPA prepared a new modified proposed permit and Statement of Basis and provided an additional public comment period by repropounding the permit in its entirety on January 8, 2010. Although these commenters asked that all of their comments on the August 2009 proposed permit be considered resubmitted, these commenters also stated in their comments on the January 8, 2010 proposed permit that EPA has provided a timely and transparent set of records on this permit action for review and better understanding of the proposed action in the Statement of Basis. EPA understands that the permit application in this case consists of numerous submittals. Therefore, in order to increase public understanding of and access to the application materials, the entire application has been posted on EPA's website and also made available in paper and electronic copy. In addition, the Statement of Basis (pp. 6-9) contains an index of the documents that comprise the application. EPA therefore believes the commenter's concerns relating to the sufficiency of the permit application have been addressed by issuance of the modified proposed permit in January 2010.

D.2 Comment: Commenters question why EPA concluded that Shell's Chukchi OCS/PSD permit was complete based on the air monitoring data submitted by Shell, but determined that Shell's Beaufort OCS/PSD permit application was not complete when it had similar (although admittedly even more substantial) monitoring problems. The commenters ask that EPA explain this discrepancy.

Response: This comment relates to the permit that was proposed for public comment in August 2009. Additional air monitoring data was submitted by Shell in support of the January 8, 2010 modified proposed permit. Specific concerns with the air monitoring data are discussed in Category Z.

D.3 Comment: Commenters point to EPA regulations requiring that the owner or operator of an OCS source submit to the EPA all information necessary to perform any analysis or make any determination required under this section, citing 40 C.F.R. § 55.6(a)(1)(i). Here, the commenters assert, Shell has submitted a permit application that is incomplete and inconsistent with its representations to other agencies and should not receive a permit until it can fully describe its proposed activities in an accurate manner. For example, the commenters note, the regulations require Shell to provide "[a] detailed description as to what system of continuous emissions reduction is planned for the source or modification,

emission estimates, and any other information necessary to determine that best available control technology would be applied.” 40 CFR § 52.21(n)(1)(ii). In light of the numerous changes Shell has proposed to its operations, the commenters state, it is difficult to discern whether these requirements have been met or not.

Response: This comment relates to the permit that was proposed for public comment in August 2009. Additional permit application materials have been submitted by Shell in support of the January 2010 modified proposed permit and are included in the administrative record. EPA believes that Shell has provided a detailed description as to what system of continuous emissions reduction is planned for the source or modification, emission estimates, and other information necessary to determine the best available control technology that would be applied.

D.4 Comment: Commenters assert that EPA is not allowed to process a permit until the applicant has fully complied with the application requirements for that permit, citing 40 CFR § 124.3(a)(2). Because, according to the commenters, Shell has not demonstrated compliance with EPA’s application requirements, the commenters request that Shell not be issued a permit at this time.

Response: Additional permit application materials have been submitted by Shell in support of the January 2010 modified proposed permit. For reasons of efficiency and resources, EPA often works with applicants prior to receipt of a complete application by reviewing the application materials submitted, identifying additional information needed for a complete application and developing draft permit terms and support documents for internal EPA consideration. In making completeness determinations, it is generally most efficient to carry out work that is essential for developing a proposed permit at the same time.

EPA believes 40 C.F.R. § 124.3(a)(2) precludes EPA from proposing a permit prior to receipt of a complete application but allows (but does not require) EPA to work on an application and draft permit prior to the application being deemed complete.

D.5 Comment: Commenters note what they believe to be inconsistencies between Shell’s permit application and statements in Shell’s Exploration Plan for the Chukchi Sea, in that Shell’s Exploration Plan states that the primary generators on the Discoverer will be retrofitted with selective catalytic reduction devices and that all other engines on Discoverer will either be Tier 3 or will be retrofitted with Catalytic Diesel Particulate Filters (CDPFs) to reduce carbon monoxide (CO), volatile organic compounds (VOC), and hazardous air pollutants (HAP). In contrast, the commenters contend, the proposed permit does not, in fact, require this control technology, noting that Shell is not applying any control technology to the boilers or incinerator beyond “good control technologies.” Therefore, the commenters assert, the statements in the Exploration Plan are incorrect and misleading and Shell’s assertions do not clearly state that a whole host of engines associated with its operations are not being regulated at all, because Shell has not

conducted a best available control technology (BACT) analysis for its ancillary vessels or the Discoverer's propulsion engine.

Response: As shown by the language quoted by the commenter, the quoted discussion in the Exploration Plan relates solely to engines and does not include a discussion of the boilers and the incinerators. Shell 2010 Chukchi Exploration Plan, p. 45. EPA therefore does not see inconsistencies between these statements in the Exploration Plan and Shell's permit application. As discussed in EPA's response to Comment G.3.a below, the Discoverer's propulsion engine will not be operated when the Discoverer is an OCS source and it is therefore not required to implement BACT. As discussed in response to Comment G.1 below, aside from the supply vessel when it is attached to the Discoverer, none of the other vessels in the Associated Fleet³ are OCS sources subject to BACT under EPA's OCS regulations. See 40 C.F.R. § 55.2 (definition of OCS source). EPA notes, however, that engines on the Associated Fleet are regulated through emission limits and throughput limits in order to ensure that emissions from Shell's exploration drilling operations will not interfere with attainment or maintenance of any currently applicable NAAQS or exceed any applicable increment.

D.6 Comment: Commenters note that EPA's proposed permit for Shell's exploration activities in the Chukchi Sea includes important provisions to ensure that the permitted sources cannot be modified from the source parameters that were reflected in Shell's complete PSD permit application, such as the date of the PSD permit application and descriptions of the proposed sources that include the individual make and model, as well as the rated capacity. The commenters strongly support the inclusion of these provisions and references to the representations made in the permit application in order to ensure that Shell cannot change its operation in ways that could change air pollutant dispersion or alter BACT analyses without limitation. As an added measure, the commenters suggest that EPA include a provision in the permit stating that operation of the permitted sources must be in accord with the information provided in the PSD permit application initially submitted by Shell on December 19, 2008, revised on February 23, 2009 and supplemented with the specific submittals identified in the administrative record for this permit action.

Response: Permit Condition A.1 requires the permittee to construct and operate the OCS Source and the Associated Fleet in accordance with the application and supporting materials submitted by the permittee, which is based on provisions in the OCS and PSD regulations. See 40 C.F.R. §§ 55.6(a)(4)(i) and 52.21(r)(1). This condition ensures that Shell cannot change its operations in ways that affect air pollutant dispersion or alter the BACT analysis without seeking a revision to this OCS/PSD permit.

D.7 Comment: Commenters assert that EPA must require notification of any deviations from the information included in the permit application materials, and

³ In this Response to Comments document, EPA uses the term "Associated Fleet" to refer to the vessels supporting the Discoverer's operations that may be operating within 25 miles of the Discoverer while the Discoverer is an OCS source. These vessels include an icebreaker (Icebreaker #1), an anchor handler/icebreaker (Icebreaker #2), a supply ship, an oil spill response ship and oil spill workboats.

must make clear that any significant deviation from the representations made by Shell in its PSD permit application may be grounds for suspension or revocation of the permit. The commenters state that these types of permit provisions are commonly required in PSD permits, and provide a necessary assurance to the public and tribal, state and federal regulatory agencies that operation of significantly different sources, or significant modifications of the proposed sources, cannot occur without further evaluation.

Response: As discussed above, Permit Condition A.1 requires the permittee to construct and operate the OCS Source and the Associated Fleet in accordance with the application and supporting materials submitted by the permittee. See 40 C.F.R. § 55.6(a)(4)(i) and 52.21(r)(1). Permit Condition A.6 contains provisions for revision, termination, or revocation and reissuance of the permit for cause, including in the case of a material mistake, inaccurate statements made during permit issuance, failure to comply with permit requirements, or ensuring compliance with the requirements of the Clean Air Act. EPA believes these conditions are sufficient to ensure that Shell operates in accordance with its application materials and that an additional requirement to notify EPA of deviations from application materials is not required. In addition, Permit Condition A.15, which has been added in response to comments, requires the timely reporting of all permit deviations.

E CATEGORY - EMISSION INVENTORY

E.1 Comment: Commenters note that, according to the Statement of Basis for the August 2009 proposed permit, the proposed drilling is identified as having no emissions of sulfuric acid mist, but that Shell's fleet will use fuel containing sulfur, which the commenters assert, makes emissions of sulfuric acid mist possible. The commenters request EPA to explain why the fleet has no potential to emit sulfuric acid mist and, if EPA intends to indicate potential emissions of sulfuric acid mist are negligible, to specify this.

Response: This comment was made on the August 2009 proposed permit and was incorporated by reference in comments made on the January 2010 proposed permit. After the comment was made, Shell submitted additional information, including a request to be limited to the use of ultra-low sulfur diesel fuel in the Associated Fleet, which substantially reduces emissions of sulfuric acid mist. The Statement of Basis for the January 2010 proposed permit contains a revised potential to emit (PTE) for emissions of sulfuric acid mist from the project (Table 2.1, p. 24). As indicated, PTE emissions for sulfuric acid mist are well below the significant emission rate established in 40 C.F.R. § 52.21. Consequently, no further action is required.

E.2 Comment: In estimating potential emissions from some of Shell's vessels, commenters state that EPA has not directly provided a worst-case assessment of emissions from the equipment associated with Shell's operations and instead estimates potential emissions by relying on more generic data, which EPA indicates are still conservative. The commenters acknowledge that, due to a lack

of available manufacturer information for each specific unit, it may be necessary for EPA to rely on generic data, but assert that for all emission units where EPA has relied on such data, EPA should verify potential emissions for these emission units before each drilling season. The commenters also ask that the permit explicitly state that Shell will not be able to use the emissions unit if actual potential emissions exceed those included in the model.

Response: In determining the project's PTE, EPA relied on the best emissions data available at the time of permit issuance. These data are the basis for enforceable conditions limiting emissions from the various emission units. In addition, these emission limits are used as inputs to ensure that the project will comply with the NAAQS and PSD increment and therefore serve to prevent significant degradation in air quality. To assure compliance with these conditions, the permit does require stack testing of almost all emission units prior to the first drilling season. To the extent the test results from the initial testing indicate that additional stack testing is warranted, EPA has authority to require additional stack testing as provided in Permit Condition B.7.14 and Section 114 of the Clean Air Act. In addition, EPA has authority to add additional testing, monitoring, recordkeeping, and reporting to assure compliance with applicable requirements of the CAA in the Title V operating permit. Shell is required to apply for a Title V operating permit within 12 months of commencing operation. See 40 C.F.R. § 71.5(a)(1)(i).

With respect to the request that the permit explicitly state that Shell will not be able to use the emissions unit if actual potential emissions exceed those included in the model, no additional permit language is needed or appropriate. Condition A.2 of the permit states that the permittee must comply with all requirements of the permit and that failure to do so is a violation of Section 111(e) and 165 of the CAA, subject to enforcement action under the CAA.

E.3 Comment: Commenters note that the proposed permit is based on total HAP emissions from Shell's proposed exploration drilling program of 3.5 tons per year, as quantified in Shell's permit application materials. The commenters assert, however, that while the emissions calculations included in Shell's application materials show HAP estimates for units FD-1 through FD-22, the ice management fleet and the oil spill response fleet, there are no HAP emissions estimates for the incinerator (FD-23), the fuel tanks (FD-24 through FD-30), the drilling mud system (FD-32) and the shallow gas diverter system (FD-33). The commenters are concerned that this application still does not include estimates for individual HAP as well as an assessment of total HAP emissions from all sources combined and that EPA did not complete a technical review of the HAP emissions inventory since the permit was initially proposed in August 2009. The commenters continue that EPA still relies on Shell's February 2009 estimate of 3.5 tons of HAP and that this number is underestimated because it uses non-standard industry and Minerals Management Services (MMS) venting factors. The commenters request that EPA complete a thorough review of the HAPS inventory to ensure it has been properly computed and request that Shell recalculate HAP emissions based on the substantially higher, revised VOC emission estimate from venting sources. If the

permit action is not based on the MMS venting factors identified by the commenters, the commenters recommend that the permit require source testing to verify VOC/HAP emissions from these operations during the first season of operation to improve emission estimates.

Response: As discussed below in response to comments in Category N below, EPA disagrees that the emission estimate from mud degassing that EPA relied on in this permit action is inconsistent with MMS and industry emission factors and, in the absence of more specific information, EPA continues to believe that the estimate of VOC emissions from the mud degassing operation on the Discoverer that EPA relied on in issuing the proposed permit is a reasonable estimate of emissions from this source. Consequently, revision of HAP estimates from this activity is not necessary. Source testing is not indicated in instances such as these where expected emissions are very low.

With respect to the comments on HAP emissions in general, EPA is relying on HAP estimates from Shell's submittal dated September 17, 2009 and not on Shell's February 2009 application. The September 17, 2009 submittal does list individual HAP emissions and does contain HAP emissions from the incinerator. Letter from Susan Childs, Shell, to EPA, dated September 17, 2009, re: Shell Gulf of Mexico Inc. Comments on August 2009 Proposed Discoverer/Chukchi OCS/PSD Permit to Construct, Attachment A, pp.17-18. In EPA's emission inventory (Statement of Basis, Appendix A), a PTE was not included for the diverter system as it is not expected to be used as part of planned operations (Statement of Basis, Appendix A, page A-1). In a consistent manner, HAP emissions from the diverter system are not calculated for the unlikely event that the diverter operates. Emissions from the fuel tanks and mud degassing are extremely low--a total of 0.07 tons/year. Even if this entire amount were HAP, total HAP emissions would only be about 3.37 tpy, which is well below the major source thresholds for HAPs.

As discussed in the Statement of Basis (p. 27), applicable National Emission Standards for Hazardous Air Pollutants (NESHAP) promulgated under Section 112 of the CAA apply to OCS sources if rationally related to the attainment and maintenance of federal and state ambient air quality standards or the requirements of Part C of Title I of the CAA. See 40 C.F.R. § 55.13(e). In addition, the PSD regulations require each major stationary source or major modification to meet applicable standards under 40 C.F.R. Part 61, which are NEHSAPs. See 40 C.F.R. § 52.21(j)(1). Although Permit Condition A.3, as well as 40 C.F.R. §§ 52.21(r)(3) and 55.6(a)(4)(iii), make clear that Shell is obligated to comply with all other federal requirements not included in this proposed OCS/PSD permit, this permit does not itself impose any specific NESHAP requirements on Shell's operations. The HAP emission estimate provided by Shell shows emissions of any single HAP well under 10 tons per year (tpy) and emissions of all HAPs combined to be well under 25 tpy, and thus the PTE for HAPs of this OCS source is well below the regulatory threshold for applicability of NESHAPs that apply to major sources. See CAA Section 112(a)(1). To the extent Shell has underestimated its emissions of HAP in its OCS/PSD permit application, nothing in this permit relieves Shell of its obligation to comply with any applicable NESHAPs as provided in 40 C.F.R. § 55.13(e). EPA will also be reviewing HAP emissions from Shell's exploratory operations in the Chukchi Sea and the applicability of Section 112 standards to Shell's exploration drilling operations

when Shell submits its Title V permit application within one year of commencing operations.

F CATEGORY – DEFINITION OF OCS SOURCE

F.1 Subcategory - Statutory Definition of OCS Source As Compared to Regulatory Definition

F.1.a Comment: Several commenters contend that EPA’s definition of “OCS source” in 40 C.F.R. § 55.2 impermissibly narrows the statutory definition of “OCS source” in CAA Section 328. The commenters also note that Congress provided in Section 328 that an OCS source includes equipment “authorized” under the Outer Continental Shelf Lands Act (OCSLA) and not just regulated under OCSLA and that vessels authorized under the OCSLA include not only those attached to the seabed, but also those involved with exploration, development, and production, which in turn under OCSLA includes vessels that never attach to the seabed, such as seismic testing with ships, and the transfer of minerals to shore as provided in 43 U.S.C. § 1331(k), (l) and (m). These commenters assert that Congress’s definition of OCS source is unambiguous and EPA did not have authority to replace Congress’s inclusive definition of OCS source with an exclusive one, citing to *Massachusetts v. EPA*, 549 U.S. at 528-529. Because Congress only required that an OCS source meet the three elements listed in subsections (i)-(ii) of the definition of OCS source in Section 328 of the CAA, the commenters continue, EPA did not have authority to limit the definition to those vessels that are attached to the seabed and that, by doing so, EPA impermissibly excluded an entire category of vessels that are authorized under the OCSLA but are not attached to the seabed. The commenters state that nothing in the statutory definition of OCS source suggests that the time at which a drill ship becomes an OCS source hinges on whether the vessel is attached to the seabed and that the Discoverer meets the three statutory elements days before the anchoring process even begins, triggering the statute’s jurisdiction.

Response: These comments appear to present a challenge to the definition of “OCS source” in the OCS regulations at 40 C.F.R. § 55.2, and not to EPA’s application of the regulation to this permitting action. Under Section 307(b) of the Clean Air Act, a petition for review of EPA’s promulgation of any nationally applicable regulations promulgated under the Clean Air Act must be filed in the United States Court of Appeals for the District of Columbia within sixty days from the date notice of such promulgation appears in the Federal Register, unless such challenge is based solely on grounds arising after such sixtieth day. As such, any challenge to EPA’s definition of OCS source was required to be raised within 60 days of promulgation of 40 C.F.R. Part 55. The OCS regulations were promulgated on September 4, 1992, and the time has long since passed for challenging the regulations themselves. In addition, the regulation’s distinction between attached and detached vessels has been upheld as a permissible reading of the statute and EPA’s interpretation that the OCS source does not include vessels that were

merely traveling over the OCS was held to be reasonable. See Santa Barbara County Air Pollution Control Dist. v. EPA, 31 F.3d 1179, 1181 (D.C. Cir. 1994) (holding that the regulation’s distinction between attached and detached vessels is a permissible reading of the statute and that it was reasonable for EPA to conclude that the OCS source does not include vessels that were merely traveling over the OCS); see also In re Shell Offshore Inc., Kulluk Drilling Unit and Frontier Discoverer Drilling Unit, Order Denying Review In Part and Remanding In Part, 13 E.A.D. __ (September 14, 2007), Slip Opinion at 25 (hereafter cited as “Kulluk EAB Decision”).

F.1.b Comment: By interpreting the definition of OCS source to require attachment, commenters assert, EPA’s regulatory definition of OCS source fails to regulate the emissions from the Discoverer when it engages in pre-construction activities—namely mudline cellar construction. The commenters continue that OCSLA regulates a wide range of activities related to exploratory drilling on the OCS, many of which occur without any direct attachment to the seabed. As an example, the commenters point to Section 4(d)(1) of OCSLA, which authorizes the United States Coast Guard (Coast Guard) “to promulgate . . . regulations with respect to lights and other warning devices, safety equipment, and other matters relating to the promotion of safety of life and property on the artificial islands, installation, and other devices referred to in [section 4(a)(1)] or on the waters adjacent thereto. . . .” 43 U.S.C. § 1333(d)(1) (emphasis added); see also id. at § 1340(b) (all exploration must comply with OCSLA,); id. at § 1331(k) (defining “exploration” as, *inter alia*, “the process of searching for minerals, including . . . geophysical surveys where magnetic, gravity, seismic, or other systems are used to detect or imply the presence of such minerals.”).

Response: See response to Comment F.1.a with respect to concerns that EPA has impermissibly narrowed the regulatory definition of OCS source.

F.2 Subcategory - Application of the Definition of “OCS Source” to the Discoverer

F.2.a Comment: EPA received numerous comments on its two proposed alternatives for determining when the Discoverer becomes an “OCS source” within the meaning of 40 C.F.R. § 55.2.

In favor of Option 1: One group of commenters contends that the relevant statutory provisions and legislative history require that EPA regulate the Discoverer as an OCS source no later than when it makes contact with the seabed by placing its first anchor. In support for this position, such commenters stated:

- To the extent the legislative history of OSCLA requires attachment to the seabed in the case of vessels, the attachment is at most a mere connection. See House Report 95-950 at 128. Thus, Shell’s drillship will be connected to the seabed, and subject to regulation consistent with Section 4(a)(1) of OCSLA, once its first anchor is positioned. EPA should apply its regulation, 40 C.F.R. § 55.2, which by its own terms must be applied “within the meaning” of OSCLA Section 4(a)(1),

consistent with the scope of the statute and regulate the operations no later than at that point of contact.

- EPA developed Option 2 in response to Shell's suggestion that until the anchoring process is complete, the Discoverer is not erected for purposes of exploring resources within the regulatory definition of stationary source. Option 2 does not comply with the statutory definition of OCS source and is not protective enough of air quality in the Arctic. It is clear option 2 is a way for Shell to avoid having to control the emissions from the Discoverer's propulsion engine. Shell's application for the August 2009 proposed permit stated that the propulsion engine will be shut down before the first anchor is dropped. However, in comments on the August 2009 proposed permit, Shell, MMS, and Alaskan Eskimo Whaling Commission (AWEC) highlighted a major problem with this proposal: it prohibited Shell from using the propulsion engines during the anchoring and tensioning process and throughout the exploratory drilling operations. Based upon these concerns, it is likely that at some point, EPA will have to allow Shell to use the propulsion engine during the anchoring and tensioning process. If this is true, then its emissions must be regulated under the Clean Air Act.
- EPA itself has noted that the Discoverer can safely drill before all eight anchors are placed. Thus, Option 2 presents a scenario for regulation that is even more restrictive than that provided in the regulatory definition of OCS source since it requires both attachment to the seabed floor and a declaration of position. Basing the regulation of the Discoverer on this option would readily be found to violate not only the plain language of the statute but also EPA's regulation.
- Neither *DeMette v. Falcon Drilling Company*, 280 F.3d 492, 498-500 (5th Cir. 2002) (overturned on other grounds), nor *Diamond Offshore Co. v. A&B Builders*, 302 F.3d 531, 546 (5th Cir. 2002), require attachment to be based on more than connection by a single anchor. Neither case defined the level of contact with the seabed required before OCSLA attaches. Instead, the issue the court analyzed in *DeMette* was whether OCSLA Section 4(a)(1) could cover a vessel at all. 280 F.3d at 498. *Diamond Offshore* similarly did not reach the issue of what sort of contact with the seabed is required under OCSLA Section 4(a)(1). Instead, the court ruled that there was insufficient evidence to support a determination that the requirements of OCSLA Section 4(a)(1) were satisfied, because it was not clear that the vessel was connected at all to the seabed at the relevant times. 302 F.3d at 546. If anything, the case concludes that mere contact with the seabed is sufficient for OCSLA jurisdiction to attach.
- **In favor of Option 2:** Another group of commenters asserts that, as a matter of law, the Discoverer could be considered an OCS source only when it is stabilized and ready to proceed with drilling activities. In support for this position, such commenters stated:
- Option 1 of the draft permit addresses only the "permanently or temporarily attached to the seabed" clause of the OCS Source definition. The definition in 40

C.F.R. § 55.2 requires that a vessel must be both attached to the seabed and erected thereon. It is not an OCS source if either one of these conditions is not satisfied.

- As interpreted by the federal courts, Section 4(a)(1) of OSCLA, which is referenced in the definition of OCS source in 40 C.F.R. Part 55, covers "any artificial island, installation, or other device if (a) it is permanently or temporarily attached to the seabed of the OCS, and (b) it has been erected on the seabed of the OCS, and (c) its presence on the OCS is to explore for, develop, or produce resources from the OCS."
- In issuing the proposed Kulluk minor source permit in June 2008, EPA rejected Shell's view that the Kulluk should be deemed an OCS source only when all anchors had been placed and instead defined that drill ship as an OCS source "when it is attached to at least one anchor and that anchor is attached to the seabed." Response to Comments, Kulluk Minor Source Statement of Basis, Air Quality Control Minor Permit No. R10OCS-AK-07-012, Approval to Construct, Shell Offshore, Inc. Kulluk Drilling Unit (June 18, 2008), p. 13. But, Option 1 is neither supported nor compelled by that prior determination because EPA's analysis of the issue in connection with the Kulluk permit does not discuss the definition of "OCS Source" in 40 C.F.R. § 55.2, under which a vessel must be both attached and erected for the purpose of drilling before it is an OCS source.
- While the 1978 legislative amendments to Section 4(a)(1) of the original OCS Act of 1953 substituted "installations and devices permanently or temporarily attached to the seabed" for the prior term "fixed structures" for purposes of OCSLA jurisdiction, the conference committee report made clear that "The intent of the managers in amending section 4(a) of the 1953 OCS Act is technical and perfecting and is meant to restate and clarify and not change existing law." House Conference Report No. 95-1474, 95th Cong., 2d Sess. at 80, reprinted in 1978 U.S.C.C.A.N. 1674, 1679. Thus, Congress had in mind attachments to the seabed that are similar to fixed structures – not mere anchor lines and certainly not a single anchor line -- as triggers for the OCSLA jurisdiction that, in turn, creates EPA's regulatory authority under section 328 of the Clean Air Act.
- To require the definition of an OCS source to be based on a single anchor conflicts with conventional marine operating practices. Unless and until all anchors have been set, the Alaska Region of MMS does not consider the Discoverer Mobile Offshore Drilling Unit (MODU) to be an OCS facility permanently or temporarily attached to the seabed. Until the Discoverer is permanently or temporarily attached, the Discoverer is operated under, controlled by, and subject to the maritime laws and operating practices. The Alaska Region of MMS would exercise regulatory jurisdiction for a site specific mooring analysis for station-keeping only after the Discoverer has been securely and substantially moored so that it cannot be moved without special effort.

- In addition, the MMS is not the agency responsible for issuing the permit to anchor for the Discoverer. The U.S. Army Corps of Engineers (CORPS) authorizes placement of structures under the Rivers and Harbors Act. The CORPS issued findings both that Shell's Chukchi and Beaufort Sea Exploration activities are authorized by the Nationwide Permit No. 8, Oil and Gas Structures on the OCS.
- The Discoverer will not be "erected" and ready to drill until it is correctly located and stabilized. Shell cannot begin the drilling process until the Discoverer is moored under tension and its central turret system, around which the vessel rotates to face wind and ice, has been stabilized and the Discoverer's on-site company representative declares the vessel to be secure and stable and ready for drilling personnel to commence drilling operations. The transition to OCS source status under this definition will be clearly documented. The drilling contractor must complete an International Association of Drilling Contractors (IADC) form to document changes in the status of the Discoverer. When the vessel is believed to be stable and on location, the drilling contractor will indicate on the form that the vessel's status has changed from "rig up" to "operations." However, initial completion of the IADC form does not mean that the vessel is ready to drill. Shell's representative will examine data from instruments that measure the vessel's stability and its location and then, if the Discoverer is stable and correctly located, will sign off on the IADC form (which is then archived and available for later review). Similarly, when it is time to detach the Discoverer from the seabed at a drill site, Shell will cease all drilling activity and remove all physical connections through the drill stem to the seabed before any anchor can be removed. The change in status from operations to "rig down" will be documented in the IADC activity report and must be approved in writing by the Shell representative. This determination will document the timing of the change whereby the Discoverer would no longer be stable enough for drilling and therefore is no longer "erected" on the OCS for purposes of exploration.
- Under Option 1, if the Discoverer arrived at the drill site and temporarily dropped an anchor for emergency reasons, e.g., to ride out a storm or avoid moving ice floes, or temporarily moved off the well location and anchored temporarily after suspension of drilling, the Discoverer would be considered an OCS source and that this is not a satisfactory test in light of the requirement that an OCS source be "erected" for the purpose of oil and gas exploration. With a single anchor down, the Discoverer remains mobile around the anchor location and is by definition not at a fixed location or stable and ready to drill. To define the vessel as an OCS source in that unstable and movable condition is not consistent with Congress' intent that an OCS source be functionally equivalent to a "fixed structure."
- The most logical definition of when a drill ship becomes an OCS source would be when the drill ship has all anchors set and is prepared for exploratory drilling. This is the moment before the drill ship begins operations, propulsion has ceased and the engines associated with drilling have been started up and emissions have begun that would be covered under this OCS/PSD permit. The other definition,

which relates to the placement of a single anchor on the seabed is far too general. If the drillship drops anchor for any other reason (other than to drill), such as extreme weather conditions during the transit to drilling locations, then it could theoretically fall under the permit while it is not involved in OCS drilling operations.

- Option 1 could be construed to define a jack-up rig in storage mode as an OCS source. Defining the OCS source as one in existence when the first anchor attaches to the seabed or, in the case of a jack-up rig, when the first leg touches, creates scenarios where equipment not being “used for the purpose of exploring, developing, or producing resources” is subject to 40 C.F.R. Part 55. We do not believe this was the intent of that rule for vessels like the Frontier Discoverer, a jack-up rig, or any other mobile and temporary OCS exploration-related equipment.

Response: The point in time at which a particular vessel or drilling rig becomes an OCS source within the definition of OCS source in 40 C.F.R. § 55.2 is a fact specific determination. In this case, the drilling rig, the Frontier Discoverer, is a turret-moored drilling vessel which is propelled by a 7,200 hp diesel-fired engine and is anchored to the seabed with a number of individual anchors. See Statement of Basis (pp. 19-22) for a further description of the Discoverer and its anchoring process.

After careful consideration of the definition of OCS source in 40 C.F.R. § 55.2, EPA concludes that the Discoverer will be an “OCS source” from the time the Discoverer is sufficiently secure and stable to commence exploratory activity at the drill site, which in the case of the Discoverer, is a determination made for other operational purposes by the Shell on-site representative and is an event that is recorded in the Discoverer’s logs. In reaching this conclusion, EPA relies on the fact that the regulatory definition of OCS source requires more than just attachment to the seabed. Specifically, the definition provides, in part, that vessels are OCS sources only when they are “[p]ermanently or temporarily attached to the seabed and erected thereon *and* used for the purpose of exploring, developing or producing resources therefrom, within the meaning of section 4(a)(1) of OCSLA (43 U.S.C. § 1331 et seq.)” 40 C.F.R. 55.2 (defining “OCS source”) (emphasis added). The Agency interprets this provision to require that vessels be permanently or temporarily attached to the seabed and in a position to begin exploring, developing or producing resources from the OCS. The preamble to the final 40 C.F.R. part 55 regulations⁴ supports this interpretation:

The definition of “OCS source” has been modified to clarify when EPA will consider vessels to be OCS sources. Section 328(a)(4)(C)(ii) defines an OCS source as a source that is, among other things, regulated or authorized under the OCSLA. The OCSLA in turn provides that the Department of Interior (“DOI”) may regulate “all installations and other devices permanently or temporarily attached to the seabed, which may be erected thereon for the purpose of exploring, developing or producing resources therefrom, or any such installation

⁴ This provision was not included in the proposed 40 C.F.R. part 55, but was instead added to the definition of OCS source at promulgation of the final rule.

or other device (other than a ship or vessel) for the purpose of transporting such resources.” 43 U.S.C. § [4(a)(1)]. *Vessels therefore will be included in the definition of “OCS source” when they are “permanently or temporarily attached to the seabed” and are being used “for the purpose of exploring, developing or producing resources therefrom.” This would include, for example, drill ships on the OCS.*

57 Fed. Reg. 40792, 40793 (September 4, 1992)(*emphasis added*).

For Shell’s permit, although connection of the Discoverer to the seabed by a single anchor may be considered to meet the requirement of “permanently or temporarily attached to the seabed,” EPA does not agree that the Discoverer is sufficiently secure and stable at this point to be in a position to explore for resources on the OCS. When attached by a single anchor, the Discoverer could be over a location other than the drill site or in the process of moving.⁵ Instead, EPA believes that, until the Discoverer is sufficiently attached by its anchors to begin exploratory operations, the Discoverer is not an OCS source within the meaning of 40 C.F.R. § 55.2.⁶

Some commenters argued that the Discoverer must be actively engaged in exploratory operations, such as construction of a mud cellar line or actual drilling, before EPA can consider the vessel an OCS source because, according to the commenters, the vessel is not “used for the purpose of exploring, developing, or producing resources therefrom” until that time. EPA does not agree. Federal air permits must be practically enforceable, and it would be virtually impossible for EPA to draft such a permit if we adopted commenters’ interpretation because the vessel would be constantly alternating between OCS source status and vessel status as the exploratory activities started and stopped. EPA believes that tying the OCS source determination to the time the vessel is attached *and* ready to begin exploratory operations is sufficient because, based on our experience with OCS sources, that time will generally be defined by a particular event. In this case, the Discoverer is a drill ship that is used for the purpose of resource exploration, development and production and the vessel becomes an OCS source once it is secure and stable at a drill site and the Shell representative has made the required determination, documented by a notation in the log. As discussed in the Statement of Basis (p. 21), EPA also does not agree that all eight anchors must be attached for the Discoverer to be an OCS source because available information shows that there are some circumstances in which the Discoverer is sufficiently secure and stable to begin exploratory activities when secured by fewer than eight anchors.

⁵ EPA also notes that while attachment to the seabed by a single anchor is not sufficient for EPA in this permit to conclude that the Discoverer is an OCS source, similar or even less attachment, in conjunction with other facts, could be sufficient to render a vessel an OCS source within the meaning of 40 C.F.R. § 55.2. For example, dropping of a drill string in conjunction with the operation of propulsion engines to dynamically position a vessel over a drill site would likely be sufficient.

⁶ EPA does not find the two cases cited by commenters on both sides instructive on the issue of when the Discoverer is an OCS source. *Diamond* and *DeMette* are cases under OCSLA, not the CAA, and spoke only to the issue that attachment by at least one anchor is a prerequisite for regulation under OCSLA Section 4(a).

Some commenters assert that, by basing whether the Discoverer is an OCS source on a declaration made by the on-site company representative, EPA is adding criteria to the definition of OCS source that are not in the regulation. EPA disagrees. EPA is referencing the determination made by the on-site company representative, not as an additional requirement, but rather, as evidence that the Discoverer is sufficiently secure and stable so as to be considered to be attached and ready to be used for the purpose of exploring, developing or producing resources from the OCS within the meaning of 40 C.F.R. § 55.2.

EPA recognizes that in issuing a minor source OCS permit to the Kulluk Drilling Unit in 2008, EPA determined that that vessel was an OCS source when attached to the seabed by a single anchor. Kulluk Drilling Unit, Alaska Outer Continental Shelf Air Quality Control Minor Permit Approval to Construct, No. R10OCS-AK-07-012, (June 18, 2008).

As stated above, determining when a particular vessel or drill rig becomes an OCS source within the meaning of Part 55 is a fact specific determination. Without deciding whether EPA correctly determined in that instance that attachment by a single anchor was sufficient to render the Kulluk sufficiently secure and stable to be considered ready to be used for the purpose of exploring, developing or producing resources, EPA notes that this aspect of the permit was not the subject of its subsequent appeal. In addition, the Kulluk source determination was not in fact part of a final OCS permit as Shell subsequently withdrew its application for an OCS permit for the Kulluk drilling vessel in the Beaufort Sea and EPA therefore terminated the permit before it was finalized. See Public Notice, "EPA Terminates Minor Source Air Permitting Activity for Shell Kulluk," April 24, 2009.

F.2.b Comment: In further support of Option 2, one commenter offers some specific information as it relates to the type of OCS operation in which that commenter plans to engage: using a temporary drilling rig, or jack-up rig. In this case, the commenter asserts, the "erected thereon" clause should clearly be interpreted to refer only to when the rig is in place, its three feet set on the seabed, and it is fully erected and ready to commence operation. The principal reason for this, the commenter explains, is that much activity occurs over a fairly lengthy period of time before an operator considers the rig "erected thereon" and ready for its intended activity. The commenter notes that 12 to 16 hours may transpire between the time a leg hits the seabed and when the rig is "erected thereon" and that, except for the last 2 or 3 hours, there could be much vessel activity occurring immediately around the rig and an OCS source does not exist, as the commenter reads the definition, until the cantilever is extended since the action of erecting the rig is not complete until then and the rig is not being used for the purpose of exploring, developing, or producing resources. In addition, the commenter states, a jack-up rig may need to be moved if sea ice encroaches in the drilling area, in which case, the rig legs would be lifted and the rig towed to a pre-approved location away from the ice, perhaps even away from the Devil's Paw prospect, to await better (i.e., ice-free) conditions over the drilling area. While it waits, the commenter states, the legs will be lowered and the deck lifted. Some emissions will occur since the rig engines will run for raising and lowering the legs and to

sustain a hotel load, and the tending vessels' activity could be substantial – particularly when positioning and stabilizing the rig at a location. The rig should not be defined as an OCS Source during these safety-driven relocations, when no exploration activity is performed.

Response: For a discussion of when the Discoverer becomes an OCS source, refer to response to Comment F.2.a. As discussed in that response, the point in time at which a particular vessel or drilling rig becomes an OCS source within the meaning of the OCS regulations is a fact specific determination. The point at which a jack-up rig is considered to be an OCS source is not at issue in this permit decision and these comments are therefore outside the scope of this permit action.

F.2.c Comment: MMS implementing regulations define a facility at 30 C.F.R. § 350.105 to mean all installations or devices permanently or temporarily attached to the seabed. The same standard is used in administering MMS authorities for both air emissions (30 C.F.R. § 250.303) and for platform verification (30 C.F.R. § 250.900). MMS understands the EPA has the same standard under 40 C.F.R. § 55.2 for the definition of an OCS source.

Response: EPA's OCS definition of OCS source in 40 C.F.R. § 55.2 as it applies to vessels requires "attachment" either to the seabed or an OCS source.

F.3 Subcategory - The Discoverer as an OCS Source When Not Attached to the Seabed

F.3.a Comment: The commenter advocates a third option for when the Discoverer becomes an OCS source as defined in 40 C.F.R. § 55.2: when the Discoverer enters the 25-mile radius of the drill site. In support of this position, the commenter states that Congress intended to regulate drill ship exploration that has the potential to emit air pollutants, is authorized by OCSLA, and is "in or on waters above the Outer Continental Shelf." The commenter continues that the propulsion engine on the Discoverer is intrinsic to its operations and will transport the ship within the 25-mile radius surrounding the drill site when Shell is moving onto and off the site and moving between lease blocks and that Shell's application also states that the rig may need to leave the drill-site and return due to adverse ice conditions or other factors. Thus, the commenter continues, the statutory definition of OCS source includes the Discoverer's propulsion engine as the ship moves within the 25-mile radius of the drill site and these movements of the Discoverer are akin to the type of pre-construction activities that are routinely regulated by EPA under the PSD program. The commenter states that this third option addresses several of their concerns with the previous interpretation of when the Discoverer becomes an OCS source as put forth by EPA in the August 2009 proposed permit. It also addresses, the commenter's continue, concerns with both Option 1 and Option 2.

Response: EPA does not agree with the commenters assertion that the Discoverer becomes an OCS source when it enters the 25-mile radius of the drill site. As stated above and in the Statement of Basis, EPA's OCS regulations identify the circumstances

in which EPA has authority to regulate air pollutant emissions on the OCS, and attachment of the source to the seabed is a prerequisite. As the Environmental Appeals Board has previously determined, under the plain language of the regulatory definition of OCS source, whether a vessel is attached or detached from the seabed is not only relevant to whether the vessel is or is not an OCS source but would appear to be required by the plain language of the regulatory text. *Kulluk* EAB Decision, slip op. at 26.

F.4 Subcategory - Regulation of Otherwise “Nonroad Engines” as Part of the OCS Source

Comment: One commenter asserts that EPA has improperly imposed stationary source control strategies (e.g. PSD BACT) on vessels and nonroad engines that are not stationary sources and that are not easily configured to meet stationary source emission standards. The commenter states that the Statement of Basis opines that New Source Performance Standards (NSPS) and NESHAPs apply to nonroad engines and other emission units located on vessels, but that EPA defers the imposition of these requirements to a future Title V permit. In support of its position, the commenter asserts that the statutory definition of “stationary source” in CAA Section 302(z) excludes nonroad engines, that the PSD definition of stationary source exempts vessels, that CAA Sections 111 and 112 plainly limit the application of NSPS and NESHAP requirements to stationary sources, and that none of these programs authorize EPA to apply stationary source controls to vessels or nonroad engines. Of particular relevance to the proposed permit, the commenter argues, the PSD program does not authorize EPA to establish BACT limits for nonroad engines or vessels, citing to *In re Cardinal FG Company*, PSD Appeal No. 04-04, EPA Environmental Appeals Board, 2005 WL 701329, *14 (Mar. 22, 2005). The commenter continues that EPA’s explanation in the Statement of Basis misconstrues the language of Section 328, and ignores a recent decision of the EPA Environmental Appeals Board. After agreeing with EPA that nonroad engines are part of the OCS source and emissions from vessels within 25 miles of the OCS source count as direct emissions from the OCS source for purposes of ambient impact assessment due to the definition of OCS source in CAA Section 328(a)(4)(C), the commenter states that this does not support EPA’s view that any equipment within an OCS source is subject to stationary source controls. The commenter cites to the *Kulluk* EAB Decision, in which the commenter asserts, the EAB, with support from EPA, refused to “override” the jurisdictional boundaries of the PSD program just because the equipment was part of an “OCS Source.” The commenter concludes by stating that EPA has no authority to impose BACT limits on nonroad engines or vessels and that the proposed permit must be revised to delete the approval conditions that impose BACT limits on these categories of equipment.

Response: The commenter acknowledges that engines on an OCS source are considered part of the OCS source, but asserts that such engines may not be subject to BACT or other requirements that apply to stationary sources. EPA disagrees. As EPA explained in the Statement of Basis for the proposed permit, the exclusion of nonroad engines from the general definition of “stationary source” in Section 302(z) of the CAA is overridden

by the more specific definition of “OCS source” in Section 328 of the CAA. Statement of Basis, pp. 22-23, citing CAA Section 328(a)(4)(C); see also 40 C.F.R. § 55.2. The OCS source definition states that the OCS source includes “any equipment, activity, or facility which – emits or has the potential to emit any air pollutant,” and specifically includes “drill ship exploration.” Section 328(a)(4)(C). Furthermore, CAA section 328(a)(4)(D) defines the term “new OCS source” to mean “an OCS source which is a new source within the meaning of section [111(a)] of [the CAA].” Inherent in the definition of “new source” under Section 111 is that the source to be regulated is a stationary source. See Section 111(a)(2).

Moreover, the regulatory definition of OCS source in 40 C.F.R. § 55.2 provides that, for vessels physically attached to an OCS facility, “only the stationary source aspects of the vessels will be regulated.” See 40 C.F.R. § 55.2 (definition of OCS source). There would be no point to considering the “stationary source aspects” of a vessel attached to an OCS source to be part of an OCS source in 40 C.F.R. § 55.2 unless “such stationary source aspects” were considered and regulated in some other way than as emissions from vessels within 25 miles of an OCS source because, as the commenter acknowledges, emissions from otherwise nonroad engines on vessels within 25 miles of the OCS source count as direct emissions from the OCS source for purposes of ambient impact assessment. Section 328 of the CAA plainly requires that emission units on OCS sources be regulated as stationary sources except with respect to propulsion engine emissions from vessels attached to an OCS source. Similarly, the exclusion of vessel emissions in 40 C.F.R. § 52.21 in the PSD definition of “stationary source” is plainly overridden by the specific reference to the regulation of vessels as OCS sources in the definition of OCS source in CAA Section 328(a)(4)(C) and 40 C.F.R. § 55.2. Finally, we note that in drafting the OCS provisions of the CAA, Congress specifically indicated that “[t]his legislation is intended to supersede any inconsistent authorities, including, but not limited to, section 5(a)(8) of the [OCSLA].” S. Rep. No. 101-228 at 78 (1989) (emphasis added). Accordingly, we find no basis for the claim that we must limit the OCS provisions as the comment suggests.

Consideration of the emission sources on a typical OCS source make clear that neither Congress nor EPA could have intended to exclude otherwise nonroad engines from regulation as stationary sources if part of an OCS source. Using the Discoverer as an example, under the commenters’ interpretation, only the boilers and the incinerator on the Discoverer would be subject to BACT as part of the “OCS source.” All of the other emission sources on the Discoverer are equipment powered by internal combustion engines, such as diesel electric generators and diesel powered pumps, and would, in the commenters view, be excluded from BACT under the exclusion for “nonroad engines” in Section 302(z) of CAA. Thus, under the commenter’s interpretation, only three of the 32 emission units identified by EPA as part of the OCS source for the Discoverer would be subject to direct regulation under this permit and subject to, for example, BACT.⁷

⁷ In fact, by stating that “vessels and nonroad engines that are not stationary sources,” it appears that commenter may actually be arguing that not only the nonroad engines, but the entirety of the nonroad vehicles (aka vessels), should be excluded from OCS regulation. Such an exaggerated interpretation serves to further emphasize that the

Congress's specific grant of authority to EPA in the 1990 CAA amendments to regulate OCS sources, including "drill ship exploration" would be rendered meaningless if emissions from engines that would otherwise be considered nonroad engines and that comprise the vast majority of emission units on drill ships and drilling platforms were excluded from regulation as stationary sources.

