

**BEFORE THE ENVIRONMENTAL APPEALS BOARD  
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C.**

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In re: )  
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Shell Gulf of Mexico, Inc. )  
Permit No. R10OCS/PSD-AK-09-01 )  
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and )  
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Shell Offshore, Inc. )  
Permit No. R10OCS/PSD-AK-2010-01 )  
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**EXHIBITS IN SUPPORT OF PETITION FOR REVIEW**

**NATURAL RESOURCES DEFENSE COUNCIL, NATIVE VILLAGE OF POINT HOPE,  
RESISTING ENVIRONMENTAL DESTRUCTION ON INDIGENOUS LANDS  
(REDOIL), ALASKA WILDERNESS LEAGUE, AUDUBON ALASKA, CENTER FOR  
BIOLOGICAL DIVERSITY, NORTHERN ALASKA ENVIRONMENTAL CENTER,  
OCEAN CONSERVANCY, OCEANA, PACIFIC ENVIRONMENT, and  
SIERRA CLUB**



**Native Village of Point Hope  
P.O. Box 109  
Point Hope, Alaska 99766  
(907) 368-2330  
Fax: (907) 368-2332**

March 22<sup>nd</sup>, 2010

**VIA EMAIL AND REGULAR MAIL**

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

**Re: Proposed Outer Continental Shelf Prevention of Significant Deterioration Permit  
Number R10OCS/PSD-AK-2010-01**

The Native Village of Point Hope is a federally recognized tribal government under the 1934 Indian Reorganization Act, as amended in 1936 for Alaska Natives, that is responsible for the well being of its 950 members. It is also the oldest continuously inhabited village in all of North America. For thousands of years, our members have harvested the sea. We preserve our traditional way of life, hunting bowhead whales, walrus, seals, polar bears, and beluga whales, as well as various fish and sea birds. Where we live, a half-gallon of milk costs nine dollars, and families depend on subsistence hunting as a source of healthy food. Subsistence resources are so vital to our well being that if the health of the ocean deteriorates, so will the physical health of our people. Yet, the importance of hunting, whaling, and fishing runs much deeper. They are central to our culture as a way to celebrate our heritage and maintain ties within our community. We view the ocean as our garden. It is what sustains us physically and spiritually as individuals and as community members.

We are deeply concerned about the proposal by Shell Oil to conduct exploratory drilling in the Beaufort and Chukchi seas in 2010 and beyond. The increasing industrialization of the Arctic Ocean threatens our health and culture. Shell may add thousands of tons of harmful pollutants to the air we breathe. It may emit large amounts of fine particulate matter, which scientists have strongly linked to increased mortality rates, and nitrogen oxides, which can result in substantial ozone formation that is itself a serious health hazard linked to increased asthma rates. Shell's operations will also cause our climate to change. Certainly, the Arctic is already changing rapidly, straining the web of life that sustains us. We see the results of the melting sea ice on almost a daily basis. We face severe erosion, stronger storms, and more dangerous seas.

We see a decline in the health of the species we rely on for subsistence, and fear for our communities in turn. Shell's operations will only worsen this, emitting large amounts of black carbon, which is one of the most important drivers of Arctic climate change, and about 94,000 tons per year of carbon dioxide.

We join in the March 22<sup>nd</sup>, 2010, comments by conservation groups on the proposed permit. The proposed permit that EPA has released does an insufficient job of protecting our air and health. We urge EPA not to permit Shell's operations in the Beaufort Sea. EPA should engage with other agencies to prepare an EIS analyzing the environmental impacts of Shell Oil's drilling program in the Beaufort and Chukchi seas. If EPA does continue with the permitting process, EPA must correct the identified errors and omissions before issuing a permit.

We will do everything in our power to protect our water, land, and way of life and hope that EPA will address our concerns. We look forward to meeting with your agency on this important issue.

Respectfully yours,

Lily H. Tuzroyluke  
Executive Director, Native Village of Point Hope

**NATIVE VILLAGE OF POINT HOPE**

**P.O. Box 109  
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October 20, 2009

**VIA EMAIL**

EPA Region 10  
Shell Chukchi OCS Air Permit  
1200 6th Ave, Ste. 900, AWT-107  
Seattle, Washington 98101  
Email: R10ocsairpermits@epa.gov

**Re: Draft Outer Continental Shelf Prevention of Significant Deterioration Permit for Shell Gulf of Mexico, Inc. for Exploration Drilling in the Chukchi Sea; Permit Number R10OCS/PSD-AK-09-01**

The Native Village of Point Hope is a federally recognized tribal government under the 1934 Indian Reorganization Act, as amended in 1936 for Alaska Natives, that is responsible for the well being of its 950 members. It is also the oldest continuously inhabited village in all of North America. For thousands of years, our members have harvested the sea. We preserve our traditional way of life, hunting bowhead whales, walrus, seals, polar bears, and beluga whales, as well as various fish and sea birds. Where we live, a half-gallon of milk costs nine dollars, and families depend on subsistence hunting as a source of healthy food. Subsistence resources are so vital to our well being that if the health of the ocean deteriorates, so will the physical health of our people. Yet, the importance of hunting runs much deeper than even this. Hunting is central to our culture as a way to celebrate our heritage and maintain ties within the community. The Agviq (the bowhead whale) hunt is particularly important, and we celebrate the landing of a whale for three days. For two days, we sing our traditional whaling songs passed down through generations and dance; we have a special day to honor the ladies, celebrate our first-born sons and initiate them, and give gifts to the female elders. In short, the ocean is our garden. It is what sustains us physically and spiritually as individuals and as community members.

As a community, we are deeply concerned about the proposal by Shell Oil to conduct exploratory drilling in the Chukchi and Beaufort Seas in 2010 and beyond. The increasing industrialization of the Arctic Ocean threatens our health and culture. Shell may add thousands of tons of harmful pollutants to the air we breathe. For instance, their emissions will create ozone, a serious health hazard that causes asthma. Shell's operations will also cause our climate to change. Certainly, the Arctic is already changing rapidly, straining the web of life that sustains us. We see the results of the melting sea ice on almost a daily basis. We face severe erosion, stronger storms, and more dangerous seas. During last year's whale hunt, we could not put up our tents because the ice was so thin. We see a decline in the health of the species we rely

on for subsistence, and fear for our community in turn. Shell's operations will only worsen this, emitting large amounts of black carbon, which is one of the most important drivers of Arctic climate change, and about 55,000 tons per year of carbon dioxide. We urge the EPA not to permit Shell's operations in the Chukchi Sea.

If EPA does go forward with the permit, we urge you to schedule another government-to-government meeting with the Native Village of Point Hope before EPA makes any final decision on Shell's PSD permit application. EPA must schedule such a meeting in order to comply with the mandates of the Executive Memorandum of April 29, 1994 on Government-to-Government Relations with Native American Tribal Governments, Executive Order 13175, as well as the Obama Administration's stated commitment to improve relations with tribal governments. Furthermore, EPA must work with our staff to ensure that such a meeting is scheduled far enough in advance and at a reasonable time to permit as many of the Council members to participate as possible. We were disappointed in EPA's attempt in September to have a government-to-government meeting because the meeting was held on short notice, resulting in many Council members absence from the meeting, and EPA did not schedule sufficient time of the meeting to allow the Council to become fully informed about the proposed permit.

We also join in the October 20, 2009 comments submitted by conservation groups on the proposed PSD permit. The proposed PSD permit that EPA has released does an insufficient job of meeting statutory and regulatory requirements and of protecting the environment. EPA must correct the identified errors and omissions before issuing a permit.

We will do everything in our power to protect our water, land, and way of life and hope that EPA will address our concerns. We look forward to meeting with your agency on this important issue.

Sincerely,

Caroline Cannon  
President  
Native Village of Point Hope

**ALASKA WILDERNESS LEAGUE – AUDUBON ALASKA  
CENTER FOR BIOLOGICAL DIVERSITY – EARTHJUSTICE  
NATURAL RESOURCES DEFENSE COUNCIL  
NORTHERN ALASKA ENVIRONMENTAL CENTER – OCEANA  
PACIFIC ENVIRONMENT – REDOIL  
SIERRA CLUB –WORLD WILDLIFE FUND**

March 22, 2010

**Via Email and Regular Mail**

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

**Re: Proposed Outer Continental Shelf Prevention of Significant Deterioration Permit  
Number R10OCS/PSD-AK-2010-01**

The undersigned groups hereby submit the following comments on the Environmental Protection Agency's (EPA) Proposed Outer Continental Shelf Prevention of Significant Deterioration Permit No. R10OCS/PSD-AK-2010-01 (Proposed Permit). The Proposed Permit is a multi-year permit that would allow Shell Offshore Inc.'s (Shell) drillship and support fleet to emit air pollution between July 1 and December 31 while Shell engages in exploratory drilling on the Outer Continental Shelf (OCS) of the Beaufort Sea within Shell's current lease blocks in lease sales 195 and 202.

This Proposed Permit is the second sought by Shell for activities in the Arctic Ocean this summer. In December 2009, EPA issued for public comment a similar proposed permit for Shell's activities in the Chukchi Sea, revising a draft initially proposed in August 2009. Shell's proposed activities in the Beaufort and Chukchi seas would employ the same equipment and occur in the same time frame.

Conservation groups and others submitted extensive comments on the initial and revised proposed permits for the Chukchi Sea, raising several important shortcomings. The Proposed Permit for the Beaufort Sea suffers from many of the same deficiencies. As with the Chukchi permit, EPA should apply emissions controls to Shell's most polluting sources, evaluate the impacts of black carbon emissions and limit them appropriately, require the collection of adequate background data before establishing permit terms, and limit the scope of Shell's permit to the scope of its current exploration plans. In addition, EPA should require improved modeling of potential air quality impacts and require Shell to comply with newly adopted standards.

## Background

Consideration of exploration drilling in the Arctic Ocean at this time is inappropriate because so little is known about the regional environment and climate change is affecting the Arctic so rapidly. Such uncertainty demands further research before the federal government makes decisions that could irreversibly push the Arctic down the road of environmental degradation. EPA should cooperate with other agencies to produce a comprehensive, multi-agency environmental impact statement (EIS) that analyzes the potentially significant effects of Shell's proposed operations in the Beaufort and Chukchi seas before permitting the activity.

Whether alone or in the context of Shell's larger Arctic Ocean drilling program, Shell's proposed Beaufort Sea operations threaten potentially significant effects on wildlife and people in the region. These potentially significant effects must be analyzed and disclosed in an EIS. *Idaho Sporting Cong. v. Thomas*, 137 F.3d 1146, 1149 (9th Cir. 1998) (“An EIS *must* be prepared if substantial questions are raised as to whether a project . . . *may* cause significant degradation of some human environmental factor.”) (citation omitted, emphasis in original). Shell intends to perform exploratory drilling in both the Beaufort and Chukchi seas starting in 2010. These operations will involve transporting the same equipment through the Beaufort, Chukchi, and Bering seas to reach the drilling locations, potentially affecting migratory species multiple times and in multiple places along their migration routes. The effects of Shell's entire operations should be analyzed in a single comprehensive EIS.

Further, since multiple agencies are responsible for permitting different aspects of Shell's proposed operations, these agencies should cooperate and prepare a joint EIS. 40 C.F.R. § 1501.6 (encouraging “agency cooperation early in the NEPA process”); *see also id.* at § 1501.1(b) (“Emphasizing cooperative consultation among agencies before the environmental impact statement is prepared rather than submission of adversary comments on a completed document”); *id.* at § 1502.4 (where a project involves a series of actions “which are related to each other closely enough to be, in effect, a single course of action” it should be evaluated in a single EIS). EPA's regulations require that it cooperate with other agencies in preparing an EIS when, like here, a proposed source is subject to a federal action that may have a significant impact on the environment. *See* 40 C.F.R. § 52.21(s). The other agencies responsible for permitting Shell's drilling each have similar mandates. *See* 43 U.S.C. § 1334(a) (providing that Interior “shall cooperate with the relevant departments and agencies of the Federal Government” in “the enforcement of safety, environmental, and conservation laws and regulations” on the outer continental shelf); 30 C.F.R. § 250.231, .233(b), .234 (providing the Minerals Management Service (MMS) the flexibility to prepare an EIS where an exploration plan threatens significant effects); NOAA Order, 216-6 at §5.09(e) (May 20, 1999); FWS Service Manual, 505 FW 1, 505 FW 2 (June 28, 1994).

If implemented, Shell's drilling program would constitute a massive industrial undertaking. It would involve drilling operations not only in the Beaufort Sea, but also in the Chukchi Sea. It would involve a 514-foot long drillship and armada of icebreakers and other support ships and aircraft traveling to and through the Arctic Ocean and Bering Sea, generating industrial noise in the water, running the risk of a large oil spill, and emitting tons of pollutants into the air and thousands of barrels of waste into the water.

The prevention of significant deterioration (PSD) program is designed to keep pristine areas clean. However, the Proposed Permit allows Shell to degrade the air quality of the Beaufort Sea region significantly. The Proposed Permit allows emissions that are substantial enough to risk noncompliance with applicable National Ambient Air Quality Standards (NAAQS) and PSD increments, and allows major black carbon emissions near Arctic snow and ice. The Proposed Permit would permit Shell to emit high levels of fine particulate matter (PM<sub>2.5</sub>), a major health threat and, through black carbon, global warming concern. Shell's operations may increase 24-hour PM<sub>2.5</sub> levels by 83 percent (8.3 µg/m<sup>3</sup>) in Kaktovik and 44 percent (4.4 µg/m<sup>3</sup>) in Nuiqsut. They have the potential to increase 24-hour PM<sub>2.5</sub> pollution levels by more than twice EPA's 2007 proposed PSD increment, 72 Fed. Reg. 54,112, 54,115 (2007), and result in total concentrations reaching 83 percent of NAAQS. Even these estimates may not fully reflect resulting PM<sub>2.5</sub> concentrations because EPA has failed to analyze the secondary PM<sub>2.5</sub> formation that may result from Shell's substantial nitrogen oxide (NO<sub>x</sub>) emissions.

In addition to permitting large amounts of PM<sub>2.5</sub> emissions, the Proposed Permit would authorize Shell to emit 1,371 tons per year of NO<sub>x</sub>, resulting in concentrations potentially reaching 78.8 percent of the PSD increment. Shell has not provided a modeling demonstration that these emissions will comply with EPA's final 1-hour nitrogen dioxide standard. The Proposed Permit would authorize Shell to emit pollution sufficient to consume 64.7 percent of the 24-hour coarse particulate matter (PM<sub>10</sub>) PSD increment. It would allow Shell to emit as much as 94,000 tons of carbon dioxide (CO<sub>2</sub>) – an amount equivalent to the annual household CO<sub>2</sub> emissions of about 21,000 people, roughly three times the entire population of the North Slope Borough, and nearly four times greater than the threshold triggering regulation under EPA's draft Prevention of Significant Deterioration/Title V Greenhouse Gas Tailoring Rule, 74 Fed. Reg. 55,292, 55,292 (Oct. 29, 2009).

Also, the Proposed Permit fails to regulate adequately the biggest pollution sources from Shell's proposed drilling operations – its icebreakers and support vessels – and instead relies on operational limitations on those vessels that may or may not be feasible and that, in any case, may only barely keep emissions within air quality standards. Among other problems, the Proposed Permit also misapplies best available control technology (BACT), fails to sufficiently consider the effects of Shell's emissions, including its black carbon emissions, relies on an amount of background data that does not meet regulatory requirements, and authorizes Shell to operate well beyond the scope of the operations described in Shell's 2010 exploration plans.

**1) EPA should regulate emissions from Shell's associated and servicing vessels more stringently.**

The Proposed Permit fails to regulate adequately Shell's biggest potential pollution sources. Shell's icebreakers and support vessels will emit the lion's share of pollution from Shell's proposed drilling operations. For example, they account for 96 percent of the total NO<sub>x</sub> emissions and 93 percent of the total PM<sub>2.5</sub> emissions. Shell Offshore Inc., *Outer Continental Shelf Pre-Construction Air Permit Application, Frontier Discoverer, Beaufort Sea Exploration Drilling Program* (Beaufort PSD Application) at 237 (Jan. 2010). Indeed, emissions from these



ships are the reason Shell's proposed operations qualify as a major source and are subject to BACT requirements. The Proposed Permit does not deal adequately with these emissions.

The Proposed Permit does not impose BACT, the primary mechanism for reducing pollution in pristine areas under the PSD program, on Shell's icebreakers and support vessels. It applies BACT only to Shell's drillship, a comparatively small source of pollution, and one minor supply vessel. EPA Region 10, *Statement of Basis for Proposed Outer Continental Shelf Prevention of Significant Deterioration Permit No. R10OCS/PSD-AK-2010-01* (Statement of Basis) at 61-94 (Feb. 17, 2010).<sup>1</sup> Not surprisingly, this cramped and incorrect application of BACT is insufficient alone to lower emissions from Shell's operations to meet NAAQS and PSD increment limits. *See id.* at 33 (noting that "[a]fter application of emission limitations that represent BACT, preliminary modeling indicated that additional restrictions on Shell's emissions and mode of operation would be needed to ensure attainment of the NAAQS and compliance with increment for some pollutants.").

The Proposed Permit resorts instead to placing operational limitations on Shell's icebreakers and support activity, such as limitations on the amount of time and the locations in which icebreakers can operate – limitations which may or may not be feasible and which, in any case, may only barely keep emissions within air quality standards. *See id.* at 33, 54-55, 57. EPA's use of operational limits to keep Shell's emissions under NAAQS and PSD increment limits is problematic because such restrictions will be difficult to enforce and may hinder Shell's ability to respond to unpredictable Arctic conditions. For example, the Proposed Permit limits the amount of icebreaking Shell can engage in and prohibits Shell from breaking ice in certain areas near the drillship. *Id.* at 57; Proposed Permit at O.7, P.7. However, EPA concedes that the Beaufort Sea's "ice floe frequency and intensity is unpredictable and could range from no ice to ice sufficiently dense that the fleet has insufficient capacity and the Discoverer would need to disconnect from its anchors and move off site," Statement of Basis at 54, and that as a result of this unpredictability, the "actual vessel distances [of the icebreakers] will be determined by the ice floe speed, size, thickness, and character, and wind forecast," *see id.* at 55. In the face of this variability, the Proposed Permit's restriction of Shell's response capabilities poses unnecessary potential conflicts between clean air protection and operational needs, and as a result, risks inadequate protection of health and the environment.

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<sup>1</sup> EPA is incorrect to limit its application of BACT only to the drillship and vessels attached to the drillship. However, EPA has not even fully explained its application of its own flawed approach. EPA has interpreted when a vessel is attached so as to constitute part of the OCS source by analogy to the rule governing when a vessel is part of a marine terminal stationary source. 57 Fed. Reg. 40,792, 40,793 (1992). A vessel at a marine terminal is part of the stationary source when it is attached dockside and performing activities that directly serve the terminal. 45 Fed. Reg. 52,676, 52,696 (1980). Two vessels not regulated with BACT restrictions appear to meet this definition. Shell will use a vessel, likely the *Nanuq*, to refuel the Discoverer. Statement of Basis at 118-19. That ship will be attached to the drillship and may be part of the OCS source during refueling, and even under EPA's approach, should be subject to BACT. *See id.* at 118-19. Also, "[w]hen the ice breaker fleet needs supplies, personnel, or assistance from the Discoverer, either the primary ice breaker or the anchor handler will approach the Discoverer, dock briefly, and then return to the normal ice management location." *Id.* at 117 (emphasis added). Thus, it appears that the *Nanuq* and the icebreakers may at times be part of the OCS source because they will be performing activities that serve the Discoverer directly and, if they do attach to the *Discoverer*, will be in positions analogous to a vessel dockside at a marine terminal. *See id.* at 118-19.

Instead of applying the proposed operational restrictions, EPA should apply technology-based emissions controls to Shell's most polluting sources. In fact, the Clean Air Act demands that EPA require just this. The Clean Air Act defines OCS source as any equipment, activities, or facility which emits or has the potential to emit any air pollutant, is regulated or authorized under OCSLA, and is located on the OCS or in or on the waters above the OCS. 42 U.S.C. § 7627(a)(4)(C). Drillship-based oil and gas exploration on the OCS is included in this definition. *Id.* Also, "emissions from any vessel servicing or associated with an OCS source, including emissions while at the OCS source or en route to or from the OCS source within 25 miles of the OCS source, shall be considered direct emissions from the OCS source." *Id.*

The Clean Air Act subjects major emitting facilities, like Shell's, to BACT "for each pollutant subject to regulation under this chapter emitted from . . . such facility . . ." 42 U.S.C. §§ 7475(a)(4) (emphasis added). Moreover, BACT is an "emission limitation based on the maximum degree of reduction of each pollutant subject to regulation under this chapter emitted from . . . any major emitting facility . . ." 42 U.S.C. § 7479(3) (emphasis added). The emissions of proximate associated vessels are direct emissions from the OCS source, 42 U.S.C. § 7627(a)(4)(C), and thus, are clearly subject to BACT. Applying BACT only to the OCS source is not only inconsistent with statutory requirements, but also yields the absurd result – seen here – of the vast majority of a source's emissions escaping technological control.

The legislative history for Section 328 of the Clean Air Act indicates that Congress intended to subject proximate associated vessels to BACT requirements. In enacting Section 328, Congress was interested in using pollution control technology to reduce the emissions of vessels associated with OCS sources. A&P 136 Cong. Record H12845, H12889-90 (stating that existing pollution controls can significantly reduce emissions of marine vessels involved in the construction and operation of OSC facilities). Further, Congress sought to ensure that emissions from proximate associated vessels are "controlled and offset as if they were part of the OCS facility's emissions." *Id.*

EPA's regulations do not preclude the application of BACT to these emissions. 40 C.F.R. § 55.2. EPA's regulations mirror the language of Section 328 by not including associated vessels in the definition of OCS. *See* 42 U.S.C. § 7627(a)(4)(C); 40 C.F.R. § 55.2. Also, the regulations state that emissions of proximate associated vessels are considered part of a source's potential to emit. 40 C.F.R. § 55.2. The regulations do not directly say that BACT applies to the emissions of such vessels, *id.*; however, EPA must interpret its regulations in that manner in order to comply with statutory requirements.

Even if EPA were to conclude that it is not required by the Clean Air Act to apply BACT limits to vessels, it should nevertheless impose appropriate technology based limits to these vessels to ensure compliance with NAAQS standards and PSD increments, rather than rely on operational controls that are difficult to enforce and may not be consistent with actual icebreaker or support vessel operational needs.

