S P T
Sea Port Oil Terminal

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January 28, 2019

Federal Express

Ms. Melanie Magee (6PD)
Air Permit Engineer
USEPA Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Subject: Draft Prevention of Significant Deterioration (PSD) Air Permit Application for the Sea Port Oil Terminal (SPOT) Project

Dear Ms. Magee:

SPOT Terminal Services LLC (the Applicant), a subsidiary of Enterprise Products Operating LLC, a Texas limited liability company, is proposing to develop the Sea Port Oil Terminal (SPOT) Project in the Gulf of Mexico to provide U.S. crude oil loading services on very large crude carriers (VLCCs) and other crude oil carriers for export to the global market. During meetings on August 29, 2018, October 11, 2018, and November 26, 2018, SPOT Terminal Services LLC and the USEPA discussed the air permit application process, the status of development of the SPOT Project, and willingness of USEPA Region 6 to provide feedback to the Applicant via interim review of a draft of the air permit application. As a result, this draft PSD air permit application for the offshore portion of the SPOT Project is being submitted for your review.

The enclosed document describes an overview of the SPOT Project, its location, and air quality information. The project-specific air quality information (i.e., equipment specifications, emission rates, etc.) should be considered draft since the Applicant is continuing to advance the design process to develop detailed engineering and equipment specifications. However, this document contains details that more accurately reflect the proposed design and a best available control technology (BACT) analysis, including a greenhouse gas BACT. The potential emissions inventory, along with emission calculations, have been included. The Texas Commission of Environmental Quality (TCEQ) air permit application forms are also included; the forms contain current equipment information but are subject to change. As you are aware, the Applicant has requested the USEPA's approval for use of the AERMOD-COARE model for the ambient impact modeling analysis. The version of the draft air dispersion modeling protocol, as submitted to USEPA Region 6 on October 5, 2018, is included as Appendix I and an Air Quality Modeling Analysis Report based on subsequent discussions is included as Appendix J in this application.

SPOT Terminal Services LLC appreciates the USEPA's review of this draft air permit application as we continue to develop engineering specifications for the offshore facility. If you have any questions about this application, please contact Bradley Cooley at (713) 381-5828 or email at BJCooley@eprod.com.

Sincerely,
SPOT Terminal Services LLC

Chelsea Heath, P.E.
Senior Engineer, Environmental

pranav kulkarni

Bradley Cooley, P.E.
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SPOT
Sea Port Oil Terminal

Sea Port Oil Terminal Project
Offshore Brazoria County, Texas

VOLUME I
APPENDIX F

U.S. ENVIRONMENTAL PROTECTION AGENCY REGION 6
PREVENTION OF SIGNIFICANT DETERIORATION
AIR PERMIT APPLICATION

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ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
°F	degrees Fahrenheit
API	American Petroleum Institute
Applicant	SPOT Terminal Services LLC
AQA	air quality analysis
BACT	best available control technology
bbl/h	barrels per hour
Btu/scf	British thermal units per standard cubic foot
CAA	Clean Air Act
CCS	carbon capture and sequestration
CFR	Code of Federal Regulations
CH_4	methane
CNG	compressed natural gas
CO	carbon monoxide
CO_2e	carbon dioxide equivalents
CO_2	carbon dioxide
DOE	U.S. Department of Energy
DPLA	Deepwater Port License Application
DRE	Destruction Removal Efficiency
DWP	deepwater port
DWPA	Deepwater Port Act of 1974
EOR	enhance oil recovery
EPN	emission point number
ESP	electrostatic precipitator
g/hp-hr	grams per horsepower-hour
g/kW-hr	grams per kilowatt hour
GHG	greenhouse gas
H_2S	hydrogen sulfide
HAP	hazardous air pollutant
HVAC	ventilation and air conditioning
hp	horsepower

hp-hr	horsepower hour
IMO/UN	International Maritime Organization/United Nations
ISO	International Organization for Standardization
kW	kilowatts
LAER	Lowest Achievable Emission Rate
LDAR	leak detection and repair
LNG	liquefied natural gas
LPG	liquefied petroleum gas
MACT	Maximum Achievable Control Technology
MARAD	U.S. Maritime Administration
MMBtu/hr	million British thermal units per hour
MOU	Memorandum of Understanding
MW	megawatt
N_2	nitrogen
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NNSR	Nonattainment New Source Review
NO	nitrogen oxide
NO_2	nitrogen dioxide
NOx	nitrogen oxides
NSCR	non-selective catalytic reduction
NSPS	New Source Performance Standards
NSR	New Source Review
O&M	operations and maintenance
OCSLA	Outer Continental Shelf Lands Act
OCS	Outer Continental Shelf
PLEM	pipeline end manifold
PM	particulate matter
PM_{10}	particulate matter with aerodynamic diameters less than or equal to 10 microns
$PM_{2.5}$	particulate matter with aerodynamic diameters less than or equal to 2.5 microns

ppm	parts per million
ppmw	parts per million by weight
Project	Sea Port Oil Terminal Project
PSD	Prevention of Significant Deterioration
psia	pounds per square inch (absolute)
psig	pounds per square inch (gauge)
PTE	potential to emit
RACT	Reasonably Available Control Technology
RBLC	Reasonably Available Control Technology (RACT)/Best Available Control Technology (BACT)/Lowest Achievable Emission Rate (LAER) Clearinghouse
RVP	reid vapor pressure
SCR	selective catalytic reduction
SNCR	selective non-catalytic reduction
SO_2	sulfur dioxide
SPM	single point mooring
SPOT	Sea Port Oil Terminal; also the Project
TCEQ	Texas Commission on Environmental Quality
tpy	tons per year
TVP	true vapor pressure
U.S.	United States
U.S.C.	United States Code
USCG	U.S. Coast Guard
USEPA	U.S. Environmental Protection Agency
VCU	vapor combustion unit
VLCC	very large crude carrier
VOC	volatile organic compound

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PROJECT FAST FACTS

General Project Terminology	
Applicant	SPOT Terminal Services LLC, a subsidiary of Enterprise Products Operating LLC
SPOT Project	The overall project (offshore and onshore components)
SPOT Deepwater Port	The offshore portion of the SPOT Project
Oyster Creek Terminal	The onshore crude oil storage facility and pumping station for the SPOT Project
ECHO Terminal	Existing crude oil terminal providing crude oil supply for the SPOT Project

Location and General Information	
SPOT Deepwater Port Location	• 27.2 to 30.8 nautical miles (31.3 to 35.4 statute miles, or 50.4 to 57.0 kilometers) off the coast of Brazoria County, Texas
SPOT Deepwater Port Lease Blocks	• Galveston Area Lease Blocks 463 and A-59, Outer Continental Shelf, Gulf of Mexico
SPOT Deepwater Port Water Depth	• Approximately 115 feet (35.1 meters)
ECHO Terminal	• Harris County, Texas
Oyster Creek Terminal	• Brazoria County, Texas
Onshore pipelines	• Harris County and Brazoria County, Texas
Loading Capacity	• 85,000 barrels per hour/2 million barrels per day

SPOT Deepwater Port Components	
subsea crude oil export pipelines	• Two (2) colocated, 36-inch (91.4-centimeter) outside diameter, each 46.9-statute-mile (75.5-kilometer) long crude oil pipelines • Maximum operating pressure (MOP) of 1,480 psig with ASME Class 600 rating for pipeline (at a minimum) and ASME Class 600 rating for associated components (i.e., flanges, etc.) • Pipelines will be trenched with top-of-pipe 3 feet (0.9 meter) below natural bottom, and trenched with top-of-pipe 10 feet (3.0 meters) below natural bottom in the Shipping Safety Fairways • Pipelines would be bi-directional for pigging purposes as well as inventory management
platform (1 total)	• Fixed/offshore with eight (8) piles; topsides include: o Four (4) departing crude oil pipeline pig receivers/launchers o Four (4) incoming vapor recovery pipeline pig receivers/launchers o Two (2) crude oil lease automatic custody transfer (LACT) skid o One (1) oil displacement prover o Three (3) vapor combustion units

SPOT Deepwater Port Components	
single point mooring (2 total)	• Interconnects the crude oil underbuoy hose to the very large crude carrier (VLCC) • Two (2) pipeline end manifolds (PLEMs) for each single point mooring (SPM) buoy • Two (2) crude oil underbuoy hoses • One (1) vapor recovery underbuoy hose • Two (2) crude oil loading pipelines • Two (2) mooring hawser lines • Two (2) crude oil floating hoses 1 vapor recovery floating hose
crude oil loading pipelines (4 total: 2 per PLEM/SPM buoy)	• 30-inch (76.2-centimeter) outside diameter pipeline from the platform to the PLEM/SPM buoy • Each approximately 0.66 nautical mile (0.76 statute mile, or 1.22 kilometers) in length • Maximum operating pressure (MOP) of 300 psig with ASME Class 300 rating for pipeline (at a minimum) and ASME Class 600 rating for associated components (e.g., flanges) • Pipelines will be trenched with top-of-pipe 3-foot (0.9-meter) below natural bottom • Pipelines would be bi-directional for pigging purposes only
vapor recovery pipeline (4 total: 2 per PLEM)	• 16-inch (40.6-centimeter) outside diameter pipeline; transfers vapor from the PLEM to the DWP platform's vapor combustion unit • Each approximately 0.66 nautical mile (0.76 statute mile, or 1.22 kilometers) in length • Maximum allowable operating pressure (MAOP) of 280 psig with ASME Class 150 rating for pipeline (at a minimum) and ASME Class 300 rating for associated components (e.g., flanges) • Pipelines will be trenched with top-of-pipe 3 feet (0.91 meter) below natural bottom • Pipelines would be bi-directional for pigging purposes only
pipeline end manifold (4 total: 2 per SPM buoy)	• One per SPM buoy (2 total) interconnecting the crude oil loading pipelines and SPM buoy • One per SPM buoy (2 total) interconnecting the SPM buoy with the vapor recovery pipelines
crude oil underbuoy hose (4 total: 2 per SPM buoy)	• 24-inch (61-centimeter) nominal inside diameter hose interconnecting the PLEM to the SPM buoy
vapor recovery underbuoy hose (2 total: 1 per SPM buoy)	• 24-inch (61-centimeter) nominal inside diameter hose interconnecting the PLEM to the SPM buoy
crude oil floating hose (4 total: 2 per VLCC or other crude oil carrier)	• 24-inch (61-centimeter) nominal inside diameter hose from the SPM buoy to the VLCC • Each approximately 1,000 feet (304.8 meters) in length
vapor recovery floating hose (2 total: 1 per SPM buoy)	• 24-inch (61-centimeter) nominal inside diameter hose connected to the moored VLCC or other crude oil carrier • Each approximately 1,000 feet (304.8 meters) in length
VLCC or other crude carrier (up to 2)	• Specifically refers to a carrier that would receive the crude oil and transport it to export markets worldwide *(Note: VLCCs or other crude oil carriers are not part of the SPOT Project)*
hawser line (4 total: 2 per VLCC)	• Thick, nylon or similar material mooring line from VLCC or other crude oil carrier to SPM buoy

ECHO Terminal Components	
mainline crude oil pump (4 total)	• Four (4) 10,000-horsepower electric-driven centrifugal pumps in series to pump crude oil at or up to 1,480 psi (10,204-kpa, or 102.04-bar)
booster crude oil pump (4 total)	• Four (4) 2,500-horsepower electric-driven vertical booster pumps, with two (2) sets of two (2) pumps each working in parallel to move crude oil from the storage tanks through the measurement skid
meter for measuring departing crude oil (1 total)	• One (1) measurement skid that provides helical turbine metering equipment capable of metering all crude oil leaving ECHO Terminal for the Oyster Creek Terminal

ECHO Terminal to Oyster Creek Terminal Pipeline	
crude oil pipeline	• One (1) 36-inch diameter 50.1-statute-mile (80.6-kilometer) long pipeline from the existing ECHO Terminal to the Oyster Creek Terminal
mainline valves (6 total)	• Six (6) new mainline valves (MLVs) along the right-of-way to perform isolation services
crude oil pipeline pig launcher (1 total)	• Located within fence line of ECHO Terminal

Oyster Creek Terminal Components	
mainline crude oil pump (6 total)	• Six (6) 9,000-horsepower electric-driven centrifugal pumps, with three (3) per pipeline working in series • Provide a crude oil flow rate of up to 42,500 barrels per hour to each pipeline (total 85,000 barrels per hour) • Pumps would be variable speed to accommodate variable flow rates
booster crude oil pump (4 total)	• Four (4) 900-horsepower electric-driven vertical booster pumps, two (2) per pipeline to the SPOT DWP, working in parallel to move crude oil from the storage tanks through the measurement skids
meters for measuring incoming crude oil (2 total)	• Two (2) measurement skids, one (1) located at the incoming pipeline from the existing ECHO Terminal, and one (1) installed and reserved for a future pipeline connection, providing helical turbine metering equipment, for metering incoming crude oil
meters for measuring departing crude oil (2 total)	• Two (2) measurement skids, providing helical turbine metering equipment, for metering departing crude oil to SPOT DWP
vapor combustion unit (3 total)	• Three (3) vapor combustor units (2 permanent and 1 portable) to destroy volatile organic compound (VOC) vapors during crude oil tank loading, maintenance, or inspection activities when the tank roof has landed • Vapors are only collected until the roof of the storage tanks begins to float; once the roof floats, vapors are not created during the loading operation
firewater system	• Firewater pond with 600,000 barrel capacity • Firewater pump system used to contain any fires • Foam system for tank seal fire suppression • System designed per National Fire Prevention Association (NFPA) requirements

Oyster Creek Terminal Components	
aboveground storage tanks (7 total)	• Seven (7) aboveground steel storage tanks, with an interior steel floating roof and an exterior geodesic aluminum roof • Each tank has 685,000 barrels (600,000 barrels working storage capacity) of crude oil storage capacity, for a total onshore storage capacity of approximately 4.8 million barrels (4.2 million barrels working storage) of crude oil

Oyster Creek Terminal to Shore Crossing Pipeline	
crude oil pipelines (2 total)	• Two (2) parallel 36-inch diameter 12.2-statute-mile (19.6-kilometer) long pipelines from the Oyster Creek Terminal to Shore Crossing
mainline valve (4 total, 2 per pipeline)	• Four (4) new MLVs along the right-of-way to perform isolation services • Two (2) valves side by side at each location for each 36-inch (91.4-centimeter) pipeline
crude oil pipeline pig launcher/receiver (2 total)	• Two (2) pig launcher/receivers located within the fence line of the Oyster Creek Terminal • One (1) per 36-inch (91.4-centimeter) diameter pipeline

1 SPOT DEEPWATER PORT AIR PERMIT APPLICATION

1.1 INTRODUCTION

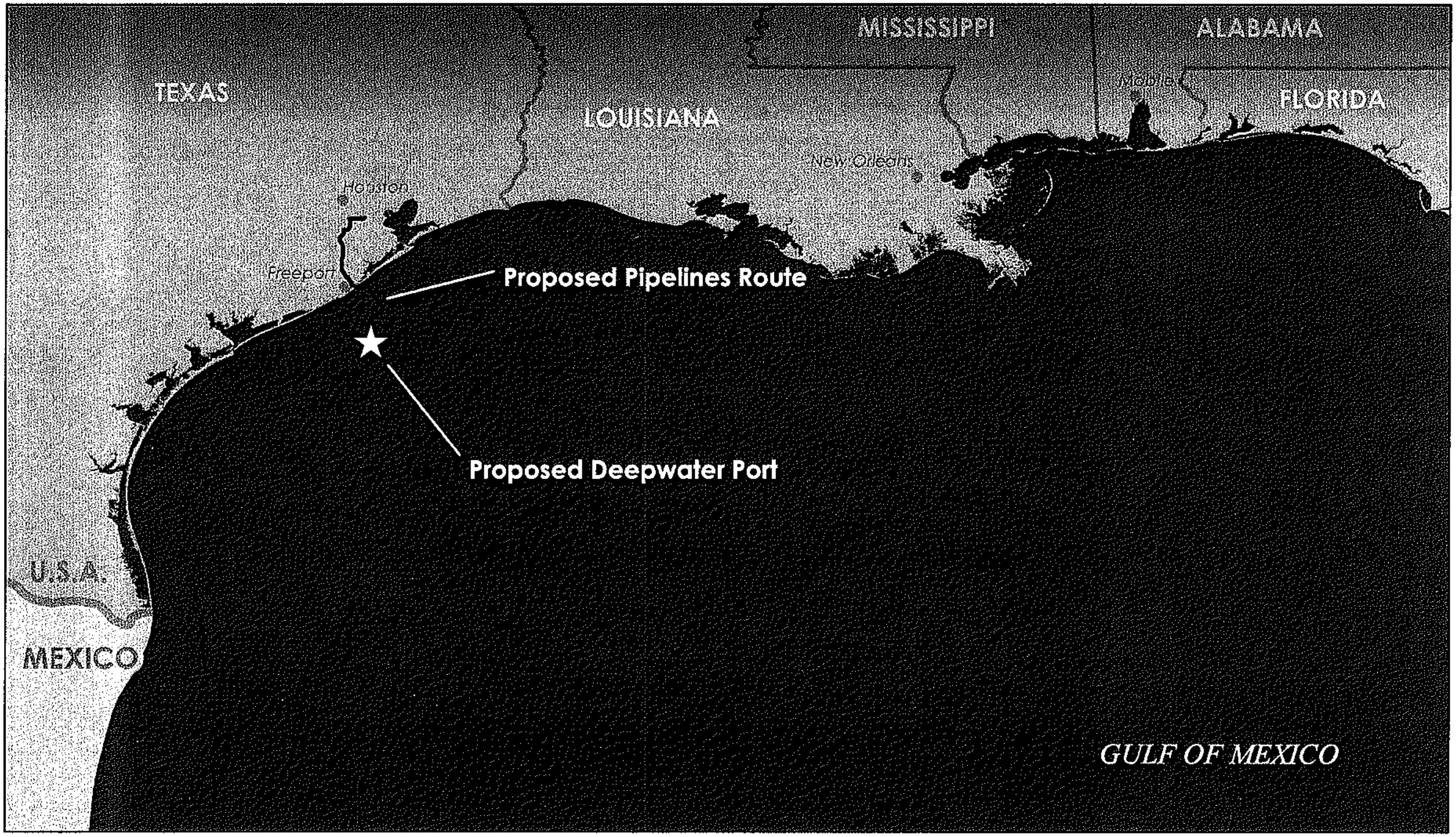
SPOT Terminal Services LLC (the Applicant), a subsidiary of Enterprise Products Operating LLC, a Texas limited liability company, is proposing to develop the Sea Port Oil Terminal (SPOT) Project in the Gulf of Mexico to provide the United States with crude oil loading services on very large crude carriers (VLCCs) and other crude oil carriers for export to the global market (see Figure 1). The SPOT deepwater port (DWP) would be located in federal waters within the Outer Continental Shelf in Galveston Area Lease Blocks 463 and A-59, approximately between 27.2 and 30.8 nautical miles (31.3 and 35.4 statute miles, or 50.4 and 57.0 kilometers), respectively, off the coast of Brazoria County, Texas, in water depths of approximately 115 feet (35.1 meters) (see Figure 2).

The Applicant is filing an application for a license to construct, own, and operate the SPOT DWP pursuant to the Deepwater Port Act of 1974 (DWPA), as amended, and in accordance with U.S. Coast Guard (USCG) and U.S. Maritime Administration (MARAD) implementing regulations. The primary purpose of the SPOT Project would be to provide a safe and reliable long-term supply of crude oil for export to the global market. The Applicant either currently owns, or has access to, several crude oil pipelines from multiple sources that lead to numerous crude oil nearshore terminals owned and operated by the Applicant along the northern Texas Gulf Coast.

