**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
**Region 4**
**Atlanta, Georgia**

# Preliminary Determination & Statement of Basis

Outer Continental Shelf Air Permit OCS-EPA-R4021
for

## Anadarko Petroleum, Inc.
## Noble Bob Douglas Drilling Project

**November 2016**

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## ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AP-42 | AP-42 Compilation of Air Pollutant Emissions Factors |
| AQRV | Air Quality Related Values |
| BACT | Best Available Control Technology |
| Bbl | Barrels |
| BOEM | Bureau of Ocean Energy Management |
| Breton NWR | Breton National Wildlife Refuge |
| Btu | British Thermal Unit |
| CAA | Clean Air Act |
| CFR | Code of Federal Regulations |
| CO | Carbon Monoxide |
| $CO_2$ | Carbon Dioxide |
| $CO_2e$ | Carbon Dioxide ($CO_2$) Equivalent |
| EPA | United States Environmental Protection Agency |
| ESA | Endangered Species Act |
| DAT | Deposition Analysis Thresholds |
| FLM | Federal Land Manager |
| GHG | Greenhouse Gas |
| GOM | Gulf of Mexico |
| HAP | Hazardous Air Pollutants |
| hp | Horsepower |
| IC | Internal Combustion |
| $m^3$ | Cubic Meters |
| MMScf/day | Million Standard Cubic Feet per Day |
| MSA | Magnuson-Stevens Fishery Conservation and Management Act |
| NAAQS | National Ambient Air Quality Standards |
| NESHAP | National Emission Standards for Hazardous Air Pollutants |
| $NO_2$ | Nitrogen Dioxide |
| NOAA | National Oceanic and Atmospheric Administration |
| $NO_X$ | Oxides of nitrogen |
| NSPS | New Source Performance Standards |
| NSR | New Source Review |
| OCS | Outer Continental Shelf |
| OCSLA | Outer Continental Shelf Lands Act |
| Part 55 | 40 CFR part 55 |
| PEMS | Parametric Emission Monitoring System |
| PM | Particulate Matter |
| $PM_{2.5}$ | Particulate Matter with an Aerodynamic Diameter Less Than or Equal to 2.5 Microns |
| $PM_{10}$ | Particulate Matter with an Aerodynamic Diameter Less Than or Equal to 10 Microns |
| ppm | Parts Per Million |
| PSD | Prevention of Significant Deterioration |
| PTE | Potential to Emit |
| SIL | Significant Impact Level |
| $SO_2$ | Sulfur Dioxide |
| Support Vessels | Support Boat, Anchor Handling Boat, Stimulation Vessel, Tug, Well Evaluation Vessel, and Barge |

| | |
|---|---|
| TPY | Tons Per Year |
| TVP | True Vapor Pressure |
| VOC | Volatile Organic Compounds |

# 1.0 Introduction

Anadarko Petroleum Corporation (the Applicant or Anadarko) has applied for an Outer Continental Shelf (OCS) air permit pursuant to section 328 of the Clean Air Act (CAA) from the United States Environmental Protection Agency (EPA) Region 4 for the proposed mobilization and operation of the deepwater drilling vessel *Noble Bob Douglas* and associated support fleet located on the OCS in the Gulf of Mexico east of longitude 87°30' (87.5°). Anadarko proposes three phases of project activity: drilling, well completion, and production well maintenance. The project will operate approximately 300 days per year for no more than two years.

The EPA Region 4 is the agency responsible for implementing and enforcing CAA requirements for OCS sources in the Gulf of Mexico east of 87°30' (87.5°).[1] The EPA has completed a review of Anadarko's application, including all supplemental materials provided, and is proposing to issue Permit Number OCS-EPA-R4021 to Anadarko for an exploratory drilling program subject to the terms and conditions contained in the draft permit. The draft permit incorporates applicable requirements from the federal PSD and title V operating permit programs, New Source Performance Standards (NSPS), and National Emission Standards for Hazardous Air Pollutants (NESHAP) as required by the OCS air quality regulations in 40 CFR part 55.

This document serves as a fact sheet, preliminary determination, and statement of basis for the draft permit. It provides an overview of the project, a summary of applicable requirements, the legal and factual basis for draft permit conditions, and the EPA's analysis of key aspects of the application and draft permit, such as the best available control technology (BACT) analysis and Class II/Class I area air quality impact analysis. Additional information can be found in the draft permit accompanying this preliminary determination, as well as in the application materials and administrative record for this project, as discussed in Section 9 of this document.[2]

# 2.0 Applicant Information

## 2.1 Applicant Name and Address

Anadarko Petroleum Corporation
1201 Lake Robbins Drive
The Woodlands, Texas 77380

## 2.2 Facility Location

Anadarko is proposing to drill on the OCS in the eastern Gulf of Mexico in lease blocks that are located east of longitude 87°30', west of the Military Mission Line (86°41' west longitude), at

[1] *See* CAA section 328. The Department of the Interior has jurisdiction for CAA implementation west of 87°30'.
[2] The EPA must follow the administrative and public participation procedures in 40 CFR part 124 used to issue PSD permits when processing OCS permit applications under Part 55. 40 CFR § 55.6(a)(3). The EPA must also follow the administrative and public particpation procedures of 40 CFR part 71 when issuing permits to OCS sources subject to Title V requirements. 40 CFR § 71.4(d). Accordingly, the EPA has followed the procedures of 40 CFR parts 71 and 124 in issuing the draft permit. This Preliminary Determination & Statement of Basis document serves as a statement of basis under 40 CFR § 124.7, a fact sheet under 40 CFR § 124.8, and a statement of basis under 40 CFR § 71.7(a)(5).

least 100 nautical miles from the northern Florida shoreline, and at least 125 nautical miles from the eastern Florida shoreline.[3] The area contains both active lease blocks and lease blocks that the BOEM may lease in the future. The available lease blocks are identified in Figure 2-1 below.

**Figure 2-1 - Anadarko Oil Site and Lease Blocks in Eastern Gulf of Mexico**

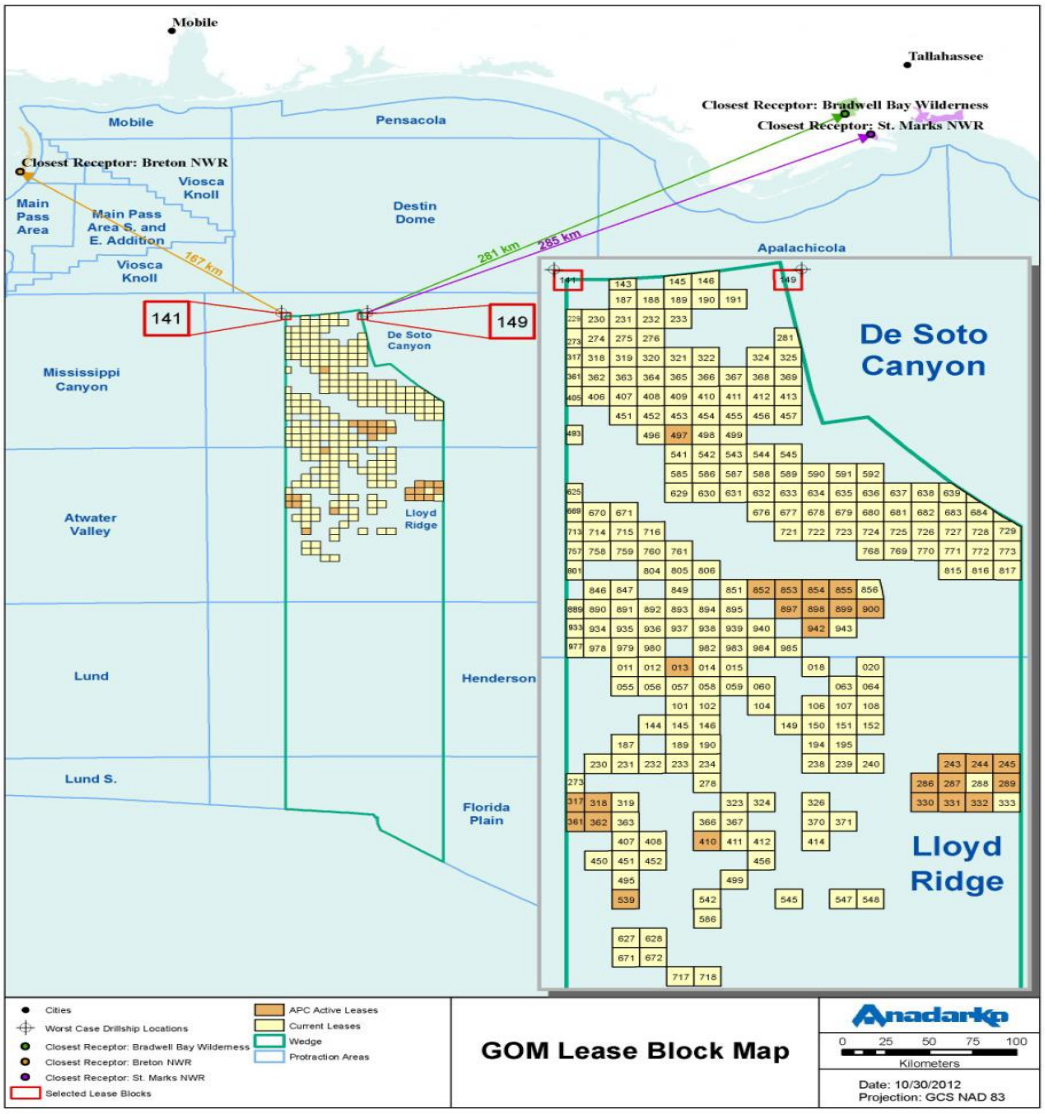



*Image Source: Anadarko Petroleum Corporation Application, October 2013*

# 3.0 Proposed Project

The proposed project will mobilize the *Noble Bob Douglas* drillship and associated support vessels. These vessels will include a combination of supply boats, an anchor handling boat, tug

[3] The northeastern boundaries are established by the Gulf of Mexico Energy Security Act of 2006.

boats, barges, stimulation vessels, and well evaluation vessels. The proposed project will consist of three phases: the drilling phase, the well completion phase, and the production well maintenance phase. At this time, there are no plans to establish permanent production platforms at the well site. Such permanent facilities would be permitted separately. Emissions from production well maintenance activities related to facilities on the sea floor are subject to regulation by this permit. The proposed project's annual operation will be limited by fuel use.[4]

Air pollutant emissions generated from the project include the criteria pollutants nitrogen dioxide ($NO_2$), carbon monoxide (CO), particulate matter (PM), particulate matter with an aerodynamic diameter less than or equal to 2.5 microns ($PM_{2.5}$), particulate matter with an aerodynamic diameter less than or equal to 10 microns ($PM_{10}$), and sulfur dioxide ($SO_2$), as well as other regulated New Source Review (NSR) pollutants, including volatile organic compounds (VOC), oxides of nitrogen ($NO_X$), and greenhouse gases (GHGs). VOC and $NO_X$ are the precursors and measured pollutants for the criteria pollutant ozone, and $NO_X$ and $SO_2$ are precursors for $PM_{2.5}$.

Emissions are primarily released from the combustion of diesel fuel in the drilling vessel's main engines and in smaller engines that supply power for operating drilling equipment and support vessels. Emissions may also be released from other equipment such as fuel and mud storage tanks and from activities such as well completion, pumping heavy lubricating mud, painting and welding, and from flare emissions associated with well maintenance activities.

Based on emissions estimates and the applicable permitting thresholds, the project will have emissions of $NO_x$ CO, VOC, PM, $PM_{10}$, and $PM_{2.5}$ that meet or exceed the respective PSD and title V significant emission rates and, hence, is subject to the PSD and title V programs. Any facility that emits a regulated NSR pollutant at levels meeting or exceeding its PSD significant emission rate must perform a BACT analysis for that pollutant and comply with all subsequent regulatory obligations for that pollutant as described in Section 6.0 below. Additionally, EPA applies BACT to GHG emissions in those circumstances where a source emits GHGs in the amount of at least 75,000 TPY on a $CO_2e$ basis and has already triggered PSD review for another regulated NSR pollutant.[5]

The emissions units to be used on the *Noble Bob Douglas* drilling vessel and the emissions units to be used on support vessels that will become a part of the OCS source are detailed in Sections 4.0 and 5.0 and Tables 4-2 and 4-3. The diesel powered units include six main propulsion diesel electric generators (DR-ME-01 through DR-ME-06), one emergency generator (DR-GE-01), one emergency air compressor diesel engine (DR-AC-01), one fast rescue craft engine (DR-FR-01),

[4] This fuel limit is approximately equal to operations of 300 calendar days per year, assuming that the project operates 24 hours a day.

[5] In accordance with the United States Supreme Court decision in *Utility Air Regulatory Group v. EPA*, 134 S.Ct. 2427 (2014), the U.S. Court of Appeals for the District of Columbia Circuit (D.C. Circuit) issued an amended judgment on April 10, 2015, in *Coalition for Responsible Regulation* v. *EPA*, Nos. 09-1322, 10-073, 10-1092 and 10-1167 (D.C. Cir. April 10, 2015) vacating the regulations that implemented Step 2 of the NSR Tailoring Rule (PSD and Title V permitting based solely on GHG emissions), but not the regulations that implement Step 1 of the NSR Tailoring Rule (PSD and Title V permitting of GHG emissions for "anyway sources"). The court specifically vacated sections 51.166(b)(48)(v) and 52.21(b)(49)(v) of the EPA's regulations, but did not vacate sections 51.166(b)(48)(iv) or 52.21(b)(48)(iv). The Clean Air Act continues to require that PSD permits issued to "anyway sources" satisfy the BACT requirement for GHGs.

six life boat engines (DR-LB-01 through DR-LB-06), sixteen third-party engines (DR-TP-01 through DR-TP-11 and DR-TP-17 through DR-TP-21), five third-party well evaluation engines (DR-TP-12 through DR-TP-16), and eight pump engines on the stimulation vessel (SV-PE-01 through SV-PE-08). The third-party equipment is leased on short notice and the exact specifications are unknown. Anadarko selected equipment with a "worst-case" emissions profile to develop projected emission calculations and impacts, but will identify the exact engines for the purpose of permit compliance and emissions inventory.

**Figure 3-1 Drilling Vessel**


*Image Source: http://www.drillingcontractor.org/from-recovery-into-growth-22248 [Available: Feb. 4, 2014]*

The *Noble Bob Douglas* will be supported by up to two support vessels for the entire project and four well completion vessels. The support vessels will be used, sometimes simultaneously, to transport personnel, supplies, and fuel to the drilling vessel, as required for the duration of the exploratory drilling. Various support and well completion vessels will be used interchangeably depending on availability. Anadarko selected the largest support vessels (the supply boat *HOS Coral* and the anchor handling boat *Kirt Chouest*) and the largest well completion vessels (a tug, a barge, a stimulation vessel, and a well evaluation vessel) to calculate emissions based on the worst-case scenario. Anadarko will maintain records of the engine specifications and number of hours each engine will operate within 25 miles of the *Noble Bob Douglas* for any support vessel used in place of the *HOS Coral* (supply boat), the *Kirt Chouest* (anchor handling boat), or any vessel used during well completion. Emissions for the support vessel and the well completion vessel engines assume a worst-case value while at the drill site and within 25 nautical miles of the *Noble Bob Douglas*. Diesel units used to calculate emissions from the support vessels are

detailed in Anadarko's OCS permit application materials and are included in the administrative record for this project as discussed in Section 9.0 of this document.

# 4.0 Legal Authority and Regulatory Applicability

## 4.1 EPA Jurisdiction

Pursuant to the 1990 CAA Amendments and the Consolidated Appropriations Act, 2012 (P.L. 112-74), the EPA has authority for implementation of the CAA for sources subject to the Outer Continental Shelf Lands Act (OCSLA) for all areas of the OCS with the exception of the Gulf of Mexico west of 87.5° longitude and for areas offshore the North Slope of Alaska, which are under the authority of the DOI. The proposed project is located in an area under the air permitting jurisdiction of the EPA Region 4.

