

Exhibit 10

EPA Region 10, Statement of Basis for the Draft Outer Continental
Shelf Permit to Construct and Title V Air Quality Operating Permit
No. R10OCS030000, Shell Offshore Inc.,
Beaufort Sea Exploration Drilling Program (July 22, 2011)

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

**STATEMENT OF BASIS
FOR DRAFT
OUTER CONTINENTAL SHELF
PERMIT TO CONSTRUCT AND TITLE V AIR QUALITY OPERATING
PERMIT NO. R10OCS030000**

**SHELL OFFSHORE INC.
CONICAL DRILLING UNIT KULLUK
BEAUFORT SEA EXPLORATION DRILLING PROGRAM**

Date of Permit: July 22, 2011

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1. INTRODUCTION, PROJECT DESCRIPTION, AND PUBLIC PARTICIPATION

1.1 Introduction

Shell Offshore Inc. (referred to hereinafter as Shell, facility, source, or permittee) proposes to operate the Kulluk conical drilling unit (Kulluk) and its associated fleet to conduct exploratory drilling on lease blocks located on the Outer Continental Shelf (OCS) in the Beaufort Sea off the North Slope of Alaska, as authorized by the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE). The leased areas are part of Lease Sales 186, 202, and 195, and are within and beyond 25 miles of Alaska’s seaward boundary.

The 1990 Clean Air Act (CAA or “the Act”) amendments transferred authority for implementation of the CAA for sources subject to the Outer Continental Shelf Lands Act (OCSLA) from the Mineral Management Service (now BOEMRE) to the Environmental Protection Agency (EPA). Section 328 of the Act directed EPA to establish requirements to control air pollution from OCS sources in order to attain and maintain federal and state ambient air quality standards and to comply with the provisions of Part C, Title I of the Act. EPA promulgated air quality regulations applicable to OCS Sources at Title 40 of the Code of Federal Regulations (CFR) Part 55 (Part 55).

The 1990 CAA amendments also established a comprehensive air quality permit program under the authority of Title V of the Act. EPA regulations implementing Title V are promulgated at 40 CFR Part 71 (for permits issued by EPA) and 40 CFR Part 70 (for permits issued by states). The Title V air quality operating permit, or Title V permit, is an enforceable compilation of all air pollution requirements that are applicable to an air emission source. A Title V permit is developed in a public process, sets forth enforceable terms, conditions, and limitations, and is valid for five years but may be renewed.

The operation of the Kulluk and associated fleet on and above the OCS is subject to Section 328 of the CAA, Part 55, and Alaska corresponding onshore area requirements. To comply with these requirements, which are discussed in more detail in Section 2 of this Statement of Basis (SOB), Shell submitted applications to EPA Region 10 (Region 10) for three permits to cover air pollution from its exploratory drilling operations on current OCS lease blocks in the Beaufort Sea: an OCS/Title V permit under Parts 55 and 71 for operations beyond 25 miles of Alaska’s seaward boundary; a minor permit for air quality protection under 18 Alaska Administrative Code (AAC) 50.502 and for owner requested limitations under 18 AAC 50.508 to make Prevention of Significant Deterioration (PSD) review unnecessary for operations within 25 miles of Alaska’s seaward boundary; and a Title V permit under 18 AAC 50.326 for operations within 25 miles of Alaska’s seaward boundary. Shell requested that the three permits be consolidated into a single permit (hereinafter “OCS/Title V permit” or “draft permit”).

In support of its permit application, Shell provided analyses that showed its pre-permit potential to emit (PTE) for carbon monoxide (CO), sulfur dioxide (SO₂), and nitrogen oxides (NO_x) would exceed the applicable major source threshold of 250 tons per year (tpy). In addition, the project’s pre-permit PTE for greenhouse gas (GHG) emissions would exceed 100,000 tpy carbon dioxide equivalent (CO₂e), the threshold established in EPA’s recent PSD “Tailoring Rule” defining when new sources of GHGs are subject to regulation for purposes of PSD. 75 Fed. Reg.

identified two categories of emission units on each RV/BT. An unidentified number of propulsion engines and generator engines “1A” through “1Z” will have an estimated aggregate capacity of 12,000 horsepower output. An unidentified number of seldom-used sources “2A” through “2Z” will have an unidentified aggregate horsepower output.

One oil spill response vessel will be deployed as a contingency measure. It will engage in routine oil spill response exercises. The “OSRV” that appears at the beginning of each emission unit ID signifies that the unit is located on the oil spill response vessel. Shell has identified three categories of emission units on the OSRV. Within the first category, an unidentified number of propulsion engines and generator engines “1A” through “1Z” will have an estimated aggregate capacity of 3,500 horsepower output. Within the second category, an unidentified number of seldom-used sources “2A” through “2Z” will have an unidentified aggregate horsepower output. Only one unit, an incinerator, comprises the third category. It will have an estimated maximum feed rate of 125 pounds per hour.

