

Exhibit 6

U.S. Environmental Protection Agency Region 10, Supplemental Statement of Basis for Proposed Outer Continental Shelf Prevention of Significant Deterioration Permits Noble Discoverer Drillship, Shell Offshore Inc., Beaufort Sea Exploration Drilling Program, Permit No. R10OCS/PSD-AK-2010-01, Shell Gulf of Mexico Inc., Chukchi Sea Exploration Drilling Program, Permit No. R10OCS/PSD-AK-09-01
(July 6, 2011)

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

**SUPPLEMENTAL STATEMENT OF BASIS
FOR PROPOSED
OUTER CONTINENTAL SHELF
PREVENTION OF SIGNIFICANT DETERIORATION PERMITS
NOBLE DISCOVERER DRILLSHIP**

**SHELL OFFSHORE INC.
BEAUFORT SEA EXPLORATION DRILLING PROGRAM
PERMIT NO. R10OCS/PSD-AK-2010-01**

**SHELL GULF OF MEXICO INC.
CHUKCHI SEA EXPLORATION DRILLING PROGRAM
PERMIT NO. R10OCS/PSD-AK-09-01**

Date of Proposed Permit: July 6, 2011

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As discussed above, Region 10 received petitions challenging the 2010 Permits on several grounds, including Region 10's determination of when the Discoverer becomes an OCS source. Following briefing of all issues raised in the petitions and oral argument on the OCS source issue and two additional issues, the Board issued Remand Order I on December 30, 2010. The Board remanded the permits to Region 10 because, among other things, the Board determined that the Region had not included in the administrative record a reasoned explanation of its OCS source determination. The Board also concluded that the OCS source determination in the 2010 Permits improperly delegated to Shell the determination of when the Discoverer becomes an OCS source and thus subject to regulation under CAA § 328. Remand Order I at 8. The Board particularly noted that the Region had failed to analyze how its interpretation of 40 CFR § 55.2 is informed by the terms of CAA § 328 or OCSLA § 4(a)(1).

2.2.3 The Discoverer's Anchoring Process at a Drill Site

The Discoverer is a turret-moored drillship that is able to move under its own power. During transit, it is propelled by a 7,200 horsepower (hp) Mitsubishi engine. The drillship uses a Sonat Offshore Drilling turret mooring system that provides the ability for the drill rig floor to remain stationary while the vessel itself may rotate, allowing the vessel bow to be oriented into the wind. Exploration Plan 2009, pp 6-7 and Attachment A; United States Patent No. 4,509,448; Mooring Process for the Nobel Discoverer Drillship, Operations Guideline, dated April 21, 2011 (Mooring Operations Guideline), at 5. The mooring system uses a set of 8 mooring lines, buoys and anchors which are radially located around the drillship.

Based on information submitted by Shell following issuance of the Remand Orders, the Discoverer will now be anchored at a drill site using a significantly different process than the process described by Shell in its application for the 2010 Permits and on which those permits were based. The previous application materials submitted by Shell in 2009 stated that the Discoverer would transit to a drill site powered by the Discoverer's propulsion engine. When the Discoverer reached the approximate location of the drill site, the icebreaker/anchor handler (Icebreaker #2) would be used to attach mooring lines from the Discoverer to the seabed. Once there were enough mooring lines out to control the position of the vessel with the mooring lines, the Discoverer would be put into position and mooring lines adjusted. Once the Discoverer was positioned and the anchor lines were re-tensioned at the drill site, the Discoverer's on-site Shell representative would declare that the Discoverer is "secure and stable in a position to commence activity at the well location," an event that is recorded in log books on the Discoverer. Shell advised Region 10 that the propulsion engine would not be used after the Discoverer was declared "secure and stable in a position to commence activity at the well location." See Letter from Susan Childs, Shell, to Rick Albright, Region 10, re: Shell Gulf of Mexico, Inc., Supplemental Application for the Discoverer/Chukchi OCS/PSD Permits, dated December 13, 2009. When the Discoverer prepared to depart from the drill site, the process would be reversed – anchors would be de-tensioned and then the anchor lines released. *Id.*

In supplemental information submitted by Shell on April 22, 2011 after issuance of the Remand Orders, Shell stated that "[f]ollowing a re-evaluation of the location, the mooring system, and anchor laying procedure for the [] Discoverer, the process of pre-laying the anchors has been

adopted.” Mooring Operations Guideline, at 4. The pre-laying process calls for Icebreaker #2 to proceed to the drill site ahead of the Discoverer and to position each of the 8 anchors, conduct a holding test for each anchor, and mark each anchor with a buoy. Each anchor will have two wires, one for later connection to the Discoverer and the other for connection to the surface buoy marking the anchor location. The Discoverer will transit to the general location of the drill site under its own power. When approximately one mile from the drill site, the Discoverer will turn off its propulsion engines and thereafter be towed by one of the Icebreaker/Anchor Handlers authorized under the permits (Icebreaker #1 or #2). The Discoverer’s propulsion engine will be available on standby in case of an emergency that requires the Discoverer to be moved from the drill site. The Icebreaker will then tow the Discoverer to the drill site and position the Discoverer at the “drilling” position center of the buoy pattern. The Discoverer will then drop its ship’s anchor and, once that anchor is secure, the Discoverer would detach from the icebreaker. The Icebreaker will then proceed to connect the Discoverer to each of the 8 mooring anchors. The Discoverer’s ship’s anchor will be raised and retrieved after the Discoverer is attached to the seabed by four of the 8 mooring anchors. Shell explains that pre-laying the anchors in this manner is operationally preferable to laying the anchors when attached to the Discoverer because the pre-positioned anchors are secured in advance, which eliminates the potential for error in securing and setting the anchors directly from the Discoverer. Mooring Operations Guideline at 4.¹¹

When vacating a drill site, the process is reversed. The ship’s anchor is deployed after four of the 8 mooring anchors are retrieved, next the remaining four mooring anchors are retrieved, then the ship’s anchor is retrieved and raised, and, finally, the Discoverer starts its main propulsion engines and transits to within one mile of the next location where the anchoring process is repeated. Mooring Operations Guideline at 12.1 (transmitted by email from Mark Shindler, Shell consultant, to Doug Hardesty, Region 10 re: Mooring Process for the Noble Discoverer Drillship, dated May 30, 2011).

2.2.4 Region 10’s Proposed Determination of When the Discoverer Becomes an OCS Source

As explained above, Shell has submitted supplemental application materials explaining that Shell proposes to use a different process for securing the Discoverer at the drill site by “pre-laying” 8 anchors. Region 10 has carefully reviewed the information submitted by Shell about this new process in light of the statutory and regulatory definitions of OCS source and the policy and legislative history behind CAA § 328 and OCSLA § 4(a)(1), as directed by the Remand Order. Based on this review and analysis, Region 10 proposes to consider the Discoverer as an OCS source, subject to CAA § 328 requirements, from the time it is attached to the seabed by a single

¹¹ In a March 9, 2011 letter, Shell states that it does not concede that considering the Discoverer to be an OCS source when attached to the seabed by a single anchor is authorized by EPA’s definition of OCS source, but that it is willing to accept the “one anchor down” test as an analogue to an “owner requested limit” for the purposes of these permits only, in order to minimize delays in the remand proceedings. Shell March 9, 2011 Letter at 2-3.

anchor at a drill site, which will first occur when the ship's anchor is secured at a drill site, until the last anchor is detached at the drill site. We believe this interpretation, in the context of this specific permitting action, is consistent with the relevant statutes and regulations applicable to this specific permitting action for the reasons explained below.

The statutory definition of OCS source in the CAA specifies that a source can engage in a wide range of activities, including but not limited platform and drillship exploration, construction, development, production, processing, and transportation. EPA's regulatory definition of OCS source with respect to vessels requires that a vessel be "permanently or temporarily attached to the seabed and erected thereon and used for the purpose of exploring, developing or producing resources therefrom, as those terms are used in Section 4(a)(1) of OCSLA." 40 CFR § 55.2 (emphasis added). As discussed above, OCSLA § 4(a)(1) uses the same three terms or phrases ("attached," "erected," "used for the purpose of"), but with different phrasing: "permanently or temporarily attached to the seabed, which may be erected thereon for the purpose of exploring for, developing or producing resources therefrom" (emphasis added).

Region 10 believes that, as in OCSLA § 4(a)(1), the reference to "erected thereon" in 40 CFR § 55.2 is intended to reflect the process by which a vessel becomes attached to the seabed and used thereafter for the purpose of exploring, developing, or producing resources from the seabed. As the Board noted, there is no discussion in the legislative history for CAA § 328 or OCSLA § 4(a)(1) of "erected" in the context of defining what is an OCS source or the reach of OCSLA § 4(a)(1). And there is no indication in either the proposed or final OCS regulations that EPA intended that the terms "attached to the seabed," "erected thereon," and "used for the purpose of" be used in any way different or given any different meaning from the way those terms are used in OCSLA § 4(a)(1). To the contrary, the preamble to the final OCS regulation indicates that the language was intended to cover vessels meeting two requirements, that they be attached to the seabed and used for the specified purpose:¹²

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 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).

¹² This provision was not included in the proposed 40 CFR Part 55, but was instead added to the definition of OCS source at promulgation of the final rule.

In this context, Region 10 believes (1) that the Discoverer is “attached to the seabed” when it is attached to the seabed by at least one anchor, and (2) that the Discoverer is “erected [on the seabed]” when that attachment occurs at the location where the Discoverer may be used for the purpose of “exploring, developing, or producing resources [from the seabed].” This is because the verb “to erect” generally means “to construct” or “to build,” definitions that generally suggest an intention that the activity be conducted according to some plan or specification. See The American Heritage® Dictionary of the English Language (definitions of erect, construct, and build); Merriam Webster (same). Requiring that the attachment to the seabed occur at the location where the OCS activity will (or is reasonably expected to) be conducted ensures that the attachment to the seabed is related to, and for the purpose of, engaging in a systematic, planned activity as an OCS source, and not, for example, for the purpose of waiting out a storm or anchoring in a harbor to get supplies. These interpretations of “attached” and “erected” are also consistent with the language of OCSLA § 4(a)(1), which used the phrase “which may be erected thereon” more as an explanatory phrase than as a separate requirement from attachment.

With respect to the criterion that the Discoverer be “used for the purpose of exploring, developing or producing resources,” after further consideration of the issue, Region 10 believes that this criterion is met by the fact that the Discoverer is a drillship. Although the phrasing “used for the purpose of” could indicate a requirement that the Discoverer be actively exploring for resources in order for that criterion to be met, Region 10 believes such an interpretation is too narrow to be reasonable and is contrary to Congress’s intent. According to common parlance, a hammer is a tool that is “used for the purpose of” hammering even when it is not in fact hammering a nail or other object. Similarly, Region 10 believes a drillship such as the Discoverer is clearly a vessel “used for the purpose of exploring, developing, or producing resources” even when it is not in fact engaged in the actual drilling of MLCs or drilling for oil. Its attachment to the seabed at a drill site confirms that the vessel is intended to be used for the purpose of exploring, developing, or producing resources from the seabed.

This interpretation of the regulatory definition of OCS source with respect to vessels is consistent not only with OCSLA § 4(a)(1), but also with the statutory definition of OCS source in the CAA. In Section 328(a)(4)(C), Congress specifically stated that the activities of an OCS source include construction. Congress’s direction that construction activity be considered part of an OCS source indicates Congress’s intent that the definition of OCS source be given an expansive meaning and is inconsistent with an interpretation that would require that construction of the source be fully completed and actually engaged in drilling activities before being considered an OCS source.¹³

¹³ Region 10’s interpretation of 40 CFR § 55.2’s cross-reference to OCSLA § 4(a)(1), and its application to the Discoverer, is also consistent with regulations promulgated by the MMS, now the Bureau of Ocean and Energy Management, Regulation, and Enforcement (BOEMRE), under OCSLA. Those regulations define “facility” as “all installations or devices permanently or temporarily attached to the seabed. They include mobile offshore drilling units (MODUs), even while operating in the ‘tender assist’ mode (i.e. with skid-off drilling units) or other vessels engaged in drilling or downhole operations.” 40 CFR § 250.105. Cf. *Alliance to Protect Nantucket Sound, Inc. v. United States Dep’t of the Army*, 398 F.3d 105, 109 (1st Cir. 2005) (interpreting the “which may be erected” clause in OCSLA § 4(a)(1)).

In sum, based on the analysis discussed above, Region 10 proposes to consider the Discoverer an OCS source when it is attached to the seabed by at least one anchor at a drill site. This proposal is consistent with the regulatory definition of OCS source in 40 CFR § 55.2, which in turn is consistent with CAA § 328 and OCSLA § 4(a)(1) given the purpose and legislative history of these statutes. In reaching this conclusion, Region 10 notes that vessels used for oil exploration and production (not to mention OCS vessels used for other purposes) vary greatly in configuration. Therefore, Region 10's proposal in this case that the Discoverer is an OCS source as defined in 40 CFR § 55.2 when attached to the seabed by a single anchor at a drill site does not necessarily resolve when other types of vessels or drill rigs become OCS sources, an issue that will vary to some extent depending on the factual differences in the equipment used to carry out the OCS activity and the particular project.

The effect of this proposed change in when the Discoverer is considered an OCS source on permits terms and conditions and emissions is discussed in Section 3.1 below.

2.3 Applicability of Requirements that Became Effective After Issuance of the 2010 Permits

In remanding the 2010 Permits to Region 10, the Board directed Region 10 to apply “all applicable standards in effect at the time of issuance of the new permits on remand.” Remand Order I at 82; Clarification Order at 24. Since the 2010 permits were issued, three additional PSD requirements have come into effect:¹⁴

- promulgation of a new 1-hour NO₂ NAAQS, which became effective on April 12, 2010 (75 Fed. Reg. 6474, February 9, 2010);
- promulgation of a new 1-hour SO₂ NAAQS, which became effective August 23, 2010 (75 Fed. Reg. 35520, June 22, 2010); and
- promulgation of regulations requiring control of GHGs from automobiles, which make GHGs subject to regulation under the CAA and subject to PSD requirements applicable to GHGs as of January 2, 2011. See 75 Fed. Reg. 17004 (April 2, 2010). To implement this requirement, EPA revised the definition of “regulated NSR pollutant” to include GHGs, along with promulgating provisions tailoring the applicability criteria that determine which stationary sources and modification projects become subject to PSD permitting requirements for GHGs. See 75 Fed. Reg. 31514 (June 3, 2010).

There have also been some changes to the COA regulations, although the changes to the permit terms and conditions required to address the COA changes are minimal.

The EAB recognized the Agency's discretion to determine whether a specific standard is “applicable” on remand. See Clarification Order at 24. In this case, changes made in response to the EAB Orders and additional changes requested by Shell required additional air quality and

¹⁴ Although EPA has promulgated PM_{2.5} increments since issuance of the 2010 Permits, the requirement to demonstrate compliance with PM_{2.5} increments does not come into effect until October 20, 2011. See 75 Fed. Reg. 64899, 64877, 64898-99 (October 20, 2010).

other technical analyses and resulted to changes in numerous permit conditions. Given the extent of these changes, Region 10 believes it is appropriate to require that the 2011 Revised Draft Permits meet all new requirements that have come into effect since issuance of the 2010 Permits. As discussed in more detail below, the 2011 Revised Draft Permits meet these requirements.

3 CHANGES IN PROJECT EMISSIONS AND PERMIT TERMS AND CONDITIONS

3.1 The OCS Source

As discussed in Section 2.2 above, Region 10 proposes that the Discoverer be considered an OCS source when attached by at least one anchor at a drill site. The 2011 Revised Draft Permits have been revised accordingly.

This change does not increase the PTE of the Discoverer and the Associated Fleet because the total number of operating days has been reduced from 168 to 120 and the anchor setting and retrieval is counted in that 120 day period. Total emissions under the 2011 Revised Draft Permits have been reduced significantly as compared to the 2010 Permits. Emissions during anchor handling have been modeled and determined to be less than the worst case operating scenario, which occurs during MLC drilling.

Note that, as under the 2010 Permits, Condition D.1 prohibits operation of the Propulsion Engine (FD-7) while the Discoverer is an OCS source.