## 4.2 OCS Air Regulations

Section 328(a)(1) of the CAA requires the EPA to establish requirements to control air pollution from OCS sources under the EPA's jurisdiction in order to attain and maintain federal and state ambient air quality standards and to comply with the provisions of part C (PSD) of title I of the CAA. The OCS Air Regulations at 40 CFR 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 these requirements. The regulations define "OCS source" by incorporating and interpreting the statutory definition of OCS source:

OCS source means any equipment, activity, or facility which:

> (1) Emits or has the potential to emit any air pollutant;
> (2) Is regulated or authorized under the OCSLA (*see* 43 U.S.C. §1331 et seq.); and
> (3) Is located on the OCS or in or on waters above the OCS.

This definition shall include vessels only when they are:

> (1) Permanently or temporarily attached to the seabed and erected thereon and used for the purpose of exploring, developing or producing resources there from, within the meaning of section 4(a)(I) of the OCSLA (*see* 43 U.S.C. §1331 et seq.); or
> (2) Physically attached to an OCS facility, in which case only the stationary source aspects of the vessels will be regulated [*see* 40 CFR § 55.2; *see also* CAA § 328(a)(4)(C) and 42 U.S.C. § 7627].

Section 328 and part 55 distinguish between OCS sources located within 25 nautical miles of a state's seaward boundary and those located beyond 25 nautical miles of a state's seaward boundary [*see* CAA § 328(a)(1); 40 CFR §§ 55.3(b) and (c)]. In this case, Anadarko is seeking a permit for exploratory drilling operations that will be conducted exclusively beyond 25 nautical miles of any state's seaward boundary.

Sources located beyond 25 nautical miles of a state's seaward boundaries are subject to the NSPS in 40 CFR part 60; the PSD pre-construction program in 40 CFR § 52.21, if the OCS source is also a major stationary source or 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 title V operating permit program in 40 CFR part 71. *See* 40 CFR §§ 55.13(a), (c), (d)(2), (e), and (f)(2), respectively. The applicability of these requirements to Anadarko's exploratory drilling program is discussed below.

The OCS regulations also contain provisions related to monitoring, reporting, inspections, compliance, and enforcement. *See* 40 CFR §§ 55.8 and 55.9. Sections 55.8(a) and (b) 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 listed above, provide authority for the monitoring, recordkeeping, reporting, and other compliance assurance measures included in the draft permit.

**4.3 Prevention of Significant Deterioration (PSD)**

The PSD program, as set forth in 40 CFR § 52.21, is incorporated by reference into the OCS Air Regulations at 40 CFR § 55.13(d)(2), and is applicable to major OCS sources such as this proposed project. The PSD program requires an assessment of air quality impacts from the proposed project and the utilization of BACT as determined on a case-by-case basis taking into account energy, environmental, and economic impacts, as well as other costs.

Under the PSD regulations, a stationary source is "major" if, among other things, it emits or has the potential to emit (PTE) 100 ton per year (TPY) or more of a "regulated NSR pollutant" as defined in 40 CFR § 52.21(b)(50); is "subject to regulation" as defined in 40 CFR § 52.21(b)(49); and is one of a named list of source categories. Any stationary source is also considered a major stationary source if it emits or has a PTE of 250 TPY or more of a regulated NSR pollutant. *See* 40 CFR § 52.21(b)(l).

"Potential to emit" is defined as the maximum capacity of a source to emit a pollutant under its physical and operational design. *See* 40 CFR § 52.21(b)(4). In the case of "potential emissions" from OCS sources, 40 CFR part 55 defines the term similarly and provides that:

> *Pursuant to section 328 of the Act, emissions from vessels servicing or associated with an OCS source shall be considered direct emissions from such a source while at the source, and while en route to or from the source when within 25 miles of the source, and shall be included in the "potential to emit" for an OCS source. This definition does not alter or affect the use of this term for any other purposes under 40 CFR §§ 55.13 or 55.14 of this part, except that vessel emissions must be included in the "potential to emit" as used in 40 CFR §§ 55.13 or 55.14 of this part. (40 CFR § 55.2)*

Thus, emissions from vessels servicing or associated with an OCS source that are within 25 miles of the OCS source are considered in determining the PTE or "potential emissions" of the OCS source for purposes of applying the PSD regulations. Emissions from such associated

vessels are therefore counted in determining whether the OCS source is required to obtain a PSD permit, as well as in determining the pollutants for which BACT is required.

The drilling vessels and support fleet vessels may contain emission sources that otherwise meet the definition of "nonroad engine" as defined in section 216(10) of the CAA. However, based on the specific requirements of CAA section 328, emissions from these otherwise nonroad engines on subject vessels are considered as "potential emissions" from the OCS source. Similarly, all engines that are part of the OCS source are subject to the applicable requirements of 40 CFR part 55, including control technology requirements.

Table 4-1 lists the PTE for each regulated NSR pollutant from the proposed project, as well as the significant emission rate for each regulated NSR pollutant. The permit application materials and Section 5.0 of this document contain information regarding the emissions factors used to determine PTE for the project. Emissions from the support vessels servicing the *Noble Bob Douglas* were considered direct emissions while within 25 nautical miles of the drilling vessel and are included in the PTE.

**Table 4-1 Potential to Emit for Regulated NSR Pollutants**

| Pollutant | PTE (TPY) | Significant Emission Rate (TPY) | PSD Review Required |
|---|---|---|---|
| **CO** | 788 | 100 | Yes |
| **$NO_x$**[1] | 2,407 | 40 | Yes |
| **VOC**[2] | 169 | 40 | Yes |
| **PM** | 80 | 25 | Yes |
| **$PM_{10}$** | 72 | 15 | Yes |
| **$PM_{2.5}$** | 72 | 10 | Yes |
| **$SO_2$**[3] | 1.50 | 40 | No |
| **$H_2SO_4$** | 0.04 | 7 | No |
| **Pb** | 0.03 | 0.6 | No |
| **GHGs** | 179,828 | 75,000[4] | Yes |

[1] $NO_x$ is a measured pollutant for the criteria pollutants ozone and $NO_2$ and a precursor for ozone and $PM_{2.5}$.
[2] VOC is a measured pollutant and precursor for the criteria pollutant ozone.
[3] $SO_2$ is a precursor for the criteria pollutant $PM_{2.5}$.
[4] Current BACT threshold and proposed GHG significant emissions rate for sources subject to PSD for another pollutant- "anyway sources."

The requirements of the PSD program apply to this OCS source if the project PTE is at least 250 TPY for any regulated pollutant. Anadarko's exploration drilling program is a major PSD source because emissions of $NO_X$ and CO exceed the major source applicability threshold of 250 TPY and, thus, is subject to PSD review for CO and $NO_X$ (both as a measured pollutant for $NO_2$ and ozone and as a precursor to ozone and $PM_{2.5}$). PSD review also applies to PM, $PM_{10}$, $PM_{2.5}$, and VOC (as a measured pollutant and precursor for ozone) because the source is a major source under the PSD regulations and because emissions of these pollutants exceed the respective significant emission rate thresholds. Additionally, EPA applies BACT to GHG emissions in those circumstances where a source emits GHGs in the amount of at least 75,000 TPY on a $CO_2e$ basis and has already triggered PSD review for another regulated NSR pollutant. Section 6.0 of this document contains a discussion of the BACT analysis.

### 4.4 Title V

The requirements of the title V operating permit program, as set forth in 40 CFR part 71, apply to major OCS sources located beyond 25 nautical miles of any state's seaward boundaries. *See* 40 CFR § 55.13(f)(2). Because the PTE for this project is greater than 100 TPY for $NO_X$, CO, and VOCs, the project is considered a major source under title V and part 71.

The OCS permit application submitted by Anadarko seeks to obtain a title V operating permit in accordance with 40 CFR § 55.13(f)(2) and 40 CFR part 71 concurrently with the OCS preconstruction permit. Part 71 forms are included in Section 6 of Anadarko's application received on October 17, 2013. The draft permit includes conditions necessary to meet the requirements of the title V operating permit program. For example, the draft permit will include requirements for submittal of annual compliance certifications and annual fee payments (based on actual emissions), as well as monitoring, recordkeeping, and reporting requirements.

### 4.5 New Source Performance Standards (NSPS)

An OCS source must comply with any NSPS applicable to their source category. *See* 40 CFR § 55.l3(c). In addition, per 40 CFR § 52.21(j)(1), the PSD regulations require that each major stationary source or major modification meet applicable NSPS. A specific NSPS subpart applies to a source based on source category, equipment capacity, and the date when the equipment commenced construction or modification. Potentially applicable NSPS are discussed below.

#### 4.5.1 Subpart IIII

NSPS, 40 CFR part 60, subpart IIII applies to stationary compression-ignition internal combustion engines that commence construction after July 11, 2005, and were manufactured after April 1, 2006. Relevant equipment specifications for the *Noble Bob Douglas* and the stimulation vessel are summarized below in Table 4-2 and Table 4-3, respectively. Engines installed on the drillship are subject to the emissions limitations and diesel fuel requirements of subpart IIII.

The life boats (LB-01 through LB-06) and the fast rescue boat (DR-FR-01) are classified as vessels. Therefore, only stationary source aspects are regulated. As they are used for man overboard and emergency escape scenarios, these units do not have any stationary source aspects and are not subject to subpart IIII.

The *Noble Bob Douglas* will have third party engines onboard and the third party stimulation vessel will be equipped with eight pump engines, which may be subject to subpart IIII depending on the size of the unit. Anadarko will use new engines where available, and has identified which third party engines will be subject to this subpart based on their proposed equipment needs. Since Anadarko used representative engines for all unknown engines, they must notify the EPA prior to use of any new, modified, or reconstructed engine intended to be used or in replacement of any engines identified in Tables 4-2 and 4-3, and shall submit to the EPA a reevaluation of the applicability of pertinent NESHAP and NSPS regulations, as well as copies of the manufacturer engine certification to the EPA standards. The engines that Anadarko identified in their October 2013 application as third party engines (DR-TP-01 through DR-TP-11 and DR-TP-17 through

DR-TP-21) are EPA Tier 2 certified and are subject to subpart IIII.

The main diesel engines were constructed after the applicability date of July 11, 2005. Therefore, these engines are subject to the emissions limitations and diesel fuel requirements of subpart IIII. This requires compliance with 40 CFR § 94.8 standards for the six main engines (DR-ME-01 through DR-ME-06) which have a displacement greater than 10 liters per cycle. A $NO_X$ emission limit of 9.69 g/kW-hr and a PM emission limit of 0.15 g/kW-hr are the limits required under this subpart for each 720 rpm engine. These engines are International Maritime Organization (IMO) Tier II certified engines. To demonstrate compliance with the requirements in subpart IIII, Anadarko provided the IMO certification indicating that these engines meet 40 CFR § 94.8 emissions standards. The emission standards and requirements in 40 CFR § 94.8 correspond to the IMO standards for engines of this size. These standards are applicable when the engines are operating within 10% of their maximum load. Emissions from these engines may be higher when they are operating at lower loads. Consistent with 40 CFR 1042, the emission limit was established to allow for a 10% margin of compliance for in-use or at-sea testing.

Based on specific engine size, model date, and displacement, 40 CFR part 60 subpart IIII requires the emergency generator (DR-GE-01) and emergency air compressor engine (DR-AC-01) to comply with Tier 2 emissions standards for new marine engines as set forth in 40 CFR § 94.8 and new nonroad engines as set forth in § 89.112, respectively. Compliance with the NSPS specifically requires that these engines be certified to the EPA Tier 2 standards. Since the *Noble Bob Douglas* is not a U.S. flagged vessel, it was constructed to different standards. The emergency generator is IMO Tier II certified, and the emergency air compressor meets the EU Stage 3A exhaust emission regulation. Since certification is an engine manufacturer process, it is not possible for these engines to obtain an EPA Tier certificate, even with emissions levels that meet the EPA certification requirements. *See* 40 CFR § 60.4211(c). Hence, compliance with the NSPS would require Anadarko to replace these engines with engines certified to the emission standards in § 60.4205(b) that would be applicable for the same model year and maximum engine power. Anadarko is requesting exemptions from subpart IIII for the emergency generator and emergency air compressor engines. Pursuant to 40 CFR § 55.7, the EPA may grant an exemption from a part 55 requirement, if the Administrator or the delegated agency finds that compliance is technically infeasible or will cause an unreasonable threat to health and safety.

The existing emergency generator and emergency air compressor engines were sized to meet the drillship's stringent space and weight distribution requirements in the vessel's design phase. Based on consultations with the engine manufacturer and the drillship owner, Anadarko has determined that any replacement engine would have to meet exacting output, weight, physical size, and shape restrictions dictated by the vessel's design constraints. Anadarko was not able to locate replacement engines for this vessel that would meet all the necessary criteria and fit the design footprint of the original engines as summarized in email communications to the EPA dated December 4, 2013, and included in the administrative record. Furthermore, if suitable replacement engines could be found, replacing the existing engines would likely require a redesign of the engine bed frame and vessel structural modifications that would subsequently require recertification of the vessel. Based on these source-specific technical barriers, the EPA concludes that replacement of the DR-GE-01 and the DR-AC-01 units for this operating scenario and this project is not technically feasible at this time. Thus, the EPA proposes to grant Anadarko's request for an exemption from subpart IIII.

Any exemption under §55.7 would necessitate compliance with substitute emissions and/or work practice requirements based on the next most stringent standard available. The EPA determined that the next most stringent standards for the DR-GE-01 unit are IMO certification standards for a comparable engine, and for the DR-AC-01 engine the next most stringent standard is limiting hours of operation. Detailed information regarding IMO certification standards from the *Regulations for the Prevention of Air Pollution from Ships (Annex VI)* document can be found at the IMO's website, www.imo.org.

An exemption under §55.7 also requires an estimate of residual emissions derived from the difference between the estimated reductions that would be achieved by compliance with the original requirements and the estimated emission reductions that would be achieved by compliance with the proposed substitute requirements. In accordance with 40 CFR § 55.7(e)(3), Anadarko must then obtain emission reductions of a sufficient quantity to offset the estimated residual emissions. The total residual emissions for the two engines (DR-GE-01 and DR-AC-01) detailed below are approximately 0.41 tons of $NO_X$ + non-methane hydrocarbon (NMHC), and approximately 0.049 tons of particulate matter.

As discussed above, the emergency generator engine (DR-GE-01) is a Category 2, commercial marine engine subject to emission standards located in 40 CFR part 94.8 Table A-1. The total $NO_X$ + NMHC residual emissions for the emergency generator engine is estimated to be 0.39 TPY. Residual PM emissions are approximately 0.048 TPY. Potential emissions of CO for the emergency generator are below the Tier 2 standards.

The emergency air compressor engine (DR-AC-01) is classified as a nonroad engine subject to emission standards located in 40 CFR part 89.112 Table 1. The total $NO_X$ + NMHC residual emissions for this engine is estimated at 0.021 TPY. Residual PM emissions are approximately 0.001 TPY. Potential emissions of CO for the emergency air compressor are below the Tier 2 standards.

Since this OCS source will be located beyond 25 miles from any States' seaward boundary, the EPA is authorized to determine an adequate emission offset ratio to be protective of State and Federal ambient air quality standards and to comply with part C of title I of the CAA. *See* 40 CFR 55.7(e)(3). With respect to this specific project, the residual emissions are so low as to be essentially equivalent to the original emissions standards. As such, the EPA has determined that, based on currently available data, no emissions offsets will be required.