OSRV work boats will reside upon the OSRV and will be launched routinely to participate in oil spill response exercises. The “OSRV WB” that appears at the beginning of each emission unit ID signifies that the unit is located on an OSRV workboat. Shell has identified the propulsion engines and generator engines “1A” through “1Z” as the sole category of emission units on these vessels. The aggregate rating per vessel is approximately 600 horsepower output assuming, for example, that each OSRV WB is equipped with two 300-horsepower propulsion engines.

2. REGULATORY APPLICABILITY

2.1 The Outer Continental Shelf (OCS)

The OCS regulations at Part 55 implement Section 328 of the CAA and establish the air pollution control requirements for OCS sources and the procedures for implementation and enforcement of the requirements.

Section 328 and Part 55 distinguish between OCS sources located within 25 miles of a state’s seaward boundaries referred to as the “Inner OCS” and those located beyond 25 miles of a state’s seaward boundaries referred to as the “Outer OCS”. CAA § 328(a)(1); 40 CFR § 55.3(b) and (c). In this case, Shell is seeking a permit for exploratory drilling that will be conducted on both the Inner and Outer OCS.

40 CFR § 55.13 generally sets forth the federal requirements that apply to OCS sources on the Outer OCS. These sources are subject to the New Source Performance Standards (NSPS) in 40 CFR Part 60; the PSD program in 40 CFR § 52.21 if the OCS source is also a major stationary source or if there is a major modification to a major stationary source; standards promulgated under Section 112 of the CAA if rationally related to the attainment and maintenance of federal and state ambient air quality standards or the requirements of Part C of Title I of the CAA; and the operating permit program under Title V of the CAA as implemented in Part 71. See 40 CFR § 55.13(a), (c), (d)(2), (e), and (f)(2), respectively. The applicability of these requirements to Shell’s exploration drilling program is discussed in Sections 2.2 to 2.6 below.

The OCS regulations also contain provisions relating to monitoring, reporting, inspections, compliance, and enforcement. See 40 CFR §§ 55.8 and 55.9. Section 55.8(a) and (b) authorize Region 10 to require monitoring, reporting, and inspections for OCS sources, and provide that all

monitoring, reporting, inspection, and compliance requirements of the CAA apply to OCS sources. These provisions, along with the provisions of the applicable substantive programs, provide authority for the monitoring, recordkeeping, reporting and other compliance assurance measures included in this draft OCS/Title V permit.

Section 328 of the CAA provides that requirements for sources located within the Inner OCS be the same as would be applicable if the sources were located in the corresponding onshore area (COA). Because the Inner OCS requirements are based on onshore requirements, and onshore requirements may change, Section 328(a)(1) requires that EPA update the OCS requirements, as necessary, to maintain consistency with onshore requirements in Appendix A to Part 55. For permit conditions that apply in the Inner and Outer OCS and cite to the COA regulations and federal requirements, the COA regulations provide authority only for the condition as it applies to the Inner OCS. The COA requirements are incorporated by reference in 40 CFR § 55.14 and listed in Appendix A.

On February 8, 2011, EPA proposed a consistency update to approve the incorporation of Alaska onshore requirements into 40 CFR 55.14. 76 Fed. Reg. 7,518. These requirements were proposed in response to the receipt of a Notice of Intent on December 10, 2010 from Shell. On June 27, 2011, EPA finalized the consistency update. 76 Fed. Reg. 37,274. EPA incorporated applicable provisions of the following Alaska Administrative Code (AAC) regulations by reference into 40 CFR § 55.14:

- Article 1 – Ambient Air Quality Management;
- Article 2 – Program Administration;
- Article 3 – Major Stationary Source Permits;
- Article 4 – User Fees;
- Article 5 – Minor Permits; and
- Article 9 – General Provisions.

2.1.1 The “OCS Source”

Section 328 of the CAA establishes requirements to control air pollution from “OCS sources.” Defining when the Kulluk becomes an “OCS source” therefore determines when CAA § 328 applies to and regulates air pollution from the Kulluk. This question is of primary importance because the later in time a vessel becomes an OCS source and the sooner it ceases to be an OCS source, the more limited the time during which potential emissions from both the Kulluk and its Associated Fleet will be included under the synthetic minor limits in the permit and in the air quality analysis. Based on an evaluation of the anchoring process Shell intends to use in light of the statutory and regulatory definition of OCS source, and the legislative history and policy behind CAA § 328 and the Outer Continental Shelf Lands Act (OCSLA), Region 10 proposes that the Kulluk be considered an OCS source at all times that it is attached to the seabed at a drill site by at least one anchor.

2.1.2 Statutory and Regulatory Framework

Section 328 provides that

programs.” In re Peabody Western Coal Company, 12 EAD 22, 31 (EAB Feb. 18, 2000)(upholding a Region’s decision to deny a request to establish a limit on PTE in a Part 71 permit because of concerns regarding the practicable enforceability of such a limit in a case involving large quantities of fugitive emissions).