We also find the commenter's reliance on the EAB decision in *Shell Offshore Inc., Kulluk Drilling Unit and Frontier Discoverer Drilling Unit, Order Denying Review In Part and Remanding In Part*, 13 E.A.D. __ (September 14, 2007) to be misplaced. In that case, the EAB was trying to determine if EPA had properly considered vessel emissions in determining the PTE of the OCS source for PSD applicability purposes and was specifically responding to the petitioners' claim that EPA should have considered emissions produced while the vessels were in transit from one drill site to another. Thus, the EAB was specifically focused on the PSD definition of "stationary source" to determine PSD applicability when the ship was in transit. The Board upheld EPA's PTE determination, which included emissions from otherwise nonroad engines when the vessels were not in transit between drill sites and were instead considered an OCS source, and nothing in the court's language suggests that those emissions, and thus the otherwise nonroad engines they came from, should have been excluded from the PSD definition of "stationary source." In fact, the court rejected one argument from the petitioners in that case by finding that the PSD "stationary source" in the permit at issue did not exclude any emissions units that comprised the "OCS source" identified in permit. *See id.* at 33-34 and n. 30. Accordingly, we find that neither the relevant statutory and regulatory provisions nor the EAB's prior decision dictate that the nonroad engines addressed in this permit should not be subject to PSD permitting requirements, including BACT controls.

G CATEGORY - REGULATION OF ASSOCIATED FLEET AS PART OF OCS SOURCE

G.1 Subcategory - Associated Fleet and BACT

G.1.a Comment: Commenters assert that, by requiring best available control technology (BACT) only for the drill ship and a single supply vessel, EPA is leaving the majority of the Discoverer's fleet and potentially thousands of tons of pollutants free from meaningful regulation. The commenters continue that Shell's icebreakers and support vessels will emit the lion's share of pollution from Shell's proposed drilling operations, including 96% of the operations' total NO_x emissions and 92% of their total PM_{2.5} emissions. The commenters also state that emissions from the Discoverer's propulsion engine are not calculated and were not considered in the draft permit and have yet to be calculated. The commenters contend that both the statutory definition of "OCS source" as well as the legislative history of Section 328 evince Congress's intent to count emissions

reading suggested by the commenter would strip the OCS regulations of all ability to control air emissions from the "drill ship exploration" that Congress clearly intended to regulate. See CAA § 328(a)(4)(C).

from marine vessels servicing or associated with an OCS source not solely for the purposes of potential to emit calculations and determining whether the source is subject to PSD, but also as “direct emissions of the OCS source” and for the “purposes of regulation” under PSD, including the BACT requirement. The commenters further assert that, although EPA’s regulations define an “OCS source” to exclude associated and servicing vessels, the OCS regulations do not preclude the application of BACT to emissions from the associated vessels. The commenters continue that it is critical that emissions that can be regulated under the CAA are subject to regulation now, because this permit will set the bar for the myriad of other offshore oil and gas exploration activities in the future and Shell’s permit demonstrates the incredibly significant impact just one operator can have on air quality in the Arctic.

Response: Under the regulatory definition of “OCS source,” only vessels that are “attached to the seabed and erected thereon and used for the purpose of exploring, developing, or producing resources therefrom...” or that are attached to an OCS facility are considered an OCS source and subject to regulation as stationary sources under the PSD program. EPA was challenged on this precise issue in *Santa Barbara County Air Pollution Control Dist. v. EPA*, 31 F.3d 1179, 1181 (D.C. Cir. 1994), and the OCS regulations were upheld. The OCS regulations make clear that, although the emissions from a vessel servicing an OCS source and within 25 miles of the OCS source are not regulated as part of the OCS source, emissions from such vessels are considered to be emissions from the OCS source and thus are considered in the ambient air quality impact analysis and offset calculations. 57 Fed. Reg. at 40794. Although this permit does not impose BACT on emission units that comprise the Associated Fleet, except for the supply vessels when attached to the Discoverer and the Discoverer is an OCS source, the permit does limit emissions from the Associated Fleet to ensure that the potential emissions of the OCS source do not cause or contribute to a violation of the NAAQS or violate increment.

G.1.b Comment: EPA’s application of the term “OCS source” in the Shell permit is also inconsistent with the agency’s administration of the PSD program as a whole. In its PSD regulations, EPA defines a “stationary source” –i.e., one that is subject to regulation under the program—as “any building, structure, facility or installation,” which in turn is defined as “all of the pollutant emissions activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, are under the control of the same person (or persons under common control).” 40 C.F.R. § 52.21. This is an incredibly broad interpretation of activities that are covered under the PSD program and, under these definitions, EPA has determined that facilities a mile or more apart are the same source for purposes of the PSD program. It is arbitrary for EPA to implement the PSD program broadly on shore, while narrowing the same program significantly when the activities are occurring offshore. This approach is also contrary to Congressional intent that OCS sources comply with the same requirements as non-OCS sources.

Response: Although EPA agrees that “stationary source” is defined very broadly under the PSD regulations, EPA disagrees that its interpretation of the OCS source in the Shell permit is inconsistent with EPA’s administration of the PSD program as a whole. To the contrary, as discussed in the preamble to the final OCS regulations, EPA’s determination that a vessel is to be regulated as part of the stationary source only when it is attached to an OCS source “is consistent with federal New Source Review (“NSR”) requirements [including PSD] under which emissions from the stationary source activities of vessels *at dockside* are considered primary emissions of the marine terminal and are regulated as such.” 57 Fed. Reg. at 49793 (emphasis added). Under PSD, vessels at sea that are en route to a marine terminal are not regulated as part of the marine terminal stationary source.

G.2 Subcategory - Icebreaker #2 and BACT

G.2.a Comment: Commenters assert that even if EPA were to apply BACT requirements only to vessels directly or indirectly attached to the sea-bottom as proposed, EPA should nevertheless apply BACT to the anchor-handling vessel (Icebreaker #2) because, like the supply ship, Icebreaker #2 will be attached to the bottom via attachment to the drillship. Commenters disagree with EPA’s proposed determination that Icebreaker #2 is not “physically attached” to the Discoverer on the grounds that the anchor line running between the vessels was not designed “to fasten . . . ” or “to connect . . . ” within the plain meaning of the term. Instead, the commenters assert, regardless of the anchor line’s design or intent, the anchor line in fact physically connects the vessels during the anchoring process and that Icebreaker #2 therefore falls within the plain meaning of “attached” and thus within the meaning of OCS source.

Response: Little, if any, anchor handling will occur while the Discoverer is an OCS source because, as discussed in response to Comment F.2, EPA has determined that the Discoverer is not an OCS source until it is sufficiently secure and stable to commence

drilling operation. At this point, most, if not all anchoring setting will have been completed.

In any event, EPA continues to believe that Icebreaker # 2 is not “permanently or temporarily attached” to the Discoverer during the time it is assisting the Discoverer in the anchor setting and retrieval process at a drill site. Statement of Basis. p. 21, fn. 7. The purpose of “attachment” within the definition of “OCS source” in 40 C.F.R. § 55.2 is to prevent or minimize relative movement between two vessels, between a vessel and a dock structure, or between a vessel and the seabed. See 57 Fed. Reg. 40,792, 40,793-94 (Sept. 4, 1992) (referencing activities of vessels while “at dockside”). In this instance it is clear that the anchor cable, which is repeatedly connected and disconnected from one of the Discoverer’s eight anchors, is not intended in any way to restrict the location of Icebreaker #2. In fact, the anchor cable will be played out as Icebreaker # 2 travels away from the Discoverer. Icebreaker #2 is merely transporting the anchor and the end of the anchor cable to the designated anchor site. EPA does not believe this constitutes “attachment” as used in the definition of OCS source. Additionally, even if Icebreaker #2 is considered attached to the Discoverer during the anchor setting and retrieval process via its anchor line, Icebreaker # 2 is not performing stationary source activities at this time, and only such activities are considered an OCS source in the case of a vessel that becomes an OCS source through a permanent or temporary attachment to an OCS facility. See 40 C.F.R. § 55.2 (definition of OCS source).

G.3 Subcategory - Propulsion Engine and BACT

G.3.a Comment: Commenters state that the statutory definition of “OCS source” includes the Discoverer’s propulsion engine as the ship moves within the 25-mile radius of the drill site because it is equipment that emits air pollutants, is authorized under OSCLA, and is located on the OCS or in or on waters of the OCS and further state that the legislative history of CAA Section 328 confirms that air emissions associated with stationary and in-transit activities of the vessels will be included as part of the facility’s emissions for vessel activities within a radius of 25 miles of the exploration, construction, development or production location. The commenters continue that Congress explicitly listed drillship exploration as an example of an activity that falls within the definition of OCS source, and drillship exploration inherently includes the uses of propulsion engines for reaching the drill site and maneuvering to place the ship’s anchors. Thus, commenters state, EPA improperly exempted the emissions from the Discoverer’s propulsion engine in the PTE calculation and failed to conduct a BACT analysis for this source. The commenters contend that the propulsion engine is a major contributor of air pollutants given the size of the engine and that Shell has estimated that bringing the Discoverer into and out of the 25-mile radius of a drill site would result in the addition of half a ton of NO_x to Shell’s overall emissions.

Response: EPA’s authority to regulate pollutant emissions under Section 328 and 40 C.F.R. Part 55 is limited to emissions from the “OCS source.” The permit prohibits the use of the propulsion engine when the Discoverer is an OCS source. See Permit

Condition D.1. There will thus be no emissions from the propulsion engine while the Discoverer is an OCS source.

EPA notes that in issuing a minor source (i.e., non-PSD) OCS permit for operation of the Discoverer in the Beaufort Sea in 2007, EPA stated that “Emissions from the Discoverer and support vessels within a 25-mile radius of a drill site are considered in determining the Discoverer’s potential to emit (PTE) as if the Discoverer were already located at the drill site.” Air Quality Control Minor Permit No. R10OCS-AK-07-02, Approval to Construct, Shell Offshore, Inc. Frontier Discoverer Drilling Unit, dated March 30, 2007, p. 9. The same is true for the minor OCS permit issued by EPA in 2007 for Shell’s operation of the Kulluk drilling rig in the Beaufort Sea and then reissued after a remand from the Environmental Appeals Board in 2008. Air Quality Control Minor Permit No. R10OCS-AK-07-012, Approval to Construct, Shell Offshore, Inc. Kulluk Drilling Unit, dated March 30, 2007. In its review of these permits, the Environmental Appeals Board specifically noted this aspect of EPA’s permit decisions and found that “the Region’s determination of the OCS source, and the methodology it used for allocating emissions of support vessels in calculating the source’s “potential to emit,” to be reasonable and consistent with EPA’s statements made when promulgating the OCS air regulations.” *Kulluk* EAB Decision, slip op. at 30-31, fn. 26. Shell subsequently requested that EPA suspend permitting activity on the minor source permit for the Discoverer in the Beaufort Sea after the permit was challenged and then remanded to EPA by the Environmental Appeals Board for further consideration. In addition, Shell subsequently withdrew its application for an OCS permit for the Kulluk drilling vessel in the Beaufort Sea and EPA therefore terminated the permit before it was finalized. See Public Notice, “EPA Terminates Minor Source Air Permitting Activity for Shell Kulluk,” April 24, 2009. [http://yosemite.epa.gov/R10/airpage.nsf/Permits/ocs_kulluk_terminated_ap/\\$FILE/shell_kulluk_publicnotice042409.pdf](http://yosemite.epa.gov/R10/airpage.nsf/Permits/ocs_kulluk_terminated_ap/$FILE/shell_kulluk_publicnotice042409.pdf)

After further consideration of EPA’s approach in the minor source OCS permits for the Discoverer and the Kulluk in 2007 and 2008 that were never finalized, EPA concludes that it erred in considering emissions from the Discoverer en route to and within a 25-mile radius of a drill site in determining the Discoverer’s PTE as if the Discoverer were already located at the drill site and an “OCS source.” The language in CAA Section 328(a)(1) discussing the emissions of the OCS source states that “[f]or purposes of this subsection, emissions from any vessel servicing or associated with an OCS source, including emissions while at the OCS source or en route to or from the OCS source while within 25 miles of the OCS source, shall be considered direct emissions from the OCS source.” (emphasis added). Similarly, EPA’s definition of “potential emissions” at 40 C.F.R. § 55.2 provides that “[p]ursuant to section 328 of the Act, emissions from vessels servicing or associated with an OCS source shall be considered direct emissions from such a source while at the source, and while en route to or from the source when within 25 miles of the source, and shall be included in the “potential to emit” for an OCS source....” (emphasis added). Notably, neither of these regulatory definitions make reference to the “drill site,” but instead discuss what emissions should be considered only with reference to the “OCS source.” As explained above, EPA’s position is that before the Discoverer is “attached to the seabed and erected thereon and used for the purpose of exploring, developing, or producing resources therefrom,” there is no OCS source. See

response to Comment 5.2.b. Therefore, it is not possible to be “within 25 miles of an OCS source,” and the propulsion engine emissions prior to this time are not counted. EPA therefore concludes that emissions from the propulsion engine of the Discoverer are not to be considered in the PTE of the OCS source while en route to and within 25 miles of the drill site, a period of approximately four hours, or while en route from one drill site to its next drilling location, which may be less than 25 miles away, because there is no longer an “OCS source” at this time.⁸ Shell has estimated that the four hour trip during which the Discoverer is within 25 miles of the drill site to which it is going results in emissions of approximately ½ ton of NO_x.

G.4 Subcategory - Nanuq and BACT

G.4.a Comment: Commenters contend that EPA has misapplied its own approach of not applying BACT to support vessels because EPA excludes the vessel Shell will use to refuel the Discoverer, likely the Nanuq, from its BACT requirement. Commenters contend that the Nanuq will be attached to the Discoverer and may be part of the OCS source during refueling, and therefore should be subject to BACT even under EPA’s approach. Commenters continue that when engaged in refueling, the Nanuq, or other refueling vessel, will be performing an activity that directly serves the Discoverer and would be in a position analogous to a vessel dockside at a marine terminal. Thus, commenters contend, EPA should regulate the refueling vessel as part of the OCS source during refueling and subject it to BACT requirements.

Response: Permit Condition Q.6 prohibits attachment of the Nanuq or the Kvichak work boats to the Discoverer while the Discoverer is an OCS source. Thus, the Nanuq will not be permitted to be refueled by and attached to the Discoverer, or to refuel the Discoverer while the Discoverer is an OCS source. In addition, Permit Condition 8.B prohibits the refueling of the Discoverer while the Discoverer is an OCS source.

G.5 Subcategory - Vessels not Performing Stationary Source Activities

G.5.a Comment: A commenter states that several conditions of the draft permit limit the operations of vessels to prevent them from being classified as part of the OCS source, pointing to conditions that prohibit attachment of some vessels in the Associated Fleet to the Discoverer. The commenter asserts that these restrictions should be deleted because they are based on a misreading of the 40 C.F.R. Part 55 definition of OCS Source that overlooks the proviso in the regulation stating that, when vessels attach to the Discoverer “only the stationary source aspects of the vessels will be regulated” and that this limitation derives directly from the D.C.

⁸ EPA notes that, although the Environmental Appeals Board appears to have concluded that EPA’s position on this issue in the 2007 and 2008 non-PSD OCS permits “to be reasonable and consistent with EPA’s statements made when promulgating the OCS air regulations,” *Kulluk* EAB Decision, p. 30, this position appears to be inconsistent with the EAB’s rejection of the petitioners’ claim that the “OCS source” within the meaning of CAA section 328 and 40 C.F.R. § 55.2 is the drill ship wherever it travels on the OCS.

Circuit holding in *NRDC v. EPA*. In support, the commenter cites to the preamble for the final OCS regulation, 57 Fed. Reg. at 40793-94 (September 4, 1992), which states that only the vessel's stationary source activities may be regulated, since when vessels are in transit, they are specifically excluded from the definition of OCS source by statute. The commenter asserts that the vast majority, if not all, of emissions associated with the Associated Fleet that might attach to the Discoverer are not "stationary source activities" as explained in prior judicial and EPA decisions. The commenter concludes by saying there is no justification to prohibit or limit the attachment of these vessels to the Discoverer, and all conditions in the permit that impose prohibitions or restrictions on attachment of support vessels to the Discoverer should be deleted.

Response: EPA agrees with the commenter that, in the case of vessels that are OCS sources by virtue of attachment to an OCS facility, only the stationary source aspects of such vessels are directly regulated. See 40 C.F.R. § 55.2 (definition of OCS source). The commenter does not assert that these support vessels in the Associated Fleet would not have any emissions from the "stationary source aspects," but instead asserts that the vast majority of emissions associated with the Associate Fleet that might attach to the Discoverer do not have "stationary source aspects." The permit application shows that there would be emissions from "stationary source aspects" of these vessels if attached to the Discoverer, such as incinerators and boilers. Shell informed EPA in its permit application that, aside from the supply ship for approximately eight resupply trips a year, none of the other vessels in the Associated Fleet will be attached to the Discoverer while the Discoverer is an OCS source, so Shell did not need to identify any emissions from "stationary source aspects" of these other vessels or submit a BACT analysis for them. The permit conditions prohibiting attachment of Icebreakers #1 and #2 and the oil spill response fleet to the Discoverer are appropriate to reflect Shell's intended mode of operation and implement the requirement that the OCS source be subject to PSD requirements, including BACT.

H CATEGORY – BACT ANALYSIS IN GENERAL

H.1 Comment: Commenters contend that the first step of the BACT analysis for Shell's operations—identification for the emission unit in question of "all available control options"—is inadequate. The commenters point to the following alleged deficiencies: EPA simply accepted Shell's list of possible control options and failed to explain what all available control options would be for each engine; failed to explain how it learned of these technologies and whether there are other control options available; improperly relied on the RACT/BACT/LAER Clearinghouse (RBLC) and the California BACT Clearinghouse (CA-BACT) data bases because such data bases focus on technologies that have been required to reduce emissions from stationary sources and are unlikely to have control technologies that are applicable to Shell's sources; and the lack of readily available control technologies in the RBLC does not excuse EPA from exploring alternative control technologies. The commenters continue that the EAB has

emphasized that a proper BACT analysis should consider technologies used outside the United States and existing controls applied to similar sources other than the category in question and that EPA must look beyond these data bases because BACT is meant to promote the used of the best control technologies as widely as possible.

Response: This comment was submitted on the August 2009 proposed permit and was incorporated by reference in comments submitted on the January 2010 modified proposed permit. As discussed in the Statement of Basis for the January 2010 proposed permit, Shell submitted additional permit materials analyzing BACT after this comment was made. See Statement of Basis, Section 4. As is evident in the Statement of Basis supporting the January 2010 modified proposed permit, EPA did perform a thorough search and identification of available control technologies for the emission units in question. Shell and EPA started by looking at what control options were identified in the EPA RBLC and the CA-BACT, the typical and usual place for permit applicants and permitting authorities to begin the search for available control technologies. See Draft New Source Review Workshop Manual, Prevention of Significant Deterioration and Nonattainment Area Permitting (October 1990), p. B.11. However, EPA did not limit its search for available control options to these databases, but also considered information from sources such as the EPA Office of Transportation and Air Quality lists of verified diesel retrofit technologies and emerging technology; control device manufacturers such as Cléaire; and diesel engine manufacturers such as Caterpillar and Detroit Diesel. EPA also considered the specific control technologies identified by commenters during the public comment process on the August 2009 and January 2010 proposed permits. See EPA's response to Comments in Categories I through M.

H.2 Comment: Commenters assert that EPA should have considered the following additional control technologies in step-one of the BACT analysis or explained why they are or not applicable to Shell's operations: Repowering with new Tier 2 or Tier 3 engines; retooling; hydrocarbon Selective Catalytic Reduction (SCR) or lean De-NOx catalysts to control NOx emissions; NOx absorber or trap which, in conjunction with low sulfur fuel, absorbs and stores NOx; and for those engines that are not Tier 3 and that are not receiving either oxidation catalyst (OxyCat) controls or CDPF technology, some form of diesel particulate filter.

Response: This comment was made on the August 2009 proposed permit and was incorporated by reference and resubmitted as a comment on the January 8, 2010 proposed permit. Since the comment was originally made, Shell submitted additional information in a letter to EPA dated December 9, 2009, which considered whether each of the above control options was an "available control technology" for purposes of a BACT analysis under 40 C.F.R. § 52.21(j). With the exception of engine replacement, which is discussed in response to Comments K.1 below, EPA considered and addressed these technologies in the January 8, 2010 modified proposed permit and Statement of Basis. Statement of Basis, pp. 53, 54, 60-62, 67-69, 71-74, 79-84. For example, the Statement of Basis for the January 2010 proposed permit explains that all engines other than the main generator engines that are not Tier 3 engines will be equipped with CDPF

technology. Statement of Basis, p. 73. In addition, the Tier 3⁹ engines will be equipped with either CDPF or OxyCat controls. See Permit Condition F.1 and I.1. The main generator engines will be equipped with OxyCat controls. See Permit Condition C.2.

H.3 Comment: Commenters state that EPA does not provide support for the assumption that all of the PM and PM10 emissions are also PM2.5. Commenters also assert that it is not true that control technologies for all three PM sizes are the same and that the same control technology will result in different control efficiencies for each PM size fraction. Commenters contend that, to meet BACT, EPA should analyze the control technology for each PM size fraction separately or should properly articulate a reasonable basis for assuming that all technologies for all three PM sizes are the same.

Response: This comment was made on the August 2009 proposed permit and was incorporated by reference in comment submitted on the January 2010 proposed permit. In the Statement of Basis for the January 2010 proposed permit, EPA stated that most of the particulate matter emissions from diesel engines are in the PM2.5 size range. Statement of Basis, p. 51. Particulate control devices designed to reduce PM2.5 emissions from engines are also effective on particulate matter in the larger size ranges. For example, a CDPF filters particulate matter from the exhaust gas stream and retains it within the filter until it can be oxidized to carbon dioxide. Particulate matter control options that have significantly different control effectiveness for the different particulate matter size ranges such as a cyclone, wet scrubber or electrostatic precipitators, are not relevant for use in controlling particulate matter from diesel engines. Therefore, there was no reason to evaluate BACT separately for the different particulate matter size ranges.

⁹ In 1998 EPA set new emission standards for nonroad diesel engines. The rulemaking was part of a three-tiered progression to lower emission standards. Each tier involves a phase in by horsepower rating over several years. Tier 1 standards for engines over 50 horsepower were phased in from 1996 to 2000. More stringent Tier 2 standards for all engine sizes were phased in from 2001 to 2006, and yet more stringent Tier 3 standards for engines rated over 50 horsepower were phased in from 2006 to 2008. Regulatory Announcement, New Emission Standards for Nonroad Diesel Engines, EPA420-F-98-034, August 1998. Depending on the year of manufacture, new diesel IC engines are available that meet the EPA Tier 2 or Tier 3 emission standards. Beginning in 2011, a phase-in period begins so that by 2014 all new engines must meet the Tier 4 standard. During the transition period, at least 50% of the engine manufacturer's engines must meet the Tier 4 emission standards. 69 Fed. Reg. 38958, 38971 (June 29, 2004). The resulting lower NO_x emission rates for diesel IC engines designed to meet the Tier 2, Tier 3, or Tier 4 standards are the result of the intrinsic engine design features built into them by the manufacturer.

H.4 Comment: Commenters contend that, despite Shell’s statement that ramp ups, power downs, and shut downs should not be necessary as marine mammal mitigation measures during drilling activities, ramp downs or shut downs may be required. Commenters therefore ask that EPA ensure that ramp downs and ramp ups, and shut downs and start ups be taken into account in determining the emissions from Shell’s operations, as well as the necessary best available control technologies.

Response: The ramp up and down of operations has already been taken into account in that this permit accommodates operation throughout the load range for all of the pollutant-emitting activities. Because EPA has attempted to characterize emissions conservatively throughout the load ranges, no increases in emissions are expected as a result of the ramp ups and ramp downs.

The equipment on board the Discoverer and Associated Fleet is fairly straightforward in design – engines, boilers and incinerators. As a result, shutting them down is not expected to require a complicated procedure. Start ups will take slightly longer, but again, should not pose a problem because the start-up periods for engines, boilers and the incinerator are short.

I CATEGORY – BACT FOR MAIN GENERATOR DIESEL IC ENGINES (FD-1 through FD-6)

I.1 Comment: Commenters disagree that the 0.5 g/kW-hr emission limit that EPA proposed as BACT for NOx emissions from main generator diesel IC engines controlled with SCR represents best available technology. The commenters point to the fact that the SCR system vendor expects that SCR will be capable of reducing NOx emissions to a level as low as 0.1 g/k-W-hr and claims that the record does not contain a reasoned analysis for why there should be a 500% margin between the vendor’s NOx emission expectation and EPA’s proposed emission limit. The commenters also state that EPA’s reference to stack test results to support its BACT determination is inadequate because EPA has not provided information on the entire range of emission tests for this engine and that the results from a single test may not be representative. If EPA decides that the 0.5 g/kW-hr emission limit is appropriate for the final permit, the commenters contend, the final permit should require adjustments to reflect actual operating performance as Shell collects more data.

Response: EPA does not agree it is appropriate to further reduce the emission limit for the main generator engines below the manufacturer's guarantee based on the fact that the vendor expects that SCR will at times or even for the majority of the time be capable of reducing NOx emissions to a level as low as 0.1 g/k-W-hr. EPA also does not agree that the permit should be revised to require a downward adjustment to the emission limit depending on stack test results.

The NO_x emission limit for the main generator engines contained in this permit must be met at all times, and it is appropriate that an emission limit be set to reflect what the emission unit and control equipment are capable of achieving on a continuous basis with an appropriate margin, assuming that air quality can be protected. Performance of the SCR control system to reduce NO_x emissions is a function of several variables including the type of catalyst, size of the catalyst bed, temperature in the catalyst bed, and amount and distribution of ammonia (derived from the urea reagent) throughout the catalyst bed. To achieve lower NO_x emission levels, the relationship between catalyst temperature and ammonia concentration and distribution becomes more critical and typically an excess of ammonia is required to force the reaction closer to 100% NO_x reduction. In this case, the emission units in question, the main generator engines, will be operating at varying loads. EPA believes it is not appropriate to set the emission limit so low that ammonia slip (unreacted ammonia) increases or that the potential for non-compliance due to engine load changes becomes a concern. EPA expects that the SCR system will perform at a level which will result in a NO_x emission rate lower than the proposed emission limit of 0.5 g/Kw-hr most of the time; however, EPA believes that the margin between expected performance and the proposed emission limit is appropriate and consistent with the vendor guarantee. See *In re Masonite Corp.*, 5 E.A.D. 551, 560-61 (EAB 1994) (BACT limits do not necessarily reflect the highest possible control efficiencies but, rather, are set so as to allow permittees to achieve compliance on a consistent basis); accord *In re Newmont Nevada Energy Inv., L.L.C.*, 12 E.A.D. 429, 442 (EAB 2005) (emission limit may take into account a reasonable safety factor to take into account variability and fluctuation in expected performance of the pollution control methods).

In response to the request that the emission limit be reduced based on the results of future stack tests, in addition to the fact that the emission limit was established based on information specific to the emission units in question, EPA also notes that emissions allowed under this limit are already very low—less than 1.55 tons per year for each engine—and EPA is not aware of lower NO_x emission limits for engines of this type (see also Response K.2 below).

The citation of stack test results for the uncontrolled Caterpillar engine was simply to demonstrate that the percentage reduction of NO_x at the proposed 0.5 g/Kw-hr emission limit was greater than 91%. That reduction is conservative compared to using the uncontrolled NO_x emission factor for diesel engines from the EPA emission factor document AP-42. The NO_x reduction would be 96.5% from the AP-42 uncontrolled NO_x emission factor of 14.6 g/Kw-hr (AP-42, Table 3.4-1 converting units from lb/hp-hr to g/Kw-hr).

I.2 Comment: The commenters note EPA's statement that the urea injection system will include a single NO_x analyzer that will sequence through the six generators, thereby providing direct measurement only once per hour for each engine. The commenters state that EPA should either require that each engine have its own analyzer, thus providing more frequent and better direct NO_x measurements, or justify why it is not feasible to do so.

Response: This comment was made on the August 2009 proposed permit and was incorporated by reference with other comments submitted on the January 2010 proposed permit. In the Statement of Basis (p. 57) for the January 2010 proposed permit, EPA stated that the NO_x analyzer provides a means for the urea injection algorithm to be optimized over time. Since the NO_x analyzer is not used for instantaneous continuous control of the urea injection system, periodic monitoring of NO_x is appropriate. Use of a continuous NO_x analyzer on each engine would not provide any significant benefit, but would increase analyzer maintenance requirements and monitoring costs by a factor of six.

I.3 Comment: The commenters state that EPA should consider engine replacement for the main generator engines and that upgrading to new engines may save money through fuel efficiency and future emission control requirements. The commenters contend that when a similar source with engines comparable to the Discoverer's main generator engines repowered its four main engines and generators to reduce NO_x and PM emissions, the operator received a fuel savings of almost \$400,000 per year, evidence that it is technologically feasible for the engines to be replaced on the Discoverer.

Response: EPA has concluded that replacement of the main generator engines is not cost effective and is thus appropriately excluded from further consideration in the BACT analysis. This comment was made on the August 2009 proposed permit and was incorporated by reference generally with more specific comments submitted on the January 2010 proposed permit. Since the comment was originally made, Shell submitted additional information in a letter to EPA dated December 9, 2009 which included the cost of engine replacement for the generator engines. Shell estimated replacement of the main generator engines at a cost of \$365,000 per engine, with an annualized cost of \$45,000. Assuming the new engines meet the Tier 2 emission standard of 0.64 g/Kw-hr (the applicable non-road engine standard for this engine size category for the 2006 – 2010 time period) and an SCR system which achieves 95% NO_x reduction was used, an emission limit of 0.32 g/Kw-hr could be achieved.

The cost effectiveness value of the new engines plus SCR compared to applying SCR to the existing engines is greater than \$45,000 per ton of NO_x removed since the amount of NO_x reduced per engine would be only approximately one ton per year. This amount in dollars per ton of NO_x reduced is far beyond the upper range of what EPA and State permitting authorities have considered to be cost effective for purposes of a BACT determination under 40 C.F.R. § 52.21(j). The analysis of control technology cost effectiveness should be focused on what other companies in the same industry have been required to pay in recent BACT determinations to remove a ton of the same pollutant. *In*

re Masonite Corp., 5 E.A.D. 551, 564 (EAB 1994). EPA was unable to find examples in the context of a BACT analysis of control technology cost effectiveness analyses for emission units in the same source category as the main generator engines. In reviewing cost effectiveness analyses for other source categories in the context of a BACT analysis, however, EPA was unable to find any situation in which a control technology for any source category for any pollutant had a cost effectiveness of \$45,000 per ton of pollutant removed. In fact, available information shows that control technology has been determined to be cost effective for purposes of a BACT analysis at values far below that amount. See, e.g., San Joaquin Valley Unified Air Pollution Control District, Final Staff Report: Update to BACT Cost Effectiveness Thresholds, dated May 14, 2008; Prevention of Significant Deterioration Permit to Construct, Deseret Power Electric Cooperative Bonanza Power Plant – Utah, Response to Public Comments, dated August 30, 2007, pp. 28-34 (EPA is not aware of any BACT determination for a coal-fired boiler project anywhere in the United States where incremental cost effectiveness as high as \$20,583/ton has been considered reasonable for BACT for any pollutants, regardless of the type of BACT option being considered).

I.4 Comment: Commenters contest EPA’s proposed determination that OxyCat, rather than CDPF, represents BACT for the main generator engines. The commenters disagree with EPA’s conclusion that CDPF systems are not commercially available in combination with SCR systems for diesel engines such as the Discoverer’s main generator engines and that, even if they were, they would not be cost effective. Noting that these engines contribute 30% of the maximum concentrations of PM from Shell’s activities, the commenters assert that several manufacturers have demonstrated commercial CDPF retrofit applications in conjunction with SCR to control NOx emissions, demonstrating that many of the technical considerations that Shell raises (e.g., backpressure on the engines, cross-sectional area for the catalyst matrix, filter element exchange frequency, etc.) can be overcome. If EPA is going to eliminate the use of CDPF technology as an effective control option based on cost effectiveness, commenters continue, EPA must present a detailed argument as to why \$22,000 per ton of PM removed per year is not considered cost effective for these units. The commenters contend that this argument must include an analysis of employing these technologies for Shell’s proposed operations in the Beaufort Sea as well. The commenters also point to EPA estimates in the context of several diesel retrofit programs ranging from \$11,200/ton for the Non-road Tier 4 emission standards to \$31,500/ton for the Urban Bus Retrofit and Rebuild program as evidence that retrofits can be a cost effective way to reduce air pollution.

Response: EPA continues to believe that CDPFs are not technically feasible for the main generator engines because it is not an available control technology for the emission units in question. Where a control technology has not been installed and operated successfully on the type of source under review, the control technology is only considered technically feasible if it both is available to the applicant through commercial channels (or otherwise within the common meaning of “available”) and can be reasonably deployed on or “applicable to” the emission units or source type under consideration. See *In re Maui Electric Company*, PSD Appeal No. 98-2 (September 10, 1998), Slip Op. at 17-18.

In this case, the control system is a system for the existing main generator engines and must be designed as an integrated unit to ensure that it will perform effectively within allowable parameters, such as space limitations, temperature, and backpressure that the control system imposes on the engines. The control system selected as BACT included an integrated system consisting of SCR catalyst and OxyCat in the same containment vessel. This design optimizes NO_x reduction while also achieving a significant reduction in PM, CO and VOC emissions in a cost effective manner. The vendor for the control system proposed by Shell has not incorporated a CDPF in any of its previous applications of similar SCR systems for marine diesel engines. The vendor stated that a feasibility study would be necessary before a final design for a CDPF could be developed. The feasibility study would need to consider the increased cross-sectional area required for a CDPF and the associated back pressure, the temperature profile in the CDPF to determine how well the captured soot would be oxidized in a CDPF, and what frequency of manual cleaning or filter element replacement would be required to keep backpressure within specifications. See Outer Continental Shelf Pre-Construction Air Permit Application Revised, Frontier Discoverer Chukchi Sea Exploration Drilling Program, dated February 23, 2009, Appendix F, p. 113, n. 41; Statement of Basis, p. 69. Based on this information, EPA concluded that a CDPF is not currently commercially available from the vendor of the SCR system proposed by Shell. See Statement of Basis (p. 69). Thus, although it may be technically possible to design a CDPF for use with an SCR system for the generator engines, EPA is not aware that this has been done and the commenter did not provide specific information about other vendors who may have commercially available SCR/CDPF systems for older heavy duty marine engines without modern electronic controlled fuel injection. EPA therefore continues to believe that CDPFs are not an available control technology for the emission units in question and are thus not technologically feasible.

Even if a CDPF were an available control technology for the generator engines at issue in this case, the cost effectiveness value calculated by Shell was approximately \$22,000 per ton of PM reduced. This amount is beyond the upper range of what EPA and State permitting authorities have considered to be cost effective for purposes of a BACT determination for PM under 40 C.F.R. § 52.21(j). Again, although EPA was unable to find examples in the context of a BACT analysis of control technology cost effectiveness information for emission units in the same source category as the main generator engines, in reviewing cost effectiveness for other source categories in the context of a BACT analysis, EPA is not aware of other situations in which a control technology for any source category for any pollutant with a cost effectiveness value in this range was determined to be cost effective in the context of a BACT determination. See response to Comment I.3.

Taking into consideration any additional time that the Discoverer may be operating in the Beaufort Sea under a different permit would not change the cost effectiveness analysis in any material respect. Given the restrictions on the drilling season (July 1 through December 31), the number of drilling days authorized under this permit (168 days) and the fact that the Beaufort proposed permit contains similar restrictions, there are, at most, 12 potential additional days of operation, and time spent traveling between drill sites and the two seas would further reduce this number. Permit Conditions B.2 and B.2.1;

Proposed OCS/PSD Permit to Construct, Permit Number: R10OCS/PSD-AK-2010-01, Discoverer Drilling Unit (Beaufort), Shell Offshore, Inc., proposed for public comment on February 17, 2010, Conditions B.2 and B.2.1. EPA has no information regarding use of the Discoverer between January 1 and June 30 of each year, and so considering emissions during this period in a cost-effectiveness analysis would be speculative.

The commenter points to EPA estimates for the cost of several diesel retrofit programs ranging from \$11,200/ton for the Non-road Tier 4 emission standards to \$31,500/ton for the Urban Bus Retrofit and Rebuild program as evidence that retrofits can be a cost effective way to reduce air pollution. In addition, 40 C.F.R. § 52.21(j) does not require consideration of a cost-effectiveness analysis in the context of a non-PSD rulemaking in order to determine what is cost-effective in a BACT analysis. Moreover, the cost-effectiveness analysis for the Non-road Tier 4 engines is acknowledged in the document itself to be based on an uncertain market as a baseline. Diesel Retrofit Technology Report, EPA42-S06-002, March 2006, p. 10 (EPA “would expect significant variability above and below these price estimates due to a wide range of other factors that we did not account for in this analysis”).

I.5 Comment: Commenters assert that EPA fails to provide a technical basis for its conclusion that the oxidation catalyst will result in a 50% reduction in particulate matter of all sizes.

Response: The 50% reduction of particulate matter was based on information from the control equipment vendor, D.E.C. Marine to Air Sciences, Inc., dated February 9, 2009. See Shell 2/23/09 Rev. App. Appendix F, p. 113. EPA understands the 50% reduction to apply to total mass of particulate matter, which may not be equivalent to 50% reduction for each size range of particulate matter. The OxyCat control option will remove the soluble organic fraction of the particulate matter and the smaller size fraction more effectively than the larger sized particles since the smaller particles act more like a gas and move by diffusion to the walls of the catalyst matrix where they can be oxidized.

I.6 Comment: Commenters contend that EPA did not provide factual support for its decision not to set a BACT emission standard for crankhouse ventilation on the main generator diesel IC engines. The commenters continue that EPA’s statement that quantifying PM emissions from crankhouse ventilation is difficult does not make the imposition of an emission standard infeasible.

Response: This comment was submitted on the August 2009 proposed permit and was incorporated by reference in comments submitted on the January 2010 proposed permit. In both the August 2009 and January 2010 proposed permits, EPA proposed that BACT for crankcase ventilation emissions was installation of a closed crankcase ventilation system on each generator engine, which would eliminate any venting of crankcase emissions to the atmosphere. See Statement of Basis, p. 70. Since using a closed crankcase ventilation system eliminates the emission point, there are no crankhouse emissions and no need to measure them.

J **CATEGORY – BACT FOR THE MUD LINE CELLAR (MLC) COMPRESSOR ENGINES (FD 9 through FD 11)**

J.1 Comment: Commenters contend that neither Shell’s application nor EPA’s proposed permit has evaluated all technically feasible options or provided sufficient discussion or analysis of whether the proposed BACT emission limit reflects the maximum degree of reduction of NO_x emissions that can be achieved from the MLC compressor engines. The commenters continue that Shell has proposed and EPA accepted as BACT an emission limit equal to the Tier 3 engine standards and to the NSPS for stationary compression ignition internal combustion engines, but that EPA does not thoroughly consider the use of add-on controls to reduce this limit even further. While the Tier 3 emission limit represents the most stringent of the new emission standard for non-road diesel engines, the commenters state, it does not necessarily reflect the maximum degree of reduction in NO_x emissions that can be achieved, as is required by the definition of BACT at 40 C.F.R. § 52.21(b)(12) and EPA has made clear in its policy guidance for BACT determinations that since the NSPS must always be met, it constitutes the legal floor for BACT.

Response: This comment was made on the August 2009 proposed permit and was incorporated by reference and resubmitted as a comment on the January 2010 proposed permit. In this case, EPA believes that the NSPS cited by the commenter is an appropriate benchmark for what represents BACT for NO_x since the non-road diesel engine standards for new engines are designed to be implemented in tiers over a period of time through the year 2014. For the engine size category in which the MLC engines fall, the Tier 3 emission standards apply through 2010. Beginning in 2011, a phase-in period begins so that by 2014 all new engines must meet the Tier 4 NO_x emission limit that is much lower than the Tier 3 limit. During the transition period at least 50% of the engine manufacturer’s engines must meet the Tier 4 emission standards.

Information provided by Shell also shows that the California Air Resources Board voluntary Portable Engine Registration Program (PERP) requires that engines between 75 and 750 hp, the size of the Discoverer’s MLC compressor engines, must meet the Tier 3 emission standards. Letter from Susan Childs, Shell to Rick Albright, EPA, dated December 9, 2009, re: Shell Gulf of Mexico Inc. Supplement to Application for Discover/Chukchi OCS/PSD Permit, p. 13. Local air districts in California use the PERP when permitting portable engines, including skid mounted engines used on offshore platforms and drilling operations. The Santa Barbara County Air Pollution Control District, which has offshore platforms in its jurisdiction, considers engines meeting the PERP requirements to also meet BACT requirements. For these reasons, EPA continues to believe that the Tier 3 emission limits represent BACT for the MLC compressor engines.

Whether add-on NO_x controls such as SCR can be considered as BACT for the MLC engines is addressed in response to Comments J.2 below.

J.2 Comment: Commenters state that EPA did not sufficiently justify its conclusion that SCR is not technically feasible as an add-on control for the MLC Compressor engines due to the need for portability, space limitations on deck, and lack of previous applications. Commenters assert that EPA does not discuss whether a smaller SCR reactor, perhaps with a lower NO_x reduction, might fit; whether an SCR system could be put in a stationary location to which duct work can be connected from the expected use locations of the compressor engines; or why the SCR system for the generator engines cannot also accept, via ductwork, the additional exhaust gas from the compressor engines. Commenters also contend that hundreds of SCR retrofit systems have been installed in the United States and Europe on large highway trucks, as well as on a variety of marine applications on main propulsion engines and auxiliary engines in Europe, including ferries, cargo vessels, and tugboats and that EPA's Diesel Retrofit Technology Verification program confirms that SCR is a proven technology for stationary engines applications and is commercially demonstrated for mobile applications. Commenters further state that EPA failed to consider NO_x absorbers. To properly apply BACT, commenters contend, EPA and Shell must analyze whether these options meet BACT criteria.

Response: Many of these comments were made on the August 2009 proposed permit and were incorporated by reference and resubmitted as comments on the January 8, 2010 proposed permit. After the comment was originally made, Shell submitted additional information addressing this issue and the Statement of Basis for the January 2010 proposed permit included additional discussion on the topic of an SCR system for control of NO_x emissions. Shell 12/9/09 Supp. App.; Statement of Basis, pp. 58-60.

The space available to install SCR near the MLC compressor engines is clearly very limited as shown in photograph 3-1 cited in the Statement of Basis (p. 59). Ducting the MLC engine exhaust to the SCR system for one of the generator engines is not a feasible option for several reasons, including the need to change the physical size of the generator engine SCR system, the difficulty of designing a control system for urea injection when two different engines would be contributing exhaust gas with different inlet NO_x concentrations and could be changing load at different times, maintaining temperature of the MLC engine exhaust through the transporting ductwork, and the difficulty of physically routing the ductwork. The commenter has provided no specific information to counter EPA's determination that SCR is not technically feasible for the portable MLC compressor engines. EPA therefore continues to believe that SCR is not technically feasible for the emission units in question.

In addition to space limitations, EPA recognized that the cost effectiveness value for an SCR on the MLC compressor engines was greater than \$34,000 per ton of NO_x removed. As discussed above in response to Comment I.3, this amount is far beyond the upper range of what EPA and State permitting authorities have considered to be cost effective for purposes of a BACT determination for PM under 40 C.F.R. § 52.21(j). A smaller SCR, even if one could be installed in the limited space available, would also reduce less NO_x. Since the cost of control devices typically does not decrease linearly with size, the

cost effectiveness value for a smaller SCR system would likely be even higher than the value calculated for a full-sized SCR system.