Anadarko must comply with all other applicable requirements of subpart IIII for engines DR-ME-01 through DR-ME-06, DR-AC-01, and DR-GE-01, and third party engines (DR-TP-01 through DR-TP-11 and DR-TP-17 through DR-TP-21) including recordkeeping, reporting, and the diesel fuel requirements of 40 CFR § 60.4207. Compliance with these permit requirements and the substitute control requirements will also meet the applicant's obligations for these engines under 40 CFR § 63 subpart ZZZZ, as discussed below in Section 4.6.

## Table 4-2 *Noble Bob Douglas* Engine Specifications

| Emissions Unit ID | Description | Make & Model | Rating[1] (hp) | Manufacture Year |
|---|---|---|---|---|
| DR-ME-01 | Main propulsion generator #1 | Hyundai-HiMsen 16H32/40V | 10,728 hp | 2012 |
| DR-ME-02 | Main propulsion generator #2 | Hyundai-HiMsen 16H32/40V | 10,728 hp | 2012 |
| DR-ME-03 | Main propulsion generator #3 | Hyundai-HiMsen 16H32/40V | 10,728 hp | 2012 |
| DR-ME-04 | Main propulsion generator #4 | Hyundai-HiMsen 16H32/40V | 10,728 hp | 2012 |
| DR-ME-05 | Main propulsion generator #5 | Hyundai-HiMsen 16H32/40V | 10,728 hp | 2012 |
| DR-ME-06 | Main propulsion generator #6 | Hyundai-HiMsen 16H32/40V | 10,728 hp | 2012 |
| DR-GE-01 | Emergency Generator | Cummins QSK60DM HPI | 2,547 hp | 2012 |
| DR-LB-01 | Life boat engine #1 | Sabb L3.139LB | 29 hp | |
| DR-LB-02 | Life boat engine #2 | Sabb L3.139LB | 29 hp | |
| DR-LB-03 | Life boat engine #3 | Sabb L3.139LB | 29 hp | |
| DR-LB-04 | Life boat engine #4 | Sabb L3.139LB | 29 hp | |
| DR-LB-05 | Life boat engine #5 | Sabb L3.139LB | 29 hp | |
| DR-LB-06 | Life boat engine #6 | Sabb L3.139LB | 29 hp | |
| DR-AC-01 | Emergency air compressor | Lister Petter TR2 | 23.2 hp | 2012 |
| DR-FR-01 | Fast rescue craft engine | Steyr MO 144M38 | 144 hp | |
| **Third Party Engines** | | | | |
| DR-TP-01 | Third party engine #1 | Various-Tier II Certified | ≤860 hp | Varies |
| DR-TP-02 | Third party engine #2 | Various-Tier II Certified | ≤860 hp | Varies |
| DR-TP-03 | Third party engine #3 | Various-Tier II Certified | ≤ 300 hp | Varies |
| DR-TP-04 | Third party engine #4 | Various-Tier II Certified | ≤ 300 hp | Varies |
| DR-TP-05 | Third party engine #5 | Various-Tier II Certified | ≤ 300 hp | Varies |
| DR-TP-06 | Third party engine #6 | Various-Tier II Certified | ≤ 300 hp | Varies |
| DR-TP-07 | Third party engine #7 | Various-Tier II Certified | ≤ 300 hp | Varies |
| DR-TP-08 | Third party engine #8 | Various-Tier II Certified | ≤ 300 hp | Varies |
| DR-TP-09 | Third party engine #9 | Various-Tier II Certified | ≤ 300 hp | Varies |
| DR-TP-10 | Third party engine #10 | Various-Tier II Certified | ≤ 300 hp | Varies |
| DR-TP-11 | Third party engine #11 | Various-Tier II Certified | ≤ 300 hp | Varies |
| DR-TP-12 | Third party well evaluation engine #1 | Detroit Diesel | ≤ 140 hp | Varies |
| DR-TP-13 | Third party well evaluation engine #2 | Detroit Diesel | ≤ 140 hp | Varies |
| DR-TP-14 | Third party well evaluation engine #3 | Detroit Diesel | ≤ 140 hp | Varies |
| DR-TP-15 | Third party well evaluation engine #4 | Detroit Diesel | ≤ 140 hp | Varies |
| DR-TP-16 | Third party well evaluation engine #5 | Detroit Diesel | ≤ 140 hp | Varies |
| DR-TP-17 | Third party engine #12 | Various-Tier II Certified | ≤ 126 hp | Varies |
| DR-TP-18 | Third party engine #13 | Various-Tier II Certified | ≤ 126 hp | Varies |
| DR-TP-19 | Third party engine #14 | Various-Tier II Certified | ≤ 126 hp | Varies |
| DR-TP-20 | Third party engine #15 | Various-Tier II Certified | ≤ 126 hp | Varies |
| DR-TP-21 | Third party engine #16 | Various-Tier II Certified | ≤ 126 hp | Varies |

[1] Permit conditions may limit operation to less than rated capacity.

**Table 4-3 Stimulation Vessel Engine Specifications**

| Emissions Unit ID | Description | Make & Model | Rating[1] (hp) | Manufacture Year |
|---|---|---|---|---|
| SV-PE-01 | Stimulation Vessel Pump #1 | Various | 2,250 hp | Varies |
| SV-PE-02 | Stimulation Vessel Pump #2 | Various | 2,250 hp | Varies |
| SV-PE-03 | Stimulation Vessel Pump #3 | Various | 2,250 hp | Varies |
| SV-PE-04 | Stimulation Vessel Pump #4 | Various | 2,250 hp | Varies |
| SV-PE-05 | Stimulation Vessel Pump #5 | Various | 2,250 hp | Varies |
| SV-PE-06 | Stimulation Vessel Pump #6 | Various | 2,250 hp | Varies |
| SV-PE-07 | Stimulation Vessel Pump #7 | Various | 2,250 hp | Varies |
| SV-PE-08 | Stimulation Vessel Pump #8 | Various | 2,250 hp | Varies |

[1] Permit conditions may limit operation to less than rated capacity.

### 4.5.2 Subpart K

NSPS, 40 CFR part 60, subpart K, applies to petroleum liquids tanks with a capacity of greater than 40,000 gallons that commence construction or modification after March 8, 1974, and prior to May 19, 1978, or have a capacity greater than 65,000 gallons and commence construction or modification after June 11, 1973, and prior to May 19, 1978. All storage tanks on the drilling vessel were constructed after 1978; therefore, they are not subject to subpart K

### 4.5.3 Subpart Ka

NSPS, 40 CFR part 60, subpart Ka, applies to petroleum liquids tanks with a capacity of greater than 40,000 gallons that are used to store petroleum liquids and for which construction is commenced after May 18, 1978, and prior to July 23, 1984. All storage tanks on the drilling vessel were constructed after 1984; therefore, they are not subject to subpart Ka.

### 4.5.4 Subpart Kb

NSPS 40 CFR part 60 subpart Kb applies to each storage vessel with a capacity greater than or equal to 75 cubic meters ($m^3$) that is used to store volatile organic liquids for which construction, reconstruction, or modification is commenced after July 23, 1984. This subpart does not apply to storage vessels with a capacity greater than or equal to 151 $m^3$ storing a liquid with a maximum true vapor pressure (TVP) less than 3.5 kilopascals (kPa) or with a capacity greater than or equal to 75 $m^3$ but less than 151 $m^3$ storing a liquid with a maximum true vapor pressure less than 15.0 kPa. As indicated in the application materials, all storage tanks were constructed after 1984. However, none of the fuel tanks included in the permit application are subject to subpart Kb because each tank has a capacity less than 75 $m^3$ or the liquid contained in them has a vapor pressure less than 3.5 kPa. This subpart also does not apply to condensate storage tanks that have a volume less than 1,589.874 $m^3$, if condensate is stored prior to custody transfer. None of the condensate storage tanks included in the permit application are subject to subpart Kb because each tank has a capacity less than 1,589.874 $m^3$ and the condensate will be stored prior to custody transfer. These parameters exempt the storage tanks from this subpart.

### 4.5.5 Subpart Dc

NSPS, 40 CFR part 60, subpart Dc, applies to owners and operators of steam generating units for which construction, modification, or reconstruction commenced after June 9, 1989, and that have a maximum heat input design capacity of 29 megawatts (MW) (100 million British thermal units per hour (MMBtu/hr)) or less but greater than or equal to 2.9 MW (10 MMBtu/hr). The proposed flowback boiler will be an 8 MMBtu/hr "SIGMA FIRED" SF-200SE flowback boiler, or equivalent, and is therefore not subject to subpart Dc.

### 4.6 National Emission Standards for Hazardous Air Pollutants (NESHAP)

Applicable NESHAP promulgated under section 112 of the CAA apply to OCS sources if rationally related to the attainment and maintenance of federal and state ambient air quality standards or the requirements of part C of title I of the CAA. *See* 40 CFR § 55.13(e).

NESHAP regulations set forth in 40 CFR part 63 apply to a source based on its source category listing. Many part 63 NESHAPs apply only if the affected source is a "major source" as defined in Section 112 and 40 CFR § 63.2. A "major source" is generally defined as a source that has a PTE of 10 tons per year or more of any single hazardous air pollutant (HAP) or 25 tons per year or more of all HAP combined. *See* section 112(a)(1) and 40 CFR § 63.2. An "area source" is any source that is not a major source as defined in section 112(a)(2) and 40 CFR § 63.2. Anadarko has estimated emissions of less than 25 TPY for all HAP combined and less than 10 TPY for each individual HAP. This makes the project an area source of HAPs.

### 4.6.1 Subpart ZZZZ

NESHAP, 40 CFR part 63, subpart ZZZZ, applies to stationary reciprocating internal combustion engines (RICE) located at major and area sources of HAP emissions. The regulations establish different standards for new and existing sources pursuant to CAA section 112. Area source engines rated above 500 hp that are constructed after December 19, 2002, and engines with a rating of 500 hp or less that are constructed after June 12, 2006, are considered "new" RICE.

The drillship emergency air compressor (DR-AC-01) has a horsepower rating of 39 hp and was constructed after the June 12, 2006 applicability date. The drillship main engines (DR-ME-01 through DR-ME-06) and the drillship emergency generator (DR-GE-01) installed on the *Noble Bob Douglas* drillship have individual horsepower ratings greater than 500 hp and were constructed after December 19, 2002. In addition, the third party engines (DR-TP-01 through DR-TP-11 and DR-TP-17 through DR-TP-21) will be EPA Tier 2 certified and compliant with 40 CFR subpart IIII. Therefore, 40 CFR 63 subpart ZZZZ requires that these engines comply with the requirements of 40 CFR 60 subpart IIII as discussed above in Section 4.5.1. No further requirements under subpart ZZZZ apply to these engines.

The third party well evaluation engines and the stimulation vessel pump engines are existing non-emergency engines that were not constructed after the applicability dates, and must comply with the management practices of subpart ZZZZ as defined in 40 CFR § 63.6603. The management practices depend on the engine type and size. The management practices for

existing stationary engines with a site rating of more than 300 hp located at an area source of HAP emissions on the OCS apply to the stimulation vessel pump engines and are found in 40 CFR § 63.6603(c) and include:

- Change oil every 1,000 hours of operation or annually, whichever comes first. Or, utilize an oil analysis program as prescribed in 40 CFR § 63.6625(i) in order to extend the specified oil change requirement;
- Inspect and clean air filters every 750 hours of operation or annually, whichever comes first, and replace as needed;
- Inspect fuel filters and belts, if installed, every 750 hours of operation or annually, whichever comes first, and replace as needed; and
- Inspect all flexible hoses every 1,000 hours of operation or annually, whichever comes first, and replace as needed.

The management practices for existing stationary engines with a site rating less than 300 hp located at an area source of HAP emissions apply to the third party well evaluation engines and are found in Table 2d to this subpart and include:

- Change oil and filter every 1,000 hours of operation or annually, whichever comes first. Or, utilize an oil analysis program as prescribed in 40 CFR § 63.6625(i) in order to extend the specified oil change requirement;
- Inspect air cleaner every 1,000 hours of operation or annually, whichever comes first, and replace as necessary; and
- Inspect all hoses and belts every 500 hours of operation or annually, whichever comes first, and replace as necessary.
- During periods of startup, minimize the engine's time spent at idle and minimize the engine's startup time at startup to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes, after which time the non-startup emission limitations apply.

Additionally, pursuant to 40 CFR § 63.6655 and 40 CFR § 63.6660, records of the above management practices must be maintained in readily-accessible, hard, or electronic form for at least five years following the date of each maintenance activity.

Emissions from the life boat engines and the fast rescue craft on the *Noble Bob Douglas* were included in the OCS source's PTE and emissions modeling, as required by 40 CFR part 55. These vessels are also subject to operating limits and to monitoring, recordkeeping, and reporting requirements to ensure they will not exceed the potential emissions assumed in the application and impact review. However, these units do not have any stationary source aspects, as they are used for man-overboard and emergency escape scenarios, and are therefore not subject to subpart ZZZZ standards.

### 4.6.2 Subpart HHHHHH

NESHAP, 40 CFR part 63, subpart HHHHHH, applies to paint stripping and miscellaneous surface coating operations performed at area sources of HAP emissions. This project is considered an area source, as explained above. The spray painting operation performed on the

drillship is part of the routine maintenance to protect the vessel from the marine environment. This activity meets the definition of "facility maintenance" provided in 40 CFR § 63.11180 and, therefore, the spray painting operations on the drillship are not subject to subpart HHHHHH pursuant to 40 CFR § 63.11170.

### 4.6.3 Subpart XXXXXX

NESHAP, 40 CFR part 63, subpart XXXXXX, applies to HAPs emitted from miscellaneous metal fabrication and finishing operations performed at area sources of HAP emissions. This project is considered an area source, as explained above. The welding operation performed on the drillship is part of the routine maintenance. This activity meets the definition of "facility maintenance" provided in 40 CFR § 63.11522 and, therefore, the proposed welding operations on the drillship are not subject to subpart XXXXXX pursuant to 40 CFR § 63.11514.

# 5.0 Project Emissions

This section describes the emission calculation basis for each emission source. The total projected emissions are based on estimations of the worst-case total fuel consumption for the drillship, support vessels, and well evaluation vessels. The emission factors are based on stack tests, AP-42, EPA publications, IMO and EPA nonroad engine emission Tier limits, analysis of fuel sulfur content, vendor-supplied emissions factors, fuel mass balance, NSPS, BOEM guidance document, EPA's TANKS 4.09d program, and material safety data sheets.

At the time of the application, Anadarko did not know the exact specifications for equipment leased from third party vendors. Therefore, Anadarko used the worst-case emission units for each category of air pollutant sources when calculating the PTE. The units that Anadarko modeled using worst-case emissions include: third party engines (DR-TP-01 through DR-TP-21), supply boats, stimulation vessel, well evaluation vessel, tug boat, barge, and other miscellaneous sources (painting, welding, etc.).

During the drilling, well completion, and maintenance phases, various operating scenarios can occur, including but not limited to, the following:

- Worst-case gas well flowback;
- Worst-case oil well flowback;
- Worst-case stimulation vessel operations;
- Well completion third party equipment;
- Well evaluation vessel operations; and
- Worst-case drilling.

The emissions from any one scenario or combination of scenarios at a given time will not exceed the worst-case emissions calculated. Anadarko calculated the PTE for each of the scenarios listed above. The emission calculations determined that the highest PTE will result during the worst-case oil well flowback scenario for all pollutants except for $NO_x$, which will have the highest PTE during the well evaluation vessel operations. The discussion that follows is based on the

worst-case scenario, and detailed calculations for the alternative scenarios are provided in Appendix B of the October 2013 application. These documents are located in the administrative record as referenced in Section 9 of this document.