Region 10 is relying on this authority to include in Shell’s OCS/Title V permit synthetic minor permit limits that will limit the source’s PTE to below the thresholds that would make it subject to PSD permitting.

2.5 The PTE of the OCS Source

In determining the PTE for Shell’s Beaufort Sea exploration drilling program, Region 10 included the potential emissions from the Kulluk while operating as an OCS source, as well as the potential emissions from the Associated Fleet – the icebreakers, oil spill response vessel and work boats, and the resupply vessel/barge and tug combination, when operating within 25 miles of the Kulluk while it is an OCS source.

In order to determine which pollutants require enforceable limits in order to reduce PTE to below PSD major source thresholds, it is necessary to calculate the “pre-permitted” PTE for the project. Once calculation of the pre-permitted PTE has identified the pollutants for which the source would be a major PSD source without a Title V or COA minor permit, enforceable permit conditions can be developed limiting the PTE of the OCS source to below PSD major source thresholds.

Table 2-1 lists the pre-permitted PTE as well as the permitted PTE for the regulated NSR pollutants CO, NO_x and SO₂. Table 2-1 also lists the pre-permitted PTE for GHGs. For these pollutants, Shell has requested that Region 10 include enforceable limits to reduce emissions to less than PSD major source thresholds. The reductions shown between the pre-permitted PTE and the permitted PTE reflect the impact of federally enforceable limits imposed in the permit to demonstrate compliance with the NAAQS and, as stated above, to lower the PTE to below PSD major source thresholds. See April 29, 2011 letter from Shell to Region 10 in the administrative record supporting this permitting action for detailed emissions calculations used to determine both pre-permitted PTE and permitted PTE.¹³

Table 2-1: Potential to Emit Key Pollutants

Air Pollutant	Pre-Permitted PTE (tpy)	Permitted PTE (tpy)
Carbon Monoxide (CO)	855	200
Nitrogen Oxides (NO _x)	2,339	240
Sulfur Dioxide (SO ₂)	833	10
Greenhouse Gases (GHG)	141,487	80,000

¹³ See May 10, 2011 correspondence for updated emission factor references provided by Shell.

Because exploration drilling programs are not included in the list of source categories subject to a 100-tpy PSD applicability threshold, the requirements of the PSD program apply if the project PTE is at least 250 tpy of a regulated NSR pollutant. PSD review also applies if GHG PTE is at least 100,000 tpy. From the pre-permitted PTE shown in Table 2-1, it is evident that Shell's Beaufort Sea exploration drilling program would be a major PSD source for CO, SO₂, NO_x and GHG because each would exceed the major source thresholds if federally enforceable limits were not imposed via the permit. Therefore, based on the pre-permitted PTE of the Shell project, federally enforceable limits for CO, SO₂, NO_x, and GHGs must be included in the OCS/Title V permit in order for Shell's OCS source to qualify as a "synthetic minor" not subject to PSD.

Shell has estimated its emissions of hazardous air pollutants (HAP) from its Beaufort Sea exploration drilling program at 3.4 tpy for all HAP combined. See April 29, 2011 letter from Shell to Region 10 in the administrative record for detailed HAP emissions calculations. Based upon these calculations, the project is an area source of HAP, rather than a major source of HAP.

2.6 Other Standards and Requirements Applicable to the OCS Source

As discussed above, OCS sources located beyond 25 miles of a state's seaward boundaries are subject to the NSPS in 40 CFR Part 60; the PSD program in 40 CFR § 52.21 if the OCS source is also a PSD major stationary source or if there is a major modification to a PSD major stationary source; standards promulgated under Section 112 of the CAA if rationally related to the attainment and maintenance of federal and state ambient air quality standards or the requirements of Part C of Title I of the CAA; and the operating permit program under Title V and Part 71. See 40 CFR § 55.13(a), (c), (d)(2), (e), and (f)(2), respectively. See also 40 CFR § 71.4(d).

Part 55 makes the requirements of Part 71 applicable to this OCS source. See 40 CFR § 55.13(f). Part 71 requires a Title V permit to address all "applicable requirements" as that term is defined in 40 CFR Part 71.2. The following subsections of this Section discuss the categories of Title V "applicable requirements" for the Shell exploratory operations, as well as other requirements that must be included in the OCS/Title V permit.

2.6.1 Part 55 Requirements as Applicable Requirements

Standards and requirements to control air pollution from OCS sources under Section 328 of the CAA are included in the definition of applicable requirement in 40 CFR § 71.2 and apply to the source as provided in Part 55. Accordingly, all requirements of Part 55 applicable to the OCS source have been included in the draft OCS/Title V permit and are discussed in Section 3, this includes the COA requirements incorporated by reference in 40 CFR § 55.14.