With respect to the other identified NO_x control options, in the Statement of Basis for the January 2010 proposed permit (pp. 54 and 58), EPA did evaluate these options, including NO_x absorbers and lean NO_x catalyst systems. See also response to Comments J.1 and J.5. The commenter provided no specific information suggesting EPA's analysis of this issue in the January 2010 Statement of Basis was incorrect.

In their comments on the January 2010 proposed permit, the commenters appear satisfied with the additional information provided by Shell and evaluated in the Statement of Basis by stating "We appreciate the more detailed investigation of add-on controls for reducing NO_x emissions from the MLC engines and, in particular, the cost analysis of SCR on these engines as well as the information on CARB's PERP and the associated BACT analysis for the participating engines." EPA therefore believes that these comments have been addressed.

J.3 Comment: Commenters contend that EPA failed to explain why the imposition of a CDPF system for the MLC Compressor Diesel IC Engines is not cost effective. Commenters continue that if the high cost-effectiveness is associated with up-front costs, EPA should consider the multiple trips that Shell has planned for the Discoverer under this permit as well as the multiple trips Shell is likely to take on other oil exploration trips, including under the concurrently proposed Beaufort exploration plan. (ICAS 10/20/09 p. 20).

Response: This comment was made on the August 2009 proposed permit and was incorporated by reference in comments on the January 2010 proposed permit. In the January 2010 Statement of Basis (p. 71), EPA provided additional information on the cost effectiveness of CDPF systems for the Tier 3 engines including the MLC compressor engines. The calculated cost effectiveness value for a CDPF for the compressor engines was more than \$41,800 per ton of PM removed, far in excess of what EPA and other permitting authorities have determined to be cost effective in the context of a BACT analysis. See response to Comment I.3.

Taking into consideration any additional time that the Discoverer may be operating in the Beaufort Sea under a different permit would not change the cost effective analysis in any material respect. See response to Comment I.4

J.4 Comment: Commenters state that EPA failed to explain why the imposition of an OxyCat system to the MLC Compressor Diesel IC engines is not cost effective or otherwise infeasible before eliminating it as a potential control technology.

Response: This comment was made on the August 2009 proposed permit and was incorporated by reference in comments on the January 2010 proposed permit. In the Statement of Basis for the January 2010 proposed permit (p. 58), EPA provided additional information on the cost effectiveness of OxyCat systems for the MLC compressor engines. Evaluating the cost effectiveness of an OxyCat system based on only PM resulted in a cost effectiveness value that EPA considers unreasonably high for a

BACT determination under 40 C.F.R. § 52.21(j). However, when considering OxyCat for control of CO emissions, EPA determined that the cost effectiveness value was reasonable and based the CO emission limit on using an OxyCat system. See Permit Condition F.1. Since an OxyCat system will achieve additional PM control, the PM emission limit was adjusted to a lower value to reflect the PM reduction achieved by an OxyCat system. See Permit Conditions F.2.2, F.2.3, and F.2.4,

J.5 Comment: Commenters assert that, in addition to the NSPS for stationary compression ignition internal combustion engines, individual states as well as the Northeast Ozone Transport Commission (OTC), the Regulatory Assistance Project (RAP), and the State of Texas have developed standards for stationary engines that apply to broad populations of new and in-use engines, which are more stringent than the NSPS. Commenters continued that EPA's Tier 4 nonroad diesel engine standards will be implemented for engines in the 175-750 hp size range beginning in 2011 and must meet a lower NO_x emission standard than proposed by EPA. Commenters contend that all of these limits demonstrate achievable levels of control for these and similar types of engines and, therefore, must be considered in EPA's BACT analysis.

Response: This comment was made on the August 2009 proposed permit and was incorporated by reference in comments on the January 2010 proposed permit. EPA disagrees with the commenter that it must consider emission limitations in rules when determining BACT for subject emission units, especially emission limitations in model rules that have no legal force such as the OTC and RAP model rules. Consideration of emission limitations is a requirement for determining the "lowest achievable emission rate" (LAER) for a major source in nonattainment areas, but it is not an element of a BACT analysis. Rather, a BACT analysis must consider all technically feasible control technologies and establish a unit-specific emission limitation based on the application of BACT to the specific emission unit. In addition, EPA disagrees that it needs to consider standards for new engines when determining BACT for existing engines once it is determined that engine replacement is not cost effective. New engine standards are most often based on technologies inherent in the engine design and are not technically available technologies for retrofit on existing engines. Except in the case where replacement of an existing engine with a new engine is determined to be BACT (see response to Comment K.1 on hydraulic power unit (HPU) engines), technology and standards developed for and applied to new sources are not appropriate for the existing engines on the Discoverer.

However, in response to this comment, EPA did look at the rules referenced by the commenter and the technical information supporting those rules to determine whether they were based on emission control technologies that EPA had not already considered in its BACT analysis. EPA found that many of the rules referenced by the commenter either (1) only applied to diesel electric generating units (e.g., the RAP model rule) or only applied to new engines (e.g., the Tier 4 nonroad diesel engine standards). Where the rules applied to existing small diesel engines, the limits were based on either typical uncontrolled engines or the application of SCR. EPA therefore believes that it has

identified and properly considered all technically available NO_x controls in its BACT determination for the MLC engines and other small engines on the Discoverer.

See response to Comment J.2 for a discussion about why EPA believes the Tier 3 emission standards, adjusted downward to account for installation of OxyCat controls, represents BACT for the MLC compressor engines.

K CATEGORY – BACT FOR SMALLER COMPRESSION IGNITION INTERNAL COMBUSTION ENGINES (FD 12-20)

K.1 Comment: Commenters state that EPA failed to show that the proposed emission limits for NO_x for the smaller engines reflect the maximum degree of NO_x reduction that can be achieved from these engines and failed to consider all technically and economically feasible control options. The commenters assert that these emission units collectively represent over 50% of the annual NO_x emissions and 75% of the hourly NO_x emissions from the Discoverer, and that EPA should therefore not be proposing only good engineering practices as BACT. Size, portability and space considerations, commenters continue, do not necessarily preclude the use of SCR or other technologies, such as NO_x absorbers. In addition, they assert, it is not sufficient to simply compare the proposed BACT determination to the BACT determinations of other portable sources where Shell is proposing non-traditional operations that are not readily compared to traditional sources. Commenters further contend that EPA should reconsider the option for re-powering the two HPU units as BACT for these engines because information submitted by Shell shows engine replacement is feasible and cost effective for these emission units. If EPA does not require engine replacement as BACT for the smaller engines, the commenters continue, EPA must at least consider re-tooling these and other engines as BACT instead of simply employing “good engineering practices.”

Response: Many of the comments relating to the smaller diesel engines were made on the August 2009 proposed permit and incorporated by reference in comments submitted on the January 2010 proposed permit. In submittals dated December 9 and 11, 2009, Shell provided additional analysis of control technologies for these engines, and EPA provided additional analysis of this information and BACT for the smaller engines in the Statement of Basis for the January 2010 proposed permit. Statement of Basis, pp, 60 – 64, 70-74, and 80-82; Letter from Susan Childs, Shell to Rick Albright, EPA, dated December 9, 2009, re: Shell Gulf of Mexico Inc. Supplement to Application for Discover/Chukchi OCS/PSD Permit; E-mail from Kirk Wings, ENVIRON to Paul Boys, EPA regarding edited BACT with attachment, “Diesel Engine Best Available Control Technology Analysis, Frontier Discoverer Drill Ship.” As noted in the Statement of Basis, Shell up-graded the Logging Unit Engine Winch (FD-19) to a Tier 3 engine and up-graded the Logging Unit Generator Engine (FD-20) to a Tier 2 engine. Statement of Basis, p. 60.

In addition, in response to the comments received on the January 2010 proposed permit, EPA has given further consideration to engine replacement as a BACT control option for

these engines. Shell provided cost effectiveness information for engine replacement in the context of its BACT analysis to EPA on December 11, 2009. Except with respect to the HPU engines, the cost effectiveness value for replacement of the other small engines that are not already Tier 3 engines with Tier 3 engines ranged from \$25,800 to \$55,000 per ton of NO_x removed. As discussed above in response to Comment I.3, these values are beyond the upper range of what EPA and State permitting authorities have considered to be cost effective for purposes of a BACT determination under 40 C.F.R. § 52.21(j).

The cost-effectiveness value for the HPU engines (FD-12 and FD-13) was less than \$10,000 per ton of NO_x removed for the HPU engines. Using the cost information for engine replacement that Shell provided, EPA calculated cost effectiveness values for several scenarios including: one for engine replacement with an engine meeting the Tier 3 standards; and one for engine replacement with an engine meeting the Tier 3 standards plus an add-on CDPF. See Memo from Paul Boys to file, dated March 11, 2010, re: Cost Effectiveness Estimates for HPU Engine Replacement on the Frontier Discoverer (Shell Chukchi Sea OCS Permit). For the first scenario (engine replacement with a Tier 3 engine), the sum of the reductions of all pollutants was used in the cost effectiveness calculation assuming engine operation at the maximum hours allowed by the proposed permit. EPA believes this is the proper metric to use in the cost effectiveness calculation since replacement with a Tier 3 engine will result in reductions in emissions of NO_x, PM, CO and VOC. The cost effectiveness value for engine replacement alone was \$3020 per ton of pollutants removed, which EPA believes is cost effective. The cost effectiveness value for engine replacement plus an add-on CDPF compared to the base case of uncontrolled HPU engines was \$3860 per ton of pollutants removed, which again is well-within the range of what has been found to be cost-effective by EPA and other permitting authorities. In order to measure the cost effectiveness of the CDPF based only on the emissions it reduces (PM, CO and VOC), EPA calculated the incremental cost effectiveness of a Tier 3 engine with CDPF compared to a Tier 3 engine alone (this analysis eliminates the influence of NO_x reduction which was included in the two previous cost effectiveness calculations described above). The cost effectiveness value calculated for the CDPF added to a Tier 3 engine was \$7570 per ton of pollutants removed, again, within the range of what EPA and state permitting authorities have considered to be cost-effective in the context of a BACT analysis.

EPA therefore has determined that BACT for the HPU engines is replacement of the engines with Tier 3 engines plus an add-on CDPF. Because the limits are based on the Tier 3 emission limits, the emission limit for VOC is replaced by a joint limit for NO_x and non-methane hydrocarbons (NMHC), as is the case for the MLC compressor engines.

Consequently, Condition G.2 has been revised to read as follows:

2. **BACT Limits.** *Emissions from each HPU engine (Units FD-12 – 13) shall not exceed the emission limits specified for each of the pollutants below:*

2.1. **NO_x and NMHC, in aggregate:** 4.0 g/kW-hr

2.1.1. *For compliance with Condition G.2.1, measurement of NO_x shall be determined using EPA Method 7E.*

- 2.2. **PM:** 0.030 g/kW-hr
- 2.2.1 *For compliance with Condition G.2.2, measurement of PM shall be determined using EPA Method 5.*
- 2.3 **PM₁₀:** 0.030 g/kW-hr
- 2.3.1 *For compliance with Condition G.2.3, measurement of PM₁₀ shall be determined using EPA Method 201/201A and OTM 28, provided, however, that if proposed changes to Method 202 in 56 Fed. Reg. 12970 (March 25, 2009) become final and effective, EPA Method 202 shall be used in lieu of OTM 28.*
- 2.4 **PM_{2.5}:** 0.030 g/kW-hr
- 2.4.1 *For compliance with Condition G.2.4, measurement of PM_{2.5} shall be determined using EPA Method 201/201A and OTM 28, provided, however, that if proposed changes to Method 202 in 56 Fed. Reg. 12970 (March 25, 2009) become final and effective, EPA Method 202 shall be used in lieu of OTM 28.*
- 2.5 **Visible Emissions:** *Visible emissions, excluding condensed water vapor, shall not reduce visibility through the exhaust effluent more than 20 percent averaged over any six consecutive minutes.*
- 2.5.1 *For compliance with Condition G.2.5, measurement of visible emissions shall be determined using EPA Method 9.*
- 2.6 **CO:** 0.70 g/kW-hr.
- 2.6.1 *For compliance with Condition G.2.6, measurement of CO shall be determined using EPA Method 10.*

K.2 Comment: The OTC model rule that applies to in-use non-emergency diesel fueled engines greater than 200 hp must also be considered in EPA's BACT review for these engines. The OTC NO_x emission limit for existing diesel engines is 3 g/kWh, which would represent up to an 80% reduction in emissions from these engines.

Response: See response to Comment J.5 above for why EPA does not agree that we are required to consider unenforceable model rules in a BACT determination. In addition, EPA understands that the OTC NO_x model rule emission limitation of 2.3 grams per Bhp-hr (3.1g/kWh) for new and in-use diesel engines came from an analysis of the average emission factors of smaller engines that were not regulated under regional or federal programs at the time and as such is not based on the application of any particular

control technology. Therefore, the OTC model rule and background material provide no additional technologies to consider for the smaller engines on the Discoverer.

K.3 Comment: Commenters assert that, at a very minimum, EPA should quantify the reductions in NOx emissions that can be expected from implementation of the good combustion practices defined as BACT for the smaller engines for which no additional controls are required instead of requiring the practices but enforcing an emission limit that is simply based on average engine operation for these 8V-71 engines.

Response: This comment was made on the August 2009 proposed permit and was incorporated by reference in comments submitted on the January 2010 proposed permit. The definition of BACT in 40 C.F.R. § 52.2(b)(12) states that a BACT requirement based on a work practice standard shall “*to the degree possible*, set forth the emissions achievable by implementation of such ...work practice.” (emphasis added). There is no requirement that EPA quantify the amount of reductions that can be expected from implementation of BACT. In any event, EPA does not believe it is possible in this case to determine the emission reduction that will be achieved by the good operations and maintenance requirements proposed by EPA in the permit, such as the requirement to train operating personnel to identify signs of improper operation and maintenance, or to have the maintenance specialist inspect emission units each week for proper operation and maintenance consistent with the manufacturer’s recommendations.

K.4 Comment: Commenters support EPA’s requirement to test these engines (Conditions G.7, H.7 and I.7) to verify emission limits can be achieved, but these data are needed prior to issuing a permit to set a BACT limit and determine BACT. Commenters assert that, in the event that the test data for these units demonstrate the ability to meet lower NOx limits, EPA must revise the BACT limits accordingly.

Response: EPA sets the emission limits based on the best information available to EPA at the time of permit issuance. Source test data from the emission unit in question are often not available when BACT emission limits are established in a permit. Condition A.6 authorizes EPA to revise, terminate, or revoke and reissue this permit if, among other things, it contains a material mistake. This could include a situation where stack tests conducted on a particular emission unit demonstrate that the emission unit and related control equipment are capable of achieving a materially lower BACT emission limit. It could also include a situation where stack tests conducted on a particular emission unit demonstrate that the emission unit and related control equipment are not capable of achieving an emission limit in the permit that is a BACT limit. Of course, in the latter situation, the increase in emissions from any increase in a BACT emission limit would need to be supported by a revised air quality analysis or shown to be consistent with the existing analysis.

K.5 Comment: EPA determined CDPF is not technologically feasible for application to the smaller diesel engines because it is not “commercially available.” The only statement to support this assertion is that statement from a manufacturer that they

are not aware of any applications of CDPF systems on older, heavy engines. This statement is not adequate support for EPA's assertion.

Response: This comment was made on the August 2009 proposed permit and was incorporated by reference in comments submitted on the January 2010 proposed permit. In both the August 2009 and January 2010 proposed permits, CDPF systems were proposed to be required on all of the smaller diesel engines. See Permit Conditions G.1, H.1, and I.1.

L CATEOGRY - BACT FOR THE INCINERATOR (FD-23)

L.1 Comment: Commenters state that EPA should require a standard operating procedure/waste separation plan to instruct employees on how to segregate waste to ensure that hazardous/toxic material is not inadvertently incinerated.

Response: This comment was made on the August 2009 proposed permit and was incorporated by reference in comments submitted on the January 2010 proposed permit. As requested by the initial comment, Permit Condition K.8 requires Shell to develop and implement a written waste segregation work practice plan to ensure that non-combustible items containing heavy metals that could be volatilized and emitted from the incinerator as PM are not introduced into the incinerator. This is also discussed in the Statement of Basis, p. 77.

L.2 Comment: Commenters state that EPA eliminated the use of add-on controls for the incinerator as technically infeasible, but has not adequately explained how the emission factors for PM underlying the proposed emission limits will be achieved absent additional controls because the proposed limits are a small fraction of the total AP-42 PM total emission factor for an uncontrolled multiple hearth sewage sludge incinerator and vendor data and source test data are absent to confirm the limits imposed by EPA can be achieved. Even at the emission limits in the proposed permit, the commenters continue, the incinerator PM_{2.5} emissions account for 30% of the 24-hour PM_{2.5} and PM₁₀ concentrations at maximum impact locations under Alternative Operating Scenario #2. Commenters further assert that Shell's own findings in EPA's RBLC demonstrate that lower limits can be achieved on similar-sized units using "Proper Operation and Maintenance" practices, pointing to a permit listed in the RBLC for similar waste combusting units permitted at the Kenai Refinery in Alaska. Although the commenters support EPA's requirement to test the incinerator to verify whether emission limits can be achieved, they assert that these data are needed prior to issuing a permit to set a BACT limit and determine BACT. In addition, the commenters state, the permit should include an alternative procedure in the event testing shows that the incinerator fails to achieve the proposed emission limits, such as further reducing the incinerator throughput or developing alternative waste handling strategies to reduce waste.

Response: EPA set the emission limits for the incinerator based on the best information available to EPA at the time of permit issuance. Except with respect to the information regarding the Kenai Refinery, which is discussed below, the commenter has not provided

any specific information to show that EPA's BACT analysis or owner-requested limits are inadequate. Source test data from the emission unit in question is often not available when BACT emission limits are established in a permit. See response to Comment K.4.

The RBLC, as indicated by the comment, does contain a March 2000 listing (AK-0053) for three waste incinerators permitted at the Kenai Refinery. The incinerators were identified as CF-U-59001A, CF-U-59001B and Incinerator 3. None of the construction or Title V permits for the Kenai Refinery available on ADEC's website, however, identify a waste incinerator as an emission unit at that facility and EPA has been unable to find any indication that such incinerators exist at the Kenai Refinery.

Interestingly, in the course of this inquiry, EPA learned that a construction permit issued by ADEC to ARCO for the Alpine facility on January 20, 2000 lists two waste incinerators labeled CF-U-59001A, CF-U-59001B, the same identification numbers shown in the RLBC for two of the incinerators shown as being at the Kenai Refinery. See Air Quality Construction Permit, ARCO Alaska, Inc. and Anadarko Petroleum Corporation, ADEC Permit No. 9973-AC017, dated January 20, 2000, pp. 13 and 27..

A review of that permit shows, however, that the PM BACT limit for the two incinerators only contain visible emission limits, and do not contain PM emission limits. ARCO Permit, Condition X.A.4, p. 21. EPA therefore concludes that the RBLC is likely in error and does not provide a basis for determining that the emission limit identified in the RBLC represents BACT for the incinerator on the Discoverer.

See also response to Comment L.3.

L.3 Comment: Commenters state that it is not clear why Shell uses the "D" rated emission factor from AP-42 for a refuse combustor of 2.5 lbs/ton rather than the "B" rated emission factor of 28 lb/ton found in Table 2.2-1 for a multiple hearth sewage sludge incinerator (which is 11 times larger). Commenters contend that if Shell has reduced this emission factor based on fuel type, this must be explained.

Response: The permit allows Shell to incinerate sewage and/or sewage solids. As there is limited information available on emissions from the type of waste incinerator Shell will use on board the Discoverer, EPA has relied on emissions estimates from AP-42. Shell has opined that the emission factors from large, multiple-hearth incinerators are not representative of the small batch-type incinerator proposed for the Discoverer. Consequently, they have elected to request an enforceable emission limit based on a lower emission factor. Compliance with this emission limit will be assured by testing incineration of a waste stream containing sewage.

M CATEGORY – BACT FOR BOILERS (FD-21 and FD-22)

M.1 Comment: Commenters contend that EPA must explain why the proposed BACT limits for the boilers exceed the AP-42 factors for this source. They contend that units applying BACT would presumably be able to achieve much lower emission rates than what is presented as the average factor in AP-42. The commenters continue that EPA must explain why the boilers on the Discoverer

will not have BACT limits at least as stringent as the average emission rates established in AP-42.

Response: EPA has explained the origin of the emission factors for the boilers (Statement of Basis, Appendix A, p. A-12) – they are based on manufacturer’s data. Further, and as explained in the Statement of Basis (p. 28), in developing the emissions estimates, EPA relied on emissions data that were representative of the emission unit in question. Where emissions data are available from the manufacturer, this is clearly more representative of the emission unit than a more generalized emissions estimate such as AP-42. A BACT analysis is conducted on a case-by-case basis, and is therefore based on the emissions performance of the emissions unit in question.

M.2 Comment: Commenters support EPA’s requirement to test the boilers (FD-21 and FD-22) to verify that BACT emission limits can be achieved (Condition J.5); but contend that these data are needed prior to issuing a permit to set a BACT limit and determine BACT. In the event the test data for these units demonstrate the ability to meet a lower PM10 and PM2.5 limit, the commenters continue, EPA must revise these BACT limits accordingly.

Response: See response to Comment K.4 above.

M.3 Comment: Commenters disagree with EPA’s conclusion that SCR does not represent BACT for NO_x for the boilers. The commenters assert that EPA does not explain why the boiler emissions cannot be routed to the SCR system for the main generator engines since the boilers will be located next to the engine room which is being expanded to accommodate SCR systems for the main generator engines.

Response: This comment was submitted in response to the August 2009 proposed permit and was incorporated by reference into comments submitted on the January 2010 proposed permit. Ducting the exhaust from the boilers to the SCR system for one of the main generator engines is not a feasible option for several reasons, including the need to change the physical size of the generator engine SCR system, the difficulty of designing a control system for urea injection when combining exhaust gas streams from emission units which differ significantly in absolute and variable flow rate and in NO_x concentration, maintaining temperature of the boiler exhaust through the transporting ductwork and the necessity of installing a fan or blower to boost the pressure of the boiler exhaust up to a pressure that matches the main generator engine exhaust pressure at the inlet of the SCR system. The NO_x concentration in the boiler exhaust is much lower than for the main generator engines. Therefore, even if it were feasible to mix the two exhaust streams, it would not be desirable because of the dilution effect that the boiler exhaust would have on the generator engine exhaust SCR system.

M.4 Comment: Commenters request that EPA require Shell to test both boilers to verify what emission rate can be achieved, or provide vendor data to verify that the PM10 (0.0235 lb/mmBTU) and PM2.5 (0.0235 lb/mmBTU) limits can be met without any additional emission control.

Response: EPA set the emission limits based on the best information available to EPA at the time of permit issuance. Source test data from the emission unit in question is often not available when BACT emission limits are established in a permit. Condition A.6 authorizes EPA to revise, terminate, or revoke and reissue this permit if, among other things, it contains a material mistake. See response to Comment K.4.

M.5 Comment: Commenters contend that EPA failed to explain how it concluded that designing an electrostatic precipitator (ESP) or fabric filter for small boilers is technically infeasible and that EPA's explanation that this technology may be theoretically possible but are not found in practice is not sufficient.

Response: This comment was made on the August 2009 proposed permit and was incorporated by reference into comments submitted on the January 2010 proposed permit. In the Statement of Basis for the January 2010 proposed permit (p. 74), EPA explained that more than 50 % of the PM from the diesel-fired boilers is condensable PM (in the gas phase at stack temperature), which would not be collected in a fabric filter or ESP. This fact limits the effectiveness of these PM control options and would also increase the cost effectiveness values even more since the total amount of PM emissions from each of the boilers is less than 0.4 tons per year. The commenter has not provided any specific information to show that such controls have in fact been required on boilers of this size in the context of a BACT analysis.

N CATEGORY – BACT FOR VENTED SOURCES

N.1 Comment: Commenters assert that Shell has underestimated VOC and greenhouse gas emissions from vented sources (e.g., mud degassing) and that EPA has failed to examine BACT for VOC from vented sources. Shell's low emission estimate, the commenters continue, is not only inconsistent with MMS and industry emission factors, but is inconsistent with Shell's plans to vent the gas through a 10" vent pipe because a 10" vent pipe would not be needed for such an extremely low flow rate. The commenters contend that, recognizing that mud degassing is a significant emission source, MMS hired a consulting firm in 2007 to develop offshore drilling mud degassing emission factors to improve offshore oil and gas emission estimates and that use of these MMS emission factors would result in a much higher estimate of emissions from mud degassing as part of Shell's operations. The commenters state that MMS's drilling mud degassing emission factors have been reviewed and accepted by both American Petroleum Institute and The Climate Registry and ask that EPA review the published MMS emission factor and apply it in estimating emissions from Shell's operations. Using this higher emission estimate, commenters conclude, using a flare to

control VOC and other greenhouse gases from vented sources would be cost effective.

Response: As the comment indicates, EPA has examined VOC BACT for mud degassing. See Statement of Basis, p. 84. The crux of this comment is that the emission estimate from mud degassing that EPA relied on in this proposed permit action is inconsistent with emission factors used by MMS and industry and that this in turn led to an incorrect determination that BACT for the mud degassing operation on the Discoverer is the use of existing equipment and no additional controls are required. EPA disagrees that the emission estimate from mud degassing that EPA relied on in this permit action is inconsistent with MMS and industry emission factors. EPA's Statement of Basis (p. 42) refers to material provided by Shell, and dated December 13, 2009. Shell's supplementary materials demonstrate that the calculation methodology was consistent with the referenced emission factors. The notable difference is that Shell used data available from the Chukchi Sea formations, where the referenced emission factors used default values. In the interests of accuracy, site-specific data is always preferable to generic data. Specifically, Shell states:

In its May 4, 2009 submission to EPA, Shell provided a high-end estimate of the volatile organic compound (VOC) emissions from the Discoverer drilling cuttings while drilling. These VOC emissions were estimated at 128 pounds per drilling season. Although not stated, this calculation was prepared in essentially the same manner as recommended in the 2007 Minerals Management Service study of petroleum exploration and production emission calculation methods. That study references a much earlier, 1977 study, Section 4.2.2, which states in reference to mud degassing:

“The total amount of gases emitted annually is considered to be very small, although the rate of emission during a single 24-hour period could be as much as 20,000 ft³ of gas based upon 400 ft of 12 inch hole per 24-hour day, 25 percent porosity, and 4000 psi reservoir pressure. This is equivalent to 0.4 Mg/day while drilling through producing formation.”

Working backwards, this MMS 1997 [sic] calculation is of the volume of total hydrocarbon (THC) gas under pressure in the pores of the rock in the reservoir (78 ft³) and brought down to ambient pressure (20,000 ft³). Then the gas, when assumed to be methane, is converted to the mass of 400 kg per day. This is an estimate of total hydrocarbons released and based on the density of methane at standard pressure and temperature.

This emission value is not representative of the VOC emissions from the Chukchi Sea because of difference 1) between THC and VOC and 2) in physical reservoir conditions. Expected Chukchi Sea reservoir conditions are published in a 2005 [sic] MMS study. Reservoir parameters are: VOC content (THC minus methane and minus ethane) is two percent (three percent is assumed for Shell's calculation so that it is conservative for the Beaufort Sea also), porosity is 29.5 percent, hydrocarbon layer thickness is 107 feet per well, hydrocarbon layer pressure is

3000 psi. With the possibility of drilling a maximum of four wells per year this emission rate is 128 lb VOC per year, as described in the May 4, 2009 calculation.

Letter from Susan Childs, Shell, to Rick Albright, EPA, dated December 13, 2009, re: Shell Gulf of Mexico Inc. Supplement to Application for Discoverer/Chukchi OCS/PSD Permit, Attachment C, p. C-1. EPA notes that Shell's estimate, which is based on the geology under the Chukchi Sea, is of the same order of magnitude as VOC estimates for this activity in other recent permitting actions. See Memorandum from Dan Meyer to File Regarding Volatile Organic Compound Emissions Associated with Shallow Gas Diversions and Drilling Mud Returns – Kulluk Drilling Rig, dated June 12, 2008.

The comments also question the need for a 10" pipe if the emissions of VOC are so low. As Shell's submittal addresses, short term release rates can be quite high, necessitating a pipe of adequate capacity. Shell 12/13/09 Supp. App., Attachment D, p. D-1. It is also important to note that the emissions estimate includes only VOC. Emissions from this source could consist of other organics that are not VOC (e.g. methane, ethane), and are not subject to regulation under 40 C.F.R. § 52.21.

In summary, EPA continues to believe that the estimate of VOC emissions from the mud degassing operation on the Discoverer that EPA relied on in issuing the proposed permit is a reasonable estimate of emissions from this source. The commenter has provided no specific information to the contrary. Given the low level of VOC emissions from this source, EPA also continues to believe that requiring additional controls on this source is not cost effective and therefore does not represent BACT.

Issues relating to emissions of greenhouse gases are discussed in the response to Comments in Category HH below.

N.2 Comment: Commenters state that flares or other hydrocarbon vapor control devices should be considered as VOC BACT for vented gas from the mud tanks and degassing units and that the associated PM emissions from these devices should be accounted for in the permit analysis.

Response: This comment was submitted on the August 2009 proposed permit and was incorporated by reference in comments submitted on the January 2010 proposed permit. After the comment was originally submitted in October 2009, EPA evaluated BACT for VOC for the mud degassing operations. Statement of Basis, p. 84. As discussed in the Statement of Basis and in response to Comment N.1 above, EPA determined that BACT for the mud degassing operations was the use of existing equipment and no additional controls. Consequently, there will be no flares or associated PM emissions from flares for this source.

N.3 Comment: Commenters also request that EPA require Shell to calculate HAP emissions based on the substantially higher, revised VOC estimate from mud degassing. If EPA has concerns about the MMS estimate, the commenters

contends, EPA should explain what the concerns are and provide an alternative emission factor that is more accurate, or require Shell to test the vent to verify actual emissions.

Response: As addressed in EPA’s response to Comment N.1, the emissions methodology used by Shell has been explained to be consistent with MMS’ emission factor. Consequently, there is no need to revise the VOC emission estimate or to calculate HAP emissions based on a revised VOC emission estimate. Given the low level of emissions (less than 200 lbs), it does not make sense to conduct source testing while the Discoverer is drilling.

O CATEGORY – BACT ON ASSOCIATED FLEET

O.1 Comment: Commenters contend that, in order to reach the conclusion that good operating practices are the best available for controlling emissions from the Associated Fleet vessels that are attached to the Discoverer, a BACT analysis is required. The commenters continue that Shell and EPA must use the top-down approach for applying BACT to the Associated Fleet.

Response: As discussed in the Statement of Basis (p. 84), only the supply ship will be attached to the Discoverer and thus be an OCS source subject to BACT and, even then, only during approximately eight re-provisionings a season. Therefore, a BACT analysis is only required for the supply ship, and this analysis is discussed in the Statement of Basis. Because the supply ship will be an OCS source for less than 96 hours each season, the emissions that will be emitted from the supply ship while it is an OCS source are very low, with the highest being 0.43 tons per year for NOx. Given this very low level of emissions, cost effectiveness values for potential controls on the supply vessel exceeded \$100,000 for each pollutant, far in excess of what EPA and State permitting authorities have considered to be cost effective in connection with a BACT determination under 40 C.F.R. § 52.21. See response to Comment I.3. EPA did conduct a top-down analysis for applying BACT to the supply vessel, but the low level of emissions at issue allowed EPA to conclude without extensive analysis that requiring controls beyond good combustion practices would not be cost effective. See Statement of Basis, pp. 84-85.

For a discussion of why the other vessels in the Associated Fleet are not part of the OCS source and subject to BACT, see EPA’s response to Comments in Category G.

O.2 Comment: The commenters state that the fact that the Associated Vessels and related equipment are leased by Shell cannot serve as adequate grounds for concluding that applying emission controls to the Associated Vessels would be economically infeasible. Both the Clean Air Act and the implementing regulations, the commenters continue, apply to “owners and operators,” as well as “any equipment, activity or facility” and it is thus not enough that the equipment is not owned by Shell, since Shell is the operator. At the very least, the commenters assert, Shell and EPA must disclose the cost of owning such

equipment versus the cost of leasing it, what the savings are and in light of those figures determine whether it is economical to apply control strategies.

Response: EPA did not rely on the fact that some or all of Associated Fleet and related equipment may be leased by Shell as a basis for concluding that applying emission controls to the Associated Fleet for those periods when it is an OCS source would not be cost effective. As discussed in the Statement of Basis (p. 84), only the supply ship will be attached to the Discoverer and part of the OCS source and thus subject to BACT during the time of such attachment. EPA's conclusion on the cost effectiveness of controls on the supply ship is based on the limited emissions during the time that the supply ship is an OCS source, and the resulting high cost of controlling the emissions.

P CATEGORY – PERMIT DURATION

P.1 Comment: Commenters contend that EPA should limit the duration and scope of the OCS/PSD permit to reflect Shell's submitted exploration plans. The commenters continue that Shell has to date submitted plans to perform exploration drilling on five lease blocks in the Chukchi Sea during a single drilling season, between July 1 and October 31, 2010, but that the proposed OCS/PSD permit is of unlimited duration and allows drilling on any of the Lease Sale 193 lease blocks. The commenters argue that EPA should not issue a permit for multiple years when necessary permit conditions are likely to be substantially different in future years based on changing regulatory requirements, developing information and other proposed activities in the Arctic, noting, as an example, that EPA has proposed increments for fine particulate matter, that, once adopted, would require Shell to reduce emissions of PM_{2.5} to less than half the levels allowed under the current proposed permit.

Response: PSD permits authorize construction of a major source or major modification. In contrast to Title V operating permit regulations, neither the PSD regulations nor the OCS regulations contain a limitation on the duration of permits issued under those regulations, and PSD permits, like other preconstruction permits, are typically issued for an unlimited duration. Compare 40 C.F.R. § 71.6(a)(2) (permits generally limited to a duration of five years) with 40 C.F.R. Part 55 and 40 C.F.R. § 52.21. New regulatory requirements are not imposed on a source with an existing construction permit, such as a PSD permit, except in connection with a modification to the source or a reopening for cause.

In addition, Condition A.3 makes clear the proposed OCS/PSD permit does not relieve Shell of the responsibility to comply fully with all other requirements of federal law as provided in 40 C.F.R. §§ 55.6(a)(4)(iii) and 52.21(r)(3). This would include the requirement to obtain approval of an exploration plan and other necessary approvals authorizing Shell to conduct exploratory operations for each year beyond 2010.

Finally, EPA notes that, as a "temporary" source under Title V, NAAQS and increments are "applicable requirements" (see 40 C.F.R. § 71.2 (definition of applicable

requirement) and Shell will be required to certify in its Title V permit application whether Shell in compliance with any NAAQS or applicable increments at the time it submits its Title V application and also to thereafter assure compliance every time it relocates under its Title V permit. See response to Comment II.1.

Q **CATEGORY – PERMIT TERMS AND CONDITIONS**

Q.1 **Subcategory - General**

Q.1.a Comment: A commenter requests EPA to add a permit condition prohibiting the permittee from causing or contributing to an ambient air quality standard violation.

Response: As discussed in Section 5 of the Statement of Basis, in issuing a PSD permit, EPA must conclude that, for all criteria air pollutants that would be emitted in excess of the significance thresholds at 40 C.F.R. § 52.21(b)(23)(i), the allowable emission increases from the project will not cause or contribute to a violation of any NAAQS or applicable increment. EPA’s review of Shell’s exploration drilling operations therefore included a review and analysis of dispersion modeling results and related information regarding the impact of Shell’s activities on ambient air quality. The modeling and analysis was based on the potential to emit for each of the pollutant-emitting activities associated with the project. EPA has included in the permit emission limits and related monitoring, recordkeeping, and reporting adequate to assure compliance with the NAAQS and PSD increment. The conditions in the permit achieve the objective of the permit condition proposed by the commenter.

Q.1.b Comment: A commenter asks EPA to include a permit condition providing that the owner or operator will not cause or contribute to a violation of the standards at 18 AAC 50.110 (air pollution prohibited).

Response: Because the activities being addressed in this permitting action will all occur exclusively beyond 25 miles from Alaska’s seaward boundaries, the applicable permitting requirements are contained in the federal OCS and CAA regulations. As discussed in response to Comments B.1 and Q.1, the permit includes terms and conditions adequate to assure compliance with the NAAQS and PSD increment and the other requirements of the PSD and OCS regulations.

Q.1.c Comment: Commenters state that, because the emission limits are based on emission factors derived from manufacturer's data, the AP-42, or other sources for which the reliability of the data is not known for certain, EPA must include a condition in the proposed permit that allows for a downward adjustment of rates of emissions allowable as BACT as Shell obtains actual test data. Since all of the emissions sources are proposed to be tested and EPA assumed that all emission rates would be higher than they may be in practice, the commenters contend, EPA should revise these assumptions as direct measurement data becomes available.

Response: EPA has spent considerable effort in characterizing emissions from each piece of equipment as accurately as possible based on the best information available to EPA at the time of permit issuance regarding the maximum emissions from the emission unit in question and the effect of any required control equipment or other restriction on operation. The emissions characterization has been conducted in a manner consistent with other permits issued by EPA. There is no direct regulatory requirement to reevaluate BACT on an ongoing basis. See also response to Comment I.3 above.

Q.2 Subcategory - Stack Testing Requirements

Q.2.a Comment: Commenters urge EPA to maintain the more comprehensive testing requirements in the August 2009 proposed permit for a broader range of loads, but support testing over a few number of load ratings over elimination of testing altogether. The commenters do not support Shell's request to eliminate these critical stack testing requirements.

Response: EPA concurs that stack tests play an important role in assuring compliance with emission limits for this project. Consequently, EPA is retaining the stack testing provisions as proposed, with the exception of testing of the icebreakers and the timing of the stack testing in general. These exceptions are discussed in response to Comments Q.2.k and Q.2.i below.

With respect to the concerns with the range of required loads in the stack testing, see response to Comment Q.2.b.

Q.2.b Comment: Commenters disagree with the reduced stack testing requirements based on the operating range representing the most frequently-used loads and, if EPA proceeds with less frequent testing for certain engines, urge EPA to ensure established testing will be performed at loads that are most likely to result in maximum emissions. The commenters state that this is especially important for some of the PM_{2.5} emissions because compliance is demonstrated on short-term averaging.

Response: The designation of the operating ranges at which stack testing is required to be conducted under the permit and as described in the Statement of Basis (p. 29) is consistent with the approach requested by the commenter. The required load ranges are in large part based on a review of load-specific emission factors for the Caterpillar D343 series of engines to ensure that the load ranges would capture the maximum emission rate for the emission unit (typically expressed as an emission factor - e.g. g/kW-hr for

engines. See Letter from Rodger Steen, Air Sciences to Pat Nair, EPA Region 10, dated April 6, 2009, Re: Cat 3304, D343 and C-15 Request.

Q.2.c Comment: Commenters disagree with the reduction of source testing requirements for many of the operations' sources or pollutants in the January 2010 proposed permit as compared to the August 2009 proposed permit. The commenters continue that, while the ostensible rationale for this reduction was the burden of testing on Shell, EPA has failed to demonstrate that it has properly balanced this burden against the obvious uncertainty in the emissions estimation for the project. The commenters contend that, with rare exceptions, EPA and Shell have not estimated emissions based on reliable (or representative) source tests; rather EPA and Shell have reached their estimates using EPA's AP-42 emission factors or older data from manufacturers.

Response: The commenter is correct that the informative value of additional stack tests was balanced against the cost and burden of requiring additional tests. EPA believes that the stack testing required by the permit, in conjunction with the other required monitoring, is sufficient to confirm the accuracy of the emission factors and provide a reasonable assurance of compliance with the emission limits.

The primary purpose of the stack testing is to assure compliance with the emission limits established in the permit. The bases for the emission limits are described in Section 3 and in Appendix A of the Statement of Basis. EPA set the emission limits based on the best information available to EPA at the time of permit issuance. Actual source test data for the emission unit in question is often not available at the time emission limits are established in PSD permits.

It should also be noted that a stack test provides a snapshot (in time) of an emission unit's performance. While such data is important in assuring compliance with an emission limit, it is less useful as the sole piece of information to establish an emission limits for an emission unit. A particular test provides a good picture of how that emission unit is operating at that time. However, in practice, a level of variability can be expected in stack test results. The emissions limit established should be adequate to allow for the variability that may result from a number of factors, e.g. batch of fuel, different source tester. Consequently, revising emission limits based on the latest stack test is not a practical idea. It makes much more sense to ensure that the emission units are returning emission factors that assure compliance with the established emission limits that protect the NAAQS and PSD increment or that represent BACT. Of course, as discussed in response to Comment I.3 above, Condition A.6 authorizes EPA to revise, terminate, or revoke and reissue this permit if, among other things, it contains a material mistake.

Q.2.d Comment: Commenters disagree that Shell has established that testing of the smaller engines is impossible, even for the deck cranes, and state that considerations of cost and convenience are not sufficient to preclude source testing of these engines. Commenters continue that most of Shell's difficulties arise from testing during operation when, in fact, testing prior to operation is critical so that any needed modifications can be made to remedy failed tests.

Given that Shell's exploration activities are projected to consume over 70% of the available PSD Class II increment for NO₂ and 84% of the 24-hour PM_{2.5} NAAQS, the commenters contend, it is critical that the largest contributors to these pollutant concentrations be required to verify that they can meet permit limits using stack testing – specifically, the main drill rig engines, HPU engines, cementing units and boilers for PM_{2.5} and the HPU units, cementing units and deck cranes for NO_x. The commenters support testing for all of these engines, including the deck cranes, prior to operation and at loads reflective of maximum emission scenarios.

Response: As discussed in response to Comment Q.2.a above, EPA agrees that stack tests play an important role in assuring compliance with emission limits for this project. Consequently, EPA is retaining the stack testing provisions as proposed, with the exception of testing of the icebreakers and the timing of the stack testing in general. These exceptions are discussed in response to Comments Q.2.k and Q.2.i below. As requested by the commenter, the final permit requires that the stack testing be conducted prior to the first drilling season rather than phased in over three years. See, e.g., Permit Conditions C.6 and C.6.1. As noted in the response to Comment Q.2.b, testing must be conducted at loads expected to capture the maximum emission rates.

In addition, EPA also notes that the final permit sets more stringent emission limits for the HPU engines to reflect a BACT determination based on replacement of the existing engines with newer Tier 3 engines.

Q.2.e Comment: Commenters contend that EPA has not established that the source testing it proposes will result in representative data that can be used to reduce the uncertainty in the emissions estimates, and thus, it is difficult to assess whether that system will ensure compliance. The proposal to test emission units in a source category over a period of three years, commenters contend, is not an appropriate approach to testing the emissions of an operation that for now is only proposed for a single year, and, in any event, may be changing from year to year assuming it continues. Even if EPA determines that reduced testing is appropriate, the commenters continue, it should, at a minimum, require more frequent testing of the larger sources (i.e., the ones with the largest emissions), as compared to the smaller ones.

Response: As discussed in response to Comment E.2, EPA estimated the emissions from the project and set the emission limits proposed in the permit based on the best information available to EPA at the time. These emission estimates and emission limits were used in the ambient air impact analysis, which demonstrates that emissions allowed under the permit will not cause or contribute to a violation of the NAAQS or increment. The required stack testing will provide actual data to assure that emissions from project operations remain below the established emission limits.

As discussed in response to Comment Q.2.k below, in the final permit, EPA is requiring that stack testing for each unit in each group of emission units occur prior to the first drilling season. This change to the permit addresses the commenters' concern with the

phased testing of emission units over the first three years of operation. With the exception of the timing for the testing of the main generator engines, the stack testing requirements for the largest engines--the main generator engines (FD-1 to FD-6)--has remained unchanged since the August 2009 proposed permit. The stack testing requirements for these larger engines has not been reduced. To the extent the comment raises concerns with the operating ranges during the required testing, see response to Comment Q.2.b above.

Q.2.f Comment: Commenters do not support the removal of stack testing requirements for the icebreakers and believe it is critical to include stack testing at 20% load for Icebreaker #1 unless EPA will be adding a permit requirement limiting operation time of Icebreaker #1 at 20% load. The commenters assert that Shell indicates in its supplemental materials that a 20% load often results in higher emission factors and that, without more assurance that Shell does not operate its icebreakers at these lower loads EPA must assume the icebreakers could, in fact, operate at these loads and must include permit conditions to test at these higher emission rate levels.

