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
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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 ($PM_{2.5}$), a major health threat and, through black carbon, global warming concern. Shell's operations may increase 24-hour $PM_{2.5}$ levels by 83 percent (8.3 $\mu g/m^3$) in Kaktovik and 44 percent (4.4 $\mu g/m^3$) in Nuiqsut. They have the potential to increase 24-hour $PM_{2.5}$ 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 $PM_{2.5}$ concentrations because EPA has failed to analyze the secondary $PM_{2.5}$ formation that may result from Shell's substantial nitrogen oxide (NO_X) emissions.

In additional to permitting large amounts of $PM_{2.5}$ emissions, the Proposed Permit would authorize Shell to emit 1,371 tons per year of NO_X, 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_{10}) PSD increment. It would allow Shell to emit as much as 94,000 tons of carbon dioxide (CO_2) – an amount equivalent to the annual household CO_2 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_X emissions and 93 percent of the total $PM_{2.5}$ 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).[1] 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.

[1] 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 $PM_{2.5}$ 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_2. 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 $PM_{2.5}$ emissions will include remains unclear because a source's potential black carbon emissions speciation as a function of the mass of $PM_{2.5}$ 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 $PM_{2.5}$, 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.[2] 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.

[2] 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 $PM_{2.5}$ 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 $PM_{2.5}$ data Shell collected only between August 20, 2009, and December 15, 2009, that the maximum measured 24-hour $PM_{2.5}$ concentration of 10 $\mu g/m^3$ 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.[3] 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 $PM_{2.5}$ 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_2 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 $PM_{2.5}$ that, once adopted, would require Shell to reduce emissions of $PM_{2.5}$ to less than half the levels allowed under the current Proposed Permit. 72 Fed. Reg. 54,112, 54,112 (Feb. 9 2010).

[3] Moreover, the EPA is proceeding with less than the minimum 4 months of background data for $PM_{2.5}$ 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_2 standard.*

In order to provide requisite protection of public health, EPA has established a new 1-hour NO_2 standard at a level of 100 ppb (188 µg/m^3). 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_2 concentration of 19.1 µg/m^3. 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_2 concentration of 191 µg/m^3. This exceeds the new NAAQS of 188 µg/m^3, 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_2 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. ISCST3, 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_2 "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_2 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_X, 147 tons per year of sulfur dioxide (SO_2), and 347 tons per year of PM_{10}. *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 $PM_{2.5}$ 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 $PM_{2.5}$ formation.*

The Proposed Permit does not take into account secondary $PM_{2.5}$ formation. EPA must consider the effects of such secondary formation of $PM_{2.5}$ in order to complete a sufficient analysis of the operations' potential impacts on air quality. *See* 40 C.F.R. § 52.21(k). Shell's operations could result in the formation of a substantial amount of secondary $PM_{2.5}$. In analyzing this potential for secondary $PM_{2.5}$ 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 $PM_{2.5}$ formation; strong temperature inversions are known to occur on the North Slope, and such inversions contribute to secondary $PM_{2.5}$ formation by limiting pollution dispersion. Also, Shell will emit large amounts of pollutants, such as NO_X, volatile organic compounds (VOCs), SO_2, and ammonia, known to contribute to secondary $PM_{2.5}$ formation. Shell's operations have the potential to emit 1,371 tons per year of NO_X 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.[4] Further, Shell will increase NO_X levels significantly in regional villages, such as Kaktovik, potentially resulting in local secondary $PM_{2.5}$ formation.

An analysis of secondary $PM_{2.5}$ formation is important because $PM_{2.5}$ poses significant dangers to health and the environment. $PM_{2.5}$ particles can travel deep into the lungs and even the bloodstream, and EPA links $PM_{2.5}$ 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 $PM_{2.5}$ 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 $\mu g/m^3$ between increases in $PM_{2.5}$ levels and increased mortality rates. Schwartz et al., *The Concentration-Response Relation between $PM_{2.5}$ 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 $PM_{2.5}$ 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 $\mu g/m^3$ increase in $PM_{2.5}$ 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 $PM_{2.5}$ concentrations are safe, 72 Fed. Reg. at 54,128, and

[4] 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 $PM_{2.5}$ 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 $PM_{2.5}$ emissions will not harm North Slope individuals and communities, EPA should require Shell to analyze the impacts of the secondary $PM_{2.5}$ formation that may result from its operations.