2.6.2 NAAQS as Applicable Requirements for Title V Temporary Sources

Region 10 interprets the CAA and EPA regulations to require that a temporary source seeking a Title V permit demonstrate that it will not cause or contribute to a violation of the NAAQS at all locations where it is authorized to operate. Section 504(e) of the CAA authorizes a Title V permitting authority to issue a single permit authorizing emissions from similar operations by the same source owner at multiple temporary locations, provided that the permit includes conditions that will assure compliance with all applicable requirements at all locations. EPA regulations at 40 CFR § 71.6(e) provide that a "temporary source" is any source that moves at least once during the term of a Title V permit. The application submitted by Shell requests authorization to

conduct exploratory drilling at multiple temporary locations during the term of the permit, and the project is therefore a temporary source under Title V.

Section 504(e) further provides that requirements applicable to Title V temporary sources include, but are not limited to, “ambient standards and compliance with any applicable increment or visibility requirements under Part C” of Title I of the Act. In turn, implementing regulations at 40 CFR § 71.2 define “applicable requirements” as including “(13) any national ambient air quality standard [NAAQS] or increment or visibility requirements under Part C, Title I of the Act, but only as it would apply to temporary sources permitted pursuant to section 504(e) of the Act.” EPA included the same language in 40 CFR § 70.2. When EPA adopted its Part 70 regulations, the Agency interpreted Section 504(e) of the Act to make compliance with the NAAQS an applicable requirement for temporary sources. 57 Fed. Reg. 32550, 32276 (July 21, 1992) (“Under the Act, NAAQS implementation is a requirement imposed on States in the SIP; it is not imposed directly on a source. In its final rule, EPA clarifies that the NAAQS and the increment and visibility requirements under part C of title I of the Act are applicable requirements for temporary sources only.”). Based on this prior interpretation by EPA, Region 10 reads the definition of “applicable requirement” in 40 CFR 71.2 to mean that compliance with the NAAQS is an applicable requirement for all Title V temporary sources and therefore this source.

The definition of “applicable requirement” in 40 CFR 71.2 says that the NAAQS, increment, and visibility requirements are applicable requirements “only as it would apply to temporary sources permitted pursuant to Section 504(e) of the Act.” Section 504(e) of the CAA identifies applicable requirements for temporary sources as including “ambient standards and compliance with any applicable increment or visibility requirements under part C.” Region 10 interprets these provisions to mean that NAAQS are applicable requirements for all Title V temporary sources, but that increment and visibility requirements are applicable requirements only if such sources would otherwise be subject to PSD. Because the language in section 504(e) of the Clean Air Act uses the term “applicable” before “increment or visibility requirements under part C,” Region 10 interprets Section 504(e) to only make increment and visibility requirements “applicable requirements” for a temporary source when they would otherwise be “applicable” to a new major stationary source or major modification to an existing major stationary source in a permit required under Part C of the Act. Because the permittee is taking limits such that the source will not be a new major stationary source subject to PSD, the increment and visibility requirements under 40 CFR § 52.21 and Part C of the Act are not “applicable” in this instance.

Thus, the NAAQS are considered “applicable requirements” for the Kulluk and the OCS/Title V permit must contain terms and conditions that ensure compliance with the NAAQS at all relevant locations. The application submitted by Shell includes an analysis of the air quality impacts of the emissions from its exploratory operations on the NAAQS. The air quality analysis generally follows the regulations and guidance applicable to air quality analyses supporting permits issued under the PSD program. Part 71 does not describe how a Title V temporary source should demonstrate compliance with the NAAQS. In the absence of regulations or guidance setting out the requirements for a demonstration that the terms and conditions of a Title V permit for a temporary source will assure compliance with NAAQS at all authorized locations or operation, Region 10 believes that following the regulations and guidance for conducting an air quality analysis with respect to NAAQS under the PSD program is an appropriate approach. See 40 CFR Part 52, Appendix W (“Industry and control agencies have long expressed a need for

consistency in the application of air quality models for regulatory purposes . . . The *Guideline* provides a common basis for estimating the air quality concentrations of criteria pollutants used in assessing control strategies and developing emission limits.”)

While EPA recognizes that temporary sources must demonstrate compliance with the NAAQS at all authorized locations, in the context of OCS permits, there remains some uncertainty as to whether Section 328 of the CAA should be read by EPA to require such a showing for areas of ambient air over the OCS or solely on land. EPA is therefore currently assessing how to apply the NAAQS to OCS sources beyond 25 miles of a state’s seaward boundary on the Outer OCS. And, for sources located within 25 miles of a state seaward boundary on the Inner OCS, it is considering how to apply those regulatory requirements consistent with the mandate in CAA § 328(a)(1) that requirements to control pollution from OCS sources located within 25 miles of the state seaward boundary “shall be the same as would be applicable if the source were located in the corresponding onshore area.” Under any readings of these provisions, Region 10 believes that the permit applicant has made a sufficient showing to meet this applicable requirement. As discussed in more detail in Section 4 below, Region 10 reviewed and analyzed Shell’s application and air quality analysis and concluded that it demonstrates that the emissions impact from its exploratory operations, when operating in compliance with the terms and conditions of the draft OCS/Title V permit, will not cause or contribute to a violation of any NAAQS at any location in the ambient air over any point on the OCS or within the state seaward boundary.¹⁴ Therefore, resolving the point of compliance questions is not necessary for this permitting action.