The SPOT Project would provide crude oil loading services for VLCCs and other crude oil carriers that may provide the transport of U.S. crude oil for export. Based on its current design, the SPOT Project would have the capability of loading VLCCs and other crude oil carriers at a rate of up to 85,000 barrels per hour (bbl/h). The SPOT DWP would allow for up to two (2) VLCCs or other crude oil carriers to moor at the single point mooring (SPM) buoys via a hawser line. Floating connecting crude oil hoses and a floating vapor recovery hose would be routed through the buoy to support crude oil loading. If two ships were loaded at the same time, the loading rate of 85,000 bbl/h would be the maximum rate to both SPM buoys combined, not individually. The maximum frequency of loading VLCCs would be up to 365 per year, although other smaller crude oil transport vessels may be loaded. The crude oils to be exported by the SPOT Project range from ultralight crude to light crude to heavy grade crude oil.

The SPOT Project would consist of both offshore/marine components and onshore storage/supply components. The onshore storage and supply components would consist of the Oyster Creek Terminal and the onshore pipelines to be constructed would support the SPOT Project. For the purposes of this air permit application, the onshore component is discussed for context only. The Applicant is filing for separate air permit authorizations under the Permit by Rule and Non-Rule Standard Permit programs with the Texas Commission on Environmental Quality (TCEQ) for the onshore component of the SPOT Project.

Document Path: M:\Miami\Enterprise_Oil_DWP\Maps\Mxds\Report\Appendix\IA_H\Figure 1 Proposed DWP Port Project.mxd



☆ Proposed Deepwater Port — Proposed Pipelines Route

N W E S

0 50 100 200 Miles

0 50 100 200 Nautical Miles

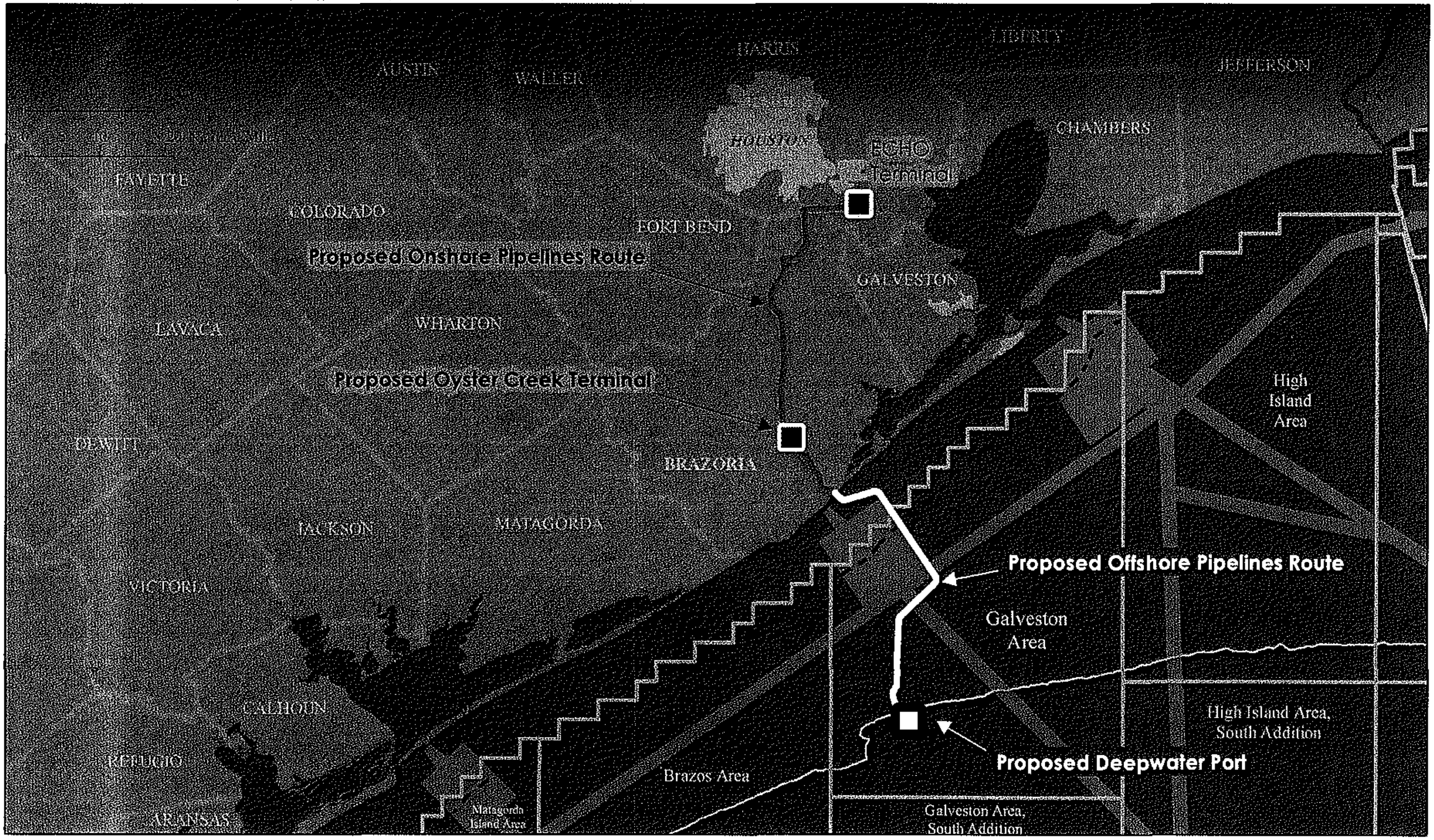
Figure 1
Proposed Deepwater Port Project

SPOT Sea Port Oil Terminal

SPOT Terminal Services LLC

Source - ESRI

Document Path: M:\Miami\Enterprise_Oil_DWP\Maps\Mxds\Report\AppendixIIA_H\Figure 2 Offshore and Onshore Components.mxd



Proposed Onshore Pipelines Route
Proposed Offshore Pipelines Route
Depth Contour (115 ft)
State Waters Boundary

Crude Oil Tank Farm
Proposed Deepwater Port

Protraction Area
Shipping Fairway

SPOT
Sea Port Oil Terminal

Figure 2
Offshore/Marine Components and Onshore Storage/Supply Components

SPOT Terminal Services LLC

Source - ESRI, EP, ENE, BOEM, NOAA, TNRIS, NPMS

The air quality permit sought by the SPOT Project is for the aggregated emissions originating from the offshore/marine components of the SPOT DWP. This application is being submitted to the U.S. Environmental Protection Agency (USEPA) Region 6 for a Prevention of Significant Deterioration (PSD) permit-to-construct under the New Source Review (NSR) and Part 71 (Title V) Source operating permit. The application comprises the following:

- Section 1 includes an overview of the facility, including a description of emission sources and an emissions summary.
- Section 2 includes an applicability analysis of federal and state air pollutant/air quality regulations.
- Section 3 includes a best available control technology (BACT) analysis of stationary emissions sources.
- Appendix A includes permit application forms using the nearest adjacent state's (Texas) forms (TCEQ administrative forms).
- Appendix B provides facility maps and plot plans.
- Appendix C provides emission source flow diagrams.
- Appendix D provides estimation methodology and emission calculations.
- Appendix E includes TCEQ technical application tables (i.e., equipment information forms).
- Appendix F includes Reasonably Available Control Technology (RACT)/BACT/Lowest Achievable Emission Rate (LAER) Clearinghouse (RBLC) database search results.
- Appendix G includes BACT costs analysis sheets for marine loading control equipment.
- Appendix H includes other supporting documentation such as equipment specification sheets and brochures.
- Appendix I provides air quality dispersion modeling protocol.
- Appendix J provides air quality modeling analysis report.

1.2 FACILITY OVERVIEW

1.2.1 PROPOSED FACILITY

As discussed in Section 1.1, "Introduction," above, the SPOT Project would provide crude oil loading services for VLCCs and other crude oil carriers that may provide the transport of U.S. crude oil for export. Based on its current design, the SPOT Project would have the capability of loading VLCCs and other crude oil carriers at a rate of up to 85,000 bbl/h. The SPOT DWP would allow for up to two (2) VLCCs or other crude oil carriers to moor at the SPM buoys via hawser line. The crude oil carriers would be connected with the SPM buoys by floating crude oil hoses and a floating vapor recovery hose. Submerged lines would extend from the SPM buoys to a pipeline end manifold (PLEM), and pipeline would extend from the PLEM to the platform. The maximum frequency of loading VLCCs would be up to 365 per year, although other smaller crude oil transport vessels may be loaded.

The main offshore components for the SPOT DWP would consist of: (1) the crude oil export pipelines; (2) the platform, including the crude oil loading pipelines and vapory recovery pipelines with associated PLEMs, and the vapor combustion units; (3) SPM buoys and interconnections; (4) service vessel moorings; and (5) anchorage areas and navigation. The offshore components are discussed in Section 1.2.3.

In order to deliver crude oil from the Oyster Creek Terminal, two (2) collocated 36-inch (91.4-centimeter) outside diameter, 40.8-nautical-mile (46.9-statute mile, or 75.5-kilometer) crude oil export pipelines would be constructed from the shoreline crossing in Brazoria County, Texas, to the SPOT DWP.

The offshore pipelines would connect to the SPOT DWP platform located in Galveston Area Lease Block 463, offshore Brazoria County, Texas, Gulf of Mexico. The platform would consist of an eight-pile jacketed platform sited in water depths of approximately 115 feet (35.1 meters). The fixed offshore platform would be comprised of four (4) decks, the laydown deck, main deck, cellar deck, and sump deck. Equipment that would be installed on the top side decks would facilitate the loading process and vapor recovery and destruction during the loading process. The equipment located on the platform is grouped into the following categories: Process Safety and Control, Metering, Pig Launchers/Receivers, Volatile Organic Compound (VOC) Vapor Combustors, Life Support/Life Saving, Navigational Aids, Utilities and Buildings and Structures. The SPOT DWP platform would be designed for a continuous and permanent living arrangement for a maximum of 20 personnel onboard.

Appendix B provides general arrangement drawings of main and cellar decks of the platform. The production system block flow diagram of the overall operational process is included in Appendix C. Details on the air emission sources from the offshore/marine components of the SPOT DWP are provided in Section 1.2.4.

1.2.2 FACILITY LOCATION

The SPOT DWP would be located in federal waters within the OCS in Galveston Area Lease Blocks 463 and A-59, approximately between 27.2 and 30.8 nautical miles (31.3 and 35.4 statute miles, or 50.4 and 57.0 kilometers), respectively, off the coast of Brazoria County, Texas, in water depths of approximately 115 feet (35.1 meters) (see Figure 2).

Table 1 presents the proposed location for key components that would be fixed to the seafloor for the life of the SPOT DWP.

Table 1
SPOT DWP Component Locations

ID	Components	Easting (UTM U.S. Survey feet)	Northing (UTM U.S. Survey feet)	Latitude (degrees minutes seconds)	Longitude (degrees minutes seconds)	Water Depth in feet (meters)
1	Platform Centroid	958,315.13	10,336,961.65	28° 27' 59.22" N	95° 07 24.49" W	117 (35.7)
2	SPM Buoy - East	960,985.54	10,339,933.02	28° 28' 29.10" N	95° 06 55.16" W	114 (34.7)
3	SPM Buoy - West	954,450.24	10,337,973.48	28° 28' 08.56" N	95° 08 07.98" W	114 (34.7)

1.2.3 OFFSHORE COMPONENTS

The SPOT Project's offshore/marine components would consist of the SPOT DWP and subsea pipelines. Figure 3 provides a schematic illustrating the offshore/marine components for the SPOT Project. The SPOT DWP would consist of the following components, as described below.

Subsea Pipelines from Onshore to the SPOT DWP

Two (2) collocated 36-inch (91.4-centimeter) outside diameter, 40.8-nautical-mile (46.9-statute-mile, or 75.5-kilometer) long crude oil pipelines would be constructed from the shoreline crossing in Brazoria County, Texas, to the SPOT DWP for crude oil delivery. These pipelines would connect the onshore crude oil storage facility and pumping station for the SPOT Project (the Oyster Creek Terminal) to the SPOT DWP. The crude oil would be metered at the offshore platform. Pipelines would be bi-directional for maintenance, pigging, changing crude oil grades, or evacuating the pipeline with water.

Platform

One (1) fixed offshore platform with eight (8) piles. The fixed offshore platform would be comprised of the four (4) decks with following main equipment:

- A sump deck with boarding shut-down valves and one (1) open drain sump;
- A cellar deck with four (4) departing crude oil pig launchers/receivers, and four (4) incoming vapor recovery pipeline pig receivers/launchers, two (2) diesel generators, and three (3) vapor combustion units;
- A main deck with one (1) crude oil lease automatic custody transfer (LACT) unit, one (1) oil displacement prover, power loop, living quarters, electrical and instrument building, and other ancillary equipment; and
- A laydown deck with crane laydown area.

Document Path: M:\Miami\Enterprise_Oil_DWP\Maps\Mxds\Report\AppendixIIA_H\Figure 3 Schematic.mxd

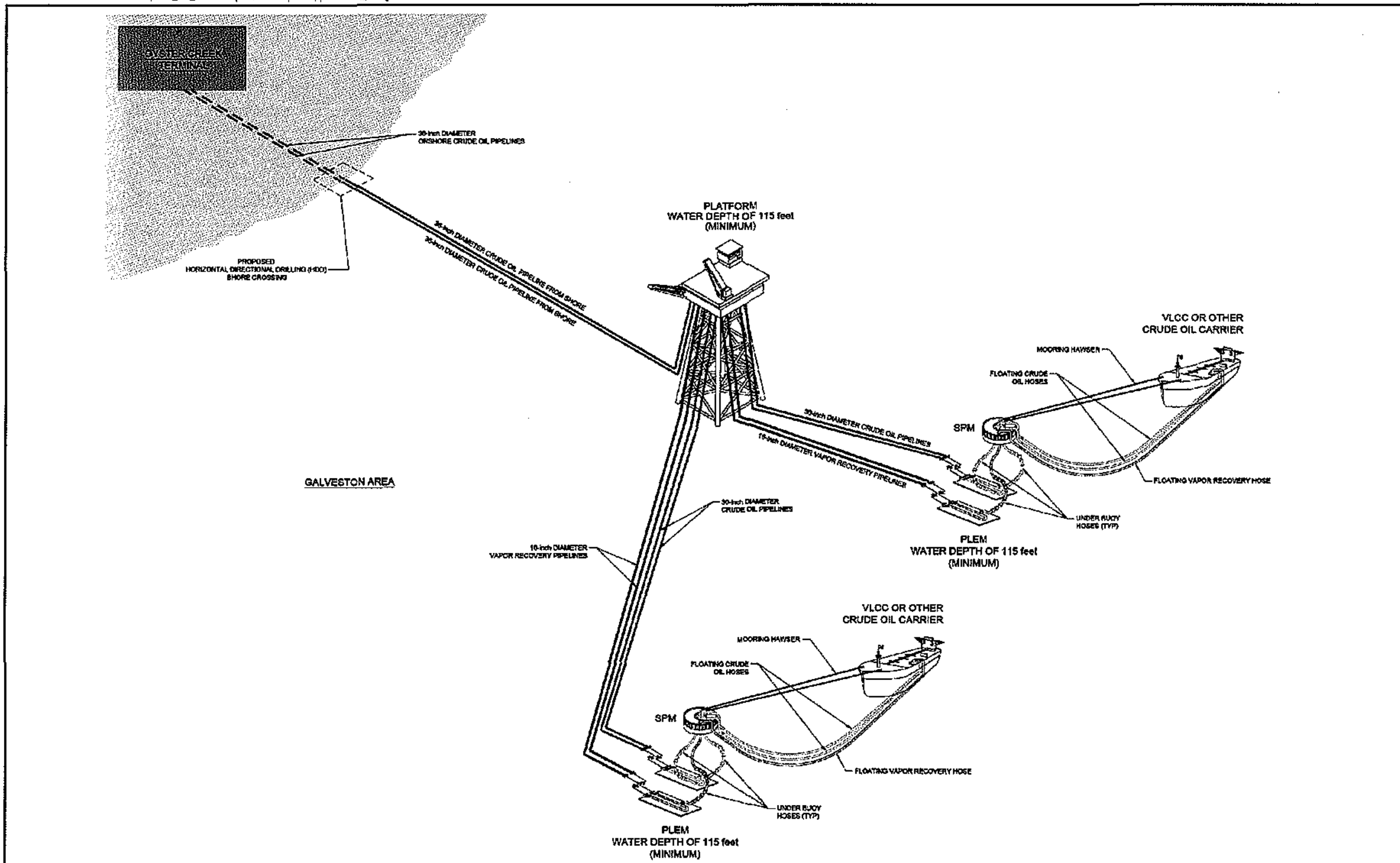


Figure 3
Proposed Deepwater Port Schematic

SPOT
Sea Port Oil Terminal

SPOT Terminal Services LLC

Pipeline End Manifolds

A total of four (4) PLEMs (two per SPM buoy) would provide the interconnection between the pipelines and the SPM buoys. Each SPM buoy would have two (2) PLEMs—one (1) PLEM for crude oil and one (1) PLEM for vapor recovery. Each crude oil loading PLEM would be supplied with crude oil by two (2) 30-inch (76.2-centimeter) outside diameter pipelines, each approximately 0.66 nautical mile (0.76 statute mile, or 1.22 kilometers) in length.

Each vapor recovery PLEM would transfer recovered vapor from the VLCC or other crude oil carrier from the PLEMs to the three (3) vapor combustion units on the platform topside via two (2) 16-inch (40.6-centimeter) outside diameter vapor recovery pipelines, each approximately 0.66 nautical mile (0.76 statute mile, or 1.22 kilometers) in length.

Single Point Mooring Buoys

The SPM buoys serve to connect the floating lines to/from the VLCC to underbuoy hoses connected to the PLEMs. There would be two (2) SPM buoys. Each buoy would have:

- Two (2) 24-inch (60.9-centimeter) inside diameter crude oil underbuoy hoses connecting to the crude oil pipeline end manifold (PLEM); and
- Two (2) 24-inch (60.9-centimeter) inside diameter floating crude oil hoses connecting to the moored VLCCs or other crude oil carriers for loading.

Each SPM buoy would also have:

- One (1) 24-inch (60.9-centimeter) inside diameter vapor recovery underbuoy hose connecting to the vapor recovery PLEM.
- One (1) 24-inch (60.9-centimeter) inside diameter floating vapor recovery hose to connect to the moored VLCC or other crude oil carrier for loading.

Each floating hose would be approximately 800 feet long.

Very Large Crude Carriers and Other Crude Oil Carriers

The Applicant intends to use the worldwide fleet of available VLCCs and other crude carriers for the SPOT Project. VLCCs and other crude oil carriers would maneuver to the SPM buoys and, with assistance from support tugs, moor by mooring hawser lines to the SPM buoy. Up to two (2) VLCCs or other crude oil carriers could moor at the SPM buoys and connect to the DWP. Flexible hoses would be used to load crude oil from the SPOT DWP to the VLCCs and other crude oil carriers. Once the crude oil cargo is loaded, the flexible hoses would be disconnected and the VLCCs and other crude oil carriers would depart the SPOT DWP to transport the cargo to various export markets across the globe. Although the SPOT DWP is expected to primarily receive VLCCs, other crude oil carriers may be loaded at the SPOT DWP.