8) *EPA should regulate Shell's CO_2 emissions.*

The Supreme Court's ruling in *Massachusetts v. EPA* established that CO_2 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_2, Beaufort PSD Application at 98 – an amount approximately equivalent to the annual household CO_2 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_2 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_2 is already subject to regulation, because Delaware and California have both established rules to control emissions of CO_2 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_2 limits on generators); 74 Fed. Reg. 32,744 (July 8, 2009) (authorizing California to control CO_2 emissions from motor vehicles). Moreover, EPA will soon be issuing regulations that will undoubtedly make CO_2 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_2 emissions now or it should decline to issue the permit precipitously so that Shell avoids imminent regulation of its CO_2 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_2 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_2 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_X BACT analysis for the Discoverer's compressor units is flawed.

EPA has not sufficiently explained its BACT determination for NO_X 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_X reduction, might fit. Presumably, the SCR dimensions correspond to a certain level of NO_X reduction. To properly apply BACT, EPA and Shell must analyze whether an SCR of smaller size, with a potentially different NO_X 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_X 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_X 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.").[5]

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.

[5] 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 $PM_{2.5}$ 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_2 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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APPENDIX A

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

March 2010

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Table of Contents

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_x (1,371 tons per year), PM_{10} (65 tpy), PM2.5 (57 tpy), CO (464 tpy), SO2 (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_2), sulfur dioxide (SO_2), carbon monoxide (CO), particulate matter less than 10 microns in aerodynamic diameter (PM_{10}), fine PM (PM2.5), 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). 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 NOx 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 NO2 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 BPIPPRIME 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 NO2, 1-hour and 3-hour SO2) 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 NOx, SO2 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 NOx and 21,683 tpy of SO2. 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/m3 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 NOx (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 NOx/VOC ratio of 12 as evidence that ozone will be suppressed. While this NOx-quenching effect is true near field (i.e. close to the emission source), ozone will increase much further downwind where the NOx emissions are converted into NO2. Under sunlight, the converted NO2 will create single oxygen which combines with the regular oxygen to form ozone (NO2 + hv => O + NO and O +O2 => O3). 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 NOx, PM10, PM2.5 and SO2 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 NO2, PM2.5, O3 and SO2. The following sections will review these new and proposed standards, and a compliance analysis of the proposed Shell project.

1. **Project NO2 1-hour impacts will exceed the new 1-hour ambient standard**

   On January 25, 2010 US EPA has promulgated a new 1-hour NO2 standard of 100 ppb. Table 5-3 of the US EPA SOB shows a maximum annual concentration of 19.1 ug/m3 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/m3 (19.1/0.1). This maximum 1-hour concentration will exceed the new 1-hour NO2 AAQS of 100 ppb (or 188 ug/m3).

2. **Project PM2.5 24-hour impacts will exceed the proposed PSD Class II 24-hour increment**

   In September 2007, US EPA has proposed PM2.5 significant impact increments (SII) (1.2-5 ug/m3 for 24-hour averages and 0.3-1.0 ug/m3 for annual averages) and PSD Class II increments (9 ug/m3 for 24-hour averages, and 4-5 ug/m3 for annual averages). Table 5-3 of the US EPA SOB shows a maximum 24-hour concentration of 18.2 ug/m3 from the Shell project alone. This maximum 24-hour concentration will exceed the proposed PSD Class II increment of 9 ug/m3. 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/m3 from the Shell project alone. This maximum annual concentration will exceed the proposed PSD SII of 0.3-1.0 ug/m3. 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.

V. REFERENCES

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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.