**2) EPA should factor the effects of Shell's black carbon emissions into its permit decision.**

Black carbon is one of the most important contributors to Arctic warming, and Shell's black carbon emissions will accelerate this warming. The Clean Air Act requires EPA to analyze the effects of black carbon on the North Slope region, 42 U.S.C. § 7475(e)(3), and EPA has the authority to require the reduction of Shell's black carbon emissions based on the environmental impacts of those emissions, 40 C.F.R. § 52.21(b)(12). However, the Proposed Permit and its supporting documents fail completely to consider the effects of Shell's emissions of black carbon. EPA should analyze the effects of Shell's black carbon emissions and require Shell to reduce those emissions through the use of particulate filters that effectively filter black carbon.

A significant fraction of the 57 tons per year of PM<sub>2.5</sub> the Proposed Permit authorizes 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 contributor to Arctic warming after CO<sub>2</sub>. Black carbon warms the environment by absorbing sunlight in the atmosphere, thereby capturing heat energy, and it darkens snow and ice after falling to earth, thus reducing the reflection of sunlight and accelerating melting. *Id.* at 7. Emissions of black carbon from sources in the Arctic itself are particularly troubling, as Arctic emissions are far more likely to come in contact with and melt Arctic snow and ice. *See id.* at 20. One recent study indicates that Arctic black carbon emissions are 10-100 times more important with respect to contributing to Arctic black carbon radiative forcing than emissions outside of the Arctic. 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 (Jan. 2010). The exact amount of black carbon Shell's PM<sub>2.5</sub> emissions will include remains unclear because a source's potential black carbon emissions speciation as a function of the mass of PM<sub>2.5</sub> emissions varies based on source characteristics. However, the warming potential of Shell's emissions due to black carbon could be relatively high. The speciation of black carbon depends on engine type, engine speed, engine load, and combustion efficiency, and it appears that Shell's operations may use engines – and use those engines at low loads and speeds – that will produce black carbon at a particularly high rate.

Shell's black carbon emissions will cause warming in an environment that is already stressed. Climate change is happening more quickly in the Arctic than other places in the world and these changes are already harming Arctic communities and Alaska Native cultural traditions that are thousands of years old. Shell's black carbon emissions may contribute to these harms substantially. “Among the most profound changes is the loss of sea ice, which is at the lowest levels in 800 years.” Anne E. Gore, *Broken Promises: The Reality of Oil Development in America's Arctic*, The Wilderness Society (Broken Promises) at 41 (2009) available at <http://wilderness.org/files/Broken-Promises-Report.pdf>. This loss of sea ice has caused subsistence hunters to have to travel farther across thinner ice, and sometimes open seas, to access the animals on which they depend, and has even directly harmed populations of animals that serve as subsistence resources. *Id.* Available methods of processing and storing subsistence resources are already growing less effective, as ice cellars are melting and food spoilage is becoming more common. Minerals Management Service, *Beaufort Sea and Chukchi Sea Planning Areas Oil and Gas Lease Sales 209, 212, 217, and 221 Draft Environmental Impact*

*Statement*, OCS EIS/EA MMS 2008-0055 (2008 DEIS) at J-23. This harm to subsistence resources endangers the welfare of people of the North Slope. Subsistence activities are very important to Native people and communities, because they support community health and play a central role in cultural traditions. Subsistence diets are high in health-promoting nutrients. 2008 DEIS at J-14. “Replacement of subsistence foods with store-bought foods in Alaska Native communities increases the risk of ‘metabolic disorders’ such as hypertension, diabetes, and high cholesterol and the common complications of these disorders, such as cardiovascular disease and strokes . . . .” *Id.* “The loss of sea ice, coupled with melting permafrost, is also accelerating coastal erosion, forcing communities to relocate, and threatening habitat for waterfowl, and caribou, which are also important food sources for indigenous people.” *Broken Promises* at 41.

The Clean Air Act requires EPA to analyze the potential effects of black carbon on the North Slope region. PSD program is designed to “assure that any decision to permit increased air pollution in any area to which this section applies is made only after careful evaluation of all the consequences of such a decision . . . .” *See* 42 U.S.C. § 7470. It requires an analysis of factors that are relevant to determining the effect of emissions from a proposed facility on an air quality control region. 42 U.S.C. § 7475(e)(3). Shell’s black carbon emissions are a relevant factor to a determination of the effect of Shell’s emissions on the North Slope region, and EPA must analyze the effect of those emissions.

Further, after assessing the potential effects of Shell’s black carbon emissions, EPA must consider these effects in determining BACT. In determining BACT for Shell’s emissions units, EPA evaluates the pollution controls, *inter alia*, in light of the environmental impacts of the control options. 40 C.F.R. § 52.21(b)(12); *Statement of Basis* at 61-62. In considering pollution controls for PM<sub>2.5</sub>, EPA should evaluate whether some filters will provide the additional environmental benefit of reducing black carbon emissions, and select as BACT control technology that will reduce Shell’s black carbon emissions significantly.

### ***3) EPA should require Shell to collect additional background data.***

Shell has not gathered enough background data to meet the requirements of EPA regulations, and EPA has failed to establish that the minimal data Shell has collected provide a sufficient basis to issue a permit. EPA should require rigorous compliance with this requirement, particularly when EPA’s own experience with the related Chukchi Sea permit – where additional data forced EPA to propose for public comment a more restrictive set of permit conditions – demonstrates that the use of small amounts of background data can fail to disclose serious potential impacts.<sup>2</sup> EPA should not make the same mistake here.

EPA’s regulations require a full year of background data, and allow EPA to accept a shorter period – but no less than 4 months – only if the data are sufficient to provide a “complete and adequate” analysis. 40 C.F.R. § 52.21(m)(1)(iv). EPA has not met that standard here.

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<sup>2</sup> In considering Shell’s PSD permit application for the Chukchi Sea, EPA had to withdraw and reissue the proposed permit when additional measurements of background 24-hour PM<sub>2.5</sub> levels forced EPA to revise its background estimate upward. *See* AECOM, *Wainwright Near-Term Ambient Air Quality Monitoring Program Fourth Quarter Data Report August through October 2009* at Table 8 (Dec. 2009).

EPA states that it believes, based on the PM<sub>2.5</sub> data Shell collected only between August 20, 2009, and December 15, 2009, that the maximum measured 24-hour PM<sub>2.5</sub> concentration of 10 µg/m<sup>3</sup> is a conservative background estimate suitable for Shell's use. Statement of Basis at 111-13. EPA has not provided a sufficient justification to support this conclusion, and there is evidence that this background estimate may not be conservative.<sup>3</sup> EPA acknowledges that emissions from local fuel-burning heating units would be higher in the fall and winter months, but EPA has not relied on PM<sub>2.5</sub> data for all of these months. *Id.* at 111. Also, EPA recognizes that no information is available on the seasonality of particulate matter transported from overseas, but has not detailed how this lack of information bears on the validity of its conclusion. *Id.* To establish conservative background concentration estimates sufficiently, EPA should require Shell to obtain background data for the full year required by the regulations. If it does not, EPA must provide a full justification for relying on lesser data and should nevertheless require, at minimum, data for all the months Shell will be operating, plus data for months on either end of the operating period that have conditions reasonably related to predicting the conditions Shell will encounter.

For other pollutants, EPA has not justified its estimates of background concentrations. EPA has allowed Shell to mix and match data from different monitoring locations with different pollutants, and has not always required Shell to use the highest recorded background levels. *Id.* at 112-13. Further, EPA does not give a justification for using data from a specific monitoring station for a pollutant, but simply indicates that it believes the data are acceptable. *Id.* at 113. EPA should require Shell to use the highest recorded levels among these sites for each pollutant, or at minimum, EPA must explain why these high measurements are inapplicable, even though the stations taking the measurements are near Shell's lease blocks. For example, EPA should explain why the higher NO<sub>2</sub> levels measured by the BPXA Prudhoe Bay Central Compressor Plant are not representative, while lower levels from the BPXA Prudhoe Bay Liberty station are.

**4) EPA should limit the permit's scope to reflect Shell's current drilling plans.**

If EPA issues Shell a PSD permit, it should limit that permit's scope to reflect Shell's submitted exploration plans. Shell has to date submitted plans to perform exploration drilling on the Sivulliq and Torpedo lease blocks in the Beaufort Sea during a single drilling season, between July 1 and October 31, 2010. Shell Offshore Inc., 2010 Outer Continental Shelf Lease Exploration Plan, Camden Bay, Alaska (Beaufort EP) at 1-2 (June 2009). However, the Proposed Permit is of unlimited duration and allows drilling on any of the lease blocks in lease sales 195 and 202. Statement of Basis at 10. EPA should not issue a permit for multiple years when necessary permit conditions are likely to be substantially different in future years based on changing regulatory requirements, developing information, and other proposed activities in the Arctic. For example, EPA has proposed increments for PM<sub>2.5</sub> that, once adopted, would require Shell to reduce emissions of PM<sub>2.5</sub> to less than half the levels allowed under the current Proposed Permit. 72 Fed. Reg. 54,112, 54,112 (Feb. 9 2010).

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<sup>3</sup> Moreover, the EPA is proceeding with less than the minimum 4 months of background data for PM<sub>2.5</sub> required by its regulations. To the extent EPA expects to rely on additional data submitted after the draft permit and statement of basis was distributed for public comment, such a course would violate EPA's obligations to provide for a full opportunity for public comment. *See* 40 C.F.R. § 51.161. EPA would have to re-issue the draft permit and statement of basis for public comment with the full set of data EPA relies on.

**5) EPA should require Shell comply with the new 1-hour NO<sub>2</sub> standard.**

In order to provide requisite protection of public health, EPA has established a new 1-hour NO<sub>2</sub> standard at a level of 100 ppb (188 µg/m<sup>3</sup>). 75 Fed. Reg. 6474 (2010). This new standard likely will be in force before the effective date of Shell's permit, if issued, *see* 40 C.F.R. § 124.15, and Shell's operations may not comply with this new standard. Shell's operations alone will cause a maximum annual NO<sub>2</sub> concentration of 19.1 µg/m<sup>3</sup>. Statement of Basis at 98. Applying EPA's scaling factor to this concentration – the maximum 1-hour concentration being equal to ten-times the maximum annual concentration – yields a maximum 1-hour NO<sub>2</sub> concentration of 191 µg/m<sup>3</sup>. This exceeds the new NAAQS of 188 µg/m<sup>3</sup>, without even accounting for background concentrations. EPA should not issue a permit that it knows may result in the violation of standards EPA has already promulgated in a final rule, and should ensure that Shell's operations will comply with the new 1-hour NO<sub>2</sub> standards.

**6) EPA should require Shell to perform adequate modeling.**

Shell has used a model that is not well suited for modeling its operations' emissions, has relied on insufficient data, and has not conservatively modeled the emissions of its support vessels. These several flaws are described in more detail in the attached statement from Mr. Khanh Tran, an expert in air quality modeling, who has reviewed the proposed permit and Shell's application. The following summarizes problems the attached statement identifies.

**a) EPA should require Shell to use a guideline model.**

Shell modeling relies on a non-guideline model that is not well suited for modeling emissions over large distances in overwater conditions. EPA should require Shell to use a guideline model, like AERMOD or CALPUFF, that is more likely to model accurately potential impacts from Shell's emissions.

A guideline model is a model that EPA has identified as a preferred model for use under certain conditions due to its effectiveness in performing source impact analyses. Guideline models are listed in Appendix W to 40 C.F.R. Part 51. A non-guideline model can only be used in performing an impact analysis if the use of a guideline model is inappropriate. 40 C.F.R. § 52.21(l). Thus, EPA must provide a reasoned basis for allowing the use of a non-guideline model, and for rejecting a guideline model as inappropriate.

Shell used a non-guideline model – ISC3-PRIME – to support its permit application. EPA's guidelines call for the use of newer, guideline models such as AERMOD. In particular, ISC3-PRIME is not as conservative as AERMOD for use in the conditions in which Shell will be working, and as a result, Shell's use of ISC3-PRIME may lead to an under-prediction of impacts. The record does not provide a reasoned basis for Shell's use of a non-guideline model, or for why a guideline model, like AERMOD, is inappropriate. EPA states that the unavailability of "over-ocean meteorological data" makes AERMOD unavailable for use. Statement of Basis at 102. EPA's rejection of AERMOD on this basis is arbitrary because, as described in Mr. Tran's attached statement, appropriate guideline models can be run using the same type of

meteorological screening data used in the older ISC3-PRIME model and, moreover, usable offshore and onshore meteorological data are available.

There are additional problems with Shell's use of ISC3-PRIME. ISC3-PRIME is inappropriate to model air pollution dispersion in offshore conditions, as it is not well suited for overwater plume transport calculations. Overwater pollutant plume transport and dispersion are significantly different than overland dispersion. Mixing heights over water are generally lower than over land due to lack of sensible heat flux from the surface. These low mixing heights can trap pollutant plumes near the surface and create areas of high concentration. However, Shell's modeling results likely miss maximum impacts resulting from this effect, because Shell has incorporated the wrong mixing heights into ISC3-PRIME. Also, Shell may have missed maximum concentrations that may result from its vessels' building downwash, meaning the wind shadow of a structure where air pollution is likely to concentrate. ISC3-PRIME has been shown to underestimate the impacts of sources with significant building downwash by up to 29 percent compared to AERMOD. EPA, *Comparison of Regulatory Design Concentrations: AERMOD vs. ISC3, CTMPLUS, ISC-PRIME*, EPA-454/R-03-002 (2003) available at <http://www.epa.gov/scram001/7thconf/aermod/compar.pdf>. Moreover, Shell used the wrong program to calculate building dimensions in ISC3-PRIME, which can also cause an impact analysis to miss building downwash effects and underestimate project impacts severely.

Shell's use of ISC3-PRIME is also unjustified due to ISC3-PRIME's inability to model the long distance transport of Shell's pollution. Shell has only modeled impacts out to 50 km, even though EPA's guidelines state that "[i]f long range transport is determined to be important, then refined estimates utilizing the CALPUFF modeling system should be obtained." 40 C.F.R. Part 51, App. W at 6.2.3 (b). Long range transport is important here. The Statement of Basis indicates that Shell's modeled predictions for NO<sub>2</sub> "had not fallen below the significant impact level" at a distance of 50km. Statement of Basis at 98. In other words, the significant impact radius for NO<sub>2</sub> extends by an unknown distance beyond the limits of Shell's analysis. This is particularly troubling because Shell has not even obtained short-term emissions data from most of the major onshore sources that are nearby; Shell's emissions may merge with emissions from these other sources and cause high concentrations of air pollution. CALPUFF would provide a more technically defensible analysis because it generates not only accurate near-field modeling results that account for building downwash, but also accurate long distance modeling results out to 300 km.

**b) EPA should require Shell to properly account for other sources of short-term emissions.**

EPA should require Shell to perform a full short-term emissions analysis. Shell has only performed a limited short-term emissions analysis that included emissions from the BP Endicott and BP Northstar facilities, but did not include emissions data from most regional onshore sources. Statement of Basis at 107-10. The sources Shell ignores are massive sources of pollution. For instance, BP's Central Compression Plant has facility wide emissions of 14,238 tons per year of NO<sub>x</sub>, 147 tons per year of sulfur dioxide (SO<sub>2</sub>), and 347 tons per year of PM<sub>10</sub>. *Id.* at 108. EPA's explanation for Shell not accounting for these other sources is the unavailability of short-term emissions data. *Id.* at 110. However, Shell can calculate these short-

term emissions based off of the facilities' annual emissions. EPA agrees that "a full analysis including short-term emissions from all sources would have been preferable . . ." *Id.* at 110. Shell's analysis may underestimate cumulative impacts beyond 50 km severely, and a full short-term analysis is necessary to accurately assess maximum impacts.

**c) EPA should require Shell to conservatively model its support vessels' emissions.**

Shell makes questionable assumptions in its modeling regarding the activity of its operations. Shell modeled the support vessels "as lines of volume sources representing their typical operating patterns." Statement of Basis at 105. "Total vessel emissions were evenly distributed among the volume sources in the line for each fleet." *Id.* For the base operating scenario, Shell distributed the primary icebreaker's emissions over a 9.6-kilometer line set 4.8 kilometers upwind from the *Discoverer*, the anchor handler's emissions over a 4.8-kilometer line set 1 kilometer upwind, and the oil spill response fleet's emissions over a 2-kilometer line set 3 kilometers downwind. *Id.* By distributing the support vessels' emissions over long lines, instead of treating the emissions sources more like stationary sources, Shell may underestimate short-term impacts to air quality. For instance, the icebreakers may not always operate in a manner consistent with Shell's assumptions. Shell's permit application states that "[o]ccasionally there may be multi-year ice ridges that are expected to be managed at a much slower speed than used for first-year ice. Multi-year ice may be managed by riding up onto the ice so that the weight of the icebreaker on top of the ice cracks it." Beaufort PSD Application at 26. Shell acknowledges that this is a separate operating scenario, but does not model the scenario because it assumes that the slower speeds of the icebreakers will necessarily result in lower concentrations. *Id.* Shell's conclusion here is not accurate. If the icebreakers are operating over a small area breaking multi-year ice, even if they are doing so at lower power, the vessels' emissions may increase concentrations beyond Shell's maximum modeled concentrations because the emissions will occur in essentially the same location, as opposed to being spread out. Greater impacts are especially likely to happen if both icebreakers are operating in this manner directly upwind of the *Discoverer*. In order to capture these maximum impacts, Shell should model a scenario where the icebreakers' emissions are represented by stationary sources located directly upwind from the *Discoverer*. Also, Shell should model its other support vessels as stationary sources when the vessels could operate in one location.

EPA should also explain a potential inconsistency in the Statement of Basis. The Statement of Basis indicates that "[t]he icebreakers are allowed to transit through their respective cones as these transit events will be of short duration and at low loads as they will not be conducting icebreaking activities within the cones. Modeled impacts from transit events in the area would therefore be expected to be lower than the worst case scenario." Statement of Basis at 57. This statement, however, seems at odds with the fact that the worst case scenario for 24-hour particulate matter concentration is the scenario in which only one of the icebreakers approaches the *Discoverer* at reduced power, *id.* at 117-18, even though the Proposed Permit allows both icebreakers to transit close to the *Discoverer* at the same time. Because worst-case 24-hour PM<sub>2.5</sub> concentrations resulted from a scenario in which a single icebreaker not engaged in breaking ice approached the *Discoverer* at low power, even higher concentrations may result



from a scenario where both icebreakers approach the *Discoverer* under reduced power. EPA should require Shell to model this possible scenario.

**7) EPA should consider the effects Shell's operations may have on secondary PM<sub>2.5</sub> formation.**

The Proposed Permit does not take into account secondary PM<sub>2.5</sub> formation. EPA must consider the effects of such secondary formation of PM<sub>2.5</sub> in order to complete a sufficient analysis of the operations' potential impacts on air quality. See 40 C.F.R. § 52.21(k). Shell's operations could result in the formation of a substantial amount of secondary PM<sub>2.5</sub>. In analyzing this potential for secondary PM<sub>2.5</sub> formation, EPA should consider conditions on the North Slope and the potential emissions of Shell's operations. Local North Slope conditions could be conducive to secondary PM<sub>2.5</sub> formation; strong temperature inversions are known to occur on the North Slope, and such inversions contribute to secondary PM<sub>2.5</sub> formation by limiting pollution dispersion. Also, Shell will emit large amounts of pollutants, such as NO<sub>x</sub>, volatile organic compounds (VOCs), SO<sub>2</sub>, and ammonia, known to contribute to secondary PM<sub>2.5</sub> formation. Shell's operations have the potential to emit 1,371 tons per year of NO<sub>x</sub> and 96 tons per year of VOCs, Statement of Basis at 27, and Shell's use of selective catalytic reduction (SCR) will likely result in the release of unreacted ammonia.<sup>4</sup> Further, Shell will increase NO<sub>x</sub> levels significantly in regional villages, such as Kaktovik, potentially resulting in local secondary PM<sub>2.5</sub> formation.

An analysis of secondary PM<sub>2.5</sub> formation is important because PM<sub>2.5</sub> poses significant dangers to health and the environment. PM<sub>2.5</sub> particles can travel deep into the lungs and even the bloodstream, and EPA links PM<sub>2.5</sub> emissions to a range of health problems, including "decreased lung function, aggravated asthma, development of chronic bronchitis, irregular heartbeat, nonfatal heart attacks, and premature death in people with heart or lung disease." 2008 DEIS at 4-378. Studies of the health effects of PM<sub>2.5</sub> emissions "provide clear indication of increasing response with increasing concentration." 72 Fed. Reg. 54,112, 54,128 (Sept. 21, 2007). At least one study indicates an essentially linear relationship down to 2 µg/m<sup>3</sup> between increases in PM<sub>2.5</sub> levels and increased mortality rates. Schwartz et al., *The Concentration-Response Relation between PM<sub>2.5</sub> and Daily Deaths*, 110 Environ Health Perspect 1025 (Aug. 2002). Another study, a four-year study of 11.5 million Medicare enrollees tracking daily counts of hospital admissions for eight major health outcomes, including heart failure and stroke or brain hemorrhage, shows that short term exposure to PM<sub>2.5</sub> pollution increases risk of cardiovascular and respiratory disease significantly among people over 65 years of age. NIH News, *Elderly Have Higher Risk for Cardiovascular, Respiratory Disease From Fine Particle Pollution* (NIH News) (March 8, 2006) available at <http://www.nih.gov/news/pr/mar2006/niehs-08.htm>. The authors analyzed the data for heart failure and found a 10 µg/m<sup>3</sup> increase in PM<sub>2.5</sub> concentrations resulted in a 1.28 percent increase in hospital admissions and that most of these increases occurred on the same day as the increase in pollution concentrations. *Id.* Studies have not established a threshold below which PM<sub>2.5</sub> concentrations are safe, 72 Fed. Reg. at 54,128, and

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<sup>4</sup> Shell's permit application appears to misrepresent the amount of ammonia its operations may emit. Shell states that the "only substantive source of ammonia emissions is ammonia slip from the SCR applied to the six main engines on the *Discoverer*." Beaufort PSD Application at 167. However, the anchor handler also will be equipped with SCR, Statement of Basis at 11, and as a much larger source of pollutants than the six main engines on the *Discoverer*, it may be a substantial source of ammonia that Shell has failed to consider.

there is compelling evidence that fine particle concentrations even at relatively low levels are harmful to cardiovascular and respiratory health. NIH News.