As also discussed below in Section 3, the draft OCS/Title V permit includes emission limits, operating restrictions, and associated monitoring, recordkeeping, and reporting requirements to ensure emissions authorized under the permit will not cause or contribute to a violation of any NAAQS.

2.6.3 New Source Performance Standards as Applicable Requirements

Standards promulgated under Section 111 of the CAA are “applicable requirements” under 40 CFR § 71.2 and Section 111 standards promulgated under 40 CFR Part 60 (Part 60) apply to OCS sources as provided in 40 CFR § 55.13(c). Specific NSPS subparts in Part 60 apply to a source based on the source category, equipment capacity, and the date when the equipment commenced construction or modification. All emission units operating on the Kulluk are potentially subject to NSPS regulations because each is an emission unit on an OCS source. The application submitted by Shell provides that the Kulluk will contain emission units in four NSPS source categories: stationary compression-ignition internal combustion engines, boilers, incinerators, and fuel tanks. The requirements of applicable NSPS subparts for stationary compression-ignition internal combustion engines and incinerators are discussed in Section 3 of the SOB.

NSPS Subparts K, Ka, and Kb: 40 CFR Part 60, Subparts K, Ka, and Kb apply to petroleum liquids tanks as follows: K applies to tanks with capacity greater than 40,000 gallons that commenced construction or modification between March 8, 1974 and May 19, 1978; Ka applies to tanks with capacity greater than 40,000 gallons that commenced construction or modification

¹⁴ As discussed in more detail below, the draft OCS/Title V permit includes a condition that supports excluding the area within 500 meters of the hull of the Kulluk from ambient air.

Condition D.3.1 and D.3.2: These conditions limit the annual duration of the permittee’s exploration operations in the Beaufort Sea. The permittee’s drilling season will largely be limited by sea ice conditions. Some variability can be expected from year to year. However, the permittee may begin drilling on July 1 and must cease operations as an OCS source by November 30 of each year. The permittee has specifically requested that the permit impose an annual limit of 120 days of operation as an OCS source. This condition limits the drilling season to the period between July 1 and November 30 of each year, which is referred to as the “drilling season” in the permit, and limits the number of days of operation as an OCS source to 120 calendar days each drilling season. This is not a continuous 120 day period but an aggregation of all time operating as an OCS source during a given drilling season. In addition, for each drill site,

Conditions D.3.3, D.3.4 and D.3.5 are necessary for ambient air quality protection. The conditions restrict the duration of time Shell can perform certain higher-emitting activities utilizing equipment on the Kulluk. The permittee shall not conduct any Drilling Activity in excess of 1,632 hours within a drilling season. Drilling Activity includes MLC Drilling Activity and Well Drilling Activity. Well Drilling Activity is defined as any time when the top drive is engaged and turning the conventional rotary bit. MLC Drilling Activity is defined as any time when any MLC HPU engine or MLC air compressor engine is operating. MLC Drilling Activity is expected to generate the most air pollution. The permittee shall not conduct any MLC Drilling Activity in excess of 480 hours.

Condition D.3.6 requires the permittee to document the exact location of the Kulluk when drilling, the lease block where drilling is occurring, and the duration of the Kulluk as an OCS source at that site.

Conditions D3.7 and D3.8 require monitoring and recording to document compliance with Conditions D 3.4 and D3.5.

Condition D.3.9 also clarifies that time recorded as an OCS source must include time spent drilling relief wells.

Condition D.4: This condition imposes synthetic minor limits (tons per “year”) to ensure that the source’s emissions remain below the levels that would make it a PSD major source and subject to PSD permitting. Only pollutants that would otherwise (without the permit) be potentially emitted at rates above the PSD thresholds must be limited; this condition limits NO_x, CO, SO₂ and GHG emissions below the PSD tons per “year” thresholds in this condition. The ton per “year” period is either a 12 month rolled monthly or a 365 day period rolled daily depending on how confident EPA is in the compliance techniques employed. EPA prefers shorter rolling compliance periods for pollutants that are harder to measure or confirm.

SO₂ emissions are limited using an emission limit as well as fuel and fuel sulfur content limits. The permit requires compliance with the SO₂ limit to be determined by measuring the total amount of fuel burned and confirming the total amount of fuel burned using nearly continuous measurements and confirming the total amount of sulfur in the fuel burned. Confidence that this technique will ensure continuous compliance is high, therefore “yearly” emissions are required to be summed only monthly.