Anadarko has proposed to only use ultra-low sulfur diesel fuel for all diesel emission units and ancillary vessels. The sulfur content of ultra-low sulfur diesel fuel is defined as a maximum sulfur content of 15 parts per million (ppm). Sulfur dioxide ($SO_2$) and sulfuric acid ($H_2SO_4$) emissions were calculated by a mass balance method. Based on a draft EPA document, EPA 420-R-03-008 titled "Draft Regulatory Impact Analysis: Control of Emissions from Nonroad Diesel Engines" dated April 2003, Anadarko used a 98% conversion factor for $SO_2$ formation during diesel fuel combustion, with the other 2% of the sulfur assumed to be converted to sulfuric acid ($H_2SO_4$). The $H_2SO_4$ emissions were assumed to condense to form total reduced sulfur (TRS) particulate matter, primarily as sulfates in the atmosphere. Since the total amount of $H_2SO_4$ was calculated at 0.05 TPY, the potential TRS PM contribution is minimal.

### 5.1 *Noble Bob Douglas* Main Propulsion Electric Generator Engines (DR-ME-01 through DR-ME-06) and Emergency Generator (DR-GE-01) Analysis

Six main engines provide power to the drilling vessel: six Hyundai-HiMsen 16H32/40V diesel generators with a rated power output of approximately 10,728 hp each. The IMO Tier 2 Certified Cummins QSK60-DM HPI emergency generator diesel engine, rated at 2,547 hp, provides emergency power to the drilling vessel and is run periodically for no more than 100 hours per year of non-emergency use to ensure the engine will operate properly in the event of an emergency.

Anadarko proposed a drillship-wide fuel limit derived from the main engine fuel based emission factors. Emissions estimates for the *Noble Bob Douglas*'s main engines and emergency generator were based on an average fuel consumption of 102 cubic meters/day. This fuel limit is the highest fuel limit of all six scenarios. This results in an annual fuel limit of 27,657 cubic meters/year, which is equal to approximately 300 days per year of 24 hour per day operation and a power requirement of 129,600,000 kW-hr/year. This will limit the maximum total emissions from the drillship.

### 5.2 *Noble Bob Douglas* Small Engines, Third Party Engines, and Miscellaneous Emission Sources Analysis

The following is a description of the additional emission units on the *Noble Bob Douglas* and the basis of the worst-case usage estimates for each engine:

**Unit ID: Emergency Air Compressor Diesel Engine (DR-AC-01)**

The Lister Petter TR2 air compressor is rated at 23.2 hp. The hourly and annual emissions were calculated based on operating 100 hours per year.

**Unit ID: Life Boat Diesel Engines (DR-LB-01 through DR-LB-06)**

The six Saab L3.139LB life boat engines, rated at 29 hp each, are operated during maintenance and safety checks and in the event of an emergency. Non-emergency, planned operation time of a maximum of 1 hour per day for each engine was used for the emission calculations. The maximum annual emissions were calculated based on operating for a maximum of 100 hours per year per engine.

**Unit ID: Fast Rescue Craft (DR-FR-01)**

The EPA Tier 2 certified Steyr MO144M38 Turbo engine rated at 144 hp in the fast rescue boat is operated during maintenance checks, safety checks, and in the event of an emergency. Non-emergency, planned operation time of 1 hour per day was used for the emission calculations. The hourly and annual emissions were calculated based on operating 100 hours per year.

**Unit ID: Third Party Engines (DR-TP-01 through DR-TP-11 and DR-TP-17 through DR-TP-21)**

These units are portable and brought on the drillship as needed by a third party supplier. The exact engines available for use during the project had not been identified at the time of the application submittal. The worst-case engines listed below were chosen to calculate emissions and the potential to emit, since they represent engines that have both the most recent available technology, but are also the largest engines that will perform the required function. Any replacement engines for the project will meet the equivalent or a higher EPA Tier standard. These engines, and any replacement engines, will be EPA Tier 2 certified or certified to a higher EPA tier standard (such as Tier 3 or 4). The engines were grouped in the following categories:

- Third Party Engines ≤ 860 hp (DR-TP-01 and DR-TP-02)
- Third Party Engines ≤ 300 hp (DR-TP-03 through DR-TP-11)
- Third Party Engines ≤ 126 hp (DR-TP-17 and DR-TP-21)

The estimated annual emissions calculations used 7,200 hours per year of operation per engine.

**Unit ID: Third Party Well Evaluation Engines (DR-TP-12 through DR-TP-16)**

These units are portable and brought on the drillship as needed by a third party supplier. The exact engines available for use during the project had not been identified at the time of the application submittal. These units may be used on the drillship or the supply boat. These engines will be rated less than or equal to 140 hp and hourly and annual emissions were calculated based on a maximum of 125 hours per year.

**Unit ID: Tanks (DR-FT-01 through DR-FT-15)**

Emissions are generated from the storage of diesel fuel (13 tanks) and helicopter fuel in tanks (2 tanks). The EPA TANKS 4.09d computer software program was used to calculate VOC emissions, using the properties of distillate fuel oil number 2 for diesel and Jet Napthha (JP-4).

The maximum fuel usage for the drillship is 102 cubic meters/day; however, a throughput more than twice as large was used as a conservative assumption.

**Unit ID: Condensate Tanks (DR-TP-24 through DR-TP-26)**

The condensate stabilization process reduces the vapor pressure of the condensate liquids. This process separates the very light hydrocarbon gases from the heavier hydrocarbon components. Vapors produced from condensate stabilization are flared through the boom flare and these flash emissions are negligible. The stabilized condensate moves to the condensate storage tanks, and this fuel generates emissions. The EPA TANKS 4.09d computer software program was used to calculate VOC emissions, using the default TANKS properties for Gasoline RVP 13. Maximum hourly emissions were calculated for the month of June, which is the month with the historic highest emissions.

**Unit ID: Mud Degassers (DR-VG-01 through DR-VG-03)**

The *Bob Douglas* has three mud degassers onboard. Two of the degassers are equipped with Burgess Manufacturing, model 1500 Magna-vac vacuum degassers and one is equipped with a Hampco degasser vertical separator containing baffles. Drilling mud cools and lubricates the drill bit during the drilling process. When the drilling mud resurfaces it could contain hydrocarbons. Once the mud reaches the surface, it will off gas generating VOC emissions. The emission factor was based on a study commissioned by the BOEM, *Year 2005 Gulfwide Emission Inventory Study*, to develop a weighted average. The maximum hourly emissions per day are based on the expected ratio of annual throughputs of synthetic based muds and the BOEM study. Annual emissions were estimated using pounds per day emissions factors and 7,200 hours of operation per year.

**Unit ID: Dust Collectors (DR-DC-01 through DR-DC-04)**

Dry mud and cement are mixed with water to be used in drilling operations. Particulate matter in the form of dust is generated and controlled by using a dust collector. The drillship will have three National Oilwell Varco dust collectors and one Schlumberger dust collector.. The annual emissions were calculated based on 7,200 hours of operation per year.

**Unit ID: Welding Operations (DR-WO-01)**

Welding occurs on the *Noble Bob Douglas* as part of maintenance activities and generates PM/$PM_{10}$/$PM_{2.5}$ and HAP emissions. Emissions were calculated using 80 pounds per day of welding rods for 300 days per year.

**Unit ID: Painting Operations (DR-PO-01)**

Painting occurs on the *Noble Bob Douglas* as part of maintenance activities, and generates PM/$PM_{10}$/$PM_{2.5}$, VOC, and HAP emissions. Anadarko will use a combination of air assisted and airless spray guns for different proposed painting operations. The calculations used an air assisted spray gun with 30% transfer efficiency. However, Anadarko may use an airless spray gun with a 50% transfer efficiency during operations. Anadarko will use both primer and thinner.

The emission calculations used 7,800 and 1,950 gallons of primer and thinner, respectively. The particulate matter emissions were calculated using a fall-out factor. This fall-out factor assumes that the majority of emissions will settle, and only a portion of the emissions will become airborne particulate matter.

**Unit ID: Fugitive Emissions from Diesel Fuel Lines (DR-FE-01)**

Fugitive emissions are emitted from the diesel fuel lines. The component count is based on the number of diesel fuel valves, which was estimated from Table 2-4 of the EPA Protocol for Equipment Leak Emission Estimates. The connector count is a factor of the valve count, for a total of 484 connectors, 152 valves, and 16 pump seals.

**Unit ID: Flowback Boiler (DR-TP-22)**

The SIGMA FIRED SF-200SE, 8 MMBtu/hr flowback boiler will operate a maximum of 2,016 MMBtu/year, which is equivalent to 14,400 gallons of fuel per year, consumed during well completion activities.

**Unit ID: Boom Flare (DR-TP-23)**

During well completion activities, Anadarko may use a gas-fired boom flare capable of processing 60 MMScf/day or 630 MMScf/year. The applicant estimated a typical VOC reduction efficiency of 98%. The boom flare will generate emissions of PM/$PM_{10}$/$PM_{2.5}$, CO, VOC, $NO_x$, $SO_2$, and GHGs.

**5.3 Anchor Handling and Supply Boat Vessel Analysis**

Various anchor handling and supply boats service the drilling vessel and will generate emissions. These vessels will transport personnel and supplies as required. The availability of specific support vessels during drilling operations was not known at the time of the application as outside vendors supply these units. The modeling calculations, described in Section 7.0, used one support vessel to estimate emissions, as described in the application and the supplemental material submitted on December 4, 2014. The support vessel was identified as either the anchor handling boat or the supply boat. Anadarko selected the largest expected supply boat (*HOS Coral*) as a worst-case basis for emissions calculations. The emissions the supply boat will generate within a 25 nautical mile radius of the *Noble Bob Douglas* are based on a fuel operating limit. Anadarko calculated their hourly usage to determine that the supply boat will consume 200 barrels per day (bbl/day) or 60,000 barrels per year (bbl/year) of diesel fuel. The permit limits the fuel use of all anchor handling or supply boats, combined, to 200 bbl/day and 60,000 bbl/year, to ensure that the emissions from both vessels will not exceed those modeled.

### 5.4 Tug Boat Analysis

Various tug boats used during well completion activities will generate emissions. The availability of specific tug boats during well completion operations was not known at the time of the application as outside vendors supply these units.

Anadarko selected the largest expected tug boat as a worst-case basis for emissions calculations. The emissions that the operation of the tug boat will generate within a 25 nautical mile radius of the *Noble Bob Douglas* are based on a fuel operating limit. Anadarko calculated their hourly usage to determine that the tug boat will consume 125 bbl/day or 37,500 bbl/year of diesel fuel.

### 5.5 Barge Analysis

Various barges used during well completion activities will generate emissions. The availability of specific barges during well completion operations was not known at the time of the application as outside vendors supply these units.

Anadarko selected the largest expected barge as a worst-case basis for emissions calculations. The emissions that the operation of the barge will generate within a 25 nautical mile radius of the *Noble Bob Douglas* are based on the hourly operation of three electric generator engines rated at 456 hp (BG-LP-01 through BG-LG-03). These engines will operate 7,200 hours per year per engine.

### 5.6 Stimulation Vessel Analysis

Various stimulation vessels used during well completion activities will generate emissions. The availability of specific stimulation vessels during well completion operations was not known at the time of the application as outside vendors supply these units.

Anadarko selected the largest expected stimulation vessel as a worst-case basis for emissions calculations. The emissions that the operation of the stimulation vessel will generate within a 25 nautical mile radius of the *Noble Bob Douglas* are based on a fuel operating limit. Anadarko calculated their hourly usage to determine that the stimulation vessel will consume 225 bbl/day or 28,350 bbl/year of diesel fuel.

### 5.7 Well Evaluation Vessel Analysis

Well evaluation vessels used during well completion activities will generate emissions. The availability of specific well evaluation vessels during well completion operations was not known at the time of the application as outside vendors supply these units.

Anadarko selected the largest expected well evaluation vessel as a worst-case basis for emissions calculations. The emissions that the operation of the well evaluation vessel will generate within a 25 nautical mile radius of the *Noble Bob Douglas* are based on a fuel operating limit. Anadarko calculated their hourly usage to determine that the well evaluation vessel will consume 144

bbl/day or 43,200 bbl/year of diesel fuel.

Detailed emission factors for these sources are available in the application materials, which are included in the administrative record referenced in Section 9.0 of this document.

### 5.8 Compliance Methodology

The draft permit has a general stack testing requirement and allows Anadarko to use one of the following monitoring systems for $NO_X$, CO, VOC, $PM/PM_{10}/PM_{2.5}$ and $CO_2$ for the main generator diesel units (DR-ME-01 through DR-ME-06): an EPA-approved continuous emissions monitoring system; an EPA-approved parametric monitoring method; or with prior written approval by the EPA, a stack testing emissions monitoring system. The same monitoring method does not need to be selected for each pollutant.

The compliance demonstration method proposed for the emergency generator diesel units (DR-GE-01), the emergency air compressor engine (DR-AC-01), the life boat engines (DR-LB-01 through DR-LB-06), the fast rescue craft (DR-FR-01), the simulation vessel pump engines (SV-PE-01 through SV-PE-08), the third party diesel engines (DR-TP-01 through DR-TP-21), and the flowback boiler (DR-TP-22) is monitoring and maintaining a contemporaneous record of the hours of engine operation using an engine hour meter or log of operating hours. These units must also meet any applicable NSPS and NESHAP monitoring requirements, including electronic reporting.

The draft permit requires the non-combustion units, the dust collectors (DR-DC-01 through DR-DC-04), the boom flare (DR-TP-23), painting operations (DR-PO-01), and welding operations (DR-WO-01), to demonstrate compliance through methods such as proper maintenance, tracking the amount and type of relevant material consumed, and/or recording the amount of time the equipment is used. The permit does not allow for the venting of methane emissions, other than fugitive emissions from diesel fuel lines and emissions from the mud degasser, which were estimated in the permit application.

The compliance demonstration for the support vessels, as specified in the draft permit, includes monitoring and maintaining a contemporaneous record of: operating and standby time within the 25 mile radius of the drilling vessel, barrels of diesel fuel on the support vessel entering the 25 mile radius, barrels of diesel fuel on the support vessel exiting the 25 mile radius, and the sulfur content of the fuel upon receiving each fuel shipment.

The draft permit also contains requirements for Anadarko to supply the EPA with all records upon request and to provide a semi-annual report of its emissions information and calculations in accordance with all relevant permit conditions.

## 6.0 Best Available Control Technology (BACT) and Recordkeeping Requirements

A new major stationary source subject to PSD requirements is required to apply BACT for each pollutant subject to regulation under the CAA that it has the potential to emit in amounts equal to

or greater than the pollutant's significant emission rate. *See* 40 CFR § 52.21(j). Based on the emission inventory for the project, presented in Table 4-1 of the preliminary determination, $NO_X$, CO, VOC, and $PM/PM_{10}/PM_{2.5}$, are the CAA-regulated pollutants that will be emitted by Anadarko in quantities exceeding the respective significant emission rate. Additionally, EPA applies BACT to GHG emissions in those circumstances where a source emits GHGs in the amount of at least 75,000 TPY on a $CO_2e$ basis and has already triggered PSD review for another regulated NSR pollutant. Therefore, BACT must be determined for each emission unit on the drillship *Noble Bob Douglas* that emits these pollutants while operating as an OCS source and for the stimulation vessel pump engines.

The life boats and the fast rescue boat are included in the OCS source's PTE and emissions modeling, as required by 40 CFR part 55, and are subject to operating limits, monitoring, recordkeeping and reporting requirements to ensure they will not exceed the potential emissions assumed in the application and impact review. Vessels operating within 25 miles of the OCS source are not subject to BACT requirements unless they are attached to the OCS, and then only the stationary source aspects of the vessel are regulated. *See* 40 CFR § 55.2. These units do not have any stationary source aspects as they are used for man overboard and emergency escape scenarios only.

BACT is defined in the applicable permitting regulations at 40 CFR § 52.21(b)(12), in part, as:

> an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under the Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event, shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of measurement technology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. The CAA contains a similar BACT definition, although the 1990 CAA amendments added "clean fuels" after "fuel cleaning or treatment" in the above definition. *See* CAA § 169(3).