1.2.4 STATIONARY AIR POLLUTANT EMISSION SOURCES

The SPOT DWP platform based air emission sources with respective emission point numbers (EPNs) are listed below.

- Three (3) marine loading vapor combustors (EPNs VC1, VC2, VC3);
- Two (2) diesel generators (1.5-megawatt (MW), EPNs DGEN1, DGEN2) for power generation;
- One (1) emergency (backup) diesel generator (0.6 MW, EPN EDGEN);
- Two (2) diesel firewater pump (0.8 MW, EPNs DFP1, DFP2);
- Two (2) pedestal cranes (0.44 MW, EPNs PC1, PC2);
- Three (3) diesel storage tanks (31,330 gallons, EPN DST1; 31,330 gallons , EPN DST2; and 8,325 gallons , EPN DST3);
- One (1) vent boom (EPN VB) to discharge evaporative losses from draining of four (4) crude oil pipelines during pigging activities;
- Uncaptured marine loading emissions (EPN UL1); and
- Component fugitive emissions (EPN FUG).

Table 2 summarizes the stationary air emission sources for the platform. Flow diagrams for these sources are included in Appendix C. It is also anticipated that fugitive emissions may be released from piping components (e.g., valves, flanges). More details on the air emission sources are provided in the following sections.

Table 2
SPOT Deepwater Port Stationary Air Emission Sources

Air Emission Source	Quantity (Fixed Offshore Platform)
Continuous Sources of Air Emissions	
Vapor Combustors	3
Diesel Generators	2
Fugitive Emissions	-
Uncaptured Loading Emissions	-
Diesel Storage Tanks	3
Intermittent Sources of Air Emissions	
Diesel Firewater Pumps	2
Pedestal Cranes	2
Emergency (Backup) Diesel Generator	1
Vent Boom	1

The facility potentially would emit the following types of air pollutants:

- Criteria air pollutants, including carbon monoxide (CO), nitrogen dioxide (NO_2), particulate matter (PM) with an aerodynamic diameter less than or equal to 10 microns (PM_{10}), PM with an aerodynamic diameter less than or equal to 2.5 microns ($PM_{2.5}$), and sulfur dioxide (SO_2);

- Ozone precursors, including nitrogen oxides (NO_X) and VOCs;
- Hazardous air pollutants (HAPs); and
- Greenhouse gases (GHGs), including CO_2, CH_4, and N_2O.

Diesel Generators

Two (2) diesel generators would provide continuous power to the SPOT DWP platform. The diesel generators would provide power to various systems on the platform such as heating, ventilating, and air conditioning (HVAC); lighting; and safety systems. Each diesel generator would have a maximum rating of 1,530 kilowatts (kW) or 2,052 horsepower (hp) (2 x 100%). Only one generator would operate at a time; each generator would be rotated into service to allow for maintenance. The total operating hours for both diesel generators combined is 8,760 hours per year. The diesel generators would use ultra-low sulfur fuel (sulfur content of 15 parts per million by weight (ppmw) or less) and comply with New Source Performance Standards (NSPS) Subpart IIII requirements. Appendix D provides the emission estimation methodology and detailed emission calculations for the diesel generators. The diesel generator specification sheet is provided in Appendix H.

Uncaptured Marine Loading Emissions

For the SPOT Project, vapors from ship loading operations would be collected using methods that achieve a 99% collection efficiency, which is Category 1 as listed in TCEQ's Marine Loading Collection Efficiency Guidance (TCEQ 2016). The uncaptured marine loading VOC emissions are estimated as 1% of total marine loading VOCs. The collected vapors are routed to the vapor combustors with a minimum VOC Destruction Removal Efficiency (DRE) of 95%. The uncaptured marine loading emission calculations are provided in Appendix D.

Vapor Combustors

The SPOT Project would utilize three (3) VOC vapor combustors to destroy up to 95% of VOCs being emitted during the loading process of VLCCs and other crude oil carriers. As discussed in Section 3.7.3, BACT analysis, this technology was selected because it is technically feasible, most reliable and safe, and has the highest VOC destruction rate of the alternatives examined as technically feasible. It also meets the Project's objectives as proposed and is economically feasible.

The vapor combustors would utilize high combustion temperatures to achieve VOC destruction. The VOC vapors displaced during VLCC loading would be enriched to ensure destruction of the VOCs to a 95% level. The enrichment would be conducted using propane, which would be stored on the platform in transportable International Maritime Organization/United Nations (IMO/UN) tanks for the vapor combustors. The Applicant has designed the SPOT DWP platform to be capable of storing approximately 32,772 gallons (124,055 liters) of propane for all users; therefore, the SPOT DWP could accommodate about 15 VLCC loadings between propane shipments. The propane enrichment is expected to be only required for the first 10 to 15% of the loading period depending on the type of crude loaded and other factors. Additionally, propane would be used as pilot gas for the vapor combustors. The vapor stream for the vapor combustion process is monitored by oxygen analyzers to ensure the correct propane to VOC gas mixture enters the combustor for efficient combustion and destruction of VOCs. During loading, the vapor combustors would reach temperature at or above 1,200 degrees Fahrenheit (°F) (648.9 degrees Celsius [°C]). The flame for the vapor combustion unit would be completely enclosed, thereby reducing radiant heat impacts and visibility to any passing ships.

The overall VOC vapor combustion system consists of three (3) VOC combustor stacks and two (2) vapor safety and injection skids, all located on the main deck of the platform; and three (3) blower skids and three (3) vapor combustors, all located on the platform's cellar deck. The vapor combustors would allow for the vapor transferred from the VLCCs or other crude oil carrier during loading to be combusted and, therefore, minimize overall VOC air emissions.

The combined vapor/propane gas mixture would flow into vapor scrubbers on the blower skids for any liquid removal. The vapor blowers would send the combined vapor/propane gas to the combustors for combustion. The liquid from the vapor scrubbers would go to the vent scrubber (i.e., closed drain sump). Air would be provided via louvers located on the exhaust stack to assist in the efficient combustion of the combined vapor/propane gas. The system would be protected by detonation arrestors located on the inlet of the combustor skid to prevent flames from propagating back into the system. After combustion, the combustor exhaust gas would exit via the combustor stacks into the atmosphere. Appendix D provides emission estimation methodology and detailed emission calculations for vapor combustors. The manufacturer's brochure for the vapor combustor is provided in Appendix H.

Emergency Backup Diesel Generator

There would be one (1) emergency back-up generator on the SPOT DWP platform's main deck for use in the event the main diesel generators fail to operate. This generator would provide power to the emergency power system, which maintains emergency lighting, communication, safety control system, and navigational aids. The emergency generators would have a routine operational limit of 100 hours per year to accommodate required maintenance/testing operation. The engine would use ultra-low sulfur fuel (sulfur content of 15 ppmw or less) and comply with NSPS Subpart IIII requirements. Appendix D provides emission estimation methodology and detailed emission calculations for the emergency generators. The equipment specification sheet is provided in Appendix H.

Pedestal Cranes

The two (2) pedestal cranes would move personnel, equipment, and consumables to, from, and on the platform. They would be located at opposing locations on the main deck of the platform. The pedestal cranes require an independent diesel engine on each crane so they may be operated in the event of power loss. The pedestal cranes would have an adjustable height boom and would rotate around a turret to provide access to the platform. Each crane would have a diesel engine with a maximum rating of 439 kW or 589 hp. Each pedestal crane would operate 12 hours per day (total 4,380 hours per year), would use ultra-low sulfur fuel (sulfur content of 15 ppmw or less), and comply with NSPS Subpart IIII requirements. Appendix D provides emission estimation methodology and detailed emission calculations for the pedestal cranes.

Diesel Firewater Pumps

Two (2) diesel engine driven firewater pumps would provide water for firefighting on the platform. The diesel engine driven firewater pumps provide water to the aqueous film-forming foam tanks for foam deluge. The firewater pumps would have a routine operational limit of 100 hours per year to accommodate required maintenance/testing operations. They would use ultra-low sulfur fuel (sulfur content of 15 ppmw or less) and comply with NSPS Subpart IIII requirements.

Vent Boom

The closed drain and vent system consists of one (1) vent boom, one (1) closed drain sump (i.e., vent scrubber), and two (2) closed drain pumps. The closed drain and vent system safely discharges vented vapors from the vent scrubber during crude oil pipeline pigging operations and the relief valve releases vapors on the SPOT DWP platform. The vent boom allows the pressure to safely be released due to the crude oil pigging operations and relief valve releases. The closed drain system is a dedicated drain system for fluids that may contain hydrocarbons and ensures that these fluids are safely and efficiently captured and processed. The fluids from the closed drains, vapor scrubbers, liquid relief (i.e., liquid pressure relief valves), vent sources, and hydrocarbons collected from the open drain sump are collected in the closed drain/vent scrubber. Any liquids in the closed drain/vent scrubber are pumped by the closed drain pumps to a temporary off-loading tank for removal by a barge, transferred back into the process, or drained directly to the boat landing for removal by a barge. The vapors from the closed drain/vent scrubber pass through a detonation arrestor and are released to the atmosphere via the vent boom. The vent boom is located on the northeast corner of the platform's Main Deck to take advantage of the prevailing winds and so it is a maximum distance from the living quarters.

Pipeline pigging operations maintain the efficiency and safety of the pipelines. The crude oil loading pipeline pigging contributes emissions only when the pig trap is drained into the closed drain/vent scrubber. The drained liquid displaces hydrocarbon vapor, which is vented. Four (4) crude oil loading pipeline pig launchers/receivers would serve pigging operations through the loading pipelines from the SPOT DWP platform to the PLEMs (round-trip pigging). Each pipeline loop is assumed to be pigged once per week. Each pig trap would be drained once per week (four [4] pig traps). The evaporative losses expected from the closed drain sump due to crude oil pipeline pigging are presented in Appendix D.

Similarly, four (4) incoming vapor recovery pipeline pig launchers/receivers would serve round-trip pigging operations through the vapor recovery pipelines between the platform and PLEMs. Each pipeline loop is assumed to be pigged once per week. The vented gas coming from either the pig receiver or the pig launcher would be nitrogen, which is used to move the pig through the pipe, while hydrocarbon vapors that are pushed ahead of the pig would be directed to the vapor combustors. The emissions from pigging of vapor lines are accounted for in the overall vapor combustors emissions estimate (Appendix D).

Diesel Fuel Storage System

Diesel is a critical fuel on the facility, since it is consumed by the engines on the platform and is the only fuel source for the power generators. Diesel would be stored on the platform in two (2) diesel tanks (31,332 gallons each) and one (1) crane pedestal diesel tank (8,316 gallons). The crane pedestal diesel storage tank is used to provide diesel to the two (2) pedestal cranes. This is about 18 days of storage capacity for normal operations. These tanks would be periodically re-filled via supply boat. Diesel would be transferred from the platform storage to the users' day tanks via a transfer pump skid. The working breathing losses from the diesel storage tanks are estimated using the USEPA Tanks Program (Version 4.0.9d) and presented in Appendix D.

Fugitive Emissions

During facility operation, there is a potential for fugitive emissions from piping components, such as from pipe flanges and valves and other components. There may also be minor emissions of propane from propane vaporizers and propane diesel transfer pumps and piping. The measures considered in the design and operation of the SPOT DWP to minimize generation of potential fugitive emissions are discussed in Section 3.7.5. To determine potential fugitive emissions, piping component counts were estimated based on proposed process equipment to be installed at the SPOT DWP. The component fugitive emissions were calculated using Oil and Gas Production Operation emission factors from TCEQ's Fugitive Guidance (2018) and are presented in Appendix D.

Insignificant Emission Sources

The platform deck drains capture storm water along with any oils or grease drips, and route water to the platform open drain sump. The sump system would skim the oils and, using a baffle/weir system, pump it to the vent scrubber (i.e., closed drain sump) via collection system pumps. Any collected liquids are pumped by the closed drain pumps to a temporary off-loading tank for removal by a barge or transferred back into the process. Normally, a negligible amount of oil is expected in the open drain sump, which is captured and processed as described above. The platform based sanitary wastewater system is not expected to produce any relevant emissions.

1.3 ESTIMATED EMISSION INVENTORY

The stationary air emission sources at the SPOT DWP facility include the emissions sources on the fixed offshore platform. Table 3 provides a summary of facility-wide emissions in tons per year (tpy). GHG emissions are reported in terms of CO_2 equivalents (CO_2e). Table 4 summarizes emissions of individual HAPs (as defined under federal regulation). Table 5 summarizes emissions of individual GHGs. The emissions estimation methodology and detailed emission calculations are presented in Appendix D.

Table 3
SPOT Annual Air Emissions (tons per year)

	Pollutants (tons per year)							
Emission Source	NOx	CO	SO_2	PM_{10}	$PM_{2.5}$	VOC	HAP	CO2e
Vapor Combustor (3)	129.95	260	36.71	7.19	7.19	1,418.52	66.50	159,257
Diesel Generators (2)	90.34	15.25	0.11	0.79	0.79	0.79	0.1	10,546
Emergency (Backup) Diesel Generator (1)	0.34	0.31	0.0005	0.01	0.01	0.34	0.0004	44
Diesel Firewater Pumps (2)	1.14	0.62	0.0013	0.036	0.036	1.14	0.0012	127
Pedestal Cranes (2)	1.7	14.86	0.03	0.08	0.08	0.81	0.03	3,028
Diesel Storage Tank (3)	0.00	0.00	0.00	0.00	0.00	0.023	0.00	0.00
Vent Boom (1)	0.00	0.00	0.00	0.00	0.00	2.04	0.00	0.00
Uncaptured Loading Emissions	0.00	0.00	0.00	0.00	0.00	283.41	13.37	253
Fugitives	0.00	0.00	0.00	0.00	0.00	22.81	3.12	1.89
Total Estimated Emissions	223.5	291	36.85	8.11	8.11	1,729.89	83.11	173,257

Key:
HAP = hazardous air pollutant
PAH = polynuclear aromatic hydrocarbons
TAP = toxic air pollutant
TAP = toxic air pollutant
tpy = tons per year

Table 4
SPOT Annual HAP Air Emissions (tons per year)

Air Pollutant	Annual Emissions (tpy)
Acetaldehyde	0.00
Acrolein	0.01
Benzene	8.44
Cumene	0.12
Ethylbenzene	0.89
Formaldehyde	0.01
Hexane	62.63
i-Octane	0.16
PAH	0.02
Toluene	7.62
m & p Xylenes	2.59
o Xylene	0.65
H_2S (TAP)	1.20
Total HAPs	**83.11**
Total H_2S (TAP)	**1.20**

Key:
HAP = hazardous air pollutant
PAH = polynuclear aromatic hydrocarbons
TAP = toxic air pollutant
tpy = tons per year

Table 5
SPOT Annual Greenhouse Gas Emissions (tons per year)

Air Pollutant	Annual Emissions (tpy)	Annual Emissions (as CO_2e)(tpy)
Carbon Dioxide (CO_2)	171,420	171,420
Methane (CH_4)	5.45	1,623.2
Nitrous Oxide (N_2O)	8.57	214.14
Total Greenhouse Gases (GHG)	--	173,257

Key:
tpy = tons per year
CO_2e = carbon dioxide equivalents

1.4 COMPARISON OF PROJECT LOCATION AND VOC CONTROL TECHNOLOGY ALTERNATIVES

A detailed evaluation of alternatives was conducted for a range of reasonable alternatives to the SPOT Project's proposed action in accordance with the requirements of NEPA. To be reasonable, the alternatives must: (1) satisfy the proposed Project's basic purpose and need; (2) have the ability to meet the proposed Project's objectives; (3) be technically and economically feasible and practical; and (4) avoid or substantially lessen a Project's potential effects.

The discussion below is excerpted from the larger alternative analysis prepared for the application for a license under the DWPA and focuses on air quality specific aspects of the following:

- Offshore Versus Onshore Project; and
- VOC control technology and design alternatives.

1.4.1 OFFSHORE VERSUS ONSHORE PROJECT

In evaluating the SPOT Project based upon the Purpose and Need, the Applicant determined that an offshore DWP is preferable to onshore crude export solutions. Enterprise Products Operating LLC, which owns SPOT Terminal Services LLC, currently operates several docks along the Texas Gulf Coast that provide crude oil export services and service smaller crude oil carriers. In order to load VLCCs, crude oil must be lightered—a process that involves smaller crude oil carriers loading at docks onshore and transporting the loaded crude oil offshore to be transferred and loaded onto VLCCs and other crude oil carriers. The limiting factor for onshore docks receiving VLCCs is the depth of harbors and inland waterways of the U.S. Gulf of Mexico coast. The draft of a fully loaded VLCC in calm sea states is approximately 75 feet (22.9 meters). Therefore, current lightering operations occur in the offshore Gulf of Mexico, where water depths are sufficient to accommodate the complete loading of a VLCC.

Given the Project's need to load up to 365 VLCCs per year (on average, each VLCC is capable of carrying approximately 2 million barrels of crude oil), it is not viable to increase its current onshore operations by constructing or expanding onshore loading facilities for the following reasons:

- Onshore loading would increase vessel traffic and air pollutant emissions in inland waterways;
- Expansion of onshore loading docks and facilities would likely lead to increased air quality impacts within and along the coastal waters of Texas;
- Multiple loadings of crude oil creates VOC vapor emissions for each loading;
- Offshore lightering does not typically include vapor recovery, thereby allowing for increased air emissions;
- Construction of onshore facilities capable of loading of VLCCs would require significant dredging and create construction related air pollutant emissions.

The Applicant, through the proposed use of a DWP option, would eliminate these air quality impacts.

1.4.2 EVALUATION OF TECHNOLOGY AND DESIGN ALTERNATIVES

Offshore Crude Oil Terminal Design Alternatives

The Applicant examined three offshore crude oil terminal designs for consideration in selecting the design alternative for the SPOT Project. These include: (1) fixed platform with a berth for VLCCs; (2) Fixed platform with a SPM buoy; and (3) SPM buoy without a fixed platform.

The Applicant selected a fixed platform with SPM buoy for the offshore crude oil terminal design, as it meets the objectives of the Project as defined. In addition, the selected alternative allows the best solution to minimize air quality impacts.

With a fixed support platform at the DWP, a crude oil loading operation is able to gain the following benefits:

- **VOC Processing**: Loading operations can more easily incorporate vapor recovery and the removal of VOCs from the vapors, thereby greatly reducing VOC emissions.

- **Pigging Operations**: Pigging operations are used for: (a) integrity management through the use of smart pigs to monitor the integrity of the pipeline; and (b) the use of pigs between different crude oil grade loadings to ensure no mixing occurs. A platform facilitates safe, cost effective pigging operations and allows for capture of VOC emissions for controlled emission.

- **Loading Operations**: A manned, fixed platform near the VLCC loading operation would allow for continuous visual monitoring, control, and quick response time to any adverse events that could produce air quality impacts if undetected.

1.4.2.1 Volatile Organic Compound Control Technology Alternatives

The use of a fixed platform provides an opportunity to control VOC emissions from crude oil loading that other proposed offshore projects without a fixed platform could accommodate. In addition to submerged loading of crude oil into tanks aboard crude oil carriers to minimize splashing and turbulence that generates VOC vapors, several methods for controlling VOC emissions have been considered. These include:

- Vapor Recovery Technologies

  - Cryogenic Condensation: Cryogenic condensation uses temperature and pressure variation to condense the VOCs out of the inert vapor. In this process, the VOC mixture displaced from the tank is compressed, condensed, dehydrated, and cooled via cascade refrigeration unit to achieve the desired VOC recovery.