GHG emissions are limited using an emission limit as well as a fuel limit. Compliance with the GHG emission limit is determined by measuring the total amount of fuel burned and calculating

the emission using measured fuel and emission factors. The combination of fuel and incineration limits as well as the fact that the emission factors are expected to be relatively consistent results in good confidence in the overall compliance technique and therefore “yearly” emissions are required to be summed only monthly.

CO and NO_x emissions are limited using emission limits. Compliance with the CO and NO_x emission limits is determined by multiplying measured fuel by periodically confirmed emissions factors. Because EPA expects the emission factors to be more variable, the “yearly” emissions are summed on a daily frequency.

For compliance techniques that rely on emission factors, the permit includes default emission factors that can be used until unit-specific emission factors are determined through testing (see Condition E.2). The testing protocol required by the permit results in conservatively high emission unit-specific emission factors, which help to assure compliance. The permit also includes specific monitoring requirements for fuel usage in engines and boilers and waste feed rates to the incinerators so limits on operational parameters can be confirmed. A cap has been set on the capacity of the incinerators. Permit-required monitoring of the SCR and oxidation catalyst control devices will help assure the devices are operating correctly and achieving the emissions reductions expected. In fact, when monitoring indicates that the SCR or oxidation catalyst units are not operating correctly, the permittee must use emissions factor that assume no control devices exist – basically “uncontrolled” emissions that are 10 times the controlled emissions from an SCR unit and 5 times the controlled emissions from an oxidation catalyst.

The limits are generally not applied to individual emission units in this permit due to the need for operational flexibility. Exploration operations such this one experience highly variable operations (well to well and season to season) due to natural elements (e.g. weather, the sea and the remoteness of the area) and the exploratory nature of the operation – that is exploration of the unknown. Given the need for flexibility, the remoteness of the operation and mix of pollutants and emission units, EPA believes that the pollutant- and emission unit-specific compliance techniques in this permit are warranted.

GHGs is the air pollutant defined in 40 CFR § 86.1818–12(a) as the aggregate group of six greenhouse gases: carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆). 40 CFR § 52.21(b)(49)(i). The term “tpy CO₂ equivalent emissions (CO₂e)” represents an amount of GHGs emitted, and is computed by multiplying the mass amount of emissions (tpy), for each of the six greenhouse gases in the pollutant GHGs, by the gas's associated global warming potential published at Table A–1 of 40 CFR Part 98, Subpart A (Global Warming Potentials). 40 CFR § 52.21(b)(49)(ii). The Kulluk and Associated Fleet emit three of the six GHGs (CO₂, N₂O, and CH₄). The permit requires the use of each greenhouse gas' associated global warming potential from 40 CFR Part 98, Subpart A, Table A–1 – Global Warming Potentials, to calculate total CO₂e emissions.

A small amount of CH₄ may be emitted by the Drilling Mud System (K-10). When wells are drilled through porous, hydrocarbon bearing rock, drilling fluids (mud) circulated through the drill bit can carry gaseous hydrocarbons from the well back to Kulluk. These gases are typically released as fugitive emissions when the mud is processed for reuse on the Kulluk or stored and shipped away; however, some of the emissions pass through a vent. Although fugitive emissions are not counted towards PSD applicability for exploratory drill rigs (see 40 CFR §

52.21(b)(1)(iii)), the permittee has agreed to count all of these methane emissions under the PTE limit for GHGs.

Based on past drilling experience, the permittee has estimated that approximately 399 pounds of methane per month could be released from the circulated mud. To account for this potential methane release while determining compliance with the GHG PTE limit, the permit assumes 4 tons per month of CO₂e emissions (399 pounds CH₄ per month multiplied by CH₄ global warming potential) will be released from the drilling mud and reduces the amount of GHGs that can be emitted from other operations.

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

- A GHG 12-month rolling limit of 80,000 tpy CO₂e;
- A total aggregate 12-month rolling limit for fuel combusted of 7,011,023 gallons¹⁶;
- A total aggregate daily waste-combusting capacity limit of 13,704 pounds.

It was necessary to assume a certain amount of waste is incinerated each day in order to calculate the season-long diesel fuel allowance for combustion equipment in aggregate. The daily waste-combusting capacity was calculated by summing the approximate capacities for incinerators on the Kulluk and Associated Fleet while considering operating limits proposed by this permit. EPA is proposed to limit operation of the Kulluk incinerator to 12 hours per day. Here is the calculation:

$$13,704 \text{ lb/day} = (276 \text{ lb/day})(12 \text{ hours/day}) + (154 \text{ lb/day})(24 \text{ hr/day}) + (154 \text{ lb/day})(24 \text{ hr/day}) + (125 \text{ lb/day})(24 \text{ hr/day})$$

For determining compliance with the 80,000 tpy CO₂e limitation, GHG emission calculations for many units will be based upon fuel usage. For certain units not expected to contribute significantly to overall emissions and for whom daily operation monitoring may be a challenge, emission calculations will be based upon the assumption that the unit is operating at maximum rated capacity. Examples of such units include incinerators and heaters/boilers.