3.2 Coast Guard Safety Zone

The air quality analysis submitted by Shell modeled emissions from the Discoverer beginning 500 meters from the center of the Discoverer and assumes that the Coast Guard will impose a safety zone of this distance around the Discoverer to exclude the public from the area in which the Discoverer's anchor array will be deployed and in which Shell will be conducting its main operations. See Shell March 18, 2011 Submittal at 38, n. 15. Shell has agreed that Region 10 will include in the 2011 Revised Draft Permits a requirement that Shell have in place during all times of operation as an OCS source a safety zone of at least 500 meters within which the Coast Guard prohibits public access. Shell has also stated in its application materials that Shell will develop in writing and implement a public access control program to locate, identify and intercept the general public by radio, physical contact, or other reasonable measures to inform the public that they are prohibited by Coast Guard regulations from entering the area within 500 meters of the Discoverer. Region 10 has included these provisions as consistent with Shell's demonstration that emissions from their exploratory operations will not cause or contribute to a violation of the NAAQS or applicable increment in any location that constitutes ambient air.

Thus, Shell’s permit application demonstrates that it complies with the PSD regulations, regardless of EPA’s ultimate decision about the point of compliance.¹⁵

3.3 Drillship Name Change

Due to a change in ownership of the Discoverer in the summer of 2010, the name of the vessel changed from the Frontier Discoverer to the Noble Discoverer.¹⁶ As a result, Region 10 made several changes though out the draft permits to change the name of the drillship from Frontier Discoverer to Noble Discoverer.

3.4 Drill Site Notification

Region 10 has increased the time for giving prior notice of the location at a drill site from 10 days to six months. Although there are currently no other permitted exploratory drilling operations in the OCS north of Alaska, Region 10 is aware of additional permit applications for activity that could potentially operate in the Beaufort or Chukchi Seas. Region 10 intends to require all permitted operations to notify Region 10 regarding their anticipated drilling locations far in advance of each drilling season (six months) so that Region 10 can evaluate whether there is a need for additional air quality impact analyses.

3.5 Restrictions on Duration of Exploration Operations

Shell requested a reduction in the number of days the Discoverer is authorized to operate as an OCS source from 168 days during any rolling 12-month period to 120 days during any drilling season, as well as a one-month reduction in the drilling season (from July 1 to November 30). Shell based its air quality analysis on the 120-day limit on OCS activity and its requested drilling season. This reduction in the duration of exploration operations results in a substantial overall decrease in air pollutants authorized under the permit. Because this restriction is designed to ensure compliance with the NAAQS and because the annual NAAQS are set based on calendar years, the restriction can similarly apply on a calendar year basis (or, in the case of these permits, a drilling season which is limited by the permit to a specific 5 month period out of any calendar year). The decrease in the duration of exploration operations has resulted in a reduction in the annual NO_x emission limits for most sources.

Shell also requested restrictions on the type of activity conducted during the 120-day period of operations. Emissions are highest during the drilling of MLCs and Shell’s air quality analysis is

¹⁵ Ambient air is defined as “...that portion of the atmosphere, external to buildings, to which the general public has access.” 40 CFR § 50.1(e). Ambient air does not include atmosphere over land owned or controlled by a source and to which the public access is precluded by a fence or physical barrier. See Letter from Douglas M. Costle, EPA Administrator to The Honorable Jennings Randolph, re: Ambient Air dated December 19, 1980; Letter from Steven C. Riva, EPA Region 2, to Leon Sedefian, New York State Department of Conservation, re: Ambient Air for the Offshore LNG Broadwater Project, October 9, 2007.

¹⁶ Noble Corporation Press Release. Noble Corporation Closes Acquisition of Frontier Drilling. July 28, 2010. <http://phx.corporate-ir.net/phoenix.zhtml?c=98046&p=irol-newsArticle&ID=1453351&highlight>

based on the limited duration of this activity. Shell therefore requested an operational limit on “MLC activity” to 480 hours during any drilling season. “MLC activity” is defined as any time any MLC engine (FD-9 – 11) or hydraulic power unit (HPU) engine (FD-12 – 13) is operating. The draft permits also prohibit operation of the cementing and logging winch engines (FD-17 – 20) during “MLC activity.”

Shell’s air quality analysis is also based on limiting the duration of total “drilling activity” to 1,623 hours during any drilling season and the draft permits therefore also contain this restriction. Drilling activity is defined as any time when the top drive is engaged and turning the conventional rotary bit, as well as any period of MLC activity. This ensures that, to the extent MLC activity is less than 480 hours during the drilling season, the remaining time can be counted toward the overall limit on drilling activity.

3.6 Limits on Potential to Emit/Owner Requested Limits

3.6.1 Sulfuric Acid Mist

The 2010 Beaufort Permit imposed an Owner Requested Limit (ORL) under the COA regulations and a limit on PTE in all areas of the Outer OCS to limit the PTE for sulfuric acid mist so as to avoid PSD applicability for this pollutant. The 2010 Chukchi Permit has a similar limit, but it was erroneously characterized as a limit on PTE for SO₂ rather than for sulfuric acid mist. This error in the Chukchi permit has been corrected.

3.6.2 Greenhouse Gases

Beginning January 2, 2011, greenhouse gases (GHGs) are subject to regulation under the PSD permitting regulations if:

1. The stationary source is a new major stationary source for a regulated NSR pollutant that is not GHGs, and also will emit or will have the PTE 75,000 tpy CO₂e or more; or
2. The stationary source is an existing major stationary source for a regulated NSR pollutant that is not GHGs, and also will have a significant and net significant emissions increase of a regulated NSR pollutant that is not GHGs, and an emissions increase of 75,000 tpy CO₂e or more.

Beginning July 1, 2011, GHGs are also subject to regulation:

1. At a new stationary source that will emit or have the PTE 100,000 tpy CO₂e or more; or
2. At an existing stationary source that emits or has the PTE 100,000 tpy CO₂e, or more when such stationary source undertakes a physical change or change in the method of operation that will result in a significant and net significant emissions increase of 75,000 tpy CO₂e or more.

40 CFR § 52.21(b)(49)(iv) and (v); 75 Fed. Reg. 31514 (June 3, 2010). “Greenhouse gases (GHGs)” is the air pollutant defined in 40 CFR § 86.1818–12(a) as the aggregate group of six greenhouse gases: carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆). 40 CFR § 52.21(b)(49)(i). The term “tpy CO₂ equivalent emissions (CO₂e)” represents an amount of GHGs emitted, and is computed by multiplying the mass amount of emissions (tpy), for each of the six greenhouse gases in the pollutant GHGs, by the gas's associated global warming potential published at Table A–1 of 40 CFR Part 98, Subpart A (Global Warming Potentials). 40 CFR § 52.21(b)(49)(ii).

Since the Discoverer and Associated Fleet emit three of the six GHGs (CO₂, N₂O, and CH₄) and will be a new major stationary source for a regulated NSR pollutant that is not GHGs (specifically NO_x), it would also be subject to PSD for GHGs if its PTE GHGs is 75,000 tpy CO₂e or more.

Shell has requested that Region 10 include in each permit limits on the PTE GHGs such that it would not be subject to PSD for GHGs. For the Inner OCS in the Beaufort Sea, Shell requested an owner requested limit under the COA regulations. The 2011 Revised Draft Permits therefore include conditions that ensure that the PTE GHGs will not exceed 70,000 tpy CO₂e, along with monitoring, recordkeeping, and reporting requirements to ensure that the conditions are enforceable as a practical matter.

For the Discoverer and Associated Fleet, GHGs are emitted by various fuel combustion sources (engines, boilers) and by incinerators. Region 10 is therefore establishing three limitations in each permit:

- A GHG 12-month rolling limit of 70,000 tpy CO₂e;
- A total aggregate 12-month rolling limit for fuel combusted of 6,346,493 gallons; and
- A total aggregate 12-month rolling limit for waste combusted of 1,657,440 pounds.

The permits require Shell to monitor total fuel used by the Discoverer when it is an OCS source and total fuels used in all vessels in the Associated Fleet when they are within 25 miles of the Discoverer while it is an OCS source. The permits also require Shell to monitor total waste combusted in the Discoverer incinerator when it is an OCS source and total waste combusted in any incinerator in the Associated Fleet when they are within 25 miles of the Discoverer while it is an OCS source. These fuel and waste amounts are then used with the appropriate distillate fuel oil emission factors in EPA’s Greenhouse Gas Reporting Rule (40 CFR Part 98, Subpart C, Tables C-1 and C-2); and the CO₂ emission factor in AP42 Table 2.1-7 (10/96) for incinerators, along with each greenhouse gas’ associated global warming potential from 40 CFR Part 98,

Subpart A, Table A-1 – Global Warming Potentials, to calculate total CO₂e emissions in tpy on a 12-month rolling basis.¹⁷

A small amount of CH₄ may also be emitted by the Drilling Mud System (FD-32) and, in the Beaufort Sea, the Cuttings/Mud Disposal Barge (FD-34). When wells are drilled through porous, hydrocarbon bearing rock, drilling fluids (mud) circulated through the drill bit can carry gaseous hydrocarbons from the well back to drillship. These gases are typically released as fugitive emissions when the mud is processed for reuse on the drillship and stored on the Cuttings/Mud Disposal Barge; however, some of the emissions pass through a vent. Although fugitive emissions are not counted towards PSD applicability for exploratory drillships (see 40 CFR § 52.21(b)(1)(iii)), Shell has agreed to count all of these methane emissions under the PTE limit for GHGs.

Based on past drilling experience, Shell has estimated a conservative amount of hydrocarbon gas - 17 tons per drilling season - that could be released from the circulated mud. To account for this potential methane release while determining compliance with the GHG PTE limit, each permit assumes 17 tons per month of CO₂e emissions (0.798 tons per month of methane) will be released from the drilling mud and reduces the amount of GHGs that can be emitted from other operations to comply with the 70,000 tpy aggregate limit. To determine compliance with the 70,000 tpy limit, actual GHG emissions from combustion and incineration are added to the assumed mud emissions each month and then added to the previous 11 months of GHG emissions. Given that the PTE limit is 5,000 tpy less than the GHGs applicability threshold of 75,000 tpy of CO₂e and the conservative estimate of maximum GHG from the Drilling Mud System, Region 10 is not including additional conditions for monitoring these minimal GHGs. Region 10 believes this approach is conservative for the following reasons:

- Shell's assumed length of the hydrocarbon bearing zone of the well is what is expected to be found in the Chukchi Sea, but considered worst-case for the Beaufort Sea.
- Shell's estimate assumes 100% of the porous space in the rock drilled in the hydrocarbon bearing zone is filled with hydrocarbon which is typically not the case.
- Shell is assuming 97% of the gas is methane when actual testing of the muds has documented that 97% of the gas is a mix of ethane and methane (only methane is a GHG).
- Shell's estimate (17 tpy) is based on drilling 4 holes each season, while the permit conservatively assumes the total amount (17 tons) is emitted each month. The permit is therefore applying an additional safety factor of 5 to Shell's already conservative estimation assuming a 5-month drilling season.

¹⁷ Note that consistent with Shell's emission inventory, Region 10 has included a provision stating that there shall be no emissions of any regulated NSR pollutant or GHGs from the shallow gas diverter system (FD-33), a device that emits only in the event of an emergency due to encountering shallow gas during drilling. Therefore, emissions from this source are not included in the PTE calculation for GHGs.

consideration with appropriate documentation. Excluding these wildfire days from consideration would result in a background concentration of only $5 \mu\text{g}/\text{m}^3$.

For the 1-hour SO_2 standard, Region 10 selected the highest 1-hour value from any available 5-month drilling season. Memorandum from Stephen Page, OAQPS re: “Guidance Concerning the Implementation of the 1-hour SO_2 NAAQS for the Prevention of Significant Deterioration Program,” dated August 23, 2010; Memorandum from Tyler Fox, OAQPS, re: “Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard,” dated August 23, 2010.

Region 10 has not calculated a single 1-hour NO_2 background value for the modeling of maximum offshore impacts. This is because, consistent with EPA guidance for modeling conducted in connection with the 1-hour NO_2 standard, Shell has used paired modeled and monitored concentrations based on hour-of-day in its modeling analysis for the 1-hour NO_2 NAAQS. See discussion in Section 5.7 below; Memorandum from Tyler Fox, OAQPS, re: “Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard,” dated March 1, 2011.

5.7 Modeling Results

5.7.1 New 1-Hour NO_2 NAAQS

As discussed above, since issuance of the 2010 Permits, a new 1-hour NO_2 NAAQS went into effect on April 12, 2010. The new 1-hour NO_2 NAAQS is attained when the 3-year average of the 98th-percentile point of the annual distribution of daily maximum 1-hour concentrations does not exceed 100 ppb ($188 \mu\text{g}/\text{m}^3$) at each monitor within an area. With the form of the new standard being probabilistic, a much stricter averaging period, and the more complex analysis procedures associated with the form of the new standard, EPA issued guidance to clarify the applicability of current guidance in 40 CFR Part 51, Appendix W with respect to procedures for demonstrating compliance with the new 1-hour NO_2 NAAQS. See Memorandum from Stephen Page, OAQPS, re: “Guidance Concerning the Implementation of the 1-hour NO_2 NAAQS for the Prevention of Significant Deterioration Program,” dated June 29, 2010; Memorandum from Tyler Fox, OAQPS, re: “Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard,” dated March 1, 2011.

As discussed above, Shell is proposing to use the AERMOD dispersion model using an AERMET-by-pass approach for the meteorological data and Plume Volume Molar Ratio Method (PVMRM) (Hanrahan 1999), which is considered a Tier 3 application under Section 5.2.4 of Appendix W. This PVMRM method is considered a non-regulatory-default option within AERMOD and requires approval by the Regional Office on a case-by-case basis, pursuant to Sections 3.1.2.c, 3.2.2.a, and A.1.a(2) of Appendix W. The AERMET-by-pass approach, in this case AERMOD-COARE, also requires Regional Office approval. Region 10, in consultation with OAQPS, approved the use of AERMOD-COARE on May 6, 2011. See Memorandum from George Bridgers, OAQPS, re: “Model Clearinghouse Review of AERMOD-COARE as an

Alternative Model Application in an Arctic Marine Ice Free Environment,” dated March 1, 2011. Region 10 gave Shell conditional approval to use AERMOD-COARE in its air quality analysis for the 2011 Revised Draft Permits on May 8, 2011 pursuant to Section 3.2.2.a of Appendix W. See E-mail from Herman Wong, Region 10 Modeling Contact, to Andy Hawkins dated May 8, 2011, re: Approval request for non-guideline modeling – Shell Disco and Kulluk dispersion modeling.

Region 10 is specifically requesting public comment on the use of AERMOD-COARE and PVMRM, including the models, their inputs, and all applicable associated documents for use in issuance of the 2011 Revised Draft Permits. Regional office review and approval of PVMRM and the underlying key modeling inputs for PVMRM are discussed in more detail in the Region 10 Technical Analysis.

The NO_x emissions created during combustion are partly nitric oxide (NO) and partly NO₂. After the combustion gas exits the stack, additional NO₂ can be created due to atmospheric reactions. The modeling of ambient NO₂ concentrations therefore requires ambient data or assumptions regarding the atmospheric conversion of NO to NO₂. Section 5.2.4 of the Appendix describes several approaches that may be considered in modeling annual average NO₂ impacts. These approaches are also generally applicable in modeling 1-hour NO₂ impacts. Memorandum from Stephen Page, OAQPS, re: “Guidance Concerning the Implementation of the 1-hour NO₂ NAAQS for the Prevention of Significant Deterioration Program,” dated June 29, 2010.

For NO₂/NO_x in-stack ratios, Shell conducted 90 specific stack tests on equipment being used on the Discoverer and the Associated Fleet at different loads and control scenarios. One of the issues identified during the Region 10 review was varying NO₂/NO_x in-stack ratios at different loads and for different control equipment. Because of the ranges of NO₂ ratios, Shell chose to use generic ratios for the equipment based on the type of controls on the equipment. In order to ensure the use of generic ratios would be protective of the NAAQS, Region 10 requested and Shell provided several AERMOD runs with varying ratios based on actual testing of the permitted equipment. Shell submitted additional modeling runs with alternative in-stack ratios on April 29, 2011. Region 10 also performed independent testing of these ratios to ensure the 1-hour NO₂ NAAQS was being protected should the ratios vary. It was determined that the ratios do make a difference in the modeled concentrations, but in all cases reviewed, the NAAQS were protected.

For the background NO₂ values, Shell used the Badami monitoring data for the Beaufort Sea, and Wainwright data for the Chukchi Sea. Shell initially used hour-by-hour pairing of modeled concentrations with background NO₂ data. Region 10 determined hour-by-hour pairing of monitored data may not be representative of the entire modeling domain or of background sources. Thus, Region 10 requested that Shell use a diurnal profile of monitoring data for the drilling season based on the 98th percentile values by hour-of-day, to be combined with modeled concentrations by hour-of-day. Shell’s April 29, 2011 Submittal included the pairing of modeling results with the 98th percentile diurnal profiles by hour-of-day based on the monitoring data in both the Beaufort and Chukchi Seas. This difference in pairing methodology did change overall cumulative modeled concentrations but in all cases the 1-hour NO₂ NAAQS are protected.