  - Absorption - Absorption is a process in which atoms or molecules transfer from a gas phase into a liquid phase. The vapor stream containing the VOCs is compressed from near atmospheric pressure to approximately 150 pounds per square inch (gauge) (psig) for optimal VOC recovery. A portion of the crude oil being loading onto the crude oil carrier is diverted to a refrigerated chiller to reduce its temperature and consequently its true vapor pressure. The chilled crude oil is then contacted with the vapor stream in an absorber vessel where the VOC vapors are condensed and absorbed into the liquid crude oil stream. The chilled crude oil and condensed VOCs are reinjected into the loading line and into the crude oil carrier.

  - Membrane Technology: The membrane process for VOC removal utilizes a specialized membrane to separate the VOCs from the recovered vapors. This technology is an addition to the typical absorption process that is discussed above and is used to remove additional VOCs that were not removed during the absorption process. After recovered vapors leave the absorption system, they would flow into a membrane where the differential pressure (due to a vacuum pump on one side of the membrane) drives the VOCs across the membrane and filters VOCs from the vapors before they are released into the atmosphere.

- Absorption with Adsorption: This method utilizes a combination of adsorption and absorption technologies to achieve VOC recovery of the recovered vapors. The recovered vapors' first pass through one or multiple adsorber beds. A two-stage vacuum pump system is used to regenerate the activated carbon vessels after they become saturated with VOCs. The discharge gases of the vacuum pumps are routed through a single absorber column where the VOCs are absorbed into a circulating lean oil stream. The lean oil stream along with the recovered VOCs are collected at the base of the absorber column and pumped back into the oil flow of the vessel being loaded.

- Vapor Combustion Technologies
  - Vapor Combustor: Vapor Combustion Units (VCUs) utilize high combustion temperatures in an enclosed stack to achieve VOC destruction. The VOC vapors displaced from tanker loading are enriched with propane, as needed, to a minimum of 164 British thermal units per standard cubic foot (Btu/scf) to ensure combustion would be hot enough (> 1,200°F) to destroy the VOCs. Propane would be supplied from International Organization for Standardization (ISO) tanks.
  - Process Flare: Process flare fuel supply components are almost identical to the vapor combustor. However, combustion occurs from a burner tip in open air. There is less control of combustion temperature and residence time, and the flame is visible in all directions. To maintain high destruction removal efficiency, a flare must maximize tip velocity, have a continuous burning pilot, and waste gas heating value should be greater than 300 Btu/scf.

These VOC control technologies were evaluated in a BACT analysis as presented in Section 3.7.3 to select the technology that maximizes VOC reduction through consideration of technical feasibility, and most effective reduction in VOC considering cost and other collateral air quality impacts. Vapor combustor units were selected at the completion of the analysis. This would provide a 95% reduction in VOC vapor emissions from crude oil loading.

1.4.2.2 Location of Volatile Organic Compound Vapor Combustor

The requirements of the vapor combustor to function with the proposed VLCC loading rates (up to 365 VLCCs per year) drive the selection of the most appropriate location for the vapor combustor. The vapor combustor consists of four main components: dock safety skids, vapor blowers, staging skids, and three vapor combustors (each approximately 80 feet [24.4 meters] tall). An adequate supply of electrical power for the vapor blower motor, instrument air for all control valves and propane for inert enrichment are also considerations in selecting the proper location for the control system.

The following alternatives for the location of the vapor combustor were evaluated.

- Ship-based, portable (placed on VLCCs or other visiting crude oil carriers);
- SPM buoy-based;
- Support vessel-based, adjacent to a buoy or VLCC; and
- Onshore (with vapor return line to shore).

Platform-based Vapor Combustor

A platform-based vapor combustor would be placed with the required equipment on the fixed platform, which is located approximately 1 statute mile (1.6 kilometers) from each SPM buoy. To transport the VOCs to the platform for destruction, a VLCC vapor manifold would be connected to a floating hose that runs from the VLCC to the SPM buoy. The buoy would be connected via a flexible hose to the PLEM located on the sea floor. The PLEM is then connected to the fixed platform via two vapor recovery pipelines. The fixed platform would be able to provide the necessary utilities (electric, instrument air, and propane for inert enrichment) since it has adequate space to accommodate this equipment. The vapor combustor's location on the platform is a safe location that would keep the 1,200°F (648.9°C) vapor combustor temperatures away from crude oil loading and away from the VLCC or other crude oil carrier. This option would meet the vapor combustor requirements, satisfy the Project objective to reduce VOC emissions, and therefore is the selected location option.

Ship-based Portable Vapor Combustor (Placed on VLCCs or Other Crude Oil Carriers)

Placement of the vapor combustor on VLCCs or other crude oil carriers was evaluated. Upon evaluation of this option, the following key requirements could not be met and, therefore, this option was dismissed:

- VOC control equipment would need to be lifted onto VLCCs or smaller crude oil carriers. Typically, adequate crane capacity is not available onboard these vessels to lift the required VOC equipment components and would not be conducive for use with the worldwide tanker fleet;
- Deck space and deck area that can accommodate weighted loads typically is not adequate to accommodate the vapor combustors on the main deck of the VLCCs or other crude oil carriers;
- A stable deck area that does not oscillate or vibrate to set the equipment is not available. There is not a viable method to secure the equipment to the VLCC deck (no welding allowed); as a result, the equipment would become unstable and unsafe to operate; and
- Adequate instrument air, electrical power, and propane for inert gas enrichment would not be available on the existing worldwide fleet of VLCCs and smaller crude oil carriers that would call on the DWP.

SPM Buoy-based Vapor Combustor

Placement of the vapor combustor on the SPM buoy was also evaluated. Upon evaluation of this option, the following key requirements could not be met and, therefore, this option was dismissed.

- An adequate footprint to accommodate the vapor combustor is not available on the SPM buoy;
- Stable deck areas that do not oscillate or vibrate are not available because the buoy oscillates in varying sea state conditions; and
- Adequate instrument air, electrical power, and propane for inert gas enrichment is not available nor is there space to add equipment to produce it.

Support Vessel-based Vapor Combustor (Adjacent to a SPM Buoy, VLCC, or Other Crude Oil Carrier)

Placement of the vapor combustor on a support vessel that could be moored alongside a VLCC or other crude oil carrier or SPM buoy was evaluated. Upon evaluation of this option, the following key requirements could not be met and, therefore, this option was dismissed:

- A purpose-built support vessel mounted VOC recovery system would be required. A concept vessel has been operated in Japan using cryogenic recovery to treat very small volumes of VOC vapors. However, use of vapor combustors on a dedicated vessel has not been attempted;
- Due to space constraints, this concept utilizes a cryogenic process for VOC recovery. As such, this method does not provide the proven space for the placement of vapor combustors; and
- Stable areas that do not oscillate or vibrate are not available on a vessel for placing the equipment.

Onshore Vapor Combustor

Placement of the vapor combustor onshore was also evaluated. The vapors would need to be transported in a new dedicated pipeline about 40.8-nautical-mile (46.9-statute mile, or 75.5-kilometer) to the onshore terminal for destruction. Gas compression equipment would be required on the platform to raise the pressure of the vapors from just above atmospheric pressure to a nominal pressure necessary to push the vapors onshore. The footprint and electric requirements for the required compression would require more space for compressor and additional electric generation equipment on the fixed platform than the proposed vapor combustor. The environmental footprint, cost, and complexity of the SPOT Project would increase. Incrementally, to transport the VOC vapors to shore would require approximately a 40.8-nautical-mile (46.9-statute mile, or 75.5-kilometer) or longer pipeline to transport the VOC vapors, thus leading to an increase of seafloor disturbance with the addition of a pipeline. Therefore, there is no advantage to locating the vapor combustor onshore and, as a result, the onshore location of the vapor combustor was eliminated from consideration.

2 REGULATORY APPLICABILITY

2.1 FEDERAL AIR REGULATIONS

The Deepwater Port Act (DWPA) (33 United States Code [U.S.C.] 1501, et seq.) governs licensing of deepwater ports (DWPs). The processing of deepwater port license applications (DPLAs) is delegated to the U.S. Maritime Administration (MARAD) and the U.S. Coast Guard (USCG). A 1994 Memorandum of Understanding (MOU) between various federal agencies established the jurisdictional responsibilities for offshore facilities and roles in reviewing DPLAs. For DPLAs, the U.S. Environmental Protection Agency (USEPA) administers Federal Clean Air Act (CAA) requirements and reviews air quality analyses of National Environmental Policy Act (NEPA) documents, air quality permit applications, and modeling analyses. Note that the Outer Continental Shelf Lands Act (OCSLA; 43 U.S.C. 1334(a)(8)) does not apply to DWPs.

Under the CAA, the USEPA has established National Ambient Air Quality Standards (NAAQS) and states have adopted enforceable plans to meet or stay below the standards. Air quality regulations associated with the CAA are codified under Title 40, Parts 50–99 of the Code of Federal Regulations (CFR). This section summarizes federal air regulations that establish emission limits and/or operation conditions that apply to the proposed facility's emission sources.

2.1.1 NEW SOURCE PERFORMANCE STANDARDS

Section 111 of the CAA authorizes the USEPA to develop technology-based standards that apply to specific categories of stationary sources. These standards are referred to as New Source Performance Standards (NSPS) and are found in 40 CFR 60. The NSPS apply to new, modified, and reconstructed affected facilities in specific source categories. These standards are intended to promote use of the best air pollution control technologies, taking into account the cost of such technology and any other non-air quality, health, and environmental impact and energy requirements.

Subpart IIII - Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

SPOT DWP's diesel-powered emergency (backup) generator, fire water pumps, pedestal cranes, and diesel generators are subject to NSPS Subpart IIII, which establishes emission standards for new stationary compression ignition internal combustion engines. The rule provides various emissions standards based on the engine's use, manufacture date, engine configuration, and engine size. The applicable standards associated with the equipment would be dependent on the final engine selection.

2.1.2 NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS

Section 112 of the CAA authorized the USEPA to develop technology-based standards that apply to specific categories of stationary sources that emit hazardous air pollutant (HAPs). These standards are referred to as National Emission Standards for Hazardous Air Pollutants (NESHAP) and are found in 40 CFR 61 and 40 CFR 63. NESHAP can apply to major and/or area (minor) sources of HAPs. A major source of HAPs emits 10 tons per year (tpy) or more of an individual HAP or 25 tpy or more of any combination of HAPs. To be classified as a minor source, HAP emissions must be less than these thresholds.

For the SPOT DWP, the annual emissions of an individual HAP would be greater than 10 tpy and the total annual emissions of all HAPs would be greater than 25 tpy. Therefore, the facility would be a major source of HAPs.

Subpart Y - National Emission Standards for Marine Tank Vessel Loading Operations

NESHAP Subpart Y establishes Maximum Achievable Control Technology (MACT) standards for marine tank loading operations for sources that are major for HAPs. In particular, 40 CFR 63.562b(4) would apply to the SPOT DWP. It states that the owner or operator of a new major source offshore loading terminal shall reduce HAP emissions from marine tank vessel loading operations by 95 weight-percent, as determined using methods in §63.565 (d) and (l). The SPOT loading operations would comply with this requirement through use of vapor combustors. The requirements under 40 CFR 63.562b(3) would not apply to the SPOT DWP as they are not applicable to offshore loading terminals.

Subpart ZZZZ - National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

NESHAP Subpart ZZZZ establishes emission and operating requirements for HAPs emitted from stationary reciprocating internal combustion engines located at major and area sources of HAP emissions. This subpart also establishes requirements to demonstrate initial and continuous compliance with the emission limitations and operating limitations. Since the SPOT DWP would be a major source of HAPs, the emergency backup diesel generator, diesel fire water pumps, crane engines, and diesel electric generator engines would be subject to the requirements of NESHAP Subpart ZZZZ. In accordance with 40 CFR 63.6590(b)(i), the engines do not have to meet the requirements of NESHAP Subpart ZZZZ and of NESHAP Subpart A except the initial notification requirements.

New Source Review/Prevention of Significant Deterioration

NSR is the preconstruction permitting program under Parts C and D of the CAA. New major sources or major modifications to existing major sources must undergo NSR review before construction and/or modification activities are initiated. PSD refers to the review process for air pollutant emissions from sources located in areas designated as attainment or unclassified with respect to the NAAQS. Nonattainment New Source Review (NNSR) refers to the review process for air pollutant emissions from sources located in areas designated as nonattainment with respect to the NAAQS.

The NSR requirements applicable to the SPOT DWP were discussed with USEPA Region 6. The USEPA stated that ozone nonattainment requirements applicable in Brazoria County (the nearest land area to the DWP) would not apply to offshore DWP located in federal waters. Based on this consultation, federal PSD permit application requirements would apply to the Project.

The PSD requirements are promulgated in 40 CFR 52.21. For new sources, the PSD program is applicable only to sources that are defined as major sources under the PSD program. A new facility is defined as a major source if it has the potential to emit (PTE) any criteria pollutant regulated under the CAA in amounts equal to or exceeding 100 or 250 tpy. The 100 tpy threshold applies only to 28 distinct source categories listed in 40 CFR 52.21. The 250 tpy threshold applies to all other categories. Since SPOT DWP does not belong to any of the 28 listed source categories, the 250 tpy threshold is used to determine if the facility is a major source under the PSD program.

Table 6 compares SPOT DWP's estimated emissions to PSD thresholds and significant emission rates as defined under the PSD program. Based on calculations of the facility's PTE, and per the definitions in 40 CFR 52.21, the SPOT Project would be a new major stationary source for VOC and carbon monoxide (CO), and subject to PSD review.

After a determination that PSD review is required, all pollutants that exceed specified "significant emission rates" are included in the PSD review for the facility. Therefore, nitrous oxide (NO_2), and greenhouse gas (GHG) emissions from the facility are subject to PSD review because their emission are greater than the corresponding significant emission rates thresholds. In addition, the facility would be a major source of HAPs.

Table 6
Comparison of SPOT Deepwater Port Air Emissions to PSD Thresholds

Air Pollutant	Annual Emissions (tpy)	PSD Threshold (tpy)	PSD Significant Emission Rates (tpy)	Subject to PSD Modeling?
Nitrogen Dioxide (NO_2)	223.50	250	40	Yes
Carbon Monoxide (CO)	291	250	100	Yes
Volatile Organic Compounds (VOCs)	1,729.90	250	40	Yes
Particulate Matter (PM)	8.11	250	25	No
Particulate Matter with an aerodynamic diameter less than or equal to 10 microns (PM_{10})	8.11	250	15	No
Particulate Matter with an aerodynamic diameter less than or equal to 2.5 microns ($PM_{2.5}$)	8.11	250	10	No
Hazardous Air Pollutants (HAPs)	83.11	N/A	N/A	N/A
Sulfur Dioxide (SO_2)	36.85	250	40	No
Hydrogen Sulfide (H_2S)	1.20	NA	10	No
Greenhouse Gases (GHG; as Carbon Dioxide equivalents [CO_2e])	173,257	75,000	NA	N/A

Key:
tpy = tons per year
PSD = prevention of significant deterioration
SER = significant emission rate
HAP = hazardous air pollutant
CO_2e = carbon dioxide equivalents

Prevention of Significant Deterioration (PSD) review includes the following components:

- A best available control technology (BACT) analysis to identify the maximum degree of emission reduction for each pollutant subject to PSD by taking into account technical feasibility and energy, environmental, and economic impacts. The BACT analysis for the SPOT DWP is presented in Section 3.

- An air quality analysis (AQA) of the ambient impacts to demonstrate that new emissions would not cause or contribute to a violation of any applicable NAAQS or PSD increment. The air dispersion modeling protocol and AQA for the SPOT DWP are presented in Appendix I and J, respectively.

- An additional impacts analysis to assess any potential impacts on soils, vegetation, additional industrial/residential growth, and visibility caused by emission increases of regulated pollutants. The scope of the additional impacts analysis is dependent on site conditions and is discussed in the AQA.

Title V Operating Permits

Title V of the CAA requires operating permits for major sources. These permits are regulated under 40 CFR Part 71. The operating permits outline the emission limits and operating conditions applicable to the emission units at a major source. A source is defined as a major source under the Title V operating permit program if its annual potential to emit equals or exceeds any of the following thresholds:

- 100 tpy of a regulated air pollutant (except GHGs);
- 10 tpy of an individual HAPs; or
- 25 tpy of any combination of total HAPs.

The facility-wide emissions listed in Table 6 indicate that the Project is subject to Title V permitting, as NO_X, CO, and VOC would exceed the 100 tpy threshold for annual emissions. In addition, the facility would be a Title V major source of HAPs.

Greenhouse Gas Mandatory Reporting Rule

The USEPA has promulgated monitoring, reporting, and recordkeeping rules for GHGs. A facility is required to report its GHG emissions if its aggregate maximum rated heat input from all combustion sources is greater than 30 million British thermal units per hour (MMBtu/hr) and the facility emits more than 25,000 metric tpy of carbon dioxide equivalent (CO_2e).

In May 2010, the USEPA issued the GHG Tailoring Rule, which set thresholds for GHG emissions that define when PSD and Title V Operating Permit programs are required for new and existing facilities.

In June 2014, the United States Supreme Court ruled that the USEPA could not classify a facility as a major PSD or Title V source based solely on its GHG emissions meeting the major source threshold (USEPA 2017). A source is subject to PSD permitting for GHG emissions only when emissions of a non-GHG pollutant are above the major source threshold of 100 or 250 tpy and GHG emissions as CO2e are above 75,000 tpy.

2.2 TEXAS AIR REGULATIONS

For DPLAs, the USEPA administers CAA requirements and reviews air permit applications, using adjacent state's regulation. Texas is the nearest adjacent state to the Project's offshore location. Therefore, the Texas Commission on Environmental Quality (TCEQ) rules and regulations would apply to the offshore portion of the Project. Texas state air quality regulations in 30 Texas Administrative Code, Chapters 101 through 122 (TCEQ 2018) that establish emission limits and/or operational conditions that may apply to the SPOT DWP are described below.

Chapter 101 - General Air Quality Rules

Chapter 101 covers general rules that would apply to the Project. Some items included in Chapter 101 are nuisance rules, inspection fees, emission fees, emission events, scheduled maintenance, and expedited permitting. The SPOT DWP would comply with all applicable rules and requirements listed in this Chapter.

Chapter 111 - Control of Air Pollution from Visible Emissions and Particulate Matter

Chapter 111 establishes standards for visible emissions and opacity from stationary vents, gas flares, ships, and other sources, and for particulate matter emissions from selected sources, including material handling and construction. In general, opacity from a new stationary vent or stack must not exceed 20% averaged over a 6-minute period, and opacity from a ship stack must not exceed 30% averaged over a 5-minute period, except during reasonable periods of engine startup. Gas flares must not have visible emissions for more than 5 minutes in any 2-hour period. The Project would comply with all applicable opacity and particulate emission limits specified in Chapter 111.

Chapter 112 - Control of Air Pollution from Sulfur Dioxide

This chapter outlines emission limits as well as monitoring, reporting, record-keeping requirements, and net ground level concentration limits for sulfur compounds. The SPOT DWP would demonstrate compliance with the net ground level concentration of applicable sulfur compounds (i.e., SO_2, hydrogen sulfide [H_2S]) through air dispersion modeling analysis.

Chapter 113 - Standards of Performance for Hazardous Air Pollutants and for Designated Facilities and Pollutants

Chapter 113 incorporates by reference all of the federal NESHAP standards contained in 40 CFR 63, including applicability as described earlier in Section 2.1.2.