Condition D.4.9 prohibits Shell from operating the Kulluk in the Beaufort Sea within the same drilling season as the Noble Discoverer drilling vessel. With this condition, the scope of emissions generating activity occurring in time and space that could be considered part of the source under the CAA does not extend beyond the Kulluk.

Conditions D.5 and D.6: These conditions include provisions necessary to ensure that the project does not cause or contribute to a violation of any NAAQS under authorized operational scenarios. As discussed in Section 2 above, for a Title V temporary source, the NAAQS are an applicable requirement and the Title V permit must include terms and conditions to ensure compliance with the NAAQS at all locations. See 40 CFR §§ 71.2 (definition of applicable requirement), 71.6(a)(1), and 71.6(e). Specific to just the Inner OCS, COA 18 AAC 50.544(c)(1) requires this permit to construct to contain terms and conditions necessary to protect the short and long-term SO₂ standards, the 24-hr PM₁₀ standard and the annual NO₂ standard. The air

¹⁶ See July 20, 2011 EPA memorandum entitled, “Calculation of No. 2 Diesel Fuel Usage Restriction for Condition D.4.6 in Draft Permit to Shell for Operation of Conical Drilling Unit Kulluk in Beaufort Sea.”

quality modeling analysis submitted as part of the permit application demonstrated initial compliance with the NAAQS. The air quality impact analysis is discussed in Section 4. Emission limitations and operational restrictions have been included to ensure compliance with the hourly NO₂ and the 24-hour PM₁₀ and PM_{2.5} NAAQS. These conditions convert key assumptions that were made by the permittee in the modeling analysis into enforceable permit conditions.

The air quality analysis submitted by the permittee modeled emissions from the Kulluk beginning 500 meters from the hull of the Kulluk and assumes that the Coast Guard will impose a safety zone of this distance around the Kulluk to exclude the public from the area in which the main operations will be conducted.¹⁷ Region 10 will include in the permit a requirement that the permittee have in place during all times of operation as an OCS source a safety zone of at least 500 meters within which the Coast Guard prohibits public access. To implement this provision, the draft permit also requires that the permittee develop in writing and implement a public access control program to locate, identify and intercept the general public by radio, physical contact, or other reasonable measures to inform the public that they are prohibited by Coast Guard regulations from entering the area within 500 meters of the Kulluk. Region 10 has included these provisions in Condition D.5.1, consistent with the permittee's demonstration that emissions from their exploratory operations will not cause or contribute to a violation of the NAAQS in any location that constitutes ambient air. Thus, the permittee's application demonstrates that it complies with the NAAQS at all authorized locations, regardless of EPA's ultimate decision about the point of compliance.¹⁸

Conditions D.5.2 through D.5.5 include specific operational restrictions inherent in the modeling analysis conducted by the permittee. These conditions include limits on hour of operation for specific equipment, duration and frequency of certain activities, and a requirement that certain stacks be vertical uncapped stacks. For example, the permit places a restriction on the number of times a vessel can operate in dynamic positioning mode while resupplying (including removing waste) the Kulluk over the course of a drill season. The permit also restricts the duration of such events to 24 hours. Region 10 is relying on vessel tracking data required to be collected via modern global positioning system technology under Condition F.1.3 and has included recordkeeping requirements.

The NAAQS protection limits in Condition D.6 include emission limits on specific emission units or groups of specific emission units (including whole vessels) that reflect emission rates used in the modeling analysis conducted in support of the permit application (discussed in more detail in Section 4 and Appendix A of this SOB). Although the permit allows some flexibility in the selection of vessels and equipment as part of its operations, the vessels and equipment selected must comply with the emission limits and operations restrictions in the permit. For example, Condition D.6.1.1 and D.6.1.2 limit emissions from the Kulluk electric generation

¹⁷ See Shell Permit Application 02/28/11, page 44 of Appendix F

¹⁸ Ambient air is defined as "...that portion of the atmosphere, external to buildings, to which the general public has access." 40 CFR § 50.1(e). Ambient air does not include atmosphere over land owned or controlled by a source and to which the public access is precluded by a fence or physical barrier. See Letter from Douglas M. Costle, EPA Administrator to The Honorable Jennings Randolph, re: Ambient Air dated December 19, 1980; Letter from Steven C. Riva, EPA Region 2, to Leon Sedefian, New York State Department of Conservation, re: Ambient Air for the Offshore LNG Broadwater Project, October 9, 2007.

minimum values for monitoring – see Permit Conditions E.2.6 and E.3.7. Unless these requirements conflict with specific testing conditions in the permit, all sources testing done to comply with this permit should meet these general conditions.