Results of the modeling indicate the maximum modeled 98th percentile total impacts (including background values) of $81.6 \mu\text{g}/\text{m}^3$ in the Beaufort Sea and $174.0 \mu\text{g}/\text{m}^3$ in the Chukchi Sea.¹⁹ These 98th percentile impacts at the location of maximum modeled impact are below the NAAQS and, given the conservative modeling approach, demonstrate compliance. The large differences in modeling concentrations between the two seas are due to varying meteorological conditions coupled with varying emissions in the two locations. In the Chukchi Sea, the frequency of wind directions and dispersion conditions are such that the resulting concentrations (that is, the impacts from the Discoverer's operations in the Chukchi Sea) are higher than in the Beaufort. Also note that in the case of the Chukchi Sea modeling analysis, the higher impacts are seen occurring northwest of the proposed drilling activities, which is away from the North Slope communities of Point Lay and Wainwright. Figures 4 and 5 in the Region 10 Technical Analysis illustrate this phenomenon. Note that the maximum modeled impacts occur near Shell's assumed ambient air boundary, a typical finding for sources with short stacks and plumes subject to downwash. Modeled impacts generally decrease as the distance from this location of maximum modeled impact increases, and in general there is a rapid decrease in concentrations as the distance from the Discoverer increases in both locations. Also note, as discussed above, the Beaufort Sea Associated Fleet emissions were modeled for the Chukchi Sea and so these impacts are higher than they would be if the Chukchi Sea Associated Fleet emissions had been modeled.

Modeled impacts at communities along the Beaufort Sea also indicate that concentrations associated with emissions authorized under the 2011 Revised Draft Permit for the Beaufort Sea will be well below the 1-hour NO_2 NAAQS at all locations. At Kaktovik, the maximum modeled 98th percentile impact was $37.0 \mu\text{g}/\text{m}^3$, while the maximum modeled impacts at Deadhorse and Nuiqsut were $98.9 \mu\text{g}/\text{m}^3$ (represented by 50 kilometers in the direction of Deadhorse and Nuiqsut). It is important to note that these impacts include monitored background concentrations, which in all cases are a significant portion of the total impact.

Modeled impacts at communities along the Chukchi Sea also indicate that concentrations associated with emissions authorized under the 2011 Revised Draft Permits will be well below 1-hour NO_2 NAAQS at all locations. At Point Lay the maximum modeled 98th percentile impact was $52.8 \mu\text{g}/\text{m}^3$ while at Wainwright the maximum 98th percentile modeled impact was $42.9 \mu\text{g}/\text{m}^3$. Both of these estimated impacts are based on modeled concentrations at 50 kilometers in the direction of the communities because AERMOD is used to predict impacts at distances of 50 kilometers or less. Actual impacts will be lower than those reported above as the communities are further away than 50 kilometers and additional dispersion will further lower concentrations. Again, these estimates include background concentrations, which are a significant portion of the total impact. Table 6 below provides the maximum modeled concentrations for the 1-hour NO_2 standard at the modeled location of maximum impact and in the on shore communities.

¹⁹ Note that these maximums are derived from several modeling scenarios that Region 10 requested Shell perform based on varying in-stack NO_2/NO_x ratios. Values are taken from Shell's May 19, 2011 submittal.

Table 6. 1-hour NO₂ Modeled Impacts at Various Locations

Location	Distance from Drilling Location (km)	Shell Only Impact ² (µg/m ³)	Background Concentration ³ (µg/m ³)	Total Impacts (including background) (µg/m ³)	NAAQS (µg/m ³)	% of NAAQS
<i>Beaufort Sea</i>						
Maximum Modeled Impact	0.5	72.3	9.3	81.6	188	43%
Kaktovik	14	16	21.0	37.0	188	20%
Deadhorse (84 km from nearest lease block) ¹	50	4.9	94.0	98.9	188	53%
Nuiqsut (182 km from nearest lease block) ¹	50	4.9	94.0	98.9	188	53%
<i>Chukchi Sea</i>						
Maximum Modeled Impact	2	160.8	13.2	174.0	188	93%
Point Lay (99 km from nearest lease block) ¹	50	11.8	41.0	52.8	188	28%
Wainwright (105 km from nearest lease block) ¹	50	4.9	38.0	42.9	188	23%

¹ Modeling concentrations 50 km away in the direction of village (50 km recommended AERMOD distance limit)

² NO₂ concentrations are highest impact from Table 5 or Table 6 in ALTERNATE APPROACHES TO EVALUATING 1-HOUR NO₂ IMPACTS FOR THE SHELL DISCOVERER DRILLSHIP – NO₂ PAIRING AND NO₂/NOX RATIOS

³ Background Concentrations at villages from June 23 memo from Chris Hall titled "EPA's Determination of Appropriate Background Values for the Chukchi Sea and Beaufort Sea OCS Permits"

Table 7. 1-hour SO₂ Modeled Impacts at Various Locations

Location	Distance from Drilling Location (km)	Shell Only Impact ² (µg/m ³)	Background Concentration ³ (µg/m ³)	Total Impacts (including background) (µg/m ³)	NAAQS (µg/m ³)	% of NAAQS
<i>Beaufort Sea</i>						
Maximum Modeled Impact	0.5	22	13.0	35.0	196	18%
Kaktovik	14	2.9	10.0	12.9	196	7%
Deadhorse (84 km from nearest lease block) ¹	50	1.4	14.0	15.4	196	8%
Nuiqsut (182 km from nearest lease block) ¹	50	1.4	14.0	15.4	196	8%
<i>Chukchi Sea</i>						
Maximum Modeled Impact	2	17.3	23.0	40.3	196	21%
Point Lay (99 km from nearest lease block) ¹	50	2.2	14.0	16.2	196	8%
Wainwright (105 km from nearest lease block) ¹	50	2.2	12.0	14.2	196	7%

¹ Modeling concentrations 50 km away in the direction of village (50 km recommended AERMOD distance limit)

² SO₂ concentrations are from Tables 3-9 and 3-10 in Discoverer Drillship Impact Evaluation for SO₂ and NO₂ Using AERMOD Chukchi and Beaufort Seas, Shell Alaska Exploratory Drilling Program

³ Background Concentrations at villages from June 23 memo from Chris Hall titled "EPA's Determination of Appropriate Background Values for the Chukchi Sea and Beaufort Sea OCS Permits"

Table 9. Maximum Modeled Impacts in the Chukchi Sea

Air Pollutant	Averaging Period	Shell Only Impacts ¹ (without background)	Background Concentration ² (µg/m ³)	Total Impact Including Background (µg/m ³)	NAAQS (µg/m ³)	Total impact as a % of NAAQS	PSD Class II Increment (µg/m ³)
NO ₂	1-hour	160.8	13.2	174.0	188	93%	NA
	Annual	3.3	2.0	5.3	100	5%	25
PM _{2.5}	24-hour	12.4	11.0	23.4	35	67%	NA
	Annual	0.4	2.0	2.4	15	16%	NA
PM ₁₀	24-hour	11.5	79.0	90.5	150	60%	30
SO ₂	1-hour	17.3	23.0	40.3	196	21%	NA
	3-hour	13.6	14.0	27.6	1300	2%	512
	24-hour	8.1	5.0	13.1	365	4%	91
	Annual	1.4	0.4	1.8	80	2%	20
CO	1-hour	561.9	959.0	1520.9	40000	4%	NA
	8-hour	328.7	945.0	1273.7	10000	13%	NA

¹ Modeled Impacts from Tables 3 and 4 in Shell Technical Memorandum "AERMOD AIR QUALITY IMPACT ANALYSIS OF NO₂, SO₂, PM_{2.5}, PM₁₀, CO, AND NH₃ – DISCOVERER DRILLSHIP." May 19, 2011

² Background concentrations from June 17 memo from Chris Hall titled "EPA's Determination of Appropriate Background Values for the Chukchi Sea and Beaufort Sea OCS Permits"

5.7.5 Offsite Impacts

The impact from neighboring (off-site) sources must be accounted for in a cumulative impact assessment. As provided in Section 8.2.3 of Appendix W, “all sources expected to cause a significant concentration gradient in the vicinity of the [applicant’s source] should be explicitly modeled.” The impact from other sources can be accounted for through ambient monitoring data.

A common long-term practice for selecting the “nearby” sources for explicit modeling was to follow a very prescriptive procedure in EPA’s draft New Source Review Workshop Manual (Manual) (USEPA 1990). Under this approach, an off-site source located within the applicant’s “significant impact area” (SIA) would need to be explicitly modeled. Sources located beyond the applicant’s SIA, but with impacts inside of the SIA, would also be candidates for modeling. EPA recently clarified that “following such procedures in a literal and uncritical manner may in many cases result in cumulative impact assessments that are overly conservative.” March 2011 NO₂ Modeling Guidance. Appendix W is consistent with the March 2011 NO₂ Modeling Guidance, stating that professional judgment is required for ascertaining which sources should be explicitly modeled and which sources can be represented through ambient monitoring data.

The BP Badami facility is the only regional source located within 50 kilometers of the Shell permitted lease blocks in either the Beaufort or Chukchi Seas. The BP Badami facility is located 37 kilometers from the nearest lease blocks on which Shell would be allowed to operate under

these permits in the Beaufort Sea. NO₂ and PM₁₀ were the only pollutants for which the SIA extended to this distance. Because the distance to the BP Badami facility from Shell's exploratory operations is so great, it is not expected that emissions from the BP Badami facility would cause a significant concentration gradient in the vicinity of Shell's lease blocks. In addition, for NO₂, Badami monitoring data are being used as background monitoring data in the modeling analysis and should therefore reflect the impacts of this source. For PM₁₀, the CCP monitoring data were used. Prudhoe Bay has significantly more PM₁₀ sources than any other area within 50km of the permitted lease blocks and this monitor should therefore represent a background value higher than any current neighboring source would cause. Based on this analysis, Region 10 has determined the one distant BP Badami facility is adequately represented in the ambient monitoring data for NO₂ and PM₁₀, would not cause a significant concentration gradient, and does not need to be explicitly included in the modeling runs.

5.8 Conclusion

Region 10 has reviewed and determined that the air quality monitoring data, meteorological measurements, model input and output files, and other related information submitted by Shell satisfy the requirements in Appendix W to make an adequate demonstration of compliance with the NAAQS and applicable increments. The AERMOD and AERMOD-COARE modeling predicted concentrations with conservatively representative background concentrations do not show a violation of any NAAQS. The revised analysis also demonstrates that the proposed Discoverer drilling program complies with the Alaska Ambient Air Quality Standards (AAAQS) and PSD increments.

In the Chukchi Sea, modeled 1-hour NO₂ impacts at the location of maximum modeled impact are very close to the applicable NAAQS. These impacts are partially due to the conservative assumptions used by Shell in its modeling analysis. For example, the movement of the drilling ship will decrease short-term impacts of all pollutants, especially in the near field where high modeled concentrations occur, if averaging were performed over multiple years. The combination of only one or two years of meteorological data for some pollutants and the assumption of a fixed drilling location for the entire 120 day operating period produces a conservative analysis (i.e., the predicted modeled impacts are larger than what would likely be realized with a ship operating at several locations with averaging over a longer period of time).

Finally, modeled impacts generally decrease as the distance from the 500 meter ambient air boundary increases, and in general there is a rapid decrease in concentrations as the distance from the Discoverer increases. Modeled impacts at all on-shore locations in both seas are well below the NAAQS.

scientific evidence and analyses; and comment received from CASAC and the public.” Id. at 6483.

6.4.2 Northern Iñupiat Communities

The North Slope is bordered by the Arctic Ocean to the north and the Brooks Mountain Range to the south. In all it encompasses approximately 89,000 square miles of northern Alaska. The incorporated villages of the North Slope Borough (NSB) include Point Hope, Point Lay, Wainwright, Atqasuk, Barrow, Nuiqsut, Kaktovik and Anaktuvuk Pass. These communities are situated completely above the Arctic Circle and are considered remote villages, with no roads between them.

Most of the communities are coastal villages located near the Chukchi and Beaufort Seas. In the Chukchi Sea, the nearest towns or villages to Shell’s proposed operations are Point Lay and Wainwright, which are located 99 and 105 kilometers (61 and 65 miles), respectively, from the closest lease block in the Chukchi Sea. In the Beaufort Sea, the nearest towns or villages are Kaktovik, Deadhorse, and Nuiqsut, which are located 14, 84, and 193 kilometers (8, 52, and 120 miles), respectively, from the closest lease block in the Beaufort Sea.

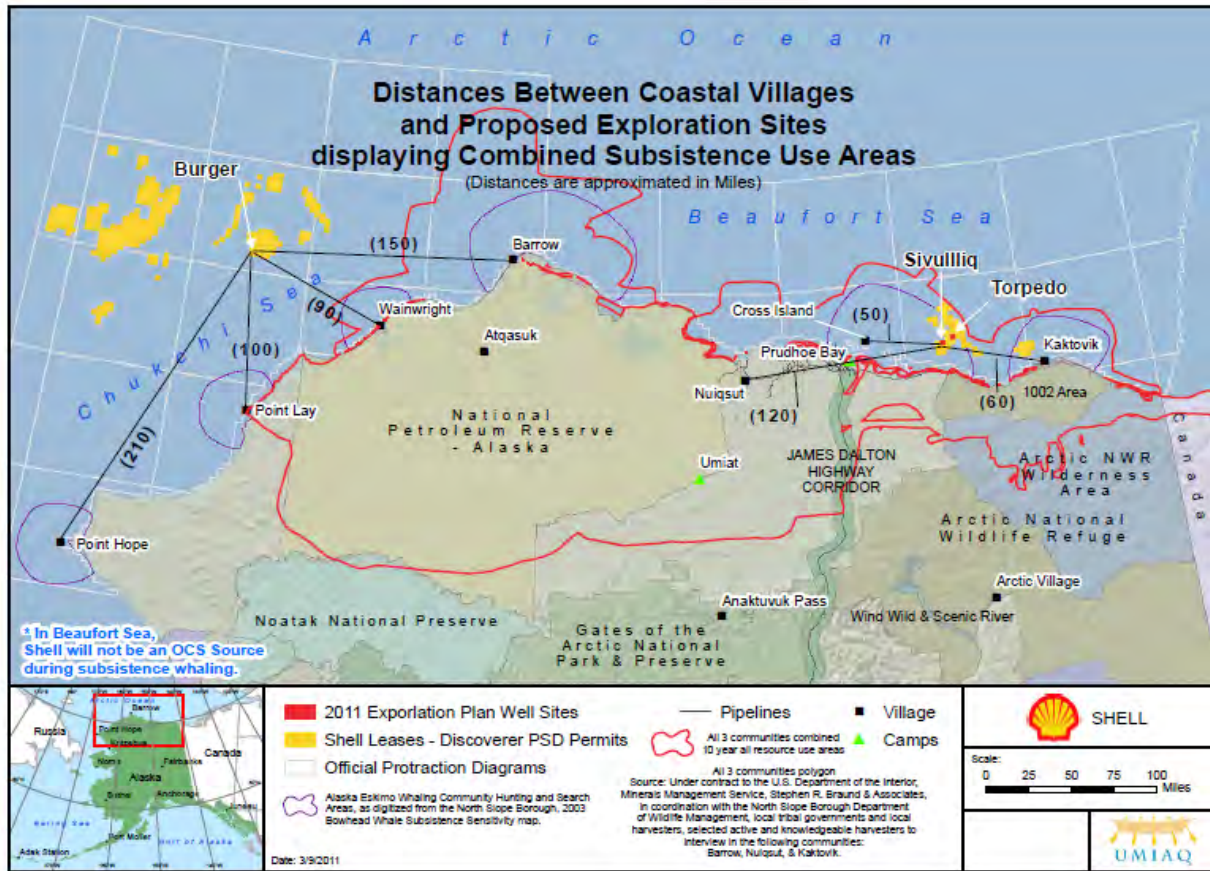
As discussed in more detail in the Supplemental Environmental Justice Analysis, a review of demographic characteristics shows that the North Slope area has a significantly high percentage of Alaska Natives, who are considered a minority under Executive Order 12898. In addition, nearly half the people who reside in the North Slope speak a language other than English at home. Subsistence foods from traditional practices such as hunting (marine mammals, terrestrial and birds), fishing, and whaling are an important component of the Iñupiat diet.²³ In 2004, the Alaska Department of Fish and Game reported that over a 25 year period residents in the North Slope Borough harvested an average of 434 pounds of subsistence food per capita.²⁴ Subsistence activities also play an important cultural role.²⁵ Residents report traveling long distances offshore to hunt for bowhead whale and other subsistence activities. Figure 1 depicts Shell’s lease block in the Chukchi and Beaufort Seas overlaid with an outline of onshore and offshore subsistence use areas.