On December 1, 1987, the EPA issued a memorandum describing the top-down approach for determining BACT. Memorandum from J. Craig Potter, Assistant Administrator for Air and Radiation, to the EPA Regional Administrators regarding Improving New Source Review (NSR) Implementation (Dec. 1, 1987). In brief, the top-down approach provides that all available control technologies be ranked in descending order of control effectiveness. Each alternative is then evaluated, starting with the most stringent, until BACT is determined. The top-down approach consists of the following steps:

Step 1: Identify all available control technologies.

Step 2: Evaluate technical feasibility of options from Step 1 and eliminate options that are technically infeasible based on physical, chemical, and engineering principles.

Step 3: Rank the remaining control technologies from Step 2 by control effectiveness, in terms of emission reduction potential.

Step 4: Evaluate the most effective controls from Step 3, considering economic, environmental and energy impacts of each control option. If the top option is not selected, evaluate the next most effective control option.

Step 5: Select BACT (the most effective option from Step 4 not rejected).

Below is a summary of the EPA's top-down BACT analysis for the *Noble Bob Douglas* and the equipment that is part of the OCS source during the well completion activities.

The applicant identified available control technologies in their OCS permit application submitted in October 2013 and supplemental material submitted on November 8, 2013, December 4, 2013, December 5, 2013, February 5, 2014, February 11, 2014, May 12, 2014, August 8, 2014, and May 22, 2015. The discussion below considers these control technologies and control technologies or analyses not considered in the application and supplemental material and provides EPA's BACT determinations. The reader is referred to the BACT section of the application, which is included in the Administrative Record, for additional details regarding the control technologies.

### 6.1 BACT Analysis for Internal Combustion Engines

The following large internal combustion engines (*i.e.*, engines greater than 500 hp), on *Noble Bob Douglas* are included in this section of the BACT analysis: six (6) main diesel engines (DR-ME-01 through DR-ME-06) and one (1) emergency generator (DR-GE-01). The following engines on the stimulation vessel are also included in this section and are considered large internal combustion engines: eight (8) stimulation vessel pump engines (SV-PE-01 through SV-PE-08).

The following small internal combustion engines (*i.e.*, engines less than 500 hp), on *Noble Bob Douglas* are included in this section of the BACT analysis: one (1) emergency air compressor engine (DR-AC-01), and (5) third party well evaluation engines (DR-TP-12 through DR-TP-16). The temporary EPA Tier 2 certified third party engines onboard the *Noble Bob Douglas* consist of three types of engines, those rated less than or equal to 860 hp, 300 hp, or 126 hp (DR-TP-01 through DR-TP-11 and DR-TP-17 through DR-TP-21). Therefore, these engines consist of both small and large engines. The applicant identified available control technologies in the BACT analysis as if all the temporary engines are large engines.

The main diesel engines will not produce emissions at a steady rate. These engines operate at variable load based on drilling and operational power demand. The emergency generator engine

will be tested periodically but not operated continuously. In addition, engine efficiency and performance typically degrade over time, resulting in increased emissions. These factors are important considerations in the BACT analysis for these units.

### *6.1.1 $NO_X$ BACT Analysis for all Internal Combustion Engines*

$NO_X$ emissions are generated as both a result of high temperature combustion (thermal $NO_X$) and oxidation of nitrogen present in the fuel (fuel-bound $NO_X$). Thermal $NO_X$ emissions increase with an increase in combustion temperature, and are generally the main cause of $NO_X$ emissions from a combustion source.

In addition to the analysis presented in the application and supplemental material, the EPA found that the replacement of the third party engines and the well evaluation engines is technically infeasible. The cleanest available third-party engines include EPA Tier 3 or Tier 4 engines; however, these engines, at most, comprise 20% of the available inventory. Proposed drilling plans change on short notice, and require contracts within short timeframes. The vendors do not have their entire inventory available within these time constraints. The five third party well evaluation engines are pre-1998 engines and are not certified to any Tier standard. These engines require deepwater, high-pressure, ratings. Currently, only one vendor offers this technology and this vendor does not have any EPA Tier certified engines.

The application contains a ranking and cost analysis for SCR control technology. Since the EPA concurred with the analysis in the application that this technology is technically infeasible at this time for the proposed project due to space constraints and the infeasibility of retrofits, the Agency did not consider it in its analysis.

Select BACT

The EPA determined BACT for the diesel engines on the *Noble Bob Douglas* and for the pump engines on the stimulation vessel as discussed below and summarized in Table 6-1.

**Main Engines:** The EPA proposes limits for $NO_X$ emissions dependent on the engine load. Our determination is based on our analysis of the stack test data conducted on July 22, 2014, and submitted to EPA on May 22, 2015, IMO Tier standards, and past BACT determinations for similar engines. The EPA proposes an emission limit of 12.22 g/kW-hr when the engines are operating at or above 50% load (based on rated hp of the engine). The EPA proposes a $NO_X$ limit of 107.8 lb/hr when these engines operate at less than 50% load, based on engine stack test data from 40% to 60% load. Emission limits for engines operating above 50% were set in g/kW-hr, while those below 50% were set in lb/hr. The lb/hr emission limit better reflects the lower fuel usage of the engines while operating at low loads. These emissions limits correspond to BACT requirements that include engines certified to IMO Tier II (or higher) classification with inherent low NOx design, including: turbocharger, aftercooler, and high injection pressure.

Anadarko must also comply with 40 CFR part 60 subpart IIII, as required by Conditions 6.6.1.1.1 and 6.11 of the draft permit, and described in section 4.5.1, above. All main engines

operating within 10% of 100% peak load (or the highest achievable load) must comply with a $NO_X$ limit of 9.69 g/kW-hr, with a 10% margin of compliance allowed for in-use source testing.

The EPA has also included requirements for a parametric emissions monitoring system (PEMS) meeting the provisions of 40 CFR 60.4211(d)(2) to be used in conjunction with an enhanced monitoring, maintenance, and load management system to ensure good combustion practices and manage load levels to ensure combustion efficiency. The permittee must submit an enhanced monitoring, maintenance, and load management system protocol with the annual compliance report as required in Condition 5.17.

Enhanced monitoring and load management is intended to reduce $NO_x$ emissions by alerting the operator to instances when the engines emissions are increasing outside an established operating range, whereby the operator can adjust the engine load or other parameters to reduce emissions. Given the significant load variations required by the operations on the drillship and the information provided by the applicant and vendor, the EPA has determined that a compliance averaging period of 24 hours on a rolling basis is appropriate in this case.

**Emergency Generator Engine and Emergency Air Compressor Engine:** The applicant estimated $NO_x$ emissions at 7.85 g/kW-hr for the emergency generator and an operating time of 100 hours per year, and for the emergency air compressor engine the applicant estimated $NO_x$ emissions at 0.031 lb/hp-hr and an operating time of 100 hours per year. Since these units will be operated minimally, measuring compliance with a numeric emission limit would be unreasonably burdensome and costly. The EPA has determined that BACT for these two engines is use of work practice standards including good combustion practices, the use of IMO Tier certified engines, and operating in accordance with the manufacturer's specifications, and low $NO_x$ engine (LNE) design for the emergency generator. The engines must maintain compliance with the hourly operating limits specified above for each engine.

**Pump Engines and Third Party Engines**: These units will be used on an as-needed basis during drilling operations. The exact units are unknown prior to drilling, and therefore, other than monitoring these units' hourly usage, an advanced monitoring system would be cost prohibitive and impractical. Given the use of these emission units, the EPA has determined that BACT is more appropriately implemented as work practice standards to include either the use of EPA Tier certified engines and/or good combustion practices. Furthermore, to maintain consistency with the emission estimates in the permit application, the draft permit includes operational limits for these units.

**Table 6-1: $NO_X$ BACT Conclusion**

| **Emissions Unit ID** | **BACT Control Options Technology and $NO_X$ BACT Emission Limits*** |
|---|---|
| DR-ME-01 thru DR-ME-06 | IMO Tier II (or higher) Standards, LNE Design (Including Turbocharger and Aftercoolers, and High Injection Pressure with load management, enhanced parametric monitoring, and good combustion practices; $NO_x$ limit for loads at or above 50%: 12.22 g/kW-hr; $NO_x$ limit for loads below 50%: 107.8 lb/hr |

| | |
|---|---|
| DR-GE-01 | IMO Tier II (or higher) Standards, LNE Design (Including Turbocharger and Aftercoolers, and High Injection Pressure) and Good Combustion Practices |
| DR-AC-01 | Good Combustion Practices |
| Third Party Engines (DR-TP-01 through DR-TP-11 and DR-TP-17 through DR-TP-21) | 40 CFR part 89/1039 EPA Tier 2 (or higher) Standards and Good Combustion Practices |
| Third Party Well Evaluation Engines (DR-TP-12 through DR-TP-16) | Good Combustion Practices |
| Stimulation Vessel Pump Engines (SV-PE-01 thru SV-PE-08) | EPA Tier certified engines and/or Good Combustion Practices |

*Short-term limits are based on a 24-hour rolling average.

### *6.1.2 CO and VOC BACT Analyses for all Internal Combustion Engines*

Incomplete combustion of the diesel fuel in the combustion chamber forms CO and VOC. Insufficient residence time during the final step in the oxidation of hydrocarbons during combustion will produce CO. The maximum oxidation of CO to $CO_2$ occurs when the combustion process maintains sufficient temperature, residence time, and oxygen supply. Also, most VOCs found in diesel exhaust are the result of unburned fuel, although some are formed as combustion products. VOC compounds participate in atmospheric photochemical reactions. These reactions can result in the formation of ozone. VOCs do not include methane, ethane, and other compounds that have negligible photochemical reactivity.

Select BACT

The EPA determined BACT for the diesel engines on the *Noble Bob Douglas* and for the pump engines on the stimulation vessel as discussed below and summarized in Table 6-2.

**Main Engines**. The EPA proposes a CO limit of 14.0 lb/hr, which is based on our analysis of stack test data conducted at 3 loads on all six engines. This data, provided to EPA on May 13, 2014, is available in the Administrative Record.

The EPA proposes two limits for VOC emissions dependent on the engine load and based on EPA's analysis of stack test data submitted to EPA on July 15, 2014,. The EPA proposes an emission limit of 1.1 g/kW-hr when the engines are operating at or above 50% load. This limit is based on the stack test data from the test runs of the main engines (DR-ME-01 through DR-ME-06) on the *Noble Bob Douglas,* and EPA's review of CO emission limits in EPA permits for similar engines. The EPA proposes a VOC limit of 8.6 lb/hr when these engines operate at less than 50% load, based on the linear interpolation of stack test data from 40% to 60% load from all six engines. Emission limits for engines operating above 50% were set in g/kW-hr, while those below 50% were set in lb/hr. The lb/hr emission limit better reflects the fuel usage of the engines while operating at low loads.

Given the significant load variations required by the operations on the drillship and the information provided by the applicant and vendor, the EPA has determined an averaging period of 24 hours on a rolling basis is appropriate in this case. BACT for the main engines will also include work practice standards including good combustion practices based on the current manufacturer's specifications for these and operating in accordance with the manufacturer's specifications and LNE design.

**Emergency Generator Engine and Emergency Air Compressor Engine:** The BACT determination in Section 6.1.1 is also applicable for CO and VOC, except that the IMO Tier II standards for the emergency generator engine do not include CO and VOC emissions.

**Pump Engines and Third Party Engines**: The BACT determination in Section 6.1.1 is also applicable for CO and VOC.

**Table 6-2: CO and VOC BACT Conclusions**

| Emissions Unit ID | BACT Control Technology and CO and VOC BACT Emission Limits* |
|---|---|
| Main Diesel Engines (DR-ME-01 thru DR-ME-06) | LNE Design (Including Turbocharger and Aftercoolers, and High Injection Pressure) and Good Combustion Practices; CO limit for: 14.0 lb/hr |
| | LNE Design Including Turbocharger and Aftercoolers, and High Injection Pressure and Good Combustion Practices; VOC limit for loads at or above 50%: 1.1 g/kW-hr; VOC limit for loads below 50%: 8.6 lb/hr |
| Emergency Generator Engine (DR-GE-01) | LNE Design Including Turbocharger and Aftercoolers, and High Injection Pressure and Good Combustion Practices |
| Emergency Air Compressor (DR-AC-01) | Good Combustion Practices |
| Third Party Engines (DR-TP-01 through DR-TP-11 and DR-TP-17 through DR-TP-21) | 40 CFR part 89/1039 EPA Tier 2 Standards and Good Combustion Practices |
| Third Party Well Evaluation Engines (DR-TP-12 through DR-TP-16) | Good Combustion Practices |
| Stimulation Vessel Pump Engines (SV-PE-01 thru SV-PE-08) | Good Combustion Practices |

*Short-term limits are based on a 24-hour rolling average.

### *6.1.3 $PM/PM_{10}/PM_{2.5}$ BACT Analysis for Internal Combustion Engines*

Diesel particulate emissions are primarily products of incomplete combustion of diesel fuel and lubrication oil in the combustion chamber. The majority of the PM emissions from stationary

diesel engines are $PM_{2.5}$; therefore, BACT for $PM/PM_{10}/PM_{2.5}$ is addressed concurrently since any control technology available for the control of $PM_{2.5}$ will also effectively control PM and $PM_{10}$.

In addition to the technologies identified in the application and supplemental material, the EPA identified the sea scrubber as an available control technology. This add-on control technology is used to reduce both $SO_2$ and particulate matter emissions. The EPA contacted industry experts and determined that this technology could be used on engines that operate at variable loads. However, the sea scrubber technology has not been demonstrated in the field on similar engines. Therefore, this technology was not considered a technically feasible BACT option.

Select BACT

The EPA determined BACT for the diesel engines on the *Noble Bob Douglas* and for the pump engines on the stimulation vessel as discussed below and summarized in Table 6-3.

**Main Engines:** The EPA proposes a BACT emission limit for $PM/PM_{10}/PM_{2.5}$ of 3.5 lb/hr. This limit was established based on the stack test data of the main engines (DR ME 01 through DR ME 06) and is consistent with the BACT emission limits established in Region 4 OCS permits with similar engines.

Anadarko must comply with the limits of 40 CFR part 60 subpart IIII, as maintained in Condition 6.11, and described in section 4.5.1. All main engines operating within 10% of 100% peak load (or the highest achievable load) must comply with a $PM/PM_{10}/PM_{2.5}$ limit of 0.15 g/kW-hr, with a 10% margin of compliance allowed for in-use source testing.

Given the significant load variations required by the operations on the drillship and the information provided by the applicant and vendor, the EPA has determined an averaging period of 24 hours on a rolling basis is appropriate in this case. BACT will also include use ultra-low sulfur diesel and work practice standards including good combustion practices and operating in accordance with the manufacturer's specifications and LNE design.

**Emergency Generator Engine and Emergency Air Compressor Engine:** The BACT determination in Section 6.1.1 is also applicable for $PM/PM_{10}/PM_{2.5}$, except that the IMO Tier II standards for the emergency generator engine do not include $PM/PM_{10}/PM_{2.5}$ emissions In addition, BACT reduction of $PM/PM_{10}/PM_2$ also includes use of ULSD.

**Pump Engines and Third Party Engines**: The BACT determination in Section 6.1.1 is also applicable for $PM/PM_{10}/PM_{2.5}$. In addition, BACT for reduction of $PM/PM_{10}/PM_2$ also includes use of ULSD.