Condition E.2: Because the Kulluk, Associated Fleet vessels, and all associated emission units to be used by the permittee are not specified or known at this time, many generic emission factors have been used to calculate the estimated emissions from this project. The permittee relied on a combination of emission testing of similar units, manufacturer’s emissions data and literature, including AP-42. These sources of emissions information are generally considered to be less reliable and accurate than unit-specific testing data. Because of the inherent uncertainty of the project approach taken by the permittee, Region 10 has generally addressed this by basing emission limits on the estimated rates included in the permittee’s permit application materials, and requiring thorough source testing in order to obtain unit-specific test data. Region 10 is therefore requiring that many units be tested prior to the first drilling seasons (as well as ongoing periodic testing), and that emissions data collected during these performance tests be used to derive emission factors which will be more accurate than the generic factors used by the permittee to support its permit application. This condition contains the required procedure for testing specific emission units to derive equipment-specific emission factors. The derivation of the emission factors is through an approved replicable procedure or ARM as provided for in 40 CFR § 71.2 and 40 CFR § 71.6(a)(1).

An important element of this condition is the selection of worst case emission factors for each emission unit or group of emission units tested. Testing engines at three loads will produce emission factors for each load. The permittee is required to use the highest of the three emission factors for determining ongoing compliance with emission limits in the permit for all operating loads during actual operation. This allows the permittee to avoid continuous engine load monitoring and provides additional confidence that the engine is complying with the emission limits in the permit. When a single emission factor will be used to represent a group of emission units, the highest emission factor of all the emission units in the group will be used for demonstrating compliance. This allows the permittee to monitor fuel to the group of engines in one place and provides yet another level of confidence that the group will be complying with the emission limits in the permit.

To support testing each engine at various operating loads, instrumentation is necessary to monitor the percentage of rated capacity that each engine is operating at during each test run. Because the specific engines and related ancillary equipment will be leased for this project and therefore are unknown at this time, Condition E.2 requires electrical power output monitoring devices be installed during the test. To account for possible variation in the specific equipment used, provisions are included to allow an alternative method of load measurement based on written approval by Region 10. This condition also requires the monitoring and recording of fuel injection timing while testing engines. This information is useful for establishing the conditions under which the engines were tested.

The condition separates the testing instructions between those for engines and those for testing incinerators. This condition also requires the testing to be completed by May 1 and reported to EPA by June 15. The results will be available to be used for compliance determinations during the drilling season that begins 15 days later (July 1) for each year that testing is performed. The

permittee is required to use the test-derived emission factor for all emission calculations and compliance determinations required under the permit.

Condition E.3: This condition specifies which emission units and pollutants must be tested to develop emission factors for ensuring compliance with synthetic minor and NAAQS-based emission limits. The permittee is required to test many emission units before the first two drilling seasons. The frequency, beginning in the third year, is then set based upon how variable the results are. EPA's goal is to determine representative emission factors for compliance use. Once relatively consistent (in two consecutive test years) emission factors have been identified, the frequency can be reduced but not discontinued. The less frequent testing is still necessary to indicate whether conditions and emission factors are changing over time.

Emission units that are less emitting, less variable in operations and emissions and used less frequently are required to be tested less frequently or not at all. EPA believes it is reasonable to focus emission testing resources where the results will most likely impact compliance decisions.

The tested pollutants include CO and NO_x (two pollutants for which synthetic minor limits are needed) and PM₁₀ and PM_{2.5} (which, along with NO_x, are limited by the permit for NAAQS protection purposes). NO₂ will be also measured simultaneously with NO_x so the NO₂ ratios assumed for use in the ambient air quality impact analysis can be verified. Visible emission testing is also required for additional unit performance feedback. Average incinerator exit and SCR inlet temperatures will be documented for use in compliance monitoring.

3.6 Source-Wide Monitoring & Recordkeeping Conditions

Condition F.1: This condition requires the permittee to use a modern global positioning system on the Kulluk and all vessels in the Associated Fleet (except work boats) to track the movement and location of these vessels in order to implement permit conditions limiting the movement and location of certain vessels in the Associated Fleet. This includes requirements based on the inclusion of emissions of Associated Fleet vessels as emissions of the OCS source when Associated Fleet vessels are within 25 miles of the OCS source. Workboats are not required to be individually tracked because they never travel far from the vessel the workboats are stored on.

Condition F.2.1: This condition first requires that all monitoring equipment and systems necessary to perform the monitoring required by this permit (e.g. temperature, fuel flow, etc) are installed, calibrated, maintained and operated. This condition also includes specifications for fuel flow meters required by the permit. These provisions ensure that the meters meet appropriate accuracy specifications and that their installation is appropriate to provide the necessary data. Fuel monitoring requirements for smaller and seldom used emission units are also specified. An option for using operating time in place of fuel monitoring is included and operating time tracking is included here where appropriate. The measured operating time is converted to fuel usage by conservatively assuming that the monitored unit is operating at its maximum capacity – something few emission units do all of the time. The permit also includes requirements for monitoring the sulfur content of fuel for the Kulluk and the Associated Fleet.

Incinerator exit temperature monitoring is also required by this condition and expected to be kept above the minimum value established during emission testing. The permit condition clarifies when a reportable temperature deviation occurs.