Figure 1 Subsistence Use Areas Mapped Over Exploration Sites

²³ Wernham, Inupiat Health and Proposed Alaskan Oil Development: Results of the First Intergrated Health Impact Assessment/Environmental Impact Statement for Proposed Oil Development on Alaska’s North Slope, 2007.

²⁴ Wolfe, R. J. 2004. Local traditions and subsistence: a synopsis of twenty-five years of research in Alaska. Technical Paper No. 284. Alaska Department of Fish and Game, Division of Subsistence. Juneau, Alaska.

²⁵ In the words of the Environmental Director of the Inupiat Community of the Arctic Slope (ICAS), speaking at the Environmental Justice Session held during the 2011 Alaska Forum on the Environment, “For thousands of years, our people have depended on a subsistence lifestyle for a large majority of our food, and also for our cultural and spiritual health. Through the subsistence hunt, we not only provide food for our families, but we also carry on the ancient traditions that have been passed down to us by our parents and grandparents. Our subsistence activities define who we are and bind us together as a community. We therefore depend on the land and sea for our survival and we hold the deepest and most profound respect for the natural resources that have sustained us for so many years. Our very survival as a people depends on our ability to safeguard and protect the resources that have provided for us for thousands of years.”



The 2009 Alaska Native Health Status Report issued by the Alaska Native Tribal Health Consortium provides an overview of health conditions in this region.²⁶ Between 2004-2007, the leading causes of death among Alaskan Natives living in the North Slope region were cancer, heart disease, suicide, unintentional injury and chronic obstructive pulmonary disease (COPD). There is a higher incidence of outpatient visits for upper respiratory problems in the North Slope area than in the rest of Alaska. In fact, in 2006 diseases of the respiratory system were the leading cause for inpatient hospitalization at Samuel Simmons Memorial Hospital in Barrow. Respiratory issues range from the common cold (acute) to pneumonia (severe).²⁷

As discussed below, EPA has identified people with respiratory problems to be potentially at greater risk of experiencing adverse health effects from NO₂ and SO₂. This was taken into consideration when setting the new NAAQS standards. 75 Fed. Reg. 6481 (February 9, 2010); 75 Fed. Reg. 35527 (June 22, 2010).

²⁶Alaska Native Tribal Health Consortium: Alaska Native Epidemiology Center. Alaska Native Health Status Report 2009 http://www.anthc.org/chs/epicenter/upload/01_HSRintro.pdf

²⁷ Alaska Native Tribal Health Consortium: Alaska Native Epidemiology Center. Regional Health Profile: Arctic Slope, 2009. http://www.anthc.org/chs/epicenter/upload/Regional_Health_Profile_ASNA_1109.pdf

provided additional support for its conclusion. Region 10 therefore believes that the PM_{2.5} standard will be met at all locations more than 500 meters from the Discoverer even when accounting for the possibility of the secondary formation of PM_{2.5}.

6.4.5 Conclusion

In summary, as indicated above, there is a significantly high population of Alaskan Natives in the North Slope, as well as a high population of individuals that speak a language other than English at home. These characteristics combined with the health profile of residents may increase vulnerability or sensitivity to air emissions as compared to the reference populations. Based on available information, Region 10 concludes that the activities proposed to be authorized under the 2011 Revised Draft Permits will not cause or contribute to air quality levels in excess of health-based standards for SO₂, CO, PM₁₀, PM_{2.5}, Ozone or NO₂ beyond 500 meters of the center of the Discoverer. Region 10 therefore concludes that there will not be disproportionately high and adverse human health or environmental effects with respect to these air pollutants on minority or low-income populations residing in the North Slope. In reaching this conclusion, Region 10 considered the impact on communities while engaging in subsistence activities in areas where such activities are regularly conducted.

6.5 Executive Order 13175 – Tribal Consultation

Pursuant to Executive Order 13175 issued on November 9, 2000 and entitled “Consultation and Coordination with Indian Tribal Governments,” federal agencies are required to have an accountable process to assure meaningful and timely input by tribal officials in the development of regulatory policies on matters that have tribal implications. 65 Fed. Reg. 67249 (November 9, 2000). In accordance with Region 10’s May 2009 North Slope Communications Protocol, a regional policy for early community and tribal involvement, Region 10 held an informal informational meeting in Barrow on May 29, 2009 to discuss the upcoming air permitting actions.

Prior to beginning the public comment period on the 2010 Permits, Region 10 sent letters to potentially interested tribal governments, offering government-to-government consultation opportunities on Region 10’s proposed action to issue the 2010 Permits. As described in the Statement of Basis for the 2010 Permits, Region 10 held a government-to-government consultation meeting with the Inupiat Community of the Arctic Slope (ICAS) and Native Village of Point Hope and held informational meetings for the local communities prior to issuing the 2010 Permits. Region 10 also notified the potentially interested tribal governments of the opportunity to provide public comment on the draft permits during the public comment periods and to attend and provide testimony during the scheduled public hearings.

Like the recently issued “EPA Policy on Consultation and Coordination with Indian Tribes” (May 4, 2011), Region 10 tribal consultation procedures call for consultation based on the potential to affect the tribal community or their subsistence resources. As discussed above in Section 5 and Section 6.4, Region 10 expects minimal impacts from air emissions under the 2011 Revised Draft Permits at all on-shore locations. However, given the geographic proximity of the Discoverer’s operations to on-shore communities along the Beaufort Sea (approximately 14

kilometers from the closest lease block to Kaktovik), as well as the proximity between the Discoverer's operations and off-shore areas where subsistence activities are conducted in the Beaufort Sea (see Figure 1 in Section 6.4 above), Region 10 determined it is appropriate to consult with ICAS, the Native Village of Nuiqsut, and the Native Village of Kaktovik. Accordingly, on June 7, 2011, Region 10 sent letters to these tribal entities offering tribal consultation on the 2011 Revised Draft Permit for exploratory activities in the Beaufort Sea. Region 10 will hold government-to-government tribal consultation meetings with the invited tribes that request consultation. Whenever possible, Region 10 will accommodate requests for consultation received any time during the permitting process.

In addition to notifying these tribal governments of the opportunity for government-to-government consultation, Region 10 will also notify tribal entities of the opportunity to provide public comment on the 2011 Revised Draft Permits during the public comment period and to attend and provide testimony during the scheduled public hearing. Region 10 sent out an invitation for informational meetings that were held in Barrow and Kaktovik on June 15-17, 2011. The meetings were open to the public and all North Slope entities (City Governments, Tribal Governments, the North Slope Borough, and the Alaska Eskimo Whaling Commission) received invitations to attend the early informational meetings.

6.6 National Environmental Policy Act

See Section 6.6 of the Statements of Basis for the 2010 Permits.

Exhibit 7

U.S. Environmental Protection Agency Region 10, Public Notice,
Kulluk Air Permit, Beaufort Sea



Region 10: the Pacific Northwest

URL: <http://yosemite.epa.gov/r10/airpage.nsf/Permits/kullukap>
Last updated on Friday, October 21st, 2011.

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Shell Kulluk Air Permit - Beaufort Sea

Final air permit issued

On October 21, 2011, EPA issued a final air permit for Shell Offshore Inc. to explore for oil and gas in the Beaufort Sea on the Outer Continental Shelf. The permit authorizes air pollutant emissions from Shell's exploration drilling with the Kulluk drill rig and a support fleet of icebreakers, oil spill response vessels, and supply ships for up to 120 days each year. This final Minor Source/Title V air operating permit limits Shell's emissions of regulated air pollutants to less than 250 tons per year which is the "major" permit threshold in the Prevention of Significant Deterioration program.

The public comment period on the draft permit began July 22 and ended Sept. 6, 2011. Public hearings were held in Barrow and Anchorage on Aug. 23 and 26, 2011. EPA carefully reviewed and considered the many public comments received, the federal statutes and regulations, and additional relevant material contained in the administrative record. EPA issued the final permit under Section 328 and Title V of the Clean Air Act and 40 CFR Parts 55, 70 and 71. Shell plans to begin exploration drilling in July 2012, as authorized by the [U.S. Bureau of Safety and Environmental Enforcement](#).

Petitions for review of this permit must be submitted to the [Environmental Appeals Board](#) by **November 28, 2011**. See below for more information about appeals.

Shell Kulluk 2011 Final Air Permit Documents

- **New!** Final Shell Kulluk Air Permit (PDF) (87 pp, 325K)
- **New!** EPA's Response to Public Comments (PDF) (161 pp, 898K)
- Statement of Basis (PDF) (60 pp, 1.6MB) - July 2011

Draft Permit and Related Documents

- Public Comments on Shell Kulluk draft air Permit
- Draft Permit (PDF) (69 pp, 1.5MB) - July 2011
- Ambient Air Quality Impact Analysis (PDF) (39 pp, 1.8MB) - July 2011
- Environmental Justice Analysis, July 2011 (PDF) (15 pp, 477K) - July 2011
- Public Notice: Air Permits Proposed for Public Comment (PDF) (1 pg, 107K) - July 22, 2011
- EPA Shell Kulluk air permit application completeness determination letter July 19, 2011 (PDF) (1 pg, 15K) - July 2011
- 2011 Air Permit Application Documents

Petitions to Environmental Appeals Board due November 28

By November 28, 2011, any person who commented on the draft permit or participated in the public hearings may petition the Environmental Appeals Board (EAB) to review any condition of the final permit. The appeal must state the reasons for requesting review by the EAB and show that the issues were raised during the public comment period and, when appropriate, show that the permit conditions are based on 1) a finding of fact or conclusion of law which is erroneous, or 2) an exercise of discretion or an important policy consideration which the EAB should review.

Any person who did not comment or participate in the public hearings on the draft permit may petition for administrative review only on changes from the draft permit to the final permit decision or that were not reasonably foreseeable during the public comment period.

This permit becomes effective 38 days after the final permit decision notice, unless the permit is appealed to the EAB. Permit appeals must be submitted to the EAB by November 28, 2011.

More information:

- Environmental Appeals Board
- 40 CFR 71.11 (PDF) (2 pp, 40K) - Federal rule on appeal of Clean Air Act Title V

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Related Information

- Alaska Outer Continental Shelf (OCS) Permits
- Shell Discoverer Air Permit (Beaufort Sea)
- Shell Discoverer Air Permit (Chukchi Sea)
- ConocoPhillips Air Permit (Chukchi Sea)
- Arctic Oil & Gas Wastewater General Permits
- New Source Review/Prevention of Significant Deterioration Permits

What is the Outer Continental Shelf?

The Outer Continental Shelf (OCS) refers to federal submerged lands that lie seaward of the states' jurisdiction (generally three nautical miles from the shoreline).



You will need Adobe Reader to view some of the files on this page. See [EPA's PDF page](#) to learn more.

permits

Where to Review Hard Copy Documents

The permit record includes Shell's application materials and all other materials relied on by EPA.

The permit record includes Shell's application materials and all other materials relied on by EPA. The permit record is available for review at **EPA Region 10, 1200 6th Ave, Seattle, Washington, 9am-5pm Monday-Friday (206-553-1200)**..

The final permit documents will also be available at these locations in Alaska:

EPA, Federal Building, 222 West 7th Ave, Anchorage (907-271-5083); **Barrow City Office**, 2022 Ahkovak Street, Barrow (907-852-4050); **Nuiqsut City Office**, 2230 2nd Avenue, Nuiqsut (907-480-6727); **Kaktovik City Office**, 2051 Barter Avenue, Kaktovik (907-640-6313); **Wainwright City Office**, 1217 Airport Road, Wainwright (907-763-2815); **Kali School Library**, 1029 Ugrak Ave, Point Lay (907-833-2312); **Point Hope City Office**, 530 Natchiq Street, Point Hope (907-368-2537); **Atkasuk City Office**, 5010 Ekosik Street, Atkasuk (907-633-6811); **Anaktuvuk Pass City Office**, 3031 Main St, Anaktuvuk Pass (907-661-3612).

For more information or to request a copy of permit documents, contact Suzanne Skadowski, 206-553-6689.

Exhibit 8

U.S. Environmental Protection Agency Region 10, Public Notice,
ConocoPhillips Air Permit, Chukchi Sea



Region 10: the Pacific Northwest

You are here: [EPA Home](#) [Region 10](#) [Air Page](#) [Permits](#) conocophillips

ConocoPhillips Air Permit - Chukchi Sea

Summary: On July 22, 2011, EPA Region 10 proposed a draft Title V, Clean Air Act permit for ConocoPhillips to explore for oil and gas on the Outer Continental Shelf in the Chukchi Sea northwest of Alaska. Public hearings were held in Barrow and Anchorage, Alaska, on August 24 and 26, 2011, and the public comment period ended September 21, 2011. On September 26, 2011, ConocoPhillips withdrew their permit application. ConocoPhillips has stated that they want more operational flexibility, for safety and other reasons, than the draft permit would allow. EPA Region 10 will not be responding to public comments submitted.

ConocoPhillips has advised EPA Region 10 that within two months they plan to submit a new permit application for their jack-up drill rig with a new ambient air impact analysis. In the new ambient air impact analysis, rather than demonstrate compliance with the National Ambient Air Quality Standards (NAAQS) beginning at a 500 meter radius around the drill rig as in the draft permit, ConocoPhillips intends to propose a new NAAQS point of compliance closer to shore.

After ConocoPhillips submits their new application, EPA Region 10 will evaluate the application for compliance with the Clean Air Act, develop a new draft permit, and provide an opportunity for the public to comment.

ConocoPhillips 2011 Draft Air Permit

(*Note: This permit application was withdrawn on September 26, 2011*)

- Conoco Application Withdraw Letter (PDF) (1 pp, 379K) - September 26, 2011
- Draft Permit (PDF) (1 pp, 107K) - July 22, 2011
- Statement of Basis (PDF) (53 pp, 1.6MB) - July 2011
- Ambient Air Quality Impact Analysis (PDF) (51 pp, 1.8MB) - July 2011

Related Documents

- Public Comments on ConocoPhillips draft air Permit (FTP) - September 2011
- Public Notice: Air Permits Proposed for Public Comment (PDF) (1 pg, 107K) - July 22, 2011
- 2011 Air Permit Application Documents
- EPA's Application Completeness Determination (PDF) (1 pg, 15K) - April 2010
- Early Information Fact Sheet: ConocoPhillips Air Quality Permit (PDF) (4 pp, 1.5MB) - Spring 2010

Where to Review Hard Copy Documents

The permit record includes ConocoPhillips' application materials and all other materials relied on by EPA.

The permit record is available for review at **EPA Region 10, 1200 6th Ave, Seattle, Washington, 9am-5pm Monday-Friday (206-553-1200)**.

The application materials will also be available at these locations in Alaska:

EPA, Federal Building, 222 West 7th Ave, Anchorage (907-271-5083); **Barrow City Office**, 2022 Ahkovak Street, Barrow (907-852-4050); **Nuiqsut City Office**, 2230 2nd Avenue, Nuiqsut (907-480-6727); **Kaktovik City Office**, 2051 Barter Avenue, Kaktovik (907-640-6313); **Wainwright City Office**, 1217 Airport Road, Wainwright (907-763-2815); **Kali School Library**, 1029 Ugrak Ave, Point Lay (907-833-2312); **Point Hope City Office**, 530 Natchiq Street, Point Hope (907-368-2537); **Atkasuk City Office**, 5010 Ekosik Street, Atkasuk (907-633-6811); **Anaktuvuk Pass City Office**, 3031 Main St, Anaktuvuk Pass (907-661-3612).

For more information or to request a copy of permit documents, contact Suzanne Skadowski, 206-553-6689.

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Related Information

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- New Source Review/Prevention of Significant Deterioration Permits

What is the Outer Continental Shelf?

The Outer Continental Shelf (OCS) refers to federal submerged lands that lie seaward of the states' jurisdiction (generally three nautical miles from the shoreline).



You will need Adobe Reader to view some of the files on this page. See [EPA's PDF page](#) to learn more.