Chapter 115 - Control of Air Pollution from Volatile Organic Compounds

Chapter 115 establishes rules for VOC emissions from specific sources, including vent gases, loading, and unloading of VOCs. Chapter 115 applies to sources in nonattainment and specifically listed covered attainment counties in §115.10. The requirements listed in Chapter 115 do not apply to the SPOT DWP. The Project is not in a nonattainment area, nor in one of the specifically listed attainment counties. However, the SPOT DWP would control offshore marine loading VOC emissions at a 95% VOC destruction efficiency.

Chapter 116 - Control of Air Pollution by Permits for New Construction or Modification

Through Chapter 116, the TCEQ administers the NSR (Non-Attainment and PSD review) air permit programs in Texas. However, for sources located outside of the state seaward boundary on the Outer Continental Shelf (OCS), USEPA Region 6 administers the PSD program, using adjacent state regulations. Therefore, SPOT DWP is applying to USEPA Region 6 for a PSD permit prior to commencing construction.

Chapter 117 - Control of Air Pollution from Nitrogen Compounds

Chapter 117 establishes emission limits for nitrogen compounds in ozone nonattainment areas and specifically listed areas. The Project is not located in nonattainment area; therefore, it is not subject to Chapter 117.

Chapter 118 - Control of Air Pollution Episodes

Chapter 118 establishes requirements for generalized and local air pollution episodes. The requirements listed in Chapter 118 do not apply to SPOT DWP since the Project location is not in any geographical area that might be affected by an air pollution episode.

Chapter 122 - Title V Operating Permit Applicability

The SPOT DWP will be a major source of regulated pollutants and will require a federal Title V operating permit. For sources located outside of the state seaward boundary on the OCS, USEPA Region 6 administers the Title V permit program, using adjacent state regulations. Therefore, the SPOT DWP will submit an initial Title V operating permit application to USEPA Region 6 prior to starting operation of the facility.

3 BEST AVAILABLE CONTROL TECHNOLOGY ANALYSIS

3.1 OBJECTIVE

The objective of this analysis is to select the appropriate best available control technology (BACT) for each stationary emission source at the SPOT DWP platform based on the maximum degree of reduction of each pollutant subject to prevention of significant deterioration (PSD) review. BACT for each source is determined by identifying the emission reduction achievable through application of available methods, systems, and techniques for control of each such pollutant. The BACT analysis includes energy, environmental, and economic impacts. The following criteria air pollutants are subject to PSD and are included in the BACT analysis: carbon monoxide (CO), nitrogen oxides (NO_X), and volatile organic compounds (VOC). The BACT analysis also includes greenhouse gases (GHGs) (carbon dioxide [CO_2], methane [CH_4], and nitrous oxide [N_2O]).

3.2 METHODOLOGY

The BACT analysis was performed in accordance with U.S. Environmental Protection Agency (USEPA) guidance, which outlines a "top-down" five-step process to determine the appropriate emission control technologies/limitations:

- Step 1 – Identification of All Control Technologies
- Step 2 – Elimination of Technically Infeasible Options
- Step 3 – Ranking of Remaining Control Technologies by Control Effectiveness
- Step 4 – Evaluation of Most Effective Controls
- Step 5 – Selection of BACT

The top-down BACT analysis was performed for groups of similar emission units, as shown in Table 7. The determination of BACT for each group of emission units is addressed separately by pollutant.

Available control technologies are identified for each emission unit. The following methods are used to identify potential technologies: (1) researching the Reasonably Available Control Technology (RACT)/BACT/Lowest Achievable Emission Rate (LAER)[1] Clearinghouse (RBLC) database; (2) surveying regulatory agencies; (3) drawing from previous engineering experience; (4) surveying air pollution control equipment vendors; and/or (5) surveying available literature. The TCEQ has established Tier I BACT requirements for a number of industry types. The current TCEQ BACT guidelines for applicable Chemical and Combustion sources were additionally reviewed. While TCEQ follows "three-tiered" approach for BACT analysis, the end result from using either the "three-tiered" or USEPA's "top-

[1] The terms "RACT," "BACT," and "LAER" are acronyms for different program requirements under the New Source Review program. RACT means Reasonably Available Control Technology; BACT, as defined earlier, is Best Available Control Technology, while LAER is Lowest Achievable Emission Rate.

down" approach should be the same. This BACT analysis follows "top-down" approach since the PSD application is submitted to the USEPA Region 6.

Table 7
Emission Unit Groups for Best Available Control Technology

Emission Unit Description	Group
Diesel Generator Engines, Pedestal Cranes	Internal Combustion Engines
Emergency (Backup) Diesel Generator, Diesel Firewater Pumps	Emergency Use Internal Combustion Engines
Vapor Combustors	Other Miscellaneous Combustion
Diesel Storage Tanks	Storage Tanks
Fugitive Emissions	Fugitive Emissions

Step 1 - Identification of all Control Technologies

The first step was to identify all available control options for each emission unit type. Available control options included air pollution control technologies or techniques with a practical and demonstrated commercial potential for application to the emission unit and the regulated pollutant under evaluation. Air pollution control technologies and techniques included lower emitting processes, work practices/good management, and post-combustion controls. A unique aspect of identification of available control technologies is the consideration that SPOT DWP is an offshore platform with limited deck space and no external gas or electric supply.

Step 2 - Elimination of Technically Infeasible Options

The second step was to identify the technical feasibility of the control options identified in Step 1. Technically feasible control options include technology that is commercially and readily available and in common use. Technical infeasibility is defined as one or more technical difficulties that preclude the successful use of the control option on the emission unit under review. For an offshore platform, technical infeasibility may include the limitations imposed by limited power supply, limited or no gas supply, deck space for installation or uniqueness of application. Technical infeasibility is documented and demonstrated based on physical, chemical, and engineering principles. Technically infeasible options eliminated in Step 2 were not given further consideration in the BACT analysis. Special consideration was given to carbon capture and sequestration (CCS) in the GHG analysis; if deemed infeasible, a qualitative discussion of CCS was carried forward due to the unique interest afforded GHG control technologies.

Step 3 - Ranking of Remaining Control Technologies by Control Effectiveness

The third step was to list and rank all the remaining control alternatives not eliminated in Step 2. The ranking was based on control effectiveness for the pollutant under review.

Step 4 - Evaluation of Most Effective Controls

The next step involved consideration of the energy, environmental, and economic impacts of the remaining alternatives.

If the top-ranked alternative was selected, consideration was given to whether impacts of unregulated air pollutants or impacts in other media would justify selection of an alternative control option. If there were no issues regarding collateral environmental impacts of the top-ranked alternative, an analysis of energy and economic impacts was not required, and the process proceeded to Step 5.

In the event that the top-ranked alternative was shown to be inappropriate due to energy, environmental, or economic impacts, the rationale for this finding was documented. Then the next most stringent alternative in the list was similarly evaluated. This process continued until a technology under consideration was not eliminated due to environmental, energy, or economic impacts.

Step 5 - Selection of BACT

The most effective control alternative that was not eliminated in Step 4 was proposed as the BACT for the pollutant and emission unit under review. The selected BACT cannot result in an emissions limit less stringent than the emissions limits established by an applicable new source performance standard (NSPS).

3.3 SUMMARY OF SELECTED BACT

Table 8 summarizes the selected BACT for each emission unit group. A detailed discussion of application of Steps 1 through 5 for each group by pollutant is presented in Sections 3.5 through 3.8.

Table 8
Summary of Selected BACT

	Pollutant	BACT Emission Limit	Control Technology Selected
Diesel Generators	NO_X	6.4 NO_X +NMHC - g/kW-hr	Good Combustion Practices, Fuel Injection Timing Retard, Lean Burn Combustion and Compliance with NSPS Subpart IIII
	CO	3.5 g/kW-hr	Good Combustion Practices, Lean Burn Combustion, Use of Oxidation Catalyst and Compliance with NSPS Subpart IIII
	VOC	6.4 NO_X +NMHC - g/kW-hr	Good Combustion Practices, Lean Burn Combustion, Use of Oxidation Catalyst and Compliance with NSPS Subpart IIII
	GHG	Annual emission limit	Good combustion practices
Emergency (Backup) Diesel Generator	NO_X	NO_X +NMHC - 5.5 g/kW-hr	Good Combustion Practices, and Compliance with NSPS Subpart IIII
	CO	CO - 4.9 g/kW-hr	Good Combustion Practices, and Compliance with NSPS Subpart IIII
	VOC	NO_X +NMHC - 5.5 g/kW-hr	Good Combustion Practices, and Compliance with NSPS Subpart IIII
	GHG	Annual emission limit	Good combustion practices
Diesel Firewater Pumps	NO_X	NO_X +NMHC - 6.4 g/kW-hr	Good Combustion Practices, and Compliance with NSPS Subpart IIII
	CO	CO - 3.5 g/kW-hr	Good Combustion Practices, and Compliance with NSPS Subpart IIII
	VOC	NO_X +NMHC - 6.4 g/kW-hr	Good Combustion Practices, and Compliance with NSPS Subpart IIII
	GHG	Annual emission limit	Good combustion practices

Table 8
Summary of Selected BACT

	Pollutant	BACT Emission Limit	Control Technology Selected
Pedestal Cranes	NO_X	NO_X +NMHC - 0.4 g/kW-hr	Good Combustion Practices, and Compliance with NSPS Subpart IIII
	CO	CO - 3.5 g/kW-hr	Good Combustion Practices, and Compliance with NSPS Subpart IIII
	VOC	NMHC - 0.19 g/kW-hr	Good Combustion Practices, and Compliance with NSPS Subpart IIII
	GHG	Annual emission limit	Good combustion practices
Marine Loading Operations	VOC	Vapor Combustors with 95% DRE	99% Vapor Collection Efficiency, Annual vapor tightness test requirements, Route to VOC control device
Vapor Combustors	NO_X	0.15 lb/MMBtu	Good combustion practices
	CO	0.3 lb/MMBtu	Good combustion practices
	VOC	95% destruction efficiency	Vapor Combustor
	GHG	Annual emission limit	Good combustion, operating, and maintenance practices
Diesel Storage Tank	VOC	True vapor pressure < 0.5 psia	Fixed roof with submerged fill
Component Fugitives	VOC	None	Proper piping design and good work practices
	GHG	Annual emission limit for platform	Proper piping design and good work practices

Key:
BACT = best available control technology
CO = carbon monoxide
FLNGV = floating liquefied natural gas vessel
g/kW-hr = grams per kilowatt hour
GHG = greenhouse gas
NO_X = nitrogen oxides
VOC - volatile organic compounds

3.4 INFORMATION SOURCES

Informational databases, clearinghouses, and documents were used to identify recent control technology determinations for similar source categories and emission units for this BACT analysis. The following information sources were reviewed: the USEPA's RBLC database; permits; technical journals, newsletters, and reports; information from control technology suppliers; and engineering design on other projects.

3.5 NO_X BACT ANALYSIS

NO_X consists of a mixture of nitrogen oxide (NO) and nitrogen dioxide (NO_2). NO_X is typically generated from the combustion of fossil fuels. It is a combination of fuel NO_X formed through the oxidation of the fuel-bound nitrogen and thermal NO_X formed through the oxidation of a portion of the nitrogen contained in the combustion air.

NO_X emission control methods can be divided into two categories: in-combustion and post-combustion. In-combustion controls reduce the quantity of NO_X formed during the combustion process. Post-combustion controls reduce NO_X emissions in the exhaust gas stream. Some of these methods may be used alone or in combination to achieve the various degrees of NO_X emission reduction.

3.5.1 DIESEL GENERATOR ENGINES

Step 1 - Identification of All Control Technologies

The available control options for the diesel generator's internal combustion engines include the following:

- In-combustion controls
  - Fuel selection
  - Engine Good Combustion Practices
  - Fuel Injection Timing Retard
  - Lean Burn Combustion
- Post-combustion controls
  - Selective catalytic reduction (SCR)
  - Selective non-catalytic reduction (SNCR)
  - Non-selective catalytic reduction (NSCR)
  - EMx catalyst system

Fuel Selection

The amount of air pollutant emissions generated (per heating value) for a combustion source is dependent upon the fuel type. While natural gas-fueled engines may provide lower NO_X emissions per unit of power output compared to diesel engines, there is no gas source available for the power generation engines on the platform. Diesel fuel is the only option available, which would comply with 40 CFR 60 (NSPS), Subpart IIII requirements. The engines would use ultra-low sulfur diesel fuel (no more than 15 ppmw sulfur).

Engine Good Combustion Practices

Good combustion practices are typically incorporated into the design of diesel engines. These designs can include features such as electronic engine controls, injection systems, combustion chamber geometry, and turbocharger and after cooler systems. Turbochargers and after coolers work to increase the overall thermal efficiency of the diesel cycle, thereby reducing emissions on a per unit basis.

Fuel Injection Timing Retard

Fuel injection timing delivers fuel into the engine cylinders, while precisely controlling the injection timing, fuel atomization, and other parameters. Fuel injection timing improves fuel efficiency, thereby reducing the emissions on a per unit basis.

Lean Burn Combustion

Lean burn combustion limits the fuel so that the air fuel ratio is below stoichiometric conditions. By limiting the quantity of fuel, available peak combustion temperatures are lowered and thermal NOx formation is reduced.

SCR, SNCR, NSCR, and EMx Catalyst System

These post combustion emission control options are described below:

SCR

SCR is a post-combustion NO_X control technology that treats the flue gas downstream of a combustion source. SCR systems reduce NO_X emissions by injecting ammonia or urea into the exhaust flow upstream of a catalyst. In the SCR unit, NO_X, ammonia, and O_2 react to form N_2, CO_2, and water. Some ammonia passes through unreacted, which is "ammonia slip." Several types of catalyst materials are available, including noble metals, base metal oxides such as vanadium and titanium, or zeolite-based material. These catalysts are susceptible to fouling and have a finite lifespan. SCR systems can typically be used on equipment with exhaust gas temperatures ranging from approximately 450 degrees Fahrenheit (°F) to 850°F for optimum reduction of NO_X. The performance and effectiveness of SCR systems are directly dependent on the temperature of the flue gas when it passes through the catalyst. Vanadium/titanium catalysts have been used on the majority of SCR system installations. The flue gas temperature range for optimum SCR operation using a conventional vanadium/titanium catalyst is approximately 600°F to 750°F. At temperatures above 850°F, permanent damage to the vanadium/ titanium catalyst occurs. At temperatures below 600°F, the conditions are not present for effective reaction. Contaminants in the fuel may poison or mask the catalyst surface causing a reduction or termination in catalyst activity. Load fluctuations can cause variations in exhaust temperature and NO_x concentration, which can create problems with the effectiveness of the SCR system.

SNCR

SNCR is an add-on control technology that reduces NO_X emissions by injection of ammonia or urea into specific temperature zones in the exhaust gas from a combustion source. SNCR is similar to SCR in that both control systems use ammonia to react with NO_X. However, SNCR operates at higher temperatures than SCR, requires sufficient residence time in the exhaust gas within a specific temperature range, and does not use a catalyst. The operating temperature range required for effective operation of SNCR is 1,600°F to 2,200°F.

NSCR

NSCR uses a catalyst without injected reagents to reduce NO_X emissions in an exhaust gas stream. NSCR is typically used in rich-burn internal combustion engines and employs a platinum/ rhodium catalyst.

NSCR is effective only in a stoichiometric or fuel-rich environment where the combustion gas is nearly depleted of oxygen.

EMx Catalyst System

The EMx system is an add-on control technology that can be used to control NO_X, CO, and VOC emissions using a single catalyst and does not require a reagent such as ammonia. The catalyst is a monolithic design made from a ceramic substrate with both a proprietary platinum-based oxidation catalyst and a potassium carbonate adsorption coating. The system oxidizes pollutants and absorbs NO_2 on the catalyst surface. The potassium carbonate then reacts with NO_2 to form potassium nitrites and nitrates. Once the carbonate absorber coating on the catalyst surface has been reacted to form potassium nitrites and nitrates, it must be regenerated by passing a controlled mixture of regeneration gases and/or steam across the surface of the catalyst in the absence of oxygen. While the regeneration process occurs, exhaust must pass through a parallel EMx system in order to maintain pollution control capabilities. The EMx system is designed to operate effectively at temperatures ranging from 300°F to 700°F.

Step 2 - Eliminate Technically Infeasible Options

This step addresses the feasibility of each identified control option.

Fuel Selection

The diesel-fired engine would use ultra-low sulfur diesel to minimize emissions. Use of an alternate fuel is not a viable option as there is no gas source available for the platform power generation.

Engine Good Combustion Practices

This is a feasible technology.

Fuel Injection Timing Retard

This is a feasible technology.

Lean Burn Combustion

This is a feasible technology.

SCR

SCR systems are typically used on equipment with exhaust gases temperatures ranging from approximately 450°F to 850°F. The exhaust manifold temperature range of the proposed engine is 880°F to 1,100°F. Exhaust (stack) outlet temperatures would range from 680°F to 808°F. In the exhaust ductwork where a catalyst would be located and ammonia injected, it is highly likely that exhaust temperatures would be above the upper limit for SCR. In addition, installation of SCR would require additional space on the platform to install the catalyst bed, ammonia tank, and associated pipes and controls. Space constraints hinder the housing of the additional necessary equipment. Environmental impacts of SCR include ammonia slip and spent catalyst waste. In addition, there are safety concerns with use of ammonia storage on the deck; ammonia slip would also be of concern as personnel living and working on the platform would be in its close proximity. Unreacted ammonia in the exhaust stream is toxic and can cause irritation and burning of the skin, eyes, nose, and throat. Spent catalyst is considered a hazardous waste and must be disposed of properly.

Therefore, with exhaust temperature above the upper limit for SCR, constrained deck space for installation, and proximity to personnel working on the platform, SCR is considered infeasible as a NO_X control option for diesel generators.

SNCR and NSCR

SNCR's optimum temperature range for injection of ammonia or urea is 1,600°F to 1,900°F. The exhaust temperature from the vendor specified engine during varied load conditions would be well below the range of SNCR. Therefore, SNCR is considered technically infeasible as an NO_X control option.

NSCR is effective only in a fuel- rich environment with exhaust gas nearly depleted of oxygen. It is, therefore, not compatible with other beneficial NOx reduction technologies such as lean-burn engine technology. Due to this incompatibility, NSCR is considered not technically feasible.

EMx Catalyst System

EMx has been used in very limited applications on gas turbines at electrical power plants. The catalyst is also very susceptible to poisoning due to even the low amount of sulfur in diesel fuel used in the generator engines. There is no listing in the RBLC database of EMx catalyst system use on an internal combustion engine. Given these uncertainties and lack of commercial use on an internal combustion engine, the EMx catalyst system is considered technically infeasible as a NO_X control option.

Step 3 - Ranking of Remaining Control Technologies by Control Effectiveness

The use of good combustion practices, fuel injection timing retard and lean combustion are all considered technically feasible options for the diesel generator engines. SPOT would utilize these options for NO_X control.

Step 4 - Evaluation of Most Effective Controls

There are no issues regarding collateral environmental impacts with the selected technologies in Step 3.

Step 5 - Selection of BACT

The use of good combustion practices, fuel injection timing retard and lean combustion are proposed as BACT for the diesel generator engines. Diesel engines meeting these BACT requirements and applicable NSPS Subpart IIII requirements would be specified and procured during final Project design.

3.5.2 EMERGENCY BACKUP DIESEL GENERATOR AND DIESEL FIRE WATER PUMPS

The emergency backup diesel generator engine would be operated in the event that the main diesel electric generators fail to operate (i.e., only in emergencies) and for brief periods for routine maintenance checks. Fire water pump engines would only be routinely run for periodic maintenance checks; their sole other use would be in the event of emergency situations. The emergency generator and fire water pumps would be powered by diesel-fueled reciprocating internal combustion engines.