Increased PM<sub>2.5</sub> concentrations on the North Slope will expose Alaska Natives to heightened risk of morbidity and mortality. Alaska Natives in the North Slope region have high rates of lung disease. 2008 DEIS J-4. Chronic pulmonary disease mortality rates among Alaska Natives have climbed 192 percent since 1979, and North Slope residents' mortality rate for chronic lung disease is three times the rate for the U.S. Minerals Management Service, *Chukchi Sea Planning Area Oil and Gas Lease Sale 193 and Seismic Surveying Activities in the Chukchi Sea Final Environmental Impact Statement*, OCS EIS/EA MMS 2007-026 (193 EIS) at IV-257-258. These high rates "may be associated with exposure to environmental pollutants," 2008 DEIS at J-4, and make NSB residents more vulnerable to particulate pollution than the general U.S. population, see 2008 DEIS at 4-378. In the North Slope Borough, "[i]ndividual adverse health outcomes can be highly significant" 2008 DEIS at J-5. The interdependence between individuals, social structures, and kinship and sharing networks means that serious adverse health events can have far reaching significance for the affected individual and community. *Id.* In order to help ensure that Shell's PM<sub>2.5</sub> emissions will not harm North Slope individuals and communities, EPA should require Shell to analyze the impacts of the secondary PM<sub>2.5</sub> formation that may result from its operations.

**8) EPA should regulate Shell's CO<sub>2</sub> emissions.**

The Supreme Court's ruling in *Massachusetts v. EPA* established that CO<sub>2</sub> is a "pollutant" under the Clean Air Act, and EPA has the statutory authority to regulate it. 549 U.S. 497, 529, 532 (2007). Shell's proposed operations will emit about 94,000 tons per year of CO<sub>2</sub>, Beaufort PSD Application at 98 – an amount approximately equivalent to the annual household CO<sub>2</sub> emissions of 21,000 people, roughly three times the entire population of the North Slope Borough. It is also nearly four times greater than the threshold triggering regulation under EPA's proposed PSD and Title V Greenhouse Gas Tailoring Rule. 74 Fed. Reg. at 55,292.

EPA should require BACT for Shell's CO<sub>2</sub> emissions. The Clean Air Act requires BACT for "each pollutant subject to regulation" under the Act emitted from a major emitting facility. 42 U.S.C. § 7475(a)(4). Indeed, CO<sub>2</sub> is already subject to regulation, because Delaware and California have both established rules to control emissions of CO<sub>2</sub> directly, regulations which EPA has approved. Delaware Department of Natural Resources and Environmental Control, Division of Air and Waste Management, Air Quality Management Section, Regulation No. 1144 (Jan. 11, 2006), at § 3.0 (establishing CO<sub>2</sub> limits on generators); 74 Fed. Reg. 32,744 (July 8, 2009) (authorizing California to control CO<sub>2</sub> emissions from motor vehicles). Moreover, EPA will soon be issuing regulations that will undoubtedly make CO<sub>2</sub> a regulated pollutant and trigger BACT requirements for Shell's operations. 74 Fed. Reg. 55,292, 55,300 (Oct. 27, 2009). EPA should, therefore, either apply BACT standards to Shell's CO<sub>2</sub> emissions now or it should decline to issue the permit precipitously so that Shell avoids imminent regulation of its CO<sub>2</sub> emissions.

In applying BACT, EPA will not be limited to end-of-pipe control technologies. EPA should consider a variety of options for controlling Shell's CO<sub>2</sub> emissions, including the "application of

production processes and available methods, systems, and techniques, including fuel cleaning, clean fuels, or treatment or innovative fuel combustion techniques . . . .” 42 U.S.C. § 7479(3). Shell may be able to reduce CO<sub>2</sub> emissions from its marine engines through the incorporation of improvements in efficiency and the inclusion of “higher compression ratios, higher injection pressure, shorter injection periods, improved turbocharging, and electronic fuel and air management.” 73 Fed. Reg. 44,354, 44,467 (July 30, 2008).

**9) EPA should improve the BACT limitations in the permit.**

**a) EPA’s NO<sub>x</sub> BACT analysis for the Discoverer’s compressor units is flawed.**

EPA has not sufficiently explained its BACT determination for NO<sub>x</sub> emissions from the *Discoverer*’s compressor units. Statement of Basis at 68-70. EPA states that there is limited space around the compressor units, and therefore, it is technically infeasible for Shell to accommodate SCR. However, EPA has not sufficiently justified this conclusion because the analysis does not make clear what sizing criteria or catalyst EPA considered to support the SCR dimensions discussed in the documents. *Id.* Further, even accepting that the specific SCR unit EPA and Shell discuss would not fit in the space, a smaller SCR reactor, perhaps with a lower NO<sub>x</sub> reduction, might fit. Presumably, the SCR dimensions correspond to a certain level of NO<sub>x</sub> reduction. To properly apply BACT, EPA and Shell must analyze whether an SCR of smaller size, with a potentially different NO<sub>x</sub> reduction efficiency, can be accommodated in the space available and whether this smaller SCR can meet BACT criteria.

**b) EPA should include a permit condition that adjusts BACT rates downward if Shell’s emissions controls perform better than assumed in the Proposed Permit.**

EPA should include a condition in the Proposed Permit that allows for a downward adjustment of rates of emission allowable as BACT as Shell obtains actual test data on its units. In the Proposed Permit, EPA relies on emission factors derived from manufacturer’s data, the AP-42, or other sources. Because the reliability of this data is not known for certain, the Proposed Permit assumes that emissions will be higher than they might be in practice. Since all of the emissions sources are proposed to be tested, EPA should revise these assumptions as direct measurement data becomes available.

Such a revision should be allowed for emissions from the *Discoverer*’s expected D.E.C. Marine SCR system. *See* Statement of Basis at 66-67. As described in this SCR system’s technical content, the SCR system is capable of reducing NO<sub>x</sub> emissions to as low as 0.1 g/kW-hr under ideal steady state conditions. *Id.* at 67-68. While D.E.C. Marine only guarantees a rate of 0.5 g/kW-hr, because of the continually varying operating level of the engines and the severe environmental conditions in the Arctic Ocean, it also recognizes that “the SCR system is designed with ‘plenty of margin to make sure [it] will stay below the guaranteed level . . . .’” *Id.* at 67. The Proposed Permit includes the very conservative rate of 0.5 g/kW-hr as BACT. *Id.* Because the SCR can achieve a level of NO<sub>x</sub> reduction that is substantially below this figure, EPA should require adjustments to reflect actual operating performance as Shell collects more data.

**10) EPA should require more frequent testing for Shell's larger sources of pollution.**

EPA's regulations require Shell to certify its compliance with air quality standards and permit conditions. 42 U.S.C. § 7414; 40 C.F.R. § 60.8. The Administrator has the discretion to adjust testing requirements depending on the circumstances, 40 C.F.R. § 60.8, but should not do so at the cost of ensuring compliance.

With rare exceptions, EPA and Shell have not estimated emissions based on reliable (or representative) source tests; rather EPA and Shell have reached their estimates using EPA's AP-42 emission factors or older data from manufacturers. The only way to verify these assumptions is via representative source tests. However, EPA has not explained how its proposed testing requirements will result in representative data that can be used to reduce the uncertainty in the emissions estimates; thus, it is difficult to assess whether EPA's system will ensure compliance. EPA notes that under its current approach, "not all emission units in a source category will be tested each year, but by the end of the first three drilling seasons, all of them will have been tested." Statement of Basis at 33. This is not an appropriate approach to testing the emissions of operations that for now are only proposed for a single year, and, in any event, may be changing from year to year assuming they continue. EPA should explain how its proposed testing requirements will result in accurate emissions estimates.

**11) EPA should regulate emissions from Shell's drilling no later than when the Discoverer's first anchor is attached to the seabed.**

EPA has requested comments on whether the *Discoverer* will become an OCS source for the purposes of the Proposed Permit when it makes contact with the seabed or only after it is fully secured on the seabed and ready to drill. Statement of Basis at 23-24. The relevant statutory provisions and legislative history strongly suggest that EPA should regulate the *Discoverer* as an OCS source no later than when it makes contact with the seabed by placing its first anchor.

Section 328 of the Clean Air Act extends EPA's regulatory authority to facilities that emit air pollution, are located on or in waters over the outer continental shelf (OCS), and are regulated under the Outer Continental Shelf Lands Act (OCSLA). See 42 U.S.C. § 7627(a)(4)(C). OCSLA regulates a wide range of activities related to exploratory drilling on the OCS, many of which occur without any direct attachment to the seabed. For example, Section 4(d)(1) of OCSLA authorizes the Coast Guard "to promulgate . . . regulations with respect to lights and other warning devices, safety equipment, and other matters relating to the promotion of safety of life and property on the artificial islands, installation, and other devices referred to in [Section 4(a)(1)] or on the waters adjacent thereto. . . ." 43 U.S.C. § 1333(d)(1) (emphasis added); see also *id.* at § 1340(b) (all exploration must comply with OCSLA); *id.* at § 1331(k) (defining "exploration" as, *inter alia*, "the process of searching for minerals, including . . . geophysical surveys where magnetic, gravity, seismic, or other systems are used to detect or imply the presence of such minerals.").

EPA's regulation, 40 C.F.R. § 55.2, focuses on Section 4(a)(1) of OCSLA. That section extends federal jurisdiction "to all artificial islands, and all installations and other devices permanently or temporarily attached to the seabed, which may be erected thereon for the purpose of exploring

for, developing, or producing resources therefrom . . . .” 43 U.S.C. § 1333(a)(1). As the legislative history of Section 4(a)(1) indicates, however, it does not restrict jurisdiction to devices only when they are fully secured to the seabed and ready to operate. Rather, Congress intended to authorize regulation of ships and other exploration equipment based on their location – in OCS waters – and purpose – resource development. In the original 1953 version of OCSLA, Section 4(a)(1) stated that the jurisdiction of the United States extends “to all artificial islands and fixed structures which may be erected thereon for the purpose of exploring for . . . resources therefrom. . . .” Public Law 212, Aug. 7, 1953. However, Congress later clarified this language by adding the words “and all installations and other devices permanently or temporarily attached to the seabed” and removing the words “fixed structures” to clarify the application of the statute to new exploration technologies, like drillships and jack-up rigs, not in existence at the time Section 4(a)(1) was originally enacted. In so amending the statute, Congress emphasized that the United States’ jurisdiction under Section 4(a)(1) applies to OCS apparatus based on whether the apparatus was brought to the OCS for resource development, and not on the basis of the specific physical features of the apparatus or attachment to the seafloor. *See* H.R. Conf. Rep. 95-1474 at 80 (noting, by way of example in the custom duty context, that jurisdiction extends to facilities “brought into OCS waters for placement so that it can be used to develop and produce OCS minerals”). To the extent the history elsewhere suggests that attachment to the seabed is an element, it references at most a mere connection. *See* House Report 95-590 at 128 (The amendments to OCSLA “made clear that Federal law is to be applicable to all activities on all devices in contact with the seabed for exploration, development, and production. The committee intends that federal law is, therefore, to be applicable to activities on drilling ships, semi-submersible drilling rigs, and other watercraft, when they are connected to the seabed by drillstring, pipes, or other appurtenances, on the OCS for exploration, development, or production purposes.”).<sup>5</sup>

Thus, Shell’s drillship will be connected to the seabed, and subject to regulation consistent with Section 4(a)(1) of OCSLA, once its first anchor is positioned. EPA should apply its regulation, 40 C.F.R. § 55.2, which by its own terms must be applied “within the meaning” of Section 4(a)(1), consistent with the scope of the statute and regulate the operations no later than at that point of contact.

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<sup>5</sup> Neither *DeMette v. Falcon Drilling Company*, 280 F.3d 492, 498-500 (5th Cir. 2002) (overturned on other grounds), nor *Diamond Offshore Co. v. A&B Builders*, 302 F.3d 531, 546 (5th Cir. 2002), require a different conclusion. Neither case defined the level of contact with the seabed required before OCSLA attaches. Instead, the issue the court analyzed in *DeMette* was whether Section 4(a)(1) could cover a vessel at all. 280 F.3d at 498. *Diamond Offshore* similarly did not reach the issue of what sort of contact with the seabed is required under Section 4(a)(1). Instead, the court ruled that there was insufficient evidence to support a determination that the requirements of Section 4(a)(1) were satisfied, because it was not clear that the vessel was connected at all to the seabed at the relevant times. 302 F.3d at 546. If anything, the case concludes that mere contact with the seabed is sufficient for OCSLA jurisdiction to attach. *See id.* at 545 (“Since there is no evidence that the Ocean Concorde was connected to the ocean floor by its anchors or through its drilling mechanisms, and there is no evidence of *any other contact* with the seabed, the second requirement that the Ocean Concorde was ‘erected’ on the OCS at the time of McMillon’s alleged injury is clearly not satisfied.” (emphasis added)).

**12) Shell has not established that it will comply with corresponding onshore area rules.**

Shell has applied for a PSD permit that would allow it to construct a major emitting facility within 25 miles of Alaska's seaward boundary. Statement of Basis at 22. As a result, Shell must comply with several Alaska Administrative Code regulations. *Id.* Shell's application materials and the Statement of Basis do not sufficiently explain how Shell will comply with these corresponding onshore area rules. EPA should provide additional explanation regarding Shell's compliance with these limits.

Shell may not emit any air pollution "which is injurious to human health or welfare, animal or plant life, or property, or which would unreasonably interfere with the enjoyment of life or property." 18 A.A.C. 50.110. Shell's January 2010 permit application does not discuss Shell's compliance with this requirement. EPA only states that Shell must comply with this requirement, that air quality standards should ensure such compliance, and that Shell will have to monitor for violations and respond to complaints. Statement of Basis at 43-44. EPA should provide additional analysis regarding the likelihood that Shell will cause harm that 18 A.A.C. 50.110 prohibits. While NAAQS standards are designed to protect public health, Clean Air Act limitations do not prevent all possible injury to human health due to air pollution emissions. For instance, as explained *supra*, there is compelling evidence that PM<sub>2.5</sub> levels below NAAQS can result in serious harm to human health, including death, and Shell's operations may cause a violation of EPA's new 1-hour NO<sub>2</sub> standard. Moreover, EPA's monitoring requirement is of questionable utility, because someone who is injured by Shell's emissions is far from certain to realize the cause of the injury. Thus, EPA should provide additional protections to ensure that Shell will not violate 18 A.A.C. 50.110.

Shell's operations also must comply with limits on degradation of visibility, 18 A.A.C. 50.050(a), 50.055, 50.070. Shell indicates that it will comply with these limits through a combination of controls. Beaufort PSD Application at 35-36. However, Shell has not actually modeled potential impacts on visibility. *See id.* at 174-76. Shell should do so in order to ensure its compliance with Alaska law.

Respectfully submitted,

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Policy, Arctic Program  
World Wildlife Fund

# APPENDIX A



**Comments on the Air Quality Impact Analysis of the  
PSD Permit Application for the  
Shell Beaufort Sea Exploration Drilling Program**

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Prepared for:

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## **I. INTRODUCTION**

Shell Offshore Inc. (Shell) has proposed to conduct a multi-year exploratory oil and gas drilling program within its current lease blocks in lease sales 195 and 202 on the Beaufort Sea Outer Continental Shelf (OCS) off the North Slope of Alaska. Shell will operate the drillship Frontier Discoverer and associated fleet on the OCS, within and beyond 25 miles from Alaska's seaward boundary. AMI Environmental (AMI) has been retained by Earthjustice to review and comment on the air quality impact analysis of the proposed drilling program. These analyses have been conducted for the Prevention of Significant Deterioration (PSD) Permit Application that has been submitted by Shell to U.S. Environmental Protection Agency (US EPA), Region 10. Qualifications of Mr. Khanh Tran, Principal of AMI, to perform the review are shown in Appendix A.

## **II. PROJECT DESCRIPTION**

According to the US EPA Statement of Basis (SOB) and Shell PSD Permit Application, the project will emit significant amounts of NO<sub>x</sub> (1,371 tons per year), PM<sub>10</sub> (65 tpy), PM<sub>2.5</sub> (57 tpy), CO (464 tpy), SO<sub>2</sub> (2 tpy) and VOC (96 tpy). These are controlled emissions following the BACT controls proposed by Shell.

The proposed facility will be located off the North Slope of Alaska that is currently designated as attainment or unclassified for all regulated pollutants: nitrogen dioxide (NO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>), carbon monoxide (CO), particulate matter less than 10 microns in aerodynamic diameter (PM<sub>10</sub>), fine PM (PM<sub>2.5</sub>), lead and ozone.

The project's surrounding area is classified as PSD Class II. The closest PSD Class I area is Denali National Park. This PSD Class I area is located about 750 km from the proposed project.

## **III. REVIEW METHODOLOGIES**

AMI's review has focused on the documents prepared by US EPA Region 10 and the applicant Shell. Below is a list of the documents and modeling data that have been reviewed:

*USEPA Region 10 Draft PSD Permit*  
*US EPA Region 10 Draft Statement of Basis, February 17, 2010.*  
*Shell Air Permit Application, revised January 2010*

*ISC3-PRIME Modeling Input and Output Files*

## IV. COMMENTS ON AIR QUALITY MODELING

Our comments are organized into four sections. Section A comments on EPA's failure to justify the use of a non-guideline model, when a guideline model that will yield a more technically defensible analysis of impacts is available for use. Section B identifies specific errors and shortcomings in Shell's use of the ISC3-PRIME model. Section C presents comments on Shell's failure to provide a sufficient analysis for certain pollutants. Section D identifies additional standards that EPA has adopted or proposed which Shell's operations may violate.

### A. Use of Non-Guideline Model ISC3-PRIME

#### **Comment #1: The non-guideline and obsolete ISC3-PRIME model is unsuitable for predicting project and cumulative impacts and guideline models AERMOD and CALPUFF are more suitable**

EPA has not provided a sufficient explanation for allowing Shell to use the ISC3-PRIME model (version 04269) to predict air quality impacts from the proposed Shell project. ISC3-PRIME is not a guideline model approved by the US EPA (US EPA, 2005) and has been shown to underpredict impacts for the conditions in which Shell intends to operate. We believe that this obsolete model is unsuitable for the proposed project and that better models that are currently approved by the US EPA such as AERMOD, CALPUFF and OCD are more suitable. Below are our comments on the unsuitability of the ISC3-PRIME model.

The ISC3-PRIME model is based on the model ISC3 and includes the building downwash algorithm PRIME (Plume Rise Model Enhancement). Hence it is named ISC3-PRIME. It has never been fully approved as a guideline model like ISC3. ISC3 and ISC3-PRIME are now both obsolete. AERMOD, which also incorporates the PRIME building downwash algorithm, has officially replaced ISC3 as a guideline model since December 2006.

In addition to its status as a guideline model, AERMOD has been shown to be more accurate than ISC3-PRIME. For a tracer field experiment on the North Slope, Alaska, the ISC3-PRIME model performed better than an earlier version AERMOD that did not incorporate the PRIME algorithm. The SOB cites this as a reason for selecting ISC3-PRIME (Section 5.2.6 of SOB). However, EPA's reasoning is inadequate, because a more recent model evaluation study has shown that AERMOD with the PRIME algorithm is much more accurate than ISC3-PRIME in predicting the maximum 1-hour concentrations measured during the North Slope tracer study (US EPA, 2003a). This superiority of AERMOD over ISC3-PRIME is very important since the modeled 1-hour concentrations are converted into 3-hour, 8-hour, 24-hour and annual averages by using scaling factors (section 5.2.8 of SOB).

Also, in adopting AERMOD as a guideline model, the US EPA conducted an extensive consequence analysis that compared ISC3-PRIME and AERMOD side by side. The

results of this study showed that the ISC3-PRIME model has been shown to underestimate the impacts of sources with significant building downwash by up to 29% compared to AERMOD (US EPA, 2003b). Thus, ISC3-PRIME may severely underpredict the impacts of the proposed Shell project, especially for receptors located near the drill ship Discoverer and affected by the effects of building downwash. It is important that these effects are not underestimated since high concentrations occur in building wake regions.

The primary reason given by EPA for not using AERMOD is the lack of site-specific overwater meteorological data (Section 5.2.6 of SOB). In the following paragraphs, we will show that the same set of screening meteorological data Shell has used with ISC3-PRIME can also be used with guideline models such as AERMOD and OCD, and real offshore and onshore data do exist and can be used.

*1. Use of Screening Meteorological Data with Guideline Models*

EPA has not justified Shell's use of ISC3-PRIME, because screening meteorological data can be used with appropriate guideline models. Shell used a data set of screening meteorology of 54 hours of combinations of wind speed, stability, temperature and mixing height, similar to those in the SCREEN3 model, with ISC3-PRIME. However, a similar set of screening meteorology can also be generated for use by the AERMOD model. The format of the AERMOD meteorological data, as shown in Appendix D-1 of its user's guide (US EPA, 2004), can accommodate screening data. The AERMOD model requires both surface and profile data and, thus, offers a more accurate treatment of pollutant transport and dispersion than ISC3-PRIME.

The above screening meteorological data can also be used by another better model approved by US EPA. Developed by the Minerals Management Service (MMS), the OCD (Offshore and Coastal Dispersion) model simulates plume transport and dispersion from offshore point, area and line sources to receptors located on land or water. The Modeling Guidelines from Alaska Department of Environmental Conservation (ADEC) have indicated that the OCD model "is most commonly used for off-shore drilling operations. Alaskan applicants have used OCD to model offshore platforms in either Cook Inlet or the Beaufort Sea during open water periods" (ADEC, 2006). The format of the OCD meteorological data, as shown in Section 3-2 of its user's guide (MMS, 1989), can also accommodate screening data. The OCD model requires both onshore and offshore data and, thus, offers a more accurate treatment of pollutant transport and dispersion than ISC3-PRIME.

*2. Availability and Use of Offshore Meteorological Data*

The Minerals Management Service (MMS) has sponsored a Beaufort Sea Mesoscale Meteorology Study at the University of Alaska at Fairbanks (<http://mms-meso.gi.alaska.edu>). This study has collected data from over 200 monitoring stations from 1979 through 2009, including a MMS buoy in the Beaufort Sea. The MMS-UAF website indicates that the data will be made public

in Fall 2010. Since MMS is the sponsor of this extensive data collection program, we believe that the data can be made available much sooner for use in dispersion modeling for the proposed Shell project. In addition, the MMS study is utilizing the UAF supercomputer to generate detailed, three-dimensional windfields and other meteorological inputs for 30 years (from 1978 to 2008) at a spatial resolution of 10 km. These gridded meteorological data should be more accurate and technically defensible than screening data.

A complete onshore-offshore data set for the entire state of Alaska for the year 2002 has been generated by the mesoscale model MM5. As part of the regional haze program, this dataset has been generated for visibility modeling with the CALPUFF model in Alaska (WRAP, 2005). The MM5 grid covering the Beaufort Sea area has a resolution of 45 km. The preprocessor CALMET can then use these MM5 inputs to generate data at a finer resolution (5-10 km). This dataset can be processed to generate inputs not only for CALPUFF but also AERMOD, ISC3-PRIME and OCD. It should be noted that this MM5 grid covers the entire Beaufort Sea, so its data are applicable to both the lease blocks near shore as well those located in the outer OCS. Again, the use of these gridded meteorological data is much more accurate and technically defensible than the screening meteorological data.