Response: In the permit proposed by EPA in August 2009, Icebreaker #1 and Icebreaker #2 were interchangeable vessels. For example, if there were two icebreaking vessels, referred to as Vessel A and Vessel B, Vessel A could start the drilling season as Icebreaker #1 and Vessel B would then be Icebreaker #2. Midway through the drilling season, the vessels could switch roles, where Vessel B was now Icebreaker #1 and Vessel A was Icebreaker #2. In either event, only the vessel serving as Icebreaker #2 could conduct the bow washing of the Discoverer. Bow washing is typically done at very low loads, as low as 20%. Since either Vessel A or B could be used to bow wash, it was necessary to test both vessels at 20% load. Under the modified permit proposed by EPA in January 2010, the vessels are no longer interchangeable. Only Icebreaker #2 (i.e. either the Tor Viking or Hull 247)--the vessel that will be conducting bow washing--will still be tested at 20% load. There is therefore no longer a need to test Icebreaker #1 at that low load.

Q.2.g Comment: Shell requests that the testing requirements for both crane engines for NO_x, CO, PM, VOC and visible emissions be deleted because Shell asserts the tests would provide little meaningful information. Shell contends that these tests are particularly difficult to conduct for the cranes because of their location and the transient nature of their loads and that the emission factors provided by the manufacturer (Caterpillar) and used in the application are sufficient to define a maximum for the crane engine emissions. Shell asserts that testing is unnecessary because it is highly likely the testing will show emissions below these specification estimates; the crane engines are mounted on girder pedestals 10 meters above the deck so that it is particularly difficult to access the engines and accordingly the testing carries safety risk for the testers; and the cranes operate only very intermittently while lifting and depositing loads so there is no simple way to provide a constant load to these engines, needed for stack testing, without disassembling them.

Response: EPA does not agree that emissions estimates for the deck cranes are conservative enough to warrant elimination of the source testing requirements, although EPA understands that testing the cranes presents challenges. Given the absence of a reliable alternative method to assess compliance with BACT emission limits and other emission limits that form the basis for the modeling analyses, EPA does not believe it is appropriate to revise or eliminate the testing requirements for the deck cranes.

Q.2.h Comment: Shell agrees that it is appropriate to test the Discoverer generator engines, ice management fleet and Nanuq propulsion engines, and ice management fleet generator engines because they are large (>1,000 hp), but contends that testing of the smaller engines is unnecessary. Shell asserts that the remainder of the engines are under 600 hp and the PTE are less than 12 tons per year for all pollutants. Shell also believes that it is appropriate to test the incinerators (on the Discoverer and ice management fleet) because even though they are small, the feedstock composition is uncertain. Shell bases its request on, among other things, its contention that testing on board a vessel is difficult, poses safety risks, is time consuming, and is expensive; that the emission rates have been defined in the application as “conservative,” and by permit condition B.12, these emission units will be maintained according to manufacturer’s recommendations, so stack testing would reasonably be expected to confirm that the emissions are below the application-provided values; and that all engines will be fueled by ultra low sulfur diesel (ULSD), which is a highly refined fuel that minimizes particulate emissions.

Response: EPA continues to believe that requiring initial stack testing of the smaller engines on the Discoverer (FD-9 to FD-23) is an appropriate and important compliance assurance requirement. Because the permit applicant did not have actual emissions data for the various emissions sources, the best available emissions data were used to estimate project emissions. Where multiple data (from different sources) were available, the more conservative option was used. However, this measure of conservatism does not obviate the need for stack testing to ensure that the emission unit in question is in fact meeting the emission limit imposed by the permit.

Rather, the modeling analysis conducted in support of this permit indicates that even the smaller emission sources can have a disproportionate effect on ambient impacts. Further, the applicant must have a means to assure compliance with the BACT emission limits. This compliance could be assured by use of continuous emission monitors for a more complete picture of emissions. However, EPA recognizes the logistics challenges in trying to operate this type of instrumentation on board a ship and under arctic conditions. EPA believes that for the emission sources authorized under this permit, compliance can be adequately assured by a balanced program of stack testing in conjunction with the other monitoring required by the permit. This permit reflects a balanced approach to stack testing where potentially larger emission sources are required to conduct a more rigorous testing program, and smaller sources a less involved testing program. As a result, except with respect to the timing of the testing as discussed in response to Comment Q.2.k, the permit conditions for the smaller sources remain unchanged.

Q.2.i Comment: Shell contends that testing of the same emission units on the ice management fleet in multiple years is not necessary. With proper maintenance, and a definition of the emissions from testing of two of the same model units, Shell asserts, the initial tests will be valid for the duration of Shell's operations.

Response: After further consideration, EPA agrees that testing of the icebreakers is not necessary for each drilling season. EPA believes that testing of all emission sources on each icebreaker for the first two drilling seasons of use is adequate to assure compliance. To the extent the test results from the first two years of testing indicates that additional stack testing is warranted, EPA has authority to require additional stack testing as provided in Permit Condition B.7.14 and Section 114 of the Clean Air Act. In addition, EPA has authority to add additional testing, monitoring, recordkeeping, and reporting to assure compliance with applicable requirements of the CAA in the Title v operating permit. Shell is required to apply for a Title V operating permit within 12 months of commencing operation. See 40 C.F.R. § 71.5(a)(1)(i). EPA has also clarified that Permit Condition N.10.2 applies to the non-propulsion generator engines.

Consequently, the initial portion of Condition N.10 has been revised as follows:

10. ***Stack Test Requirements.*** *Prior to each of the first two drilling seasons that a vessel is used as Icebreaker #1, and while the Discoverer is operating under this permit in the Chukchi Sea, the permittee shall stack test each propulsion engine, non-propulsion generator engine, boiler and incinerator on Icebreaker #1 as follows:*

Similarly, the initial portion of Condition O.12 has been revised as follows:

12. ***Stack Test Requirements.*** *Prior to each of the first two drilling seasons that a vessel is used as Icebreaker #2, and while the Discoverer is operating under this permit in the Chukchi Sea, the permittee shall stack test each propulsion engine, non-propulsion generator engine, boiler and incinerator on Icebreaker #2 as follows:*

Q.2.j Comment: Commenters question whether the main propulsion engines would actually be completely shutdown when the Discoverer is operating as an OCS source and ask that, if EPA determines the propulsion units will be operated, source testing be required.

Response: Permit Condition D.1 is very clear that the propulsion engine cannot be used while the Discoverer is an OCS source. Consequently, no testing of the Discoverer's propulsion engine is necessary.

Q.2.k Comment: Commenters request that EPA provide more information in its Statement of Basis to demonstrate how it confirmed stack testing of one unit will be representative of another similar unit. The commenters contend that information on the unit year, model type and historical use should be provided to demonstrate that the equipment is of like equipment specification and has a similar operating history. Commenters contend that EPA must either demonstrate that the units are representative, or it must require each unit to be tested individually before the first drilling season. If EPA continues to take the position that testing of one engine is representative of emissions from other emission units in a source category, the permit must clearly state that if the representative unit fails the stack test, all like emission units correspondingly are assumed to have failed and must be repaired or additional emission controls must be installed to meet the limit.

Response: After a reevaluation of this issue and in response to this comment, EPA has decided to require each emission unit to be tested before the first drilling season rather than phasing in the testing for each group of emission units over a three year period. This change addresses the concern regarding whether the emissions of one emission unit in a group are in fact representative of emissions of other emission units in that group.

Consequently, Conditions C.6 and C.6.1; F.6 and F.6.1; G.8 and G.8.1; H.7 and H.7.1; I.7 and I.7.1; and J.5 and J.5.1 now read as follows:

[] ***Stack Test Requirements.*** *The permittee shall stack test all of Units [FD-... to FD-...] as follows:*

[] *At the start of the first drilling season that the Discoverer operates under this permit in the Chukchi Sea, all six of Units [FD...to-...FD] shall have been stack tested under the requirements of this section.*

Q.2.l Comment: Commenters request that EPA require all stack tests, including those for the icebreakers, to be completed at least 180 days prior to each drilling season to ensure there is adequate time to analyze and remedy any test results that exceed permit limits before the start of the drilling season. If stack testing only occurs a few days prior to the drilling season, commenters contend, there will not be adequate time to analyze and remedy any test results that exceed the permit limits before drilling starts and a quarter of the drilling season could pass before EPA even receives the test results.

Response: There is no regulatory requirement that stack testing be completed as early as requested by this comment. It should also be noted that for most PSD sources, a condition as requested by the commenter would be impossible to comply with because construction of the new source or modification cannot commence until issuance of the permit. In fact, in most permits (including PSD permits), testing is conducted after a source commences operation – sometimes as much as 180 days after commencing operations (see PSD Permit R10PSD-OR-05-01, Diamond Wanapa LLP, issued August 8, 2008, Condition 14.2.3). This permit requires that stack testing be conducted prior to the first drilling season, even though the results of the testing may not be available until after operations have begun. EPA believes this is appropriate given the number of emission sources to be tested.

It is also important to note that should the stack test results indicate that the permittee is not in compliance with the permit, any period of violation will not date from receipt of the stack test results, but would instead be based on evidence regarding the first date of violation. Any operations in excess of the emission limit in the permit would be a violation of the permit and subject to EPA enforcement authorities.

Q.2.m Comment: Commenters request that the permit clearly state that any emission unit that fails to meet the permitted emission limit must not be operated until the unit is repaired or additional emission control is installed. The commenters contend that EPA would also need to revise ambient air modeling to ensure NAAQS and increment compliance. The commenters continue that collecting test data, and merely reporting excess emissions if tests fail to meet permit limits, is not an acceptable solution, especially where, as here, the annual NO_x and 24-hour PM_{2.5} NAAQS compliance margins are very tight.

Response: The requirement to report excess emissions does not relieve the permittee of its duty to comply with all requirements of this permit or authorize operation in violation of permit terms and conditions. Condition A.2 of the permit states that the permittee must comply with all requirements of the permit and that failure to do so is a violation of Section 111(e) and 165 of the CAA, subject to enforcement action under the CAA. No additional permit language is needed. If information shows that Shell's emissions exceed an emission limit in the permit, EPA will consider the appropriate response at that time. This could include, but is not limited to, issuance of a compliance order to require the installation of additional controls or a requirement to reopen the permit as provided in Condition A.6, which authorizes reopening of the permit for cause, including failure to comply with permit requirements. Any enforcement response or reopening of the permit

will be conducted in accordance with all CAA requirements. See, e.g., Memorandum from Gary McCutchen, Chief, New Source Review Section, and Michael Trutna, Chief, Air Toxics Program Section, OAQPS, to J. David Sullivan, Chief, ALO Enforcement Section, Region VI, dated November 19, 1987, titled Request for Determination on Best Available Control Technology (BACT) Issues -- Ogden Martin Tulsa Municipal Waste Incinerator Facility.

Q.3 Subcategory – Monitoring

Q.3.a Comment: Commenters assert that the repropoed permit ensures that calculated emission rates used for compliance demonstration are based on the maximum emissions scenario for the range of loads tested, except for the boilers on the Discoverer. The commenters request EPA revise the following permit conditions to be more explicit regarding this point for the boilers by revising Permit Condition J.

Response: EPA agrees that it is appropriate to add the words “each load range” to Condition J.5.4 so that it is consistent with the other similar testing requirements.

Condition J.5.4 is revised to read as follows:

5.4 For each boiler, each load range and each pollutant, the permittee shall determine emission factors in the following units: lbs/MMBtu and lbs/gallon.

Q.3.b Comment: Commenters request that EPA include a recordkeeping requirement to track the operating loads during the first drilling season to verify actual operating load ranges and require additional stack testing if actual operating practices include operating loads outside the currently assumed ranges.

Response: The PTE estimates in Appendix A of the Statement of Basis, which form the basis for the permit emission limits, are based on operation of the emission units at various load conditions. Similarly, the compliance assurance approach is conservatively based on using operating parameters (such as fuel usage) and the highest emission factor measured during source testing. Since this approach is not based on the operating load, there is no need to monitor the operating load of the smaller emission units on board the vessel. Note, however, that operating loads are monitored for some of the larger sources such as the main generator engines (Permit Condition 7.3) because the load-dependent nature of emissions and the magnitude of emissions supports a more demanding monitoring regime. Consequently, EPA declines to add a requirement to track the operating loads for the smaller emission units.

Q.3.c Comment: The commenters request that, with respect to the load monitoring for the main generator engines on the Discoverer and the icebreaker generator engines, the permit require an assumed generator efficiency of 90.% Without more specifics on the actual gensets used and because compliance with the PM2.5 NAAQS is just barely demonstrated when considering the accuracy of the input data, the commenters continue, EPA must consider the most conservative

approach to ensuring compliance. Alternatively, the commenters contend, EPA could require a minimum generator efficiency (based on technical data for the actual gensets used) of 2% and include a corresponding permit condition and compliance demonstration requirements to ensure this minimum efficiency.

Response: Pursuant to Condition N.11.1, each vessel designated as Icebreaker #1 shall have the electrical output to an accuracy of at least 2%. In addition, EPA is revising Condition N.1.7 to require that prior to the first deployment of a vessel to be used as Icebreaker #1, Shell shall provide EPA with confirmation of the generator efficiency of the engines on board Icebreaker #1.

Condition N.1.7 now reads as follows:

1.7 No later than 45 days prior to deployment to the Chukchi Sea each drilling season, the permittee shall provide notification to EPA of the vessel selected as Icebreaker #1. The notification shall include a list of all emission sources on board the vessel as well as manufacturer, model and rated capacity of each such emission source, and the conversion efficiency (mechanical to electrical) of each generator on board.

Q.3.d Comment: Commenters support the continued compliance demonstration requirements for fuel monitoring in the re-proposed permit for the MLC compressor engines (FD 9-11), HPU engines (FD 12-13), deck cranes (FD 14-15), Cementing Units and Logging Winches (FD 16-20), boilers on the Discoverer (FD 21-22) and on the icebreakers and for the Nanuq propulsion and non-propulsion engines (FD-N 1-4). Commenters also support the continued requirement that fuel flow meters measure the fuel flow rate with an accuracy equal to or better (less) than 2% of the meter's upper range value (see, e.g., Condition F.7.1.3).

Response: EPA acknowledges this comment's support of the use of fuel monitoring for compliance purposes. EPA has retained the use of fuel monitoring except for the Discoverer's main generator engines and for the engines on board the icebreakers and the Nanuq. The accuracy of the fuel meters has been retained at no greater than 2% of the meter's upper range value.

Q.3.e Comment: Commenters state that, since compliance with the NAAQS as demonstrated in the ambient air quality analysis for the proposed permit, can just barely be demonstrated for PM_{2.5} on a short-term basis, it is imperative that the accuracies of the measurements that are the basis for the modeling inputs be no more than the margin needed to demonstrate compliance with the NAAQS. That is to say, the commenters continue, since the difference between the 24-hour PM_{2.5} NAAQS of 35 ug/m³ and the maximum predicted 24-hour average PM_{2.5} concentration plus the background concentration used in the ambient analysis is less than 4%, the fuel flow meters must be accurate, at least, to this level (i.e., ≤ 4%).

Response: This comment was made on the August 2009 proposed permit and was incorporated by reference in comments submitted on the January 2010 modified proposed permit. A more recent comment submitted by this same commenter expresses support for the proposed permit requirements relating to fuel monitoring. See Comment Q.3.e and the accompanying response.

Q.3.f Comment: Shell requests that, because of space constraints that in some cases make physical location close to the engine difficult, the conditions relating to the location of the fuel meter be revised to state: “Each fuel meter shall be located so that there are no fuel inflows or outflows between it and the engine or engine group.”

Response: EPA understands Shells interest in co-locating fuel meters. This request can be accommodated provided that there is no potential for introduction of fuel into the fuel lines downstream of the meters. This potential includes introduction of fuel from tanks, fittings that allow for connection to other lines of fuel, and connections to other lines with separation by means of a valve.

Conditions F.7.1.1, G.9.1.1, H.8.1.1, I.8.1.1, J.6.1.1, N.11.4.1, O.13.4.1, and Q.8.1.1 have been revised to read as follows:

Each fuel flow meter shall be located so that there is no potential for fuel inflows or outflows between it and the boiler(s) being served by the meter;

Q.3.g Comment: Shell requests that the phrase “or the combined set” be added to all of the fuel meter conditions such that they read: “Equip each of the units [specify units] or the combined set, with a diesel fuel flow meter.” These include F.7.1, G.9.1, H.8.1, I.8.1, and J.6.1, N.11.4, O.13.4, Q.8.1. This will allow a single meter to measure fuel consumption where the permit has an aggregate fuel consumption limit.

Response: Since these units have aggregated fuel limits, EPA agrees it is appropriate to monitor fuel usage for all grouped units in aggregate.

Conditions F.7.1, G.9.1, H.8.1, I.8.1, J.6.1, N.11.4, O.13.4, and Q.8.1 have therefore been revised to read as follows:

Equip each of Units [FD-...] with a diesel fuel flow meter, or install a single fuel meter for all of Units [FD-...]:

Q.3.h Comment: Commenters contend that EPA must establish permit limits that, when considering the accuracy of the emission factor and operating data, demonstrate compliance with the NAAQS with a margin of error no less than the accuracy of the input data. Commenters assert that, since the emissions inputs for the model are based, in general, on multiplying the applicable emission factor by the associated operating factor (e.g., fuel usage rate), then the accuracy of this input is determined by the sum, in quadrature, of the fractional uncertainties associated with each factor. The commenters continue that if, as Shell indicates, the uncertainty in the stack test data is upwards of 15%, then Shell must be able to demonstrate compliance with the NAAQS considering a margin of error no less than 15%.

Response: There is a difference between precision and accuracy in the analysis. In the absence of absolute data (which do not exist) all permits are issued based on available data collected using the best practices. This permit is no different. The permit requires stack testing of the emission units prior to the first drilling season which will provide information regarding compliance with the emission limits in the permit. EPA does not believe further changes to the permit to address this concern are required or appropriate.

Q.4 Subcategory - Condition B.2 Relief Wells

Q.4.a Comment: Commenters agree with Permit Condition B.2.3, which requires Shell to include any time spent drilling a relief well in the total 168 day annual limit on the drilling season.

Response: EPA acknowledges this comment in support of EPA's requiring any emissions from the drilling of relief wells to be included in the calculation of emissions for purposes of determining compliance with permit limits and to count any time spent drilling relief wells towards the 168-day annual limit on the drilling season.

Q.4.b Comment: Commenters request that EPA revise Permit Condition B.2.3 to require that all exploratory well drilling (planned wells and sidetracks) must be completed within 134 days, reserving at least a 34 day period to drill a relief well. The commenters continue that any time spent drilling a relief well must be included in the time recorded in Conditions B.2.2.3 and B.2.2.4 and that if the relief well exceeds a 34 day period, excess emissions must be reported.

Response: As noted in both Comment Q.4.a and in the response to that comment, emissions resulting from the drilling of relief wells will be counted toward emission limits under the permit and will count towards the 168-day annual limit on the drilling season. See Permit Conditions B.2.1 and B.2.3. If Shell exceeds the limit on the number of drilling days, Shell is in violation of the permit. To the extent the need to drill a relief

well extends beyond the number of drilling days allowed under the permit, EPA will evaluate any continued operation in accordance with EPA's excess emissions policy.¹⁰

Q.5 Subcategory - Conditions B.4 and B.5 - Sulfur Content of Diesel Fuel

Q.5.a Comment: Commenters request that the main propulsion engines on the Discoverer be required to use ultra-low sulfur fuel (15 ppm sulfur) in accordance with Shell's commitment and EPA's June 6, 2006 Final Rule: Control of Air Pollution from Motor Vehicles and Nonroad Diesel Engines: Alternative Low-Sulfur Diesel Fuel Transition Program for Alaska. 71 Fed. Reg. 32450-32464 (June 6, 2006).

Response: Under this permit, there is no scenario where the Discoverer's propulsion engine will operate while the Discoverer is an OCS source. See Permit Condition D.1. As discussed in the Statement of Basis (p. 32), although Shell has committed to using only ultra-low sulfur diesel fuel (i.e. 0.0015% or less sulfur) in the propulsion engine of the Discoverer when operating north of the Bering Strait, EPA's authority to impose emission limitations and other operating restrictions on the Discoverer is limited to when the Discoverer is an OCS source. Therefore, EPA will not be adding a permit provision as requested by this comment. Given that the permit does contain enforceable requirements to use ultra-low sulfur diesel fuel in and on all vessels involved in this project (i.e. Discoverer, icebreakers, Nanuq, Kvichaks, and supply ship) with the exception of the Discoverer propulsion engine, we note that given logistical constraints, it is extremely likely that Shell will follow through on its commitment and use the same fuel in the Discoverer propulsion engine.

Q.5.b Comment: Commenters commend Shell's actions to commit to the use of ultra-low sulfur diesel fuel for its OCS exploration activities in the Chukchi Sea north of Bering Strait and state that the huge reduction in emissions that will result from this commitment is significant, and will not only reduce localized emissions of SO₂, but will reduce PM_{2.5} pollution from this project as well.

Response: EPA agrees that use of ultra low-sulfur diesel in the Associated Fleet is a preferred option as compared to the permit proposed in August 2009. EPA expects emissions of SO₂ to be much lower (two tons per year) and that emissions of particulates will also be lower as compared to the August 2009 proposed permit.

¹⁰ See e.g., Memorandum from Kathleen M. Bennett to Assistant Administrator for Air, Noise and Radiation Regional Administrators, Regions I-X, Re: Policy on Excess Emissions During Startup, Shutdown, Maintenance, and Malfunctions, dated September 28, 1982; Memorandum from John B. Rasnic, Director, Stationary Source Compliance Division Office of Air Quality Planning and Standards to Linda M. Murphy, Director, Air, Pesticides and Toxics Management Division Region 1, Re: Automatic or Blanket Exemptions for Excess Emissions During Startup, and Shutdowns Under PSD, dated January 28, 1993; Memorandum from Eric Schaeffer, Director, Office of Regulatory Enforcement, to Addressees, Re: Guidance on the Appropriate 6/12/08 Meyer Memo; Memorandum from Steven A. Herman, Assistant Administrator for Enforcement and Compliance Assurance; Robert Perciasepe, Assistant administrator for Air and Radiation to Regional Administrators, Regions I-X, Re: State Implementation Plans: Policy Regarding Excess Emissions During Malfunctions, Startup, and Shutdown, dated September 20, 1999.

Q.5.c Comment: Commenters request that proposed Permit Conditions B.4 and B.5 be revised to clarify that fuel that does not meet the 15 ppm standard cannot be used, and must be returned to the supplier. These commenters state it is not acceptable to merely test the fuel sulfur content, and report any exceedances as a BACT approach.

Response: The requirement to report fuel received in excess of the limit does not relieve the permittee of its duty to comply with all requirements of this permit or authorize operation in violation of permit terms and conditions. Condition A.2 of the permit states that the permittee must comply with all requirements of the permit and that failure to do so is a violation of Section 111(e) and 165 of the CAA, subject to enforcement action under the CAA. No additional permit language is needed.

Q.6 Subcategory - Condition B.8: Prohibited Activities

Q.6.a Comment: Commenters request that Permit Condition B.8 prohibit also prohibit venting formation gas and refueling within 25 miles of a drill-site unless those emissions are accounted for in the permit and BACT is applied.

Response: Permit Condition B.8 does prohibit the refueling of vessels within 25 miles of the Discoverer, while the Discoverer is an OCS source. Condition B.8 also greatly limits the venting of formation gas by prohibiting the flow testing of wells – thereby avoiding the venting of large volumes of formation gas associated with well testing. However, EPA believes it is inappropriate to prohibit venting of any formation gas. Such venting may be necessary as a safety measure, as when degassing drilling mud. As noted in the response to Comment N.1 and shown in the Statement of Basis (p. 84 and App. A, p. 1), EPA continues to believe that the estimate of VOC emissions from the mud degassing operation on the Discoverer that EPA relied on in issuing the proposed permit is a reasonable estimate of emissions from this source and supports the resulting BACT determination. EPA has therefore properly accounted for emissions from mud degassing and no changes to the permit in response to this comment are required or appropriate.

Q.7 Subcategory - Condition C: Main Generator Engines

Q.7.a Comment: Shell has requested that the compliance conditions of the Discoverer's main generator engines (FD-1 through 6) be clarified to be on an aggregate basis rather than on an individual basis as is currently listed in permit conditions C.4.1, C.4.2, C.4.3. Shell states that the impact modeling assumes that all emissions are exhausted from a single stack, so it is immaterial to both emissions quantification and impact assessment that the emissions are limited on an aggregate basis. Shell also requests that C.4 be modified to limit emissions on an aggregate basis.

Response: EPA agrees that, as all six main generator engines were modeled as a single emission point, it is appropriate to express these emission limits as an aggregate limit for all six engines rather than as unit-specific emission limits. In fact, Condition C.5 already reflects an aggregate emission limit for all six generator engines.

Condition C.4 has therefore been revised to read as follows:

4. **Potential to Emit (PTE) Emission Limits.** Emissions from all six generator engines in aggregate (Units FD-1 – 6) shall not exceed the emission limits specified for each of the pollutants below:

4.1 **Nitrogen oxides (NO_x):** 9.000 tons/rolling 12-month period

4.1.1 For compliance with Condition C.4.1, measurement of NO_x shall be determined using EPA Method 7E.

4.2 **Particulate Matter with an aerodynamic diameter**

Less than 10 microns (PM₁₀): 28.80 lbs/day

4.2.1 For compliance with Condition C.4.2, measurement of PM₁₀ shall be determined using EPA Method 201/201A and OTM 28, provided, however, that if proposed changes to Method 202 in 56 Fed. Reg. 12970 (March 25, 2009) become final and effective, EPA Method 202 shall be used in lieu of OTM 28.

4.3 **Particulate Matter with an aerodynamic diameter**

less than 2.5 microns (PM_{2.5}): 28.80 lbs/day

4.3.1 For compliance with Condition C.4.3, measurement of PM_{2.5} shall be determined using EPA Method 201/201A and OTM 28, provided, however, that if proposed changes to Method 202 in 56 Fed. Reg. 12970 (March 25, 2009) become final and effective, EPA Method 202 shall be used in lieu of OTM 28.

Q.8 Subcategory - Condition D.1: Propulsion Engine

Q.8.a Comment: MMS contends that Permit Condition D.1, which prohibits the use of the main propulsion engine unit on the Discoverer once the vessel has been anchored on location, impacts the safety of the operation in the event of a storm or emergency disconnect associated with a possible well control event or ice encroachment. The commenter asserts that not being able to maintain instant accessibility to main ship propulsion would extend response time to the situation and increase potential risks to the ship and crew and that the permit should clarify and accommodate the use of the propulsion engines in emergency situations.

Response: This permit is being issued based on operational scenarios requested by Shell and on the analyses supporting these scenarios. As discussed in response to Comment F.2.b above, EPA has determined that the Discoverer is not an OCS source until it secures

and stable in a position to commence exploratory activity at the drill site, as declared by the on-site company representative and documented in the vessel's logs. EPA has received no information from Shell to doubt the safety of Shell's agreement to not use the Discoverer propulsion engine while the Discoverer is an OCS source. EPA therefore declines to make the permit changes as requested. If in the case of an emergency, and Shell does operate the propulsion engines while the Discoverer is an OCS source, EPA will evaluate any such operation in accordance with EPA's excess emissions policy. See footnote 10 of this Response to Comments.

Q.8.b Comment: Commenters request that EPA consult with the Coast Guard to determine if it is safe to completely shutdown the propulsion engine when setting the anchors, particularly in rough sea conditions. The commenters continue that propulsion engines typically continue to operate while anchors are set and are started prior to releasing the anchors so that the captain has full control of the vessel while the anchors are set and released and that setting a large drillship adrift in heavy ice conditions without operational propulsion systems does not appear to be a safe plan. The commenters continue that neither Shell nor EPA explain how the Discoverer will be placed with its bow facing the wind while the ship is being anchored, which both EPA and Shell acknowledge to be important for ice management, without the use of the propulsion engine and that Shell's 2007 air permit application for the Discoverer in the Beaufort Sea stated that the propulsion engine on the Discoverer would be operated during anchoring. The commenters contend that if the Discoverer propulsion engine is required for safe anchoring and station-keeping at the drill site, then those emissions should be included in the source's PTE and BACT should be applied

Response: As discussed in response to Comment F.2.b above, EPA has determined that the Discoverer is not an OCS source until it is secure and stable in a position to commence exploratory activity at the drill site, as declared by the on-site company representative and documented in the vessel's logs. Thus, at the point at which the Discoverer is an OCS source, the Discoverer will no longer be moving into position at the drill site but will instead be secure and stable at the drill site. Permit Condition D.1 prohibits the use of the propulsion engine while the Discoverer is an OCS source.

Q.9 Subcategory – Conditions L and P: Supply Ship

Q.9.a Comment: Shell asks that Table 4 of the proposed permit and Permit Condition P to increase the range of acceptable supply ship generator sizes while continuing to meet the impact limitations that are provided in the proposed permit. Shell proposes to restrict the supply ship to a total of 7,784 hp from the propulsion and utility generator IC engines (the sum of the engine capacities listed in Table 4), excepting any emergency generator, while also restricting the propulsion power to no more than 7,200 hp (also listed in Table 4). In this way, Shell continues, the generators capacity can be greater than 584 hp, if propulsion engine horsepower is reduced correspondingly below 7,200 hp and that the emissions and thus the ambient impacts during transit to and from the Discoverer will be the same as or less than already demonstrated since the gross power limit will not change. Shell

states that the emergency generator will be less than 200 kW capacity, and that it accepts the restriction on the emergency generator that it not be exercised while within 25 miles of the Discoverer.

Response: As emissions from both groups of engines (i.e. propulsion and non-propulsion) for the supply ship were calculated using the same emission factors, and emissions were modeled as a volume source, this requested change can be accommodated. The same emission factors apply to both groups of engines (i.e. propulsion and non-propulsion), so ships with the same total engine horsepower are expected to have the same total emissions. The supply ship's transit was modeled as a line of volume sources, which means that all of its emissions are treated in the model as one continuous plume along the entire line of travel. If an alternate vessel has the same (or lower) total engine horsepower as the original vessel, it is expected to have the same (or lesser) overall effect on air quality, even if its engines' relative sizes and positions are slightly different from the original vessel's. This requested permit change can therefore be accommodated and still assure compliance with the NAAQS. Table 4 was revised to accommodate this change in how engine ratings were presented. In addition, a category of "emergency engine" was added to the table.

Table 4 now reads as follows:

Table 4 – Supply Ship

<i>Description</i>	<i>Make and Model</i>	<i>Maximum Aggregate Rating^a</i>
<i>Propulsion Engines and Non-Propulsion Generator Engine(s), Excluding Emergency Engine</i>	<i>Various</i>	<i>7,784 hp</i>
<i>Propulsion Engines only</i>	<i>Various</i>	<i>7,200 hp</i>
<i>Emergency Engine</i>	<i>Various</i>	<i>200 kW</i>

^a *Permit conditions may limit operation to less than rated capacity.*

As requested, and consistent with the modeling analysis, Condition P.1 has been revised to reflect the prohibition on operation of the emergency engine while within 25 miles of the Discoverer while the latter is an OCS source.

Condition P.1 has also been revised to reflect a revised limitation on the maximum operating capacity of the propulsion engines. This revision is necessary because emissions (and resultant modeling) from the non-propulsion engines were based on operation at full load but operation of the propulsion engines was based on operation at no greater than 80% load. If, as the result of this request, the non-propulsion engines are rated greater than 584 hp, then the propulsion engines must be limited to a load lower than 80%. Since the maximum rating of the non-propulsion engines are not limited, the operating load limit is expressed in the form of an equation.

Condition P.1 now reads as follows:

1. ***Operational Limits on Supply Ship Engines.*** *At all times while the Discoverer is an OCS source and the supply ship is within 25 miles of the Discoverer, the permittee shall:*

- 1.1 *Not operate the emergency engine;*

- 1.2 *Limit operation of the propulsion engines in the supply ship to no greater than the limit as determined by the equation below:*

$$\text{Operating limit in percent} = (5760 - (X - 584)) / (7784 - X) * 100$$

Where $X =$ *maximum rating (in hp) of all non-propulsion engines (excluding emergency engine) on board the supply ship.*

Q.9.b Comment: Regarding the supply ship status when tied to the Discoverer and defined as part of the OCS source, Shell asks for the 12-hour time restriction (L.1.1) and the generator capacity limit of 292 hp (L.1.2) to be replaced by an equivalent energy consumption restriction equivalent of 3,504 hp-hr (292 hp x 12

hours). Using the assigned supply ship IC engine heat rate of 7,000 Btu per hp-hr, and fuel heat value of 133,098 Btu per gallon, Shell continues, compliance with this energy restriction can be tracked through fuel usage and will be limited to approximately 184 gallons per day when part of the OCS source. In this way, Shell asserts, the daily maximum emissions from the supply ship while part of the OCS source will not change, nor will the 24-hour impacts. With the change in limit from 12 hours to an energy production of 3504 hp-hrs per day, Shell contends, it is possible to produce the associated emissions in a period of 8 hours or less, which would increase the eight-hour and one-hour CO emissions and impacts but would not threaten the CO NAAQS.

Response: Based on the data contained on p. A-14 of Appendix A to the Statement of Basis, EPA agrees that operation of the one 292-hp non-propulsion utility generator for 12 hours in one day would result in fuel consumption of no more than 184.0 gallons per day – this translates into 1472 gallons per rolling 12-month period (based on the 8 trips per drilling season). EPA has therefore revised Condition L.1 to accommodate these two fuel-based limits.

Conditions L.1.1 and L.1.2 now read as follows:

- 1.1 Not use in excess of 184.0 gallons of fuel per day in the non-propulsion generators (not including the emergency engine), in aggregate;*
- 1.2 Not use in excess of 1472.0 gallons of fuel during any rolling 12-month period in the non-propulsion generators (not including the emergency engine), in aggregate; and*

Additional conditions are required to make Conditions L.1.1 and L.1.2 enforceable. The new conditions, L.5.1 through L.5.4, will be added to L.5 and will require the installation and operation of fuel meters and monitoring of fuel use. The original Conditions L.5.1 through L.5.3 have been renumbered sequentially and the original L.5.4 has been revised to be consistent with all the other changes.

Condition 5.1 now reads as follows:

- 5.1 Equip each of the non-propulsion generator engines (not including the emergency engine) with a diesel fuel flow meter, or install a single fuel meter for all of these engines:*
 - 5.1.1 Each fuel flow meter shall be located so that there is no potential for fuel inflows or outflows between it and the engine(s) being served by the meter;*
 - 5.1.2 Each fuel flow meter shall be totalizing and nonresettable; and*
 - 5.1.3 Each fuel flow meter shall measure the fuel flow rate with accuracy equal to or better than 2 percent of the meter's upper range value.*

- 5.2 *No less than 60 days before the first deployment to the Chukchi Sea of a vessel as the supply ship, collect information from the manufacturer of each fuel flow meter so as to determine its accuracy. Submit this information to EPA no less than 30 days prior to departure of the supply vessel to the Chukchi Sea.*
- 5.3 *Maintain the accuracy of each fuel flow meter in accordance with manufacturer's recommendations.*
- 5.4 *Monitor and record fuel usage for the non-propulsion generators while the supply vessel is attached to the Discoverer.*
- 5.5 *For each event, record the date and time that the supply ship attaches to the Discoverer;*
- 5.6 *For each event, record the date and time that the supply ship detaches from the Discoverer;*
- 5.7 *For each event, record the manufacturer, model no. and rated capacity (in hp) of the supply ship generator engine; and*
- 5.8 *For each event, calculate daily emissions of NO_x, PM_{2.5} and PM₁₀ using the using the highest emission factor collected under Condition L.4.5 and fuel usage data collected under Condition L.5.4.*

EPA has also revised Permit Conditions L.2 and L.3 to be consistent with Condition L.1 with respect to applying when the Discoverer is an OCS source.

Q.10 Subcategory – Permit Conditions N, O, and Q: Icebreakers and Oil Spill Response Fleet

Q.10.a Comment: A commenter disagrees with the permit conditions that set a distance and direction prohibition between the icebreakers and the Discoverer (Permit Conditions N.7 and O.7); prohibit the icebreakers and Nanuq from being attached to the Discoverer (Permit Conditions N.8, O.9, and N.8); and require the oil spill response fleet to operate downwind from the Discoverer except for the transport of crew and supplies to or from the Discoverer or when responding to an oil spill (Permit Condition Q.6). The commenter states that these restrictions are to account for a worst case pollutant modeling concentration that could occur, but contends that these may be rare events and that safe vessel operation requires the flexibility to evaluate on-scene circumstances which might affect the safe operation of the vessels associated with the operation. The commenter continues that ice and weather conditions and ice management operations may require that the location of the Associated Fleet vessels be organized in such a way as to enhance safety that does not conform to this generic separation scenario. Because MMS has the jurisdiction for oil spill response plans for OCS facilities (30 C.F.R. § 254), the commenter states, EPA should consult with MMS with regard to the

effects on spill response plans. The commenter asks that the permit clarify and accommodate such emergency configurations.

Response: It is incumbent on a permit applicant to describe fully how the vessels will be used and to analyze the ambient air quality impacts from all of the described scenarios to ensure compliance with NAAQS and PSD increment. Shell, as the permit applicant, submitted the scenarios to EPA in its permit application for evaluation and analysis. EPA is issuing the permit in a manner that is consistent with Shell's underlying application and analyses. To the extent Shell determines that safety considerations associated with an emergency require Shell to violate the permit conditions relating to location, distance, and attachment of the Associated Vessels, EPA will evaluate any such situation in accordance with EPA's excess emissions policy. See footnote10 of this Response to Comments. No changes to the permit are appropriate or required.

Q.10.b Comment: Shell requests that Permit Condition O.9.1 be revised to state that the 100 meter limitation is between the two stack locations, rather than between the hulls. Shell asserts that the bow washing impact was evaluated at a distance of 100 meters between the propulsion stacks of the Discoverer and propulsion stack of the anchor handler, not from hull to hull and that this fact supports its request.

Response: The air quality modeling analysis used volume sources to represent Icebreaker # 2's emissions while performing bow washing. The modeled volumes have a width of 50 meters, and are essentially centered on Icebreaker #2's main stack. In the bow washing modeling performed for this permit application, six volumes were placed in the area where bow washing could occur. Three volumes were placed adjacent to each other along each side of the Discoverer, parallel to its long centerline (along the direction of the wind), with the volume centers at a distance of 100 meters perpendicular to the Discoverer's centerline. See E-mail from Kirk Winges, ENVIRON to Herman Wong, EPA, regarding Bow Washing Emissions for PM 2.5 and PM 10 , dated July 16, 2009. Therefore, strictly speaking, the compliance condition should be based on the perpendicular distance between the stack of Icebreaker #2 and the centerline of the Discoverer.

Accordingly, Permit Conditions O.9.1 and O.9.3 have been revised in the final permit as follows:

- 9.1 *During bow washing operations, Icebreaker #2 shall operate such that the distance from the rearmost stack on the icebreaker to the centerline (which stretches from the mid-point of the stern to the mid-point of the bow) of the Discoverer shall not be less than 100 meters;*
- 9.3 *The permittee shall, every 5 minutes after the time in Condition O.9.2, record the distance between the rearmost stack on Icebreaker #2 and the centerline of the Discoverer, until completion of bow washing operations as specified in Condition O.9.4;*

Q.10.c Comment: Shell requests that Permit Condition O.1.2, which limits the generator engines on Hull 247 to 0 hp, be modified to recognize the combined duty of the propulsion generator engines on the Hull 247. In support, Shell states that the propulsion engines on Hull 247 will consist of both direct drive engines and generators and will be used to power the ship utilities.

Response: EPA agrees that the language in Permit Condition O.1.2 should be revised to clarify that Hull 247 has no electricity generation capacity beyond the 24,000 kW specified in Condition O.1.1, and that the 24,000 kW may be used to generate electricity.

Condition O.1.2 has therefore been revised to read as follows:

The total capacity of all non-propulsion generator engines on Icebreaker #2 shall not exceed 2,336 hp for the Tor Viking and Hull 247 shall not have electrical generation capacity in addition to the engines specified in Condition O.1.1;

Q.10.d Comment: Shell requests that 95 % efficiency be used for calculation of the energy production allowance for the generators specified for Hull 247 in Permit Condition O.5, instead of the presently assumed 92% based on information submitted in support of Shell's comments.

Response: The permit applicant has indicated that the generators specified for Hull 247 have a mechanical to electrical conversion efficiency of 95%. However, Attachment C to Shell's comment letter of February 2, 2010 indicates that efficiency varies from 92.1% at 25% load to 96.2% at 100% load. The permit applicant has indicated that the engines will never be operated in excess of 80% load. In addition, EPA understands that much of the icebreaking will be conducted at low loads, as will the bow washing and transit activities. It therefore appears unlikely that the higher efficiency rates discussed in Attachment C will be realized. In the absence of enforceable conditions limiting time of operation at each load, EPA believes it is appropriate to base the electrical energy production limits on a conservative efficiency value of 92% that is based on extended operation at low loads. Consequently, the energy production limits in Permit Condition O.5 remain unchanged.

Q.10.e Comment: A commenter states that EPA's use of operational limits to keep Shell's operations under NAAQS and PSD increment limits is problematic because such restrictions will be difficult to enforce and may limit Shell's ability to respond to unpredictable Arctic conditions. For example, the commenter asserts, the proposed permit limits the amount of icebreaking in which Shell can engage and prohibits Shell from breaking ice in certain areas near the drillship. EPA acknowledges, for example, the commenters continue, that the Chukchi Sea's ice floe frequency and intensity is unpredictable and could range from no ice to ice sufficiently dense that the fleet has insufficient capacity and the Discoverer would need to disconnect from its anchors and move off site. In the face of this variability, the commenter states, the proposed permit's operational restrictions of Shell's response capabilities pose unnecessary potential conflicts between clean air protection and operational needs, and as a result, risks

inadequate protection of health and the environment, especially given that EPA has not developed operational limits based on site-specific ice or meteorological data. The commenter contends that EPA should apply technology-based emissions controls to Shell's most polluting sources, even if EPA concludes that it is not required by the CAA to apply BACT limits to vessels, to ensure compliance with NAAQS standards and PSD increments, rather than rely on operational controls that are difficult to enforce and may not be consistent with actual icebreaker or support vessel operational needs.

Response: EPA does not agree that the operational restrictions on the icebreakers, including the distance and location requirements, pose unsafe or unmanageable operational difficulties or will be difficult to enforce. The permittee has not challenged these permit conditions and understands that the permit may constrain its operations in certain respects. Modern vessels employ a host of electronic instrumentation, including Global Positioning Systems, that will allow a determination of the location of the vessels and the distance between vessels, and thus will provide information regarding the permittee's compliance with these permit terms and conditions.

Q.10.f Comment: Commenters state they are not convinced that capping the aggregate capacities of various vessel parameters, requiring the vessels meet certain emission rates for PM_{2.5}, PM₁₀ and NO_x and requiring a minimum volume source release height is enough to ensure that the use of different vessels for Icebreaker #1 will ensure compliance with NAAQS. The commenters prefer that EPA require that Shell specify which ice management vessels it will use and establish permit limits and associated modeling requirements based on the use of these specific vessels, rather than allowing the use of a generic ice management vessel. Commenters also state that they support the specific permit limits and modeling for Icebreaker #2 in the January 2010 proposed permit.

Response: In comments submitted on the August 2009 proposed permit, the commenters expressed this concern with respect to both Icebreakers #1 and #2. As acknowledged by the commenter's comments submitted on the January 2010 proposed permit, the permit has been revised to specify one of two vessels as Icebreaker #2 (see Permit Condition O.1) and the commenters no longer appear to have these concerns with respect to Icebreaker #2. With respect to the commenters' remaining concerns with respect to Icebreaker #1, although the commenters prefer that EPA require the use of specific ice management vessels as Icebreaker #1, the commenters do not assert that EPA's approach in the proposed permit is contrary to legal requirements or lacks an adequate technical basis. Nor do the commenters explain with any specificity the basis for their concerns.