Step 1 - Identification of All Control Technologies

The available control options for the diesel engines at the SPOT facility include the following:

- In-combustion controls
  - Fuel selection
  - Engine Good Combustion Practices
  - Fuel Injection Timing Retard
  - Lean Burn Combustion
- Lean Burn Combustion Post-combustion controls
  - SCR
  - SNCR
  - EMx catalyst system

Fuel Selection

The amount of air pollutant emissions generated (per heating value) for a combustion source is dependent upon the fuel type chosen. Diesel fuel is the only option available since natural gas is not available at the platform. Ultra-low sulfur diesel fuel (no more than 15 ppmw sulfur) that meets NSPS Subpart IIII requirements is available and would be used.

Engine Good Combustion Practices

The application of good combustion practices as an in-combustion emission control option is discussed in Section 3.5.1.

Fuel Injection Timing Retard

This is an in-combustion emission control option and is discussed in Section 3.5.1.

Lean Burn Combustion

This is also an in-combustion emission control option and is discussed in Section 3.5.1.

SCR, SNCR, NSCR, and EMx Catalysts

These post combustion emission control options are described in Section 3.5.1.

Step 2 - Eliminate Technically Infeasible Options

This step addresses the feasibility of each identified control option for emergency use diesel engines.

Fuel Selection

While natural gas-fueled engines may provide lower NO_X emissions per unit of power output compared to diesel engines, there is no gas source available for fueling these engines on the platform. Additionally, natural gas is not considered a technically feasible fuel for the emergency generator and firewater pump engines since they would need to be used in the event of facility-wide power outage or in case of fire, when natural gas supplies from a pipeline may be interrupted. Therefore, fuel selection of natural gas is considered technically infeasible as a control option.

Engine Good Combustion Practices

Most engine manufacturers incorporate good combustion practices into the design of diesel engines to meet USEPA emission standards. Therefore, engine good combustion practices are considered technically feasible and will be considered further.

Fuel Injection Timing Retard

Modifying the fuel injection timing reduces the peak power available from the engine. This is unacceptable for emergency generators that are required to perform at peak power for short periods. Therefore, fuel injection timing retard has been determined infeasible and rejected as BACT.

Lean Burn Combustion

It is technically infeasible for these emergency units to employ lean burn technology and comply with an associated BACT limit over the short operating periods. Therefore, lean burn combustion has been determined infeasible and rejected as BACT.

SCR and SNCR

Due to the intermittent use of the emergency generator and fire water pump engines, SCR, and SNCR, which require a complex ammonia injection system, are deemed technically infeasible. Further, the exhaust temperatures from the engines need to be within optimum operating ranges of the post combustion control techniques. Additionally, for engines that operate up to 100 hours per year for testing and maintenance, there are no controls that are cost effective. Therefore, SCR and SNCR are considered technically infeasible as a NO_X control option.

EMx Catalyst System

EMx has been used only in very limited situations on gas turbines at electrical power plants. There is no record of EMx catalyst system use on diesel-fueled reciprocating internal combustion engines. The catalyst is very susceptible to poisoning due to sulfur in fuel used in the engines. Therefore, the EMx catalyst system is considered technically infeasible as an NO_X control option.

Step 3 - Ranking of Remaining Control Technologies by Control Effectiveness

Engine good combustion practices are the only control option considered technically feasible for the emergency backup diesel generator and diesel fire water pump engines. Therefore, no ranking of control technologies is necessary.

Step 4 - Evaluation of Most Effective Controls

There are no issues regarding collateral environmental impacts with the use of engine good combustion practices.

Step 5 - Selection of BACT

The use of engine good combustion practices is proposed as BACT for the emergency generator and fire water pump engines. The emergency generator and fire water pump engines use would be limited to 100 hours per year of non-emergency operations. The engines will use ultra-low sulfur diesel fuel (no more than 15 ppmw sulfur) and meet requirements of 40 CFR Part 60 (NSPS), Subpart IIII.

3.5.3 VAPOR COMBUSTORS

Step 1 - Identification of All Control Technologies

Good Combustion Practices

Good combustion practices are incorporated into equipment design, such as proper excess air and good air/fuel mixing during combustion, to minimize emissions.

Low NO_X Burners

Low NO_X burners reduce NO_X by accomplishing the combustion process in stages. Staging partially delays the combustion process, resulting in a cooler flame, which suppresses thermal NO_X formation. The two most common types of low NO_X burners are staged air burners and staged fuel burners. NO_X emission reductions of 40 to 85 percent (relative to uncontrolled emission levels) have been observed with low NO_X burners.

SCR and SNCR

These post-combustion emission control options are described in Section 3.5.1.

Step 2 - Eliminate Technically Infeasible Options

Good Combustion Practices

This is a feasible technology.

Low NO_X Burners

The use of low NOx burners is consider an infeasible option for several reasons related to the main purpose of the vapor combustors which is to control marine loading VOC emissions. By cooling the flame temperature to reduce NOx, the technology works contrary to the need to maintain a high combustion temperature at a minimum of 1,200°F (648.9°C) to achieve 95% VOC removal efficiency and maintain good combustion to achieve a low CO emission rate (0.3 lb/MMBtu). The NOx rate achievable in this application (0.15 lb/MMBtu) is the best available emission rate given the need to attain the VOC reduction efficiency required. To maintain vapor combustion temperature control for varying loading rates, three vapor combustor would be used rather than one larger unit. This configuration would allow the ability to distribute the proper amount of vapor to one or more combustors to maintain optimal combustion conditions and achieve 95% DRE.

SCR

Vapor combustors are pollution control devices used to control VOC emissions. To achieve maximum VOC control, addition of post combustion control such as SCR could alter the effectiveness of VOC control. Addition of an SCR would require an increase in deck size and vapor combustor capacity due to backpressure caused by flow restriction through the catalyst. SCR is best suited to reduce NOx from a continuously operating process however; crude carrier loading activities are a batch process rather than a continuous process. As such, it would be necessary to run SCR in a batch mode with a start/stop cycle for each loading event. The start/stop cycling could cause lower control efficiency and excess ammonia slip resulting in an additional pollutant being emitted. SCR systems require exhaust gas temperatures between 450°F (232°C) to 850°F (454°C) to effectively reduce NO_X emissions. Vapor combustor exhaust temperatures would be a minimum of 1,200°F (648.9°C) to maintain VOC destruction efficiency which is much higher than temperatures required for SCR operation. The RBLC search for existing installations of an SCR on a VCU resulted in no such installations (Appendix F – RBLC database search results). Due to the unacceptable operating temperatures of the combustor, increase in deck size required to accommodate SCR, vapor combustor capacity and the batch mode process, SCR is considered technically infeasible as a NO_X control option for the vapor combustor.

SNCR

SNCR optimum temperature range for injection of ammonia or urea is 1,600°F (871°C) to 1,900°F (1,038°C). The effective temperature range for SNCR is above the expected exhaust temperature for the vapor combustor. Therefore, SNCR is considered technically infeasible as a NO_X control option for the vapor combustors.

Step 3 - Ranking of Remaining Control Technologies by Control Effectiveness

Good combustion practices are the only NOx control option considered technically feasible for the vapor combustors. Therefore, no ranking of control technologies is necessary.

Step 4 - Evaluation of Most Effective Controls

Good Combustion Practices

There are no issues regarding collateral environmental impacts with good combustion practices.

Step 5 - Selection of BACT

The use of good combustion practices is proposed as NO_X BACT for the vapor combustors.

3.6 CO BACT ANALYSIS

CO is formed during combustion processes due to incomplete oxidation of the carbon contained in the fuel. CO formation is controlled by applying techniques to enhance complete and efficient combustion of the fuel.

CO emission control methods can be divided into two categories: in-combustion and post-combustion. In-combustion controls reduce the quantity of CO formed during the combustion process. Post-combustion controls reduce CO emissions in the flue gas stream. Some of these methods may be used alone or in combination to achieve various degrees of CO emission reduction.

3.6.1 DIESEL GENERATOR ENGINES

Step 1 - Identification of All Control Technologies

The available control options for the diesel generator engines include the following:

- In-combustion controls
  - Good combustion practices

- Post-combustion controls
  - Oxidation catalyst
  - EMx catalyst system

Good Combustion Practices

Along with reducing NO_X emissions, good combustion practices would result in reduced emissions of CO and VOC from the diesel generator engines. The combination of good combustion practices with lean combustion discussed in Section 3.5.1 would reduce emissions to a greater degree when compared to good combustion practices alone. These improved combustion characteristics allow minimization of emissions without sacrificing engine performance.

Oxidation Catalyst

An oxidation catalyst provides high-efficiency CO and VOC emissions control. The catalyst is usually made of a precious metal such as platinum, palladium, or rhodium. Other formulations, such as metal oxides for emission streams containing chlorinated compounds, are also used. The catalyst promotes the oxidation of CO and VOCs to CO_2 and water as the gas stream passes through the catalyst bed.

Oxidation catalyst technology does not require the introduction of additional chemicals for the reaction to proceed. Rather, the oxidation to CO_2 occurs spontaneously and utilizes the excess oxygen present in the engine exhaust. The activation energy required for the reaction to proceed is lowered in the presence of the catalyst. Optimum operating temperatures for oxidation catalysts generally fall in the range of 700°F (371°C) to 1,100°F (593°C). Below 700°F (371°C), air pollutant conversion efficiency falls off rapidly. Above 1,200°F (649°C), catalyst sintering may occur, thus causing permanent damage to the catalyst. Operation at part load or during start-up/shut-down would result in less than optimum temperatures and reduced control efficiency.

EMx Catalyst System

The EMx system is described in Section 3.5.1.

Step 2 - Eliminate Technically Infeasible Options

This step addresses the feasibility of each identified control option.

Good Combustion Practices

Good combustion practices with lean combustion are considered technically feasible as a CO control option and will be considered further.

Oxidation Catalyst

Optimum operating temperatures for oxidation catalysts generally fall in the range of 700°F (371°C) to 1,100°F (593°C). Below 700°F (371°C), air pollutant conversion efficiency falls off rapidly. The exhaust temperature range for the expected load variation from the diesel generator engines is expected to fall within the temperature range required for effective operation of oxidation catalyst. Therefore, an oxidation catalyst is considered a technically feasible method to control CO emissions from the diesel generators.

EMx Catalyst System

Technical feasibility of the EMx catalyst system is discussed in Section 3.5.1. The same technical concerns apply when considering EMx catalyst as a CO control option. Therefore, EMX catalyst is considered technically infeasible as a CO control option.

Step 3 - Ranking of Remaining Control Technologies by Control Effectiveness

The technically feasible CO control technologies for diesel generators are ranked by control effectiveness in Table 9.

Table 9
Ranking of Feasible Technologies (CO - Diesel Generators)

Technology	Efficiency	Rank
Oxidation Catalyst	70% - 80%	1
Good Combustion Practices	Not Assessed (considered baseline)	2

Step 4 - Evaluation of Most Effective Controls

Since the SPOT DWP has selected the highest efficiency control, the following information is provided for information purposes only.

Good Combustion Practices

There are no issues regarding collateral environmental impacts with the use of engine-based good combustion practices.

Oxidation Catalyst

The addition of a catalyst bed onto the diesel generator engine exhaust for the oxidation catalyst will create extra pressure drop, resulting in increased backpressure to the engine. This has the effect of reducing the efficiency of the engine and the power generating capabilities. The oxidation catalyst oxidizes CO and VOC to CO_2, which is released to the atmosphere. In addition, as with all controls that utilize catalysts for removal of pollutants, the catalyst must be disposed of after it is spent. The catalyst may be considered hazardous waste and require special treatment or disposal; and even if it is not hazardous, it will add minor waste volume to landfills. The health and environmental benefits of reducing CO emissions are considered to outweigh the other energy and environmental impacts.

Step 5 - Selection of BACT

The use of oxidation catalyst and good combustion practices with lean combustion are proposed as CO BACT for the diesel generator engines. The engines will also comply with 40 CFR 60 (NSPS), Subpart IIII requirements for CO.

3.6.2 EMERGENCY (BACKUP) DIESEL GENERATOR AND DIESEL FIRE WATER PUMPS

Step 1 - Identification of All Control Technologies

The available control options for the emergency generator and firewater pump include the following:

- In-Combustion Controls
  - Engine good combustion practices
- Post-Combustion Controls
  - Oxidation Catalyst
  - EMx catalyst system

Engine Good Combustion Practices

Engine good combustion practices are described in Section 3.5.1.

Oxidation Catalyst

Oxidation catalyst is described in Section 3.6.1.

EMx Catalyst System

The EMx system is described in Section 3.5.1.

Step 2 - Eliminate Technically Infeasible Options

This step addresses the feasibility of each identified control option.

Engine Good Combustion Practices

Most engine manufacturers incorporate good combustion practices into the design of diesel engines to meet USEPA emission standards. Therefore, engine good combustion practices are considered technically feasible and will be considered further.

Oxidation Catalyst

Due to the intermittent use of the diesel engines for the emergency power generation and firefighting with diesel fire water pumps, add-on oxidation catalyst is deemed technically infeasible. During the short period, the emergency generator and fire water pumps are run for maintenance/testing purposes, the catalyst does not have sufficient time to achieve proper operating temperature and effectively reduce CO.

EMx Catalyst System

The drawbacks of using EMx catalysts for CO control are the same as those discussed in Section 3.5.1 for NO_X control. There is no listing in the RBLC database of EMx catalyst system on intermittent use, short operating duration diesel-fueled reciprocating internal combustion engines. Therefore, the EMx catalyst system is considered technically infeasible as a CO control option.

Step 3 - Ranking of Remaining Control Technologies by Control Effectiveness

Engine-based good combustion practices were the only control option considered to be technically feasible for the diesel engines for the emergency backup diesel generator and diesel fire water pumps. Therefore, no ranking of control technologies is necessary.

Step 4 - Evaluation of Most Effective Controls

There are no issues regarding collateral environmental impacts with the use of engine-based good combustion practices.

Step 5 - Selection of BACT

The use of engine-based good combustion practices is proposed as CO BACT for the emergency backup diesel generator and diesel fire water pump engines. The use of engine good combustion practices would allow the engines to meet the CO emissions limits under NSPS Subpart IIII.

3.6.3 VAPOR COMBUSTORS

Step 1 - Identification of All Control Technologies

Good Combustion Practices

Good combustion practices for vapor combustors are described in Section 3.5.3.

Oxidation Catalyst

An oxidation catalyst provides high-efficiency CO and VOC emissions control. The catalyst is usually made of a precious metal such as platinum, palladium, or rhodium. Other formulations, such as metal oxides for emission streams containing chlorinated compounds, are also used. The catalyst promotes the oxidation of CO and VOCs to CO_2 and water as the gas stream passes through the catalyst bed.

Oxidation catalyst technology does not require the introduction of additional chemicals for the reaction to proceed. Rather, the oxidation to CO_2 occurs spontaneously and utilizes the excess oxygen present in the exhaust gas stream. The activation energy required for the reaction to proceed is lowered in the presence of the catalyst. Optimum operating temperatures for oxidation catalysts generally fall in the range of 700°F (371°C) to 1,100°F (593°C). Below 700°F (371°C), air pollutant conversion efficiency falls off rapidly. Above 1,200°F (649°C), catalyst sintering may occur, thus causing permanent damage to the catalyst.

Step 2 - Eliminate Technically Infeasible Options

Good Combustion Practices

Good combustion practices are considered a feasible technology.

Oxidation Catalyst

Use of an oxidation catalyst for CO control on a vapor combustor is not feasible primarily due to incompatible exhaust temperature and introduction of back pressure to the relatively low flow rate exiting the VCU. The VCU operates at a minimum of 1,200°F (648.9°C); as noted in the description of oxidation catalyst control, catalyst sintering may occur at and above this temperature, reducing CO control effectiveness and causing permanent damage to the catalyst. The VCU exhaust exits through a large diameter stack at a relatively low flow rate created by the thermal buoyancy from the combustion of the waste gases. Placement of an oxidation catalyst in this exhaust stream would disturb the exhaust flow by creating a flow restriction and creating back pressure in the VCU that may affect the efficiency and safety of combustion. A search of the RBLC for existing installations of an oxidation catalyst on a VCU at an onshore or offshore installation resulted in no such installations (Appendix F – RBLC Database Search

Results). Additionally, mounting for a CO catalyst inside of the VCU exhaust stack would require structural modifications to the platform to stabilize the stack and support the additional weight, and potentially requiring additional space for each VCU resulting in the need for a larger platform. For these reasons, use of an oxidation catalyst on the VCUs is eliminated as technically infeasible.

Step 3 - Ranking of Remaining Control Technologies by Control Effectiveness

Good combustion practices are the only control option considered technically feasible. Therefore, no ranking of control technologies is necessary.

Step 4 - Evaluation of Most Effective Controls

There are no issues regarding collateral environmental impacts with good combustion practices.

Step 5 - Selection of BACT

Good combustion practices are proposed as CO BACT for the vapor combustors.

3.7 VOC BACT ANALYSIS

VOC is formed during combustion processes due to incomplete oxidation of the fuel. The amount of VOC formation is dependent upon factors such as fuel mixing, air-to-fuel ratios, combustion temperature, and residence time. Typically, most VOC in exhaust streams are the result of unburned fuel, although some can be formed as combustion products.

Generally, methods used to control CO will also result in VOC control for stationary combustion engine sources. Similar to CO control methods, VOC emission control methods can be divided into two categories: in-combustion and post-combustion. In-combustion controls reduce the quantity of VOC formed during the combustion process. Post-combustion controls reduce VOC emissions in the exhaust gas stream. Some of these methods may be used alone or in combination to achieve various degrees of VOC emission reduction.

3.7.1 DIESEL GENERATOR ENGINES

Step 1 - Identification of All Control Technologies

The available control options for the diesel generator engines include the following:

- In-Combustion Controls
  - Good combustion practices
- Post-Combustion Controls
  - Oxidation catalyst
  - EMx catalyst system

Good Combustion Practices

Along with reducing NO_X emissions, engine good combustion practices would result in reduced emissions of CO and VOC from the essential service generator engines. The combination of good combustion practices with lean combustion reduces emissions to a greater degree when compared to good combustion practices alone. These improved combustion characteristics allow minimization of emissions without sacrificing engine performance.

Oxidation Catalyst

Oxidation catalyst is described in Section 3.6.1.

EMx Catalyst System

The EMx system is described in Section 3.5.1.

Step 2 - Eliminate Technically Infeasible Options

This step addresses the feasibility of each identified control option.

Good Combustion Practices

Good combustion practices with lean combustion are considered technically feasible as a VOC control option and will be considered further.

Oxidation Catalyst

Optimum operating temperatures for oxidation catalysts generally fall in the range of 700°F (371°C) to 1,100°F (591°C). Below 700°F (371°C), air pollutant conversion efficiency falls off rapidly. The exhaust temperature range for the expected load variation from the diesel generator engines are expected to fall within the temperature range required for effective operation of oxidation catalyst. Therefore, an oxidation catalyst is considered technically feasible method for controlling VOC emissions from the diesel generators.

EMx Catalyst System

The technical feasibility of an EMx catalyst system is discussed in Section 3.6.1 and has been determined to be technically infeasible as a control option for the diesel generator engines.

Step 3 - Ranking of Remaining Control Technologies by Control Effectiveness

The technically feasible VOC control technologies for diesel generators are ranked by control effectiveness in Table 10.