### 3. *Use of Onshore Meteorological Data*

Onshore meteorological data are also available to Shell. Especially in analyzing maximum impacts from operation on Shell's near shore lease blocks, the use of this data would be more technically defensible.

AERMOD requires both surface data and upper-air data. Appropriate surface data is available. The full or cumulative impact modeling for onshore sources has not used the screening meteorological data but real meteorological data. Five years of meteorological data (1991-1995) from Badami have been employed by ISC-PRIME. This real dataset can be used to model for overwater sources since some lease blocks are located only three miles from the coast. In addition to surface data, AERMOD also requires upper-air data. Upper-air data from Barrow for the same period (1991-1995) are available online ( [http://www.webmet.com/State\\_pages/met\\_ak.htm](http://www.webmet.com/State_pages/met_ak.htm) ). This upper-air dataset is also applicable to outer lease blocks since it contains measurements high above the surface.

The above upper-air data from Barrow and the surface data from Badami can readily be processed for use by AERMOD. The use of AERMOD is consistent with the current US EPA Guidelines (known as Appendix W). It will also enhance the accuracy and validity of the modeling results since AERMOD is considered to be state of the science.

Shell has recently sponsored a data collection entitled the Badami Ambient Air Quality and Meteorological Station, August 15 through December 15, 2009 (AECOM, 2009). The study report states that “the program has been designed to ... collect dispersion meteorological data in support of the ambient air quality monitoring and suitable for use with either the AERMOD or the OCD dispersion model”. As stated by Shell, this real dataset can be used to run the models AERMOD, ISC3-PRIME and OCD. At a minimum, it should be used to identify meteorological conditions that do not exist in the screening data (e.g. low wind speed less than 1 m/s under very stable G conditions) that can result in higher impacts.

Due to their Gaussian plume formulation, AERMOD, ISC3-PRIME and OCD are only valid within 50 km of a source. Table 5-3 of the SOB shows that, for the NO<sub>x</sub> emissions from the proposed Shell project alone, the radius of the significant impact area (SIA) has to be cut off at 50 km, even though the NO<sub>2</sub> concentration has not fallen below the significant impact level (SIL) at this distance. This severely limits their applicability since the Shell project sources are located far offshore and are widely separated from other regional sources by large distances over 50 km. Not only large emission sources are ignored in the full impact modeling, receptors located beyond 50 km are also omitted. The NSR Workshop manual states that all potential sources within the SIA should be included (US EPA, 1990). Thus, omitting sources beyond 50 km severely underestimate the cumulative impacts. The CALPUFF model does not have such source-receptor restrictions since it is recommended by the US EPA for long-range transport up to 300 km. The same PRIME algorithm for building downwash has also been implemented in CALPUFF, so like AERMOD, CALPUFF will be accurate in modeling near-ship concentrations. CALPUFF has been applied before in Alaska. Alaska DEC has sponsored a near-field modeling study using CALPUFF/MM5 in the Juneau area (ADEC, 2001).

Based on the above comments, we believe that the ISC3-PRIME model is not suitable for the proposed Shell project. The ISC3-PRIME model is obsolete and is no longer or rarely used since 2006. US EPA Region 10 has ignored the US EPA Guidelines (Appendix W) since better models are currently available and recommended in these US EPA guidelines. Specifically, the guideline models AERMOD, OCD and CALPUFF can be used for a more accurate and technically defensible modeling analysis. All these models are approved by both the US EPA and Alaska DEC. We have also shown that both the screening and onshore meteorological data currently used by ISC3-PRIME can also be employed by AERMOD or OCD. Among the above models, the most suitable is CALPUFF since it can handle both near-field and long-range transport, and meteorological data are available for its applications. The CALPUFF model does not suffer the 50-km limit of ISC3-PRIME, AERMOD and OCD and, hence, can offer a more accurate and technically defensible cumulative impact analysis. Instead of using different sets of data for onshore and offshore sources with ISC3-PRIME, CALPUFF only uses a single meteorological dataset for both project onshore and offshore sources as

well as cumulative sources. This is an advantage since the CALPUFF predictions are more consistent and technically defensible than those of ISC3-PRIME.

## **B. Shell's Specific Use of ISC3-PRIME**

### **Comment #2: Building dimensions are calculated by the incorrect BPIP program**

Shell's use of incorrect building dimensions may have caused ISC3-PRIME to underpredict impacts. Section 5.1.6 of the Permit Application indicates that the BPIP program (version 04274) has been used to calculate the building dimensions. This is incorrect since the ISC3-PRIME model requires that building dimensions be calculated with the BPIP-PRIME program. Using incorrect building dimensions results in invalid modeling results and can severely underestimate maximum near field impacts resulting from building downwash. All ISC3-PRIME modeling runs that use incorrect building dimensions should be rejected and rerun again.

### **Comment #3: Project impacts are underpredicted with the final plume rise option**

A review of the ISC3-PRIME modeling input files indicates that the final plume rise has been used in modeling offshore sources. Final plume rise is part of the regulatory default. However, this option can severely underestimate the impacts at receptors located close to the emission sources, e.g. receptors located a few meters off the drill ship Discoverer. The US EPA Guidelines has stated that "gradual plume rise is generally recommended where its use is appropriate ... when calculating the effects of building wakes:" (Section 7.2.5.b of Appendix W, US EPA, 2005). Shell's vessels, especially the Discoverer, will create building wake effects. Thus, impacts close to the drillship are severely underestimated with the use of final plume rise. Modeling runs involving the drillship should be rerun with the option "gradual plume rise" to ensure that maximum project impacts are modeled.

### **Comment #4: Project impacts are severely underpredicted since only a single wind direction is modeled**

For modeling offshore sources, the ISC3-PRIME model only calculates the impacts for a single wind direction (east to west). This severely underestimates the impacts for sources and receptors that are not lined up, e.g. for modeling scenarios with the ice breakers and anchor vessels moving in the north-south direction while the drill ship is stationary. Since the ISC3-PRIME modeling runs do not require long computer execution time, 180 wind directions (from north to south at 1 degree increment) should be modeled. These additional wind directions will ensure that maximum project impacts are modeled.

### **Comment #5: Modeling results for offshore sources with large plume rise are invalid by the incorrect calculation of mixing height under neutral and unstable in the screening meteorological data**



Section 5.1.2 of the Permit Application shows that the mixing height under neutral and unstable conditions was calculated as  $320 * u$ , where  $u$  is wind speed (m/s). For example, since several hours with low wind speed (1m/s) are included in the screening dataset, this results in a low mixing height of 320 m for neutral and unstable conditions. With this unrealistically low mixing height, elevated plumes from the drilling ship and large vessels such as the ice breakers will remain above the mixing height, never reach the surface and, hence, do not cause any impact. This results in severe underestimation of project impacts for both receptors located near the emission sources and far away. The mixing height should be recalculated using the SCREEN3 recommendation that it be set to **(plume height+ 1 m)** in case the plume height is higher than the mechanical mixing height ( $320 * u$ ). The highest plume should be below the mixing height in order to impact the surface. Thus, all ISC3-PRIME modeling results for offshore sources with high plume height using the wrong mixing height are invalid. These modeling results should be rejected and the ISC3-PRIME modeling runs should be performed again.

**Comment #6: Modeling results for offshore sources are invalid by large mixing height under stable conditions in the screening meteorological data**

For modeling offshore sources, the ISC3-PRIME model used a large mixing height of 10,000 m for stable conditions (Section 5.1.2 of the Permit Application). Stable conditions (E and F stability) are not characterized by such “unlimited mixing” as stated in the Permit Application. They are characterized by limited mixing, with a mixing height set at 100 m or less. A lower mixing height under stable conditions restricts the upward motion of plumes, keeps them close to the surface and, hence, maximizes their impacts. Thus, all ISC3-PRIME modeling results for offshore sources using the wrong mixing height (10,000 m) are invalid, because they severely underestimate the concentrations that may occur closer to the surface. These modeling results should be rejected and the ISC3-PRIME modeling runs should be performed again.

**Comment #7: Impacts from support vessels are underestimated due to high plume rise**

Section 5.1.4 of the Permit Application indicates that ice management and anchor handling vessels that are the source of most of Shell’s emissions are modeled as volume sources with their release height based on the plume height. Plume height for each vessel is calculated using neutral D stability conditions and a wind speed of 20 m/s. However, this high wind speed of 20 m/s results in high plume rise and, hence, lower surface concentrations. A lower wind speed (10 m/s or less) and more stable conditions (E stability) should be used to calculate a lower plume rise since the ISC3-PRIME model only predicts the maximum 1-hour concentrations and such conditions may occur over several 1-hour periods. Accounting for the lower plume rise that may occur will ensure that the maximum impacts are captured, especially for receptors located near the ships.

**Comment #8: Short-term impacts from support vessels are underestimated by modeling as volume sources**

Section 5.1.4 of the Permit Application indicates that vessels used in ice management and anchor handling are modeled as volume sources. This approach is acceptable for annual modeling but it underestimates short-term impacts (e.g. for 1-hour NO<sub>2</sub>, 1-hour and 3-hour SO<sub>2</sub>) of activities that take place over a smaller area. Under short-term scenarios, support vessels that may operate over a smaller area than the modeling represents – for instance, if the icebreakers operate at slower speed and full load when breaking multi-year ice – should be modeled as stationary point sources. Further, in order to capture maximum impacts, these support vessels should line up with the drill ship in the east-west direction since this is the only wind direction modeled in ISC3-PRIME.

**Comment #9: Project impacts are severely underpredicted since several stacks are merged**

For modeling the drill ship Discoverer, several stacks with similar stack parameters and located within 100 m of each other are modeled as a single stack (section 5.1.5 of the Permit Application). This stack merging is acceptable if the receptors are located far downwind (several kilometers). However, it is not valid for receptors located very close to the sources, e.g. receptors located a few meters from the drill ship Discoverer. Impacts at these receptors are largely underestimated since they are located at a farther distance from the stacks than their actual location. In addition, since only a single wind direction is modeled, impacts at these receptors are largely underpredicted since they may not lie on the plume centerline. Shell should model the true locations of these stacks in order to ensure that the impacts analysis captures maximum impacts close to the drill ship.

**Comment #10: Cumulative impacts are underestimated due to omission of short-term emissions from cumulative sources**

In order to model maximum cumulative impacts sufficiently, Shell must account for onshore sources. Short-term full impact modeling was conducted for only two sources: BP Endicott and BP Northstar. In Section 5.2.19 of the Permit Application, Shell has stated that it “was unable to obtain short-term emissions data for most of the onshore sources. Shell therefore performed a limited analysis with only two sources” (BP Endicott and BP Northstar). This is invalid since most cumulative sources are operated continuously (8760 hours per year) and their short-term emissions can easily be computed from their annual emissions reported in Table 5-8 of the Permit Application. These annual emissions can be divided by 8760 hours to obtain 1-hour emissions. This conversion is routinely used to convert annual emissions to short-term emissions for continuous sources, and Shell should compute short-term emissions for omitted onshore sources in this manner. Further, these 1-hour data can also be used for 3-hour, 8-hour and 24-hour modeling.

It is particularly important that Shell account for these sources because the Badami wind rose in Figure 7-4 of the Permit Application shows predominant east-northeast winds that

can transport project plumes to the onshore area where most cumulative sources are located. By failing to account for concentrations that may result from Shell's emissions being transported to these onshore sources, Shell has severely underestimated cumulative impacts.

### **C. Additional analyses**

#### **Comment #11: Project PM2.5 impacts are severely understated by omitting secondary formation**

Shell has failed to account for the secondary formation of PM2.5. The PM2.5 impacts reported in the SOB and Permit Application were estimated using the ISC3-PRIME model and PM2.5 primary emissions. They do not account for the secondary formation due to chemical conversion of precursors such as NO<sub>x</sub>, SO<sub>2</sub> and VOC. These precursors are emitted not only by the Shell project but also other facilities in the North Slope area. Table 5-8 of the SOB shows that cumulative sources emit 65,644 tpy of NO<sub>x</sub> and 21,683 tpy of SO<sub>2</sub>. Secondary chemical conversion has been estimated by the US EPA to account for over half of total ambient PM2.5 nationwide (Seitz, 1997). Thus, 24-hour PM2.5 impacts reported in the SOB (18.2 ug/m<sup>3</sup> in Table 5-3) may be doubled, which would result in a violation of air quality standards.

#### **Comment #11: Project ozone impacts have not been quantified**

The proposed project will emit significant amounts of NO<sub>x</sub> (1,371 tpy) and VOC (96 tpy). Known as ozone precursors, these emissions will react under sunlight to form ozone. The Shell Permit Application has inadequately addressed the project ozone impacts with some qualitative discussions. It cites a NO<sub>x</sub>/VOC ratio of 12 as evidence that ozone will be suppressed. While this NO<sub>x</sub>-quenching effect is true near field (i.e. close to the emission source), ozone will increase much further downwind where the NO<sub>x</sub> emissions are converted into NO<sub>2</sub>. Under sunlight, the converted NO<sub>2</sub> will create single oxygen which combines with the regular oxygen to form ozone (NO<sub>2</sub> + hv => O + NO and O + O<sub>2</sub> => O<sub>3</sub>). The proposed Shell project will add to ozone levels in the region and may interfere with the attainment or maintenance of current ozone standard.

#### **Comment #12: Health impacts of air toxics emissions have not been considered**

The proposed Shell project will emit 1.69 tpy of hazardous air pollutants (HAP). Except for ammonia that has a State AAQS, the Permit Application has not quantified the health impacts of other air toxics emitted by project sources. Health risks of both carcinogens and non-cancer toxics should be quantified individually. Predicted risks for each HAP should be compared against applicable minimum risk levels approved by Alaska DEC (<http://www.dec.state.ak.us/air/anpms/toxics/mrls/mrlshome.htm>). Health risks for each HAP should also be added together to obtain total risks which are then compared against acceptable risk levels, e.g. below 1 in a million for carcinogens.

### **Comment #13: Plume blight from project sources have not been modeled**

Since some lease blocks are located only 3 miles from shore, plume blight from the drillship, the tanker and other support vessels should be analyzed. These project sources emit significant amounts of NO<sub>x</sub>, PM<sub>10</sub>, PM<sub>2.5</sub> and SO<sub>2</sub> that are known to reduce visibility. The VISCREEN model developed by the EPA should be used to analyze local visibility effects of both project onshore and offshore sources.

### **D. Compliance against new and proposed AAQS and PSD increments**

#### **Comment #14: Summary of Compliance Analysis**

In recent years, EPA has adopted or proposed new ambient air quality standards (AAQS) or PSD increments for NO<sub>2</sub>, PM<sub>2.5</sub>, O<sub>3</sub> and SO<sub>2</sub>. The following sections will review these new and proposed standards, and a compliance analysis of the proposed Shell project.

#### **1. Project NO<sub>2</sub> 1-hour impacts will exceed the new 1-hour ambient standard**

On January 25, 2010 US EPA has promulgated a new 1-hour NO<sub>2</sub> standard of 100 ppb. Table 5-3 of the US EPA SOB shows a maximum annual concentration of 19.1 ug/m<sup>3</sup> from the Shell project alone. This annual concentration is computed as 10% of the maximum 1-hour concentration predicted by the ISC-PRIME model. Thus the maximum 1-hour concentration can be back calculated as 191 ug/m<sup>3</sup> (19.1/0.1). This maximum 1-hour concentration will exceed the new 1-hour NO<sub>2</sub> AAQS of 100 ppb (or 188 ug/m<sup>3</sup>).

#### **2. Project PM<sub>2.5</sub> 24-hour impacts will exceed the proposed PSD Class II 24-hour increment**

In September 2007, US EPA has proposed PM<sub>2.5</sub> significant impact increments (SII) (1.2-5 ug/m<sup>3</sup> for 24-hour averages and 0.3-1.0 ug/m<sup>3</sup> for annual averages) and PSD Class II increments (9 ug/m<sup>3</sup> for 24-hour averages, and 4-5 ug/m<sup>3</sup> for annual averages). Table 5-3 of the US EPA SOB shows a maximum 24-hour concentration of 18.2 ug/m<sup>3</sup> from the Shell project alone. This maximum 24-hour concentration will exceed the proposed PSD Class II increment of 9 ug/m<sup>3</sup>. As shown in Section 5.2.23 of the SOB, this PSD Class II increment is exceeded not only by the base operating scenario but by eight other operating scenarios. Among nine additional operating scenarios that were modeled, only the tanker scenario does not cause the exceedance of the proposed PSD Class II increment.

Table 5-3 of the US EPA SOB shows a maximum annual concentration of 1.1 ug/m<sup>3</sup> from the Shell project alone. This maximum annual concentration will exceed the proposed PSD SII of 0.3-1.0 ug/m<sup>3</sup>. Exceeding the SII requires a full impact modeling of the Shell project and other regional sources for PSD increment analysis and NAAQS compliance (US EPA, 1990).

**3. Shell's emissions may not comply with proposed 8-hour ozone standards**

On January 6, 2010, US EPA has proposed to strengthen the existing 8-hour ozone standard from 0.075 ppm to a new lower standard between 0.06-0.07 ppm. Table 8-3 of the Permit Application shows a maximum 8-hour concentration of 0.05 ppm was measured at Barrows, which is close to the lower end of the proposed standard (0.06 ppm). The Shell project will add to the regional background and may interfere with attainment of the new lower ozone standard that will be promulgated by the US EPA by August 31, 2010.

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## APPENDIX A

### Qualifications of Khanh T. Tran

Mr. Khanh Tran is the owner and Principal Scientist of AMI Environmental since its establishment in 1980. He has over 30 years of experience in project management, meteorological modeling, air quality modeling, emissions inventory and visibility analysis. He has successfully managed over 200 air quality studies conducted by AMI on behalf of government agencies (including US Department of Energy, Bureau of Land Management, Minerals Management Service, Arizona Department of Environmental Quality, California Energy Commission and California South Coast Air Quality Management District) as well as large utilities (including Duke Power, Los Angeles Department of Water and Power and Southern California Edison) and oil companies (including Arco, Occidental Petroleum and Texaco).

Mr. Tran received his B.S. (1973) and M.S. (1974) degrees in Mechanical Engineering from the University of California, Santa Barbara. From 1978-1980, he completed graduate courses in Atmospheric Sciences, Computer Sciences and Environmental Fluid Dynamics at UCLA. In 1978, he also developed a predictive atmospheric modeling system for real-time emergencies as part of his Ph.D. research at UCLA. Mr. Tran is a former member of the National Committee on Meteorological Aspects of Air Pollution of the American Meteorological Society.

Mr. Tran has extensive experience in the development, evaluation and application of air quality simulation models, from simple Gaussian dispersion models (AERMOD, CALPUFF, ISCST3) to complex photochemical grid models (UAM, CAMx, Models3/CMAQ). He has also developed air quality models that have received approval from regulatory agencies. He has performed a wide variety of air quality modeling studies, including:

- He has recently reviewed the air quality and visibility impact analyses that have been performed as part of PSD permit applications of proposed coal-fired power plants in Georgia (Longleaf and Washington), Idaho (Power County), Kentucky (Trimble), Montana (Highwood), Nevada (Ely), New Mexico (Desert Rock), Ohio (AMP), Michigan (Consumers and Wolverine), South Dakota (Hyperion), Virginia (Virginia City Hybrid) and Wyoming (Dry Fork and Medicine Bow). He has performed AERMOD, ISCST3 and CALPUFF modeling to verify the results documented in the PSD permit applications and predict air quality and visibility impacts from alternative emissions scenarios.
- He has applied the photochemical model CAMx to predict ozone impacts in Houston from the proposed White Stallion coal-fired power plant. He has also

- used the CAMx model to assess cumulative ozone impacts of Texas existing and new coal-fired plants in neighboring states such as Arkansas and Oklahoma.
- He has performed a comparative study of short-range dispersion models (ISCST3, ISC-PRIME and AERMOD). He has extensive experience in applying these models to air quality impact analyses for power plants, oil refineries and other facilities. He had applied Gaussian-based models to proposed coal leases by the Bureau of Land Management in New Mexico. He had used the ISCST3 model to assess potential impacts of several proposed gas-fired power plants in California.
  - He modified and applied the long-range transport MESOPUFF (a predecessor of CALPUFF) to coal development projects in Utah and North Dakota. As part of these project EIS, he had performed visibility modeling to assess potential impacts of end-use facilities (e.g. power plants) at nearby PSD Class I areas.
  - He developed the diagnostic wind module that has been included in the preprocessor CALMET of the CALPUFF model.
  - He developed PC-based versions of the MM5 model, and applied the model to air quality modeling studies, e.g. the 1997 Southern California Ozone Study (SCOZ). He also modified the MM5 model to provide Web-based real-time weather forecasts for wind energy plants in California and Texas as well as tropical storms in Southeast Asia.
  - He had developed the photochemical trajectory model TRACE and applied to power plant siting (e.g. the Lucerne Valley generating station for Southern California Edison) and offshore oil and gas development in California. He also applied other photochemical grid models to the development of ozone air quality attainment plans (AQAP) for Santa Barbara County, San Diego County and Kern County in California, and the Phoenix metropolitan area of Arizona. He recently applied the Urban Airshed Model to predict ozone impacts from proposed power plants in southern California and Phoenix.
  - He developed the multipathway risk assessment model ACE2588 that has become widely used in over 1000 facilities under California's air toxics regulations (AB 2588). The ACE2588 model has also been used in other states and foreign countries. He improved the ACE2588 model to include a Monte Carlo uncertainty analysis to provide more realistic risk estimates.
  - He developed the ACEHWCF model that implements the U.S. EPA health risk assessment guidelines for hazardous waste combustion facilities.
  - He was in charge of prioritizing over 800 air toxics facilities in the Los Angeles air basin, reviewing and modifying their risk assessments submitted under the California Air Toxics Hot Spots AB 2588.
  - He completed the development of a comprehensive emission inventory of over 10,000 point sources, including power plants, for regional exposure modeling of air toxics in the Los Angeles area.
  - He has also used several dispersion models ranging from simple Gaussian puff to multiphase, dense gas models (e.g., DEGADIS and SLAB) to simulate accidental releases of hazardous chemicals.