Exhibit 9

U.S. Environmental Protection Agency Region 10, Fact Sheet,
Final Revisions to the National Ambient Air Quality Standards for
Nitrogen Dioxide

FACT SHEET
FINAL REVISIONS TO THE NATIONAL AMBIENT AIR QUALITY STANDARDS
FOR NITROGEN DIOXIDE

SUMMARY OF ACTION

- On January 22, 2010, EPA strengthened the health-based National Ambient Air Quality Standard (NAAQS) for nitrogen dioxide (NO₂). The new standard will protect public health, including the health of sensitive populations – people with asthma, children and the elderly.
- EPA is setting a new 1-hour NO₂ standard at the level of 100 parts per billion (ppb). This level defines the maximum allowable concentration anywhere in an area. It will protect against adverse health effects associated with short-term exposure to NO₂, including respiratory effects that can result in admission to a hospital.
- In addition to establishing an averaging time and level, EPA also is setting a new “form” for the standard. The form is the air quality statistic used to determine if an area meets the standard. The form for the 1-hour NO₂ standard, is the 3-year average of the 98th percentile of the annual distribution of daily maximum 1-hour average concentrations.
- EPA also is retaining, with no change, the current annual average NO₂ standard of 53 ppb.
- This suite of standards will protect public health by limiting people’s exposures to short-term peak concentrations of NO₂ – which primarily occur near major roads – and by limiting community-wide NO₂ concentrations to levels below those that have been linked to respiratory-related emergency department visits and hospital admissions in the United States.
- To determine compliance with the new standard, EPA is establishing new ambient air monitoring and reporting requirements for NO₂.
 - In urban areas, monitors are required near major roads as well as in other locations where maximum concentrations are expected.
 - Additional monitors are required in large urban areas to measure the highest concentrations of NO₂ that occur more broadly across communities.
 - Working with the states, EPA will site a subset of monitors in locations to help protect communities that are susceptible and vulnerable to NO₂-related health effects.
- The addition of a new 1-hour NO₂ standard and changes to the NO₂ monitoring network are consistent with the recommendations of the majority of the Clean Air Scientific Advisory Committee (CASAC). CASAC provides independent advice to the EPA Administrator on the relevant scientific and technical information and on the standards.
- These changes will not affect the secondary NO₂ standard, set to protect public welfare. EPA is considering the need for changes to the secondary standard under a separate review.

NO₂ AND PUBLIC HEALTH

- Current scientific evidence links short-term NO₂ exposures, ranging from 30 minutes to 24 hours, with an array of adverse respiratory effects including increased asthma symptoms, more difficulty controlling asthma, and an increase in respiratory illnesses and symptoms.
- Studies also show a connection between short-term exposure and increased visits to emergency departments and hospital admissions for respiratory illnesses, particularly in at-risk populations including children, the elderly, and asthmatics.
- NO₂ concentrations near major roads are appreciably higher than those measured at monitors in the current network. Concentrations in heavy traffic or on freeways can be twice as high as levels measured in residential areas or near smaller roads. Monitoring studies indicate that near-road (within about 50 meters) concentrations of NO₂ can be 30 to 100 percent higher than concentrations away from major roads.
- EPA's NAAQS for NO₂ is designed to protect against exposure to the entire group of nitrogen oxides (NO_x). NO₂ is the component of greatest concern and is used as the indicator for the larger group of NO_x. The sum of nitric oxide (NO) and NO₂ is commonly called NO_x. Other nitrogen oxides include nitrous acid and nitric acid.
- Emissions that lead to the formation of NO₂ generally also lead to the formation of other NO_x. Control measures that reduce NO₂ can generally be expected to reduce population exposures to all gaseous NO_x. This may have the co-benefit of reducing the formation of ozone and fine particles both of which pose significant public health threats.
 - NO_x react with ammonia, moisture, and other compounds to form small particles. These small particles penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease, leading to increased hospital admissions and premature death. EPA's NAAQS for particulate matter (PM) are designed to provide protection against these health effects.
 - NO_x react with volatile organic compounds to form ozone. Children, the elderly, people with lung diseases such as asthma, and people who work or exercise outside are at risk for adverse health effects from ozone. These effects include reduced lung function and increased respiratory symptoms, more respiratory-related emergency department visits and hospital admissions, and increased risk of premature death from heart or lung disease. EPA's NAAQS for ozone are designed to provide protection against these health effects.

REVISING THE NO₂ MONITORING NETWORK

- EPA is setting new requirements for the placement of new NO₂ monitors in urban areas. These include:
 - Near Road Monitoring**
 - At least one monitor must be located near a major road in any urban area with a population greater than or equal to 500,000 people. A second monitor is required

near another major road in areas with either:

- (1) population greater than or equal to 2.5 million people, or
- (2) one or more road segment with an annual average daily traffic (AADT) count greater than or equal to 250,000 vehicles.

These NO₂ monitors must be placed near those road segments ranked with the highest traffic levels by AADT, with consideration given to fleet mix, congestion patterns, terrain, geographic location, and meteorology in identifying locations where the peak concentrations of NO₂ are expected to occur. Monitors must be placed no more than 50 meters (about 164 feet) away from the edge of the nearest traffic lane.

- EPA estimates that the new NO₂ monitoring requirements will result in a network of approximately 126 NO₂ monitoring sites near major roads in 102 urban areas.

Community Wide Monitoring

- A minimum of one monitor must be placed in any urban area with a population greater than or equal to 1 million people to assess community-wide concentrations.
- An additional 53 monitoring sites will be required to assess community-wide levels in urban areas.
- Some NO₂ monitors already in operation may meet the community-wide monitor siting requirements.

Monitoring to Protect Susceptible and Vulnerable Populations

- Working with the states, EPA Regional Administrators will site at least 40 additional NO₂ monitors to help protect communities that are susceptible and vulnerable to NO₂-related health effects.

- All new NO₂ monitors must begin operating no later than January 1, 2013.
- EPA Regional Administrators have the authority to require additional monitoring in certain circumstances, such as in areas impacted by major industrial point sources or a combination of sources where there is an indication that the standards may be exceeded. The Regional Administrators also have the authority to require additional near-road monitoring in urban areas where multiple peak concentration areas may be caused by a variety of mobile source factors including fleet mix, traffic congestion patterns, or terrain.

IMPLEMENTING THE NEW NO₂ STANDARD

- In this final rule, EPA is outlining the Clean Air Act requirements that states must address to implement the new NO₂ air quality standard.
- The new standard must be taken into account when permitting new or modified major sources of NO_x emissions such as fossil-fuel fired power plants, boilers, and a variety of other manufacturing operations.
- EPA expects to identify or “designate” areas as attaining or not attaining the new standard by January 2012, within two years of establishing the new NO₂ standard. These designations

will be based on the existing community-wide monitoring network. Areas with monitors recording violations of the new standards will be designated “nonattainment.” EPA anticipates designating all other areas of the country “unclassifiable” to reflect the fact that there is insufficient data available to determine if those areas are meeting the revised NAAQS.

- Once the expanded network of NO₂ monitors is fully deployed and three years of air quality data have been collected, EPA intends to redesignate areas in 2016 or 2017, as appropriate, based on the air quality data from the new monitoring network.

BACKGROUND

- The Clean Air Act requires EPA to set national ambient air quality standards for pollutants considered harmful to public health and the environment. National standards exist for six pollutants: nitrogen dioxide, ozone, particulate matter, carbon monoxide, sulfur dioxide, and lead.
- For each of these pollutants, the Clean Air Act requires EPA to set the health-based or “primary” standards at a level judged to be “requisite to protect the public health with an adequate margin of safety” and establish secondary standards that are “requisite” to protect public welfare from “any known or anticipated adverse effects associated with the pollutant in the ambient air” including effects on vegetation, soils, water, wildlife, buildings and national monuments, and visibility. EPA is considering the need for changes to the secondary NO₂ standard under a separate review.
- The law also requires EPA to review the standards and their scientific basis every five years to determine whether revisions are appropriate.
- Nitrogen dioxide is one of a group of highly reactive gasses known as “oxides of nitrogen.” NO₂ forms quickly from emissions from cars, trucks and buses, power plants, and off-road equipment. In addition to contributing to the formation of ground-level ozone and fine particle pollution, NO₂ is linked with a number of adverse effects on the respiratory system.
- EPA first established standards for NO₂ in 1971, setting both a primary standard (to protect health) and a secondary standard (to protect the public welfare) at 53 ppb, averaged annually. Prior to the current review, the Agency reviewed the standards twice since 1971, but chose not to revise the standards at the conclusion of each review.
- All areas presently meet the 1971 NO₂ NAAQS, with annual NO₂ concentrations measured at community-wide monitors well below the level of the standard (53 ppb). Annual average ambient NO₂ concentrations, as measured at community-wide monitors, have decreased by more than 40 percent since 1980. Currently, the annual average NO₂ concentrations range from approximately 10-20 ppb.
- EPA expects NO₂ concentrations to continue decreasing as a number of mobile source regulations take effect. Tier 2 standards for light-duty vehicles began phasing in during 2004, and new NO_x standards for heavy-duty engines are phasing in between 2007 and 2010

model years. Current air quality monitoring data reflect only a few years of vehicles entering the fleet that meet these stricter NO_x tailpipe standards.

FOR MORE INFORMATION

- To download a copy of the final rule, go to EPA's Web site at: <http://www.epa.gov/air/nitrogenoxides>.
- This final rule and other background information are also available either electronically at <http://www.regulations.gov>, EPA's electronic public docket and comment system, or in hardcopy at the EPA Docket Center's Public Reading Room.
- The Public Reading Room is located in the EPA Headquarters, Room Number 3334 in the EPA West Building, located at 1301 Constitution Avenue, NW, Washington, DC. Hours of operation are 8:30 a.m. to 4:30 p.m. eastern standard time, Monday through Friday, excluding Federal holidays.
- Visitors are required to show photographic identification, pass through a metal detector, and sign the EPA visitor log. All visitor materials will be processed through an X-ray machine as well. Visitors will be provided a badge that must be visible at all times.
- Materials for this action can be accessed using Docket ID No. EPA-HQ-OAR-2006-0922.

Exhibit 10

Alaska Wilderness League, et al., Comments on Revised Draft Air Permits for Shell's Proposed Oil and Gas Exploration Drilling in the Beaufort Sea and Chukchi Sea, Alaska (Aug. 5, 2011)

**ALASKA WILDERNESS LEAGUE—AUDUBON ALASKA
CENTER FOR BIOLOGICAL DIVERSITY—DEFENDERS OF WILDLIFE
GREENPEACE— EARTHJUSTICE—NATIONAL WILDLIFE FEDERATION
NATIVE VILLAGE OF POINT HOPE
NATURAL RESOURCES DEFENSE COUNCIL
NORTHERN ALASKA ENVIRONMENTAL CENTER—OCEAN CONSERVANCY
OCEANA—PACIFIC ENVIRONMENT—REDOIL—SIERRA CLUB
THE WILDERNESS SOCIETY—WORLD WILDLIFE FUND**

August 5, 2011

VIA EMAIL

Shell Discoverer Air Permits
EPA Region 10
1200 6th Ave., Ste. 900, AWT-107
Seattle, WA 98101
Email: R10ocsairpermits@epa.gov

Re: Revised Draft Air Permits for Shell’s Proposed Oil and Gas Exploration Drilling in the Beaufort Sea and Chukchi Sea, Alaska

Alaska Wilderness League, Audubon Alaska, Center for Biological Diversity, Defenders of Wildlife, Greenpeace, Earthjustice, National Wildlife Federation, Native Village of Point Hope, Natural Resources Defense Council, Northern Alaska Environmental Center, Ocean Conservancy, Oceana, Pacific Environment, REDOIL, Sierra Club, The Wilderness Society, and World Wildlife Fund hereby submit the following comments on U.S. EPA Region 10’s revised draft Outer Continental Shelf (“OCS”) Prevention of Significant Deterioration (“PSD”) Clean Air Act Permits for Shell Gulf of Mexico, Inc. and Shell Offshore Inc. (collectively, “Shell”), authorizing air emissions from Shell’s *Discoverer* drillship and associated vessels for proposed oil and gas exploration drilling operations in the Beaufort Sea and the Chukchi Sea.

Shell proposes to undertake large-scale and long-term industrial operations involving many ships that will emit large amounts of pollution into the environment and create significant amounts of noise that is harmful to Arctic species. Shell’s operations would affect a huge region, all the way from the western Alaskan Beaufort Sea down to the Bering Sea. Further, Shell’s *Discoverer* permit applications are just the beginning of what could become a massive influx of oil company development in the Arctic. Indeed, Region 10 has also received Clean Air Act permit applications from Shell for exploration drilling operations in the Beaufort Sea using the *Kulluk* drill rig and from ConocoPhillips (“Conoco”) for exploration drilling operations in the Chukchi Sea using a jack-up rig. Thus, it is essential that Region 10 exercise extreme diligence and caution in reviewing these first permit applications. The agency’s actions here likely will have consequences beyond the *Discoverer*’s potential operations, and will establish precedents that must provide sufficient protection to the Arctic’s people and environment.

As an initial matter, we maintain that Region 10 must account for the substantial lack of data concerning the Arctic environment. Since the Environmental Appeals Board (“EAB”) remanded the *Discoverer* permits back to Region 10, the Secretary of Interior released a major report from the U.S. Geological Survey on the gaps in the scientific understanding of the United States’ Arctic. See Holland-Bartels, Leslie, and Pierce, Brenda, eds., 2011, An evaluation of the science needs to inform decisions on Outer Continental Shelf energy development in the Chukchi and Beaufort Seas, Alaska: U.S. Geological Survey Circular 1370. It concludes that there are large information gaps about the Arctic Ocean, and these gaps are a “major constraint to a defensible science framework for critical Arctic decision making.” *Id.* at 151. Moreover, the Alaska Federal District Court remanded Chukchi Lease Sale 193 because the agency had not fully considered the importance of missing information in its environmental impact analysis. Region 10 must acknowledge these shortcomings in the scientific understanding of the Arctic and move forward cautiously, ensuring that any permits it issues are designed to provide maximum protection for human health and the environment.

With regard to the revised draft air permits for Shell, the current permits offer some limited improvements upon the previous drafts. For example, the required use of selective catalytic reduction and oxidation catalyst pollution controls on ice breaker #1’s main propulsion engines and generators will reduce emissions of nitrogen oxides (NO_x) and particulate matter. Also, Region 10 improved the permit by abandoning its previous, unlawful approach to determining when the *Discoverer* constitutes an Outer Continental Source (“OCS”), opting instead to determine that the ship is such a source from the moment the first anchor attaches to the seabed at the drill site until the moment the last anchor is removed.

Despite these improvements, the revised draft permits and the underlying analysis upon which they are predicated is unlawfully inadequate. The draft permits’ significant flaws include the following:

- Region 10 unlawfully has established an ambient air boundary of 500 meters around the *Discoverer*. Such a distant boundary conceals the true maximum impacts of Shell’s pollution.
- Shell has failed to demonstrate that it will not cause a violation of the new national ambient air quality standard (“NAAQS”) for 1-hour nitrogen dioxide (NO₂), as required by 40 C.F.R. § 52.21(k).
- Shell’s modeling fails to demonstrate compliance with NAAQS because it does not account for Conoco’s planned exploration activities, which may occur in close proximity to Shell’s operations.
- Region 10 has not provided a sufficient analysis of potential secondary fine particulate matter (“PM_{2.5}”) pollution formation because it failed to determine whether Shell will emit significant quantities of PM_{2.5} precursors.
- Region 10 has neglected to require Shell to comply with all applicable Clean Air Act standards, including the recently updated increment for PM_{2.5}.
- The draft permits lack both reliable controls on Shell’s greenhouse gas emissions as well as critical monitoring requirements for those emissions; without such permit conditions, Region 10 has not lawfully exempted Shell’s operations from stringent technological controls for greenhouse gases.

- Region 10’s environmental justice analysis is wholly inadequate because the agency has not considered Shell’s contribution to Arctic warming or the disproportionate effect that such warming may have on Alaska Natives.
- Region 10 has not imposed stringent “best available control technology” (“BACT”) on Shell’s associated vessels, as required by the Clean Air Act.

I. The permits’ 500 meter ambient air boundary is unlawful.

Region 10’s decision to set the ambient air quality boundary at 500 meters from the center of the *Discoverer* is arbitrary and unlawful. This is because the 500 meter boundary is inconsistent with EPA’s policy regarding where the ambient air begins. In order to comply with this longstanding policy, Region 10 must set the ambient air boundary at the hull of the *Discoverer*.

The Clean Air Act requires EPA to promulgate standards protecting the quality of the ambient air. 42 U.S.C. § 7409. EPA has defined “ambient air” as “that portion of the atmosphere, external to buildings, to which the general public has access.” 40 C.F.R. § 50.1(e). According to EPA policy, an “exemption from ambient air is available only for the atmosphere over land owned or controlled by the source and to which public access is precluded by a fence or other physical barriers.” Letter from Douglas M. Costle, EPA Administrator to The Honorable Jennings Randolph, re: Ambient Air (Dec. 19, 1980) (“Letter Costle to Randolph”). EPA’s interpretation is a longstanding policy: it has been in force for over 30 years.