However, it should be understood that Icebreaker #1 was modeled as a volume source. When emission units are modeled as point sources, predicted (modeled) impacts are based on various parameters that include location, emission rate, stack velocity and stack temperature. Consequently, a given emission rate could result in very different impacts depending on which emission unit is emitting those pollutants. With Icebreaker #1, all emission units are modeled as a volume source -- aggregated emissions from all emission units on board are then modeled along the path of travel for the vessel. However, in the

context of this comment, it is more important to note that when modeled as a volume source, all emissions from the emission units on board are aggregated and the aggregate total is used in the analysis. As a result, it is not relevant which emission unit is actually emitting the pollutants. This allows for some flexibility in how emission units are aggregated, with an aggregated capacity limitation. Note that units are aggregated based on source category to facilitate compliance – engines, boilers and incinerators are all in separate categories related to how compliance will be tracked – e.g. kWe for engines, fuel usage for boilers. See Conditions N.1 through N.6 and N.11.1 through N.11.7.

Modeled impacts are based on the volume source release height, as this affects dispersion. Release heights greater than 25.22 meters can be expected to result in greater dispersion, and release heights below 25.22 can be expected to result in less dispersion. So, if a replacement vessel has a volume source release height greater than 25.22 meters, predicted impacts can be expected to be less than shown in the modeling analysis. It is appropriate, therefore, to rely on minimum volume source release heights, calculated based on a reproducible methodology (see Condition N.9.1.2), to remain consistent with the modeling analysis which shows compliance with the NAAQS and PSD increment.

Q.10.g Comment: Commenters support the specific permit limits and associated compliance demonstration requirements for Icebreaker #2 (also known as the anchor handler) in order to ensure that the vessel's emissions are, in fact, properly represented by AP-42 emission factors. The commenters state that this is particularly important given that there are no stack test data available for PM emissions from these, or similar, engines and that if EPA will be allowing the use of the much-lower AP- 42 emission factors for Icebreaker #2, then EPA must include associated emission limits in the final permit.

Response: EPA acknowledges the comment and agrees that specific permit limits and associated compliance demonstration requirements are needed for Icebreaker # 2. The permit contains a number of conditions that effectively limit emissions from this vessel, including limits on electrical power production limits for the engines and fuel usage limits for the heat boilers. See Permit Conditions O.3, O.4, O.5 and O.6. It should also be noted that emission units on board Icebreaker #2 will be stack tested and the results used to assess compliance with the required emission limits.

Q.11 Subcategory - Condition R: Post-Construction Ambient Monitoring

Q.11.a Comment: A commenter states that, because exploration activities are temporary, lasting months and not operating year round, full year data collection will be difficult to collect until permanent facilities exist on which to station year-round equipment. The commenter encourages EPA to consider correlation of onshore data with available data collected offshore during the exploration timeframes, especially if background concentrations are being used to add to modeled concentrations offshore. The commenter states that correlation of onshore ambient air quality monitoring data could be done with the onshore wind direction to get estimates of the offshore background.

Response: EPA agrees with the commenter that until permanent facilities exists (e.g., a platform), it will not be possible to collect year round meteorological and air quality data off shore. If and when there are concurrent onshore and offshore data collection programs, EPA will review the measurements to determine any correlation.

Q.11.b Comment: A commenter states that MMS has an ongoing study, the goal of which is to achieve accurate simulation of the Beaufort and Chukchi Seas surface wind and associated mesoscale meteorology using available observational data from 1979-2009 and that the results of this study will aid in correlating onshore and offshore data.

Response: EPA is aware of the meteorological data collection programs that have been conducted or are under way in the Beaufort and Chukchi Seas, and has been providing input to the MMS Alaska Office. EPA is also collaborating with the University of Alaska at Fairbanks in its Weather Research and Forecasting Model development for the Arctic.

R **CATEGORY – TITLE V APPLICABILITY**

R.1 Comment: A commenter notes that the final sentence in the Title V applicability discussion in the Statement of Basis should have the word “source” added so it would then read: Because the PTE for this project is greater than 100 tons per year for several criteria pollutants, it is a major source under Title V and Part 71 and must apply for an operating permit as provided in 40 C.F.R. §71.5(a)(1)(i) within 12 month of first becoming an OCS source on Shell’s current leases in the Chukchi Sea.

Response: EPA agrees with the comment, but is not be revising the Statement of Basis in conjunction with issuance of the final permit.

S **CATEGORY – COMPLIANCE MONITORING AND ENFORCEMENT**

S.1 Comment: EPA received numerous comments on compliance monitoring and enforcement of the permit requirements, including the following:

- Shell should not be allowed to self-monitor under the permit, and EPA, and not Shell, should conduct the monitoring.
- The Regional Tribal government of the Inupiat Community of the Arctic (ICAS) requests that the reports from Shell’s permit be submitted to ICAS once Shell has the capability to monitor what EPA has the ability to permit.

- Native Alaskans should be able to inspect and enforce environmental compliance should the development go forward.
- The State of Alaska should not be doing enforcement and monitoring because they have a conflict of interest – their strong desire to develop oil and gas. Shell should not be self-monitoring.
- The Northwest Arctic Borough requests that EPA establish permit conditions with methods to communicate results of compliance with the EPA air quality permit and share monitoring information.
- Due to the lack of monitoring equipment and stations, the Northwest Arctic Borough requests the permit include air quality monitoring stations on shore in the communities of Kivilina, Point Hope, and Point Lay. The Borough continues that if the project is permitted, the Borough would like to know whether Shell as the applicant is within air quality limits or exceeding limits and measures to take corrective action and that communication of this information will be useful to the Borough staff as well as its residents when reviewing current and future proposals for offshore activities.
- EPA's regulations require Shell to certify its compliance with air quality standards and permit conditions. 42 U.S.C. § 7414; 40 C.F.R. § 60.8. EPA has the discretion to adjust testing requirements depending on the circumstances, 40 C.F.R. § 60.8, but should not do so at the cost of ensuring compliance.
- We expect that enforcement be done, whether through the Department of Justice or another forum or agency, and we expect that Tribes be able to play a role and to enforce in the same manner as the Department of Justice. Federal agencies have in the past turned a blind eye and have not followed through on their laws and procedures and we expect them to do so.
- EPA and other agencies have not enforced the remediation and restoration at Prudhoe Bay, and companies have stated they will clean up the area and have not done so. Alaska is responsible for enforcement in that area; it is clear that the State has failed in its delegated authority and it must be returned to EPA.

Response: EPA agrees that a strong enforcement presence is needed to verify compliance with air pollution permit requirements. Although federally-recognized Tribes and Native Villages in Alaska and ADEC are important partners in ensuring that Clean Air Act requirements are met in Alaska, EPA has retained authority to implement and enforce Section 328, and any OCS or PSD permit issued thereunder, on the OCS off the coast of Alaska where Shell will be operating under the permit. Citizens also have authority to bring enforcement actions for Clean Air Act violations as provided in Section 304 of the CAA.

The permit has testing, monitoring, recordkeeping, and reporting requirements to provide information regarding whether Shell is operating in compliance with permit conditions.

For example, the permit requires stack testing of most emission units prior to initial operation. See, e.g., Permit Condition C.6. The proposed permit required Shell to report to EPA via fax any exceedance of any emission limit or throughput limit within three days of discovery. In response to comments raising compliance monitoring concerns and pursuant to authority in 40 C.F.R. § 55.8(a), in the final permit, EPA has expanded the reporting requirements to require the reporting of all permit deviations to EPA and to require the submission of an annual operating report. See Permit Conditions A.15 and 16¹¹. Former Permit Condition B.1 has been combined into Condition A.15. The public has a right to request and receive this information under the Freedom of Information Act (FOIA), 5 U.S.C. § 552. Additional monitoring, recordkeeping, and reporting requirements may be included in the Title V operating permit issued to Shell as appropriate. See generally 40 C.F.R. Part 71.

In addition, the permit includes mechanisms that enhance the reliability of Shell's self-monitoring. First, the permit requires Shell to install, maintain, and operate devices to measure and record fuel usage, operating loads, and other emissions-related data. For example, all Catalyzed Diesel Particulate Filter control devices must be equipped with a monitor and alarm unit that records exhaust pressure and temperature, parameters that indicate that the control equipment is working. Under Section 113(c)(2)(C) of the CAA, it is a criminal offense to falsify, tamper with, render inaccurate, or fail to install any monitoring device or method required under the Clean Air Act. Second, in some instances, the permit requires more than one monitoring method to ensure compliance with a single requirement. Finally, all reports and records required to be submitted to EPA under the permit must be certified by a responsible official for Shell as to their truth, accuracy, and completeness. Again, Shell could be subject to criminal liability for falsifying these records or reports.

Although self-monitoring by Shell is a component of ensuring Shell is operating in compliance with the permit, as indeed it is for other sources subject to Clean Air Act requirements, EPA will have an active oversight role. Because Shell's exploratory operations on the Chukchi Sea constitute a "major source," EPA's Compliance Monitoring Strategy calls for a "Full Compliance Evaluation" at least once every two years. A Full Compliance Evaluation is a comprehensive evaluation of the compliance status of a facility, which may involve an on-site inspection, that addresses all regulated

¹¹ On February 17, 2010, EPA proposed to include similar excess emission/deviation reporting and operating report requirements in the proposed OCS/PSD permit for operation of the Discoverer in the Beaufort Sea permit for that portion of the permit governing operations within 25 miles of Alaska's seaward boundary. See Discoverer (Beaufort) Proposed OCS/PSD Permit, Conditions A.23 and A.26. EPA based these conditions in the Beaufort permit on Standard Permit Conditions III and VII in ADEC's permit rules, 18 AAC 50.346, which EPA has incorporated into 40 C.F.R. Part 55 as rules of the "corresponding onshore area" under Section 328 of the CAA. To facilitate operation of the Discoverer under this permit governing operations in the Chukchi Sea and in the Beaufort Sea under the proposed Beaufort Sea OCS/PSD permit, if finalized, EPA believes it is appropriate to base the excess emission/deviation reporting and operating report permit terms that EPA is adding to this permit on the similar requirements in the Beaufort permit.

pollutants at all regulated emission units. See Clean Air Act Stationary Source Compliance Monitoring Strategy, April 2001, p. 7
<http://www.epa.gov/compliance/resources/policies/monitoring/cmstrategy.pdf>

The results of the Full Compliance Evaluation will be documented in a report and the date of the evaluation and a summary of the results will be available via EPA's Enforcement and Compliance History Online (ECHO) website. <http://www.epa-echo.gov/echo/> A full copy of the report will be available via FOIA as long as it meets the requirements for disclosure under 40 C.F.R. Part 2. In some instances, EPA may withhold all or a portion of a Full Compliance Evaluation report from release due to concerns about ongoing enforcement. In addition, EPA has authority to observe the conduct of stack tests of any emission unit and will review all stack test reports to verify that the proper procedures and equipment were used to measure emissions from the emission units and to evaluate compliance with the permit terms and conditions. The date of each stack test, the date of each report and the test results (e.g. in compliance or in violation) will be available via EPA's ECHO website. A full copy of each stack test report will be available via FOIA. EPA will also be reviewing periodic reports and episodic (e.g. deviation) reports submitted under the permit. Again, the date of each report and the results (e.g. in compliance, deviations reported) will be available via EPA's ECHO website and a full copy of each report will be available via FOIA. In addition, under Permit Condition A.14 and Section 114 of the CAA, EPA has authority to compel an air pollution source to submit any and all information necessary to determine compliance with CAA requirements.

The Clean Air Act provides EPA with broad authority to enforce CAA requirements. Under section 113 of the Clean Air Act, EPA is authorized to bring enforcement actions against a permittee, such as Shell, for violations of an OCS/PSD permit. This authority includes civil and administrative penalty authority, the authority to seek injunctive relief, and the authority to pursue criminal actions. Additional authorities also exist in other parts of the Act, including EPA's emergency authority under section 303 and penalty authority under section 120.

With respect to stack testing requirements, see response to Comments in Category Q.2. EPA notes that 40 C.F.R. Part 60 does not apply to testing required under this permit.

With respect to the request for additional ambient air monitoring, EPA believes the post-construction monitoring in Permit Condition R, in conjunction with the air quality analysis underlying this permit and the terms and conditions of the permit, are adequate to ensure compliance with the NAAQS and increment. EPA notes that the Alaska Native Tribal Health Consortia, under a three year Cooperative Agreement with EPA Region 10, has initiated discussions with the Nuiqsut tribal community to respond to the community-identified need for independent air quality data and assessment of air-related impacts from energy development activities in their area. A meeting with the tribal council and others in the community took place in February 2010 to develop an understanding of the community's needs and a tribal resolution of support was subsequently passed. An air monitoring site may be operational by the summer of 2010 to collect data on NO_x, SO_x and PM_{2.5}.

Comments relating to past contamination at Prudhoe Bay and Alaska's administration of EPA environmental programs are outside the scope of the PSD program. See response to Comment PP.1.

T CATEGORY: APPLICABILITY OF INCREMENT AND BASELINE ON THE OCS

T.1 Comment: Commenters contend that the establishment of an Air Quality Control Region (AQCR) by EPA as part of an individual permit issuance is unprecedented and inconsistent with the legislative intent expressed in Section 107 of the Clean Air Act. These commenters assert that EPA does not have authority to implement an AQCR in the geographical area of the proposed operation outside of the statutory authority provided under Section 107 of the Clean Air Act and in any event that EPA did not adequately explain the basis for such authority. Moreover, the commenters continue, even if EPA has the authority to designate an AQCR on the OCS, the method and procedure for establishing the AQCR is inconsistent with the prescribed procedure under Section 107 and EPA provided no technical basis or air quality control based rationale for the AQCR designation in this case. The commenters claim it is illogical that if Congress intended EPA to designate AQCR's on the OCS, Congress would not also expect the same prescribed procedure for designation including public participation in the designation process.

Response: Contrary to the comment, EPA has not designated an AQCR under CAA Section 107 in the Chukchi Sea. Rather, EPA has explained how it is implementing the regulatory definition of "baseline area" and the technical basis for the baseline area that EPA is using for the outer OCS off the coast of Alaska. As explained in the Statement of Basis and in a memorandum supporting this permit action, the baseline area on the outer OCS is similar in extent to the onshore baseline area, which extends from the State waters of the Chukchi Sea on the west to the Alaska/Canada border on the east. See Statement of Basis, Section 5.2.2; Memorandum from David C. Bray, Senior Policy Advisor to Rick Albright, Director, Office of Air, Waste, and Toxics and Janis Hastings, Associate Director, Office of Air, Waste, and Toxics dated July 2, 2009, titled "Implementing PSD Baseline Dates, Baseline Areas, and Baseline Concentrations on the Outer Continental Shelf in Alaska;" 18 AAC 50.015 and 50.020 (onshore baseline area and its baseline dates). While this baseline area for the outer OCS north of Alaska is large, it is not arbitrary because it allows EPA to manage offshore deterioration of air quality over an area that parallels the onshore baseline area which is used by ADEC to manage onshore deterioration.

T.2 Comment: Commenters state that EPA's proposed AQCR designation supporting this permit action is deficient because Congress established the PSD program in CAA Section 161 as a component of an "implementation plan;" Congress specified in CAA Section 161 that implementation plans will includes

measure to prevent significant deterioration in each region “designated pursuant to section 107” as attainment or unclassifiable; in Section 107 Congress provided for designation by EPA of air quality control regions, but only in consultation with State and local authorities, and only for “any interstate area or major intrastate area. . .”; in Section 162 Congress designated all areas within the States for purposes of the PSD program as Class I and II areas, and provided a mechanism for a State or Tribe to propose changes in the designation of an area, but Congress provided no mechanism for designation of areas outside of a State; and the 40 C.F.R. § 52.21 definition of “baseline area” defines the term to mean “any intra-state area (and every part thereof) . . .” so there can be no major or minor source baseline in the OCS. The commenters request that EPA retract the AQCR designation for the OCS beyond 25 miles from the shoreline established via the internal memo until EPA has proposed and adopted the AQCR on the OCS consistent with the Section 107 or until Congress amends the Clean Air Act.

Response: See response to Comment T.1. It is important to emphasize that the OCS regulations at 40 C.F.R. Part 55 are enacted pursuant to Section 328 of the Clean Air Act and not section 161 of the CAA. Section 328 requires EPA to adopt federal regulations to, among other things, “...comply with the provisions of part C of title I.” EPA interprets Section 328 to provide EPA with express authority to adopt regulations that apply to sources on the OCS that, except as otherwise provided, are the same as the provisions of Part C of Title I of the CAA but apply outside the boundaries of States. As such, EPA does not believe that Section 328 requires EPA to develop “implementation plans” as required in Sections 161 and 110(a)(2)(J) of the CAA since those are requirements for States for areas within State jurisdiction. As the commenter points out, some of the provisions of Part C of Title I of the CAA (e.g., CAA Section 162) apply specifically to “States” and it is clear that in order to meet the requirements of Section 328, EPA’s implementing regulations must make such provisions apply on the OCS outside of State boundaries.

T.3 Comment: Commenters assert that, in modeling emissions increases against the increments, EPA erroneously required Shell to demonstrate attainment of the increments at the facility boundary (in this case the rail of the Discoverer). The commenters state that EPA’s justification for this is that while the legislative history of CAA Section 328 reflects only a concern for the onshore impacts of OCS activity, “Section 328 does not identify a particular area where the requirements to control air pollution from OCS sources located offshore must attain and maintain” NAAQS and increments. The commenters contend that the limits on the geographic scope of the PSD program are found, not in Section 328, but in Title I of the CAA and that the PSD enabling language in CAA Title I, the history of CAA Section 328 and the rulemaking record supporting 40 C.F.R. Part 55 leave no doubt that the point of compliance for an increment demonstration by a major stationary source operating in the OCS is on shore, not in the OCS.

Response: EPA disagrees that the statute, legislative history, and rulemaking record establish that the only point of compliance with increments is onshore. While EPA agrees that the legislative history evidences Congress’ concern for protection of onshore

air quality, the actual enacted statutory language never uses the term “onshore” but rather simply requires EPA to promulgate regulations to attain and maintain ambient standards and comply with the provisions of Part C of Title I of the CAA (the provisions for prevention of significant deterioration of air quality). Nothing in the statute precludes or limits EPA’s discretion in how it structures the required regulations to comply with the statutory directive. EPA believes that it has the authority to adopt regulations, and has adopted regulations, that require compliance with the NAAQS and increments at all locations, both offshore and onshore. The existing Part 55 regulations therefore comply with the requirements of CAA Section 328 and address Congress’ concern that onshore air quality is protected. See also Statement of Basis, Section 2.3.

T.4 Comment: A commenter contends that CAA Section 107 does not contemplate the establishment of air quality control regions outside of State boundaries, noting that when Congress enacted Part C of Title I in 1977, EPA had no authority to regulate air quality on the OCS, and Part C includes no mechanism to implement the PSD program on the OCS. The commenter states that Congress filled that gap in 1990 with the enactment of Section 328, but Congress did not direct EPA to regulate the increments in the OCS and that, to the contrary, Section 328 merely directs EPA to adopt rules “to comply with the provisions of Part C” This language, the commenter continues, accomplished the congressional objective of protecting onshore air quality from degradation by OCS sources. The commenter asserts that this legislative purpose was not lost on EPA when it adopted the Part 55 OCS permitting rules and that the preambles to the proposed and final Part 55 rules repeatedly emphasize that the goal of Part 55 PSD permitting is to protect increments on shore. Thus, the commenter concludes, neither the Part 55 rules nor 40 C.F.R. § 52.21 provide any authority to require increment attainment demonstrations within the OCS.

Response: The commenter is essentially arguing that PSD increments only apply within areas designated under CAA Section 107 as attainment or unclassifiable and that EPA has no authority under Section 107 to designate such areas on the OCS. The commenter fails to recognize that this argument could be taken so far as to mean that nothing in Part C of Title I of the CAA, including the requirement for a permit and BACT, would apply on the OCS since the applicability of Part C in its entirety is limited to areas designated as attainment or unclassifiable under Section 107 of the CAA. See CAA Section 161(a). EPA believes CAA Section 328 and Part C of Title I of the CAA must be read together to give full meaning to the Clean Air Act. Congress presumably understood that Title I, Part C and Section 107 of the CAA apply to areas within States. However, CAA Section 328 directs EPA to promulgate regulations that would apply outside of States. EPA believes that Congress provided EPA with both the direction and authority to establish regulations to protect NAAQS and to prevent significant deterioration of air quality that did not rely on designations under CAA Section 107. EPA has complied with this directive in its Part 55 rules by requiring OCS sources to comply with all of the requirements of 40 C.F.R. § 52.21, including the requirement in section 52.21(k) to demonstrate compliance with NAAQS and increments at all locations in ambient air. See 40 C.F.R. § 55.13(d). Indeed, EPA specifically provided in adopting the OCS regulations that, “For requirements adopted prior to promulgation of this part, language in such

requirements limiting the applicability of the requirements to onshore sources or to sources within State boundaries shall not apply.” 40 C.F.R. § 55.13(b)(4).

T.5 Comment: A commenter states that in establishing the baseline area on the outer OCS, EPA overlooks the fact that Congress established the PSD program to prevent significant deterioration in air quality control regions designated as attainment pursuant to CAA Section 107, and that Section 107 plainly limits the establishment of air quality control regions to “any interstate area or major intrastate area” deemed appropriate for attainment of the NAAQS. The commenter also asserts that the area covered by Shell’s leases in Lease Sale 193 area is not a Class II area because CAA Section 162(b), the section of the CAA that EPA cites as authority for this conclusion, defines as Class II areas only areas “in such State” that are not established elsewhere as Class I areas and provides no mechanism for designating portions of the OCS under the PSD class designation scheme.

Response: EPA disagrees with the commenter regarding the PSD classification of the outer OCS. EPA’s implementing rules at 40 C.F.R. § 52.21(e)(3) define as Class II areas all areas that are not mandatory Class I areas or those areas that were reclassified as Class I under the previous rules. This provision is not limited to only areas within States but includes the outer OCS where 40 C.F.R. § 55.13 makes 40 C.F.R. § 52.21 applicable. Similarly, the provisions for ambient air increments in 40 C.F.R. § 52.21(c) and ambient air ceilings in 40 C.F.R. § 52.21(d) are not restricted in any way to areas within the boundaries of States. Even if the boundaries of “baseline areas,” as that term is defined in 40 C.F.R. § 52.21(b), are uncertain, that uncertainty has no impact on the requirements for this permit. Regardless of the exact boundaries of the baseline area, Shell’s Chukchi permit application is the first ever PSD application for a major source in the outer OCS and thereby triggers the minor source baseline date. Therefore, this permit action is not affected by any alleged lack of clarity with respect to the boundaries of baseline areas. See also response to Comment T.4.

T.6 Comment: A commenter states that EPA should revise its increment consumption analysis and delete all permit limits based on that analysis. The commenter contends that the decision to apply the PSD increments at the rail of the Discoverer is prejudicial in ways that impact not only Shell but also ConocoPhillips because the emission limits in the proposed permit unlawfully restrict Shell's operations to achieve the increments at locations where they do not apply; ConocoPhillips and other Chukchi Sea lessees likely will require PSD permits to develop and produce the oil and gas reserves in the Chukchi Sea; and the decision to establish a PSD baseline area and to establish a point of compliance for the PSD increments on the OCS as opposed to on shore will preclude EPA from permitting the mix of exploration and production activities that must be performed to enable the holders of MMS leasehold interests to explore for, develop and produce mineral resources for which they acquired rights from the United States, at an aggregate cost of \$2.7 billion. The commenter continues that EPA's current actions may preclude the exercise of lease rights contrary to the terms of the leases.

Response: See response to Comments T.1 to T.5 above on where increment compliance must be demonstrated and the interpretation of baseline areas. With respect to the comment on revising the increment consumption analysis and deleting all permit conditions based on that analysis, EPA disagrees that such revisions are appropriate. The current modeling analysis relies on emission controls and operational restrictions that impact all pollutants and are relied upon for demonstrating compliance with both NAAQS and increments. Few, if any, conditions in the permit can be said to arise exclusively from the need to demonstrate compliance with increments. For example, the 24-hour NAAQS for PM_{2.5} is 35 ug/m³ whereas the 24-hour increment for PM₁₀ is 37 ug/m³. Since PM_{2.5} and PM₁₀ emissions are nearly the same for controlled diesel engines, it is highly likely that the requirement to comply with the PM₁₀ increment resulted in no additional permit conditions than what was needed to comply with the PM_{2.5} NAAQS. Furthermore, EPA is not aware of anything in OCSLA or leases granted thereunder that would exempt leaseholders from compliance with the CAA or other environmental statutes.

The commenter's statement that EPA's approach would preclude the ability of MMS leaseholders to exercise their rights is unsubstantiated. EPA recognizes that additional air pollution controls and operational restrictions may be necessary to protect air quality, but believes that additional oil and gas exploration activities may still be permitted.

T.7 Comment: Other commenters strongly support EPA’s position on the need for demonstrating compliance with PSD increments on the OCS and agree that OCS permitting rules applicable to sources further than 25 miles beyond a state’s seaward boundary apply in the same manner as the PSD requirements of 40 C.F.R. § 52.21 apply to onshore sources. Clearly, these commenters continue, this includes compliance with the PSD increments for Shell’s exploration activities in Lease Area 193 and the required air analysis is not limited to the impacts of offshore sources to onshore areas.

Response: We acknowledge this comment in support of EPA’s approach to demonstrating compliance with NAAQS and increments on the OCS. As discussed in response to Comments T.1 to T.6 above, EPA agrees that the required air quality analysis is not limited to the impacts of offshore sources to onshore areas.

U AMBIENT AIR BOUNDARY

U.1 Comment: Commenters note that Shell has applied for a safety zone for the Discoverer drill ship and the Coast Guard has proposed approval of such a zone. Some commenters raise this issue to make the point that nothing in the Coast Guard proposal for the temporary safety zone indicates an intent to change the location of the ambient air boundary for the purposes of demonstrating compliance with Clean Air Act requirements, including compliance with NAAQS and PSD increments. These commenters further assert that, regardless of the need for a safety zone (to minimize the potential threats to life, property and the environment from allisions, oil spills, etc.), Shell must continue to demonstrate compliance with all CAA requirements at the location of maximum concentration regardless of the safety zone boundary and that EPA cannot ignore predicted concentrations just because they occur within a Coast Guard designated safety zone. Another commenter points to the Coast Guard proposal and asserts that, if finalized, establishment of a safety zone would lessen the maximum impacts from the permitted activities to which the public will be exposed. This commenter also states that the because there is no reason for a vessel that is not a part of the project to risk coming close to the Discoverer, the assumption of exposure of the public to ambient air immediately adjacent to the drillship is highly conservative.

Response: As discussed in the Statement of Basis (p. 96), ambient air is defined as “...that portion of the atmosphere, external to buildings, to which the general public has access.” 40 C.F.R. § 50.1(e). As also discussed and as Shell acknowledges, EPA based the proposed permit on an ambient air boundary that begins at, and extends outward from the edge of the Discoverer and each vessel in the Associated Fleet. That Shell has applied for a safety zone for the Discoverer from the Coast Guard, 75 Fed. Reg. 803 (January 6, 2010), is not relevant to this permit action because the Coast Guard has not taken final action on Shell’s request and because the ambient air quality analysis in this OCS/PSD permit is not premised on the existence of such a safety zone. The ambient air quality analysis supporting this permit action shows that the permit terms and conditions

assure compliance with currently applicable NAAQS and PSD at the edge of the hull of the vessels.

V CATEGORY - GENERAL COMMENTS ON AMBIENT AIR QUALITY ANALYSIS AND SUPPORTING DATA

V.1 Comment: One commenter states that the evaluations for the permit (e.g., source emissions, air quality modeling, air quality monitoring data, operating conditions) are primarily based on worst case analyses and encourages EPA to use what the commenter asserts are more realistic evaluations and adaptive management as information is collected during activities.

Response: Beginning in early 2006, EPA suggested that Shell collect ambient data to support its preparation of an air permit application. In late 2008, Shell joined Conoco-Phillips Alaska, Inc (CPAI) in collecting air quality data at Wainwright, Alaska to represent background air quality levels at the drill sites located off-shore in Lease Area 193. There was also no hourly meteorological data that EPA believed to be representative of a marine environment at the time Shell was preparing its OCS/PSD permit application. In the absence of more site-specific data, Shell's only option was to employ an air quality model (i.e., ISC3-PRIME) using screening meteorology to predict the emission impacts from its different operating scenarios. In the implementation of this option, EPA required Shell to employ certain procedures to bias the results to protect the NAAQS because of the over water stationary source location of Shell's proposed operations and because the meteorology over water is different from a terrestrial location.

If Shell had collected hourly meteorological data representative of a marine environment and used that data with an EPA preferred (or guideline) model, the predicted concentrations from this alternative could be less conservative (i.e., lower concentrations) than the predicted concentrations from the option selected by Shell. EPA also notes that the ambient air quality analysis supporting a PSD permit decision must be based on the maximum emissions allowed by the permit and thus, is intended to reflect a reasonable worst case analysis.

Additional details are provided in responses to comments AA.2 and BB.2.

V.2 Comment: One commenter states that the impact modeling was performed using multiple conservative assumptions, none of which the commenter believes are necessary to estimate maximum impacts by EPA procedures. The commenter continues that these assumptions include that 1) there is no EPA recognition of a safety exclusion zone around the Discoverer drill ship; 2) wind speeds used in determining maximum impacts are inconsistent and biased to high-side impacts; and 3) the model only evaluates a maximum impact rather than a 98th percentile impact and the maximum is used to be a conservative representation of the 98th percentile value. The commenter states that the first two conservative assumptions result in impact estimates of about 50% and 33% above maximum realistic estimates of 24-hour PM and annual NO_x, respectively, and the third

assumption, using the 98th percentile, overstates the PM_{2.5} impact by at least 30%.

Response: EPA disagrees with the commenter that conservatism (i.e., higher model concentration prediction) is unnecessary as part of this ambient air quality impact analysis. As stated in response to Comment V.1, it was Shell's decision not to collect meteorology representative of a marine environment that would be needed to use an EPA preferred model. The procedures required by EPA were intended to address uncertainties in model predictions and maintain consistency with EPA practice. With respect to the specific points raised by the commenters:

1. The approval of a safety zone around the Discoverer is the responsibility of the Coast Guard and not EPA. As discussed in response to Comment U.1 above, to date, the Coast Guard has not taken final action on Shell's request for a safety zone for the Discoverer. Since Shell did not establish in its permit application a basis for an ambient air boundary other than the hull of the vessels, the ambient air quality analysis supporting this permit was required to be and, in fact, was conducted to demonstrate compliance with the NAAQS and PSD increments at the hull of the vessels.
2. EPA agrees that the vessels could be represented as volume sources provided the height of the volume sources are obtained using a wind speed of 20 meters per second and D stability in the SCREEN3 model. As discussed in the Statement of Basis (p.100), because there are no established procedures to model underway ship emissions, the vessels were modeled as volume sources with the release height based on the lowest final plume rise in each fleet. EPA believes this approach will result in conservative, yet reasonable, concentration predictions.
3. Screening models are used to predict the maximum 1-hour concentration. To obtain concentrations for other averaging times, the 1-hour concentration is multiplied by scaling factors recommended by EPA. The predicted 1-hour concentration and the derived other averaging time concentrations are used in determining compliance with NAAQS. For example, the PM_{2.5} 24-hour concentration was obtained by multiplying the 1-hour model prediction with the high end scaling factor of 0.6. The Statement of Basis (pp.103-104) describes the scaling factors used in the ambient air quality impact analysis.

For a screening model analysis, the EPA metric for determining compliance with the short term NAAQS is the highest modeled concentration prediction. If Shell had used hourly meteorological data representative of a marine environment with an EPA preferred model, the eighth-highest concentration is recommended for determining compliance with the NAAQS. Hence, the commenter is incorrect to imply that the screening model prediction for determining compliance with NAAQS should be 98th percentile. In fact, a screening model cannot derive a 98th percentile concentration because screening meteorology is fed into the model.

See also the response to Comments AA.1 and BB.1.

W **CATEGORY – IMPACT ON FUTURE OIL AND GAS EXPLORATION IN THE CHUKCHI SEA**

W.1 Comment: The commenter states that there are other leaseholders in Lease Sale 193, including the commenter, who paid significant amounts of money to the United States for the right to explore for and develop oil and gas resources on the outer OCS in the Chukchi Sea and that every such operator must deploy not only a drill rig but also a fleet of support vessels charged with supporting drilling operations, protecting the environment and protecting the operation from floating ice. The commenter asserts that support vessels for such an operation have a larger potential to emit than the drill rig and the support vessels must constantly reposition themselves over areas far larger than Shell’s lease blocks, especially the icebreakers. The commenter asserts that the mobility and relative magnitude of Associated Fleet emissions means that Shell’s operations alone will be modeled to consume substantial portions of the increments and to threaten compliance with the NAAQS at other locations in the Chukchi Sea, including locations within the commenter’s Lease Sale 193 lease blocks. The commenter contends that it may not be able to demonstrate that its operation will not cause a NAAQS violation if Shell’s emissions consume large portions of the NAAQS at the location of the commenter’s drilling rig

Response: EPA understands the commenter’s concern that the “first-come, first-served” structure in EPA’s permitting regulations would allow Shell’s operations to potentially utilize a significant portion of the available air resources in the area where they are located. However, many years of PSD permitting has shown that the temporal and spatial nature of NAAQS and PSD increments are such that few, if any, situations have arisen where multiple new sources or modifications have not been able to be permitted in the same vicinity. For example, it is possible for two sources to impact the same location on different days such that each can utilize all of the available increment. The fact that Shell’s maximum impacts may occur at the hull of the Discoverer and lower impact occur over a broad region, does not necessarily mean that subsequent sources would be unable to get permits that would allow emissions in that broader region. More importantly, the portable nature of exploratory drilling operations somewhat minimizes the effect of the “first-come, first-served” approach to permitting since no permitted source will have “locked up” available increment at a future location until the source actually constructs and emits at that location. Once Shell and the commenter have Part 71 operating permits pursuant to Section 504(e) of the Clean Air Act, then either exploratory operation will need to account for the other if one of them is already operating at a drill site when the second proposes to locate nearby.

W.2 Comment: The commenter contrasts EPA’s permitting approach with that of the MMS permitting approach in the Western and Central Gulf of Mexico OCS areas where the MMS has jurisdiction. The commenter contends that MMS protects onshore air quality in a more well-established and easily understood process that does not require an unreasonable amount of time. The commenter acknowledges

that the EPA is governed by the CAA but states that Section 328(b) of the CAA requires the EPA to consult with the Department of Interior (DOI) to ensure coordination of the air pollution control regulations in the OCS.

Response: EPA acknowledges this comment and points out that CAA Section 328(a) required EPA to consult with DOI before promulgating the OCS regulations but does not require the ongoing consultation implied by the commenter. To the extent the commenter actually meant to refer to CAA Section 328(b), that section requires DOI to consult with EPA when promulgating air pollution control regulations in those specific OCS areas that are specifically designated in the provision. The OCS area covered in this permitting action is not included in the areas designated in Section 328(b) and is thus covered by EPA regulations pursuant to Section 328(a).

Moreover, as discussed above in response to Comment T.3, CAA Section 328 and the PSD regulations at 40 C.F.R. § 52.21 require the protection of NAAQS and increment on the OCS itself. EPA believes it has processed Shell's request for an OCS/PSD permit in an expeditious manner that is consistent with the requirements of the OCS and PSD statutory and regulatory requirements.

W.3 Comment: A commenter contends that the errors EPA has made in issuing this permit will hinder the permitting of not only exploration activities in lease blocks adjoining Shell's in Lease Sale 193, but also production activities throughout the Chukchi Sea and the rest of the OCS. The commenter asserts that the errors in EPA's approach to permitting will become more apparent once EPA promulgates PM 2.5 increments and MMS leaseholders other than Shell apply to permit exploration projects in other lease blocks in the Lease Sale 193 area that they will share with Shell's support fleet.

Response: See response to Comments T.6 and W.1 above. EPA does not believe that it has erred in issuing this permit. Furthermore, implementation of the PSD permitting program on the OCS in the same manner as it is implemented onshore will not hinder exploration and development of the OCS mineral resources. To the contrary, implementing the PSD permitting program in a manner that ensures BACT is applied and minimizes emissions will provide more opportunities for leaseholders to explore and develop the resources and ensure the NAAQS and increment are protected. EPA will continue to apply the relevant rules equitably to all lease holders and ensure that all Clean Air Act requirements are met.

X CATEGORY – CONSIDERATION OF OTHER SOURCES OF EMISSIONS IN AIR QUALITY ANALYSIS

X.1 Comment: Commenters state that EPA failed to adequately account for and consider emissions from several sources, including oil spills, shallow gas hazards, and blow outs. The comments include:

- EPA’s regulations require the inclusion in “potential to emit” of certain emissions that “are the result of poor maintenance, careless operation, or other preventable conditions. “ 40 C.F.R. Part 51, Appendix W, Section 8.1.2. Under this authority, EPA should require Shell to account for emissions from oil spills and related response activities and shallow water gas hazards. EPA has in fact previously requested that Shell include in its application information on scenarios resulting from operations encountering undesirable conditions as a result of natural hazards or human error such as the drilling of relief wells, use of diverters, well control events, flares, well testing, fuel tanks, etc. EPA should direct Shell to model scenarios that involve unexpected conditions such as oil spills and encountering gas hazards in order to assess possible source impacts and the likelihood of operations causing a violation of air quality standards.
- Under the PSD program, EPA has maintained a longstanding policy that the Clean Air Act does not allow automatic exemptions for excess emissions during startup, shutdown, and malfunction events and the EAB relied upon this policy to remand a PSD permit that included a provision exempting a coal-fired steam electric generating station from otherwise applicable emissions limits during startup, shutdown, and malfunction events. EPA therefore must consider in the PTE and air quality analysis emissions associated with emergency situations, namely unaccounted for vessel emissions in connection with oil spills and the in situ burning of spilled materials. These are events that can be foreseen and planned for as part of an oil spill response event at an off-shore drilling site as is indicated by the fact that several legal requirements mandate that Shell plan for a response to an oil spill.
- “Potential to emit” means "the maximum capacity of a source to emit a pollutant under its physical and operational design." By employing and training the oil spill response fleet, Shell has included an oil spill response within the operational design of the fleet. Because these activities fall within the operational design, they increase the maximum capacity of Shell's operations and must be accounted for in the PTE.
- If EPA does not consider emissions from these events in the PTE and air quality analysis, EPA should clarify the applicability of U.S. Coast Guard and ADEC guidelines and rules to Shell’s operations (e.g., related to spill scenarios for in-situ burning, etc.) and how these will ensure protection of human health in the event of an oil spill.

- Shell characterizes a loss of well control that might lead to a large oil spill as a highly unlikely event as 1 in 6,000 or 0.0001667 spills per well drilled, but it is misleading to assess the likelihood of an emergency event on a per-well basis when a PSD permit would allow Shell to drill multiple wells over multiple years. The probability of a large oil spill, as offered by Shell, is large enough to justify an examination of effects on air quality, especially considering that Shell may underestimate the risk of a well control event occurring and that the resulting spills are also likely to be large.
- Even though there is a significant possibility that multiple small spills will occur during the regular course of Shell's exploration operations, Shell has not included information on the level of emissions that may result from the spills themselves and the effort required to clean them up and EPA should require an analysis of these emissions.
- Shell's statement that the emissions from the Discoverer already account for the hourly emissions rates that would result from the drilling of a relief well may be incorrect because oil blowouts can potentially disable a drilling rig making it incapable of drilling a relief well. The possibility exists that the Discoverer will not be able to drill a relief well, and that Shell will be forced to bring another drillship to the drilling site that may have a very different emissions profile from that of the Discoverer.
- Although EPA states the probability of Shell encountering shallow gas is low, EPA has not detailed what is the resulting probability. If Shell encounters shallow gas, Shell may have to use the diverter system which will result in additional emissions. Even more significantly, a blowout caused by shallow gas may release many tons of gaseous hydrocarbons, of which a significant amount would be nonmethane hydrocarbons classified as VOC. EPA should direct Shell to fully analyze the probability of their operations experiencing a blowout due to shallow gas, and to assess the effect of the emissions that would result.

Response: EPA did request that Shell provide as part of its permit application a detailed accounting of all pollutant-emitting activities associated with their Chukchi project. EPA then ensured that all pollutant-emitting activities proposed for routine operation were considered in the air quality modeling analysis. Emissions from emergency or upset conditions are generally not considered in determining allowable emissions and therefore not considered in the air quality impact analysis for PSD permits. See 40 C.F.R. Part 51, Appendix W, Section 8.12, fn a. There is no information at this time to suggest that emissions from oil spills and related response activities, a blow out, or shallow gas hazards would be the result of poor maintenance, careless operation, or other preventable conditions. In fact, to the contrary, the factors cited by Shell and listed in the Statement of Basis (p. 43) indicate just the opposite – for example, Shell tried to identify shallow hazards prior to drilling and has committed to using drilling practices that will facilitate management of and maintain a level of contingency for any such event that might occur.

X.2. Comment: Commenters state that the icebreakers' emissions must be modeled to account for the maximum potential operation scenario under maximum ice conditions for the relevant time of year and request that the emissions be recalculated based on full time ice management, the modeling be rerun and both be provided for public review. These commenters contend that ice management activities may be underestimated in the re-proposed permit because Shell based its estimate of the need for ice management support on statistics on ice at the Sivulliq drill site in the Beaufort Sea. Because EPA has included a limit in the proposed permit that caps the amount of fuel that the icebreakers are allowed to use based on Shell's estimate of how much fuel the icebreaker fleet will consume and this estimate may be overly conservative, the commenters continue, the icebreakers may reach the fuel usage limit before the end of the drill season and any attempt by Shell after that point to perform oil exploration in the Chukchi Sea would pose an unacceptable risk to the safety of Shell's crew and the environment. The commenters ask that the permit directly state that Shell must terminate operations for the season once the icebreaker fleet approaches or reaches its permitted fuel usage limit.

Response: The commenter is correct that the icebreakers' potential to emit must be modeled, but not necessarily based on worst case ice conditions. Determination of potential to emit or allowable emissions for purposes of an ambient air quality analysis allows for the consideration of operational limits to the extent that they are enforceable. See 40 C.F.R. § 52.21(b)(4) and (16)(definitions of potential to emit and allowable emissions); see also *Kulluk* EAB Decision, slip op. at 50.

As discussed in the Statement of Basis (p. 46), the fuel limits on the icebreakers are based on Shell's estimate of its need for icebreaking capacity, which Shell has assumed to be approximately 38% of the time during the drilling season. The ambient air quality analysis that supports this permit action, in turn, is based on the maximum emissions contained in the emission inventory (see Appendix A to the Statement of Basis), which reflect the restrictions on fuel usage, emissions, number of drilling days, and other restrictions contained in the permit as enforceable permit conditions. Shell is required to comply with the fuel usage and other limits in the permit applicable to the icebreakers and has accepted the risk that, if ice conditions are much worse than predicted, Shell may be required to curtail its drilling season. There is no need to specifically state that Shell must terminate operations for the season once the icebreakers approach or reach their respective fuel usage limits because that is already required by the permit. There is also no need to revise the emission estimates or the modeling as requested because they reflect the maximum emissions allowable under the permit.

X.3. Comment: Commenters contend that Shell's air impact analysis, and EPA's approval of that analysis, is deficient because it has neglected to consider emissions from a refueling tanker, an oil spill response barge, and shallow water landing craft, and that Shell cannot, and should not, guarantee these vessels will stay outside of a 25-mile radius of the OCS source. As an example, the commenters state that Shell justifies the omission of the oil spill response barge by arguing that the barge will only perform near-shore clean-up in the event of an

oil spill and will not be within 25 miles of the drill site. But, the commenters continue, there is no 25 mile exclusion zone around the OCS source for the oil spill response barge in the proposed permit, nor is such an exclusion zone appropriate considering the unknown circumstances an oil spill would present. If any of these vessels will be operating within 25 miles of the Discoverer, the commenters state, the emissions from the vessels must be included in Shell's PTE because a project's PTE is essential for determining the scope of PSD review.

Response: The commenter is correct that the tanker, barge, and shallow water landing craft were not included in the EPA's review for the PSD permit. Under normal and routine operations, these vessels are not expected to operate within 25 miles of the Discoverer while the Discoverer is an OCS source. A provision has been added to Permit Condition B.8 to ensure that these vessels, which support the Chukchi project, do not come within 25 miles of the Discoverer while it is an OCS source. To the extent any of these vessels do so in response to emergency conditions, EPA will evaluate any such operation in accordance with EPA's excess emissions policy. See footnote10 of this Response to Comments.