Table 10
Ranking of Feasible Technologies (VOC - Diesel Generators)

Technology	Efficiency	Rank
Oxidation Catalyst	35% - 40%	1
Good Combustion Practices	Not Assessed (considered baseline)	2

Step 4 - Evaluation of Most Effective Controls

Since the SPOT DWP has selected the highest efficiency control, following information is provided for information purposes only.

Good Combustion Practices

There are no issues regarding collateral environmental impacts with the use of engine-based good combustion practices.

Oxidation Catalyst

The addition of a catalyst bed onto the diesel generator engine exhaust for the oxidation catalyst will create extra pressure drop, resulting in increased backpressure to the engine. This has the effect of reducing the efficiency of the engine and the power generating capabilities. The oxidation catalyst oxidizes CO and VOC to CO_2, which is released to the atmosphere. In addition, as with all controls that utilize catalysts for removal of pollutants, the catalyst must be disposed of after it is spent. The catalyst may be considered hazardous waste and require special treatment or disposal; and even if it is not hazardous, it will add minor waste volume to landfills. The health and environmental benefits of reducing VOC emissions are considered to outweigh the other energy and environmental impacts.

Step 5 - Selection of BACT

The use of oxidation catalyst and good combustion practices with lean combustion are proposed as VOC BACT for the diesel generator engines.

3.7.2 EMERGENCY (BACKUP) DIESEL GENERATOR AND DIESEL FIRE WATER PUMP ENGINES

Step 1 - Identification of All Control Technologies

The available control options for the emergency (backup) diesel generator and diesel fire water pump engines include the following:

- In-combustion controls
  - Engine good combustion practices
- Post-combustion controls
  - Oxidation catalyst
  - EMx catalyst system

Engine Good Combustion Practices

Engine good combustion practices are described in Section 3.5.1.

Oxidation Catalyst

Oxidation catalyst is described in Section 3.6.1.

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EMx Catalyst System

The EMx system is described in Section 3.5.1.

Step 2 - Eliminate Technically Infeasible Options

This step addresses the feasibility of each identified control option.

Engine Good Combustion Practices

Most engine manufacturers incorporate good combustion practices into the design of diesel engines to meet USEPA emission standards. Engine good combustion practices are considered technically feasible and will be considered further.

Oxidation Catalyst

Due to the intermittent use of the emergency (backup) diesel generator and diesel fire water pump engines, add-on oxidation catalyst is deemed technically infeasible, as discussed in Section 3.6.2.

EMx Catalyst System

The drawbacks to using EMx catalysts for VOC control are the same as those discussed in Section 3.5.2 for NO_X control. There is no listing in the RBLC database of EMx catalyst system use on diesel-fueled, reciprocating, internal combustion engines used for intermittent, short-duration operations. Therefore, the EMx catalyst system is considered technically infeasible as a VOC control option.

Step 3 - Ranking of Remaining Control Technologies by Control Effectiveness

Engine-based good combustion practices were the only control option considered to be technically feasible for the diesel engines for the emergency backup generator and fire water pumps. Therefore, no ranking of control technologies is necessary.

Step 4 - Evaluation of Most Effective Controls

There are no issues regarding collateral environmental impacts with the use of engine good combustion practices.

Step 5 - Selection of BACT

The use of engine-based good combustion practices is proposed as VOC BACT for the emergency backup diesel generator and diesel fire water pump engines. The use of engine good combustion practices would allow the engines to meet the VOC emissions limitations under NSPS Subpart IIII.

3.7.3 MARINE LOADING OPERATIONS

Marine loading operations are expected to produce the largest quantity of emissions at the SPOT DWP. Marine loading produces VOC emissions during carrier loading as crude oil filling the carrier displaces VOC vapors out of the headspace of the tanks aboard crude carrier. To prevent overpressure of the carrier tank, these VOC vapors are allowed to vent from the carrier tank. VOC control technologies considered focus on methods to reduce these VOC emissions prior to release into the atmosphere.

An RBLC search was used to determine potential control VOC technologies from marine loading. Entries from the past 10 years were used for comparison. The search results are included in Appendix F. A detailed study was also conducted to review available options to control VOC from offshore marine loading. Additionally, permits were reviewed, and based on technical literature research and engineering experience; following potential control technologies were identified.

Step 1 - Identification of All Control Technologies

- Submerged Loading
- Vapor Recovery Technologies
    - Cryogenic Condensation
    - Absorption
    - Membrane Technology
    - Absorption with Adsorption
- Vapor Combustion Technologies
    - Vapor Combustor
    - Process Flare

All of the above technology options are briefly described below.

Loading Method - Submerged Loading

The quantity of evaporative losses from loading operations is a function of several parameters including method of crude carrier loading. The method that is primarily used for loading large crude carriers is submerged loading. In the submerged loading method, the fill pipe dispensing the crude extends almost to the bottom of the carrier tank. This eliminates splashing and reduces surface liquid turbulence during loading resulting in lower evaporative losses. Submerged loading is the commonly used method for loading large crude carriers and has been considered as a basis for estimating uncontrolled loading emissions. Therefore, because this method is in common practice, it is not considered in the BACT analysis as a method to further reduce marine loading VOC emissions.

Vapor Recovery - Cryogenic Condensation

Cryogenic condensation uses temperature and pressure variation to condense the VOCs out of the inert vapor. In this process, the VOC mixture displaced from the tank is compressed, condensed, dehydrated and cooled via cascade refrigeration unit to achieve the desired VOC recovery.

Vapor Recovery - Absorption

Absorption, in chemical technology, is a process in which atoms or molecules transfer from a gas phase into a liquid phase. A portion of the crude oil being loading into the crude oil carrier is diverted to a refrigerated chiller (chilled via a propane refrigeration loop) to reduce its temperature and consequently its true vapor pressure (TVP). The vapor stream from the crude oil carrier loading process containing the VOC vapor must first be compressed from near atmospheric pressure to approximately 150 psig for optimal VOC recovery. The chilled crude oil is then contacted with the vapor stream in an absorber vessel and a significant portion of the VOC vapors are condensed and absorbed into the chilled liquid crude oil stream.

The chilled crude oil and condensed VOCs are collected and reinjected back into the loading line and into the crude oil carrier (CTI/EDG 2018).

Vapor Recovery - Membrane Technology

The membrane process for VOC removal utilizes a specialized membrane to separate the VOCs from the inert gases displaced during ship loading. This technology is an addition to the absorption process that is discussed above and is used to remove additional VOCs that were not removed during the absorption process. After recovered vapors leave the absorption system, they would flow into a membrane where the differential pressure (due to a vacuum pump on one side of the membrane) drives the VOCs across the membrane leaving the inerts in the cleaned vapor stream to be released to atmosphere.

Vapor Recovery - Adsorption with Absorption

The Carbon Adsorption-Absorption technology removes VOC from the vapor stream by passing the vapor mix through one or multiple adsorber beds. The Carbon Adsorption-Absorption technology uses a two-stage vacuum pump system to regenerate the activated carbon vessels after it becomes saturated with VOCs. The discharge gases of the vacuum pumps are routed through a single absorber column where the VOCs are absorbed into a circulating liquid hydrocarbon stream (lean oil). The lean oil stream along with the recovered VOCs are collected at the base of the absorber column and pumped back into the oil flow of the vessel being loaded.

Vapor Combustion Technology - Vapor Combustor

Vapor Combustion Units (VCU) utilize high combustion temperatures to achieve VOC destruction. The VOC vapors displaced in tanker loading are enriched with propane, as needed, to a minimum of 164 Btu/scf to ensure combustion would be hot enough to destroy the VOCs. The mixture is fed into the combustor, which reaches temperatures at a minimum of 1,200°F (648.9°C). The vapor combustor is provided with a stack temperature control function. A thermocouple is used to control both the assist gas valve and cooling air dampener to keep the combustion temperature within desired range. The flame for the vapor combustor is completely enclosed, thus reducing radiant heat impacts, noise and visibility of the combustion flame from any viewpoint off the platform. Due to the lack of an uninterruptible fuel gas supply pipeline to the SPOT DWP platform, the vapor stream would need to be enriched utilizing propane. Vapor combustors can typically achieve stable combustion with lower heat content gases than is possible with an open flare design discussed below.

Vapor Combustion Technology - Process Flare

The components of a vapor control process flare are almost identical to the vapor combustor discussed above. However, the process flare does not include the stack temperature control function that is used in vapor combustor. For the process flare, the burner element is located at the top of a smaller diameter riser and the flame is visible in all directions around the stack. Certain process conditions must be maintained in order to maintain high destruction removal efficiency for a process flare. Those include a maximum tip velocity, a continuous burning pilot, a waste gas heating valve of no less than 300 Btu/scf and a smokeless flame plume.

Step 2 - Eliminate Technically Infeasible Options

Vapor Recovery - Cryogenic Condensation

The maintenance of a cascade refrigeration loop, extensive rotating equipment for refrigeration and cryogenic temperature, is a complex system for operations to maintain and operate. The batch process required for loading large ships is not compatible with the cascade refrigeration system (CTI/EDG 2018). This precludes the successful use of cryogenic condensation on the emission source. Additionally, the technology has high operational complexity and lacks worldwide industrial usage for the previous 20 years (i.e., not in common use) (CTI/EDG 2018). Due to these reasons, the Cryogenic Condensation technology option was eliminated from further consideration.

Vapor Recovery - Absorption

The main components of absorption technology are the absorber and a single refrigerant (e.g., propane) loop. The compression of the vapor stream and refrigeration compression via compressors and air coolers is required. This requires additional footprint on the platform and additional electric generation, which would cascade to an increase in diesel fuel shipments and use. However, the associated safety risks of additional diesel storage on the platform is expected to be manageable. Although this technology option comes with additional footprint and power requirements, it is passed on to the next step and assessed further.

Vapor Recovery - Membrane Technology

The engineering research suggests that the membrane technology required for this particular VOC application has not been deployed on a commercial industrial scale anywhere in the world. While membrane technology is effective for processes such as nitrogen generation and hydrogen rejection, most membranes are easily damaged by fuels such as gasoline and other petroleum products. Based on the research conducted, the crude oil VOC vapors would have an even more detrimental impact on the membranes (CTI/EDG 2018). A high differential pressure would be required across the membrane to achieve adequate VOC separation. This would require substantial additional compression, vacuum equipment, and energy use. The platform does not have sufficient space to accommodate these requirements. Industrial-scale applications for VOC removal utilizing membrane technology was studied extensively in 2003 and 2004 and ultimately concluded that the needed membrane technology to make an industrial size facility economical did not exist (CTI/EDG 2018). Based on this information, it is concluded that membrane technology is not a technically feasible control option.

Vapor Recovery - Adsorption with Absorption

While technically viable, the Carbon Adsorption-Absorption VOC control option has several challenges. The footprint requirements off shore are substantial. Initial estimates require a minimum of 120 feet (36.6 meters) by 80 feet (24.4 meters) space on the platform and approximately 1,000 metric tons of equipment. This does not include the incremental utilities required for the equipment or the added steel weight to expand and reinforce the deck and jacket. Carbon Adsorption-Absorption requires the highest level of operations supervision and requires frequent and significant downtime for maintenance compared to other technically viable technologies. The technology also has substantial additional electrical load requirements. Carbon Adsorption-Absorption does not have sufficient operational history (less than 5 years) in crude oil loading operation to have an established level of confidence in the technology. Carbon Adsorption-Absorption is deemed technically infeasible and not carried forward in the BACT analysis because it has significant platform infrastructure requirements that would change the basic design of the platform, large power and fuel requirements and has never been attempted offshore on a large scale comparable to the SPOT DWP.

Vapor Combustion Technology - Vapor Combustor

Vapor combustors are the most common VOC recovery technology utilized in onshore fuel terminals is the United States today. It has been demonstrated to achieve 99%+ destruction efficiency at land-based loading terminals. This technology has the greatest flexibility in handling varying VOC composition, requires the least amount of incremental capital, and is the easiest to maintain.

Vapor combustor technology used offshore would require fuel enrichment to achieve a minimum stream heating value (British thermal units per standard cubic foot (Btu/scf)) for effective VOC destruction. During the early stages of crude oil loading on the SPOT DWP, supplemental/enrichment fuel would be required. Enrichment fuel for the combustor is not available from the crude oil transfer process on the platform because no processing of the crude that would produce fuel byproducts would occur. No nearby long-term reliable source of fuel gas (e.g., from a natural gas pipeline) exists. Therefore, the only natural gas option that could be considered to secure a long-term reliable fuel gas source is a new fuel gas pipeline from the shore, at an estimated incremental cost of approximately $50 million USD. Alternatively, propane could be used as an enrichment fuel as needed during the loading operations. A fuel gas pipeline from shore was considered infeasible because the natural gas supply would be interruptible requiring a backup supply of propane located on the platform. Because propane would be required anyway and supply and storage would be controlled by SPOT DWP, use of propane is considered feasible. It is practical only to the extent that related safety risks are manageable on the fixed offshore platform where living quarters are also located. The vapor combustor manufacturer has guaranteed VOC destruction efficiency of 95% based on crude oil vapor properties and propane availability, which is contingent upon propane storage provisions on the SPOT DWP platform.

A greater than 95% control efficiency is possible with higher temperatures, however, propane requirements increase substantially (non-linearly) and as would the safety risks when approaching the highest destruction efficiencies possible. A collateral effect of higher control efficiency would be an increase in NOx emissions. It should be noted that vapor combustor units are common for land-based terminals but the technology has not been demonstrated on a source similar to the proposed SPOT DWP.

Considering the uniqueness of vapor combustor technology on a similar source and after ensuring that all safety risks can be mitigated via design of adequate propane storage on the platform, use of vapor combustors with VOC control efficiency of 95% is considered technically feasible for this application.

Vapor Combustion Technology - Process Flare

Technically, the flare process is nearly identical to the process outlined for the vapor combustor. However, ensuring that the velocity of the vapors sent to the flare flame tip is adequate for combustion to occur introduces additional complexity that does not exist for the vapor combustor. Flares are also required to be used with the net heating value of the gas being combusted at 300 Btu/scf or greater if the flare is steam assisted or air assisted. This requires open-flame flaring technologies to utilize much greater levels of enrichment gas when compared to vapor combustor technology in similar service.

The open flame also creates undesirable issues such as light and increased noise levels on the offshore platform. However, the main safety concern for the flaring system is thermal radiation issues. Use of a process flare generates safety concerns and space requirements related to protecting personnel and equipment from radiant heat from the open lit flame. The flare design considers radiation limits at the base of the flare tower and at key point locations on the platform such as helideck, cranes, living quarters and flammable, combustible gas storage areas. The preliminary assessment of including a flare in the design recommends significantly larger size of the platform or a remote flare located separate from the platform to dismiss the radiation concerns. Taking into account the need for additional enrichment gas and limitations imposed by the available deck space on the platform, the process flare is eliminated as potential VOC control option from marine loading operations.

Step 3 - Ranking of Remaining Control Technologies by Control Effectiveness

The two feasible technologies for controlling VOC vapors generated from marine loading operations are ranked by removal efficiency in Table 11.

Table 11
Ranking of Feasible Technologies (VOC - Marine Loading)

Technology	Efficiency	Rank
Vapor Combustor	95%	1
Vapor Recovery - Absorption	80%	2

Step 4 - Evaluation of Most Effective Controls

The vapor combustor technology is ranked the highest in terms of destruction efficiency.

Vapor combustion creates collateral emissions of other pollutants from the combustion process. Nonetheless, the benefit to air quality from reduction of VOC emissions is considered as substantially more significant compared to generation of other pollutant emissions. Based on the early engineering estimates, the vapor combustor cost effectiveness is estimated at $553 per ton of VOC reduced. A detailed economic analysis using EPA's estimation method is presented in Appendix G.

The vapor recovery technology with absorption is ranked the lowest in terms of control efficiency. Its economic impact is significantly higher than the vapor combustor technology. As presented in Appendix G, the absorption technology cost is estimated at $916 per ton of reduced VOC. Although absorption makes recovery of liquid from the vapor VOC stream possible and does not produce any other collateral pollutant emissions, it requires higher plot space for compression of the vapor stream and requires refrigeration compression equipment, all of which requires more electric power generation and increase in associated pollutant emissions. Its control efficiency is lower and economic costs are significantly higher compared to vapor combustor.

Step 5 - Selection of BACT

The vapor combustor has the lowest technological risks, smallest footprint, minimum operations requirements, lowest power and fuel requirements, and lowest costs. With 95% control efficiency, risks with propane storage requirements are manageable for the size and arrangement of the currently proposed offshore platform design. The flame for the vapor combustor is completely enclosed, reducing radiant heat impacts, noise and visibility of the flame. Therefore, vapor combustor with 95% VOC control efficiency is proposed as BACT for marine loading operations.

3.7.4 UNCAPTURED MARINE LOADING EMISSIONS

Steps 1 through 3 - Identify, Evaluate and Rank Control Technologies

Identification of control technologies, evaluation of their technical feasibility, and ranking of control effectiveness, which are steps 1 through 3 of the BACT evaluation process, are taken from the TCEQ's Marine Loading Collection Efficiency Guidance (TCEQ 2016). The TCEQ evaluated the technical feasibility of marine loading collection efficiencies for ocean going marine vessels, identified loading collection efficiencies and provided guidance on additional requirements that apply to marine loading operations for VOC when the vapor pressure of the material is greater than 0.5 psia.

Step 4 Evaluation of Most Effective Controls

The TCEQ Marine Loading Collection Efficiency Guidance provides four categories of collection efficiencies as follows:

- Category 4 – 99.9%;
- Category 3 – 99.5% to 99.89%;
- Category 2 - >99.0% to 99.45%; and
- Category 1 – 99.0%.

The TCEQ guidance document specifies testing requirements for each category. Category 1 requires no additional testing meaning that previous ship testing results have demonstrated that 99.0% collection efficiency is very reliable and does not require periodic compliance tests. Category 2 requires one initial compliance test within 12 months; category 3 requires one test per year for three years; and category 4 requires three tests per year for five years.

Step 5 - Selection of BACT

Because SPOT does not control the marine vessels and cannot make modifications to them, it has no ability to effectively enforce marine vessels to adhere to control efficiencies greater than 99.0%. Therefore, the collection efficiency of 99% (Category 1) as listed in TCEQ's Marine Loading Collection Efficiency Guidance would be implemented by the SPOT DWP as BACT. The marine vessels would be subject to annual vapor tightness testing as specified in 40 CFR Part 63.565(c) (MACT Subpart Y) or 40 CFR Part 61.304(f). VOC loading rates would be recorded during loading. The loading rate would not exceed the maximum permitted loading rate. As discussed in section 3.7.3, the collected vapors will be routed to vapor combustors with VOC control efficiency of 95%.

During loading, the SPOT DWP shall conduct audio, olfactory, and visual checks for leaks once every 8 hours for on-shore equipment and on board the ship. If a liquid leak is detected during loading and cannot be repaired immediately (for example, by tightening a bolt or packing gland), then the loading operation shall cease until the leak is repaired. If a vapor leak is detected by sight, sound, smell, or hydrocarbon gas analyzer during the loading operation, then a "first attempt" shall be made to repair the leak. Date and time of each inspection shall be noted in the operator's log or equivalent. Records shall be maintained at the site of all repairs and replacements made due to leaks.

These control methods meet or exceed current BACT requirements for offshore marine loading operations.

3.7.5 FUGITIVE EMISSIONS

During facility operation, there is a potential that fugitive emissions would be released from piping components such as pipe flanges and valves. There may also be minor emissions of propane from the propane vaporizer and propane, diesel transfer pumps, and piping.