**ALASKA WILDERNESS LEAGUE – AUDUBON ALASKA  
CENTER FOR BIOLOGICAL DIVERSITY – EARTHJUSTICE  
NATURAL RESOURCES DEFENSE COUNCIL  
NORTHERN ALASKA ENVIRONMENTAL CENTER – PACIFIC ENVIRONMENT  
OCEAN CONSERVANCY – OCEANA – SIERRA CLUB  
REDOIL –WORLD WILDLIFE FUND**

February 17, 2010

**Via Email and Regular Mail**

EPA Region 10  
Shell Chukchi OCS Air Permit  
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Seattle, Washington 98101  
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**Re: Proposed Outer Continental Shelf Prevention of Significant Deterioration Permit  
Number R10OCS/PSD-AK-09-01**

The undersigned groups hereby submit the following comments on the Environmental Protection Agency's (EPA) Proposed Outer Continental Shelf Prevention of Significant Deterioration Permit No. R10OCS/PSD-AK-09-01 (Proposed Permit). The Proposed Permit is a multi-year permit that would allow Shell Gulf of Mexico Inc.'s (Shell) drillship and support fleet to emit air pollution between July 1 and December 31 while Shell engages in exploratory drilling on the Outer Continental Shelf (OCS) of Chukchi Sea within lease blocks purchased pursuant to Lease Sale 193. EPA published a prior version of the Proposed Permit for public comment on August 20, 2009, and the undersigned groups submitted comments on that prior version on October 20, 2009. After reviewing the public comments on the original Proposed Permit, receiving new monitoring data showing higher background concentrations of some pollutants, and receiving new information from Shell, EPA decided to propose a new modified permit with a new comment period. The current version of the Proposed Permit leaves unchanged several issues we identified in our October 20, 2009, comments and we resubmit those comments as Exhibit A. We also submit additional comments addressing the changes to the Proposed Permit.

It is not appropriate to consider exploration drilling in the Arctic Ocean in the face of serious questions about the validity of the Chukchi Sea leases on which Shell proposes to drill. These leases are subject to direct challenge in federal court, and the Department of Interior has still not remedied the deficiencies that led the District of Columbia Court of Appeals to vacate the 2007-12 Five-Year Leasing Program, pursuant to which Lease Sale 193 was held. Additionally, EPA should cooperate with other agencies to produce a comprehensive, multi-agency environmental impact statement that analyzes the potentially significant effects of Shell's proposed operations in the Chukchi and Beaufort seas before permitting the activity.

If EPA proceeds to consider the proposed permit before a full EIS is completed for Shell's proposed operations, it should re-consider the Proposed Permit in several important respects.

While the current Proposed Permit generally permits somewhat less pollution than the first version, it does not adequately protect the clean air in the Chukchi Sea region. As the revision demonstrates, Shell could do more to protect the air, and EPA should require it to do so. Specifically, EPA should: 1) apply emissions controls to Shell's most polluting sources; 2) evaluate the impacts of black carbon emissions on the Arctic and impose limits to prevent adverse impacts from such discharges; 3) require the collection of adequate background data; and 4) limit the Proposed Permit to one year. We also offer additional improvements that should be made.

## ***Background***

The prevention of significant deterioration (PSD) program is designed to keep pristine areas clean. However, the Proposed Permit, even as revised, allows Shell to degrade significantly the air quality of the Chukchi Sea region. Emissions allowed by the latest draft would still be substantial enough to risk noncompliance with applicable National Ambient Air Quality Standards (NAAQS) and PSD increment limits, and the permit would allow major black carbon emissions in the Arctic.

The Proposed Permit would permit Shell to emit high levels of fine particulate matter, a major health and, through black carbon, global warming concern. Studies have shown a linear relationship between increases in PM<sub>2.5</sub> levels and increased mortality rates. Shell's operations have the potential to cause PM<sub>2.5</sub> pollution levels to reach 84 percent of 24-hour NAAQS, and their predicted impact on 24-hour NAAQS for PM<sub>2.5</sub> (18.4 µg/m<sup>3</sup>) is more than twice what EPA's 2007 proposed PSD increments for PM<sub>2.5</sub> would allow (9 µg/m<sup>3</sup>). 72 Fed. Reg. 54,112, 54,115 (2007). Shell's operations may increase 24-hour PM<sub>2.5</sub> levels by close to 12 percent in Point Lay and Wainwright and EPA states that these towns may reach 73 percent of NAAQS for PM<sub>2.5</sub>. However, even these estimates may not fully reflect Shell's potential emissions of PM<sub>2.5</sub>, because EPA has failed to analyze secondary PM<sub>2.5</sub> formation. The Proposed Permit allows Shell to emit over a thousand tons of NO<sub>x</sub> per year, which may result in substantial secondary PM<sub>2.5</sub> formation.

The Proposed Permit would authorize Shell to emit over 1,188 tons per year of NO<sub>x</sub>, 72.8 percent of the PSD annual increment. It would authorize Shell to emit pollution sufficient to fill 64.7 percent of the PSD increment for 24-hour PM<sub>10</sub>, causing PM<sub>10</sub> concentrations of up to 73.6 percent of 24-hour NAAQS for PM<sub>10</sub>. It would allow Shell to emit significant amounts of black carbon. It would also permit Shell to emit as much as 94,000 tons of CO<sub>2</sub><sup>1</sup>—an amount approximately equivalent to the annual household CO<sub>2</sub> emissions of 21,000 people, roughly three times the entire population of the North Slope Borough, and nearly four times greater than the threshold triggering regulation under EPA's draft Prevention of Significant Deterioration/Title V Greenhouse Gas Tailoring Rule, 74 Fed. Reg. 55,292, 55,292 (2009).

The Proposed Permit fails to regulate adequately the biggest pollution sources from Shell's proposed drilling operations—its icebreakers and support vessels—and instead relies on

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<sup>1</sup> Shell's permit application for the Chukchi Sea does not include an estimate of the amount of CO<sub>2</sub> its operations will emit. Its Beaufort Sea application for the same vessels operating for approximately the same amount of time, however, calculates emissions of up to 94,000 tons of CO<sub>2</sub>.

operational limitations on those vessels that may or may not be feasible and that, in any case, may only barely keep emissions within air quality standards. Among other problems, the Proposed Permit also misapplies best available control technology (BACT), fails to sufficiently consider the effects of Shell's emissions, including its black carbon emissions, and relies on insufficient background data.

***EPA should regulate more stringently emissions from Shell's associated and servicing vessels.***

The Proposed Permit still fails to regulate adequately the biggest pollution sources from Shell's proposed drilling operations. Shell's icebreakers and support vessels will emit the lion's share of pollution from Shell's proposed drilling operations. For example, they account for 96 percent of the operations' total NO<sub>x</sub> emissions and 92 percent of their total PM<sub>2.5</sub> emissions. Indeed, emissions from these ships are the reason Shell's proposed operations are subject to the PSD program. The Proposed Permit does not deal adequately with these emissions.

The Proposed Permit does not impose BACT, the primary mechanism for reducing pollution in pristine areas under the PSD program, on Shell's icebreakers and support vessels. It applies BACT only to Shell's drillship, a comparatively small source of pollution, and one minor supply vessel.<sup>2</sup> Not surprisingly, this cramped and incorrect application of BACT is insufficient alone to lower emissions from Shell's operations to meet NAAQS and PSD increment limits. *See* January 8, 2010, Statement of Basis for Proposed Permit (Statement of Basis) at 29 (noting that "[a]fter application of emission limitations that represent BACT [to the drillship and supply ship], preliminary modeling indicated that additional restrictions on Shell's emissions and mode of operation would be needed to ensure attainment of the NAAQS and compliance with increment for some pollutants").

The Proposed Permit resorts instead to placing operational limitations on Shell's icebreakers and support activity, such as limitations on the amount of time and the locations in which icebreakers can operate—limitations which may or may not be feasible and which, in any case, may only barely keep emissions within air quality standards. *See id.* at 29, 43-44, 46. EPA's use of operational limits to keep Shell's operations under NAAQS and PSD increment limits is problematic because such restrictions will be difficult to enforce and may limit Shell's ability to respond to unpredictable Arctic conditions. For example, the Proposed Permit limits the amount of icebreaking in which Shell can engage and prohibits Shell from breaking ice in certain areas near the drillship. Statement of Basis at 44, 46; Proposed Permit at N.7, O.7. However, it

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<sup>2</sup> As described in our October 20 Comments, EPA is incorrect to limit its application of BACT only to the drillship and vessels attached to the drillship. However, EPA has misapplied even this flawed approach, because it excludes the vessel Shell will use to refuel the *Discoverer*, likely the *Nanuq*, from its BACT requirement. That ship, however, will be attached to the drillship and may be part of the OCS source during refueling, and even under EPA's approach, should be subject to BACT. EPA has interpreted when a vessel is attached so as to constitute part of the OCS source by analogy to the rule governing when a vessel is part of a marine terminal stationary source. 57 Fed. Reg. 40,792, 40,793 (1992). A vessel at a marine terminal is part of the stationary source when it is attached dockside and performing activities that directly serve the terminal. 45 Fed. Reg. 52,676, 52,696 (1980). When engaged in refueling, the *Nanuq*, or other refueling vessel, will be performing an activity that directly serves the *Discoverer* and would be in a position analogous to a vessel dockside at a marine terminal. Thus, EPA should regulate the refueling vessel as part of the OCS source during refueling and subject it to BACT requirements.

concedes that the Chukchi Sea's "ice floe frequency and intensity is unpredictable and could range from no ice to ice sufficiently dense that the fleet has insufficient capacity and the *Discoverer* would need to disconnect from its anchors and move off site," Statement of Basis at 43, and that as a result of this unpredictability, the "actual vessel distances [of the icebreakers] will be determined by the ice floe speed, size, thickness, and character, and wind forecast." *See* Statement of Basis at 44. In the face of this variability, especially given that EPA has not developed operational limits based on site-specific ice or meteorological data, the Proposed Permit's operational restrictions of Shell's response capabilities pose unnecessary potential conflicts between clean air protection and operational needs, and as a result, risks inadequate protection of health and the environment.

Instead of applying the proposed operational restrictions, EPA should apply technology-based emissions controls to Shell's most polluting sources. As an initial matter, and as we have commented in the past, we believe the Clean Air Act requires that EPA impose BACT limitations to the icebreakers and support vessels. *See* October 20 Comments at Section (I)(a). The Clean Air Act subjects major emitting facilities, including OCS sources like Shell's proposed drilling, to BACT for each regulated pollutant emitted from the facility. 42 U.S.C. §§ 7475(a)(4), 7627. Emissions from proximate associated vessels, such as Shell's icebreakers, are included as "direct emissions from the OCS source," 42 U.S.C. § 7627(a)(4)(C), and are thus subject to BACT. EPA's regulation, 40 C.F.R. § 55.2, does not preclude the application of BACT to these emissions.

Even if EPA were to conclude that it is not required by the Act to apply BACT limits to vessels, it should nevertheless impose appropriate technology based limits to these vessels to ensure compliance with NAAQS standards and PSD increments, rather than rely on operational controls that are difficult to enforce and may not be consistent with actual icebreaker or support vessel operational needs.

***EPA should factor the effects of black carbon into its permit decision.***

PSD program is designed to "assure that any decision to permit increased air pollution in any area to which this section applies is made only after careful evaluation of all the consequences of such a decision. . . ." *See* 42 U.S.C. § 7470. It requires an analysis of factors that are relevant to determining the effect of emissions from a proposed facility on an air quality control region. 42 U.S.C. § 7475(e)(3). The Proposed Permit and its supporting documents, however, completely fail to consider the effects of Shell's emissions of black carbon, a significant forcer of climate change, particularly when released in the Arctic.

A significant fraction of the 51.58 tons per year of fine particulate emissions the Proposed Permit authorizes is black carbon. *See* Statement of Basis, Appendix A at A-1 (listing the potential amount of fine particulate emissions). Black carbon contributes to global and regional warming in multiple ways. It absorbs sunlight in the atmosphere, thereby capturing heat energy, and it darkens snow and ice after falling to earth, thus reducing the reflection of sunlight and accelerating melting. Black carbon is generally regarded as the second most important contributor to Arctic warming after CO<sub>2</sub>. Emissions of black carbon from sources in the Arctic itself are particularly troubling. A recent study has shown that black carbon emissions in the

Arctic itself can cause substantially more regional warming than similar amounts of black carbon emitted outside the Arctic. 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, 686 (2010). EPA should consider the effects of Shell's significant black carbon emissions, including the black carbon that may result from Shell's activity through the formation of secondary PM<sub>2.5</sub>, and factor such impacts in to EPA's decisions about appropriate emissions limitations for the proposed Shell operations.

***EPA should require the collection of additional background data.***

The high emission levels authorized by the Proposed Permit are particularly troubling in light of EPA's continued reliance on an amount of background data that is less than EPA generally requires and that does not cover all the months the Proposed Permit would allow Shell to operate. Statement of Basis at 105. As recent experience has shown, this is problematic. Under EPA's original Proposed Permit, drafted with only a few months of background data collected far from the drill sites and only after considerable problems with original data collection, Shell's emissions of PM<sub>2.5</sub> were projected to be as high as 96 percent of NAAQS. Statement of Basis to the August 2009 Proposed Permit, Appendix B at Table 12b. After issuing the draft, EPA received more background data showing higher PM<sub>2.5</sub> levels, to the point the original draft Proposed Permit would have exceeded NAAQS limits. *See* Wainwright Near-Term Ambient Air Quality Monitoring Program Fourth Quarter Data Report August through October 2009 at Table 8. As a result, EPA was forced to revise the permit conditions. This experience illustrates the importance of meeting the regulation's requirement for at least a full year's worth of data collection. However, the Proposed Permit continues to rely on less than a year's worth of PM<sub>2.5</sub> data.

EPA has not justified why less than one year's data is sufficient to provide a "complete and adequate" analysis. 40 C.F.R. § 52.21(m)(1)(iv). EPA's primary justification seems to be that the limited data on which it relies in the Proposed Permit is sufficient for a "complete and adequate" analysis, because the data is taken from the coastal village of Wainwright, where, EPA states, pollution levels are likely to be higher than the offshore areas in which Shell proposes to drill. Statement of Basis at 104-07. However, EPA has excluded from its review onshore data gathered from low-precipitation, high-wind days. *Id.* at 106-07. EPA has failed to justify its conclusion that use of limited Wainwright data provides a "complete and adequate" analysis in the face of its choice to eliminate from consideration data that makes the onshore information conservative in the EPA's view. Moreover, where EPA is already severely hampered by a complete lack of site-specific data—background and meteorological, *see* October 20 Comments at (II)(b)(3)—the agency should not skimp on the data that *can* be obtained, particularly when EPA's own experience with the use of this substitute data reveals that more data results in a more refined—and more protective—set of permit restrictions. At minimum, EPA should require Shell to collect background data for all the months the Proposed Permit allows Shell to operate.

***EPA should limit Shell's permit to a duration of one year.***

If EPA issues Shell a PSD permit, it should limit that permit's scope to reflect Shell's submitted exploration plans. Shell has to date submitted plans to perform exploration drilling on five lease

blocks in the Chukchi Sea during a single drilling season, between July 1 and October 31, 2010. Shell Gulf of Mexico, Inc., 2010 Exploration Drilling Program, OCS Lease Sale 193, Chukchi Sea, Alaska at 1-2. However, the Proposed Permit is of unlimited duration and allows drilling on any of the Lease Sale 193 lease blocks. Statement of Basis at 3-4. EPA should not issue a permit for multiple years when necessary permit conditions are likely to be substantially different in future years based on changing regulatory requirements, developing information and other proposed activities in the Arctic. For example, EPA has proposed increments for fine particulate matter, 72 Fed. Reg. 54,112, that, once adopted, would require Shell to reduce emissions of PM<sub>2.5</sub> to less than half the levels allowed under the current Proposed Permit.

***EPA should consider the effects Shell's operations will have on secondary PM<sub>2.5</sub> formation.***

The Proposed Permit still does not take into account secondary PM<sub>2.5</sub> formation. EPA or Shell must consider the effects of such secondary formation of PM<sub>2.5</sub> in order to complete a sufficient analysis of the operations' potential impacts on air quality. See 40 C.F.R. § 52.21(k). Even though the Proposed Permit now predicts lower emissions of PM<sub>2.5</sub> and secondary PM<sub>2.5</sub> precursors, the dangers that PM<sub>2.5</sub> poses to health and the environment should compel EPA to consider the effects of its secondary formation. EPA has stated that "[n]itrate formation is favored by the availability of ammonia, low temperatures, and high relative humidity." 73 Fed. Reg. 28,321, 28,328 (May 16, 2008). Given that the use of SCR technology creates a potential for release of unreacted ammonia, and that such potential emissions would occur in colder arctic temperatures over open water, conditions could favor a large conversion of NO<sub>x</sub> to fine particulate matter. EPA should consider this in its analysis.

***EPA should improve the BACT limitations in the permit.***

*EPA's NO<sub>x</sub> BACT analysis for the Discoverer's compressor units is flawed.*

EPA has not sufficiently explained its BACT determination for NO<sub>x</sub> emissions reductions for the *Discoverer's* compressor units. Statement of Basis at 58-59. EPA states that there is limited space around the compressor units, and therefore, it is technically infeasible for Shell to accommodate selective catalytic reduction (SCR). However, EPA has not sufficiently justified this conclusion, because the analysis does not make clear what sizing criteria or catalyst EPA considered to support the SCR dimensions discussed in the documents. *Id.* Further, even accepting that the specific SCR unit EPA and Shell discuss would not fit in the space, a smaller SCR reactor, perhaps with a lower NO<sub>x</sub> reduction, might fit. Presumably, the SCR dimensions correspond to a certain level of NO<sub>x</sub> reduction. To properly apply BACT, EPA and Shell must analyze whether an SCR of smaller size, with a potentially different NO<sub>x</sub> reduction efficiency, can be accommodated in the space available and whether this smaller SCR can meet BACT criteria.

*EPA should include a permit condition that adjusts BACT rates downward if Shell's emissions controls perform better than assumed in the Proposed Permit.*

EPA should include a condition in the Proposed Permit that allows for a downward adjustment of rates of emission allowable as BACT as Shell obtains actual test data on its units. In the

Proposed Permit, EPA relies on emission factors derived from manufacturer's data, the AP-42, or other sources. Because the reliability of this data is not known for certain, the Proposed Permit assumes that emissions will be higher than they might be in practice. Since all of the emissions sources are proposed to be tested, EPA should revise these assumptions as direct measurement data becomes available.

Such a revision should be allowed for emissions from the *Discoverer's* expected D.E.C. Marine SCR system. See Statement of Basis at 56-57. As described in this SCR system's technical content, the SCR system is capable of reducing NO<sub>x</sub> emissions to as low as 0.1 g/kW-hr under ideal steady state conditions. Shell's Outer Continental Shelf Pre-Construction Air Permit Application Revised, Feb. 23, 2009, Appendix F at 195-209. While D.E.C. Marine only guarantees a rate of 0.5 g/kW-hr, because of the continually varying operating level of the engines and the severe environmental conditions in the Arctic Ocean, it also recognizes that "the SCR system is designed with 'plenty of margin to make sure [it] will stay below the guaranteed level. . . .'" Statement of Basis at 56. The Proposed Permit includes the very conservative rate of 0.5 g/kW-hr as BACT. *Id.* Because the SCR can achieve a level of NO<sub>x</sub> reduction that is substantially below this figure, EPA should require adjustments to reflect actual operating performance as Shell collects more data.

***EPA should regulate Shell's CO<sub>2</sub> emissions.***

The Supreme Court's ruling in *Massachusetts v. EPA* established that CO<sub>2</sub> is a "pollutant" under the Clean Air Act, and that EPA has the statutory authority to regulate it. 549 U.S. 497, 529, 532 (2007). Shell's operations also have the potential to emit up to 94,000 tons of CO<sub>2</sub>—an amount approximately equivalent to the annual household CO<sub>2</sub> emissions of 21,000 people, roughly three times the entire population of the North Slope Borough. It is also nearly four times greater than the threshold triggering regulation under EPA's proposed PSD and Title V Greenhouse Gas Tailoring Rule. 74 Fed. Reg. at 55,292. As described in our October 20 Comments, EPA should regulate Shell's CO<sub>2</sub> emissions by requiring Shell to apply BACT to those emissions.

***EPA should take into account emissions that would result from scenarios involving oil spills or other emergency conditions.***

The Proposed Permit fails to account for emissions that would result from scenarios involving oil spills and other emergency conditions. For the reasons stated in our prior comments, the Proposed Permit should consider emissions that could result from large or small oil spills, encounters with shallow gas hazards, or a blowout. October 20 Comments at (II)(a)(4).

***EPA should analyze the effect Shell's operations will have on ozone formation.***

EPA states that it will not require Shell to perform modeling for ozone formation resulting from its emissions. Statement of Basis at 109. EPA justifies this decision, in part, by reasoning that Shell will emit a relatively low amount of ozone precursors in relation to sources in the North Slope Borough, and thus, is unlikely to endanger the region's current compliance with ozone standards. *Id.* Still, there is some cause for concern over ozone levels: Shell's monitoring results show that 8-hour ozone concentrations in Wainwright have reached 63 percent of NAAQS, even

though there are few sources of pollution near Wainwright, *id.*; Shell's operation has the potential to emit over a thousand tons per year of NO<sub>x</sub>, a precursor of ozone; and, as described in our October 20 Comments, Section (II)(b)(6), the Arctic environment has specific characteristics that may cause rapid ozone formation. In light of these factors, EPA should require Shell to model the formation of ozone that may result from its operations.

***EPA should require more frequent testing for Shell's larger sources of pollution.***

EPA's regulations require Shell to certify its compliance with air quality standards and permit conditions. 42 U.S.C. § 7414; 40 C.F.R. § 60.8. The Administrator has the discretion to adjust testing requirements depending on the circumstances, 40 C.F.R. § 60.8, but should not do so at the cost of ensuring compliance.

In the revised Proposed Permit, EPA reduced the source testing requirements for many of the operations' sources or pollutants. Statement of Basis at 5, 29. While the ostensible rationale for this reduction was the burden of testing on Shell, EPA has failed to demonstrate that it has properly balanced this burden against the obvious uncertainty in the emissions estimation for the project. With rare exceptions, EPA and Shell have not estimated emissions based on reliable (or representative) source tests; rather EPA and Shell have reached their estimates using EPA's AP-42 emission factors or older data from manufacturers. The only way to verify these assumptions is via representative source tests.

EPA does not discuss whether the source testing it proposes will result in representative data that can be used to reduce the uncertainty in the emissions estimates, and thus, it is difficult to assess whether that system will ensure compliance. EPA notes that under its current approach, "not all emission units in a source category will be tested each year, but by the end of the first three drilling seasons, all of them will have been tested. . . ." Statement of Basis at 29. This is not an appropriate approach to testing the emissions of an operation that for now is only proposed for a single year, and, in any event, may be changing from year to year assuming it continues. EPA should explain how its new proposal will result in accurate emissions estimates. Even if EPA determines that it reduced testing is appropriate, it should, at a minimum, require more frequent testing of the larger sources (i.e., the ones with the largest emissions), as compared to the smaller ones.