**Table 6-3: $PM/PM_{10}/PM_{2.5}$ BACT Conclusions**

| Emissions Unit ID | BACT Control Technologies and $PM/PM_{10}/PM_{2.5}$ BACT Limits* |
|---|---|
| Main Diesel Generator Engines (DR-ME-01 thru DR-ME-06) | 40 CFR part 60, subpart IIII Standards, LNE Design (Including Turbocharger and Aftercoolers, and High Injection Pressure), ULSD, and Good Combustion Practices; $PM/PM_{10}/PM_{2.5}$ limit: 3.5 lb/hr and 0.17 g/kW-hr for loads above 90%. |
| Emergency Generator Engine (DR-GE-01) | LNE Design (Including Turbocharger and Aftercoolers, and High Injection Pressure), ULSD, and good combustion practices |
| Emergency Air Compressor Engine (DR-AC-01) | ULSD, and Good Combustion Practices |
| Third Party Engines (DR-TP-01 through DR-TP-11 and DR-TP-17 through DR-TP-21) | 40 CFR part 89/1039 EPA Tier 2 Standards, ULSD, and Good Combustion Practices |
| Third Party Well Evaluation Engines (DR-TP-12 through DR-TP-16) | ULSD and Good Combustion Practices |
| Stimulation Vessel Pump Engines (SV-PE-01 thru SV-PE-08) | ULSD and Good Combustion Practices |

*Short-term limits are based on a 24-hour rolling average.

### *6.1.4 GHG BACT Analysis for Internal Combustion Engines*

The majority of GHG emissions from the diesel internal combustion engines are in the form of carbon dioxide ($CO_2$). $CO_2$ is formed in the combustion chamber as a result of complete combustion of diesel when the carbon in the fuel is converted to $CO_2$.

Select BACT

The EPA determined BACT for the diesel engines on the *Noble Bob Douglas* and for the pump engines on the stimulation vessel as discussed below and summarized in Table 6-4. The respective emission limits are based on 40 CFR 98 Subpart C.

**Main Engines:** The EPA proposes two limits for GHG emissions dependent on the engine load and based on the stack test data submitted to EPA on July 15, 2014, and methodology outlined in a letter to EPA dated January 29, 2015. The EPA proposes an emission limit of 860 g/kW-hr of $CO_2e$ when the engines are operating at or above 50% load. This limit is based on the stack test data from the engines (DR-ME-01 through DR-ME-06) The EPA proposes a GHG limit of 7,400 lb/hr when these engines operate at less than 50% load, based on the linear interpolation of stack test data from 40% to 60% load at 4,000 kW output. Emission limits for engines operating above 50% were set in g/kW-hr, while those below 50% were set in lb/hr. The lb/hr emission limit better reflects the fuel usage of the engines while operating at low loads.

Given the significant load variations required by the operations on the drillship and the information provided by the applicant and vendor, the EPA has determined an averaging period of 24 hours on a rolling basis is appropriate in this case. BACT will include good combustion practices to optimize energy efficiency and operating in accordance with the manufacturer's specifications and LNE design.

**Emergency Generator Engine and Emergency Air Compressor Engine:** The BACT determination in Section 6.1.1 is also applicable for GHGs, except that the IMO Tier II standards for the emergency generator engine do not include GHG emissions.

**Pump Engines and Third Party Engines**: The BACT determination in Section 6.1.1 is also applicable for GHGs, except that the EPA Tier II standards do not include GHG emissions.

**Table 6-4: GHG BACT Conclusions**

| **Emissions Unit ID** | **BACT Control Technologies and $CO_2e$ Limits*** |
|---|---|
| Main Diesel Generator Engines (DR-ME-01 thru DR-ME-06) | LNE Design (Including Turbocharger and Aftercoolers, High Injection Pressure), Optimized supercharger with Miller Cycle, and Good Combustion Practices; $CO_2e$ limit for loads at or above 50%: 860 g/kW-hr; $CO_2e$ limit for loads below 50%: 7,400 lb/hr |
| Emergency Generator Engine (DR-GE-01) | LNE Design (Including Turbocharger and Aftercoolers, and High Injection Pressure) and Good Combustion Practices |
| Emergency Air Compressor Engine (DR-AC-01) | Good Combustion Practices |
| Third Party Engines (DR-TP-01 through DR-TP-11 and DR-TP-17 through DR-TP-21) | Good Combustion Practices |
| Third Party Well Evaluation Engines (DR-TP-12 through DR-TP-16) | Good Combustion Practices |
| Stimulation Vessel Pump Engines (SV-PE-01 thru SV-PE-08) | Good Combustion Practices |

*Short-term limits are based on a 24-hour rolling average.

## 6.2 BACT Analysis for Third Party Flowback Boiler

The *Noble Bob Douglas* will operate a small 8 MMBtu/hr diesel fired flowback boiler (DR-TP-22) during well completion activities. The boiler is subject to BACT review for emissions of $NO_x$, CO, VOC, $PM/PM_{10}/PM_{2.5}$, and GHGs.

The applicant plans to operate the flowback boiler up to 2,016 MMBtu/yr, which is equivalent to 14,400 gallons of fuel consumed per year. Given the limited use of this emission unit, the EPA has determined that BACT is more appropriately implemented as work practice standards

including good combustion practices based on the most recent manufacturer's specifications issued for this boiler at the time that the boiler is operating under this permit and use of ULSD.

### 6.3 BACT Analysis for Boom Flare

The *Noble Bob Douglas* will operate a boom flare (DR-TP-23) subject to BACT review for emissions of $NO_x$, CO, VOC, $PM/PM_{10}/PM_{2.5}$ and GHGs. The boom supports the flare system and the associated piping. The boom primarily reduces heat radiation by locating flames far away from the drillship and personnel. The boom flare will be leased from a third party vendor. Pilot gas assistance is not necessary for certain types of boom flares. If the boom flare leased from the vendor requires pilot gas assistance, the emissions resulting from pilot gas assistance will be negligible. The flaring operation will take place primarily during the well completion operations, and not during drilling.

In addition to the control technologies listed in the application and supplemental material, the EPA further identified use of a flare tip as an available control that is also referenced in our administrative record (see Section 9.0). Flare tips provide enhanced mixing by promoting an adequate air supply for efficient combustion. The type of flare tips available range depending on the fuel stream (*i.e.,* steam-assisted, air-assisted, pressure-assisted, or non-assisted). The type of fuel and the pressure of the stream dictate which flare tip is appropriate. Since Anadarko will conduct an exploratory drilling project, the type of fuel and the amount of gas in the well are unknown. Therefore, this project cannot use a specified flare tip because the amount and pressure of the fuel cannot be determined beforehand and may vary during the project.

Based on a review of the available control technologies, the EPA has determined that BACT for $NO_x$, CO, VOC, $PM/PM_{10}/PM_{2.5,}$ and GHG emissions is more appropriately implemented as work practice standards including maintaining compliance with 40 CFR 60.18, use of good combustion practices, and proper flare maintenance.

### 6.4 BACT Analysis for Storage Tanks

The *Noble Bob Douglas*, the supply boat, and the anchor handling boat have various types of storage tanks subject to BACT review for VOC emissions. The tank loading emissions for the supply boat and anchor handling boat qualify as regulated stationary source activities. Onboard the *Noble Bob Douglas* there are diesel fuel, helicopter fuel, and condensate storage tanks. The following tanks on the *Noble Bob Douglas* are included in this analysis: DR-FT-01 through -13 (diesel fuel storage tanks); DR-FT-14 and DR-FT-15 (helicopter fuel storage tanks); and DR-TP-24 through -26 (condensate tanks used for well completion activates). The tanks on the supply boat are SB-DT-01 through -15 (diesel fuel storage tanks). The tanks on the anchor handling boat are AB-DT-01 through -19 (diesel fuel storage tanks). The fuel in these tanks will generate VOC emissions resulting from both breathing and working (*i.e.,* loading) losses.

Based on a review of the available control technologies, the EPA has determined that BACT is use of good maintenance practices. This will limit tank leakage and excessive VOC emissions. The amount of VOC emissions emitted from the tanks is contingent upon both the fuel type and the amount of fuel. Therefore, the applicant will maintain records of the tank identification, the

dimensions of each tank, the fuel type or condensate stored, and capacities of units DR-FT-01 through DR-FT-15 and DR-TP-24 through DR-TP-26. For the *Noble Bob Douglas*, EPA has determined that the fuel tanks DR-DT-01 through -15 (diesel fuel and helicopter storage tanks) will have a VOC BACT limit of 0.53 tons per year and that the condensate tanks DR-TP-24 through -26 will have a VOC BACT limit of 10.04 tons per year. The EPA has determined that the diesel fuel storage tanks (SB-DT-01 through -15) on the supply boat will have a VOC BACT limit of 0.11 tons per year and that the diesel fuel storage tanks (AB-DT-01 through -19) on the anchor handling boat will have a VOC BACT limit of 0.14 tons per year. All of these emissions limits are on a 12-month rolling total basis. These emission limits reflect the modeling results from EPA's TANKS 4.0.9d program found in the October 2013 application.

### 6.5 BACT Analysis for Cement and Mud Mixing Operations

The *Noble Bob Douglas* has cement and mud mixing operations (DR-DC-01 through DR-DC-04) subject to BACT review for emissions of PM/$PM_{10}$/$PM_{2.5}$.The proposed dust collectors are cyclones that capture particulate matter and function as a control technology.

Based on a review of the available control technologies, the EPA has determined that BACT is more appropriately implemented as work practice standards including the use of dust collectors with proper maintenance and operation in accordance with the most recent manufacturer's specifications at the time that these dust collectors are operating under this permit. DR-DC-01 through DR-DC-04 are not closed systems and no pressure reading can be taken. Therefore, Anadarko will ensure that the dust collector bin is not over capacity, and report any times where there is a high-level alarm at which time the operator will investigate the cause and take corrective action.

### 6.6 BACT Analysis for Mud Degassing

The *Noble Bob Douglas* has mud degassing operations (DR-VG-01 through DR-VG-03) subject to BACT review for emissions of VOCs and GHGs. The mud degassers will vent through two control technologies. The vents are equipped with a vacuum degasser that will operate during normal operations.

Based on a review of the available control technologies, the EPA has determined that BACT for VOC and GHG emissions from mud degassing is proper maintenance and operation of the mud degassing operations units in accordance with the most recent manufacturer's specifications at the time that these degassers are operating under this permit. The EPA has determined the mud degassing operations will have a VOC BACT limit of 8.03 TPY combined on a 12-month rolling total basis. The EPA has determined the mud degassing operations will have a GHG BACT limit of 407 TPY of $CO_2e$ combined on a 12-month rolling total basis, based on the *Year 2005 Gulfwide Emission Inventory Study*, U.S. Department of Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, December 2007, referenced in Appendix B of the October 2013 application.

## 6.7 BACT Analysis for Painting Operations

The *Noble Bob Douglas* has painting operations (DR-PO-01) subject to BACT review for emissions of VOC and PM/$PM_{10}$/$PM_{2.5.}$

An airless spray gun is used to paint large deck areas or bulkheads and an air assisted spray gun is used to paint smaller areas (*e.g.*, piping, brackets, and other multi-angle items).

The VOC contents of a coating dictate the preferred application area and the method of operation. Low VOC paints tend to be very thick, which makes it difficult to apply to small areas. These paints are more appropriate for use in large areas.

Based on a review of the available control technologies, the EPA has determined that BACT for VOC and PM/$PM_{10}$/$PM_{2.5}$ emissions from painting is best management practices that include, but are not limited to, down spraying of paint and use of a containment system such as a shroud or a barrier around the section of the ship being painted, whenever practical, to prevent the airborne particulate matter from drifting into the atmosphere, and proper storage of coatings and thinners in non-leaking containers. The EPA has determined the painting operations will have an operating limit of 7,800 and 1,950 gallons per calendar year of primer and thinner, respectively, and Anadarko will use an airless spray gun with transfer efficiency of 50% or greater; where it is not practical to use an airless spray gun, the permittee may use an air assisted spray gun with a transfer efficiency of 30% or greater. The limits on the total gallons per year that Anadarko will use are based on their estimated annual usage.

## 6.8 BACT Analysis for Welding Operations

The *Noble Bob Douglas* has welding operations (DR-WO-01) subject to BACT review for emissions of PM/$PM_{10}$/$PM_{2.5}$.

Based on a review of the available control technologies, the EPA has determined that BACT is a work practice standard including requiring Anadarko to follow current manufacturer's recommendations for all equipment used in welding operations at the time that that welding occurs under this permit, including but not limited to, recommendations regarding voltage levels. This will limit excess PM/$PM_{10}$/$PM_{2.5}$ emissions. The applicant will maintain records of the types and amounts (in pounds) of welding rods used annually.

## 6.9 BACT Analysis for Fugitive Emissions

The applicant identified their best management and fuel loading practices in their December 4, 2013, supplemental material submittal. The EPA has determined that BACT is work practice standard including good maintenance practices to minimize fugitive emissions, including but not limited to minimizing the release of emissions from valves, pump seals, connectors, and following the best management practices for bunkering fuel oil. The permittee will perform a daily check to ensure that there are no leaks, and will take corrective action if leaks are found. The permittee will also report any leaks and the corrective action taken.

# 7.0 Summary of Applicable Air Quality Impact Analyses

## 7.1 Required Analyses

The PSD permitting regulations for proposed major new sources generally require applicants to perform an air quality impact analysis for those pollutants that the project emits in significant quantities, as discussed in Sections 4.0 and 5.0 and provided in Table 4-1. However, the PSD regulations also provide that certain provisions of the analysis are not required for temporary sources that meet specific conditions. The PSD regulations at 40 CFR § 52.21(i)(3) do not require temporary sources to perform National Ambient Air Quality Standards (NAAQS) and PSD increment analyses (*See* 40 CFR § 52.21(k)), preconstruction and post-construction monitoring (*See* 40 CFR § 52.21(m)), and additional impact analysis (*See* 40 CFR § 52.21(o)) if the allowable emissions of the subject pollutant from the source would impact no Class I area and no area where the applicable increment is known to be violated. EPA considers sources operating for less than two years in a given location to be temporary sources for PSD permitting purposes. *See* Amended Regulations for Prevention of Significant Deterioration of Air Quality, 45 Fed. Reg. 52676, 52719, 52728 (August 7, 1980).

For sources impacting Federal Class I areas, 40 CFR § 52.21(p) requires EPA to consider any demonstration by the Federal Land Manager that emissions from the proposed source would have an adverse impact on air quality related values, including visibility impairment. If EPA concurs with the demonstration, the rules require that EPA shall not issue the PSD permit.

The maximum allowable PSD increments are listed in 40 CFR § 52.21(c), and those used for this review are given in Table 7-1 below. There are no increments for ozone. There are PSD Class I, II, and III increments applicable to areas designated Class I, II, and III, respectively. Class I areas are defined in 40 CFR § 52.21(e). Mandatory Class I areas (which may not be redesignated to Class II or III) are international parks, national wilderness areas larger than 5,000 acres, memorial parks larger than 5,000 acres, and national parks larger than 6,000 acres. There are currently no areas designated Class III.