Condition B.8 now reads as follows:

8. ***Prohibited Activities.*** *The permittee shall not:*
 - 8.1 *Flow test wells,*
 - 8.2 *Flare gas,*
 - 8.3 *Store liquid hydrocarbons recovered during well testing,*
 - 8.4 *Refuel any vessel (including the Discoverer, and excluding the Kvichak workboats) within 25 miles of the Discoverer, while the Discoverer is an OCS source, or*
 - 8.5 *Allow any vessel associated with this project, and that is not authorized by Tables 1 through 5 of this permit, to approach within 25 miles of the Discoverer, while the Discoverer is an OCS source.*

X.4. Comment: Commenters contend that a Marine Mammal Observer vessel is listed as part of Shell's proposed operations and that it does not appear the emissions from this vessel are included in the PTE.

Response: The commenter does not provide a basis for the assertion that there will be a Marine Mammal Observer vessel, and EPA is not aware of a separate vessel for marine mammal observation in connection with the Shell activities that are authorized by this permit. Shell did not discuss a marine mammal observation vessel as part of its permit application and a separate marine mammal observer vessel is therefore not authorized under this permit. According to the Exploration Plan, Shell's Marine Mammal

Monitoring Program will be conducted by observers stationed aboard the Discoverer and the Associated Fleet. See Final Shell Chukchi Exploration Plan, Appendix D, pp. 1-2.

X.5. Comment: Commenters state that EPA must account for any emissions associated with the resupply of fuel to the Discoverer and its associated fleet when within 25 miles of the drill site and must ensure these emissions are clearly identified and included in the modeling analysis. These commenters request that EPA require Shell to provide more information in its air permit application on the fuel storage capacity for each vessel; which vessels (and capacity per vessel) will be used to resupply fuel; where the fuel transfers will occur; the frequency of fuel transfers required; and if the resupply ship (FD-31) includes fuel transfers or if other vessels will be needed for refueling.

Response: Condition B.8 prohibits refueling of the vessels (except the Kvichak workboats) within 25 miles of the Discoverer (when it is an OCS source). Consequently, the information requested by the commenter is not needed to issue the final permit and there is no need to account for emissions associated with the refueling of the Discoverer. As discussed above in response to Comment G.3.a, the emission limitations in the permit do not apply when the Discoverer is not an OCS source.

X.6. Comment: Commenters state that EPA should include emissions from sources other than Shell's operations in its air quality analysis and that EPA's guidelines on air quality modeling make a distinction between areas with a single source and areas with multiple sources. The commenters further assert that for multi-source areas, the guidelines state that the application should consider the impact of nearby sources by examining the area where all sources combine to cause maximum impact and that a portion of the background attributable to all other sources (e.g., natural sources, minor sources, and distant major sources) should be determined. The commenters contend that Shell's modeling fails to meet these requirements because only the maximum predicted concentrations from the Discoverer's activities on the Chukchi OCS were added to the ambient baseline concentration for comparison to the NAAQS and PSD increment. If CPAI or another company is planning on performing any seismic surveying or exploratory activity in nearby areas while Shell is drilling, the commenters contend, EPA's guidelines suggest that Shell should include these emissions in any modeling estimates.

Response: EPA disagrees with the commenter. As discussed in the Statement of Basis (p. 92), because there are no existing major or minor stationary sources in any of the applicable air pollutant significant impact areas impacted by this permitting action, Shell only needed to address its own emissions in conducting the air quality impact analysis. See 40 C.F.R. § 52.21(b)(13), 40 C.F.R. § 52.21(k)(1) and Draft New Source Review Workshop Manual, Prevention of Significant Deterioration and Nonattainment Area Permitting (October 1990).

Neither CPAI, nor any other owner or operator of an a source subject to the OCS regulations had submitted a permit application at the time EPA deemed Shell's

application for the permit at issue here to be complete. Consequently, a cumulative impact analysis that includes emissions from Conoco-Phillips or any other owner or operator is not required.

See also response to Comment GG.1.

X.7. Comment: Commenters state that, if EPA will not be addressing an emergency oil spill response event directly in this permit, then it needs to address how attainment of the NAAQS will be assured for this particular Air Quality Control Region (AQCR), in general. The commenters contend that the CAA Section 110 requirements for States to prepare State Implementation Plans that detail provisions for attainment and maintenance of the NAAQS in the AQCR under its jurisdiction do not apply to the AQCR where Shell proposes to conduct its exploratory drilling program. The commenters assert that EPA must explain how it will be ensuring attainment of all NAAQS in this AQCR in the absence of a State Implementation Plan for the region and how the enforceable measures of a Federal Implementation Plan may be needed in order to establish contingency plans for air pollution emergencies, such as may occur during an oil spill.

Response: As discussed in response to Comment X.1, EPA then ensured that all pollutant-emitting activities proposed for routine operation were considered in the air quality modeling analysis. To the extent an emergency oil spill does occur, Section 303 of the CAA authorizes EPA to take immediate action to abate imminent and substantial endangerments to public health, welfare, or the environment caused by the emissions of air pollutants. This authority may be carried out either through an injunction in civil court or, where it is not practicable to bring a civil action to assure prompt action, through issuance of an administrative order to stop the emissions or require other measures as necessary to abate the endangerment. This "gap-filling" authority allows EPA to obtain relief in a wide range of endangerment scenarios, regardless of a pollution source's compliance or noncompliance with any provision of the Clean Air Act.

Y **CATEGORY – MODEL SCENARIOS**

Y.1 **Comment:** Commenter states that EPA has based its modeling on an assumption that the icebreakers and the oil spill response fleet will not approach within a certain radius of the Discoverer, pointing to Permit Conditions N.6, O.6 and Q.3. However, the commenters continue, Shell has stated its vessels will approach the Discoverer when safety and operational factors demand and EPA’s models should therefore consider scenarios where Shell’s vessels operate in close proximity to the drillship, for example, when cleaning up an oil spill. EPA’s omission is significant, the commenters assert, because the operation of the icebreakers or the spill response fleet close to the Discoverer may increase air pollution concentrations beyond levels represented by Shell’s data and even a small increase in PM2.5 emissions, which the current models show reaching as high as 96% of allowable limits, may result in a violation of air quality standards.

Response: Several operating scenarios, including scenarios in which vessels of the Associated Fleet approach the Discoverer, were identified in Shell’s application. These scenarios were modeled and shown to be protective of the NAAQS and PSD increment. See Statement of Basis, Sections 5.2.4 and 5.2.8. Daily training exercises for the oil spill response fleet are included in the primary operating scenario. Permit conditions restrict the Associated Fleet either to positions which are beyond 25 miles from the Discoverer, or positions which have been evaluated by air quality modeling. See Permit Conditions O.6, N.6, and Q.3.

The permit does not prohibit the oil spill response fleet from approaching the Discoverer when responding to oil spills. All sources proposed for routine operation were considered in the air quality modeling analysis. Applicants are not expected to try to anticipate and quantify emissions during emergencies. Emissions from emergency or upset conditions are generally not considered in determining allowable emissions and therefore not considered in the air quality impact analysis for PSD permits. See 40 C.F.R. Part 51, Appendix W, Section 8.12, fn. a. There is no information at this time to suggest that such emissions would be the result of poor maintenance, careless operation, or other preventable conditions. Moreover, to preclude Shell from responding to an oil spill situation that was not specifically modeled would likely result in greater environmental harm than what might occur from emissions during cleanup activities.

Z CATEGORY – BACKGROUND AIR MONITORING DATA

Z.1 Subcategory - Location

Z.1.a Comment: Commenters state that Shell has not collected monitoring data within even 25 miles of where it is proposing to explore for oil and gas and that the data provided in support of a permit application must be representative of actual conditions at the project site.

Response: This comment was made on the August 2009 proposed permit and was incorporated by reference in comments submitted on the January 2010 proposed permit. As explained the Statement of Basis (p. 105), there are no islands, platforms or infrastructure in the Chukchi Sea on which to install, operate and maintain ambient air quality monitoring equipment. EPA therefore determined that the Wainwright monitoring station provides a conservative representation of background air quality in the area covered by Shell's leases in Lease Area 193 because of the relative closeness of Wainwright to the Shell leases, the relative lack of air pollution sources in Wainwright and the area covered by Shell's leases, and the general similarity of the meteorology in Wainwright and the area covered by Shell's leases.

This permit action is supported by air quality measurements from the Wainwright monitoring station covering the period from November 8, 2008 to December 7, 2009 (March 6, 2009 to December 7, 2010 with respect to PM_{2.5}). The hourly measurements have been reviewed, compared to the Quality Assurance Program Plan (QAPP) and accepted by EPA. EPA believes this data meets the requirements of 40 C.F.R. § 52.21 (m)(1)(iii).

Z.1.b Comment: One commenter states that relying on a single monitoring station in Wainwright is not sufficient because a monitor in Wainwright will be influenced by emissions from Shell's exploration drilling operations only if there is a west wind. The commenter continues that the prevailing wind is a northeast wind and monitoring stations are therefore needed in Lisburne and Point Hope and, for a north wind, Point Lay.

Response: The purpose of the preconstruction monitoring requirement is to characterize existing air quality in the area of the expected maximum impact of the project, which in this case is approximately 100 kilometers off the coast of Alaska. As discussed in response to Comment Z.1.a, EPA determined that the Wainwright monitoring station provides a conservative representation of background air quality in the vicinity of Shell's proposed operations, where the impact from the proposed project is expected to be highest. This background air monitoring data is then used in conjunction with meteorological data, allowable emissions from the proposed project, source location, other data, and an air quality model to predict air quality after the proposed project is operational. In this case, the maximum impact from the project was shown to be immediately over water downwind of the vessel hulls, far from on-shore areas. That predicted maximum impact, when added to monitored background air quality data, was below the level of the NAAQS. Emissions at other locations, such as Lisburne, Point Hope, and Point Lay, which are 100 kilometers or more from the area of the predicted

maximum impact, are therefore also expected to be below the level of the NAAQS. As shown in Table 5-13 of the Statement of Basis, predicted impacts from Shell's proposed operations in Point Lay are approximately 25% below the NAAQS for PM₁₀ and PM_{2.5}, and well below the NAAQS for all other pollutants.

Z.1.c Comment: A group of commenters expresses strong support for EPA's use of actual maximum monitored PM_{2.5} concentrations at Wainwright as representative of background concentrations onshore when determining compliance with NAAQS onshore.

Response: EPA agrees with the commenter that the maximum value is an appropriate background value for the evaluation of the NAAQS onshore. It should be noted that the ambient air quality in the onshore communities is affected by local emissions as well as any emissions transported from distant sources. As explained further in response to Comments Z.3.a below, the concentrations measured at Wainwright were used to determine compliance with the applicable NAAQS onshore.

Z.2 Subcategory - Duration of Monitoring Data

Z.2.a Comment: The commenters assert that Wainwright data was collected by CPAI and is a subset of a much larger data set that CPAI is collecting to support a PSD permit application that it anticipates submitting in the future. The commenters continue that these efforts by CPAI demonstrate that, with proper planning, a more sufficient data set can be collected.

Response: EPA agrees with the commenters. EPA has worked closely with CPAI to ensure maximum air pollutant data recovery over the life of the data collection program at Wainwright.

Z.2.b Comment: EPA received many comments contending that the permit application and proposed permit do not meet the requirement for at least one year of pre-construction monitoring data. The comments include the following:

- Shell has provided monitoring data for SO₂, NO₂, NO_x, NO, CO, ozone and PM₁₀ from November 8, 2008 to July 30, 2009 and this fails to meet the requirement that the "analysis shall contain continuous air quality monitoring data." 40 C.F.R. Part 51, Appendix W, Sections 8.2.1(b) and 8.3(a).
- The data set does not allow a complete and accurate analysis of air quality impacts, particularly where the data does not even cover all the months that Shell is anticipating operating in the Chukchi Sea – i.e., August, September, October, and November. Expected meteorological conditions change from season to season and to reliably predict the background pollution levels that will be present during Shell's operations, EPA, at a minimum should require reliable data for the time of year in which Shell will be operating or provide further justification as to why data collected from a different part of the year is representative of background concentrations during the proposed exploration activities or why the

available data are more conservative than what would be expected during the project time period.

- Under the August 2009 proposed permit, drafted with only a few months of background data collected far from the drill sites and only after considerable problems with original data collection, Shell's emissions of PM_{2.5} were projected to be as high as 96% of the NAAQS. After issuing the draft, EPA received more background data showing higher PM_{2.5} levels-- nine 24-hour periods of PM_{2.5} measurements equal to or greater than the 8.0 micrograms per cubic meter during the months of July and August, 2009, with the highest measured concentration at 14.42 mg/u³—such that the original draft Proposed Permit would have exceeded NAAQS limits. As a result, EPA was forced to revise the permit conditions. This experience illustrates the importance of meeting the regulation's requirement for at least a full year's worth of data collection.
- EPA has not justified why less than one year's data is sufficient to provide a "complete and adequate" analysis as required by 40 C.F.R. § 52.21(m)(1)(iv). EPA's primary justification seems to be that the limited data on which it relies is sufficient because the data is taken from the coastal village of Wainwright, where, EPA states, pollution levels are likely to be higher than the offshore areas in which Shell proposes to drill. However, EPA has excluded from its review onshore data gathered from low-precipitation, high-wind days. EPA has failed to justify its conclusion that use of limited Wainwright data provides a "complete and adequate" analysis in the face of its choice to eliminate from consideration data that makes the onshore information conservative in the EPA's view. Moreover, where EPA is already severely hampered by a complete lack of site-specific data—background and meteorological, —the agency should not skimp on the data that can be obtained, particularly when EPA's own experience with the use of this substitute data reveals that more data results in a more refined—and more protective—set of permit restrictions.
- A full year's worth of data is especially important in this case because of the high emission levels authorized by the permit, Shell is collecting data far from the drilling site and there is a lack of information on conditions in the Chukchi Sea, making it important to ensure that background data are robust enough to conservatively estimate the conditions Shell will encounter.
- EPA is requiring that Shell collect monitoring data through December 2009 for its proposed exploration drilling program in the Beaufort Sea for the very same reasons argued here and has not deemed the permit application complete as a result of this, and other, deficiencies in Shell's application. EPA's September 4, 2009 incompleteness letter on the Beaufort application highlights these issues, stating that the data "at a minimum, should represent the [Shell] drill season months July to December, so EPA can be reasonably assured there won't be a NAAQS violation."

- These same issues were raised to Shell in 2007 when additional site-specific monitoring data was requested to be collected for their proposed exploratory drilling program; Shell has had adequate time to collect the data. There are no short cuts for failing to collect an adequate amount of pre-construction monitoring data and Shell must be held to the same regulatory standards as all other applicants.

Response: Many of these comments were made on the August 2009 proposed permit and were incorporated by reference in comments on the January 2010 modified proposed permit. As discussed below, after the August 2009 permit was proposed, Shell submitted additional background air quality monitoring data and the January 2010 proposed permit further restricted emissions from Shell's operations.

Paragraph (m)(1)(iv) of 40 C.F.R. § 52.21 states that "In general, the continuous air quality monitoring data that is required shall have been gathered over a period of at least one year and shall represent at least the year preceding receipt of the application, except that, if the Administrator determines that a complete and adequate analysis can be accomplished with monitoring data gathered over a period shorter than one year (but not to be less than four months), the data that is required shall have been gathered over at least that shorter period."

When the Chukchi permit was initially proposed in August 2009, it relied on monitoring data collected from November 8, 2008 through July 31, 2009 for SO₂, NO₂, NO_x, NO, CO, ozone and PM₁₀. Prior to proposing the new modified permit in January 2010, additional monitoring data was received covering the period August 1, 2009 through October 31, 2009. Thus, the January 2010 proposed permit was supported by just under twelve months of background monitoring data for SO₂, NO₂, NO_x, NO, CO, ozone and PM₁₀—November 8, 2008 to October 31, 2009—and spanned all but a few days of the drilling season. This portion of the comment has therefore been addressed with respect to these pollutants.

With respect to PM_{2.5}, the August 2009 proposed permit relied on data from March 6, 2009 through June 30, 2009. As the commenters note, shortly after EPA proposed the initial permit in August 2009, PM_{2.5} data for July 2009 became available showing PM_{2.5} levels higher than those relied on in the August 2009 proposed permit. This newly available air monitoring data was a significant factor in EPA's decision to re-propose the permit in its entirety with further emission reductions to account for the higher background air monitoring data for PM_{2.5}. Prior to proposing the new modified permit in January 2010, EPA received additional monitoring data covering the period August 1, 2009 through October 31, 2009, resulting in approximately eight months of PM_{2.5} monitoring data at the time EPA proposed the January 2010 permit.

As the commenters note, less than one year of data may be used to support a PSD application. During the months from July to October, the land surrounding the Wainwright monitoring station is generally free from any ground cover such as snow and ice. Under this environmental condition, EPA expects the Wainwright station to measure higher PM_{2.5} concentrations during this period than during the other times of the year

because increased human activities during the warmer summer months and wind entrainment are two sources that elevate particulate concentration levels. The PM_{2.5} monitoring data supporting this proposed permit covers this period where EPA would predict higher PM_{2.5} concentrations.

In this case, during part of the time during which there is no monitoring data for PM_{2.5}—January 1 through March 5—no operation under the permit is authorized (Permit Condition B.2) and so measurements during this time period are not essential to the ambient air quality analysis. With respect to the time period between November 1, and December 31, the area surrounding the monitoring station is expected to be covered with ice and snow during this period, thereby reducing human activity-generated and wind entrained fine particulates. Air monitoring data for the period November 1 through December 7, 2009 was subsequently submitted and confirms that the measured PM_{2.5} concentrations were lower during this period than between July and October, the snow- and ice-free periods. It is therefore not expected that PM_{2.5} levels during the time periods for which no PM_{2.5} monitoring data is available would exceed levels recorded during other periods of the drilling season when data is available. Therefore, EPA concludes that a complete and adequate analysis can be accomplished with PM_{2.5} monitoring data gathered from March 6, 2009 through December 7, 2009.

Z.2.c Comment: Commenters assert that the fact that EPA’s proposed (and re-proposed) permit for Shell’s exploratory drilling program in the Chukchi Sea includes a requirement for post-construction monitoring of PM_{2.5} (Permit Condition R.1) undercuts the Agency’s argument that sufficient pre-construction monitoring data exist.

Response: EPA disagrees. As discussed above in response to Comment Z.2.b, EPA believes that a complete and adequate analysis can be accomplished with the monitoring data collected at Wainwright from November 8, 2008 through December 7, 2010 for SO₂, NO₂, NO_x, NO, CO, ozone and PM₁₀ and from March 6, 2009 through December 7, 2010 for PM_{2.5}.

The PSD regulations authorize EPA to require post-construction monitoring when EPA determines it is “necessary to determine the effect emissions from the stationary source or modification may have, or are having, on air quality in the area.” 40 C.F.R. § 52.21(m)(2). EPA’s Ambient Monitoring Guidelines further provide that “In general, EPA may require postconstruction monitoring from large sources or sources whose impact will threaten standards or PSD increments. The permit granting authority will make this decision on a case-by-case basis.” EPA 5/87 Ambient Monitoring Guidelines, Section 1(e).

Because the total predicted PM_{2.5} concentrations for a 24-hour average authorized under the permit, in conjunction with monitored background air quality data, approach the PM_{2.5} NAAQS as shown in the Statement of Basis (Table 5.1, page 111), Permit Condition R.1 requires Shell to conduct post-construction monitoring for PM_{2.5}.

Z.2.d Comment: Numerous commenters contend that, if EPA will be accepting less than twelve months worth of pre-construction monitoring data for PM_{2.5}, EPA

must consider the fact that the background concentrations are based on a more limited data set than optimal and, therefore, must pursue conservative assumptions in defining background concentrations. EPA's original proposed permit and modeling demonstration used a 24-hour average PM_{2.5} background concentration of 8 µg/m³.

Response: The commenter is correct that PM_{2.5} measurements at Wainwright between July 1, 2009 and October 31, 2009 were higher than had been previously measured. The highest measured PM_{2.5} concentration for a 24-hour average was 22.8 ug/m³ in October 2009. In addition, there were nine measured concentrations between 8.0 and 15.0 ug/m³ for a 24-hour average during this period, including values of 14.9, 14.4, 12.7, and 11.4 ug/m³.

EPA agrees with the commenter that conservative assumptions are appropriate in defining the background 24-hour average concentration here to determine compliance with NAAQS. However, EPA believes it is appropriate to discount measured concentrations that are not representative of background concentrations offshore where Shell will be conducting operations. Shell stated in its December 9, 2009, analysis using wind speed and precipitation data that some monitored values were likely to have been affected by wind blown dust from local sources. Statement of Basis, pp. 106-107. Based on this information, EPA determined it was appropriate to use a background value of 11 ug/m³ in the air quality analysis for the proposed permit.

In response to comments on the PM_{2.5} background level used in the impact analysis, EPA conducted a more rigorous analysis of the PM_{2.5} data, looking at hourly wind speed and direction and hourly precipitation, as well as the location of potential sources of fugitive dust in relation to the Wainwright Near-Term Station. See Memorandum from Chris Hall, Air Data Analyst/Air QA Coordinator, to Herman Wong, EPA, dated March 31, 2010, re: Wainwright Particulate Matter Data Review - July 1 through December 7, 2009. An overview of the area shows that there are unpaved roads and an intersection immediately adjacent to the site, as well as the airport access road, and airport runway and taxi ways within 1000-2000 feet. EPA's analysis showed that the four highest PM_{2.5} values were associated with a single meteorological regime consisting of persistent high winds from the east and east-northeast and no precipitation. Given that the unpaved intersection, unpaved airport access road, unpaved airport staging area, and unpaved runway are all to the east of the monitoring site, it is likely that windblown dust from one or all of these sources are impacting the monitoring during these conditions and would not be representative of conditions 100 kilometers offshore whether Shell will be conducting the exploration drilling operations under the permit.

EPA has therefore analyzed the maximum predicted impact of Shell's project offshore using 11.4 ug/u³¹² as the background concentration. Using the predicted source concentration shown in Table 5-12 of the Statement of Basis and the 11.4 ug/u³ concentration, the total air quality impact is 29.8 ug/m³ (18.4 + 11.4) or 85% of the 24-hour NAAQS of 35 ug/m³. Note, however, that the maximum monitored value of 22.8

¹² The Statement of Basis rounded this 11.4 value to 11, resulting in an impact of 84 percent of the 24-hour NAAQS.

ug/m³ has been retained for use in the NAAQS evaluation of the impact of Shell's operations on local onshore communities.

See response to Comment Z.2.b for a discussion of EPA's determination that a complete and adequate analysis can be accomplished with less than 12 months of PM_{2.5} ambient air pollutant data.

See response to Comment Z.2.c for a discussion of post-construction monitoring.

Z.3 Subcategory – Influence of Sources of Local Dust on Wainwright Monitor

Z.3.a Comment: The commenter states that, after the 4th quarter monitoring report from Wainwright showed even higher 24-hour PM_{2.5} concentrations (as high as 23 ug/m³), Shell proposed, and EPA agreed, that localized sources of dust could be impacting the monitored concentrations at the site. Shell then proposed the use of an offshore background concentration of 9 ug/m³ based on several factors, including an adaptation of the data set to subtract out days with high winds, no precipitation and non-stabilized surfaces (i.e., no snow cover). EPA's repropoed permit is based on a background concentration for "offshore" PM_{2.5} concentrations of 11 µg/m³. After a close look at the data set, we support adapting the data set to account for the fact that windblown dust is not a factor in offshore concentrations but we do not support a concentration as low as 9ug/m³. We strongly urge EPA not to go any lower than its proposed background concentration of 11 ug/m³ in the final permit. Specifically, because at least one 24-hour average concentration of 11ug/m³ occurred on a day with no high-winds (see, e.g., data collected on July 14, 2009) it is imperative that EPA use, at least, this maximum monitored value as representative of background concentrations offshore. This is particularly important since, as we mentioned previously, we do not support the use of a pre-construction monitoring period less than a year.

Response: EPA agrees with the commenter that appropriate background concentration levels should be used in the ambient air quality impact analysis. As explained above, a PM_{2.5} background concentration of 11 ug/m³ was used in Table 5-12 in the January 2010 Statement of Basis. EPA's more refined analysis of the PM_{2.5} data from July 1 through October 31 conducted in response to comments also shows that an appropriate conservative background concentration for the offshore impact analysis is 11.4 ug/m³.

Z.3.b Comment: Shell submitted supplementary information that it believes provides additional evidence for the inference that the highest onshore measurements reflect localized effects of fugitive dust and are not representative of regional concentrations on or offshore and that the Chukchi Sea concentration estimates provided in Table 5-11 of the Statement of Basis are therefore truly conservative. Shell submitted a revised fourth quarter 2009 data report (August, September and October 2009) and a monthly data report for November and the beginning of December, 2009 collected at the original Wainwright monitoring site, which was decommissioned in early December, when another air monitoring station in

Wainwright gained primary status (referred to as the Permanent Station).¹³ During an overlap when data were collected at both stations, Shell continues, there are several concurrent measurements of PM_{2.5} and PM₁₀. Shell contends that these additional data records serve to supplement the record by 1) adding five weeks of data from the Near-Term Station, 2) removing four contaminated PM_{2.5} 24-hour samples collected in September at the Near-Term Station, and 3) showing large inconsistencies between the two stations on at least two days in October, with much lower readings at the Permanent Station, thereby implicating the data from Near-Term Station as being locally influenced on those two days. Thus, Shell asserts, the period average concentrations are lower with more data.

Response: EPA has evaluated the additional PM_{2.5} and PM₁₀ data submitted by Shell and their updated fugitive dust analysis. EPA agrees that the inclusion of the additional data in November and December lowers the period average concentrations. As described above in the response to Comment Z.2.d, EPA has conducted additional, more refined analysis to determine which days are likely highly impacted by local fugitive dust sources. EPA also evaluated Shell's contention that the data from the new Permanent Station further supports the contention that the Near-Term Station is highly impacted by local fugitive dust sources on windy days. EPA agrees that the Permanent Station recorded significantly lower levels than the Near-Term Station for two high days in October, but there is too little data from the Permanent Site (and the actual QA/QC'd data has not been provided to EPA) to perform any rigorous comparison of the two monitoring sites. It is interesting to note, however, that the highest values for the Permanent Station in Shell's analysis are when the wind is from the west-southwest, in the direction of the unpaved airport areas.

¹³ The original Wainwright monitoring site is referred to as the "Near-Term Station" and is located in the Wainwright Search and Rescue Headquarters Building. On September 14, 2009, air monitoring commenced in what is referred to as the "Permanent Station," which is approximately 0.5 miles northeast of the Near-Term station. Both the Near-Term Station and the Permanent Station operated concurrently and the Permanent Station has recently replaced the Near-Term Station.

Z.3.c Comment: One commenter explains that Table 2 of Shell’s comments contains a comparison of the coincidental sampling, of the Near-Term Station to the Permanent Station and that all comparisons are within 4 ug/m³ except two that are from October 7 and 8, 2009. The commenter asserts that it is also evident from PM₁₀ that these two days also experienced large concentration differences between the Near-Term Station and the Permanent Station and that since both stations would read the same regional baseline concentration plus any local influences, it is likely that the Permanent Station was sampling regional baseline, while the Near-Term Station was sampling regional baseline plus some strong local influence seen with both the PM_{2.5} and PM₁₀ data. Therefore, the commenter asserts, it is likely that the October 7 and 8, 2009 PM_{2.5} measurements of 15 ug/m³ and 23 ug/m³ respectively are not representative of regional onshore baseline and that, if these readings were to be eliminated, the highest onshore 24-hour measured concentration would be 14 ug/m³ on July 3, 2009, much lower than the presently listed and highly conservative 23 ug/m³.

Response: EPA has further considered the PM_{2.5} data obtained from the Near-Term and Permanent Stations. Contrary to the commenter’s view, EPA believes that it is appropriate to use the October 8, 2009 measured value of 22.8 ug/m³ from the Near-Term Station when evaluating Shell’s potential impact in the communities of Wainwright and Point Lay. Individual emission sources in the villages were not explicitly modeled, so the local source influence as measured is important to take into account. EPA agrees, however, that for determining a conservative value to represent the background PM_{2.5} concentrations that would be present near the maximum modeled concentration from Shell’s operations in Lease Sale Area 193 in the Chukchi Sea, it is appropriate to consider the apparent local effects on the monitor when determining the onshore baseline. See Statement of Basis, Section 5.2.6, pp. 104-108. See also the response to Comment AA.2.b. for a discussion of the use of monitored 24-hour PM_{2.5} concentrations to represent offshore background concentrations.

Z.4 Subcategory – Quality Assurance/Quality Control

Z.4.a Comment: Commenters assert that the Wainwright data is far from continuous as demonstrated by its monitoring reports, which discuss power outages, tape error, etc.

Response: It is highly unlikely that an ambient air quality data collection program would ever achieve 100% data recovery for each and every air pollutant measured due to a natural event, equipment audit, equipment malfunction, or power loss, all of which could cause data loss. EPA’s Ambient Monitoring Guidelines state that “The data recovery should be 80% of the data possible during the information effort.” Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD), EPA-450/4-87-0078, Office of Air Quality Planning and Standards, Research Triangle Park, NC (May 1987), p. 8. For the four primary months during the drill season (i.e., July 2009 to October 2009), for example, the data recovery rates for SO₂, NO₂, CO, ozone, PM₁₀, and PM_{2.5} were 97%, 97%, 97%, 92%, 98% and 96%, respectively. The recovery rates for the six air pollutant therefore exceeded the EPA minimum requirement.

Z.4.b Comment: Commenters assert that Shell has been operating the PM2.5 equipment with incorrect background data programmed into the analyzer as showing by the operating reports. This mistake in programming, the commenters continue, may have affected measurements, making the PM2.5 data less reliable.

Response: This is not a mistake in programming but rather an adjustment made to the factory set value. This offset value is determined in the field by an initial zero background test and entered into the sampler's storage by the site technician. Data gathered prior to this offset value being determined is simply corrected after the fact by the Primary Quality Assurance Organization (PQAO). This correction in no way affected the operation of the monitor or the reliability of the data.

Z.4.c Comment: Commenters assert that, in its monitoring report, the PQAO express several concerns with the adequacy of the PM2.5 data it is collecting, explaining that it conducted two background tests with different results, it made adjustments to its PM2.5 data, and that PM2.5 background values are higher than PM₁₀ values.

Response: Data should only be discarded if through investigation it is determined that the instrument malfunctioned or procedures were not performed correctly. Although PM2.5 concentrations were typically higher than PM₁₀ on a daily average basis from March 6, 2009, through April 30, 2009, there was no instrument or quality control related reason to disqualify or invalidate the data for these instruments. The samplers passed all quality control checks/audits and were found to be operating within precision limits specified by the manufacturer. As all days during this timeframe were days when particulate matter concentrations were very low, often below the practical quantitation limit of the sampler, these are days that would not be used for NAAQS modeling purposes. On the days where particulate matter concentrations were above the practical quantitation limit of the monitors, there were no days when the PM2.5 concentrations were higher than PM₁₀ concentrations. See Wainwright Near-Term Ambient Air Quality Monitoring Program Monthly Preliminary Data Summary, May 2009, prepared by AECOM, Inc, dated July 2009; Wainwright Near-Term Ambient Air Quality Monitoring Program Monthly Preliminary Data Summary, June 2009, prepared by AECOM, Inc, dated July 2009; Letter from Susan Childs, Shell, to EPA, dated September 17, 2009, re: Shell Gulf of Mexico Inc. Comments on August 2009 Proposed Discoverer/Chukchi OCS/PSD Permit to Construct (includes Wainwright Near-Term Ambient Air Quality Monitoring Program Third Quarter Data Report).

Z.4.d Comment: Numerous commenters raise questions about the quality of the PM2.5 data that Shell has collected at Wainwright, pointing to the requirement that there be a co-located Federal Reference Monitor (FRM)¹⁴ and Federal Equivalent

¹⁴ An FRM is a manual sampler that pulls air through a filter for 24 hours (midnight to midnight). The filter is then weighed in a lab and a PM_{2.5} concentration is calculated based on the mass increase of the filter and the volume of air drawn through it. FRMs follow the procedures detailed in the appendices to 40 C.F.R. Part 50.

Monitors (FEM)¹⁵ for PM2.5 at one of the PSD monitoring network sites. These comments include:

- EPA stated in a September 4, 2009, letter to Shell, that, as of that date “[t]he monitoring stations at Wainwright and Badami currently are not operating a collocated sampler.” This is significant because, as EPA recognized, “[t]he monitoring state at Wainwright is the first site on the North Slope with a PM2.5 monitor.” Until adequate PM2.5 data is collected, there is no basis for making any assumptions about the baseline PM2.5 levels on the North Slope.
- EPA should require collocation at least at one site in the network the PQAQO is operating, one-in-six days for a sampler operating on a one-in-three day schedule, or one-in-three days for a sampler running every day. EPA must also require quarterly Performance Evaluation Program (PEP) audits of 100% of the network every quarter. See 40 C.F.R. Part 58, Appendix A, §§ 3.2.5.5, 3.2.5.7, and 3.2.7. Since PSD monitoring sites operate for such a short relative period, it is extremely important to have tight Quality Assurance controls spelled out in the approved QAPP. EPA must clearly identify the expectations for how the data being gathered will be used and what is allowable for the precision and bias values in order to be able to apply the data with a reasonable level of confidence. Given the fact that this particular PSD monitoring site has been collecting data for less than a year, it is extremely important to have a good measure of the precision and bias of the monitoring network to ensure that the monitoring that is done has tight Quality Assurance controls.
- EPA must make clear when the co-located samplers were established and must count the four months of monitoring data from that date.

Response: EPA agrees with the commenter that it is important to ensure that the monitoring network underlying a PSD permitting action has good quality assurance controls. The PSD regulations provide that a PSD application "shall contain an analysis of ambient air quality in the area that the major stationary source...would affect." 40 C.F.R. § 52.21(m)(1)(i). The regulations further provide that, for NAAQS pollutants, "the analysis shall contain continuous air quality monitoring data gathered for purposes of determining whether emissions of that pollutant would cause or contribute to a violation of the standard or any maximum allowable increase." See 40 C.F.R. § 52.21(1)(iii). Section 52.21(m)(1)(iv) states that "[i]n general, the continuous air quality monitoring data that is required shall have been gathered over a period of at least one year and shall represent at least the year preceding receipt of the application, except that, if the Administrator determines that a complete and adequate analysis can be accomplished with monitoring data gathered over a period shorter than one year (but not to be less than four months), the data that is required shall have been gathered over at least that shorter period." The regulations also require that the owner or operator of the source meet the requirements of 40 C.F.R. Part 58, Appendix B (which has since been

¹⁵ An FEM is an air sampling collection and analysis method that does not follow the reference procedures in 40 C.F.R. Part 50, but has been certified and designated by the EPA as obtaining "equivalent" results.

combined with and relocated to Appendix A) during the operation of monitoring stations for purposes of satisfying paragraph (m) of this section. See 40 C.F.R. § 52.21(m)(3). The substantive requirements of the 40 C.F.R. Part 58, Appendix referenced in 40 C.F.R. § 52.21(m)(3) shall be referred to hereafter as “Appendix A.”

Section 3.2.5.5 of Appendix A requires that, within a network under a single primary quality assurance organization or PQAQ, there be at least one collocated PM_{2.5} monitor that is a FRM and that the site in the monitoring network with the highest predicted 24-hour concentration must be selected. See also 40 C.F.R. Part 58, Appendix A, Section 3.2.5.1. The purpose of collocation sampling for PM_{2.5} is to help assess data quality, by estimating the comparability of two monitors sited next to each other and operating on similar schedules. A collocated FRM has been determined by EPA to be a reference instrument to use for data quality assessments. Section 3.2.5.7 of Appendix A suggests that “about” 25 valid pairs should be used for the precision and bias estimates for which collocation is required.¹⁶

As discussed in Section 5 of the Statement of Basis, to fulfill the preconstruction monitoring requirement of 40 C.F.R. § 52.21(m)(1) in this permit action, Shell is relying on data from a monitoring station in Wainwright, Alaska referred to as the “Near-Term Station,” which is one monitor in a network of ambient air monitoring stations on the North Slope of Alaska operated by AECOM.¹⁷ The PSD monitoring network also includes another monitoring station in Badami and one in Nuiqsut. AECOM began operation of the Near-Term Station on November 8, 2008 with one Met One PM_{2.5} monitor (model BAM 1020), as well as monitors for other pollutants. A problem with the instrumentation for the PM_{2.5} monitor, which has since been addressed, rendered invalid the PM_{2.5} data collected from November 8, 2008 through March 5, 2009 at the Near-Term Station. See Memorandum from Chris Hall, Air Data Analyst/Air QA Coordinator, to Herman Wong, EPA, dated July 31, 2009, re: Air Permitting/Air Quality Modeling.

On October 23, 2009, AECOM began operation of collocated PM_{2.5} monitors in Deadhorse, Alaska, predicting that PM_{2.5} concentrations would be highest in this location of all monitoring stations in its network. The Deadhorse monitoring station includes two PM_{2.5} FRMs and two Met One PM_{2.5} beta attenuation sampler (model BAM 1020). These BAM samplers are the same model and configuration as the PM_{2.5} BAM samplers at the Wainwright monitoring sites and the Badami site. All BAM samplers in this network are considered FRM or FEM samplers. The collocated monitors are operating at the sampling frequency required by 40 C.F.R. Part 58, Appendix A.

EPA has worked closely with AECOM to ensure the adequacy of the Wainwright and Deadhorse QAPPs and to put into place quality control requirements for each monitoring

¹⁶ Contrary to the commenters’ assertion, Appendix A does not require quarterly PEP audits of each monitoring device in a PSD network every quarter.

¹⁷ AECOM operates these monitors with primary oversight from either Shell or Conoco-Phillips Alaska, Inc. (CPAI). For some monitors, such as the Wainwright Near-Term Station and the Deadhorse Station, Shell and CPAI share the monitoring results.

instrument and process that are as good as or better than that required by regulation or guidance. Both the Wainwright and Deadhorse QAPPs have been reviewed in detail and approved by EPA.

Data quality objectives or the results of other systematic planning processes are statements that define the appropriate type of data to collect and specify the tolerable level of potential decision errors that will be used as a basis for establishing the quality and quantity of data needed to support the monitoring site. See 40 C.F.R. Part 58, Appendix A, Section 2.3.1. Appendix A contains precision and bias goals for collocated PM_{2.5} State and Local Air Monitoring sites, see 40 C.F.R. Part 58, Appendix A, Section 4.3, but provides that the development of data quality objectives or the results of other systematic planning processes are the responsibility of the PQA/O for PSD and other monitoring stations. See 40 C.F.R. Part 58, Appendix A, Section 2.3.1. Appendix A states that both PM_{2.5} collocated monitors must read concentrations greater than 3 ug/m³ to be used for the precision and bias calculations for which collocation is required because “[a]t low concentrations, agreement between the measurements of collocated samplers, expressed as relative percent difference or percent difference, may be relatively poor.” See 40 C.F.R Part 58, Appendix A, Section 4(c)

In consultation with EPA, AECOM developed precision and bias objectives and metrics for evaluating PM_{2.5} values from the collocated monitors at the Deadhorse monitoring site, which have been incorporated into section A.5.3 of the Deadhorse Quality Assurance Program Plan (QAPP). EPA has acknowledged that, at low concentrations, agreement between the measurements of collocated PM_{2.5} samplers, expressed as relative percent difference or percent difference, may be relatively poor. The PM_{2.5} concentrations recorded by the monitors in the AECOM network on the North Slope have generally been quite low, averaging approximately 3 ug/m³ over 24 hours at the Wainwright Near-Term Station from May to October 2009. Therefore, AECOM developed and EPA approved as part of the Deadhorse QAPP objectives (or goals) and associated metrics that recognize and address the limited utility of the statistical equations prescribed and provided in Appendix A for State and Local Ambient Monitoring Stations (or SLAMS) PM_{2.5} monitors given in light of the typically low PM_{2.5} concentration environment. EPA concurred with AECOM that an appropriate upper bound goal for the data set is 3 ug/m³ for precision and 4 ug/m³ for bias for this project and EPA therefore approved these goals and objectives as part of the Deadhorse QAPP. Using the AECOM precision and bias equations for the Deadhorse data collected through November 28, 2009, calculations show that these monitor are more than meeting these goals by achieving a precision of 1 ug/m³ and a bias of 1 ug/m³ for all sample pairs ≥ 2 ug/3m (32 pairs) and for all sample pairs ≥ 3 ug/m³ (27 pairs). EPA therefore concludes that the precision and bias goals are being met for the primary FEM and audit FRM PM_{2.5} monitors in the AECOM monitoring network.

Although AECOM was not operating collocated PM_{2.5} monitors during the entire period of PM_{2.5} relied on by Shell in its permit application, other information and quality control data collected since March 2009 is appropriately used to evaluate data quality. These other data quality indicators for the PM_{2.5} data from the Wainwright Near-Term Station include:

- The QAPP for the Wainwright Near-Term Station, as approved by EPA on January 5, 2009, describes monitoring objectives and quality control checks to assure proper operation.
- The PM2.5 BAM monitors were initially calibrated to the tolerance requirements of the approved QAPP.
- Instrument calibrations of the PM2.5 BAM have been performed on a quarterly basis. All calibrations have passed, thus verifying the proper operation of the BAM monitors.
- Daily flow checks have been conducted for each BAM monitor instrument, which helps confirm instrument accuracy. All instruments have passed these checks.
- Quarterly independent flow check audits are conducted for each BAM to verify instrument accuracy. All instruments have passed these audits.
- The Wainwright Near-Term Station data set being relied upon for this permit passed calibration and/or independent performance audits.
- The data from the Wainwright Near-Term Station is documented and is identifiable with respect to time, site, parameter, scale, and units.
- Log reports are available that record biweekly on-site inspection of the instrumentation and site.
- Documentation of the traceability of maintenance and calibration exists in sufficient detail to allow reconstruction of instrument history.

Based on the totality of available information regarding precision and bias for the PM2.5 monitoring data collected at the Wainwright Near-Term Station since March 6, 2009, EPA concludes that the data meets the requirements of 40 C.F.R. § 52.21(m). For the period from October 8, 2009 through November 28, 2009, the monitoring station met the collocated monitoring requirement of Appendix A. The other quality control measures taken and data collected prior to October 8, 2009 indicate that the PM2.5 data collected on and after March 6, 2009 is valid and reliable data in all respects. Although 40 C.F.R. § 52.21(m)(3) does require that a PSD monitoring station meet the requirements of Appendix A, 40 C.F.R. § 52.21(m)(1)(iii) and (iv), which do not reference Appendix A, makes clear that EPA has considerable discretion in determining the extent and duration of air quality data needed for a complete and adequate air quality analysis. EPA interprets 40 C.F.R. § 52.21(m) to provide EPA the discretion in appropriate circumstances to find its requirements met where the collocated monitoring requirement of Appendix A is met for a sufficient period to determine that there is at least four months of data that, as a whole, is sufficiently accurate and reliable to provide a "complete and adequate" analysis, consistent with the purposes for which Appendix A is referenced in 40 C.F.R. § 52.21(m).

Z.4.e Comment: Commenters state that there is no reference to a collocated sampler or to the requirement for Shell to operate a collocated sampler in the January 2010 proposed permit or accompanying Statement of Basis. Supplemental materials included in the administrative record discuss the installation of a collocated sampler at Deadhorse but the details of the QAPP are not addressed. The commenters state that according to the PSD requirement for collocated monitors, 40 C.F.R. Part 58, Appendix A, § 3.2.5.5 states that, for collocated monitors, "[a] site with the predicted highest 24-hour pollutant concentration must be selected." The commenters request that EPA discuss how this requirement is met, either through monitoring or modeling and that there is no concrete information to support the claim that a station located in Deadhorse likely will have the highest concentrations in the network.

Response: 40 C.F.R. Part 58 Appendix A, Section 3.2.5.5, does not specify how to determine the predicted highest 24-hr concentration site. For the State and Local Air Monitoring Stations (SLAMS) program, operators of monitoring networks typically review historic concentrations at existing monitors to determine the predicted high site in the network. This was not possible for the monitoring network in this case, however, since these sites are new and do not have historic records. Deadhorse was selected in part due to local industrial activity and the numerous sources of particulate pollution in the vicinity as compared to Wainwright and Badami. Given the remote locations of the monitoring stations in this network, logistical and operational considerations suggested that a Deadhorse location would have the best chance for success as a collocated site.