***EPA should require Shell to analyze the operations' effect on soils and vegetation.***

"Shell is required to provide an analysis of the impairment to soils and vegetation in the significant impact area of the proposed new source that is expected to occur as a result of its permitted activities and general commercial, residential, industrial, and other growth associated with the project." Statement of Basis at 114. As discussed in our October 20 comments, Shell has assessed possible impairment of soils and vegetation within a 50-km radius of the *Discoverer*, but has not analyzed the effect its onshore and associated activities will have on soils and vegetation. Statement of Basis at 114. By failing to consider how its onshore activities may affect soils and vegetation, Shell has failed to satisfy PSD regulatory requirements. *See* 40 C.F.R. § 52.21(o)(1).



***EPA should regulate emissions from Shell’s drilling no later than when the Discoverer’s first anchor is attached to the seabed.***

EPA has requested comments on when the *Discoverer* will become an OCS source for the purposes of the Proposed Permit—when it makes contact with the seabed or only after it is fully secured on the seabed and ready to drill. Statement of Basis at 20. The relevant statutory provisions and legislative history strongly suggest that EPA should regulate the *Discoverer* as an OCS source no later than when it makes contact with the seabed by placing its first anchor.

Section 328 of the Clean Air Act extends EPA’s regulatory authority to facilities that emit air pollution, are located on or in waters over the outer continental shelf (OCS), and are regulated under the Outer Continental Shelf Lands Act (OCSLA). *See* 42 U.S.C. § 7627(a)(4)(C). OCSLA regulates a wide range of activities related to exploratory drilling on the OCS, many of which occur without any direct attachment to the seabed. For example, Section 4(d)(1) of OCSLA authorizes the Coast Guard “to promulgate . . . regulations with respect to lights and other warning devices, safety equipment, and other matters relating to the promotion of safety of life and property on the artificial islands, installation, and other devices referred to in [section 4(a)(1)] *or on the waters adjacent thereto. . .*” 43 U.S.C. § 1333(d)(1) (emphasis added); *see also id.* at § 1340(b) (all exploration must comply with OCSLA.); *id.* at § 1331(k) (defining “exploration” as, *inter alia*, “the process of searching for minerals, including . . . geophysical surveys where magnetic, gravity, seismic, or other systems are used to detect or imply the presence of such minerals.”).

EPA’s regulation, 40 C.F.R. § 55.2, focuses on Section 4(a)(1) of OCSLA. That section extends federal jurisdiction to “to all artificial islands, and all installations and other devices permanently or temporarily attached to the seabed, which may be erected thereon for the purpose of exploring for, developing, or producing resources therefrom. . . .” 43 U.S.C. § 1333(a)(1). As the legislative history of Section 4(a)(1) indicates, however, it does not restrict jurisdiction to devices only when they are fully secured to the seabed and ready to operate. Rather, Congress intended to authorize regulation of ships and other exploration equipment based on their location—in OCS waters—and purpose—resource development. In the original 1953 version of OCSLA, Section 4(a)(1) stated that the jurisdiction of the United States extends “to all artificial islands and fixed structures which may be erected thereon for the purpose of exploring for . . . resources therefrom. . . .” Public Law 212, Aug. 7, 1953. However, Congress later clarified this language by adding the words “and all installations and other devices permanently or temporarily attached to the seabed” and removing the words “fixed structures” to clarify the application of the statute to new exploration technologies, like drillships and jack-up rigs, not in existence at the time Section 4(a)(1) was originally enacted. In so amending the statute, Congress emphasized that the United State’s jurisdiction under Section 4(a)(1) applies to OCS apparatus based on whether the apparatus was brought to the OCS for resource development, and not on the basis of the specific physical features of the apparatus or attachment to the seafloor. *See* H.R. Conf. Rep. 95-1474 at 6 (noting, by way of example in the custom duty context, that jurisdiction extends to facilities “brought into OCS waters for placement so that it can be used to develop and produce OCS minerals”). To the extent the history elsewhere suggests that attachment to the seabed is an element, it references at most a mere connection. *See* House Report 95-950 at 128 (The amendments to OCSLA “made clear that Federal law is to be applicable to all activities on

all devices in contact with the seabed for exploration, development, and production. The committee intends that federal law is, therefore, to be applicable to activities on drilling ships, semi-submersible drilling rigs, and other watercraft, when they are connected to the seabed by drillstring, pipes, or other appurtenances, on the OCS for exploration, development, or production purposes.”).<sup>3</sup>

Thus, Shell’s drillship will be connected to the seabed, and subject to regulation consistent with section 4(a)(1) of OCSLA, once its first anchor is positioned. EPA should apply its regulation, 40 C.F.R. § 55.2, which by its own terms must be applied “within the meaning” of section 4(a)(1), consistent with the scope of the statute and regulate the operations no later than at that point of contact.

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For the foregoing reasons and the reasons stated in our October 20 Comments, the undersigned urge EPA not to issue the Proposed Permit in its current form. EPA should work jointly with other agencies responsible for permitting Shell’s drilling to prepare a full EIS analyzing the potentially significant impacts of Shell’s multi-sea, multi-year drilling plan. If EPA goes forward with its permitting process, it must remedy the flaws detailed above and in our October 20 Comments before finalizing the permit.

Respectfully submitted,

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<sup>3</sup> Neither *DeMette v. Falcon Drilling Company*, 280 F.3d 492, 498-500 (5th Cir. 2002) (overturned on other grounds), nor *Diamond Offshore Co. v. A&B Builders*, 302 F.3d 531, 546 (5th Cir. 2002), require a different conclusion. Neither case defined the level of contact with the seabed required before OCSLA attaches. Instead, the issue the court analyzed in *DeMette* was whether section 4(a)(1) could cover a vessel at all. 280 F.3d at 498. *Diamond Offshore* similarly did not reach the issue of what sort of contact with the seabed is required under section 4(a)(1). Instead, the court ruled that there was insufficient evidence to support a determination that the requirements of Section 4(a)(1) were satisfied, because it was not clear that the vessel was connected at all to the seabed at the relevant times. 302 F.3d at 546. If anything, the case concludes that mere contact with the seabed is sufficient for OCSLA jurisdiction to attach. *See id.* at 545 (“Since there is no evidence that the Ocean Concorde was connected to the ocean floor by its anchors or through its drilling mechanisms, and there is no evidence of *any other contact* with the seabed, the second requirement that the Ocean Concorde was ‘erected’ on the OCS at the time of McMillon’s alleged injury is clearly not satisfied.” (emphasis added)).

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# **Exhibit A**



**ALASKA WILDERNESS LEAGUE – AUDUBON ALASKA  
CENTER FOR BIOLOGICAL DIVERSITY – EARTHJUSTICE  
NATURAL RESOURCES DEFENSE COUNCIL  
NORTHERN ALASKA ENVIRONMENTAL CENTER – PACIFIC ENVIRONMENT  
OCEANA – SIERRA CLUB – WORLD WILDLIFE FUND**

October 20, 2009

**VIA EMAIL**

EPA Region 10  
Shell Chukchi OCS Air Permit  
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Email: R10ocsairpermits@epa.gov

**Re: Draft Outer Continental Shelf Prevention of Significant Deterioration Permit for Shell Gulf of Mexico, Inc. for Exploration Drilling in the Chukchi Sea; Permit Number R10OCS/PSD-AK-09-01**

The undersigned groups hereby submit the following comments on the Environmental Protection Agency's (EPA) Draft Outer Continental Shelf Prevention of Significant Deterioration (PSD) Permit for Shell Gulf of Mexico, Inc. (Shell) for Exploration Drilling in the Chukchi Sea, Permit Number R10OCS/PSD-AK-09-01 (Proposed Permit).

As an initial matter, it is not appropriate to consider exploration drilling in the Arctic Ocean in the face of serious questions about the validity of the Chukchi Sea leases on which Shell proposes to drill. These leases derive from Lease Sale 193, which was held pursuant to the previous administration's 2007-12 Five-Year Leasing Program. The D.C. Circuit Court of Appeals vacated that program in April 2009 for failing to adequately consider the environmental sensitivity of the Arctic Ocean. *See Ctr. for Biological Diversity v. U.S. Dep't of the Interior*, 563 F.3d 466 (D.C. Cir. 2009). Lease Sale 193 has also been directly challenged in federal district court in Alaska by a number of conservation and Alaska Native groups because the Minerals Management Service (MMS) failed to analyze and disclose the impacts of oil and gas activities on wildlife and the subsistence way of life. *See Native Village of Point Hope v. Salazar*, No. 1:08-cv-00004-RRB (D. Alaska, filed Jan. 31, 2008). In the context of both of these legal challenges, the Department of the Interior has represented that it is reviewing the Chukchi Sea leases at issue. No permitting of activities on these leases should proceed until the Department has completed this review based on a thorough environmental analysis.

Further, if implemented, Shell's drilling program would constitute a massive industrial undertaking. It would involve operations not only in the Chukchi Sea, but also in the Beaufort Sea. It would involve a 514-foot long drill ship and armada of ice-breakers and other support ships and aircraft traveling to and through the Arctic Ocean from July through October, generating industrial noise in the water, running the risk of a large oil spill, and emitting tons of

pollutants into the air and thousands of barrels of waste into the water. Shell's proposed 2010 drilling is just one part of a multi-year, multi-sea drilling campaign. Whether alone or in the context of Shell's larger Arctic Ocean drilling program, Shell's proposed Chukchi Sea drilling threatens potentially significant effects on wildlife and people in the region. These potentially significant effects must be analyzed and disclosed in an environmental impact statement (EIS). *Idaho Sporting Cong. v. Thomas*, 137 F.3d 1146, 1149 (9th Cir. 1998) (“An EIS *must* be prepared if substantial questions are raised as to whether a project ... *may* cause significant degradation of some human environmental factor.”) (citation omitted, emphasis in original). Because Shell intends to drill in both the Beaufort and Chukchi Seas starting in 2010, transporting the same equipment through these seas to each drill location and potentially affecting migratory species multiple times and in multiple places along their migration routes, the operations should be analyzed in a single comprehensive EIS.

Further, since multiple agencies are responsible for permitting different aspects of Shell's proposed operations, these agencies should cooperate and prepare a joint EIS. 40 C.F.R. § 1501.6 (encouraging “agency cooperation early in the NEPA process”); *see also id.* at § 1501.1(b) (“emphasizing cooperative consultation among agencies before the environmental impact statement is prepared rather than submission of adversary comments on a completed document”); *id.* at § 1502.4 (where a project involves a series of actions “which are each related to each other closely enough to be, in effect, a single course of action” it should be evaluated in a single EIS). EPA is mandated by its regulations to cooperate with other agencies in preparing an EIS for the exploration plan. *See* 40 C.F.R. § 52.21(s). The other agencies responsible for permitting Shell's drilling each have similar mandates. *See* 43 U.S.C. § 1334(a) (providing that Interior “shall cooperate with the relevant departments and agencies of the Federal Government ...” in “the enforcement of safety, environmental, and conservation laws and regulations” on the outer continental shelf); 30 C.F.R. § 250.231, .233(b), .234 (providing MMS the flexibility to prepare an EIS where an exploration plan threatens significant effects); NOAA Order, 216-6 at §5.09(e) (May 20, 1999) (NMFS); FWS Service Manual, 505 FW 1, 505 FW 2 (June 28, 1994). Indeed, EPA stated in an August 9 letter responding to correspondence by some of the signatories hereto that it has initiated a federal agency coordinating process to address the issues raised by Shell's proposed activities. We urge you to complete this process prior to proceeding with this PSD permit.

We offer the following comments in the event EPA does proceed with the Proposed Permit.

Shell's operations constitute a “major emitting facility” because they will potentially emit over 250 tons per year (tpy) of nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), and particulate matter (PM) and will exceed significance thresholds for sulfur dioxide (SO<sub>2</sub>) and volatile organic compounds (VOC). 42 U.S.C. § 7479(1); Statement of Basis for Proposed OCS Prevention of Significant Deterioration Permit at 15 (Aug. 14, 2009) (Statement of Basis). EPA must thus ensure that Shell meets stringent emissions standards, known as best available control technology (BACT), to limit emissions “for each pollutant subject to regulation under [the CAA] emitted from, or which result from, such facility.” 42 U.S.C. § 7475.

To protect human health and the environment, EPA must ensure that Shell's operations will not violate air quality standards. The proposed permit does not achieve this. EPA has only required



best available control technology (BACT) for the drillship and a single supply vessel, leaving the majority of the fleet, and potentially thousands of tons of pollutants, free from meaningful regulation. EPA should limit these associated vessels' emissions by requiring that Shell apply BACT to them. Shell has also failed to provide a complete analysis of the operation's potential emissions because Shell's analysis fails to consider important sources of pollution, correctly characterize the facility's potential to emit, or provide reliable estimates of the conditions Shell will encounter in the Chukchi. As describe in more detail below, EPA must revise the proposed permit to correct these errors and omissions. Additionally, EPA must engage in consultation under the Endangered Species Act (ESA) before issuing a permit to Shell. It should also require Shell to apply for an individual National Pollutant Discharge Elimination System (NPDES) permit to regulated its discharges into the ocean.

#### **I) EPA should properly apply BACT to the fleet.**

##### **a) EPA should require BACT for emissions from Shell's associated and servicing vessels.**

Shell's drilling has the potential to emit 1965 tons per year (tpy) of NO<sub>x</sub>, 762 tpy of CO, and 260 tpy of PM. Statement of Basis at 15. Accordingly, EPA's proposed permit subjects Shell's operations to the CAA's PSD program. 42 U.S.C. §§ 7470-7492; Statement of Basis at 3. The PSD program requires that major emitting facilities, such as Shell's operations here, meet stringent emissions standards, known as BACT, to limit emissions of air pollutants. 42 U.S.C. § 7475. Shell's drilling operations involve not only a drillship, but also a supply vessel, ice breakers, and a host of other vessels. Indeed, most of the emissions from Shell's proposed drilling operation will likely come from the associated support vessels, not from the drillship itself. Statement of Basis, App. A at 1-21. Section 328 of the CAA includes emissions of these vessels in the direct emissions from the source when they are within 25 miles of the source. 42 U.S.C. § 7627 (a)(4)(C). EPA's proposed permit, however, only requires Shell to apply BACT to the emissions from its drillship and one supply vessel, excluding the majority of the operation's emissions from technology-based pollution controls. *See* Statement of Basis at 33-39. EPA should require Shell to apply BACT to the emissions from each of the vessels in its fleet that are counted as direct emissions from the source under Section 328. 42 U.S.C. § 7627 (a)(4)(C).<sup>1</sup>

In addition, even if EPA were to apply BACT requirements only to vessels directly or indirectly attached to the sea-bottom as proposed, EPA should nevertheless apply BACT to the anchor-handling vessel. Like the supply vessel, which EPA agrees must be regulated under BACT standards, the anchor handling vessel will be attached to the bottom-attached drillship. However, EPA's proposed permit does not apply BACT to the anchor-handling vessel and fails to provide a basis for this omission. Statement of Basis at 36. EPA states that there is no scenario where the anchor handler is attached to the drillship, *id.*, even though Shell's application clearly states that the vessel will be connected to the *Discoverer*, via the anchor, for approximately 18 hours

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<sup>1</sup> Tracking the Clean Air Act, EPA's regulations define an "OCS source" to exclude associated and servicing vessels, but include emissions from these vessels in the OCS source's potential to emit. 40 C.F.R. § 55.2. The regulations do not preclude the application of BACT to emissions from the associated vessels, and EPA should apply the stringent controls to those emissions.

while it operates, Shell, Outer Continental Shelf Pre-Construction Air Permit Application Revised, Frontier Discoverer Chukchi Sea Exploration Drilling Program at 29-30 (Feb. 23, 2009) (PSD Permit Application). Thus, the anchor handler will be attached to the *Discoverer* and acting as a stationary source for extensive periods of time. Statement of Basis at 31; PSD Permit Application at 29-30. Even under EPA's proposed approach, the anchor handler will be part of the outer continental shelf (OCS) source and EPA must require BACT for its emissions units.

**b) EPA should correctly determined BACT for the OCS source.**

EPA's permit purports to apply BACT to the engines that will operate while Shell's drillship is moored to the sea-bed and conducting drilling operations. The proposed permit's application of BACT to the drillship suffers from numerous flaws.

The permit does not justify the relatively permissive emissions reductions it imposes on certain diesel engines. The permit imposes selective catalytic reduction as the NO<sub>x</sub> BACT for the Generator Diesel IC Engines. Statement of Basis at 48. However, it only imposes an emissions rate of 0.5 g/kW-hr. *Id.* This level is not the best available technology. As EPA appears to recognize, the selective catalytic reduction system vendor, DEC Marine, expects that selective catalytic reduction will be capable of reducing NO<sub>x</sub> emissions to a level as low as 0.1 g/kW-hr. *Id.* at 46. Yet, the permit imposes only 0.5 g/kW-hr because "of the continually varying operating level of the engines and the severe environmental conditions in the Arctic Ocean." *Id.* These justifications for a five-fold increase in the expected NO<sub>x</sub> emission rate are too general. EPA must explain what aspects of the severe operating conditions affect the operations of the selective catalytic reduction system. Further, the Statement of Basis contains no design information on the selective catalytic reduction system, and fails to provide information about how much and what type of catalyst is going to be used, whether it is feasible to use a bigger selective catalytic reduction system (with lower NO<sub>x</sub> emissions) with more catalyst. The analysis does not follow the BACT guidance that EPA uses. The BACT level seems to echo what is mentioned in the vendor letter. For example, in later discussion, EPA references a stack test for the Caterpillar engine that showed uncontrolled emissions ranging from 5.62 to 6.99 g/kW-hr. *Id.* at 46-47. However, it is not clear if these are the only emissions tests available for this engine. If EPA wants to support its choice of BACT using emissions tests, it should provide the entire range of emissions tests for this engine; the results from a single test may not be representative. There is also no indication that these tests are representative of the engine NO<sub>x</sub> emissions expected at the *Discoverer*. In sum, the record does not contain a reasoned analysis as to why there should be a 500 percent margin between the vendor's NO<sub>x</sub> emission expectation and its desired NO<sub>x</sub> limit. As DEC Marine itself notes, the NO<sub>x</sub> level of 0.5 g/kW-hr will be easily met since "the [selective catalytic reduction] system is designed 'with plenty of margin.'" *Id.* at 47. While some compliance margin is prudent and to be expected, a margin of 500 percent is unjustified.

EPA does not sufficiently justify its rejection of certain NO<sub>x</sub> reduction technology. EPA rejects the use of selective catalytic reduction as NO<sub>x</sub> BACT for Compressor Diesel IC Engines due to several factors including a lack of previous similar installations, portability of use of these engines, and lack of space on deck. *Id.* at 48-49. However, EPA's analysis is insufficient. For example, lack of previous use is not, by itself, a reason to reject the use of selective catalytic

reduction from a technical standpoint. Just because the engines are portable, furthermore, does not mean that a selective catalytic reduction control system for the engines also has to be portable. EPA does not explain why the selective catalytic reduction system cannot be put in a stationary location to which duct work can be connected from the expected use locations of the compressor engines. It does not explain why the selective catalytic reduction system has to be located on the deck. It does not explain why the selective catalytic reduction system for the generator engines cannot also accept, via ductwork, the additional exhaust gases from the compressor engines. Without exploring any of these issues, EPA cannot reasonably reject the use of selective catalytic reduction on technical infeasibility grounds.

EPA also rejects selective catalytic reduction as NO<sub>x</sub> BACT on technical infeasibility grounds for each and every one of the Smaller Diesel IC Engines, even though they range from 48 hp to 365 hp. *Id.* at 49-51. As discussed above in connection with the compressor engines, EPA should analyze more fully the various options for employing selective catalytic reduction for these engines.

EPA also rejects selective catalytic reduction as NO<sub>x</sub> BACT for the Diesel-Fired Boilers. Statement of Basis at 51-52. These boilers will be located “next to the engine room which is being expanded to accommodate the [selective catalytic reduction] systems for the generator engines.” *Id.* at 51. EPA does not explain why the boiler emissions cannot be routed to these selective catalytic reduction systems since they are practically adjacent to each other.

EPA notes that the urea injection system will include a single NO<sub>x</sub> analyzer that will sequence through the six generators, thereby providing a direct NO<sub>x</sub> measurement only once per hour for each engine. *Id.* at 46. EPA does not explain why each engine cannot have its own analyzer, thus providing more frequent and better direct NO<sub>x</sub> measurements. EPA should impose such a requirement or justify why it is not feasible to do so.

EPA notes that the “oxidation catalyst will result in a 50% reduction in emissions of particulate matter of all sizes.” *Id.* at 26. EPA fails to provide a technical basis for this conclusion.

EPA does not adequately justify its application of the same technology to all particulate matter. The proposed permit states that BACT for PM, PM<sub>10</sub>, and PM<sub>2.5</sub> “will be addressed together for all emission units except the incinerator. . . .” *Id.* at 42. EPA justifies this approach on the assumption that “essentially all of the PM and PM<sub>10</sub> emissions are also PM<sub>2.5</sub> emissions, and the available control technologies are similar for all three particulate matter size categories.” *Id.* However, EPA provides no support for the assumption that all of the PM and PM<sub>10</sub> emissions are also PM<sub>2.5</sub>. *Id.* In fact, EPA’s estimates for the hourly emissions of the Hydraulic Power Units are different for PM<sub>10</sub> and PM<sub>2.5</sub>. Statement of Basis, App. B at Table 3. EPA should describe further why it can assume that all PM and PM<sub>10</sub> are also PM<sub>2.5</sub>. Also, it is not true that control technologies for all three PM sizes are the same. The same control technology will result in different control efficiencies for each of the three PM sizes. Thus, to meet BACT, EPA should analyze the control technology for each PM size fraction separately, or should properly articulate a reasonable basis for assuming that technologies for all three PM sizes are the same.

**c) EPA should regulate Shell's CO<sub>2</sub> emissions.**

The Supreme Court's ruling in *Massachusetts v. EPA* established that CO<sub>2</sub> is a "pollutant" under the CAA, and EPA has the statutory authority to regulate it. 549 U.S. 497, 529, 532 (2007). Shell's proposed operations will emit about 55,000 tpy of CO<sub>2</sub>. Shell Gulf of Mexico, Inc., Exploration Plan, 2010 Exploration Drilling Program, Chukchi Sea, Alaska, Environmental Impact Analysis (EIA), App. F at 36 (2009) (Chukchi Sea EP). By any measure, this is a significant amount of CO<sub>2</sub> emissions.