**Table 7-1 Ambient Air Quality Concentration Values**
**(Amended to show only project PSD pollutants)**

| Pollutant and Averaging Period | | National Ambient Air Quality Standards *(µg/m³ (ppm))* | | PSD Increments *(µg/m³)* | | PSD Significant Impact Levels *(µg/m³)* | | PSD *De Minimis* Impact Levels *(µg/m³)* |
|---|---|---|---|---|---|---|---|---|
| | | **Primary** | **Secondary** | **Class I** | **Class II** | **Class I** | **Class II** | |
| Particulate Matter ($PM_{10}$) | *24-hr* | 150 | 150 | 8[a] | 30[a] | 0.3 | 5 | 10 |
| | *Annual* | None | None | 4 | 17 | 0.2 | 1 | |
| Particulate Matter ($PM_{2.5}$) | *24-hr* | 35[c] | 35[c] | 2[a] | 9[a] | 0.07[i] | 1.2[i] | 4 |
| | *Annual* | 12[d] | 15[d] | 1 | 4 | 0.06[i] | 0.3[i] | |
| Carbon Monoxide | *1-hr* | 40,000 (35)[a] | None | | | | 2000 | |
| | *8-hr* | 10,000 (9)[a] | None | | | | 500 | 575 |
| Ozone | *8-hr (2008)* | (0.075) | . (0.075) | | | | | |
| | *8-hr (2015)* | (0.070)[e] | .(0.070)[e] | | | | | 100[f] |
| Nitrogen Dioxide | *1-hr* | 188[g, h] (0.100) | None | | | | 7.55[h](0.004)[b] | |
| | *Annual* | 100 (0.053) | 100 (0.053) | 2.5 | 25 | 0.1 | 1 | 14 |

Notes:
a – Not to exceed more than once a year.
b – Recommended interim SIL
c – Achieved when the average of the annual 98th percentile 24-hour concentration averaged over the years modeled is less than or equal to the standard.
d – Achieved when the average of the annual mean concentration over the number of years modeled is less than or equal to the standard.
e – Achieved when the average of the annual fourth-highest daily maximum 8-hour average concentrations is less than or equal to the standard.
f – Measured in tons/year of volatile organic compounds.
g – Achieved when the 98th percentile of the annual distribution of the daily maximum 1-hour average concentrations averaged over the number of years modeled is less than or equal to the standard.
h – Values in ug/m³ are estimates. These may change when values and/or ppm to µg/m³ conversion procedures are provided by the EPA.
i –These SILs were remanded and vacated in *Sierra Club v. EPA*, 705 F.3d 458 (D.C. Cir. 2013). See section 7.4.5, below, for further discussion.

## 7.2 Qualification as a Temporary Source

Anadarko has requested an air quality permit for approximately 300 calendar days per year of potential exploratory drilling, well completion, and production maintenance activity conducted over a period of two years. The proposed activity will be in OCS waters in the Eastern Gulf of Mexico east of longitude 87.5 degrees and west of the Military Mission Line (86.88 degrees longitude) at distances of at least 100 miles from any shore. Since the project will operate for no more than two years, the project is considered a temporary source under the applicable PSD regulations. Therefore, the following sections address the impact related criteria for temporary sources in 40 CFR § 52.21(i)(3).

## 7.3 Area of Known PSD Increment Violation

The impact-related criteria that must be met for a temporary source under 40 CFR § 52.21(i)(3) require that the project emissions must not impact any PSD Class I area nor any area where the

applicable increment is known to be violated. The wedge of available lease blocks (Figure 2-1) for the proposed exploratory drilling activity is located in the Eastern Gulf of Mexico approximately 100 miles (160.9 km) from the Louisiana shoreline and 125 miles (201.1 km) from the Florida shoreline. There are no known areas in the Eastern Gulf of Mexico violating the $NO_2$ or particulate matter ($PM_{10}$, $PM_{2.5}$) PSD increments. Therefore, the proposed project's emissions will not impact any area where applicable increments are known to be violated. Nor, based on the analysis discussed below, does EPA believe the project's emissions will significantly impact any onshore areas.

### 7.4 PSD Class I Areas Impact Analyses

The nearest PSD Class I area to the lease block wedge is Breton National Wildlife Refuge (NWR) located on the southeast coast of Louisiana, approximately 167 km from the nearest proposed drilling site. St. Marks NWR and Bradwell Bay Wilderness located in Florida, two other PSD Class I areas within a 300 km radius of the proposed drilling sites, are located approximately 285 km and 281 km, respectively, from the nearest potential lease block. Anadarko evaluated the project's potential impacts to these three areas by assessing the impact to air quality related parameters of concern at PSD Class I areas: Air Quality Related Values (AQRV) (*e.g.,* visibility and nitrogen and sulfur deposition) and PSD increments. The Federal Land Managers for these PSD Class I areas (U.S. Fish & Wildlife Service and Forest Service) have an affirmative responsibility to protect the AQRV.

#### 7.4.1 Model Selection and Class I Area Modeling Procedures

The EPA-preferred model for long-range transport assessments, CALPUFF Version 5.8, was used to evaluate potential AQRV and PSD increment impacts at the three PSD Class I areas within 300 km of the potential lease block locations. The other components of the CALPUFF system used in the impact assessment were CALMET Version 5.8 and CALPOST Version 5.6394 or Version 6.221.

The recommendations of the Interagency Workgroup on Air Quality Modeling and the Federal Land Manager Air Quality Related Values Workgroup and guidance provided in the following documents were used in defining the models and methods used in the PSD Class I impact assessments: Guideline on Air Quality Models (40 CFR Part 51, Appendix W), EPA Guidance for Estimating Natural Visibility Conditions under the Regional Haze Rule, and EPA Regional Haze Regulations and Guidelines for Best Available Retrofit Technology (BART) Determinations.

The CALPUFF modeling options used in the AQRV impact assessment were the default options recommended by Federal Land Managers Air Quality Related Workgroup Phase I Report (Revised June 2008). With the EPA default options, this model is also an appropriate regulatory model (*i.e.,* a model approved under 40 CFR part 51, Appendix W) to estimate the impact of the project emissions on the PSD Class I areas.

The CALPUFF modeling assessment used the operational maximum emissions, as described below, from the drilling vessel and support vessels. Because the ambient PSD increments and AQRV of concern have averaging periods of 24-hours or greater, the maximum emissions were

those associated with these periods. The emission rates for the most significant sources of pollutants modeled (*e.g.*, internal combustion engines for the *Noble Bob Douglas* and support vessels) were based on the worst-case emission scenario in terms of potential to emit and air quality impact for the three phases associated with this permit – the drilling, well completion, and well maintenance phases. Modeling with the worst-case conditions for these permitted phases gives Anadarko the flexibility to operate at any location within the worst-case lease block or any other lease block location further from the Class I areas.

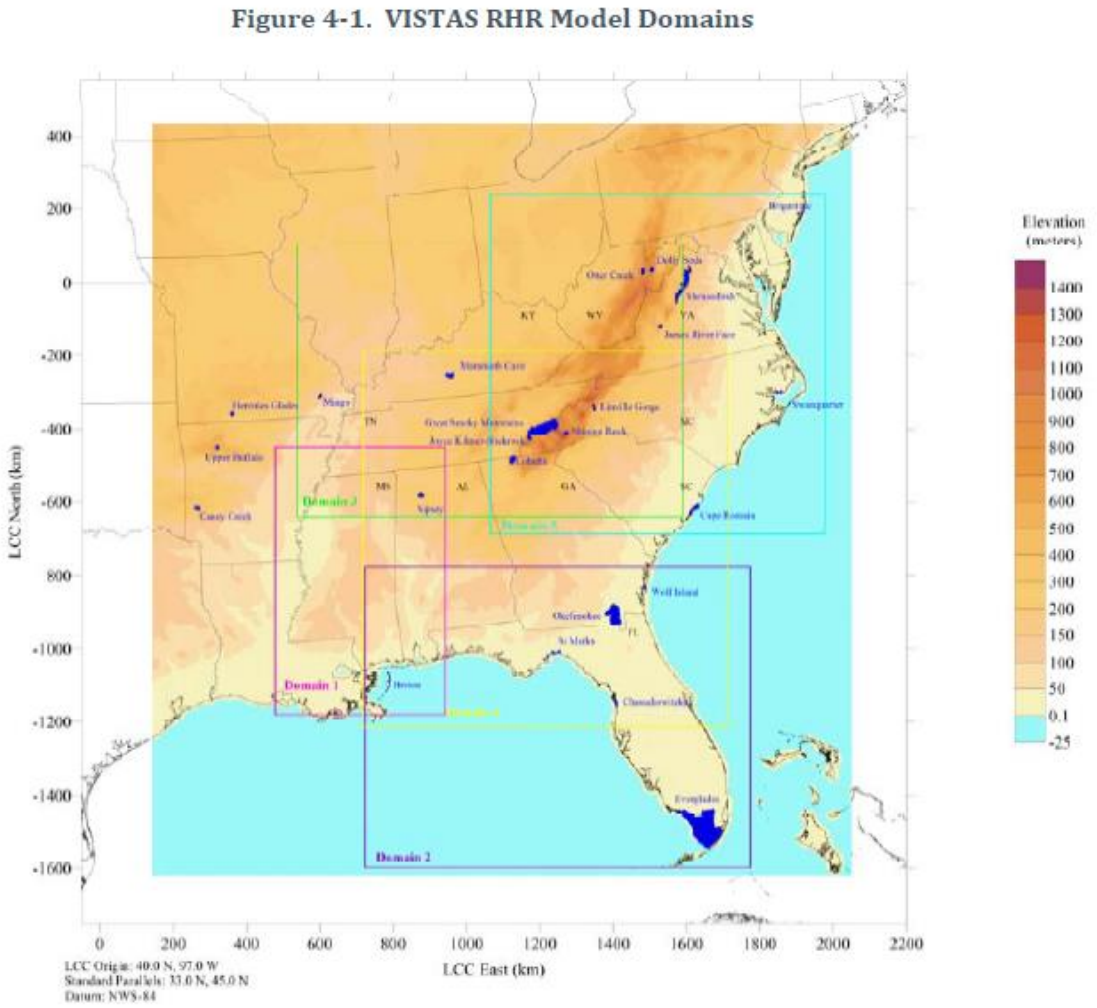
The worst-case project emissions and location for the drilling vessel were modeled with the support vessels. For Breton NWR, the northwest corner of the Desoto Canyon lease block 141 was the closest worst-case location. For St. Marks NWR and Bradwell Bay Wilderness, the northeast corner of Desoto Canyon lease block 149 was the closest worst-case location. The modeling assumed that all emissions would be emitted through a single stack associated with the main drillship engines, the largest source of emissions for the proposed operations. All $NO_x$ emissions for the three operational phases were conservatively assumed to be 100 percent $NO_2$. The stack exit parameters used were based on typical operating load using a formula provided by the engine manufacturer. Because of the proximity of the emission sources on the drillship compared to the long travel distances to the PSD Class I areas, and the use of the stack with the largest emissions, the modeling results should provide acceptable estimates of PSD Class I area impacts.

The support vessels include a combination of work and/or crew boats, well evaluation vessels, well stimulation vessels, tug boats and barges, and an anchor handling boat that will be used to transport personnel, supplies, and fuels to the drillship. Because the support vessels will be used interchangeably based on availability, the potential hourly, daily, and annual emissions were estimated for the worst-case boats and used in the modeling to conservatively account for the worst-case support vessels available. The modeling considered the support vessels docked at the drillship and while en route to/from the drillship, when within 25 miles of the worst-case drillship location.

### 7.4.2 Meteorological Data

The three-year meteorological dataset (2001-2003) developed by the Visibility Improvement State and Tribal Association of the Southeast (VISTAS) was used for the PSD Class I impact assessment. This dataset covers the Gulf of Mexico region of interest in five sub-domains. These meteorological data were processed using the regulatory version of CALMET (Version 5.8). The dataset was developed using observations from 100 to 109 surface stations, 10 upper air stations, 9 overwater stations, and 92 to 103 precipitation stations, depending on the meteorological year. The sub-domain 2 was used for this assessment. Figure 7-1 displays the region of interest, the location of the proposed Anadarko site, and the VISTAS sub-domain 2.

**Figure 7-1 VISTAS Regional Haze Rule Modeling Domains**
**(Anadarko: Air Quality Modeling Analysis Report: Figure 4-1)**




### 7.4.3 Model Outputs

The CALPUFF-estimated hourly concentrations were averaged for comparison with the annual and 24-hour $PM_{10}/PM_{2.5}$ and annual $NO_2$ Class I PSD significant impact levels (SIL and increments. Extinction coefficients for 24-hour daily periods and annual total deposition fluxes were estimated. The highest estimated values for the 3-year period were used in comparisons with the significant impact levels and the Federal Land Manager Deposition Analysis Thresholds (DAT). For the visibility assessment, the 98$^{th}$ percentile modeled changes in extinction from vessel emissions (*i.e.*, CALPOST Method 8) were compared to the Federal Land Manager target value that is associated with the just-perceptible change in visibility.

### 7.4.4 Atmospheric Chemistry

The CALPUFF chemistry transformations depend on the ambient ammonia and ozone concentrations. Because of the low ammonia background concentration expected over the Gulf of Mexico, the Federal Land Manager requested value of three parts per billion was used. The modeling used the ozone background concentrations for the 2001-2003 modeled years from the monitor in Sumatra, Florida, due to its proximity to the modeling domain.

### 7.4.5 Modeling Results

The maximum Class I area estimated impacts of $NO_2$ and $PM_{10}/PM_{2.5}$ from the proposed exploratory drilling, well completion, and well maintenance emissions are provided in Table 7-2. This table includes the modeled impacts at the closest Class I area of Breton NWR and the maximum impacts for the more distant St. Marks NWR and Bradwell Bay Wilderness areas. . This table shows the maximum modeled concentrations associated with the proposed three-phased project emissions are much less than the PSD Class I SILs. Therefore, the project is not considered to have impacts on the PSD Class I area.

The January 22, 2013 decision by the United States Court of Appeals for the District of Columbia Circuit (D.C. Circuit) concerning the use of the $PM_{2.5}$ SILs must be considered in this assessment. *See Sierra Club v. EPA,* 705 F.3d 458 (D.C. Cir. 2013). The court indicated the $PM_{2.5}$ SIL alone cannot be used to determine if a project's impact would cause or contribute to a NAAQS or PSD increment exceedance. However, the use of the $PM_{2.5}$ SIL in this application is to determine whether the project's emissions will have a significant impact to PSD Class I areas within 300 km of the project location. The use of the $PM_{2.5}$ SIL as an indication of a significant impact on a Class I area was not the basis for the court's $PM_{2.5}$ SIL vacatur. Given this fact, the previous use of the $PM_{2.5}$ SIL as a significant impact indicator, and the lack of any other objective concentration metric, its use as a concentration considered small enough to qualify a project for the temporary source exemption (i.e., no impact to Class I areas) appears appropriate. The fact that the maximum modeled project impacts are smaller than the Class I SIL (*i.e.,* the Table 7-2 maximum project impacts are 92.6% of the 24-hour and 6.8% of the annual $PM_{2.5}$ SIL) supports the conclusion that the project impacts are insignificant at all PSD Class I areas of concern.

The CALPUFF estimates of deposition of acid-forming compounds from the project's maximum emissions are provided in Table 7-3. This table includes the modeled impacts at the closest Class I area of Breton NWR and the maximum impacts for the more distant St. Marks NWR and Bradwell Bay Wilderness areas modeled together. The Federal Land Manager accepted DAT established for areas east of the Mississippi is also provided. The DAT is defined as the additional amount of nitrogen or sulfur deposition within a PSD Class I area below which estimated project impacts are considered negligible. *See* Federal Land Manager's Air Quality Related Values Workgroup, Phase I Report (Revised June 2008). The estimated project deposition rates are much less than the DAT and, therefore, are considered negligible.