For Shell’s permits, Region 10 has taken an inconsistent approach in setting the ambient air boundary. When Shell initially applied for the air permits, the company’s application materials included an ambient air boundary of 900 meters. *See* Shell, Outer Continental Shelf Pre-Construction Air Permit Application, Frontier Discoverer, Chukchi Sea Exploration Drilling Program at 63 (Feb. 23, 2009) (“Shell Feb. 23, 2009, Chukchi App.”). Shell assumed that the ambient air would begin at this distance because it had “submitted a request to the US Coast Guard, for issuance of a safety exclusion and equipment protection zone surrounding the *Discoverer*” *Id.* Nevertheless, for the original draft permits, Region 10 required Shell to model impacts from the hull of the *Discoverer*, outward. *See, e.g.*, Region 10, Statement of Basis for Proposed 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 at 99 (Jan. 8, 2010) (“2010 Chukchi Statement of Basis”). Now, in the Supplemental Statement of Basis for the revised draft permits, Region 10 has indicated that it will allow Shell to model impacts starting 500 meters from the center of the *Discoverer*. Region 10, Supplemental Statement of Basis for Proposed Outer Continental Shelf Prevention of Significant Deterioration Permits, Noble Discoverer Drillship, Shell Offshore Inc., Beaufort Sea Drilling Program, Permit No. R10OCS/PSD-AK-2010-01, Shell Gulf of Mexico Inc. Chukchi Sea Exploration Drilling Program, Permit No. R10OCS/PSD-AK-09-01 at 26 (July 6, 2011) (“Supp. Statement of Basis”).

The 500 meter ambient air boundary Region 10 has proposed to establish for the revised draft permits is inconsistent with the EPA policy detailed above. EPA has established that an exemption from the ambient air is available only for areas “owned or controlled by the source and to which public access is precluded by a fence or other physical barriers.” *See* Letter Costle

to Randolph. Shell does not own or control the area within the 500 meter radius and it cannot effectively prevent public access. Shell's proposal to implement a public access control program to "locate, identify and intercept the general public" clearly does not constitute the fence or other physical barrier excluding the public that EPA's policy requires. *See* Supp. Statement of Basis at 26. In fact, Shell actually plans to allow members of the public—such as marine mammal observers and subcontractors, who are not Shell employees—onto and near Shell's vessels within the 500 meter boundary.

If Region 10 were to recognize, as it should, that the edge of the hull is the appropriate boundary, Shell has not demonstrated that its operations will not cause a violation of air quality standards in the "ambient air." In its 2010 permit application, Shell directly states that maximum impacts occurred only a short distance from the drill ship. *See* Shell, Outer Continental Shelf Pre-Construction Air Permit Application, Frontier Discoverer, Beaufort Sea Exploration Program at 166 (Jan. 2010) ("Shell Jan. 2010 Beaufort App.") ("at all receptors, the cumulative concentrations were less than the peak Project contribution alone, which occurs only 80 meters downwind of the drill site"). In the Supplemental Statement of Basis, EPA likewise acknowledges that maximum impacts could occur close to the drill ship, stating that "modeled impacts generally decrease as the distance from the 500 meter boundary increases, and in general there is a rapid decrease in concentrations as the distance from the Discoverer increases." Supp. Statement of Basis at 59. Because EPA has arbitrarily approved an inappropriate boundary, Shell did not provide information about compliance with standards at a distance less than 500 meters.

Thus, in order to identify maximum impacts, properly ensure that Shell will not violate NAAQS, and comply with EPA's policy defining the extent of ambient air, EPA must set the ambient air boundary at the *Discoverer's* hull.

II. Shell has not demonstrated that its operations will not cause a violation of air quality standards.

Both the statute and applicable regulations dictate that Region 10 may not issue Shell a PSD permit unless Shell demonstrates that "allowable emission increases from the proposed source . . . in conjunction with all other applicable emissions increases . . . (including secondary emissions), would not cause or contribute to air pollution in violations of" any NAAQS or increment. 40 C.F.R. § 52.21(k); *see also* 42 U.S.C. § 7475(a)(3). As described below, Shell has not made this demonstration.

a. Shell has not demonstrated that it will comply with the new 1-hour NO₂ standard.

The 1-hour NO₂ NAAQS became effective on April 12, 2010. 75 Fed. Reg. 6,474, 6,474 (Feb. 9, 2010). EPA set the 1-hour NAAQS at a level of 188 µg/m³ (or 100 parts per billion). *Id.* This standard reflects EPA's recognition of the substantial body of scientific evidence demonstrating that the previous, annual NO₂ NAAQS alone was insufficient to protect human health. *Id.* at 6,479-81. Short term spikes in NO₂ concentrations are associated with a range of negative human health effects, including breathing problems and even death. *Id.* The new 1-hour NO₂ NAAQS also includes a new "form" for the standard: compliance is "based on the 3-year average of the

98th percentile of the yearly distribution of 1-hour daily maximum concentrations” *Id.* at 6,474.¹

Region 10 cannot issue Shell the permits unless Shell demonstrates that it will comply with the 1-hour NO₂ standard. 40 C.F.R. § 52.21(k). Shell has not made this demonstration: (i) Shell’s modeling fails to identify maximum impacts because Shell’s modeling did not include sufficient receptors; (ii) Shell has understated 1-hour NO₂ impacts by inappropriately excluding data confirming higher impacts; (iii) Shell has utilized offsite background air quality data in a manner that systematically understates pollution levels; (iv) Shell’s use of the PVMRM model is unlawful; (v) Shell employed NO₂/NO_x ratios in its modeling that result in an unjustified downward bias; (vi) Shell’s modeling is predicated upon operating scenarios that fail to include the various ways in which Shell may operate and the wide range of conditions Shell may encounter; (vii) Shell understated maximum 1-hour NO₂ impacts by using area polygons; and (viii) Shell has failed to obtain the amount of meteorological data required by EPA’s regulations.

i. Region 10 must require Shell to remodel its impact on 1-hour NO₂ concentrations in the Chukchi Sea using a higher density of receptors.

Using a sufficient density of modeling receptors is essential to identifying the maximum projected impacts from Shell’s proposed operations. Quite obviously, a model cannot identify a maximum impact if there is no receptor located in the area of highest impact. Region 10 recognizes as much, stating that Shell’s receptor grid should be designed to “characterize the pattern and location of maximum 1-hour impacts from the *Discoverer* and Associated Fleet.” Supp. Statement of Basis at 42. Indeed, it is well-established protocol among air agencies that ambient air modeling should include the placement of additional receptors in the vicinity of projected maximum impacts to ensure that the model does not miss the true maximum. For example, the Alaska Department of Environmental Conservation (“ADEC”) “recommends a 25 meter spaced grid surrounding the receptor with the maximum impact to ensure the maximum has truly been defined.” ADEC Modeling Review Procedures Manual at 60. As ADEC explains, “[i]f the location of the maximum concentrations are not within a 25-meter spaced grid . . . then the maximum concentration may not have been correctly identified.” *Id.* The Wyoming Department of Environmental Quality likewise states that “[f]ine-spaced (100-m or less) receptors should be used to refine the maximum predicted impacts if they occur in an area with

¹ Our comments below acknowledge EPA’s new “data handling conventions for NO₂” whereby NAAQS compliance is “based on the 3-year average of the 98th percentile of the yearly distribution of 1-hour daily maximum concentrations.” 75 Fed. Reg. at 6,474. Significantly, the new data handling convention is specific to determining “area-wide” compliance with the revised NAAQS. *See, e.g., id.* at 6,482. There is no basis in the Clean Air Act nor the new standard itself for the PSD permitting approach that Region 10 has adopted here, namely, allowing a proposed new source to discount its highest projected impacts. Indeed, such an approach ignores both the importance of the absolute value of the NAAQS standard—which must be set at the requisite level to protect human health, *see* 42 U.S.C. § 7409—as well as the PSD program requirement that a proposed new source demonstrate that it will not cause a NAAQS exceedance. 42 U.S.C. § 7475(a)(3); 40 C.F.R. § 52.21(k).

receptor spacing of 250-m or more.” Wyoming Department of Environmental Quality/Air Quality Division Guidance for Submitting Major Source/PSD Modeling Analyses at 1.

Unfortunately, Region 10 ignored established modeling practice and did not require Shell to utilize a receptor density capable of reliably capturing the maximum projected air quality impacts of Shell’s operations. Shell spaced receptors at intervals of 25 meters along the ambient air boundary (at 500 meters), then placed receptors 100 meters apart out to one kilometer, and then 250 meters apart out to five kilometers. *See* Region 10, Technical Support Document, Review of Shell’s Supplemental Ambient Air Quality Impact Analysis for the Discoverer OCS Permit Applications in the Beaufort and Chukchi Seas at 9-11 (Jun. 24, 2011) (“Technical Support Document”). Shell claimed that this arrangement would be effective in capturing maximum impacts, noting that for most pollutants AERMOD predicts that the highest ambient air concentration will be predicted at the 500 meter ambient air boundary. *See* Shell, Discoverer Drillship Impact Evaluation for SO₂ and NO₂ using AERMOD, Chukchi and Beaufort Seas, Shell Alaska Exploratory Drilling Program at 38 (Mar. 18, 2011) (“Shell Mar. 18, 2011, App.”). Region 10 agreed, stating that it had “reviewed Shell’s receptor grid and determined that it ha[d] sufficient density and coverage for characterizing the maximum impacts from Shell’s drilling operations.” Supp. Statement of Basis at 42. Yet Shell’s maximum modeled impact for 1-hour NO₂ did not occur at the 500 meter ambient air boundary (with 25 meter spacing for receptors) or even within a distance of one kilometer (100 meter spacing); rather, it occurred 1.5 kilometers from the center of the *Discoverer*, in an area where the receptors were coarsely spaced at 250 meters, suggesting that other higher impacts were lost in the gaps between receptors.

Air modeling expert Khanh Tran reviewed Shell’s analysis and, for the hour during which the maximum NO₂ impacts are predicted, duplicated Shell’s modeling with additional receptors placed around the area of maximum impact. As described in the attached report, the results of this additional modeling run reveal a cluster of elevated 1-hour NO₂ concentrations, including numerous receptors registering a level that would exceed 188 µg/m³—the NAAQS limit—when added to the background concentrations for that hour. Comparing a first model run (identical to Shell’s approach) with a second model run (that incorporated more receptors), Mr. Tran reported:

High concentrations above 174.8 ug/m3 (exceeding the NAAQS with the added background) have been predicted at more receptors in the second run than in the first run: the first run has 9 receptors exceeding 174.8 ug/m3 while the second run has 56 such receptors. As shown in Appendix A (page 10), the concentration of 160.8 ug/m3 at the receptor (x=-1500 m, y =1500 m) is ranked 65th in the first run. This same concentration is ranked 425th in the second run in Appendix B (page 23). Thus, the 98th percentile concentration reported by Shell in the permit application is underestimated and will be higher with additional receptors at 100 m resolution. Since the existing total impact of 174 ug/m3 is close to the NAAQS of 188 ug/m3, it is highly likely that this standard can be exceeded with higher concentrations at these additional receptors.

Statement of Khanh Tran at 5-6 (emphasis added). These findings illustrate the need, consistent with well established protocol, for Region 10 to require Shell to remodel impacts with a higher

density of receptors in the vicinity of maximum impacts in order to capture the true effect of Shell's proposed project on air pollution concentrations.²

By failing to model with sufficient receptor points around the location of maximum projected impact, Shell has failed to account for the true magnitude of the impacts of its NO₂ emissions upon air quality. With such maximum impacts not only unaccounted for, but also likely in violation of the NO₂ NAAQS, Shell has failed to demonstrate that its operations "would not cause or contribute to air pollution in violation" of the NAAQS, as required by 42 U.S.C. § 52.21(k). To correct this obvious error—an error that Region 10 has implicitly acknowledged—Region 10 must direct Shell to rerun its models with additional receptors in the region between 1 and 5 kilometers. And if Shell's additional modeling reveals a NAAQS violation, additional controls must be imposed upon Shell's operations.

ii. Shell has understated 1-hour NO₂ impacts by inappropriately excluding data confirming higher impacts.

Shell has understated maximum 1-hour NO₂ impacts by failing to accurately calculate the multiyear average of the 98th percentile of the annual distribution of daily maximum 1-hour values. EPA determined that use of the 98th percentile is appropriate for determining compliance with the 1-hour NO₂ standard because it will help insulate the standard from extreme events, meaning outlier concentrations. 75 Fed. Reg. at 6,492-93. EPA estimated that, when evaluating the measured concentrations for a year's worth of monitoring data, the 98th percentile would be equivalent to the 7th or 8th highest daily maximum for the 365-day period. *Id.* at 6,492.

In calculating its compliance with the 1-hour NO₂ standard, Shell selected the 8th highest daily maximum, but this is an underestimate of the true 98th percentile associated with its operations. Shell's drilling season is only 120 days long, and it modeled only that many days. *See* Supp. Statement of Basis at 11, 41. Selecting the 8th highest daily maximum from 120 days corresponds roughly to the 93rd percentile, not the 98th percentile. Having failed to identify the 98th percentile maximum daily 1-hour NO₂ impact associated with the duration of its actual operations, Shell has not demonstrated that its proposed operations will not cause or contribute to air pollution violations, as required by 40 C.F.R. § 52.21(k).

iii. Shell has understated 1-hour NO₂ impacts by using background data in a manner that understates health and environmental risks.

Shell has not demonstrated compliance with the 1-hour NO₂ NAAQS because Shell has used background ambient air data in a manner that systematically understates the impact of its operations. In order to ensure compliance, Region 10 must direct Shell to estimate background values in a manner that does not bias the results and underestimate impacts.

² Consistent with the requirement of Clean Air Act section 328 that OCS sources be held to the same requirements "as would be applicable if the source were located in the corresponding onshore area, 42 U.S.C. § 7627(a)(1), EPA should require Shell to model with receptors at a distance of 25 meters in the vicinity of its predicted maximum impacts. *See* ADEC Modeling Review Procedures Manual at 60.

In its modeling, Shell has neglected to use the highest background pollution levels measured in the vicinity of its proposed operations. Instead, Shell has adjusted background ambient air data by using multiyear averages of the 98th percentile background concentrations for each hour of the day. Although compliance with the 1-hour NO₂ standard is determined using a “probabilistic” form (*i.e.*, the 98th percentile maximum 1-hour impact), Shell has made two downward adjustments: in addition to discounting the highest concentrations caused by its operations, Shell has assumed that such concentrations will not occur at a time when background concentrations are at their highest observed levels. This has the effect of “compounding” the 98th percentile adjustment, thereby understating the true maximum impacts that may occur as a consequence of Shell’s operations.

Region 10 has not offered any explanation for why Shell’s double-discounting approach is consistent with the standard. In separate guidance, EPA has indicated that this technique may be appropriate in some circumstances. *See* Memorandum from Tyler Fox to Regional Air Division Directors, Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-Hour NO₂ National Ambient Air Quality Standard at 19-20 (Mar. 11, 2011) (“Fox Memo”). However, it is impossible to square this guidance with the 1-hour NO₂ standard itself. The 1-hour NO₂ NAAQS limit is 188 ug/m³ (or 100 ppb), and compliance with this standard is evaluated with a single adjustment for the 98th percentile.

Shell’s manner of selecting 1-hour NO₂ background data for use in its model disregards the highest possible background levels and underestimates the true maximum impact of Shell’s operations. In light of this downward bias, Shell plainly has failed to demonstrate that it will not cause a violation of air quality standards, as required by 40 C.F.R. § 52.21(k).

iv. Shell’s use of the PVMRM model adjustment is unlawful.

Region 10 has specifically requested public comment on Shell’s use of the Plume Volume Molar Ratio Method (“PVMRM”) as a component of its ambient air modeling. *See* Supp. Statement of Basis at 13, 50. Shell used AERMOD’s PVMRM option to model its 1-hour NO₂ impacts. Technical Support Document at 21.

The NO_x emissions created during combustion (as occurs in Shell’s ship engines and other equipment) are emitted partly as nitric oxide (NO) and partly as NO₂. Once in the atmosphere, NO interacts with ozone and is ultimately converted to NO₂. Both NO and NO₂ are harmful to human health and the environment. However, compliance with the final 1-hour NO₂ NAAQS is calculated by measuring NO₂ alone. *See* 75 Fed. Reg. at 6,474. The standard relies upon NO₂ as an indicator for ambient NO_x, 75 Fed. Reg. at 7,490, mostly as a matter of administrative convenience.