Z.4.f Comment: Commenters state that, according to the project schedule, the first quarterly report for the collocated monitor is not due until 30 days after the end of the quarter and request assurance from EPA, in the final permit, that the precision and bias goals established in the QAPP are being met.

Response: Data from the collocated samplers at Deadhorse have been submitted to EPA through December 15, 2009. The precision and bias goals through this date are being met. See Memorandum from Chris Hall, Air Data Analyst/Air QA Coordinator, to Herman Wong, EPA, dated January 7, 2010, re: Wainwright Air Monitoring Data Review - July 1 through October 31, 2009; Memorandum from Chris Hall, Air Data Analyst/Air QA Coordinator, to Herman Wong and Mary Portanova, EPA, dated March 31, 2010, re: Wainwright Air Monitoring Data Review - November 1 through December 7, 2009; Memorandum from Chris Hall, Air Data Analyst/Air QA Coordinator, to Herman Wong, EPA, January 7, 2010, re: Deadhorse Air Monitoring Data Review - October 23 through December 31, 2009; and Memorandum from Chris Hall, Air Data Analyst/Air QA Coordinator, to Herman Wong, EPA, dated July 31, 2009, re: Air Permitting/Air Quality Modeling.

Z.4.g Comment: Commenters state that the accuracy of the PM_{2.5} data is particularly important because EPA indicates that Shell's emissions of PM_{2.5} may reach 96% of the 24-hour NAAQS but that Shell has not yet obtained sufficient data to allow a complete and adequate analysis of the air quality effects of Shell's operations. Thus, the commenters assert, the actual result of Shell's operations could be a

violation of air quality limits for PM2.5 and this is unacceptable because PM2.5 has been linked to human health concerns and is an important driver of climate change. The commenters therefore request that EPA should ensure that the PM2.5 data used in the models are reliably representative of the period during which Shell will be operating in the Chukchi Sea.

Response: This comment was submitted on the August 2009 proposed permit and was incorporated by reference in comments submitted on the January 2010 proposed permit. As discussed in response to Comment Z.2.a above, after the August 2009 permit was proposed, Shell submitted additional background air quality monitoring data and the January 2010 proposed permit further restricted emissions from Shell's operations. For the reasons discussed in response to Comments Z.2.a and Z.2.d, EPA believe that the PM2.5 data used in the models are reliably representative of the period during which Shell will be operating in the Chukchi Sea and that operation at the permitted levels will not cause or contribute to a violation of applicable NAAQS or exceed increment.

AA CATEGORY – METEOROLOGICAL DATA

AA.1.a Comment: Commenters state that, for meteorological data, EPA recommends that the model should require enough data to ensure that worst-case meteorological conditions are adequately represented in the model results, citing to 40 C.F.R. Part 51, Appendix W, Section 8.1.2.18 The commenter continues that five years of meteorological data should therefore be used when estimating concentrations with an air quality model and that the data Shell incorporates into its models do not meet these requirements.

Response: As explained in 40 C.F.R. Part 51, Appendix W, there are two basic types of models: screening and refined. A screening model uses a relatively simple estimation technique using pre-defined conditions and worst-case meteorological conditions to obtain conservative air quality impact estimates. See 40 C.F.R. Part 51, Appendix W, Section 2.2.a. The second, more sophisticated, type of model is referred to as a "refined" model and relies on precise input data and provide a more specialized impact estimates. 40 C.F.R. Part 51, Appendix W, Section 2.2.b. In this case, more detailed information and data, such as source data, receptor locations, and meteorology, are input into the refined model.

In some cases, a screening technique is the only practical and technically viable option available. See 40 C.F.R. Part 51, Appendix W, Section 2.2c. As explained in the Statement of Basis Section 5.2.3, because the absence of site-specific over-ocean meteorological data precluded the use of a refined model, the air quality impact analysis for this permit relied on the use of ISC3-PRIME in a screening mode. The ISC3-PRIME model uses screening meteorological data, rather than location-specific data, to predict the maximum concentration immediately over water downwind of the vessel hulls. Therefore, five years of meteorological data is not needed with the screening model.

¹⁸ EPA believes this references is in error and that the commenters intended to cite to Section 8.3.1.1 of Appendix W.

Sections 5.2.3 and 5.2.5.4 of the Statement of Basis summarize the use of ISC3-PRIME with screening meteorology in conducting the project ambient air quality impact analysis.

AA.1.b Comment: Commenters assert that Shell has not provided meteorological data for the Chukchi Sea or adequately justified its reliance on data from elsewhere and that accurate meteorological data are vital to a model's ability to predict how air pollution will disperse from a source. The commenters cite to 40 C.F.R. Part 51, Appendix W, Section 8.3.1 in stating that applicants should acquire enough data to ensure that worst-case meteorological conditions are represented and that five years of meteorological data should be used. In this case, the commenters continue, Shell has not provided any data on meteorological conditions in the Chukchi Sea and, although Shell claims to have incorporated worst-case conditions into the models, the estimates of worst-case conditions are built off land measurements. The commenter contends that EPA and Shell cannot say with any confidence that Shell's estimated worst-case conditions account for worst-case conditions in the Chukchi Sea because neither EPA nor Shell have any data describing meteorological conditions in the Chukchi Sea. The commenters conclude by saying that EPA should not accept unrepresentative data that do not meet EPA standards and that EPA should require preconstruction meteorological monitoring to gather wind speed, wind direction, and offshore wind, water and temperature information for more accurate air quality modeling.

Response: EPA is aware that there have been some limited meteorological data collection programs in the Chukchi Sea initiated by the MMS, Shell and CPAI. The data were collected periodically by instruments aboard research vessels and buoys, and usually for a period of weeks to months. Hence, the period of data collection is not continuous or of sufficient length to support its use in a refined air quality model.

EPA recognize the safety concerns and technical difficulties with installing and operating a meteorological (or air quality) monitoring station a hundred kilometers from the nearest shoreline of Alaska and above the Arctic Circle, in the Chukchi Sea. EPA is therefore working to develop alternatives to collecting meteorological data at over water locations where environmental and atmospheric conditions make it hazardous and technically challenging. The results of these efforts are currently undergoing testing and evaluation for use in refined models, but are not yet available for use in this permit.

EPA acknowledges there may be some limitations associated with the use of screening meteorology in an air quality model for sources located in a marine environment. To address these limitations, additional conservatism has been incorporated into the screening model predictions by:

- Applying modeling assumptions to obtain a peak 1-hour concentration.
- Utilizing the upper limit scaling factors to derive 3-hour, 8-hour, and 24-hour, and annual average concentrations from the peak 1-hour modeled concentration.
- Employing D stability and 20 meters per second wind speed to obtain a volume source height. The volume source is used to represent a vessel or ship.
- Using the highest acceptable measured background to represent ambient levels.

As a result, EPA believes the screening model predictions supporting this permit action are conservative and are likely to over predict rather than under predict the maximum

concentration impact. EPA believes this approach to the modeling is appropriate, where, as in this case, site-specific meteorology and more location-specific monitoring data is not available.

See response to Comments V.1, Z.2.b, AA.1, BB.1 and BB3 for additional related discussions.

BB **CATEGORY – CHOICE OF MODEL**

BB.1 Comment: Commenters assert that Shell used a non-guideline model, ISC3-PRIME, that another model has superseded and that the ISC3-PRIME model contains algorithms that accounts for building downwash, meaning the dispersion of pollutants in the downward wake of a building. The commenters continues that EPA now prefers AERMOD, another model that accounts for such affects and that includes a number of additional improvements over ISC3-PRIME, to the use of ISC3-PRIME, citing to 40 C.F.R. Part 51, Appendix W, Appendix A, Section 4.1. For example, the commenter states, EPA’s regulations state that a new building downwash algorithm was developed and tested within AERMOD and that the PRIME algorithm has been evaluated using a variety of data sets and has been found to perform better than the downwash algorithm that is in ISC3, and has been shown to perform acceptably in tests within AERMOD. Further, the commenter points to changes Shell made to the ISC3-PRIME model program code to address the unique aspects of its operation. The commenters contend that the record does not provide a reasoned basis for Shell’s use of an altered non-guideline model, or for why a guideline model, like AERMOD, is inappropriate. Without more information on Shell’s models, the commenter continues, it is impossible to fully ascertain whether those models provide reliable predictions for conditions in the Chukchi Sea and how the changes Shell made in the models will affect the overall modeling predictions. The commenters conclude by saying that EPA should require the use of a guideline model suitable for such modeling or provide a more detailed explanation as to why the model Shell has used is appropriate.

Response: As discussed in response to Comment AA.1, Section 2.2(c) of Appendix W indicates that there are situations when the use of a screening technique is the only practical and technical option for estimating a source impact. Due to the paucity of available representative marine meteorology, EPA believed that the only suitable approach to estimate concentration impacts associated with Shell’s exploratory drilling operations was the development and refinement of screening techniques consistent with Section 2.2(c) of Appendix W. The impact analysis for Shell’s exploration drilling operations was developed consistent with these recommendations.

The existing EPA screening model available at the inception of this project was the SCREEN3 model. SCREEN3 is a single source screening model that uses a pre-defined matrix of wind speed, Pasquill-Gifford stability classes, and mixing height combinations to determine worst case meteorological conditions and to estimate 1-hour peak plume

centerline concentrations. EPA determined that SCREEN3 was not suitable for this application because of multiple vessels and their combustion sources. But as described more fully below, EPA determined that ISC3-PRIME was suitable and appropriate for use in this instance.

It is important to note that SCREEN3 and ISC3-PRIME will produce identical estimates of 1-hour concentrations at the plume centerline given the same wind speed and stability class combinations because they are based upon the same technical formulation for treating dispersion in the atmospheric boundary layer. Due to model formulation differences in the treatment of the atmospheric boundary layer and turbulence characterization between the alternative model, ISC3-PRIME, and EPA's current preferred model, AERMOD, the screening meteorological dataset was not compatible with the AERMOD's turbulence based dispersion. A mechanism is under development to generate screening meteorological parameters for AERMOD. Consistent with the recommendations of Section 4.2.1.1(b) of Appendix W, the screening procedures developed for this application were adjusted to the site and nature of the problem at hand by using the ISC3-PRIME model with screening meteorology as described in response to Comment AA.1 and AA.2.

As explained above, there are two basic types of models, screening and refined, and the ISC3-PRIME model was used in this case. 40 C.F.R. § 52.21 (1)(2) explains that when an air quality model specified in Appendix W of Part 51 is inappropriate, the model may be modified or another model may be substituted. Such modification or substitution is subject to public notice and opportunity for public comment. Appendix A to Appendix W of 40 C.F.R. Part 51 includes the summaries of refined air models that are "preferred for use in regulatory applications." 40 C.F.R. Part 51, Appendix W, Appendix A. All of the listed preferred models are refined models. In this case, as explained above, because there was no representative hourly sequential meteorology available for over water use in this instance, a screening model was used. ISC3 PRIME is not one of the models listed in the Appendix W guidelines and is therefore a non-guideline model.

Appendix W does not specify a model appropriate for use in the situation presented in this permit action. EPA, in the public notice for this permit, specifically alerted the public to the use of the ISC3-PRIME model and sought public comment on it. The public notice/information sheet for this permit stated "The permit is based on the non-guideline ISC3-PRIME modeling system used to predict air pollutant concentrations, the same model relied on in the August 2009 proposed permit. This modeling system has not been approved by the EPA for general use, but has been tested for use in arctic conditions. EPA specifically requests public comment on the suitability of this model in this permitting action." Air Permit Public Notice and Information Sheet, New Modified Air Quality Permit Proposed for Shell to Operate the Frontier Discoverer Drillship in the Chukchi Sea, Alaska, January/February 2010.

With respect to the model code changes, Section 5.2.5 of the Statement of Basis explains the modifications that Shell made to the ISC3-PRIME source code: "Furthermore, to model the majority of the scenarios by air pollutant in a single model run, Shell modified the ISC3-PRIME source code to accept at least 1318 emission sources, 20000 receptor

points, and thirty (30) source groups.” Shell verified its code changes by running their modified ISC3-PRIME model using the EPA test case input file and comparing the predicted concentrations against the test case output file. After noting that the results are equivalent out to the third decimal point, Shell concluded that the verification is sufficient. Statement of Basis, pp. 95-96. EPA concurs with the verification results and believes that no modifications have been made that alter the concentration estimates of ISC3-PRIME.

See response to Comment BB.2 for further discussion regarding choice of model.

BB.2 Comment: Commenters assert that if Shell provides an explanation on the appropriateness of its model, EPA should provide an opportunity for the public to comment on the explanation.

Response: In 78 Fed. Reg. 21506 (April 21, 2000), EPA proposed additions and changes to the Guideline on Air Quality Models (GAQM), i.e., Appendix W of 40 C.F.R. Part 51. One of the changes was integrating the PRIME downwash algorithm into ISC3 and renaming the model ISC-PRIME (or ISC3-PRIME). Both ISC-PRIME and AERMOD were being recommended as a guideline model; however, AERMOD did not include the PRIME downwash algorithm.

As part of the process, EPA held the 7th Conference on Air Quality Modeling to receive public comments on the proposed changes to the GAQM on June 28-29, 2000 in Washington, D.C. The docket for this proposal included an independent evaluation of ISCST3 and ISC-PRIME, a consequence analysis of ISC-PRIME, and a user’s guide for ISC-PRIME. Nearly every commenter urged EPA to integrate the PRIME downwash algorithm into AERMOD so there would be only one complete model to do the work instead of two air quality models.

The final rulemaking for the proposed changes was promulgated November 9, 2005 with an effective date of December 9, 2006. 70 Fed. Reg. 68218. EPA recommended AERMOD with PRIME as a guideline model to replace ISC3 and the proposed ISC-PRIME model. After the one year transition period, AERMOD became the EPA preferred model. ISC3 and ISC-PRIME were re-designated as Appendix B models or non-guideline models requiring Regional Office approval prior to regulatory use.

Under 40 C.F.R. § 52.21(l) and Section 3.2 of 40 C.F.R. Part 51, Appendix W, an EPA regional office may approve the use of a non-guideline model with acceptable technical justification and evaluations. More specifically, Section 3.2.2.b of Appendix W identifies three separate conditions in which an alternative model may be found acceptable while Sections 3.2.2.c to 3.2.2.e detail the demonstrations for each condition.

EPA relied on the positions and rationale as explained in 78 Fed. Reg. 21506 (April 21, 2000), and the materials contained in the docket of that April 2000 proposed rulemaking, to accept the use of ISC3-PRIME with screening meteorology in the Shell over water stationary source ambient air quality impact analysis.

BB.3 Comment: Commenters contend that ISC3-PRIME is inappropriate to model air pollution dispersion in the offshore conditions in which Shell intends to operate and that the EPA-recommended offshore air quality model is the Offshore and Coastal Dispersion Model. The commenters assert that overwater pollutant plume transport and dispersion are significantly different than overland dispersion and that the ISC3-PRIME model Shell uses is not suited for overwater plume transport calculations because mixing heights over water are generally less than overland situations due to lack of sensible heat flux from the surface. According to the commenters, these low mixing heights can trap pollutant plumes near the surface and create areas of high concentration. Shell has not sufficiently explained, the commenters continue, how it has determined the atmospheric mixing heights for their modeling and how ISC3-PRIME is the best model for this application.

Response: Contrary to the commenter's claim, ISC3-PRIME is appropriate to use in this instance. As stated in response to Comment V.1, because there was no location-specific meteorological data, Shell's only option was to use the ISC3-PRIME with screening meteorology to estimate project concentration impacts. EPA believes the use of ISC3-PRIME is an acceptable option as explained in its responses in BB.1 and AA.2. Also, ISC3-PRIME tends to predict higher concentrations than AERMOD by a factor of two. See AERMOD: Latest Features and Evaluation Results, Office of Air Quality Planning and Standards, Emissions Monitoring and Analysis Division, Research Triangle Park, NC, June 2003.

EPA acknowledges that there is uncertainty in mixing heights used in the modeling. However, despite this uncertainty, EPA determined that the refinements in the form of modeling assumptions which tend toward over prediction of model concentrations, as explained in response to Comment AA.2, should adequately accommodate for the doubt in the model predictions. Nevertheless, to gain additional information and data on mixing heights in the Arctic Ocean, Shell, at the request of EPA, will be installing a temperature profiler at a location representative of a marine environment in early summer 2010. Collecting upper air temperatures will give Shell and EPA a better understanding of the mixing heights over water and could help indicate whether any changes need to be made in over water dispersion models used in air permitting.

The derivation of the convective and mechanical mixing heights used in the modeling are described in Shell's permit application. Shell 2/23/09 Rev. App., p. 56. Shell's source for this derivation is contained in the User's Guide for the Industrial Source Complex (ISC3) Dispersion Models, Volume I, User Instructions EPA-454/B-95-004, dated September 1995.

BB.4 Comment: A group of commenters contend that, although the Statement of Basis acknowledges that model predictions had not fallen below the significance threshold for the annual NO_x, 24-hr SO₂, and 24-hr PM₁₀ standards at the 50 km significant impact area radii Shell used in its analysis, Shell's analysis does not assess effects outside of this 50 km radius. The commenters assert that Shell should have used a long range transport model capable of calculating concentrations at distances greater than 50 kilometers, such as CALPUFF, a long

range model recommended by the EPA Guideline on Air Quality Models, 40 C.F.R. Part 51, Appendix W.

Response: As explained in Section 5.2.1 of the Statement of Basis, The significant impact levels are also used to obtain significant impact area radii. The radius is the farthest distance from a proposed major stationary source or major modification in which the concentration predicted by an EPA model exceeds its significant impact level. EPA guidance limits the radius to 50-kilometers because this distance is considered the limit of applicability for most steady state Gaussian plume models. See 40 C.F.R. Part 51, Appendix W, Sections 4.2 and 6.1.c.

By the time the plume has traveled 50-kilometers, it is well dispersed and the air pollutant concentrations are decreasing and small compared to the predicted peak value. Hence, EPA deemed it was unnecessary to use a long range transport model such as CALPUFF to estimate concentrations at distances greater than 50-kilometers. Although not required, but in recognition of the public concern regarding potential onshore impacts, ISC3-PRIME was used to predict concentration impacts at Point Lay and Wainwright, which are located about 100-kilometers and 110-kilometers, respectively, from Shell's lease holdings in Lease Sale Area 193. The purpose of the modeling was to approximate the magnitude of project impacts at the two nearest villages to the location of Shell's exploration drilling operations. The modeling indicates that the concentration impacts are small at these on-shore locations. See Statement of Basis, Sections 5.2.8 and 5.2.9.

BB.5 Comment: A commenter states that MMS is very familiar with the ISC3-PRIME Modeling system and finds that the ISC3-PRIME modeling system as applied to this permit application is conservative and is more than sufficient to support this permit action and findings.

Response: EPA agrees with the commenter.

CC CATEGORY – PLUME HEIGHT

CC.1 Comment: A commenter states that EPA has required the calculation of associated vessel plume heights to be based on an extreme wind speed of 20 meters/second, which forces the plume to be close to the sea surface and that the closer the plume is to the ocean surface, the higher the impact from that plume will be. The commenter continues that this low plume height is used to estimate the impacts regardless of the dispersion speed that actually causes the estimates of highest impacts and that, in the modeling provided in the application materials, wind speeds that cause highest impacts are less than 8 m/s. Therefore, the commenter asserts, if the speed used to calculate plume height of the associated vessels were consistent with the speed causing highest impacts, the associated vessel plumes would be much higher and surface-level impacts would be lower.

Response: Since Shell decided to use ISC3-PRIME with screening meteorology to predict concentration impacts in a marine environment, EPA determined made a

judgment that the estimates should bias towards conservatism. As a result, EPA recommended using D stability and a wind speed of 20 meters per second to obtain the lowest plume rise. In terms of the atmosphere, D stability (or neutral condition) is associated with "...overcast case conditions, day or night, regardless of wind speed", Workbook of Atmospheric Dispersion Estimates, EPA No. AP-26 (1970).

See the Statement of Basis (p. 100), for further discussion of this issue.

Additional details are provided in responses to Comments W.1 and W.2.

**DD CATEGORY – AIR QUALITY ANALYSIS FOR PM2.5 NAAQS
(INCLUDING SECONDARY PM2.5)**

DD.1 Comment: A commenter asserts that the recently promulgated PM2.5 24-hour standard regulates the 98th percentile impact, which in effect allows for 2% of the impacts to be above the standard. Using Badami Site actual meteorology and analyzing the impact of 24-hour PM2.5, the commenter continues, the 98 percentile value is at least 30% below the maximum value.

Response: See response to Comment V.2.

DD.2 Comment: Numerous commenters state that, as EPA's own information shows, in addition to primary PM_{2.5} emissions, emissions of NO_x, VOCs, SO₂ and ammonia can form, after being emitted into the atmosphere, into PM_{2.5} and this can potentially be a significant component of ambient PM_{2.5} concentrations, which can be more regional in scale. The commenters note that Shell's operations have the potential to cause PM_{2.5} pollution levels to reach 84% of 24-hour NAAQS, and their predicted impact on 24-hour NAAQS for PM_{2.5} (18.4 µg/m³) is more than twice what EPA's 2007 proposed PSD increments for PM_{2.5} would allow (9 µg/m³), citing to 72 Fed. Reg. 54,112, 54,115 (2007). The commenters further note that Shell's operations may increase 24-hour PM_{2.5} levels by close to 12% in Point Lay and Wainwright and that these towns may reach 73% of NAAQS for PM_{2.5}. Even these estimates, the commenters continue, may not fully reflect Shell's potential emissions of PM_{2.5}, because EPA has failed to analyze secondary PM_{2.5} formation. The commenters also assert that the presence of strong temperature inversions that limit dispersion contribute to the formation of secondary PM_{2.5} in the atmosphere and can increase secondary PM_{2.5} formation. Because of the presence of strong temperature inversions on the North Slope, the commenters continue, EPA must seriously consider the contribution from secondary PM_{2.5} to total PM_{2.5} concentrations from the permitted sources. EPA or Shell, the commenters continue, must consider the effects of such secondary formation of PM_{2.5} in order to complete a sufficient analysis of the operations' potential impacts on air quality. See 40 C.F.R. § 52.21(k).

Response: EPA acknowledges the commenter's concerns with respect to the secondary formation of PM_{2.5}. There are, however, limitations in the tools and models currently available to address secondary PM_{2.5} emissions. See Memorandum from Stephen D. Page, Director, Office Air Quality Planning and Standards, dated March 23, 2010 Re: Modeling Procedures for Demonstrating Compliance with PM_{2.5} NAAQS.

Nevertheless, in EPA's view, the conservatism built into the modeling assumptions that were used in conducting the air impact analysis for this project (discussed in response to Comment V.1, V.2 and Z.2.d) mitigate against the possibility that PM_{2.5} would cause or contribute to a violation of the NAAQS. In addition, EPA also notes that the modeled PM_{2.5} emission rates for most of the Discoverer drill ship combustion sources were estimated to equal the PM₁₀ emission rates from such sources. This is another added layer of conservatism that impacts the modeling of PM_{2.5} emissions. Consequently, EPA believes the cumulative effect of these conservative assumptions has adequately accounted for the possibility of secondary formation of PM_{2.5}. Although EPA has proposed increments for PM_{2.5}, this rulemaking has not been finalized.

As discussed in response to Comment Z.2.c above, the final permit requires post-construction monitoring for PM_{2.5}. In response to the concerns regarding secondary PM_{2.5} formation, the final permit adds a requirement to install and operate a FRM sampler in addition to the FEM continuous sampler required in the proposed permit. An FRM is a manual sampler that pulls air through a filter for 24 hours (midnight to midnight). The filter is then weighed in a lab and a PM_{2.5} concentration is calculated

based on the mass increase of the filter and the volume of air drawn through it. Use of a manual sampler will allow the filter to be analyzed for the chemical speciation of PM_{2.5} constituents such as sulfates, nitrates, organics, sea salt and metals. With this data, EPA, Shell and the public will be better able to evaluate the significance of secondary formation of PM_{2.5} from sources in the area. The manual sampler will also assist in determining the contribution of local sources of fugitive dust to PM_{2.5} concentrations.

DD.3 Comment: Commenters contend that, if EPA will not be addressing secondary PM_{2.5} impacts from permitted sources directly in Shell's final permit, EPA, at the very least, should give an indication of how it is working to address this important component of PM_{2.5} in future permitting actions. The commenters note that EPA's Support Center for Regulatory Atmospheric Modeling (SCRAM) provides various resources for modeling the impacts of secondary PM_{2.5}, such as EPA's recently-developed model based on the Community Multi-scale Air Quality (CMAQ), the Comprehensive Air quality Model with extensions (CAMx), and the Regional Modeling System for Aerosols and Deposition (REMSAD). With adequate testing (using existing regional monitoring data to ensure accuracy), the commenters continue, these models could be used in the permitting context for larger sources or, as an alternative to these grid models, EPA could develop a screening point source model—like CALPUFF to look at near-field PM_{2.5} primary and secondary impacts. The commenters state that there have been several oil and gas Environmental Impact Statements that have already used (or are using) CMAQ or CAMx to estimate PM_{2.5} concentrations. The commenters also point to both the Continental Divide and Hiawatha Environmental Impact Statements in Wyoming as examples of projects using grid modeling to assess PM_{2.5} concentrations. The commenters conclude by stating that the secondary PM_{2.5} component could be critical to understanding the best way to mitigate potential PM_{2.5} impacts.

Response: EPA-preferred air quality models for permit modeling are identified in Appendix W of 40 C.F.R. Part 51 and can be downloaded from the SCRAM website. The six models listed in Appendix W are used to determine concentration impacts from inert or nonreactive air pollutants. None of the models were designed and evaluated to explicitly estimate secondary formation of PM_{2.5} concentration impacts for permitting purposes. CAMx, CMAQ, and REMSAD are not included in the appendix and are therefore, not recommended for air permit modeling without acceptable testing and evaluation. As described in the response to Comment DD.2, EPA has not yet developed and promulgated any air quality models for permitting purposes to address the secondary formation of PM_{2.5}.

See also generally the response to Comment DD.2.

EE CATEGORY – AIR QUALITY ANALYSIS FOR OZONE

EE.1 Comment: Several groups commented that, in order to fulfill its regulatory responsibilities to ensure compliance with all NAAQS, EPA must include a more

thorough evaluation and discussion of potential ozone impacts in the region from ongoing permitting activity on the OCS. Although the commenters concede that monitored levels of ozone from the Wainwright monitor do not threaten compliance with the NAAQS, they note that background concentrations as high as 50 ppb have been observed. The commenters contend that emissions will dilute as they transport away from their source of origin, but spreading of plumes is not always rapid and is highly dependent on the atmospheric stability at the time. The commenters point to a study looking at future ozone concentrations in the Arctic from increased shipping traffic in the Arctic northern passages providing that ships' combustion engines could increase ozone concentrations in the region by 2-3 times in the decades ahead. Thus, the commenters assert, it is conceivable that NO_x (and VOC) emissions from Shell exploration activities in the Chukchi and Beaufort Seas could contribute to elevated ozone concentrations in the region, even during the summer months. The commenters request that EPA conduct a more thorough evaluation of potential ozone impacts in the region from on-going permitting activity on the North Slope in light of the fact that monitoring levels of ozone are already over 80% of the level at which EPA has concluded results in health impacts to adults.

Response: The commenters states that it is “conceivable” that NO_x and VOC emissions from Shell exploration activities could contribute to elevated ozone concentrations in the region, but do not provide any specific information to show that is the case or that such elevated concentrations would cause or contribute to a violation of the NAAQS. As discussed in Section 5.2.7 of the Statement of Basis, given the low level of ozone precursor emissions from Shell’s exploration operations in comparison to regional emissions of ozone precursors, the fact that there are no other stationary sources in the more immediate regional vicinity of Shell’s operations in the Chukchi Sea that contribute ozone precursors to the air shed, and the moderate levels of the maximum 1-hour and 8-hour measured on the North Slope and at Wainwright, the contribution of the ozone precursor emissions from Shell’s exploration operations to the formation of ozone in the region is expected to be small. For these reasons, EPA believes that emissions from Shell’s exploration operations will not cause or contribute to a violation of the NAAQS for ozone and that EPA has addressed the requirements of 40 C.F.R. 52.21(k) for ozone. The potential impacts on any future activity in the area that may cause or contribute to ozone formation will be examined as provided in the applicable permitting process for that activity and are not taken into consideration in the issuance of a PSD permit for this facility.

EE.2 Comment: Commenters assert that even though EPA reasons that Shell will emit a relatively low amount of ozone precursors in relation to sources in the North Slope Borough, and thus, is unlikely to endanger the region’s current compliance with ozone standards, there is still some cause for concern over ozone levels because Shell’s monitoring results show that 8-hour ozone concentrations in Wainwright have reached 63% of the NAAQS. Although there are few sources of pollution near Wainwright, the commenters contend that Shell’s operation has the potential to emit over a thousand tons per year of NO_x, a precursor of ozone, and that the Arctic environment has specific characteristics that may cause rapid

ozone formation. In light of these factors, the commenters conclude, EPA should require Shell to model the formation of ozone that may result from its operations.

Response: The processes which form and transport ozone in the atmosphere are complex. There are photochemical models which have been used to simulate regional ozone formation for purposes of NAAQS attainment planning. As discussed in Section 5.2.7 of the Statement of Basis, however, although EPA's current ozone models are effective for evaluating large-scale regional ozone control programs, they are not capable of showing the clear contribution of one source to predicted regional ozone levels. It is difficult or impossible at this time to accurately determine the contribution of individual sources or single industrial entities to regional ozone levels. Therefore, EPA relies on monitored data and emissions comparisons in order to make determinations on the effect of permitting projects on ozone levels. See also response to Comment EE.1.

EE.3 Comment: Commenters contend that EPA has not sufficiently considered how Shell's fleet will affect ozone levels within the region. The commenters continue that, although EPA states that Shell is required to perform an ambient air quality impact analysis for ozone, Shell has not completed one and conclusions regarding Shell's contribution to ozone levels are unsupported.

Response: The emissions from the Associated Fleet which will accompany the Discoverer and operate within 25 miles of it were included in the project's potential to emit calculations and in the air impact analysis for ozone. EPA's conclusions regarding ozone therefore include the effects of the emissions from the Associated Fleet. See Statement of Basis, Sections 2.4.2 and 5.2.4; see also response to Comments EE.1 and EE.2.

EE.4 Comment: Commenters state that although elevated ozone levels are traditionally thought to be a summer-time problem that plagues large urban areas, recent events that have occurred in rural southwest Wyoming in wintertime demonstrate this is not always the case. According to a recent study by the National Oceanic and Atmospheric Administration, the commenters assert, ozone rapidly formed in southwest Wyoming when three factors converged: ozone-forming chemicals from the natural gas field, a strong temperature inversion that trapped the chemicals close to the ground, and extensive snow cover, which provided enough reflected sunlight to jump-start the needed chemical reactions. The commenters continue that the North Slope of Alaska also exhibits these three factors needed for ozone formation. The commenters assert that, while there may not be available sunlight in the dead of winter, there is certainly abundant sunlight in the fall and spring in conjunction with snow cover and strong temperature inversions. The fact that the pollution sources and photochemical mechanisms for producing ozone are available and the possibility of elevated background concentrations from global transport of pollution is real, the commenters continue, means that EPA must more thoroughly investigate the effects of NO_x and VOC sources from the proposed exploration activities on the OCS and from existing and reasonably foreseeable NO_x and VOC sources in the region on ozone formation on the North Slope.

Response: Although EPA is aware that ozone formation has recently been observed under the conditions the commenter describes, the current state of the art in ozone modeling may not be equipped to accurately predict photochemical reactions in cold weather conditions. The commenter does not explain how, if there are strong temperature inversions trapping emissions from the current Prudhoe Bay sources close to the ground, emissions from Shell's Chukchi exploratory operation hundreds of miles away would significantly contribute to ozone formation. EPA agrees that the Wyoming situation raises questions about the potential for ozone formation in certain wintertime conditions. However, the commenter provides insufficient information to determine if any such potential exists in the area of Shell's Chukchi Sea exploratory operations where there might be inversions but no snow cover within 50 to 60 miles. As noted above, current ozone models cannot reliably predict individual source contributions to ambient ozone levels. Therefore, EPA can only evaluate ozone precursor emission levels. EPA believes our evaluation of the Shell Chukchi Sea project is conservative for the reasons discussed above in response to Comment Z.2.d See also response to Comments EE.1 and EE.6 regarding the need for a cumulative ozone analysis.

EE.5 Comment: Commenters state that in Shell’s PSD permit application, Shell relies on data provided either as year long averages of ozone concentrations or data collected during the winter months, even though the drilling activity is scheduled to occur in the summer months. The commenters contend that ozone levels are dependent on air temperature, that higher temperatures are generally the result of higher ozone levels, and that by using air quality data from the winter months, Shell is not providing a conservative estimate of the air quality during the summer months. The commenters ask that EPA require Shell to use summer data to establish the air quality baseline for their activities.

Response: This comment was submitted on the August 2009 proposed permit and incorporated by reference in comments submitted on the January 2010 proposed permit. Shell submitted additional air monitoring data, including for ozone, prior to the January 2010 proposal, that covers the summer time. EPA took this data into account in issuing the January 2010 proposed permit. See Statement of Basis, Section 5.2.6 and response to Comment Z.2.b.

EE.6 Comment: EPA received numerous comments requesting a comprehensive quantitative regional assessment of ozone even if this particular permit action does not require such an analysis. These commenters noted the fact that there are at least three OCS exploration projects being permitted in the region in the near future (e.g., Shell’s Chukchi and Beaufort Sea programs as well as ConocoPhillips’ proposed exploration in the Chukchi Sea) and assert that as EPA continues to permit additional sources of NO_x and VOC in the region, it must be able to determine the cumulative impacts of these sources on future ozone concentrations and should not wait until monitoring shows a problem. The commenters note that background concentrations of ozone are already as high as 50 ppb (8-hour average) on the North Slope, two-thirds of the way to the 8-hour average standard of 75 ppb and over 80% of the way towards the lower range of EPA’s proposed revisions to the ozone standard. The commenters point out that EPA is proposing to strengthen the 8-hour average ozone standard, designed to protect public health, to a level within the range of 60-70 ppb and that EPA’s proposal is based on scientific information, including epidemiological and human clinical studies, showing effects in healthy adults at levels as low as 60 ppb.

Response: While EPA understands the commenters’ concerns about the potential for increased emissions and the potential usefulness of a cumulative analysis, EPA maintains—as the commenters concede—that a cumulative analysis of all current sources of ozone precursors is not required for this PSD permit. As discussed in Section 5.2.7 of the Statement of Basis and in response to Comments EE.1 and EE.2 above, current monitored ozone levels in the area are currently below the NAAQS and the contribution of the ozone precursor emissions from Shell’s exploration operations to the formation of ozone in the region is expected to be small. In addition, in this PSD issuance process, the permit applicant and EPA are not required to consider the impact of potential future development on air quality. See also response to Comment GG.1 below. EPA does agree that a cumulative analysis of current and potential future exploratory and production activities on the Arctic OCS as well as onshore could aid in the understanding

of ozone creation in an Arctic environment, especially in light of the proposed revisions to the ozone standards. EPA will look for opportunities to discuss the possibility of such an analysis with both our federal co-regulators on the OCS and the State of Alaska.

FF CATEGORY – SOILS AND VEGETATION ANALYSIS

FF.1 Comment: The commenters state that EPA requires PSD permit applicants to provide an analysis of the impairment to visibility, soils and vegetation that would occur as a result of the source and impacts associated with the source, but that in this case, Shell has simply concluded that it failed to “identify any negative impacts on aquatic vegetation” with commercial or recreational value from the air emissions from Shell’s proposed operations. The commenters ask EPA to explain why this conclusion is correct and why additional information and an actual analysis is not required to comply with 40 C.F.R. § 52.21(o). The commenters express particular concern about the impacts of Shell’s proposed emissions on the “planktonic and benthic foodwebs” that support the Chukchi Sea’s “faunal biomass,” which the commenters state is one of the highest in the Arctic, as well as in the world ocean. The commenters continue that a full analysis of the impacts from Shell’s emissions on the foodwebs in the Chukchi Sea is necessary before Shell can obtain a permit under the CAA.

Response: This comment was made on the August 2009 proposed permit and was incorporated by reference in comments submitted on the January 2010 proposed permit, but was not specifically discussed in the commenters’ comments on the January 2010 proposed permit. As discussed in Section 5.3.2 of the Statement of Basis, Shell analyzed the potential impacts from the project on aquatic vegetation having commercial or recreational value and sediment by reviewing published literature and consulting with numerous government agencies, local groups and residents, and the University of Alaska. Their efforts did not reveal any aquatic vegetation or sediment having commercial or recreational value in the significant impact areas that are expected to be negatively impacted by the Shell drilling operations in the Chukchi Sea. The commenters have provided no specific information to show that the operations to be authorized under the proposed permit are expected to have a negative impact on aquatic vegetation or sediment having commercial or recreational value.

Based on the information submitted by Shell, EPA is satisfied that Shell has met the requirements of 40 C.F.R. § 52.21(o) with respect to the soils and vegetation analysis.

FF.2 Comment: Commenters asserts that Shell’s analysis of the impact its operations will have on soils and vegetation is inadequate because Shell’s analysis is restricted to an area within 50 km of the drill site and does not consider the effects of the temporary growth in population and industrial activity that will develop at and around Shell’s support facilities “at several possible locations.” The commenters note that Shell’s support facilities will include storage facilities, aircraft hangers, and possibly a new warehouse, that Shell’s crews will be lodged at hotels and trailer camps, and that Shell will use helicopters to transport the

crew to and from the drillship. The commenters state that the effects that will result from these activities are unclear and that by restricting the analysis to within 50 km of the drill site, Shell fails to meet the requirements of 40 C.F.R. § 52.21(o) because its analysis does not consider how its on-shore activities and associated growth along the Alaska coast may affect or impair soils and vegetation.

Response: EPA regulations state that “[t]he owner or operator shall provide an analysis of the impairment to visibility, soils and vegetation that would occur as a result of the source or modification and general commercial, residential, industrial and other growth associated with the source or modification.” 40 C.F.R. § 52.21(o)(1). In this case, the only associated growth that would not be temporary in nature is a possible warehouse located in either Wainwright or Barrow. EPA determined that an analysis of the air quality impact of this warehouse was necessary under 40 C.F.R. § 52.21(o)(2) but that an analysis of the impairment to soils and vegetation and under § 52.21(o)(1) is not necessary. EPA based this determination on three factors – the speculative location of the warehouse (Wainwright or Barrow), the minimal amounts of emissions (gas or oil fired space heating only), and the likely site of a new warehouse (within an existing commercial or industrial area). Given these factors, EPA determined that it was highly unlikely that emissions from a warehouse would impact soils and vegetation with significant commercial or recreational value and the commenters have presented no specific information to the contrary.

GG CATEGORY – CUMMULATIVE IMPACTS

GG.1 Comment: Commenters note that Shell is also currently proposing operations for the Beaufort Sea in 2010 during the same timeframe as its Chukchi operations and the company owns many more leases in these areas. In addition, several other companies have leases authorizing exploratory drilling in the Chukchi and Beaufort Seas and may be applying for air permits. Thus, the commenters contend, the overall cumulative impacts of Shell’s proposed and likely future operations, as well as the impacts of other expected oil exploration projects, on the air quality of the North Slope must be accounted for.

Response: Shell is proposing to drill in the Chukchi Sea and Beaufort Sea. Both projects will use the Discoverer drill ship to perform the drilling operations. However, the operations will never be concurrent because the same drill ship will be used. Furthermore, the distance between the drilling locations in the Chukchi Sea and the Beaufort Sea is approximately 500 kilometers. This distance exceeds the limitations of any long range transport model recommended by EPA. Nevertheless, any cumulative impact is expected to be insignificant.

For a PSD cumulative analysis to even occur as part of the Chukchi Sea ambient air quality impact analysis, the Beaufort Sea application would have needed to be deemed complete. The Beaufort Sea OCS/PSD application was deemed complete on February 11, 2010, well after Chukchi Sea OCS/PSD was deemed complete and a proposed permit

for operations in the Chukchi Sea was issued by EPA. See Letter from Rick Albright, EPA, to Susan Childs, Shell, dated February 11, 2010, Re: Permit Application for Frontier Discoverer Drill Vessel in the Beaufort Sea. In any event, the Beaufort OCS/PSD permit that EPA proposed for public comment on February 17, 2010 is based on an ambient air quality analysis that does include a cumulative impacts analysis.

The air quality impact of oil exploration by other leaseholders in the Chukchi and Beaufort Seas will be considered as required by the Clean Air Act when and if such other leaseholders submit air permit applications.

HH CATEGORY – GLOBAL WARMING/GREENHOUSE GASES

HH.1 Subcategory – General Comments

HH.1.a Comment: The proposed permit would permit Shell to emit as much as 94,000 tons of CO₂¹⁹—an amount approximately equivalent to the annual household CO₂ emissions of 21,000 people, roughly three times the entire population of the North Slope Borough, and nearly four times greater than the threshold triggering regulation under EPA’s draft Prevention of Significant Deterioration/Title V Greenhouse Gas Tailoring Rule, 74 Fed. Reg. 55,292, 55,292 (2009).

HH.1.b Comment: The NWAB is concerned with global climate change. Current information is especially important in light of changes to species concentrations and distributions as a result of climate change. Polar bears, whales, walruses and seals are particularly sensitive to climate change. The cumulative effects of activities from oil and gas exploration and development associated with climate change and increased natural hazards are an important consideration that needs to be addressed and understood before further exploration occurs.

HH.1.c Comment: The proposed permit does not address CO₂ or other greenhouse gases (GHG) to be emitted from the proposed OCS source. GHG from oil and gas sources can be significant. Greenhouse gases from oil and gas sources can be significant. The Arctic has already witnessed temperature increases that are twice as large as global averages and is poised to continue warming temperatures at greater levels than the rest of the world. The effects of global warming are acute in the Arctic where melting glaciers and rising sea levels threaten local species and coastal communities. The US Fish and Wildlife Service has recognized that climate change threatens the survival of marine mammals who depend on sea ice. Reducing GHG is imperative to

¹⁹ Shell’s permit application for the Chukchi Sea does not include an estimate of the amount of CO₂ its operations will emit. Its Beaufort Sea application for the same vessels operating for approximately the same amount of time, however, calculates emissions of up to 94,000 tons of CO₂.

slowing and stopping these dramatic events from further harming the people and ecosystems of the Arctic.

HH.1.d Comment: In Shell's Exploration Plan 2010 Exploration Drilling Program, Shell highlights MMS's position that Shell's CO₂ emissions represent an extremely small amount of global greenhouse gases and thus the cumulative effects of Shell's CO₂ emissions are insubstantial. However, this position ignores the importance of incremental regulatory steps toward redressing the harms caused by global warming. In *Massachusetts v. EPA*, the Supreme Court rejected the argument that mobile source emissions were such an insignificant source of global greenhouse gases that regulation of those emissions could not redress petitioner's injury from global warming because of incremental steps.

HH.1.e Comment: The Discoverer drillship and its associated support vessels will contribute large amounts of heat-trapping CO₂, an estimated 20,000 tons, to the air each year from the Discoverer itself and about 55,000 tpy from the Discoverer and its support vessels. In annual CO₂ emissions, that is equivalent to the annual CO₂ emissions from 11,000 cars. Marine diesel engines, such as those employed by Shell, when looked at cumulatively significantly degrade air quality, which is why there is an international agreement to reduce emissions. The oil and gas industry in Alaska emits 15.3 million metric tons of CO₂ emissions each year. By regulating emissions above PSD thresholds of GHG, the agency could reduce a significant amount of these pollutants that are emitted, and take an important step in slowing down the acute warming in the Arctic.

Response: These general comments regarding global warming do not contain enough specificity relating to a deficiency in the permit to require a detailed response. However, EPA recognizes the importance of addressing the global challenge of climate change, and in light of the Supreme Court's decision in *Massachusetts v. EPA*, 127 S. Ct. 1438 (2007), the Agency is working diligently to develop an overall strategy for addressing the emissions of CO₂ and other GHGs under the Clean Air Act. While EPA has been implementing voluntary programs aimed at reducing greenhouse gases for several years, since the Supreme Court decision, EPA has been exploring the additional tools provided by the Clean Air Act to help us expand on the solid foundation we have built to achieve the global goal of reduced greenhouse gas emissions.