**Table 7-2 Class I Area Project Impacts**

| Class I Area | Parameter | Class I Area Modeling Significance Level (µg/m$^3$) | Meteorological Data Year | | |
|---|---|---|---|---|---|
| | | | 2001 (µg/m$^3$) | 2002 (µg/m$^3$) | 2003 (µg/m$^3$) |
| Breton NWR | $NO_2$ - Annual | 0.1 | 0.0163 | 0.0288 | 0.0268 |
| | $PM_{2.5}$ - 24 hour | 0.07 | 0.0648 | 0.0361 | 0.0636 |
| | $PM_{2.5}$ - Annual | 0.06 | 0.0021 | 0.0033 | 0.0041 |
| | $PM_{10}$ - 24 hour | 0.32 | 0.0749 | 0.0417 | 0.0735 |
| | $PM_{10}$ - Annual | 0.16 | 0.0024 | 0.0038 | 0.0047 |
| St. Marks NWR and Bradwell Bay Wilderness* | $NO_2$ - Annual | 0.1 | 0.0027 | 0.0014 | 0.0024 |
| | $PM_{2.5}$ - 24 hour | 0.07 | 0.0127 | 0.0201 | 0.0126 |
| | $PM_{2.5}$ - Annual | 0.06 | 0.0007 | 0.0005 | 0.0006 |
| | $PM_{10}$ - 24 hour | 0.32 | 0.0147 | 0.0232 | 0.0146 |
| | $PM_{10}$ - Annual | 0.16 | 0.0008 | 0.0006 | 0.0007 |

* St. Marks NWR and Bradwell Bay Wilderness were modeled together by including all receptors from both of these Class I areas. Therefore, the concentrations provided are the highest for both Class I areas considered together

**Table 7-3 Estimated Class I Area Deposition Fluxes**

| Class I Area | Parameter | Class I DAT Values (Kg/ha/yr) | Year | | |
|---|---|---|---|---|---|
| | | | 2001 (Kg/ha/yr) | 2002 (Kg/ha/yr) | 2003 (Kg/ha/yr) |
| Breton NWR | Nitrogen | 0.01 | 0.0035 | 0.0064 | 0.0078 |
| | Sulfur | 0.005 | 0.00005 | 0.0001 | 0.0001 |
| St. Marks NWR and Bradwell Bay Wilderness* | Nitrogen | 0.01 | 0.00201 | 0.00271 | 0.00318 |
| | Sulfur | 0.005 | 1.36E-05 | 1.92E-05 | 1.94E-05 |

* St. Marks NWR and Bradwell Bay Wilderness were modeled together by including all receptors from both of these Class I areas. Therefore, the concentrations provided are the highest for both Class I areas considered together

The visibility parameter of concern at Breton NWR is regional haze. The project's contribution to regional haze is addressed as the 24-hour change in light extinction. The Federal Land Manager considers a five percent change in extinction to be just perceptible. Federal Land Manager-accepted procedures were used to provide estimates of the change in extinction

associated with project emissions. The CALPUFF post-processor (CALPOST) performs the updated approved Method 8 employing the IMPROVE extinction equation using monthly relative humidity adjustment factors, annual background aerosol concentrations, and 98$^{th}$ percentile modeled values at each receptor.

The Method 8 estimates of project associated changes in visibility extinction provide information for the evaluation of the visibility impacts. On a daily basis, the project's drilling and well completion/maintenance emissions resulted in one day exceeding 0.5 deciview (*i.e.*, approximately a five percent change in light extinction. Table 7-4 provides summaries of the results of the Method 8 modeling analyses. The Breton NWR impacts would be larger than those for the more distant St. Marks NWR and Bradwell Bay Wilderness locations. This table reveals the Method 8 98$^{th}$ percentile values for project drilling and well completion/maintenance emissions have one value in 2001 at Breton NWR greater than the target five percent change in extinction.

Although the modeled visibility impact exceeds the recommended threshold, the Breton NWR Federal Land Manager did not object to the permit application because of the temporary nature of the activity and the conservatism built into the emissions calculations. Based on the provided analyses, the Breton NWR Federal Land Manager indicated they anticipated the project will not add any significant impacts to Breton NWR.

**Table 7-4 Method 8 - 98th Percentile Extinction Change for Proposed Operations**

| Class I Area | Parameter | | Year | | |
|---|---|---|---|---|---|
| | | | 2001 | 2002 | 2003 |
| Breton NWR | Method 8 | 98th Percentile 24-hr Average Extinction Change % | 5.18% | 3.84% | 4.37% |
| | | No. of Days > 5 % Extinction Change Threshold | 1 | 0 | 0 |
| | | No. of Days > 10 % Extinction Change Threshold | 0 | 0 | 0 |
| St. Marks NWR and Bradwell Bay Wilderness* | Method 8 | 98th Percentile 24-hr Average Extinction Change % | 1.12% | 0.84% | 1.19% |
| | | No. of Days > 5 % Extinction Change Threshold | 0 | 0 | 0 |
| | | No. of Days > 10 % Extinction Change Threshold | 0 | 0 | 0 |

* St. Marks NWR and Bradwell Bay Wilderness were modeled together by including all receptors from both of these Class I areas. Therefore, the concentrations provided are the highest for both Class I areas considered together.

### 7.5 Conclusions

Because the draft permit limits Anadarko's exploratory drilling and well completion and maintenance operations in the Desoto Canyon lease blocks to no more than two years, the project qualifies as a temporary emission source for purposes of PSD permitting. The CALPUFF project impact modeling for the PSD Class I areas within 300 km of the project's location show maximum impacts less than the PSD Class I area significant impact levels for all proposed project PSD pollutants. The AQRV impact assessment of sulfur and nitrogen deposition results in maximum impacts that are less than the Federal Land Manager Deposition Analysis Thresholds. Finally, the project's estimated impact on Class I area visibility had one value at Breton NWR greater than the Federal Land Manager's acceptable perceptibility level of 0.5 deciviews (i.e., 5 percent extinction change). Although the modeled visibility impact exceeds the recommended threshold based on a worst-case scenario, the Breton NWR Federal Land Manager did not object to the permit application because of the temporary nature of the activity and the conservative assumptions built into the emissions calculations. Based on these considerations, the proposed project's drilling and well completion/maintenance activities are not expected to significantly impact the nearest PSD Class I area of Breton NWR nor any more distant PSD Class I areas.

# 8.0 Additional Requirements

### 8.1 Endangered Species Act and Essential Fish Habitat of Magnuson-Stevens Act

Section 7(a)(2) of the Endangered Species Act (ESA) requires federal agencies, in consultation with the National Oceanic and Atmospheric Administration (NOAA) Fisheries Service and/or the U.S. Fish and Wildlife Service (collectively, "the Services"), to ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of a species listed as threatened or endangered, or result in the destruction or adverse modification of designated critical habitat of such species. See 16 U.S.C. §1536(a)(2); see also 50 CFR §§ 402.13 and 402.14. The federal agency is also required to confer with the Services on any action which is likely to jeopardize the continued existence of a species proposed for listing as threatened or endangered or which will result in the destruction or adverse modification of critical habitat proposed to be designated for such species. See 16 U.S.C. § 1536(a)(4); see also 50 CFR §§ 402.10. Further, the ESA regulations provide that where more than one federal agency is involved in an action, the consultation requirements may be fulfilled by a designated lead agency on behalf of itself and the other involved agencies. See 50 CFR §§ 402.07. In addition, Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires federal agencies to consult with NOAA with respect to any action authorized, funded, or undertaken by the agency that may adversely affect any essential fish habitat identified under the MSA.

The Bureau of Ocean Energy Management (BOEM) of the DOI is the lead federal agency for authorizing oil and gas exploration activities on the OCS. Therefore, BOEM serves as the Lead Agency for ESA section 7 and MSA compliance for Anadarko's exploration activities. In accordance with section 7 of the ESA, BOEM consults prior to a lease sale with NOAA Fisheries and FWS to ensure that a sale proposal will not cause any protected species to be jeopardized by oil and gas activities on a lease. Since the BOEM consultations address the same exploratory

drilling activities authorized by the air permit that the EPA is issuing to Anadarko, the EPA relied in part on their conclusions for the preliminary determination. In addition, the EPA is currently participating in the Section 7 ESA consultation with NOAA Fisheries and BOEM related to the preparation of an updated Biological Opinion (BO) for oil and gas activities in the Gulf of Mexico. This project will be subject to the terms and conditions of the revised BO. In addition, a draft BO has been prepared by the FWS for oil and gas activities in the Gulf of Mexico, and this project will be subject to the terms and conditions of the final BO, which will be released later this year.

In addition, EPA Region 4 recently prepared a draft Environmental Assessment for the National Pollutant Discharge Elimination System (NPDES) General Permit for Eastern Gulf of Mexico Offshore Oil and Gas Exploration, Development, and Production (EPA-904-P-16-001, July 2016), which considered impacts on species and marine fisheries for the areas covered by this permit. That analysis is included in the docket for this proposed permit and identifies the NPDES permit conditions that will be required to minimize any potential impacts on endangered or threatened species or critical fish habitat (see Appendix E). EPA's determination was that with these permit conditions in place, species are unlikely to be affected. Based upon the best available data, the EPA has determined that the issuance of this OCS air permit to Anadarko for air emissions from exploratory drilling is not likely to cause any adverse effects on listed species and essential fish habitats beyond those already identified, considered and addressed in the prior and ongoing consultations.

### 8.2 National Historic Preservation Act

Section 106 of the National Historic Preservation Act requires federal agencies to take into account the effects of their undertakings on historic properties. Section 106 requires the lead agency official to ensure that any federally funded, permitted, or licensed undertaking will have no effect on historic properties that are on or may be eligible for the National Register of Historic Places. The BOEM is the lead agency permitting Anadarko's activity in the Gulf of Mexico. The environmental effects of offshore drilling in the Gulf were analyzed by the BOEM in multi-sale Environmental Impact Statements, covering sales in 2007 through 2012, and for 2012 through 2017, accessible on the web at http://www.boem.gov/nepaprocess.

BOEM typically conducts section 106 consultation at the pre-lease stage by prior agreement with the Advisory Counsel for Historic Preservation rather than at the individual post-lease permit level. In order to reach a Finding of No Significant Impact, mitigation is carried out at the post-lease plan level by requiring remote sensing survey of the seafloor in areas considered to have a high probability for archaeological resources. Any cultural resources discovered during that inspection are required by regulation to be reported to BOEM with 72 hours. No significant archaeological properties are anticipated in this location, but should anything be discovered there as a result of the operator's investigations, BOEM would consult with the State Historic Preservation Office and the Advisory Counsel for Historic Preservation.

### 8.3 Executive Order 12898 – Environmental Justice

Executive Order 12898, entitled "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," directs federal agencies, including the EPA, to the

extent practicable and permitted by law, to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of regulatory programs, policies, and activities on minority populations or low-income populations. *See* Executive Order 12898, 59 Fed. Reg. 7629 (February 11, 1994). Consistent with Executive Order 12898 and the EPA's policy on Considering Environmental Justice in Permitting as part of the EPA's Plan EJ2014 (OEJ 09/2011), in making decisions regarding permits, such as OCS permits, the EPA gives appropriate consideration to environmental justice issues on a case-by-case basis, focusing on whether its action would have disproportionately high and adverse human health or environmental effects on minority or low-income populations.

The EPA has concluded that this proposed OCS air permitting action for Anadarko's exploratory drilling operation on the Gulf of Mexico would not have a disproportionately high adverse human health or environmental effects on minority or low-income populations. The closest drill site is located approximately 100 miles southeast of the nearest Louisiana shoreline, and 125 miles south of the nearest Alabama and Florida in the Gulf of Mexico. The project is located more than 100 miles offshore in ultra-deepwater and the EPA is not aware of any minority or low-income population that may frequently use the area for recreational or commercial reasons. In addition, since the project is located well away from land, the project's emissions impacts will be dispersed over a wide area with no elevated concentration levels affecting any onshore populated area. *See* Section 7.0 of this document pertaining to air quality impact for further information.

# 9.0 Public Participation

### 9.1 Opportunity for Public Comment

The EPA must follow the administrative and public participation procedures in 40 CFR part 124 used to issue PSD permits when processing OCS permit applications under Part 55 as well as the administrative and public participation procedures of 40 CFR part 71 when issuing Title V permits to OCS sources. 40 CFR §§ 55.6(a)(3), 71.4(d). Accordingly, the EPA has followed the procedures of 40 CFR parts 71 and 124 in issuing the draft permit. As provided in 40 CFR parts 71 and 124, the EPA is seeking comments on the Anadarko OCS air permit OCS-EPA-R4021 during the public comment period as specified in the public notice.

Any interested person may submit written comments on the draft permit during the public comment period. If you believe that any condition of the permit is inappropriate, you must raise all reasonably ascertainable issues and submit all reasonably available arguments supporting your position by the end of the comment period. Any documents supporting your comments must be included in full and may not be incorporated by reference unless they are already part of the administrative record for this permit or consist of state or federal statutes or regulations, EPA documents of general applicability, or other generally available referenced materials.

Comments should focus on the proposed air quality permit, the permit terms, and the air quality aspects of the project. If you have comments regarding non-air quality impacts, leasing, drilling safety, discharge, or other similar issues not subject to this public comment period, you should submit them during the leasing and plan approval proceedings of the BOEM, which is the lead agency for offshore drilling.

All timely comments related to the proposed action will be considered in making the final decision and will be included in the administrative record and responded to by the EPA. The EPA may summarize the comments and group similar comments together in our response instead of responding to each individual comment.

All comments on the draft permit must be received by email at **R4OCSpermits@epa.gov,** submitted electronically via www.regulations.gov (docket #EPA-R04-OAR-2016-0667), or **postmarked by December 14, 2016**. Comments sent by mail should be addressed to: USEPA Region 4, Air Permits Section, APTMD, 61 Forsyth Street, SW, Atlanta, GA 30303. An extension of the 30-day comment period may be granted if the request for an extension is filed within 30 days and it adequately demonstrates why additional time is required to prepare comments. All comments will be included in the public docket without change and will be made available to the public, including any personal information provided, unless the comment includes Confidential Business Information or other information in which disclosure is restricted by statute. Information that you consider Confidential Business Information or otherwise protected must be clearly identified as such and must not be submitted through e-mail. If you send e-mail directly to the EPA, your email address will be captured automatically and included as part of the public comment. Please note that an e-mail or postal address must be provided with your comments if you wish to receive direct notification of the EPA's final decision regarding the permit and the EPA's response to comments submitted during the public comment period.

For general questions on the draft permit, contact: Ms. Eva Land at 404-562-9103 or land.eva@epa.gov, or Ms. Kelly Fortin at 404-562-9117 or fortin.kelly@epa.gov .

**9.2 Public Hearing**

The EPA will hold a public hearing if the Agency determines that there is a significant degree of public interest in the draft permit. Public hearing requests must be in writing and received by the EPA by **December 2, 2016.** Requests should be sent by email to **R4OCSpermits@epa.gov** or by mail addressed to: USEPA Region 4, Air Permits Section, APTMD, 61 Forsyth Street, SW, Atlanta, GA 30303. Requests for a public hearing must state the nature of the issues proposed to be raised in the hearing. If a public hearing is held, you may submit oral and/or written comments on the draft permit at the hearing. You do not need to attend the public hearing to submit written comments.

If the EPA determines that there is a significant degree of public interest, the EPA will hold a public hearing on December 16, 2016, at: Bay County Public Library, 898 W 11th St, Panama City, FL 32401, (850) 522-2119.

If a public hearing is held, the public comment period will automatically be extended to the close of the public hearing. If no timely request for a public hearing is received, or if the EPA determines that there is not a significant degree of public interest, a hearing will not be held. Such an announcement will be posted on the EPA's website at:

https://www.epa.gov/caa-permitting/draft-ocs-permits-available-public-comment-southeastern-us

or you may call the EPA at the contact number above to verify if the public hearing will be held.

### 9.3 Administrative Record

The administrative record contains the application, supplemental information submitted by Anadarko, correspondence (including e-mails) clarifying various aspects of Anadarko's application, other material used in EPA's decision, and correspondence with other agencies. The administrative record and draft permit are available on www.regulations.gov (docket# EPA-R04-OAR-2016-0667).

These websites can be accessed through free internet services available at local libraries. The draft permit and the administrative record are also available for public review at the EPA Region 4 office at the address listed below. Please call in advance for available viewing times.

**EPA Region 4 Office**
61 Forsyth Street, SW
Atlanta, GA 30303
Phone: (404) 562-9043

To request a copy of the draft permit, preliminary determination, or notice of the final permit action, please contact: Ms. Rosa Yarbrough, Permit Support Specialist at 404-562-9643 or yarbrough.rosa@epa.gov.

### 9.4 Final Determination

The EPA will make a decision to issue a final permit or to deny the application for the permit after the Agency has considered all timely comments on the proposed determination. Notice of the final decision shall be sent to each person who has submitted written comments or requested notice of the final permit decision, provided the EPA has adequate contact information.