EPA should require BACT for Shell's CO<sub>2</sub> emissions. The CAA requires BACT for "each pollutant subject to regulation" under the Act emitted from a major emitting facility. 42 U.S.C. § 7475(a)(4). EPA expects that CO<sub>2</sub> will be subject to regulation before Shell begins its operations in the Chukchi Sea. Environmental Protection Agency, Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, EPA-HQ-OAR-2009-0517 at 16 (2009); Statement of Basis at 9. Shell's fleet will be a major emitting facility subject to BACT requirements under the PSD program. EPA should require Shell to meet BACT standards for CO<sub>2</sub>.

In applying BACT, EPA will not be limited to end-of-pipe control technologies. EPA should consider a variety of options for controlling Shell's CO<sub>2</sub> emissions, including the "application of production processes and available methods, systems, and techniques, including fuel cleaning, clean fuels, or treatment or innovative fuel combustion techniques. . . ." 42 U.S.C. § 7479(3). Shell may be able to reduce CO<sub>2</sub> emissions from its marine engines through the incorporation of improvements in efficiency and the inclusion of "higher compression ratios, higher injection pressure, shorter injection periods, improved turbocharging, and electronic fuel and air management." 73 Fed. Reg. 44,354, 44,467 (July 30, 2008).

**II) The modeling of possible effects on ambient air quality is insufficient.**

EPA regulations require Shell to submit "an analysis of ambient air quality in the area that the major stationary source would affect . . . for each pollutant that it would have the potential to emit in a significant amount." 40 C.F.R. § 52.21(m). A source's potential to emit is "the maximum capacity of a stationary source to emit a pollutant under its physical and operational design." 40 C.F.R. § 52.21(b)(4). "[E]missions from vessels servicing or associated with an OCS source shall be considered direct emissions from such a source while at the source, and while enroute to or from the source when within 25 miles of the source, and shall be included in the 'potential to emit' for an OCS source." 40 C.F.R. § 55.2.

According to EPA's regulations, Shell must perform an analysis of how its operations, working at maximum capacity and considering the emissions of its associated vessels, will affect the ambient air quality for the region of the Chukchi Sea in which Shell will be operating. Shell's application does not satisfy this requirement because it fails to consider important sources of emissions, correctly characterize the facility's potential to emit, or provide reliable estimates of the conditions Shell will encounter in the Chukchi Sea.

**a) EPA's modeling fails to sufficiently account for sources of emissions and the activity of those sources.**

**1) EPA improperly relies on Shell's arbitrary estimates of the amount of time the ice breakers will be active.**

Shell's ice breaker fleet is expected to consist of two ships. PSD Permit Application at 14. A central purpose of this fleet is to manage ice, which involves deflecting or breaking up ice floes that approach the drill site while the *Discoverer* is drilling. *Id.* Shell bases its estimate of ice breaker emissions on the presumption that they will be actively managing ice no more than 38 percent of the time. *Id.* at 17. Shell's presumption here is problematic. Shell acknowledges that ice floe frequency and intensity, and thus the need for ice breaker activity, is unpredictable. *Id.* at 14. However, in estimating the amount of time the ice breakers will be active, Shell has relied on ice data from the Sivulliq drill site in the Beaufort Sea, which is hundred of miles from Shell's proposed Chukchi Sea drill site. *Id.* at 15. It is unlikely that these data are representative of ice conditions Shell will encounter in the Chukchi Sea. Shell states that the "Chukchi Sea is expected to have less ice," but Shell has provided no basis for this statement. *Id.* at 15. Also, Shell states that ice conditions are unpredictable, but nevertheless concludes that 38 percent is a conservative estimate for the Chukchi Sea. *Id.* at 14-15. A true conservative estimate of ice conditions would recognize that in a year with large amounts of ice, the ice breakers could be active much more than 38 percent of the time. EPA should adjust its modeling accordingly.

EPA has included a limitation in the proposed permit that caps the amount of fuel that the ice breakers are allowed to use. Proposed Permit at 38. This usage limitation is based on Shell's estimate of how much fuel the ice breaker fleet will consume during a season when the ice breaker fleet must engage in the maximum operation of all emissions units. PSD Permit Application at 17. As stated above, Shell has determined that this maximum operation involves the ice breakers being active within 25 miles of the drillship 38 percent of the time. *Id.* However, due to the seasonal variability in ice levels, Shell's estimated maximum operation of the ice breaker fleet is not conservative, and as a result Shell's ice breakers may reach the proposed permit's fuel usage limitation before the end of the drill season. Once the ice breakers reach that limit, and thus can no longer operate under the permit conditions, any attempt by Shell to perform oil exploration in the Chukchi Sea would pose an unacceptable risk to the safety of Shell's crew and the environment. The permit should clarify its permit conditions to directly state that Shell must terminate operations for the season once the ice breaker fleet approaches or reaches its permitted fuel usage limit.

**2) EPA has based its modeling of the potential emissions of Shell's fleet on unrealistic operating assumptions that artificially limit the positioning of the fleet.**

EPA has based its modeling on an assumption that the ice breakers and the oil spill response fleet will not approach within a certain radius of the *Discoverer*. Proposed Permit at 39 (N.6), 43 (O.6), 47 (Q.3). However, Shell has stated its vessels will approach the *Discoverer* when safety and operational factors demand. Shell Gulf of Mexico, Inc., Comments on the August 2009 EPA Permit R100CS/PSD-AK-2009-01 at 8 (Sept. 17, 2009). Accordingly, EPA's models should consider scenarios where Shell's vessels operate in close proximity to the drillship, for example,

when cleaning up an oil spill. EPA's omission is significant, because the operation of the ice breakers or the oil spill response fleet close to the *Discoverer* may increase air pollution concentrations beyond the levels represented by Shell's data. Even a small increase in PM<sub>2.5</sub> emissions, which the current models show as reaching as high as 96 percent of allowable limits, may result in a violation of air quality standards. *See* Statement of Basis, App. A at Table 11.

**3) The models omit emissions from some of the ships that will be part of Shell's fleet and will be operating within 25 miles of the drillship.**

EPA has failed to model the emissions from several ships that will operate close to the drill-ship, and whose emissions must thus be included in determining whether pollution from Shell's operations will remain below applicable air quality thresholds. EPA's Statement of Basis says that the *Discoverer's* operations will be supported by an associated fleet that consists of a primary icebreaker, a secondary icebreaker, a supply ship, a oil spill response ship, and oil spill workboats. Statement of Basis at 8. This description omits vessels that Shell has included in its Chukchi Sea EP. In addition to what Shell submitted in its PSD permit application, the Chukchi Sea EP states that the associated fleet will include an oil spill response tanker, an oil spill response barge (which includes a tug), and a shallow water landing craft. Chukchi Sea EP at 41, 159-61

In its PSD permit application, Shell states that a tanker will be associated with the oil spill response fleet. This tanker will normally reside more than 25 miles away from the drill site; however, Shell will need this tanker "to come in for re-fueling and training purposes for short periods of time." PSD Permit Application at 18-19. This language indicates that the oil spill response tanker is a servicing or associated vessel of the OCS source, and EPA must include the emissions of the tanker in the OCS source's potential to emit. 40 C.F.R. §§ 52.21(b)(4), 55.2. However, Shell does not include this tanker in the PSD permit application's "Air Impacts" analysis. *See* PSD Permit Application at 55-70. In fact, Shell again lists the oil spill response fleet in this analysis, but leaves out the tanker. Shell states that the "[oil spill response] fleet is expected to consist of one managing oil response ship, the Nanuq, and three small (34-foot) craft that dock on the Nanuq." *Id.* at 58. Appendix A of the Statement of Basis also provides no data for the tanker. Thus, it appears that Shell's air impact analysis is deficient because it has neglected to consider emissions from a major vessel.

Shell's air impacts analysis also neglects to include the oil spill response barge. *See* PSD Permit Application at 55-70. Shell justifies this by arguing that the oil spill response barge will only perform "near-shore clean up" in the event of an oil spill and will not be within 25 miles of the drill site. *Id.* at 19. There is no 25-mile zone of exclusion around the OCS source for the oil spill response barge in the proposed permit, nor is such an exclusion zone appropriate considering the unknown circumstances an oil spill would present. However, because Shell cannot, and should not, guarantee that the oil spill response barge will stay outside of a 25-mile radius of the OCS source, EPA should include emissions from the oil spill response barge in its air impact analysis.

Shell's PSD Permit Application, EPA's Proposed Permit, and EPA's Statement of Basis do not mention that a shallow water landing craft will be part of Shell's associated fleet. The Chukchi Sea EP states the following about this vessel:

The exploration drilling program will require the transfer of some supplies and personnel between shorebase facilities and [oil spill response] vessels. These transfers will be accomplished in part with a shallow water landing craft such as the one pictured below in Photograph 2.2-5. The landing craft is expected to make about 2-4 round trips per week between the shorebase and [oil spill response] vessels for two months.

Chukchi Sea EP, EIA, App. F at 18. Shell expects the oil spill response vessels to be within 25 miles of the drill site. PSD Permit Application at 18. Thus, it appears that the shallow water landing craft will also need to enter within 25 miles of the drill site in order to service the drilling operations. EPA must include the emissions from this vessel in its air impact analysis.

**4) EPA has failed to account for emissions that would result from scenarios involving oil spills or other emergency conditions.**

Shell fails to analyze emissions from oil spills and encountering shallow gas hazards during drilling. Pursuant to its regulations, EPA should direct Shell to analyze such events.

An applicant for a PSD permit must analyze the effects of pollutants on air quality that a major stationary source has the potential to emit in a significant amount. 40 C.F.R. § 52.21(m). “Potential emissions means the maximum emissions of a pollutant from an OCS source operating at its design capacity.” 40 C.F.R. § 55.2. EPA’s regulations further require inclusion of certain emissions that “are the result of poor maintenance, careless operation, or other preventable conditions.” 40 C.F.R. Part 51, App. W at 8.1.2. Under this authority, EPA should require Shell to account for emissions from oil spills and related response activities and from potential encounters with shallow gas hazards

Indeed, EPA has raised many of these issues with Shell before. EPA previously requested that Shell include information on scenarios resulting from operations encountering undesirable conditions as a result of natural hazards or human error. In EPA’s comments on Shell’s December 11, 2008, PSD permit application, EPA stated:

Tables 2-1 and 2-2 do not include all the pollutant-emitting activities associated with project, e.g. drilling of relief wells, use of diverters, well control events, flares, well testing, fuel tanks, etc. Please provide detailed descriptions, emissions quantification and include these emissions in the ambient air analysis, as appropriate.

Richard Albright, EPA, Application Incompleteness Determination for Frontier Discoverer Drill Vessel in Chukchi Sea at Attachment B, II.B.4 (Jan. 16, 2009). The proposed Chukchi PSD permit now includes information on a diverter, and Shell maintains that it “does not plan to flow test wells, flare gas, or store liquid hydrocarbons recovered during well testing. . . .” PSD Permit Application at 22. Shell also indicates that a loss of well control resulting in the need to drill a relief well is such an unlikely event that it will not analyze the emissions from such a scenario. *Id.* at 22-24. Alternatively, Shell states that if it needs to consider the emissions from drilling a relief well, those emissions are already considered because its application incorporates them into the hourly emissions of the *Discoverer*, and the *Discoverer* would be used to drill any relief well.

As described below, Shell's response to EPA's comment is insufficient for a number of reasons. Pursuant to Appendix W of Part 51, EPA should direct Shell to model scenarios that involve unexpected conditions such as oil spills and encountering gas hazards in order to assess possible source impacts and the likelihood of operations causing a violation of air quality standards.

**i) EPA has failed to consider emissions that would result from a large oil spill.**

EPA should consider emission that will result from a large spill. Shell characterizes a loss of well control that might lead to a large oil spill as a highly unlikely event. Shell states that "the odds that a well control event could occur during exploration drilling on the Alaska OCS and that a relief well would then be necessary to bring the well under control are almost 1 in 6,000," or 0.0001667 spills per well drilled. PSD Permit Application at 23. However, it is misleading to assess the likelihood of an emergency event on a per-well basis when a PSD permit would allow Shell to drill multiple wells over multiple years. Shell intends to drill many wells during the life of the permit, so the chances of a large spill occurring are greater than 1 in 6000. Thus, the probability of a large oil spill, as offered by Shell, is large enough to justify an examination of effects on air quality.

The need to analyze the effects of such a large spill is even more clear when considering that Shell may underestimate the risk of a well control event occurring. The Chukchi Bercha Report modeled oil spill occurrence in the Chukchi Sea for lease sale 193. This report lists a historical rate of 25.05 exploration blowout spills per 10,000 wells, or .0025 spills per well drilled. Bercha Group, Alternative Oil Spill Occurrence Estimators and their Variability for the Chukchi Sea – Fault Tree Method at 2.7, Table 2.9 (2006) (Bercha Report). The resulting spills are also likely to be large. The Bercha Report indicates that spills over 1000 bbl make up 92 percent of these spills and spills over 10,000 bbl make up 37.35 percent. *Id.*

The air quality impacts that would result from a large oil spill are so significant that EPA should direct Shell to consider these impacts, even if EPA determines that Shell has correctly characterized the likelihood of a spill as small. One of Shell's primary planned responses to a large oil spill is to ignite the spilled oil. Chukchi Sea EP 68-69. The combustion of this large amount of oil, perhaps over 10,000 bbl, would undoubtedly have enormous effects on air quality. However, it remains unknown exactly what these effects would be, and how such a spill would affect human populations along the Alaskan coast. EPA must analyze these potential emissions.

Also, Shell's statement that the emissions from the *Discoverer*, included in the Chukchi PSD permit application, already account for the hourly emissions rates that would result from the drilling of a relief well may be incorrect. See PSD Permit Application at 23. As shown by the recent environmental catastrophe in the Timor Sea, oil blowouts can potentially disable a drilling rig making it incapable of drilling a relief well. The possibility exists that the *Discoverer* will not be able to drill a relief well, and that Shell will be forced to bring another drillship to the drilling site.<sup>2</sup> This alternate drilling ship may have a very different emissions profile from that of

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<sup>2</sup> The Minerals Management Service (MMS) has recognized the importance of Shell having an additional drillship available in case Shell needs it to drill a relief well. In approving Shell's Beaufort Sea EP, MMS stated that it would require Shell to "provide documentation on the availability of suitable alternative drilling unit(s) that would be made available to Shell should it be necessary to drill a relief well." Jeff Walker, Minerals Management Service, Letter



the *Discoverer*, and thus, the emissions included in Shell's application do not incorporate the emissions that may result from a loss of well control. In addition to directing Shell to analyze the emissions that would result directly from the release or burning of spilled oil, EPA should have Shell develop scenarios under which the *Discoverer* is damaged and another drillship drills the relief well.

**ii) EPA has failed to consider emissions that would result from a small oil spill.**

EPA should consider emissions that will result from a small spill. Small oil spills are a relatively common result of operational error or poor maintenance. Such spills will result in the emission of air pollutants. The likelihood of a small spill is high enough that Shell includes an analysis of the effects of small spills in its Chukchi Sea EP, which it submitted to MMS. Shell states that “[a]n unconfined release of 48 bbl of diesel would result in the volatilization of HAPs such as benzene, ethylbenzene, naphthalene, toluene, and xylene.” Chukchi Sea EP, EIA, App. F at 238. Even though there is a significant possibility that multiple small spills will occur during the regular course of Shell's exploration operations, Shell has not included information on the level of emissions that may result from the spills themselves and the effort required to clean them up. See PSD Permit Application. EPA should require an analysis of these emissions.

**iii) EPA has failed to account for emissions that may result from operations encountering shallow gas hazards or if a blowout occurs.**

Shell's Chukchi PSD permit application does not analyze the emissions that would result from the *Discoverer* encountering shallow gas. See PSD Permit Application. In the Statement of Basis, EPA states that due to the low probability of Shell encountering shallow gas, the permit does not need to include a permit condition for the Shallow Gas Diverter System beyond the requirements to “record and report to EPA if a diversion event occurs.” Statement of Basis at 33. However, there are significant dangers associated with shallow gas, and EPA has not sufficiently recognized the risk of Shell encountering such a hazard. As a result, EPA should direct Shell to fully analyze the probability of their operations experiencing a blowout due to shallow gas, and to assess the effect of the emissions that would result.

Shallow gas is a significant hazard that has resulted in numerous fatalities and the complete destruction of drillships, jackups and semi-submersibles. If Shell encounters shallow gas, Shell may have to use the diverter system which will result in additional emissions. Even more significantly, a blowout caused by shallow gas may release many tons of gaseous hydrocarbons, of which a significant amount would be nonmethane hydrocarbons classified as VOC. EPA Region 10 Memorandum, *Volatile Organic Compound Emissions Associated with Shallow Gas Diversions and Drilling Mud Returns – Kulluk Drilling Rig* at 3 (June 12, 2008).

Also, EPA has not sufficiently articulated a basis for concluding that the probability of Shell encountering shallow gas is too low to consider. EPA has listed what it considers to be a number factors that mitigate the risk of such an event, but EPA has not detailed what is the resulting probability. Statement of Basis at 33. Also, as described above, probabilities that appear small

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Approving Shell's Beaufort Sea Exploration Plan at 3 (Oct. 16, 2009) available at [http://www.mms.gov/alaska/ref/ProjectHistory/Shell\\_BF/2009\\_1016\\_EPapproval.pdf](http://www.mms.gov/alaska/ref/ProjectHistory/Shell_BF/2009_1016_EPapproval.pdf).

in the context of the drilling of a single well can nevertheless be large when an operation drills numerous wells over a number of years.

**5) EPA fails to justify its conclusion that Shell's operations have no potential to emit sulfuric acid mist.**

EPA states that the proposed drilling has no potential to emit sulfuric acid mist. Statement of Basis at 15. However, Shell's fleet will use fuel containing sulfur. Proposed Permit at 8-9. Any time an emissions unit uses fuel containing sulfur, emissions of sulfuric acid mist are possible. EPA should explain why the fleet has no potential to emit sulfuric acid mist. If EPA intends to indicate that potential emissions of sulfuric acid mist are negligible, it should specify this.

**b) Shell has incorrectly modeled air quality impacts.**

**1) Shell's non-guideline model is inappropriate for use in assessing the air quality impacts of Shell's operations.**

Shell's models employ an altered non-guideline model that is not well suited for modeling emissions over large distances in overwater conditions. EPA should require the use of a guideline model suitable for such modeling, or provide a more detailed explanation as to why the model Shell has used is appropriate.

EPA recognizes that Shell used a non-guideline model (ISC3-Prime) that another model has superseded. Statement of Basis at 73. The ISC3-Prime model contains algorithms that account for building downwash, meaning the dispersion of pollutants in the downwind wake of a building. However, EPA now prefers the use of AERMOD, another model that accounts for such effects and that includes a number of additional improvements over ISC3-Prime, to the use of ISC3-Prime. *See* 40 C.F.R. Part 51, App. W at 4.1. For example, EPA's regulations state "[a] new building downwash algorithm was developed and tested within AERMOD. The PRIME algorithm has been evaluated using a variety of data sets and has been found to perform better than the downwash algorithm that is in ISC3, and has been shown to perform acceptably in tests within AERMOD." *Id.* Further, EPA notes "changes Shell made to the [ISC3-Prime] model program code to address the unique aspects of its operation. . . ." Statement of Basis at 74. The record does not provide a reasoned basis for Shell's use of an altered non-guideline model, or for why a guideline model, like AERMOD, is inappropriate. Without more information on Shell's models, it is impossible to fully ascertain whether those models provide reliable predictions for conditions in the Chukchi Sea and how the changes Shell made in the models will affect the overall modeling predictions. Based on the information currently available, Shell's use of the altered ISC3-Prime model is cause for concern that the results of the ambient air quality impact analysis are inaccurate. Indeed, the ISC3-Prime model is not as conservative as the AERMOD model for the conditions in which Shell will be working, and the use of ISC3-Prime may lead to an under-prediction of impacts.

ISC3-Prime is inappropriate to model air pollution dispersion in the offshore conditions in which Shell intends to operate. The EPA-recommended offshore air quality model is the Offshore and Coastal Dispersion Model. Overwater pollutant plume transport and dispersion are significantly

different than overland dispersion. The ISC3-Prime model Shell uses is not suited for overwater plume transport calculations. Mixing heights over water are generally less than overland situations due to lack of sensible heat flux from the surface. These low mixing heights can trap pollutant plumes near the surface and create areas of high concentration. Shell has not sufficiently explained how it has determined the atmospheric mixing heights for their modeling and how ISC3-Prime is the best model for this application.

Also, the Statement of Basis states that Shell's models incorporate a significant impact radius of 50 km even though the model predictions "had not fallen below the [significance] threshold for [annual NO<sub>x</sub>, 24-hr SO<sub>2</sub>, and 24-hr PM<sub>10</sub>] at this distance." Statement of Basis at 72. In other words, the predicted significant impact radius is much greater than 50 km, but Shell's analysis does not assess effects outside of the 50 km radius. Thus, Shell should have used a long range transport model capable of calculating concentrations at distances greater than 50 kilometers, such as CALPUFF. CALPUFF is a long range model recommended by the US EPA Guideline on Air Quality Models. 40 C.F.R. Part 51, App. W.

EPA should require Shell to use an approved model that is appropriate for the modeling of overwater pollution and that uses a significance radius of greater than 50 km, or provide an explanation as to why the altered non-guideline ISC3-Prime model is appropriate. If Shell provides an explanation on the appropriateness of its model, EPA should provide an opportunity for the public to comment on the explanation.

**2) Estimates of worst-case emissions from Shell's emissions units may not be accurate.**

In estimating potential emissions from some of Shell's vessels, EPA has not directly provided a worst-case assessment of emissions from the equipment associated with Shell's operations. Instead, EPA estimates potential emissions by relying on more generic data. *See* Statement of Basis at 35, App. A at 15-19. EPA indicates that its estimates are still conservative. *See* Statement of Basis at 35. Due to a lack of availability of manufacturer information for each specific unit, it may be necessary for EPA to rely on generic data. However, for all emissions units where EPA has relied on such data, EPA should verify potential emissions for these units before each drilling season. The permit should also explicitly state that Shell will not be able to use the emissions unit if actual potential emissions exceed those included in the models.

**3) Shell's application includes incomplete data.**

EPA regulations dictate that an application for a major source PSD permit must contain an analysis of ambient air quality data for each pollutant that it would have the potential to emit in a significant amount. 40 C.F.R. § 52.21(m). In order to be accurate, such an analysis must incorporate dependable estimates of background pollution levels and meteorological conditions for the region that the operations will affect. In establishing background pollution levels, the analysis must contain a year of continuous air quality monitoring data, although EPA may accept data from a shorter period, but no shorter than four months, if a complete and adequate analysis can be accomplished with data from that shorter period. *Id.* For meteorological data, EPA recommends that "the model should acquire enough . . . data to ensure that worst-case

meteorological conditions are adequately represented in the model results.” 40 C.F.R. Part 51, App. W at 8.1.2. “Five years of representative meteorological data should be used when estimating concentrations with an air quality model.” *Id.* The data Shell incorporates into its models does not meet these requirements.