Region 10 must reject Shell’s use of PVMRM to demonstrate compliance with the 1-hour NO₂ standard. In predicting ambient air impacts, PVMRM significantly understates the extent to which NO will convert to NO₂ in the presence of ozone. PVMRM fixates on the short-term rates of conversion, even though nearly all NO is eventually converted to NO₂.

The use of PVMRM also contradicts—and undermines—the underlying assumptions of the NO₂ standard itself. In promulgating the 1-hour NO₂ standard, EPA elected to rely on NO₂—as opposed to other nitrogen oxides—as the overall indicator for ambient NO_x. 75 Fed. Reg. at 6,490. Although NO₂ was chosen as the indicator, EPA intended for the 1-hour standard to not only reduce NO₂ levels, but to provide a corresponding reduction in other harmful nitrogen oxides as well. *See id.* PVMRM is necessarily unacceptable because it allows modelers to hide other harmful nitrogen oxides in low NO₂/NO_x ratios, resulting in a substantial understatement of total concentrations.

Thus, in order to maintain consistency with EPA’s declared purpose of using NO₂ as an indicator to reduce total NO_x, Region 10 must reject Shell’s use of PVMRM.

v. Shell has utilized NO₂/NO_x ratios that underestimate the expected maximum impacts of its operations.

Predictions of ambient 1-hour concentrations of NO₂ require data (or assumptions) about the initial, in-stack ratio of NO₂ to NO_x in the emissions generated by a pollution source. Characterizing a source’s emissions with a reliable NO₂/NO_x ratio (or ratios) is therefore essential to the modeling of 1-hour NO₂ impacts. An underestimation of the proportion of NO_x emissions that are NO₂ leads to greatly understated projections of ambient NO₂ concentrations.

Initially, Shell conducted 90 stack tests to determine empirically the various NO₂/NO_x ratios associated with its emission units. *See* Shell Mar. 18, 2011, App., Attachment E. These tests revealed ratios ranging from 0.042 to 0.469. Shell Mar. 18, 2011, App. at 46. Further, they showed that NO₂/NO_x ratios varied depending on the equipment tested and the operating load. Technical Support Document at 22. However, to simplify its calculations—in light of the many potential combinations of equipment and operating loads—Shell ultimately elected to employ generic ratios. *Id.*

Shell’s use of generic ratios is problematic on its face. Shell should have reacted to the difficulty in identifying the correct NO₂/NO_x ratios by increasing the complexity of its modeling; instead, Shell reacted by using generic ratios to erase that complexity. This falsely characterizes Shell’s intricate operations—operations in which many combinations of different activities could occur together, to the detriment of air quality.

Recognizing that Shell’s generic ratios likely were not representative of Shell’s operations, Region 10 required Shell to conduct “several” additional modeling runs with alternative in-stack ratios, employing Shell’s data collected from the in-stack ratios. While this is better than allowing Shell to rely upon generic ratios alone, it is not clear that these additional modeling runs demonstrate compliance with the 1-hour NO₂ NAAQS. Region 10 acknowledges that equipment factors and operating load significantly affect the resulting ratios, and Shell’s stack tests are not sufficiently comprehensive to reveal the full range of emission ratios that might actually occur during Shell’s operations. *See* Shell Mar. 18, 2011, App., Attachment E. Thus, it is unlikely that the additional modeling runs Region 10 required actually provided a realistic representation of potential operating scenarios.

Region 10 and Shell have not provided any basis for concluding that the NO₂/NO_x ratios used in Shell's modeling are representative of the ratios that actually may result from Shell's operations. Due to the importance of these ratios to assessing 1-hour NO₂ impacts, Shell cannot say that it has demonstrated compliance with the standard. If Shell believes that its operations are simply too complex to actually measure resultant ratios, EPA's guidance provides a ready solution: EPA guidelines include a default in-stack NO₂/NO_x ratio (0.50) that is much higher than the ratios utilized by Shell. *See* Fox Memo at 5. If Shell does not obtain more reliable data, Region 10 should direct Shell to use this default ratio.

vi. Region 10 has failed to ensure that Shell's modeling assumptions reflect actual operating conditions.

Shell's modeling fails to demonstrate compliance with the new 1-hour NO₂ standard because Shell does not establish that its modeling captures all realistic combinations of allowable operations, background levels, and meteorological conditions that may result in maximum impacts. In modeling its effect on 1-hour NO₂ standards, Shell assumes a perfect choreography of closely-timed events and favorable conditions. Such modeling likely is not representative of actual operating conditions. Per 40 C.F.R. § 52.21(k), Region 10 must ensure that Shell has actually modeled the ways in which its operations could affect air quality.

Shell's modeling lines up events and conditions in an unrealistically precise manner by varying—for every hour of its proposed 2,880 hours of operation— meteorological conditions, background concentrations, and fleet operations. This method of modeling operations, however, is vulnerable to missing maximum impacts as it is difficult to imagine that Shell's projected coincidences of well-timed fluctuations in background pollution levels, weather, and equipment operations will necessarily describe actual potential impacts. Shell's modeling should be based instead on scenarios in which meteorological conditions, background concentrations, and vessel operations combine to maximize impacts.

While commenters were unable to review all of Shell's 2,880 modeling hours, it appears that Shell has not performed its modeling in a manner that will capture a full, realistic range of potential operations and conditions. Thus, Shell has not demonstrated compliance with applicable standards, including the 1-hour NO₂ NAAQS. Shell must model in a way that will reproduce the full range of operating scenarios and impacts.

vii. Shell's use of area polygons to model the emissions of associated vessels underestimates impacts.

Shell has not demonstrated compliance with 1-hour NO₂ standards, as required by 40 C.F.R. § 52.21(k), because its modeling dilutes Shell's associated vessel emissions over a large area, artificially reducing projected maximum impacts. Region 10 should direct Shell to remodel impacts using a method that does not bias modeled impacts in this manner.

In modeling the emissions of its associated vessels, Shell has used area polygons rather than volume sources to represent the emissions of associated vessels. Supp. Statement of Basis at 35. Shell's use of this method results in the distribution of associated vessel emissions within the

“areapoly.” Shell Mar. 18, 2011, App. at 26-27. The ice breaker emissions appear to be distributed over an area of roughly eight square kilometers, and the emissions of other support vessels distributed over four square kilometers. *Id.* at 29.

By treating the associated vessel emissions in this manner, Shell likely overestimates how much its ships will be moving and further underestimates short-term impacts to air quality. For instance, discussing its icebreakers, Shell has previously stated that “[o]ccasionally there may be multi-year ice ridges that are expected to be broken at a much slower speed than used for first-year ice. Multi-year ice may be broken by riding up onto the ice so that the weight of the icebreaker on top of the ice breaks it.” Shell, Outer Continental Shelf Pre-Construction Permit Application, Frontier Discoverer, Beaufort Sea Exploration Drilling Program at 19 (May 2009). Operating over such a small area—especially close to and directly upwind of the *Discoverer*—could result in higher concentrations because the vessels will emit the pollution in essentially the same location for extended periods of time. Use of area polygons does not account for operation of the ice breakers under these foreseeable conditions. As a consequence, pollution impacts are underestimated. The potential for underestimating impacts is particularly significant with short-term standards like the 1-hour NO₂ standard.

An additional problem with the area polygons is that due to their size, associated vessel emissions will never be modeled as directly upwind or downwind of major *Discoverer* emission units. Shell represents the *Discoverer* as being about 150 meters long and a little over 25 meters wide. Shell Mar. 18, 2011, App. at 28. But Shell’s area polygon for its ice breakers, at its widest, is over three kilometers wide. *Id.* at 29. The area polygon—by its very configuration—prevents an accurate assessment of the maximum impacts that would be expected during alignment of *Discoverer* and icebreakers.

Admittedly, Shell’s main purpose in using the area polygon approach was to dilute the projected ambient concentrations of its pollutants. Shell used area polygons because of a problem it encountered with PVMRM, and not because of the accuracy of area polygons. According to Shell, the regulatory version of the AERMOD model with PVMRM code allows the modeling of volume sources, but it has an error that overestimates the NO₂ chemistry for point sources when volume sources are also included. *See* Shell Mar. 18, 2011, App. at 27. EPA provided Shell with a beta version of AERMOD with PVMRM code that addresses this problem, but Shell declined to use it. *Id.* If there truly is a problem with Shell’s use of the regulatory and beta versions of AERMOD, the solution is not to allow Shell to use area polygons that will underestimate impacts.

viii. Region 10 cannot issue Shell the permits because Shell has collected far fewer meteorological data than required by EPA’s regulations.

Region 10 may not issue Shell permits because Shell has not met minimum regulatory requirements for the amount of site-specific meteorological data Shell must obtain to support a modeling demonstration that Shell’s operations will not violate air standards. As Region 10 states, Shell must obtain a minimum of one year of site-specific data, or five years of National Weather Service data. *See* Technical Support Document at 5 (citing 40 C.F.R. Part 51, App. W §

8.3.1.2(b). EPA's guidelines for the implementation of the 1-hour NO₂ NAAQS confirm that this requirement is applicable to new sources attempting to demonstrate compliance with the new standard. *See* Fox Memo at 4 ("Although the monitored design value for the 1-hour NO₂ standard is defined in terms of the 3-year average, this definition does not preempt or alter the Appendix W requirement of the use of 5 years of NWS meteorological data or at least 1 year of site specific data."). According to EPA's PSD Ambient Monitoring Guidelines, site-specific data are data collected on-site. *See* EPA, Ambient Monitoring Guidelines for Prevention of Significant Deterioration at 48 (May 1987) ("Site-specific data are always preferable to data collected off-site.").

Region 10 does not detail why it believes Shell's meteorological data meet this standard; instead, it merely lists the data sets available. *See* Technical Support Document at 5. Many of these data were available in 2009, when Region 10 was initially considering these permits. *See* Shell Mar. 18, 2011, App. at 37. Interestingly, at the time, the agency did not believe they were sufficient to support an analysis. *See* 2010 Chukchi Statement of Basis at 97 ("Because site-specific meteorology was not available, Shell used screening meteorology"); Region 10, Statement of Basis for Proposed Outer Continental Shelf Prevention of Significant Deterioration Permit No. R10OCS/PSD-AK-2010-01, Shell Offshore Inc., Frontier Discoverer Drillship, Beaufort Sea Exploration Drilling Program at 102 (Feb. 17, 2010) ("Because meteorological data representative of the open Beaufort Sea was not available, Shell used screening meteorology").

Indeed, the meteorological data Shell has collected do not come close to meeting the standard set by EPA's guidelines. For the Chukchi Sea, Shell has only a few months of site-specific data. Shell Mar. 18, 2011, App. at 37. These data amount to far less than a year, and because Shell did not obtain site-specific data for early July or late November, the data do not even cover the period during which Shell may drill. *Id.* Also, all of Shell's Chukchi data together—including both site-specific and on-land Wainwright and Point Lay data—amount to roughly 30 months and less than the full five years required for non-site specific data. For the Beaufort Sea, Shell similarly has failed to provide one year of site-specific data or five years of National Weather Service meteorological data. Shell's site-specific data covers the period from August 13th to October 11th, meaning that Shell has no site-specific data for July or November, and has data for only about half of August and October. *Id.* All of Shell's Beaufort Sea data total under 4 years of data, and the vast majority of these data were collected on-land and far from Shell's potential drill sites. *Id.* at 36-37.

Therefore, Region 10 cannot issue Shell's permits because Shell has failed to meet the regulatory minimum requirements for meteorological data collection. Region 10 must retract the draft permits and direct Shell to collect additional meteorological data.

b. Shell has failed to account for emissions from ConocoPhillips's exploration operations planned for the Chukchi Sea.

Contrary to agency guidelines, Shell's modeling assumes that its drilling operations will be undertaken in complete isolation from other Arctic development projects. EPA's air quality modeling regulations require that "[a]ll sources expected to cause a significant concentration gradient in the vicinity of the source . . . under consideration for emission limit(s) should be

explicitly modeled.” 40 C.F.R. Part 51, App. W 8.2.3(b). Shell’s modeling does not comply with this requirement because it fails to account for Conoco’s potential operations on the Devil’s Paw prospect of the Chukchi Sea.

On July 22, 2011, Region 10 issued a draft air permit for Conoco. It appears that Conoco’s drillship could operate as little as 20 miles away from Shell’s operations, and as a result, its ice breaker and oil spill response vessel operations could take place as little as 15 and 10 miles away, respectively. *See* ConocoPhillips, Outer Continental Shelf Air Permit Application, Chukchi Sea, Devil’s Paw Prospect, Appendix L at L-11, L-20 (Feb. 2010). Like Shell, Conoco’s operations will emit large amounts of pollution. According to Conoco, its operations as a whole have the potential to emit 225 tons per year (“tpy”) of NO_x, 173 tpy of CO, and 14 tpy of PM_{2.5}/PM₁₀. *Id.* at 2-1. Also, Conoco says that its ice breakers, together, have the potential to emit 92.6 tpy of NO_x, and the oil spill response vessel has the potential to emit 48.9 tpy of NO_x. *Id.* at 2-6. According to Conoco’s application documents, Conoco’s potential to emit for NO_x is roughly two-thirds Shell’s potential to emit. *See* Technical Support Document at 8. It is especially important for Shell to account for Conoco’s potential emissions because the ambient air quality monitoring data will not otherwise account for them.

By failing to account for such a significant nearby and contemporaneous source of emissions, Shell’s modeling underestimates the total, cumulative impact of its own operations. This is cause for concern because Shell’s current modeling shows 1-hour NO₂ levels reaching 93 percent of NAAQS—without accounting for Conoco. Further, in determining that Shell will not contribute to a violation of ozone standards, Region 10 relies on “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 airshed” Supp. Statement of Basis at 57.

Without accounting for Conoco’s nearby operations, Region 10 cannot determine validly that Shell has demonstrated its operations will comply with NAAQS. Accordingly, Region 10 must require Shell to rerun its model in a manner that accounts for Conoco’s potential emissions. In doing so, Shell should model Conoco’s operations from its nearest potential locations to Shell.

c. Region 10’s analysis of potential secondary PM_{2.5} formation remains insufficient.

Despite the EAB’s clear direction on the issue, neither Shell nor Region 10 have performed a proper analysis of Shell’s potential contribution to secondary PM_{2.5}. Shell cannot demonstrate compliance with NAAQS until it has performed a sufficient secondary PM_{2.5} analysis.

In issuing the *Discoverer* permits in 2010 to Shell, EPA did not analyze Shell’s potential contribution to secondary PM_{2.5} formation. The EAB remanded Region 10’s PM_{2.5} analysis in order to ensure the proper accounting of secondary PM_{2.5} formation. In particular, the EAB was concerned with Region 10’s failure to follow EPA’s guidance on modeling PM_{2.5} impacts. *See Shell Gulf of Mexico Inc. and Shell Offshore Inc.*, 15 E.A.D. ___, 17 (Mar. 14, 2011, Opinion). This guidance states that “if the facility emits significant quantities of PM_{2.5} precursors, some assessment of their potential contribution to cumulative impacts as secondary PM_{2.5} may be necessary.” *Id.* at 10 (citing Memorandum from Stephen D. Page, Director, Office of Air Quality

Planning & Standards, U.S. EPA, to EPA Regional Modeling Contacts, U.S. EPA, *Modeling Procedures for Demonstrating Compliance with PM_{2.5} NAAQS* at 9 (Mar. 23, 2010)). Region 10 argued to the EAB that Shell's operations would not emit significant quantities of precursor pollution; however, the EAB ruled that this was simply a post hoc rationale that could not sustain Region 10's permitting decision. *Shell Gulf of Mexico*, 15 E.A.D. at 17 (Mar. 14, 2011, Opinion). In remanding the permitting decision to Region 10, the EAB specifically instructed that "the Region should . . . provide an explanation of why modeling secondary PM_{2.5} is necessary or not after determining whether PM_{2.5} precursors will be emitted in significant quantities." *Id.* at 2.

Region 10 has not performed—or required Shell to perform—the analysis the EAB demanded. The EAB specifically directed Region 10 to first determine whether PM_{2.5} precursors will be emitted in significant quantities. Region 10 has blatantly ignored this order. The Supplemental Statement of Basis states that "Region 10 has not made a determination of whether PM_{2.5} precursor emissions from the project are significant . . ." Supp. Statement of Basis at 55 n.20. Region 10's refusal to make a finding on the significance of Shell's precursor emissions is odd given that the Supplemental Statement of Basis notes that Shell's emissions will exceed the regulatory "significant emission rate" for the precursor NO_x. *See id.* at 55 (citing 40 C.F.R. § 52.21(b)(23)(i)). In fact, Shell's emissions exceed this level by many times. *See* Supp. Statement of Basis at 55.