EPA has taken a number of steps to begin addressing GHG emissions under the Act. In 2008, EPA issued an advance notice of proposed rulemaking (ANPR) seeking public input regarding issues relating to the potential regulation of greenhouse gas emissions from stationary and mobile sources under the Clean Air Act. See www.epa.gov/climatechange/anpr.html. The ANPR was the first step in developing a regulatory strategy for addressing CO₂ and other GHG emissions under the CAA, and the Agency subsequently issued a final Endangerment Finding and a final Cause or Contribute Finding regarding GHGs. See <http://www.epa.gov/climatechange/endangerment.html>. EPA also proposed rules to reduce GHG emissions from light duty

vehicles under the Act (see <http://epa.gov/otaq/climate/regulations.htm>) and to address GHG emissions from stationary sources under the PSD and Title V permitting programs (see <http://www.epa.gov/NSR/actions.html#2009>). There is more information on the Agency's assessment of climate change and the various EPA programs and strategies presently at <http://www.epa.gov/climatechange/>. To the extent that the commenters are trying to imply that the permit should include BACT limits for GHGs, please see the response to comments below.

HH.2 Subcategory – GHG Are Regulated Air Pollutants for PSD

Comments: A number of comments argue that GHGs are regulated air pollutants for the purposes of the PSD program, and thus EPA erred in not including BACT limits these emissions in the proposed permit. Specifically, the commenters argue that CO₂ is already a pollutant “subject to regulation” under the CAA, and thus PSD permitting requirements, including BACT limits, must apply the Discovery's CO₂ emissions. They argue that CO₂ is a regulated pollutant based on the CO₂ monitoring and reporting requirements contained in EPA's regulations for the Acid Rain program; the inclusion of CO₂ emission limitations in an EPA-approved SIP; EPA's grant of a CAA section 209 waiver authorizing California to implement its own CO₂ emissions limitations; and because EPA finalized the rule to require mandatory reporting of greenhouse gas emissions, such as carbon dioxide, from “large sources” in the United States. While at least one comment acknowledges that EPA is reconsidering its interpretation of when pollutants become “subject to regulation” for the purposes of the PSD program, the comment argues that the “actual control of emissions” interpretation favored by EPA is wrong and that CO₂ must be limited under the proposed permit. Finally, the commenters argue that even if EPA were to maintain that CO₂ is not a “regulated pollutant” under the PSD program based on the actions described in the previous sentence, it will undoubtedly become one when EPA issues a final rule to establish light-duty vehicle greenhouse gas emission standards under Section 202 of the CAA, such that Shell's permit must require application of BACT to its CO₂ emissions.

Response: EPA has just finalized its reconsideration of when a pollutant becomes “subject to regulation” for the purposes of the PSD program. See Final Action on Reconsideration of Interpretation: Reconsideration of Interpretation of Regulations that Determine Pollutants Covered by Clean Air Act Permitting Programs (signed March 29, 2010), available at http://www.epa.gov/nsr/documents/psd_memo_recon_032910.pdf. As explained in that action, EPA will continue applying the Agency's existing interpretation of the regulation that determines the scope of pollutants subject to the federal PSD program under the CAA. In a December 18, 2008 memorandum, EPA established an interpretation clarifying the scope of the phrase “subject to regulation” found within the definition of the term “regulated NSR pollutant.” On February 17, 2009, EPA granted a Petition for Reconsideration of the December 18, 2008 memo and later issued a public notice seeking comment on alternate interpretations of the scope of this phrase. After considering the comments received in that reconsideration action, which included comments similar to those presented in the comments above, EPA

decided to continue to interpret the phrase “subject to regulation” to include each pollutant subject to either a provision in the CAA or regulation adopted by EPA under the CAA that requires actual control of emissions of that pollutant. As explained in the final action on reconsideration, EPA will continue following the interpretation in the December 18, 2008 memorandum with one exception – EPA is refining its interpretation to establish that the PSD permitting requirements will not apply to a newly regulated pollutant until a regulatory requirement to control emissions of that pollutant “takes effect.” For EPA’s complete final action on reconsideration, including the response to comments document, please see <http://www.regulations.gov>, Docket ID No. EPA-HQ-OAR-2009-0597.

For the purposes of GHG emissions, including CO₂, EPA’s final action on reconsideration explains that in applying this interpretation of “regulated NSR pollutant,” PSD permitting requirements will not apply to these emissions until at least January 2, 2011. While the light-duty vehicle rule for GHG emissions that is cited by the commenters is not yet final, EPA anticipated the finalization of that rule in its final action on reconsideration of the December 18, 2008 memorandum. EPA explained that, if finalized as proposed, the light-duty vehicle rule “takes effect” on January 2, 2011 -- the earliest date 2012 vehicles meeting the standards can be sold in the United States. Accordingly, since CO₂ and other GHGs are not currently a “regulated NSR pollutant” for the purposes of PSD permitting requirements and will not be so until at least January 2, 2011, EPA does not have a legal basis to include BACT limits for CO₂ and other GHGs in the final Shell permit.

HH.3 Shell’s Emissions Exceed the PSD Threshold for CO₂

Comments: A number of comments argue that under Shell’s Exploration Plan for its 2010 Exploration Drilling Program, Shell’s proposed operations have the potential to emit 55,000 tpy of CO₂ emissions from the drill ship and support vessels, which is well above both the statutory emission thresholds established in Section 169(1) of the CAA and the regulatory emission thresholds for GHGs proposed in the Tailoring Rule. Thus, the commenters argue that the final Shell permit must include a BACT limit for CO₂ emissions.

Response: As explained above, CO₂ is not currently a “regulated NSR pollutant” for the purposes of PSD permitting requirements. Accordingly, at this time there is no applicable permitting threshold applicable to CO₂ emissions, nor any statutory basis to include CO₂ limits in the permit. EPA also notes that the GHG emission thresholds proposed in the Tailoring Rule have not been finalized and thus are not applicable to the Shell exploratory drilling activities addressed in the final permit.

HH.4 Available Control Technologies

Comments: A number of comments argue BACT for CO₂ emissions exists and that EPA should not be limited to end-of pipe control technologies, but should instead consider a variety of options for controlling Shell’s CO₂ emissions, including improvements in efficiency and the application of other production processes and available methods, systems, and techniques. They assert that Shell

may be able to achieve cost effective and substantial GHG emissions reductions from its marine engines through the incorporation of and the inclusion of higher compression ratios, higher injection pressure, shorter injection periods, improved turbo charging, and electronic fuel and air management They also suggest limiting CO₂ emissions through carbon capture and sequestration techniques, including enhanced oil recovery.

Response: As explained above, CO₂ is not currently a “regulated NSR pollutant” for the purposes of PSD permitting requirements. Accordingly, the final permit does not contain BACT limits for CO₂ emissions, and EPA has not undertaken the accompanying analysis of control technologies for these emissions.

HH.5 Subcategory - Methane

Comment: Methane will also result from vented sources during Shell’s exploration drilling program. Methane is of particular concern as a greenhouse gas since it is over 20 times more effective in trapping heat in the atmosphere than carbon dioxide over the same 100 year period.

Response: This comment does not contain enough specificity relating to a deficiency in the permit to require a detailed response. However, EPA notes that methane is not currently a “regulated NSR pollutant” for the purposes of PSD permitting requirements and is it not regulated under any other federal standards that apply to Shell’s exploration drilling operations.

HH.6 Subcategory - Black Carbon

Comment: One commenter argues that the Proposed Permit and its supporting documents, however, completely fail to consider the effects of Shell's emissions of black carbon, a significant forcer of climate change, particularly when released in the Arctic. The comment argues that EPA has the regulatory authority to regulate particulate matter that is also black carbon because it affects health and welfare in a manner unlike other types of particulate matter. Accordingly, EPA should consider the effects of Shell's significant black carbon emissions, including the black carbon that may result from Shell's activity through the formation of secondary PM_{2.5}, and factor such impacts in to EPA's decisions about appropriate emissions limitations for the proposed Shell operations.

Response: Black carbon is not a "regulated NSR pollutant" under the PSD program, nor is it regulated under any other federal standards that apply to Shell's exploration drilling operations. To the extent black carbon is comprised of particulate matter, it is regulated as particulate matter – PM₁₀ and PM_{2.5} – in this permit, and EPA notes that emissions of those pollutants are substantially reduced by the emission limitations and control requirements in this permit. In addition, EPA's review of Shell's permit application shows that emissions from Shell's operations allowed under this permit will not interfere with attainment or maintenance of the NAAQS for PM₁₀ or PM_{2.5} or applicable increments.

II NEW NAAQS FOR NITROGEN DIOXIDE

II.1 Comment: Commenters state that, even though the effective date of the new NAAQS for NO₂ may not occur until after the final permit is issued, EPA cannot ignore the imminent requirement of this very important new health-based standard. It is imperative, the commenters continue, that EPA require Shell to demonstrate compliance with the new 1-hour NAAQS for NO₂ for its operations in the Chukchi Sea since the regulation will be effective before Shell's operations begin and Shell must be able to demonstrate compliance with all requirements that are effective during its period of operation. The commenters state that there is precedent for sources complying with regulatory requirements prior to final agency action, pointing to a permit issued for the Hyperion Energy Center in EPA Region 8. The commenters state that it is important to the residents of the North Slope communities that EPA uphold the highest standards of health protection possible.

Response: This permit, when finalized, will meet all applicable requirements in effect at the time of permit issuance. There is no requirement that a PSD permit ensure compliance with requirements that come into effect after the PSD permit has been issued. The new hourly NO₂ NAAQS was published in the Federal Register on February 9, 2010, but is not currently in effect. See 75 Fed. Reg. 7473 (February 9, 2010) (April 12, 2010 effective date).

It is important to note that, as a “temporary source” under Title V, Shell will be required to demonstrate compliance with the NO₂ NAAQS and any applicable NO₂ increment, as well as any other newly promulgated NAAQS or increment that is then in effect, when it applies for a Title V operating permit. Section 504(e) of the CAA allows the permitting authority to issue a single permit authorizing emissions from similar operations at multiple temporary locations and provides that no such permit shall be issued unless it includes conditions that will assure compliance with all the requirements of the CAA at all authorized locations, including, but not limited to, ambient standards and compliance with any applicable increment or visibility requirements under Part C of Title I of the CAA. The Part 71 regulations implement this provision (see 40 C.F.R. § 71.6(e)), and specifically include in the definition of “applicable requirement” “any national ambient air quality standard or increment or visibility requirement under part C of title I of the Act but only as it would apply to temporary sources permitted pursuant to section 504(e) of the Act.” See 40 C.F.R. § 71.2 (definition of applicable requirement). Any source that will be moved more than once during a five year period is considered a “temporary source” under Title V. See Memorandum to Docket A-90-33, re: Docketing of Detailed Responses to Comments on the Part 70 Operating Permit Regulations, p. 6-34. Thus, because Shell’s operations will be moving during the life of its Title V operating permit, Shell will be required to certify in its Title V application that it is in compliance with all applicable requirements in effect at the time it submits its application, including the new hourly NO₂ NAAQS. See 40 C.F.R. § 71.5(c)(9). Shell is required to apply for a Title V permit within 12 months of when the Discoverer commences operation in the Chukchi Sea. 40 C.F.R. § 70.5(a).

JJ CATEGORY – OTHER REGULATORY APPROVALS

JJ.1 Comment: Commenters state that it is not appropriate to consider exploration drilling in the Arctic Ocean in the face of serious questions about the validity of the Chukchi Sea leases upon which Shell proposes to drill. The commenters note that Shell’s leases derive from Lease Sale 193, a leasing program that is subject to two legal challenges.

Response: EPA is aware that Shell is required to obtain approval from other agencies before it is authorized to begin exploratory drilling in the Chukchi Sea and that there is pending litigation regarding the leases under which Shell proposes to conduct its exploratory drilling operations. EPA has an independent obligation to issue or deny a PSD permit once a complete application has been submitted. See CAA § 165(c). EPA therefore believes it is appropriate to proceed with issuance of this OCS/PSD permit so that, if or when Shell has all necessary approvals and authorizations to begin its exploratory drilling program on its leases in Lease Area 193, Shell can proceed without further delay consistent with a final OCS/PSD permit and all other necessary federal approvals and requirements. Condition A.3 makes clear that, as provided in 40 C.F.R. §§ 55.6(a)(4)(iii) and 52.21(r)(3), the permit does not relieve Shell of the responsibility to comply fully with all other requirements of federal law prior to commencing operation under this CAA permit.

KK CATEGORY – NEPA

KK.1 Comment: Commenters state that Shell’s drilling program would constitute a massive multi-year industrial undertaking, involving operations not only on the Chukchi Sea but also in the Beaufort Sea and involving a drill ship, a fleet of icebreakers, other support ships, and aircraft traveling to and through the Arctic Ocean from July through October. This, the commenters continue, would generate industrial noise in the water, run the risk of a large oil spill, and emit tons of pollutants into the air and thousands of barrels of waste into the water. The commenters request that EPA cooperate and work jointly with MMS and other agencies responsible for permitting Shell’s drilling to produce a comprehensive, multi-agency environmental impact statement (EIS) that analyzes the potentially significant effects of Shell’s proposed multi-year operations in the Chukchi and Beaufort Seas before permitting the activity. The commenters assert that EPA is mandated by 40 C.F.R. § 52.21(s) to cooperate with other agencies in preparing an EIS for the exploration plan and that other federal agencies have similar requirements. The commenters urge EPA and other federal agencies to complete the federal agency coordination process referenced in EPA’s August 2009 letter to conservation groups in order to address the issues raised by Shell’s proposed activities prior to proceeding with issuing this permit.

Response: As discussed in the Statement of Basis, Section 7(c) of the Energy Supply and Environmental Coordination Act of 1974 specifically exempts actions under the CAA, including issuance of an OCS/PSD permit, from the requirements of NEPA. Statement of Basis, pp. 121-122. EPA is therefore not required to comply with NEPA or develop an Environmental Impact Statement (EIS) or Environmental Assessment (EA) prior to issuance of this permit. MMS, which is subject NEPA, has prepared an EA and a Finding of No Significant Impact (FONSI) in support of MMS’s approval of Shell’s 2010 exploration drilling program in the Chukchi Sea. See http://www.mms.gov/alaska/ref/EIS%20EA/2009_Chukchi_2010EA/2009_EA2010_Chukchi_EP.pdf; http://www.mms.gov/alaska/ref/EIS%20EA/2009_Chukchi_2010EA/fonsi.pdf

EPA has an independent obligation to issue or deny a PSD permit once a complete application has been submitted. See CAA § 165(c). In reviewing Shells’ permit applications and drafting the permit terms and conditions in the proposed permit, however, EPA staff strove to ensure consistency with and understand MMS’s review and approval of the Exploration Plan for the Lease Sales covered by this permit. In addition to our direct role in Clean Water Act and CAA permits, EPA’s Environmental Review program reviews the EIS that MMS has completed for every level of the leasing process, from the 5-year national plan to individual lease sales. EPA’s review is intended to inform the lead agency of the issues that we believe warrant attention and analysis in the EIS, in addition to EPA’s potential regulatory role in the proposed action. EPA will continue to work closely with and consult with the relevant state and federal agencies on OSC-related issues.

LL CATEGORY – ENVIRONMENTAL JUSTICE

LL.1 Comment: Commenters assert that EPA must conduct an independent environmental justice analysis to determine the environmental implications of Shell's operations and the impact of Shell's activities on the health and welfare of the native communities in the Chukchi Sea and note that EPA has recognized that the Alaskan Natives, a minority population, make up a significantly large portion of the potentially impacted communities. The commenters contend that Shell's operations affect the communities in numerous ways, including contributing to global warming effects that will harm the Arctic and threaten the livelihood of those native communities and resulting in emissions of diesel exhaust, which EPA has recognized has associated human health hazards. The commenters contend that EPA's continued reliance on Shell's compliance with the NAAQS to determine that Shell's air emissions will not harm human health and welfare is insufficient because, although the NAAQS are supposed to protect human health with an adequate margin of safety, the standards often do not. The commenters continue that the evidence suggests that any level of particulate pollution will have human effects and that the PM NAAQS is thus not protective of human health.

Response: EO 12898 (59 Fed. Reg. 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this permitting action will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it does not affect the level of protection provided to human health or the environment. As explained above in EPA response to Comment B.1 the final permit is designed to meet the requirements of the CAA. The emission limits in the permit are expected to curb air pollution sufficiently so that air quality in the region continues to attain the applicable NAAQS. The level of the NAAQS is set low enough to protect public health, including sensitive individuals, with an adequate margin of safety. See CAA § 109(b). Numerous health studies and comments from experts and the public are used in determining the NAAQS level that will be protective of public health. After the level of a NAAQS is set, compliance with the NAAQS is used to assess health impacts. A modeled impact less than the NAAQS indicates that public health is protected, at least for the particular pollutant addressed by the NAAQS. Objections to the NAAQS themselves must be addressed during the NAAQS review process, which occurs every few years.

Furthermore, as described in Section 1 of the Statement of Basis, EPA has satisfied its regulatory obligations regarding public participation through the public notice and comments process, and EPA did not receive comments suggesting EPA has not met all

requirements for public participation in issuing the January 2010 modified proposed permit. The North Slope Communities have been provided the opportunity for involvement in the permit decision-making process as discussed in Sections 1 and 6 of the Statement of Basis.

Section 6 of the Statement of Basis describes several measures EPA has taken to provide meaningful involvement for the environmental justice communities potentially affected by this permit, consistent with the “Region 10 North Slope Communications Protocol” which EPA issued in May 2009. In an effort to engage the potentially affected communities at the beginning of the process, managers of EPA Region 10’s air and water programs conducted early outreach on air and water permitting in May 2009 in Kotzebue and Barrow. EPA also held meetings and conference calls to specifically solicit input on environmental justice concerns related to this permitting action, as well as other potential OCS air permitting actions on the Chukchi and Beaufort Seas. In addition, EPA held public hearings and community meetings on the initial August 2009 proposal and the January 2010 modified proposed permit. At the permit hearing in February 2010 in Barrow, we had access to North Slope Borough teleconference centers, and there were participants calling into the hearing from Point Hope and Kotzebue.

Also, pursuant to Executive Order 13175 issued on November 9, 2000 and entitled, “Consultation and Coordination with Indian Tribal Governments,” Region 10 has sought to provide opportunities for Tribal officials to have meaningful and timely input on both the proposed permit and the modified proposed permit, as described in Section MM below.

MM CATEGORY: GOVERNMENT-TO-GOVERNMENT CONSULTATION AND TRUST RESPONSIBILITY

MM.1 Comment: One commenter states that the United States government has a fiduciary duty and trust responsibilities to the Alaskan subsistence people and that the United States has developed defense projects in Alaska in the past that have had negative impacts on people and wildlife because of PCBs.

Response: EPA acknowledges that the federal government has a trust responsibility to federally-recognized Tribes, including many Alaska Native Villages. EPA believes its actions regarding the proposed OCS/PSD air permit have been consistent with its responsibility to consult on a government-to-government basis with federally-recognized Tribes and Alaska Native Villages. Prior to beginning the public comment period on the August 2009 proposed permit, EPA offered the opportunity for government-to-government consultation to the 12 North Slope Tribal governments on EPA’s proposed action to issue Shell an OCS/PSD permit for exploration drilling on the Chukchi Sea. As requested, EPA held a government-to-government consultation meeting with the Inupiat Community of the Arctic Slope (ICAS) in Barrow on September 23, 2009 and a further consultation meeting with ICAS on February 16, 2010 regarding the January 2010 modified proposed permit. EPA held a consultation with the Native Village of Point Hope on September 24, 2009. EPA has fully considered the issues raised by the Tribes

prior to issuing the final permit to Shell. Thus, EPA is satisfied that it has consulted with the affected Tribes consistent with its trust responsibility while fulfilling its duties under the CAA.

Comments relating to the impacts of PCBs from past projects are outside the scope of the OCS and PSD programs. *Kulluk* EAB Decision, slip op. at 68-69, fn. 66; *In re Knauf Fiber Glass GmbH*, 8 E.A.D. 121, 147 (EAB 1999) (stating that the Board's jurisdiction, and thus review power, is limited, extending only to those issues that are directly related to permit conditions that implement the federal PSD program).

Comments relating to impacts on subsistence activities are addressed in EPA's response to Comment PP.1 below.

MM.2 Comment: One commenter asserts that EPA must schedule a government-to-government meeting with the Native Village of Point Hope before making a final decision on the PSD permit, as mandated by the Executive Memorandum of April 29, 1994 on Government-to-Government Relations with Native American Tribal Governments, Executive Order 13175. The commenter further states that EPA must work with tribal staff to ensure that such a meeting is scheduled far enough in advance and at a reasonable time to permit as many of the Council members to participate as possible.

Response: EPA held a government-to-government consultation with the Native Village of Point Hope on September 24, 2009, and EPA offered the Village an additional government-to-government consultation meeting regarding the January 2010 modified proposed Chukchi OCS/PSD permit. EPA sent several emails and made several phone calls to follow up on the later consultation offer. To date the Native Village of Point Hope has not responded to EPA regarding this consultation opportunity.

NN CATEGORY – ENDANGERED SPECIES ACT

NN.1 Comment: Commenters state that the consultations on just the air emissions from these operations is isolated and insufficient to ensure against the jeopardy of listed species that may be affected by Shell's proposed operations. The commenters therefore encourage EPA to work with MMS, Fish and Wildlife Service (FWS), and the National Oceanic and Atmospheric Administration's National Marine Fisheries (NMFS) in ensuring full compliance with Section 7 of the Endangered Species Act. Acknowledging that MMS is the lead agency, the commenters continue that, while consultation may satisfy procedural obligations, an action agency cannot rely solely on a biological opinion to establish conclusively its compliance with its substantive obligations and that an agency's decision to rely on a biological opinion must not be arbitrary or capricious. The commenters further assert that the agency is also required to reinstate consultation whenever information reveals that the action that "may affect" listed species in a manner or to an extent not previously considered, citing 50 C.F.R. § 402.16(b). The commenters contend that, although biological opinions exist for

the listed species related to oil and gas activities in the Chukchi Sea, none adequately consider the full effects of Shell's planned exploratory activities

Response: EPA is working closely with MMS, FWS and NMFS. MMS, as the lead agency, has been working with the FWS and NMFS (the Services) for many years to ensure that consultations for oil and gas activities in the Chukchi and Beaufort seas are as current, thorough, and accurate as possible. The most recently concluded consultation results are contained in the September 3, 2009, FWS Biological Opinion for Beaufort and Chukchi Sea Program Area Lease Sales and Associated Seismic Surveys and Exploratory Drilling; and the July 17, 2008, NMFS revised Biological Opinion for federal oil and gas leasing and exploration by the MMS within the Alaskan Beaufort and Chukchi Seas. MMS conducted these consultations at the lease sale stage representing a broad range of impacts from potential oil and gas leasing, exploration, and development in the Beaufort and Chukchi Seas and the Services' Biological Opinions provide a thorough and comprehensive analysis of those potential impacts to listed species and critical habitat. Shell's exploration activities in the Chukchi Sea are covered within the scope of these consultations, and any impacts from the exploratory drilling activities authorized by EPA's OCS/PSD permit are not discussed with the Services as an "isolated consultation," but rather as a subset of the broader exploration activities and a closer examination of impacts already considered by the Services.

See also response to Comment NN.2.

NN.2 Comment: The commenters state that the Discoverer's emissions alone include an estimated 22,000 tons of CO₂ per year, and the combined emissions of Shell's operations include significant quantities of PSD pollutants which, the commenters contend, not only will contribute to global climate change and has in turn led to the listing of several Arctic species under the ESA, but may also threaten marine habitat. Additionally, the commenters continue, Shell's proposed operations have great potential to impact ESA listed species. The commenters state that whaling captains and Inupiat elders have long expressed concern that bowhead whales are extremely sensitive to ocean discharges as they have very strong olfactory senses and can easily detect contaminants in the water column and that the deposition of air pollutants from Shell's proposed operations have a strong likelihood of causing bowhead whales to avoid the areas where the pollutants are being deposited. It is not sufficient, the commenter continues, for EPA to rely on consultations for other projects in light of its statutory obligation to ensure that "any action" it authorizes will not "jeopardize the continued existence of any" listed or adversely modify its critical habitat.

Response: As noted in response to Comment NN.1, MMS is the lead agency for ESA Section 7 consultations with the Services regarding oil and gas exploration in the Chukchi Sea. MMS has consulted with NMFS regarding potential impacts to the bowhead whale from a broad range of activities associated with oil and gas exploration. In response, NMFS issued its July 17, 2008, revised Biological Opinion for federal oil and gas leasing and exploration by the MMS within the Alaskan Beaufort and Chukchi Seas. The BO concluded that the proposed activities may adversely affect individual

endangered bowhead, fin and humpback whales, but that the proposed action is not likely to jeopardize the continued existence of these species.²⁰ In addition to relying upon these conclusions to meet its obligation under the ESA, EPA has also analyzed additional factors, including the emission of air pollutants authorized by our permitting action, associated with issuing a Clean Air Act permit to Shell. For instance, as noted in our September 4 and 24, 2009, letters to NMFS, we analyzed issues relating to the duration and extent of exploratory drilling authorized by our permit as well as certain air pollutant emissions and concluded that our actions would have no effect on the listed species beyond those already addressed by NMFS. In its October 26, 2009 letter to EPA, NMFS concurred that the type and concentrations of the air emissions associated with the drilling activity would not have a measurable effect on these species. These and other materials in the record demonstrate that EPA has fully considered and addressed ESA requirements in connection with all air emission issues raised by the comment.

NN.3 Comment: The commenters state that the ramifications of Shell's emissions on the Chukchi Sea environment and the marine life therein must be consulted on with FWS and NMFS before a permit is issued to Shell. The commenters contend that, given the potential impacts of Shell's proposed actions and the need for additional analysis of the fragile Arctic environment, ESA Section 7 consultations should have been completed prior to the comment period on the permit because that is when EPA has the greatest flexibility to address ESA concerns, quoting from the EAB decisions in *In re Desert Rock Energy Company, LLC*, Slip Op. at 39 (EAB Sept. 29, 2009) and *In re Indeck-Elwood LLC*, Slip Op. at 110-110, 13 E.A.D. at __ (EAB Sept. 27, 2006). The commenters request that the EPA explain why it elected not to complete the section 7 consultation process before providing a draft permit for public comment.

Response: At the outset, EPA notes that the EAB did not say that EPA was required to complete ESA consultation prior to the public comment period, but rather the Board suggested it would be optimal to do so. *Indeck*, slip op. at 114. In this case, the ESA consultation process was completed before EPA provided the current proposed permit for public comment. As noted in the supporting Statement of Basis for the January 2010 proposed permit, EPA added additional analysis to the Section 7 consultation process conducted by MMS as lead federal agency. FWS and NOAA concurred with that analysis on September 23, 2009 and October 26, 2009, respectively, and that concurrence completed the consultation process. Thereafter, EPA proposed a new modified OCS/PSD permit for Shell with a comment period open from January 8 through February 17, 2010.

NN.4 Comment: The commenters state that the NMFS's regional biological opinion in July 2008 for oil and gas leasing and exploration and the similarly broad FWS regional biological opinion covering lease sales, seismic surveys, and exploration drilling for polar bears and spectacled and Steller's eiders are insufficient. The

²⁰ Such a determination may be granted only if an activity would have no more than a negligible effect on the species or stock in question, would not have unmitigable adverse impact on the availability of the marine mammal for subsistence uses, and if the permissible method of taking and requirements pertaining to the monitoring and reporting of such takings are set forth to ensure the activity will have the least practicable effect on the species or stock and its habitat.

commenters state that although NMFS concludes that jeopardy is not likely to occur based on a consideration of potential effects at the programmatic level, the BO also notes that there is the possibility of greater harm from site-specific exploration activities, including icebreaker operations and drilling and acknowledges that NMFS could not fully estimate the potential effects of added industrial noise in the Chukchi Sea and or the potential effects of an oil spill. The FWS Biological Opinion similarly provides only a general analysis, covering hypothetical oil and gas activities in both seas over a 12-year period. The commenters contend that the existing NMFS and FWS biological opinions do not satisfy EPA's legal obligations and that, before approving Shell's permit, EPA must ensure that consultation takes place for the specific exploration plan now at issue or the agency risks violating its procedural and substantive responsibilities under the ESA.

Response: See response to Comment N.N.2 and as noted in our discussions with the Services, the actual amount of exploratory drilling that can occur is limited by the MMS' approval of any exploration plan for any year that Shell requests approval. EPA believes MMS must re-initiate consultation with the Services before approving any EP that allows exploration activity outside the scope of the activity already consulted on and as otherwise required under applicable ESA regulations. As provided in 50 C.F.R. § 402.16, re-initiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if, among other things, the agency action is subsequently modified in a manner that causes an effect to listed or critical habitat not considered in the Biological Opinions.

OO CATEGORY – BASELINE DATA

OO.1 Comment: Numerous commenters state that there is the need for additional baseline data, environmental and wildlife monitoring and filling data gaps before future oil and gas exploration and development is allowed in this area and that the lack of baseline scientific information remains an ongoing concern. Commenters also state that there was not adequate baseline data to support decisions made by the past administration that allowed development of the Chukchi Sea to go forward and these decisions should be reconsidered. One commenter noted that the State of Alaska expressed similar concerns about the lack of baseline data for the Chukchi Sea in its final Alaska Coastal Management Program Consistency Response for Chukchi Sea Lease Sale 193. These commenters assert that, without baseline information, wildlife, ecosystem, and environmental impacts cannot be measured and that the ecosystem and species are threatened.

Response: This permit is issued under the authority of the OCS regulations, 40 C.F.R. Part 55, and the PSD program, 40 C.F.R. § 52.21. The PSD program specifies the baseline air quality data and related analysis that is required prior to issuance of a PSD permit. See 40 C.F.R. § 52.21(k), (m), and (o). As discussed in Section 5 of the Statement of Basis and in response to Comments Z.1.a and Z.2.b above, EPA has determined that Shell has met the requirements to have representative background air quality data as necessary to assess ambient air quality in the area that is expected to be

affected by Shell's exploratory operations. While other baseline data may be useful or helpful in connection with other regulatory decisions related to Shell's exploration drilling operations in the Chukchi Sea, no other baseline data is required prior to issuance of this OCS/PSD permit. Baseline data required for other regulatory determinations is outside the scope of this PSD permit action.

PP CATEGORY – IMPACT ON LOCAL COMMUNITIES, SUBSISTENCE ACTIVITIES, AND TRADITIONAL USE

PP.1 Comment: EPA received many comments on the impacts of Shell's exploration drilling activities on local communities, subsistence activities, and traditional use. The comments include the following:

- The NWAB Assembly has expressed their opposition to OCS development and leasing through issuance of a resolution. This resolution emphasizes the importance of subsistence activities to the Inupiat way of life.
- The NWAB is concerned about the potential impacts of new sources of pollutants, such as those associated with this permit, compounded with existing sources of air pollution, including long-distance transport of pollutants to Arctic areas. In addition to actual risks, the perception of risks to subsistence resources can result in impacts to the Arctic, especially if such a perception leads to a substitution of less nutritious western foods.
- North American salmon stock, the food stock of seals and other Arctic animals, is located in the waters where the OCS exploration is proposed. If the fisheries are destroyed, the local community will have no food source. Families not only depend on subsistence hunting of bowhead whales, walrus, seals, polar bears, and beluga whales as a source of healthy food, but also as a way of sustaining and celebrating culture, heritage, and ties with the community. Conflict avoidance agreements need to be thought through very carefully with respect to the different villages and the animals they harvest.
- It is important that future generations are able to hunt like their parents and grandparents did. The whaling season is May – June, and the ships could interfere with the hunters.
- Tribal employment rights ordinances require the use of local businesses to gather information and establish baseline information. The tribes are 75% unemployed and the permit should be denied unless there is commitment to use local businesses and workers.
- The Chukchi Sea has great cultural significance for the Inupiat who hunt and fish in this area and we have previously experienced oil and gas activities in the Arctic that caused direct conflicts with subsistence activities and the resources that have sustained the Inupiat people since time immemorial.

- Areas that are important to Inupiat subsistence activities and cultural preservation are put at risk by offshore oil and gas activities and require careful review. North Slope governments and citizens are rightfully concerned about the potential health impacts associated with oil and gas development.
- Native whaling captains and their communities rely on the health of the Chukchi and other seas to provide for marine life, which in turn sustain the people and their culture.
- There is not sufficient infrastructure to support this development and no information to guide where the infrastructure should be based.
- The noise from oil and gas activities, such as the drill rig, the support vessels, and the aircraft, and the construction of mud cellars, affects the migration of mammals and fish that migrate to the Chukchi Sea.

Response: EPA understands the sincere concerns expressed regarding the potential impacts from Shell's exploratory operations to the Inupiat subsistence hunting and fishing and interference with the traditional lifestyle. As explained in EPA's response to Comments B.1 above, EPA analysis indicates that this project, as regulated by the terms and conditions in the final permit, will not cause or contribute to a violation of any currently applicable NAAQS or exceed any applicable increment. Since NAAQS are established to protect public health and welfare, the project is not expected to have an adverse impact upon public health or welfare. Issues such as impact on subsistence hunting and fishing and on employment are outside the scope of the PSD program. *Kulluk* EAB Decision, slip op. at 68-69, fn. 66; *In re Knauf Fiber Glass GmbH*, 8 E.A.D. 121, 147 (EAB 1999) (stating that the Board's jurisdiction, and thus review power, is limited, extending only to those issues that are directly related to permit conditions that implement the federal PSD program).

However, EPA notes that there are other regulatory programs in place to address the commenter's concerns in this regard. *Kulluk* EAB Decision, slip op. at 68-69, fn. 66. For example, in the Finding of No Significant Impact (FONSI) developed by the MMS for Shell's 2010 Offshore Exploration Drilling Program, and in its approval letter for the exploration plan, for example, the MMS did consider the effect and impacts of Shell's exploration activities on subsistence activities and the Inupiat culture and way of life; risk of oil spills and their potential impacts to area fish and wildlife resources; disturbance to bowhead whale migration patterns; harassment and potential harm to wildlife from noise, discharges, and vessel operations; impacts to threatened and endangered species; and local economic effects. See Finding of No Significant Impact, dated December 7, 2010, for Shell Gulf of Mexico, Inc. 2010 Exploration Drilling Program, Burger, Crackerjack, and SW Shoebill Prospects, Chukchi Sea Outer Continental Shelf, Alaska,

http://www.mms.gov/alaska/ref/EIS%20EA/2009_Chukchi_2010EA/fonsi.pdf;

Letter from Jeffrey Walker, MMS, to Susan Childs, Shell, dated December 7, 2009, re: Shell's 2010 Outer Continental Shelf Exploration Plan, OCS Lease Sale 193, Burger,

QQ CATEGORY – HEALTH IMPACTS AND GENERAL AIR QUALITY CONCERNS

Comment: EPA received numerous comments raising concerns about the health impacts of Shell’s exploration drilling operations and general air quality concerns. These comments include:

- The communities affected by emissions from this project live in isolated areas, enjoy a lifestyle and diet that is radically different from other United States populations, have markedly higher rates of pulmonary disease as compared to the general U.S. population, and may have genetic predispositions to diseases that differ from other United State’s populations. A human health impact assessment and more thorough ambient air modeling and baseline emissions assessments are needed to ensure that human health is protected. Such analysis should acknowledge the abundant public health data that demonstrate that vulnerable populations such as those along the North Slope experience disproportionately high mortality rates.
- The residents of Nuiqsut, Alaska have the highest rates of asthma, a direct result of air pollutants from Prudhoe Bay. No one has submitted a report on air quality effects to Nuiqsut.
- There is offshore drilling in Russia, Greenland, Canada, and Norway and at the same time there is increased traffic because the Northwest Passage route has opened up. The cumulative impacts need to be considered.
- Prior oil and gas operations have impacted air quality in this area as is evidenced by the fact that ozone levels and the levels of ozone precursors (VOC and NOx) in the area where oil and gas operations are currently located are higher than the levels that have been collected at the Wainwright monitoring site.
- The North Slope is especially susceptible to air emissions impacts because there are no trees to help clean the air like there are in other areas of Alaska.
- The March 2008 Arctic Climate Impact Assessment Commission commented that models predict greater warming in the Arctic than the rest of the world and that the State of Alaska is not prepared and informed on the changes of the global climate, especially in the Arctic. The commission also supports an establishment of a regulatory regime that will prevent unrestricted exploration and exploitation of marine species until sufficient research has been conducted.

- Because of air pattern flows of contaminants and the magnetics and jet streams of the Arctic, a lot of the air pollution stays up in the Arctic and does not go anywhere.
- The communities do not have adequate resources to deal with the existing air quality impacts in the area, and this permit would allow additional emissions in the area. There are limited resources to deal with the health impacts of air pollution, which is compounded by rotating providers.
- Emissions from the flaring of the gases in the area and the resulting increased particulate matter need to be limited.
- The long distance transport of air pollution to the Arctic is not fully understood and will be compounded by the additional pollution from this proposed project.
- The communities' health should be the priority and then the development if it is safe for the communities.
- The oil companies are in this for the money and they will come and get the resources and then leave behind the health and environmental effects from their activities. This is our home. The people of Nuiqsut lived there first before the oil fields were there, and they should get the benefits, not the ones who are just visiting.

Response: EPA shares the commenters' concerns with the importance of good air quality and understands the expressed concerns about the air quality in the commenters' communities. Criteria pollutants are those pollutants for which EPA has established NAAQS. Primary NAAQS set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly, with an adequate margin of safety.

The maximum projected air quality impacts of the proposed project combined with background air quality (ambient air quality measurements assumed to be representative of the existing air quality in the project area due to general industrial development on the North Slope) are less than the currently applicable NAAQS as well as applicable increments. Project impacts on air quality in or near the Villages of Point Lay and Wainwright, the two nearest villages to Shell's leases in Lease Sale 193, will be substantially less than the project's maximum impacts which occur in the outer OCS. Thus, the proposed project is not expected to cause or contribute to a violation of the current health-related air quality standards. Since this project will not cause or contribute to a NAAQS violation and since NAAQS are established to protect public health, the project is not expected to have an adverse impact upon public health.

To the extent the comments raise concerns with respect to air pollution control practices and requirements at other facilities, they are outside the scope of this OCS/PSD permit action.

See response to Comments RR relating to water quality concerns.

RR CATEGORY – CLEAN WATER ACT

RR.1. Comment: EPA received several comments on issues relating to Shell's request for authorization for coverage under the Arctic General Permit (AKG-28-0000) for exploration activities in the Chukchi Sea, including the following:

- A request that EPA hold a clearly defined, formal public comment period on Shell's notices of intent (NOI) to be covered by the Arctic General Permit and that EPA respond to all comments received on the NOIs.
- Shell must complete a drilling fluid plan before a public comment permit on the NOIs is commenced.
- Shell's Best Management Practices (BMP) Plans should be made available for public review.
- EPA must disapprove the NOIs because the proposed discharges would violate the Clean Water Act as they would cause undue degradation to the marine environment and interpreting the general permit to allow these discharges is inconsistent with the letter and the spirit of the Clean Water Act.
- EPA should reject Shell's application for coverage under the general permit and require Shell to apply for an individual permit for its drilling because the scope of the discharges from Shell's proposed activity exceeds that analyzed in the general permit and the thermal discharge from cooling water alone entails a significant contribution of pollutants warranting an individual permit.
- Allowing the proposed discharges would violate the EPA's duty to assure that the marine environment is not unreasonably degraded because many aspects of Shell's proposed drilling discharges exceed the scope of EPA's analyses at the time it issued the general permit.
- There are additional threats from the barge industry and travel industry, which have a record of dumping trash in our waters.

Response: EPA understands that the North Slope Communities have a number of concerns regarding the potential for water quality-related impacts associated with Shell's off-shore operations. Water quality comments and concerns, however, are outside the scope of the PSD program. See response to Comment PP.1.

Other programs are in place to address these concerns. EPA issued the Arctic Exploration NPDES General Permit (Arctic Exploration GP) in June 2006, expiring on June 22, 2011. It covers oil and gas exploration activities in the Beaufort and Chukchi lease sale areas as well as Hope Basin and northern Norton Basin. The Arctic Exploration GP authorizes discharges in both state and federal (Outer Continental Shelf)

waters. EPA is planning to reissue the Arctic Exploration GP into two separate general permits, one for the Beaufort Sea and one for the Chukchi Sea. The proposed Chukchi General Permit will authorize discharges from exploration activities in federal waters and Beaufort General Permit will cover exploration activities in both state and federal waters. The Chukchi and Beaufort General Permits will be issued concurrently and will have coordinated Endangered Species Act consultation, tribal consultation, and public reviews. More information about the current and proposed Arctic Exploration GPs can be found at:

<http://yosemite.epa.gov/R10/WATER.NSF/NPDES+Permits/General+NPDES+Permits#Oil%20and%20Gas>

RR.2. Comment: Commenters requested that EPA clarify the amount and type of sewage that will be incinerated in the Discoverer's incinerator versus treated by the marine Sanitation Device and discharged overboard as described in Shell's NPDES Notice of Intent and stated that they have requested additional information on the type and treatment levels achieved by the Marine Sanitation Device in comments on the NPDES permit.

Response: Shell's application indicated that they would be incinerating sewage generated on board the Discoverer. As a result, the permit does not prohibit incineration of sewage, but Condition K.6 restricts incineration of "all waste" to 50,400 tons during any rolling 12-month period and the emission inventory and modeling analysis is premised on worst-case emission factors for all waste types. Thus, Shell could incinerate up to 50,400 tons of sewage during any 12-month period, as long as Shell complies with all other permit terms and conditions. Note that during the application processing period, Shell advised EPA that Shell no longer planned to incinerate sewage sludge on board the Discoverer, but Shell did not request changes to the permit to reflect this. Email from Roger Steen, Air Sciences, to Pat Nair, EPA, re: Disposition of Discoverer sewage sludge, dated June 12, 2009. No changes to the permit were needed because the existing permit conditions, which assume the incineration of up to 50,400 tons of sewage during any rolling 12-month period, comply with OCS and PSD requirements.

See also response to Comments L.1 and L.2.

SS OIL SPILLS AND SEISMIC ACTIVITIES

SS.1 Comment: Several commenters expressed concerns with the potential for leaks and oil spills associated with oil and gas activities on the ocean ecosystem and the impact of associated seismic activities on ocean wildlife. Some commenters state that federal agencies have in the past suppressed environmental impact information associated with oil and gas exploration and expressed concern with it happening again. Other commenters state that oil spill response capabilities and infrastructure have not been shown.

Response: Comments and concerns with oil spills and seismic activities are outside the scope of the PSD program. See response to Comment PP.1

III. OTHER CHANGES TO THE FINAL PERMIT

In addition to the changes made to the permit to address the comments, as discussed in Section II above, EPA has made the following additional changes in the final permit for the reasons discussed below.

Condition A.6 contains provisions for revision, termination, or revocation and reissuance of the permit. EPA has added language to clarify that a request by the permittee for modification, revocation and reissuance, or termination or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

Condition A.9 includes general recordkeeping requirements, including a record retention requirement of five years. EPA has added a requirement to keep copies of all reports and certifications submitted pursuant to the permit and the locations where samples were taken.

Condition A.14 is a new condition that clarifies the permittee's obligation to furnish EPA, within a reasonable time, any information EPA requests in writing to determine whether cause exists to modify, revoke and reissue, or terminate the permit or to determine compliance with the permit and, upon request, to furnish EPA with copies of records required to be kept by the permit.

Condition B.7 contains general testing requirements related to how the stack tests must be conducted and procedures for approval of an alternative to or a deviation from a reference test method. EPA has added provisions to make explicit EPA's authority to require stack testing in addition to that required by the permit (B.7.14); set a time frame for the submission of a test plan in the event of such a request (B.7.2); state that EPA can agree to different time frames for the submission of a test plan (B.7.2); clarify that retesting may be conducted without resubmitting the plan provided it is conducted in accordance with the previously submitted plan (B.7.2); clarify that stack testing must be conducted at a point or points that characterize the actual discharge into the ambient air (B.7.4); and clarify the authority for the permittee to request and EPA to approve an extension to a stack test deadline.

Condition B.11 requires the use of good air pollution control practices for minimizing emissions. EPA has added language requiring the permittee to keep records of any maintenance that would have a significant effect on emissions and a copy of either the manufacturer's or the operator's maintenance procedures.

Miscellaneous Changes: EPA has also added a permit issuance date, corrected typographical errors, renumbered to accommodate added provisions, and made minor editorial changes for consistency.