**i) Shell has not provided background pollution level data sufficient to allow an adequate analysis of air quality impacts.**

Shell’s data for background pollution levels are inadequate, and EPA should require additional data. The Proposed Permit allows Shell to conduct exploration drilling between July 1 and December 31 of each year. Proposed Permit at 8 (B.2). Meteorological conditions vary during the year, and the varying conditions affect pollution levels; Shell has not provided valid data for times of the year during which it will be operating, and thus, EPA should determine that these data do not allow a complete and adequate analysis of air quality impacts. EPA has discretion to accept less than a full year’s worth of data. 40 C.F.R. § 52.21(m). However, because Shell is collecting data far from the drilling site and there is a lack of information on conditions in the Chukchi Sea, four months of data are insufficient to allow a complete and adequate analysis. In order to ensure that background data are robust enough to conservatively estimate the conditions Shell will encounter, EPA should require a full year of data.

The record indicates that Shell’s PM<sub>2.5</sub> data are insufficient to allow a complete and adequate air quality impacts analysis for the dates on which Shell will be active, as the regulations require. *See* 40 C.F.R. § 52.21(m). Shell’s PM<sub>2.5</sub> data from November 8, 2008, through March 5, 2009, are invalid. Statement of Basis at 75. Although EPA has determined that Shell’s PM<sub>2.5</sub> data for March 6, 2009, through June 30, 2009, are valid, *id.*, the data are not representative of the background levels that will be present during the times Shell will be operating.

There are also serious questions about the quality of the PM<sub>2.5</sub> data that Shell has collected. EPA’s regulations require co-located Federal Reference Method and Federal Equivalent Method PM<sub>2.5</sub> samplers at one of the PSD network monitoring sites. 40 C.F.R. Part 58, Appendix A. Shell has not met this requirement. Statement of Basis at 75. This leaves Shell’s results unverified. Shell has also been operating its PM<sub>2.5</sub> monitoring equipment with incorrect background data programmed into the analyzer. AECOM, Inc., Wainwright Near-Term Ambient Air Quality Monitoring Program Third Quarter Data Report May through July 2009 at 2-1 (Data Report May through July 2009). This mistake in programming may have affected measurements, making the PM<sub>2.5</sub> data less reliable. In addition, at its September 25, 2009, hearing, EPA referenced data showing that background levels of PM<sub>2.5</sub> at Wainwright are higher than EPA previously believed. While the basis for EPA’s statement remains unclear, it does call into question Shell’s data.

The accuracy of the PM<sub>2.5</sub> data is particularly important because EPA indicates in the Statement of Basis to the Proposed Permit that Shell’s emissions of PM<sub>2.5</sub> may reach 96 percent of 24-Hour NAAQS. Statement of Basis, App. B at Table 1. However, as described above, Shell has not yet obtained data sufficient to allow a complete and adequate analysis of the air quality effects of Shell’s operations. Thus, contrary to the analysis in the Statement of Basis, the actual result of Shell’s operations could be a violation of air quality limits for PM<sub>2.5</sub>. This is unacceptable

because PM<sub>2.5</sub> is linked to human health concerns and is an important driver of climate change. EPA should ensure that the PM<sub>2.5</sub> data used in the models are reliably representative of the period during which Shell will be operating in the Chukchi Sea.

Background data for other pollutants are also insufficient. For these pollutants, EPA indicates that Shell has provided eight months of valid data, collected between November 8, 2008, and June 30, 2009. Statement of Basis, App. B at 11. Less than two months worth of these data were collected during the period Shell will be operating. See Proposed Permit at 8 (B.2). Thus, this does not provide an accurate representation of the conditions Shell will encounter.

In sum, expected meteorological conditions change from season to season. These changes affect pollution levels. Thus, estimates of background levels of pollution should be based on measurements taken during the seasons in which operations will take place. Here, to reliably predict the background pollution levels that will be present during Shell's operations, EPA, at a minimum, should require reliable data for the time of year in which Shell will be operating; however, to ensure that its analyses are sufficiently conservative, EPA should require a full year of reliable data.

**ii) Shell's models do not incorporate representative meteorological data.**

Shell has not provided meteorological data for the Chukchi Sea or adequately justified its reliance on data from elsewhere. Accurate meteorological data are vital to a model's ability to predict how air pollution will disperse from a source. EPA states that applicants should acquire enough data to ensure that worst-case meteorological conditions are adequately represented. 40 C.F.R. Part 51, App. W at 8.3.1. In fact, EPA states that five years of meteorological data should be used. *Id.* Shell has not provided any data on meteorological conditions in the Chukchi Sea. It claims to have incorporated worst-case conditions into the models; however, the estimates of worst-case conditions are built off land-based measurements. EPA and Shell cannot say with any confidence that Shell's estimated worst-case conditions account for worst-case conditions in the Chukchi Sea, because neither EPA nor Shell have any data describing meteorological conditions in the Chukchi Sea. EPA's guidelines for modeling state that an applicant should acquire five years of representative data. *Id.* EPA should not accept unrepresentative data that do not meet EPA standards. EPA should require preconstruction meteorological monitoring to gather wind speed, wind direction, and offshore wind, water, and temperature information for more accurate air quality modeling.

**4) Shell's models may be inaccurate because Shell has failed to consider the effects of other operations.**

EPA should include emissions from sources other than Shell's operations in its analysis. EPA's Guideline on Air Quality Modeling provides guidance on generating background concentrations for modeling. These guidelines make a distinction between areas with a single source and areas with multiple sources. 40 C.F.R. Part 51, App. W at 8.2. For multi-source areas, the guidelines state that the applicant should consider the impact of nearby sources by examining "the area where all sources combine to cause maximum impact." *Id.* at 8.2.3. It further indicates that the

“portion of the background attributable to all other sources (e.g., natural sources, minor sources and distant major sources) should be determined. . . .” *Id.*

Shell’s modeling fails to meet these requirements. Shell’s application states that “the maximum predicted concentrations from only the *Discoverer* activities on the Chukchi OCS are added to the ambient baseline concentration . . . for comparison to the NAAQS and the PSD increment.” PSD Permit Application at 68. Thus, it appears that Shell is only considering emissions from the its own operations in its modeling. Shell may be ignoring significant additional sources of air pollution, and as a result, its baseline concentration is unreliable.

Shell appears to assert that it will be operating in a single-source environment. PSD Permit Application at 68. However, there is a possibility that other emissions sources could be operating nearby. Shell and Conoco Phillips Alaska Incorporated (CPAI) have teamed together to gather ambient monitoring data in Wainwright, AK. Statement of Basis, App. B at 11. If CPAI, or another company, is planning on performing any seismic surveying or exploratory activity in nearby areas while Shell is drilling, EPA’s guidelines suggest that Shell should include these emissions in any modeling estimates. 40 C.F.R. Part 51, App. W.

**5) Shell has not sufficiently considered secondary PM<sub>2.5</sub> or black carbon in its models.**

Shell has not considered secondary PM<sub>2.5</sub> in its NAAQS modeling. The pollutants NO<sub>x</sub> and SO<sub>2</sub> are known precursors of fine particulate matter. Shell estimates emissions of NO<sub>x</sub> and SO<sub>2</sub> to be 1,169.3 pounds per hour and 69.8 pounds per hour respectively. PSD Permit Application at 8 (Table 2.1). A study by the Tennessee Valley Authority shows that 4 percent of SO<sub>2</sub> per hour is converted to fine particulate downwind of the source. Stephen F. Mueller and Roger Tanner, Tennessee Valley Authority, *Cumberland Sulfur Emissions* (Feb. 7, 2001) available at [www.tva.gov/environment/air/ontheair/cumberland.htm](http://www.tva.gov/environment/air/ontheair/cumberland.htm). The EPA has stated that “[n]itrate formation is favored by the availability of ammonia, low temperatures, and high relative humidity.” 73 Fed. Reg. 28,321, 28,328 (May 16, 2008). With the use of selective catalytic reduction, with its potential to release unreacted ammonia, on the drillship, along with arctic temperatures over open water, conditions could favor a large conversion of NO<sub>x</sub> to fine particulate matter. In the Statement of Basis, modeled concentrations of PM<sub>2.5</sub> are within 96 percent of the 24-hour average NAAQS without including fine particulate formation. Statement of Basis, App. B at Table 11. With the inclusion of fine particulate formulation into the air quality modeling, it is possible that the PM<sub>2.5</sub> 24-hour NAAQS could be exceeded.

Also, some PM<sub>2.5</sub> emissions are black carbon. See William Battye, Katherine Boyer, & Thompson G. Pace, *Methods for Improving Global Inventories of Black Carbon and Organic Carbon Particulates* at 1 (2002). Black carbon “is an aerosol and is among the particle components emitted from the incomplete combustion of fossil fuels and biomass.” Marlo Molina et al., *Reducing abrupt climate change risk using the Montreal Protocol and other regulatory actions to complement cuts in CO<sub>2</sub> emissions* at 3 (2009). Black carbon emissions contribute to global warming. *Id.* In fact, black carbon is believed to be one of the most important climate-forcing agents in the Arctic, as well as one of the most attractive targets for attempts to mitigate Arctic warming. Drew Shindell & Greg Faluvegi, *Climate Response to*

*Regional Radiative Forcing During the Twentieth Century*, 2 Nature Geoscience 294, 298 (2009). EPA has the regulatory authority to regulate particulate matter, but has established separate standards, and requires separate monitoring, for PM<sub>10</sub> and PM<sub>2.5</sub> due to those pollutants' differing effects on health and welfare. See 62 Fed. Reg. 38,652 (July 18, 1997). Similarly, because particulate matter that is also black carbon affects health and welfare in a manner unlike other types of particulate matter, EPA should analyze the effects of the fleet's black carbon emissions.

**6) Shell has not provided an analysis of its operations' effect on ozone levels.**

EPA has not sufficiently considered how Shell's fleet will affect ozone levels within the region. EPA states that Shell is required to perform an ambient air quality impact analysis for ozone. See Statement of Basis at 76. However, Shell has not completed an analysis for ozone. PSD Permit Application at 88-89. EPA should direct Shell to perform such an analysis. In the absence of such analysis, conclusions regarding Shell's contribution to ozone levels are unsupported.

In assessing Shell's effect on ozone levels, EPA should also consider the specific characteristics of the Arctic environment. In particular, three Arctic environmental factors are thought to work in concert to cause rapid formation of ozone: the presence of ozone precursors, a strong temperature inversion that can trap the chemicals close to the ground, and extensive snow cover to provide reflected sunlight to jump-start the chemical reaction. All three of these factors may be present during Shell's Chukchi operations, and thus, large amounts of ozone may form as a result of those operations.

EPA should also require representative data for ozone levels. In the PSD Permit Application's section on ozone analysis, Shell lists ambient ozone concentrations at various monitoring sites in the region. PSD Permit Application at 88-89. However, most of the data provided are either year-long averages of ozone concentration or data collected during the winter months. *Id.* This is in spite of the fact that the drilling activity is scheduled to occur in the summer months. Ozone levels are dependent on air temperature, and higher temperatures generally result in higher ozone levels. By using air quality data from the winter months, Shell is not providing a conservative estimate of the air quality during the summer months. EPA should require Shell to use summer data to establish the air quality baseline for their activities.

**7) Shell has provided an inadequate analysis of the impact its operations will have on vegetation and soils.**

Shell's analysis of the impact its operations will have on soils and vegetation is inadequate. EPA regulations state that "[t]he owner or operator shall provide an analysis of the impairment to visibility, soils and vegetation that would occur as a result of the source or modification and general commercial, residential, industrial and other growth associated with the source or modification." 40 C.F.R. § 52.21(o)(1). Shell's analysis is restricted to an area within 50 km of the drill site, PSD Permit Application at 87, and does not consider the effects of the temporary growth in population and industrial activity that will develop at and around Shell's support facilities "at several possible coastal locations." Statement of Basis at 78. Shell's support

facilities will include storage facilities, aircraft hangers, and possibly a new warehouse. *Id.* Shell's crews will be lodged at hotels and trailer camps, and Shell will use helicopters to transport the crew to and from the drill site. *Id.* The effects that will result from these activities remain unclear. By restricting its analysis to an area within 50 km of the drill site, Shell fails to meet the requirements of 40 C.F.R. § 52.21(o)(1) because its analysis does not consider how associated growth along the Alaska coast may impair soils and vegetation.

### **III) EPA must engage in consultation under the Endangered Species Act before issuing a permit to Shell.**

As EPA recognizes, its approval of Shell's permit triggers the agency's obligations pursuant to the Endangered Species Act (ESA). There are a number of listed species that may be affected by the activities associated with Shell's operations, including bowhead whales, polar bears, and spectacled and Steller's eiders.

The ESA states that agencies shall, "in consultation with" the Services, "insure that any action authorized, funded, or carried out" is "not likely to jeopardize the continued existence of any endangered species or threatened species[.]" 16 U.S.C. § 1536(a)(2). EPA further states that "the ESA regulations provide that where more than one federal agency is involved in an action, the consultation requirements may be fulfilled by a designated lead agency on behalf of itself and the other involved agencies." Statement of Basis at 81. EPA is correct that the ESA's implementing regulations do allow a designated lead agency to fulfill consultation requirements where more than one federal agency is involved. 50 C.F.R. § 402.07. The Ninth Circuit has emphasized, however, that agencies have both procedural and substantive responsibilities under the ESA. While consultation may satisfy procedural obligations, an action agency cannot "rely solely" on a biological opinion "to establish conclusively its compliance with its *substantive* obligations[.]" *Pyramid Lake Paiute Tribe v. U. S. Dep't of the Navy*, 898 F.2d 1410, 1415 (9th Cir. 1990) (emphasis in original). Consequently, an agency's decision to rely on a biological opinion must not be arbitrary or capricious. *See, e.g., Resources Ltd., Inc. v. Robertson*, 35 F.3d 1300, 1304 (9th Cir. 1993). An agency is also required to reinitiate consultation whenever information reveals that the action that "may affect" listed species in a manner or to an extent not previously considered. 50 C.F.R. § 402.16(b).

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

For endangered bowhead whales, the National Marine Fisheries Service (NMFS) issued a regional biological opinion in July 2008 for oil and gas leasing and exploration. NMFS, Oil and Gas Leasing and Exploration Activities in the U.S. Beaufort and Chukchi Seas, Alaska and Authorization of Small Takes Under the Marine Mammal Protection Act (July 17, 2008) ("Bowhead BiOp"). Although it concludes that jeopardy is not likely to occur based on a consideration of potential effects at the programmatic level, it also notes that there is the possibility of greater harm from site-specific exploration activities, including icebreaker operations and drilling. In summarizing the effects of noise and disturbance, the opinion states:



Depending on their timing, location, and number, these activities potentially could produce sufficient noise and disturbance that whales might avoid an area of high value to them and suffer consequences of biological significance. These consequences would be of particular concern if such areas included those used for feeding or resting by large numbers of individuals or by females and calves.

*Id.* at 86. Critically, because the recent data are insufficient to evaluate habitat use, NMFS acknowledges that it could not fully estimate the potential effects of added industrial noise in the Chukchi Sea. *Id.* at 89. More data is required in order to satisfy the “best available science” standard, requiring that agencies give “the benefit of the doubt” to the species. *Conner v. Burford*, 848 F.2d 1441, 1454 (9th Cir. 1988) (quoting 1979 House report).

The need for a site-specific analysis is equally clear given the opinion’s conclusions as to the potential effects of an oil spill. When discussing production, NMFS recognizes that should a large amount of fresh oil come into contact with a large aggregation of feeding whales, “effects could be greater than typically would be assumed.” Bowhead BiOp at 113. With Shell’s 2010 drilling operations planned in the whales’ migration corridor during a period that will overlap with the fall migration, the probabilities that underlie NMFS’s conclusions as to the possible harm from a spill must also be reconsidered. *See id.* at 99, 115 (estimating the potential for harm based on uncertainties as to when and where drilling would occur).

The Fish and Wildlife Service (FWS) recently issued a similarly broad regional biological opinion – covering lease sales, seismic surveys, and exploration drilling – for polar bears and spectacled and Steller’s eiders. FWS, Final Biological Opinion for Beaufort and Chukchi Sea Program Area Lease Sales and Associated Seismic Surveys and Exploratory Drilling (Sept. 3, 2009). Although it was issued following the submission of Shell’s Chukchi Sea exploration plan, it too provides only a general analysis, covering hypothetical oil and gas activities in both seas over a 12-year period.

The existing FWS and NMFS biological opinions do not satisfy the EPA’s legal obligations. Before approving Shell’s permit, EPA must ensure that consultation takes place for the specific exploration plan now at issue or the agency risks violating its procedural and substantive responsibilities under the ESA.

#### **IV) EPA should require Shell to apply for a NPDES permit for Shell’s discharges of pollutants into the ocean and deny its application for coverage under the general permit.**

In the Air Permit Information Sheet made available at the commencement of the comment period for the proposed permit, EPA includes a paragraph giving notice that “EPA has also received five notices of intent from Shell requesting authorization for coverage under the Arctic General Permit (AKG-28-0000) for exploration activities” in the Chukchi Sea. *See* Air Permit Information Sheet at 3, available at <http://yosemite.epa.gov/R10/airpage.nsf/Permits/chukchiap>. The notice does not indicate whether EPA is accepting comments on the notices of intent, what the deadline for such comments might be, or whether EPA will respond to such comments. We request that EPA hold a clearly defined, formal public comment period on Shell’s notices of intent to be covered by the Arctic General Permit. *See Environmental Defense Center v. EPA*,

344 F.3d 832, 856 (9th Cir. 2003) (“Congressional intent requires that NOIs be subject to the Clean Water Act’s public availability and public hearings requirements.”). We also request that EPA respond to all comments received on the notices of intent. Before such comment period is commenced initial information must be complete. In particular, we note that the NOIs are incomplete in that Shell has yet to complete a drilling fluid plan. Additionally, Shell’s Best Management Practices (BMP) Plans should be made available for public review.

We nonetheless offer the following initial comment on EPA’s permitting of Shell’s proposed drilling under the National Pollutant Discharge Elimination System. EPA must disapprove the NOIs because the proposed discharges would violate the Clean Water Act as they would cause undue degradation to the marine environment. Interpreting the general permit to allow these discharges is inconsistent with the letter and the spirit of the Clean Water Act. The proposed discharges include heavy metals that could threaten the benthic community and bioaccumulate threatening endangered species and subsistence resources. In addition, EPA should disapprove the discharge of biocides in the marine environment.

Based on the information Shell provided, EPA should reject Shell’s application for coverage under the general permit and require Shell to apply for an individual permit for its drilling because the scope of the discharges from Shell’s proposed activity exceeds that analyzed in the general permit. The thermal discharge from cooling water alone entails a significant contribution of pollutants warranting an individual permit.

Allowing the proposed discharges would violated the EPA’s duty to assure that the marine environment is not unreasonably degraded. In connection with issuing the general permit, EPA prepared an Ocean Discharge Criteria Evaluation (ODCE) report that identified and analyzed potential effects of discharges under the permit. ODCE at 1-1. EPA relied on this document to reach its conclusion that activities under the general permit would not cause unreasonable degradation of ocean waters. *Id.* Many aspects of Shell’s proposed drilling discharges exceed the scope of EPA’s analyses at the time it issued the general permit. For example, Shell proposes to emit nine times the amount of cooling water as was analyzed by EPA in the ODCE underlying the general permit. The ODCE estimates that cooling-water discharges will be less than 210,000 gallons (5,000 barrels) per day for drilling operations. ODCE at 2-15. Shell’s notice of intent states that it will release 1,890,000 gallons (45,000 barrels) per day when drilling its wells. Notice of Intent at 8. The effects of discharges of large quantities of hot water – particularly when the water contains biocides, as Shell’s cooling water will – on benthic species and fish are a real concern. As the National Oceanic and Atmospheric Administration Fisheries Management Plan for the Arctic states:

Thermal effluents in inshore habitat can cause severe problems by directly altering the benthic community or killing marine organisms, especially larval fish. Temperature influences biochemical processes of the environment and the behavior (e.g. migration) and physiology (e.g. metabolism) of marine organisms .... The proper functioning of sensitive areas may be affected by the action of intakes as selective predators, resulting in cascading negative consequences as observed by the overexploitation of local fish populations and coral reef fish communities.

Fisheries Management Plan for Fish Resources of the Arctic Management Area (August 2009) at 92.

Shell also proposes to discharge almost twice as much drilling fluid in a single year of drilling as the EPA estimated would be discharged over the five-year general permit period. Shell's notice of intent states that it will discharge 185,010 gallons (4,405 barrels) of drilling fluids in a year (regardless of the number of wells it drills, because it will re-use the fluids). Notice of Intent at 8. In the ODCE underlying EPA's general permit, EPA estimated and examined the effects of the discharge of from all Chukchi Sea lease sales in the five-year general permit period of 94,920 gallons (2,260 barrels) of drilling fluid. ODCE at 2-9 – 2-10. The effects on fish, benthic organisms, and other aquatic life of the discharge of this large an amount of drilling fluids all at once has not been adequately analyzed by EPA. Accordingly, it would be arbitrary for EPA to conclude that the discharge will not cause unreasonable degradation to water quality.

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For the reasons stated above, the undersigned groups urge EPA to work jointly with other agencies responsible for permitting Shell's drilling to prepare a full EIS analyzing the potentially significant impacts of Shell's multi-sea, multi-year drilling plan. If EPA goes forward with its permitting process, it should: (1) require BACT for emissions of all associated vessels in Shell's fleet that will come within 25 miles of the drill site, including those vessels' emissions of CO<sub>2</sub>; (2) correctly determine BACT for all emissions units subject to BACT requirements; (3) direct Shell to use an appropriate model for modeling emissions in an overwater environment, and to include in that model reliable and representative background pollution and meteorological data, accurate potential emissions data from all associated vessels that will be within 25 miles of the drill site, potential emissions from other sources, and potential emissions that would result from oil spills and encounters with shallow gas hazards; (4) direct Shell to fully analyze its fleet's effect on ozone and black carbon levels, secondary PM<sub>2.5</sub> formation, and soils and vegetation; (5) engage in consultation under the Endangered Species Act before issuing a permit to Shell; and (6) require Shell to apply for an individual NPDES permit to regulate its discharges into the ocean.

Respectfully submitted,

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