Region 10's failure to assess whether Shell will emit significant quantities of PM_{2.5} precursors is important. If Region 10 does not determine whether those precursor emissions are significant, it certainly cannot accurately estimate the amount of potential secondary PM_{2.5} formation; and indeed, Region 10 has not tried to do so. Instead, it has based its determination primarily on a rough comparison of Shell's potential emissions to North Slope emissions and the observation that North Slope sources do not currently appear to be contributing to substantial secondary formation in onshore communities. *Id.* at 55. Region 10 should not—and indeed, pursuant to the EAB's order, cannot—rely on such generalizations. Region 10 must assess directly whether Shell will emit precursors in a significant quantity.

In analyzing potential secondary PM_{2.5} formation, Region 10 should address additional factors. For example, as described above, neither Region 10 nor Shell have accounted for Conoco's potential operations, which will also emit a substantial amount of NO_x. Together, these two operations will generate more precursors—resulting in more secondary PM_{2.5}—than if they were operating in isolation. Additionally, Region 10 acknowledges that secondary PM_{2.5} formation can occur at a different time and place than where the precursors were emitted. This being true, Region 10 must account for the emission of precursors from Shell's operation before it has technically become an OCS source and after it has stopped being one, since these non-OCS source emissions could react with OCS source emissions.

III. Region 10 must require Shell to comply with new PM_{2.5} increments.

In remanding the permits, the EAB ordered Region 10 to "apply all applicable standards in effect at the time of issuance of the new permits . . ." *Shell Gulf of Mexico*, 15 E.A.D. at 35 (Dec. 30, 2010, Opinion). The EAB later clarified that EPA could use "any discretion it has" to interpret what "all applicable standards" means. *Shell Gulf of Mexico*, 15 E.A.D. at 24 (Feb. 10, 2011,

Opinion). Region 10 has construed this as a statement that it possesses “discretion to determine whether a specific standard is ‘applicable’ on remand.” Supp. Statement of Basis at 9. Region 10 misreads the EAB’s order. Region 10 does not have complete discretion, but must exercise “any discretion it has” within the boundaries of applicable law and through the proper processes. *See Shell Gulf of Mexico*, 15 E.A.D. at 24 (Feb. 10, 2011, Opinion).

Shell’s modeling indicates that Shell’s emissions could increase 24-hour PM_{2.5} concentrations in excess of 12 µg/m³. Supp. Statement of Basis at 57-58 (indicating “Shell Only Impacts” of 12.2 µg/m³ for the Beaufort Sea and 12.4 µg/m³ for the Chukchi Sea). This increase easily exceeds EPA’s newly enacted 24-hour PM_{2.5} increment of 9 µg/m³. 75 Fed. Reg. 64,864, 64,865 (Oct. 20, 2010). While the new increment does not become effective for all sources until October 20, 2011, 75 Fed. Reg. at 64,898, Region 10 must nevertheless require Shell to demonstrate compliance.

Region 10 has no discretion to determine whether the new PM_{2.5} increment is an applicable standard because the plain language of section 328 of the Clean Air Act, 42 U.S.C. § 7627(a)(1), defines which standards apply. Section 328 states that “[n]ew OCS sources shall comply with such requirements on the date of promulgation.” 42 U.S.C. § 7627 (emphasis added). As a “new OCS source” yet to commence operation, Shell’s proposed Arctic drilling operations must comply with all NAAQS and PSD program requirements that pre-date commencement of operations, including the new PM_{2.5} increments. *See* 42 U.S.C. §§ 7411(a)(2), 7475(a), 7627(a)(1) and (a)(4)(D). Moreover, with respect to OCS sources, Congress clearly prohibited grandfathering by directing that even “existing OCS sources shall comply on the date 24 months” after promulgation of standards. 42 U.S.C. § 7627(a)(1).³ EPA may not excuse Shell from the strict requirements of section 328 because it “does not have the power to adopt a policy that directly conflicts with its governing statute.” *Maislin Indus. v. Primary Steel, Inc.*, 497 U.S. 116, 134-35 (1990).

IV. The owner requested limit on Shell’s potential to emit greenhouse gas is unenforceable as a practical matter.

The Clean Air Act requires new major stationary sources to meet BACT requirements to obtain a PSD permit. 42 U.S.C. § 7475(a)(3). Shell’s operations are major sources for NO_x and CO. Shell March 18, 2011, App. at 14. For greenhouse gases, EPA has “tailored” special rules defining when a new source is major for greenhouse gases, and as a result, must meet BACT

³ When Congress adopted the PSD program, it understood that certain sources might get caught by changing permit requirements and it offered “grandfathering” relief only to those sources on which “construction had commenced” before the enactment of the 1977 Clean Air Act Amendments. *See* 42 U.S.C. § 7478(b). Where, as here, Congress has provided express grandfathering exemptions for certain circumstances but not others, EPA may not waive otherwise applicable statutory requirements. *See Andrus v. Glover Constr. Co.*, 446 U.S. 608, 616-17 (1980) (“Where Congress explicitly enumerates certain exceptions to a general prohibition, additional exceptions are not to be implied, in the absence of evidence of a contrary legislative intent.”); *see also Natural Resources Defense Council v. Env’t Prot. Agency*, 489 F.3d 1250, 1259 (D.C. Cir. 2007).

requirements. For a source that is already major for another pollutant, that source will also be subject to regulation for greenhouse gas emissions if it “will emit or will have the potential to emit 75,000 tpy CO₂e or more . . .” 40 C.F.R. § 52.21(b)(49)(iii).⁴

Whether a source is subject to BACT for greenhouse gases depends on the source’s potential to emit. 40 C.F.R. § 52.21(b)(49). A source may reduce its potential to emit by including “physical or operational limitation[s] on the capacity of the source to emit a pollutant . . .” *Id.* § (b)(4). However, the limitations must be both federally and practicably enforceable. *Weiler v. Chatham Forest Prods.*, 392 F.3d 532, 535 (2nd Cir. 2004). The “federally enforceable” component ensures that the limitations are enforceable by EPA and citizens. *See* Memo from John S. Seitz, Director, Office of Air Quality Planning and Standards, *Options for Limiting the Potential to Emit of a Stationary Source under Section 112 and Title V of the Clean Air Act*, at 2 (Jan. 25, 1995). The related, but distinct, “practically enforceable” component ensures that limitations are sufficient to allow effective enforcement. *Id.* at 5.

While Region 10 has placed a limit of 70,000 tpy of CO₂e in the permits, *see, e.g.*, Region 10, Draft Revised Outer Continental Shelf Prevention of Significant Deterioration Permit To Construct for the Beaufort Sea at 27 (2011) (“Draft Revised 2011 Beaufort Sea Permit”), making this owner requested limit federally enforceable, the limit is not practically enforceable because Shell’s methane emissions would be uncontrolled and unmonitored. Shell does not have equipment that will limit these methane emissions, and it could exceed the limit on CO₂e emissions without EPA or the public knowing. In particular, Region 10 assumes that the drilling mud system will vent no more than 0.798 tons per month of methane (17 tons per month of CO₂e). Region 10 makes this assumption based on nothing more than assurances from Shell regarding its “past drilling experience . . .” Supp. Statement of Basis at 30. Remarkably, despite the obvious risk of relying upon Shell’s unsubstantiated appraisal, Region 10 determined that there is no need for Shell to monitor or report these emissions. This lack of monitoring or reporting renders the greenhouse gas owner requested limit unenforceable as a practical matter. *See* Memorandum from Terrell E. Hunt, Associates Enforcement Counsel, Air Enforcement Division, U.S. EPA Office of Enforcement and Compliance Monitoring, and John S. Seitz, *Guidance on Limiting Potential to Emit in New Source Permitting* at 5-6 (Jun. 13, 1989) (stating that some system of verification of compliance is necessary to track compliance with production or operational limits); *see also* 18 A.A.C. 50.225(b)(5) (a request for an owner requested limit shall include “a description of a verifiable method to attain and maintain the limit, including monitoring and recordkeeping requirements”).

Additionally, Region 10’s limit on Shell’s use of fuel is not practically enforceable. The draft permits require Shell to track the use of fuel by associated vessels within 25 miles of the source. Draft Revised 2011 Beaufort Sea Permit at 27-29. However, Shell is only required to record the positions of these associated vessels once per hour. *Id.* at 26. Such infrequent monitoring could result in an underestimation of fuel usage if Shell does not record the position of a vessel until well after it has entered the 25 mile radius.

⁴ CO₂e means carbon dioxide equivalent. It is a standardized measurement for the climate change forcing effect of various greenhouse gases. The CO₂e for a greenhouse gas is the concentration of CO₂ that would cause the same level of radiative forcing.

Thus, the permits' owner requested limits addressing greenhouse gas emissions are not practically enforceable. Region 10 must either calculate the true maximum potential emissions and apply BACT as necessary, or revise the owner requested limits so that they are practically enforceable.

V. Region 10's environmental justice analysis is deficient because it fails to account for Shell's emissions of greenhouse gases and black carbon.

Executive Order 12898 states that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States" *See* Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations, 59 Fed. Reg. 7,629 (Feb. 16, 1994). Region 10's environmental justice analysis fails to meet this standard because it relies entirely on expected NAAQS compliance and does not consider the effect of Shell's greenhouse gas and black carbon emissions on indigenous peoples.

The Arctic is already warming rapidly. Climate models predict that temperatures will increase by as much as 6°F by 2040. *See* Anne E. Gore & Pamela A. Miller, Broken Promises: The Reality of Oil Development in America's Arctic at 41 (Sep. 2009). This warming has resulted in visible changes to Alaska's land, water, wildlife, and people. *Id.* at 40. Perhaps the most dramatic change has been the disappearance of sea ice. "As a result of receding and thinning sea ice scientists have observed polar bears drowning and going hungry, walrus forced onto land, and sharp declines in numbers of ice-dependent sea birds." *Id.* at 41. The warming is also threatening indigenous cultures. Arctic animals and subsistence hunts are central to Alaska Native cultures. Today, subsistence hunters have to travel farther to access animals. *Id.* Also, melting permafrost is accelerating coastal erosion and forcing communities to relocate. *Id.*

Shell stands to contribute to this warming, and resulting harm to indigenous cultures, by emitting greenhouse gases and black carbon. Shell's operations could emit as much as 70,000 tpy of CO_{2e}. *Supp. Statement of Basis* at 29. EPA's Administrator has found that greenhouse gases are "reasonably anticipated to endanger public health, for both current and future generations." 74 Fed. Reg. 66,496, 66,524 (Dec. 15, 2009). Further, not all regions are equally vulnerable to the effects of climate change. *Id.* at 66,535. America's Arctic—home to a large population of Alaska Natives—stands to suffer more than other locations due to the effects of high rates of projected regional warming on natural systems. *Id.*; Supplemental Environmental Justice Analysis for Proposed Outer Continental Shelf PSD Permit No. R10OCS/PSD-AK-2010-01 & Permit No. R10OCS/PSD-AK-09-01 at 9 ("Supp. EJ Analysis").

Shell's operations also could emit up to 21 tpy of PM_{2.5}, *see* Technical Supporting Document at 8, a large proportion of which will be black carbon. EPA, Current Policies, Emission Trends and Mitigation Options for Black Carbon in the Arctic Region (EPA Draft White Paper) at 21-22 (April 28, 2009). Black carbon is generally regarded as the second most important driver of Arctic warming. Black carbon contributes to warming by absorbing incoming and outgoing radiation and by darkening snow and ice, "which reduces the reflection of light back to space and

accelerates melting.” Environmental Protection Agency, Report to Congress on Black Carbon External Peer Review Draft at 12-1 (March 2011) (“Black Carbon Report”). Emissions of black carbon from sources in the Arctic are particularly troubling because Arctic emissions can cause substantially more regional warming than similar amounts of black carbon emitted outside the Arctic. See D. Hirdman et al., *Source Identification of Short-Lived Air Pollutants in the Arctic Using Statistical Analysis of Measurement Data and Particle Dispersion Model Output*, 10 *ATMOS. CHEM. PHYS.* 669 (2010).

EPA has recognized black carbon’s role in global and Arctic warming. The Administrator has acknowledged that black carbon “is an important climate forcing agent and takes very seriously the emerging science on black carbon’s contribution to . . . the high rates of observed climate change in the Arctic.” 74 Fed. Reg. at 66,520. Further, in a draft report to Congress on black carbon, EPA recognizes its “high capacity for light absorption and its role in key atmospheric processes link it to a range of climate impacts, including increased temperatures, accelerated ice and snow melt, and disruptions in precipitation patterns.” Black Carbon Report at 1-1. EPA states that modeling studies have shown that black carbon radiative forcing “from both atmospheric concentration and deposition on the snow and ice” has contributed to Arctic surface warming. *Id.* at 2-42. One study found that black carbon deposition on sea ice “may have resulted in a surface warming trend of as much as 0.5 to 1°C.” *Id.* Other modeling studies have shown increased warming of 0.4 to 0.5°C from black carbon deposited on snow; have shown black carbon may increase snowmelt rates north of 50°N latitude by as much as 19 to 28 percent; and have indicated that black carbon forcing may be the cause of as much as 50 percent of Arctic sea ice retreat. *Id.* at 2-45.

It remains unclear exactly how much Shell’s operations could contribute to the warming of the Arctic. The permits are not valid only for a particular term; they could authorize operations for many years and well into the future. However, EPA has not provided any analysis of how much CO₂ and black carbon Shell could emit over the life of the permit.

Region 10’s environmental justice analysis is arbitrary because in relying entirely on NAAQS, it failed to account for the effects Shell’s CO₂ and black carbon emissions could have on Alaska Natives. In its initial environmental justice analysis, Region 10 relied entirely on Shell’s expected compliance with NAAQS in determining that Shell’s emissions would not have disproportionately high and adverse human health or environmental effects on minority and low income populations. See, e.g., Region 10, Response to Comments for Outer Continental Shelf Prevention of Significant Deterioration Permit No. R10OCS/PSD-AK-09-01 at 138 (Mar. 31, 2010). Petitioners Alaska Eskimo Whaling Commission (“AEWC”) and Inupiat Community of the Arctic Slope (“ICAS”) challenged this analysis, arguing that Region 10’s complete reliance on NAAQS was arbitrary. AEWC and ICAS, Petition for Review at 67-71 (May 3, 2010). The EAB remanded Region 10’s environmental justice analysis, holding that the reliance on then existing NAAQS was insufficient because EPA had indicated that those standards were insufficient to protect public health. *Shell Gulf of Mexico*, 15 E.A.D. at 81-82 (Dec. 30, 2010, Opinion). On remand, Region 10 has made the same mistake the EAB faulted it for previously: by relying on NAAQS compliance, Region 10 has arbitrarily ignored other pollutants and effects recognized by EPA that NAAQS do not address. Supp. EJ Analysis at 21. Region 10’s environmental justice analysis is once again lacking. This analysis fails to account for the

adverse effects Shell's greenhouse gas and black carbon emissions could have on minority and low-income populations.

VI. Region 10 should require Shell's associated vessels to employ best available control technology.

On remand, Region 10 has not altered its decision not to require BACT for emissions from Shell's associated vessels. Commenters acknowledge that the EAB in its previous decision refused to compel Region 10 to mitigate those emissions through use of BACT. Nevertheless, we believe Region 10 should reconsider its position.

Despite Shell's commitment to using selective catalytic reduction and oxidation catalyst on ice breaker #1, the associated vessels still will be the source of the vast majority of Shell's emissions. *See* Shell, March 18, 2011, App. at 14. For example, the associated vessels will be responsible for close to 90 percent of Shell's emissions of PM_{2.5}, which causes significant effects to both human health and the Arctic environment. Especially in light of the potential for numerous oil companies to pursue similar plans in the future, Region 10 must strictly control associated vessel emissions. The agency's failure to do so could result in the substantial degradation of Arctic air quality.

The plain language of the Clean Air Act requires that Shell apply BACT to associated vessel emissions. Section 328 of the CAA defines emissions of associated vessels within 25 miles of the OCS source as direct emissions of the source. 42 U.S.C. § 7627 (a)(4)(C). It also requires that all OCS source emissions comply with the requirements of the PSD program. *Id.* § 7627(a)(1). This leaves no discretion for Region 10 to apply BACT to only some emissions of the OCS source. Region 10 should require Shell's associated vessels to comply with BACT, as the Clean Air Act demands.

For the foregoing reasons, EPA should revoke its proposed permits for the *Discoverer*, require Shell to undertake additional analysis to demonstrate compliance with the Clean Air Act, and then determine if permits can be issued lawfully.

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