Step 1 - Identification of All Control Technologies

No add-on control technologies are practical to control fugitive VOC emissions. Therefore, available VOC control options are limited to proper piping design and good work practices, including leak detection and repair.

Step 2 - Eliminate Technically Infeasible Options

Proper piping design and good work practices are feasible options to reduce fugitive VOC emissions.

Step 3 - Ranking of Remaining Control Technologies by Control Effectiveness

Proper piping design and good work practices are considered together as one control technology and is the only control option considered technically feasible for VOC fugitive emissions. Proper design includes selecting low VOC emitting components where feasible. Good work practices includes use of leak detection and repair procedures as a work practice standard to maintain proper operation of the piping components, also resulting in a reduction in fugitive emissions. Typical emission reductions range from 30% to 97%. No ranking is necessary because proper design and good work practices are considered together as one control technology and is the only control technology feasible.

Step 4 - Evaluation of Most Effective Controls

The Applicant would specify all VOC service valves as low VOC emitting valves, which would meet the ISO 15848-1 standard for industrial valves. The valves would be in a tightness class with leakage ranging from less than or equal to 50 parts per million (ppm) to 500 ppm VOC. Additionally, during initial construction, the SPOT DWP will assure the long-term integrity of the flanges by addressing the use of proper gaskets, bolt torqueing, and leak testing, and inspecting condition of flanges during maintenance of equipment.

As part of the Fire and Gas Detection System on the SPOT DWP platform, all spaces that have the potential for combustible or toxic gas emission or collection shall be monitored including the propane area by infrared point and line-of-sight gas sensors. Both the high-level and the low-level alarm shall activate an audible alarm and corrective action will be taken. Additionally, the crude oil pipeline leak detection system would consist of a real-time transient model that would provide effective leak detection with industry-leading state estimation software technology. The system is designed to continually analyze the calculated pipeline state and searches for anomalies that suggest a leak. Using two concurrent leak detection techniques, the software will provide effective leak detection and location capability.

These measures considered in the design and operation of the SPOT DWP would minimize potential fugitive emissions. The evaluation of most effective control also considers the safety risks associated with implementing a pollution control program. Utilizing the limited number of personnel stationed on the SPOT DWP platform to perform occasional leak detection and repair minimizes safety issues associated with bringing an external crew (possibly untrained in offshore operations) to the platform to perform leak detection and repair.

Considering the fugitive emission minimization principles included in the facility design and operation, offshore location of the platform, and relatively small quantity of fugitive emissions (see Appendix D), implementation of a more extensive leak detection and repair (LDAR) program is considered impractical for the facility.

Step 5 - Selection of BACT

The SPOT DWP is proposing proper piping design and good work practices as BACT for minimizing fugitive emissions. This will include:

- Use of low VOC emitting valves (< 500 ppmv) and adherence to manufacturer's recommended maintenance practices.
- Record repairs and include date of repairs, repair results, justification for delay of repairs, and corrective actions taken for all components.

3.7.6 DIESEL TANKS

Step 1 - Identification of All Control Technologies

TCEQ guidelines, 30 Texas Administrative Code Chapter 115, NSPS, and Maximum Achievable Control Technology (MACT) were reviewed to identify available control strategies for diesel storage tanks. The following potential control strategies were identified:

Fixed Roof Tank Routing to a Control Device

A fixed roof tank consists of a cylindrical steel shell with a permanently affixed roof. Flashing/working/breathing losses from the liquid stored in the tank are captured by a vapor collection system, then routed to a control device for destruction.

External Floating Roof

An external floating roof tank consists of an open-topped cylindrical steel shell equipped with a roof that floats on the surface of the stored liquid. The floating roof consists of a deck, fittings, and rim seal system. The roof rises and falls with the liquid level in the tank, and reduces evaporative loss of the stored liquid.

Internal Floating Roof

An internal floating roof tank has both a permanent fixed roof and a floating roof inside. As with an external floating roof, the internal floating roof rises and falls with the liquid level in the tank and reduces evaporative loss of the stored liquid.

Submerged Loading

There are two types of submerged loading - submerged fill pipe and bottom loading. In the submerged fill pipe method, the fill pipe extends almost to the bottom of the tank. In the bottom loading method, a permanent fill pipe is attached to the tank bottom. During most of the submerged loading by both methods, the fill pipe opening is below the liquid surface level. Liquid turbulence is controlled significantly during submerged loading, resulting in much lower vapor generation than encountered during splash loading.

Step 2 - Eliminate Technically Infeasible Options

This step addresses the feasibility of each identified control option. All of the control technologies identified above are feasible VOC control options for diesel storage tanks.

Step 3 - Ranking of Remaining Control Technologies by Control Effectiveness

All feasible technologies for diesel storage tanks ranked by control efficiency are shown in Table 12.

Table 12
Ranking of Feasible Technologies - (VOC - Diesel Storage Tanks)

Technology	Efficiency	Rank
Fixed Roof Tank Routing Emissions to a Control Device	99%	1
External Floating Roof Tank	95% - 98%	2
Internal Floating Roof Tank	95% - 98%	2
Submerged Loading	40-60%	3

Step 4 - Evaluation of Most Effective Controls

TCEQ BACT guidelines state that for compounds with a vapor pressure greater than 0.5 pounds per square inch (absolute) (psia) emissions should be routed to a VOC control device. No. 2 diesel fuel has a true vapor pressure of 0.4 psia. The small size of the diesel tanks precludes the use of a floating roof. Based on the information obtained from the USEPA's RBLC database, no diesel storage tank with similar capacity routes the emissions to a control device. Therefore, all controls, except submerged loading, are rejected as BACT.

Step 5 - Selection of BACT

Submerged loading has been selected as BACT for the diesel tanks to minimize VOC emission rates from diesel fuel tanks.

3.8 GHG BACT ANALYSIS

3.8.1 OBJECTIVE

The objective of this analysis is to select the appropriate GHG BACT for each stationary emission source at the SPOT DWP based on the maximum degree of reduction. BACT for each emission source is determined by identifying the emission reduction achievable through application of the available methods, systems, and techniques for control of each GHG (CO_2, CH_4, and N_2O). The BACT analysis includes energy, environmental, and economic impacts. Since the Project triggers PSD review for the VOCs, the applicability of PSD and BACT to GHG emissions must be considered. The potential to emit for GHG is above the 75,000-ton per year significant emission rate threshold for GHG established under the Tailoring Rule; therefore, a GHG BACT analysis based on total GHG, known as CO_2e, that is the sum of CO_2, CH_4, and N_2O with applicable global warming potential factors applied, must be performed.

SPOT DWP seeks a GHG BACT standard that provides flexibility in operating the equipment on the offshore fixed platform. A GHG BACT standard that is a single limit for the SPOT DWP is preferable, as it would provide individual unit operating flexibility underneath an overall SPOT DWP GHG annual limit. All GHG-producing equipment on the platform acts and responds as an integrated process or system; equipment performance and operational levels are dependent on other aspects of the process. In contrast, a GHG BACT standard on a per equipment basis (such as mass of CO_2 emissions per horsepower hour [hp-hr] for a diesel generator) would not provide needed operational flexibility.

3.8.2 METHODOLOGY

The BACT analysis was performed in accordance with USEPA guidance, which outlines a "top-down" five-step process to determine the appropriate emission control technologies/limitations:

Step 1 – Identification of All Control Technologies

Step 2 – Elimination of Technically Infeasible Options

Step 3 – Ranking of Remaining Control Technologies by Control Effectiveness

Step 4 – Evaluation of Most Effective Controls

Step 5 – Selection of BACT

Step 1 - Identification of All Control Technologies

The first step was to identify all available control options for each emission unit type. Available control options included air pollution control technologies or techniques with a practical and demonstrated commercial potential for application to the emission unit and the regulated pollutant under evaluation. Air pollution control technologies and techniques included lower emitting processes, practices, and post-combustion controls. A unique aspect of identification of available control technologies is that SPOT DWP is an offshore platform with limited deck space and no external gas or electric supply. In addition, because GHG control technologies and CCS techniques are slowly emerging and evolving through research and development studies, a summary of the status of these projects concerning the unique SPOT DWP offshore facility is provided.

Step 2 - Elimination of Technically Infeasible Options

The second step was to identify the technical feasibility of the control options identified in Step 1, which were evaluated with respect to source-specific factors. Technically feasible control options include technology that is commercially and readily available and in common use. Technical infeasibility is defined as one or more technical difficulties that preclude the successful use of the control option on the emission unit under review. For an offshore floating vessel installation, technical infeasibility may include the limitations imposed by no external power supply, gas supply, or space for installation. Technical infeasibility is documented and demonstrated based on physical, chemical, and engineering principles. Technically infeasible options were eliminated from further consideration in the BACT analysis.

Step 3 - Ranking of Remaining Control Technologies by Control Effectiveness

The third step was to list and rank all the remaining control alternatives not eliminated in Step 2. The ranking was based on control effectiveness for the pollutant under review.

Step 4 - Evaluation of Most Effective Controls

The next step-involved consideration of the energy, environmental, and economic impacts of the remaining alternatives.

If the top-ranked alternative was selected, consideration was given to whether impacts of unregulated air pollutants or impacts in other media would justify selection of an alternative control option. If there were no issues regarding collateral environmental impacts of the top-ranked alternative, an analysis of energy and economic impacts was not required, and the process proceeded to Step 5.

In the event that the top-ranked alternative was shown to be inappropriate due to energy, environmental, or economic impacts, the rationale for this finding was documented. Then the next most stringent alternative in the list was similarly evaluated. This process continued until a technology under consideration was not eliminated due to environmental, energy, or economic impacts that demonstrate that alternative to be inappropriate.

Step 5 - Selection of BACT

The most effective control alternative that was not eliminated in Step 4 was proposed as the BACT for the pollutant and emission unit under review. In no event shall BACT result in an emissions limit less stringent than the emissions limits established by an applicable NSPS.

3.8.3 GREENHOUSE GAS POTENTIAL TO EMIT

Table 13 summarizes source wise and the total GHG emissions for the SPOT DWP.

Table 13
Total GHG Emissions by Emission Source

	Greenhouse Gas (tons per year)			
Emission Source	CO_2	N_2O (as CO_2e)	CH_4 (as CO_2e)	CO_2e
Vapor Combustor (3)	157,637	1,591	29.66	159,257
Diesel Generators (2)	10,379	24.80	141.54	10,546
Emergency (Backup) Diesel Generator (1)	44	0.1	0.6	44.70
Diesel Firewater Pumps (2)	125	0.3	1.7	127
Pedestal Cranes (2)	2,980	7.12	40.64	3,028
Diesel Storage Tank (3)	0	0	0	0
Vent Boom (1)	0	0	0	0
Uncaptured Loading Emissions	253	0	0	253
Fugitives	1.89	0	0	1.89
Total Emissions	**171,420**	**1,623.20**	**214.14**	**173,257**

Key:
CH_4 = methane
CO_2 = carbon dioxide
CO_2e = carbon dioxide equivalent
GHG = greenhouse gas
N_2O = nitrous oxide

3.8.4 INFORMATION SOURCES

Informational databases, clearinghouses, and documents were used to identify recent control technology determinations for similar source categories and emission units for this BACT analysis, such as the USEPA's RBLC; permits; technical journals, newsletters, and reports; information from control technology suppliers; and engineering design on other projects. Note, however, that offshore platform crude oil loading is uncommon. U.S. Department of Energy research news announcements were also reviewed for the Gulf of Mexico carbon sequestration project information.

3.8.5 GHG BACT ANALYSIS

Under the PSD Tailoring Rule, the regulated air pollutant is GHG (as defined as the sum of the individual pollutants that are primarily CO_2, CH_4, and N_2O). Therefore, a BACT analysis is required only for total GHG. The analysis considers control technologies that may reduce GHG emissions. For the proposed facility, CO_2 emissions represent approximately 99% of the total GHG emissions on a CO_2e basis, while CH_4 and N_2O emissions represent the remaining 1% of the total GHG emissions on a CO_2e basis.

The USEPA believes that it is important in BACT to consider options that improve the overall energy efficiency of the source—through technologies, processes, and practices at the emitting unit. In general, a more energy-efficient technology uses less fuel than a less energy-efficient technology on a per-unit of output basis.

As shown in Table 13, the vapor combustors would be the largest source of CO_2 relative to other emission sources at the SPOT DWP. Therefore, while this GHG BACT analysis addresses all platform sources that emit GHGs, emphasis is placed on evaluating the vapor combustors.

3.8.5.1 Vapor Combustors

Step 1 - Identification of All Control Technologies

The following control options are identified as potential GHG control options for the gas turbines:

- Carbon capture and sequestration (CCS;
- Low carbon fuel; and
- Good combustion, operating, and maintenance, practices

Carbon Capture and Sequestration

CCS is a set of technologies that can reduce CO_2 emissions to the atmosphere from fossil-fuel-fired power plants and industrial sources. The first step in CCS includes the capture of CO_2 from the combustion exhaust streams or gaseous waste streams generated from industrial processes. Carbon capture involves the removal of CO_2 from the exhaust stream through "scrubbing" with solvents (e.g., amine system). After capture, CO_2 is compressed and then transported to a site where it is injected underground for permanent storage (also known as "sequestration"). CO_2 is commonly transported by pipeline. Geologic formations suitable for sequestration include depleted oil and gas fields, deep coal seams, and saline formations. Potential sequestration sites must undergo appropriate site characterization to ensure that the site can store CO_2 safely and securely. After being transported to the sequestration site, the compressed CO_2 is injected deep underground into solid, but porous rock, such as sandstone, shale, dolomite, basalt, or deep coal seams. Suitable formations for CO_2 sequestration are located under one or more layers of cap rock, which trap the CO_2 and prevent upward migration. These sites are then rigorously monitored to ensure that the CO_2 remains permanently underground (U.S. Department of Energy [DOE] 2015a).

Low Carbon Fuel

The amount of GHG emissions generated (per heating value) for a combustion source is dependent upon the fuel chosen. Low carbon intensity fuels such as natural gas fuel (compressed natural gas [CNG], liquefied petroleum gas [LPG]/propane) produce less GHG emission per heating value (British thermal units) than other fossil fuels such as diesel fuel or heavier oils such as No.2 fuel oil. 40 CFR Part 98, Table C-1 lists gaseous fuel as one of the lowest CO_2 generation rates per MMBtu of fuel of any of the fuels listed.

Good Combustion, Operating, and Maintenance Practices

Good combustion, operating, and maintenance (O&M) practices are a potential control option for improving the fuel efficiency of a combustion source. The temperature control function on vapor combustors, the "assist air blowers and stable burner" design reduces fuel consumption, effectively reducing GHG emissions.

Step 2 - Eliminate Technically Infeasible Options

This step addresses the feasibility of each identified control option.

CCS

CO_2 capture has been utilized in only a very limited number of industry sectors, primarily the power generation sector, where a continuous flow of exhaust gas containing GHG is available. The vast majority of captured CO_2 use is associated with enhanced recovery of oil or natural gas from underground deposits. Some projects have demonstrated the technical feasibility of small-scale CO_2 capture on continuous-flow slipstreams from power plants. A small-scale version of the Fluor Econamine technology, using a proprietary monoethanolamine solvent, was installed and operated at the Florida Power & Light plant in Bellingham, Massachusetts, a 300-megawatt (MW) natural gas combined cycle facility. The Fluor system processed a small slipstream of exhaust gas, resulting in the capture of approximately 10% of the facility's CO_2 emissions, which was sold for use in food and beverage production. The capture system is no longer in operation. There is no full-scale (i.e., full exhaust flow) application of CO_2 capture to a vapor combustor or similar vapor combustion technology alone. There has also been no demonstration of CO_2 capture from any batch process similar to the crude oil loading/vapor combustion process that would occur at the SPOT DWP. The RBLC search results shown in Appendix F do not list any land-based installations of CCS on a VCU.

The composition of inert gases leaving very large crude carriers (VLCCs) during early stages of loading is expected to have about 10 mol% of CO_2 with remaining gases being primarily N_2. The CO_2 concentration reduces significantly as the crude oil loading progresses and the hydrocarbon concentration increases in vapors from the ship. The post-combustion exhaust flue gas streams from the vapor combustor on average will have low concentration levels of CO_2 (< 4 mol%) in a relatively small total exhaust volume. Therefore CCS equipment would need to be able to capture a low concentration from a small exhaust volume. Additional facilities requiring significant additional area, most likely a separate platform to contain the CCS equipment, amine scrubber storage tanks, additional power generation and fuel storage for power generation and a capability to generate steam would be required to separate the CO_2 from the other exhaust gas components.

In CCS, the CO_2 is either compressed to the desired pressure using a gas compressor or is liquefied at lower pressures by using refrigeration systems and then pumped at desired pressure. The electrical power and space requirements to operate the carbon capture, compression via new gas turbines, and sequestration operations are significant. A large amount of steam would also be needed to regenerate monoethanolamine, the most common CO_2 scrubbing solvent. For example, evaluation of CCS at combined-cycle power plants indicate that 10% to 20% of the electric generation capacity of the plant would be required to supply the power needs for CCS operation (Leung et al. 2014). These requirements could be met at an onshore installation, where additional grid-supplied electrical power is available, or gas supply is available, or additional land space is available to install additional on-site electrical generation, and extra land space is available to site the CCS equipment. On the offshore platform, however, none of these options are available to meet the CCS requirements. The unavailability of gas supply and limited deck space on the platform has been discussed in previous sections. Therefore, compression of CO_2 for transport is not technically viable at the proposed SPOT DWP platform.

Although CO_2 capture and preparation for transport are deemed not technically feasible for the SPOT DWP, CCS technology is continually being studied as a potentially viable option for all types of combustion exhaust streams by the U.S. Department of Energy and other agencies. Therefore, to address the final component of CCS, that is CO_2 transport and sequestration, a brief qualitative analysis of the viability of CO_2 transport and sequestration for the SPOT DWP is provided below.

The captured CO_2 would need to be transported to a suitable sequestration site. Therefore, the project would also require the installation of a new large pipeline and compressor station that would transport CO_2 to an existing or suitable long-term CO_2 storage facility. The Denbury Green Pipeline is a CO_2 pipeline that runs from eastern Louisiana to Texas and delivers CO_2 for injection at sites for enhanced oil recovery (EOR). The pipeline is located approximately 90 miles north of the Project site. While it is theoretically feasible that a CO_2 lateral pipeline could be constructed and connected to the Denbury Green Pipeline, the cost of doing so from a qualitative standpoint would be prohibitive, with a substantial energy requirement. For example, Sabine Pass LNG examined the cost and environmental impacts associated with capturing and transporting CO_2 in a purpose built pipeline (approximately 28 to 36 miles long depending on route) from its shore-based facility to the Denbury Pipeline (see Federal Energy Regulatory Commission docket CP13-552). The environmental impacts, energy penalty, and cost were shown to be significant, as were uncertainties on the marketability of the CO_2, thereby rejecting CO_2 capture and sequestration as a GHG control option. Furthermore, if CCS were selected as BACT, it is unknown if Denbury or another selected EOR developer could commit to accept CO_2 over the period of time that SPOT DWP will operate. There is no demonstrated ongoing demand for the life cycle of larger projects, such as offshore loading terminals. This uncertainty makes the use of EOR not a viable option.

Sequestration near the SPOT DWP utilizing storage under the Gulf of Mexico is currently not technically feasible. Availability of sequestration sites, as well as the technology to inject CO_2 into storage under the Gulf of Mexico and monitor sequestered CO_2 for leakage from sequestration strata under the Gulf of Mexico, is just beginning to be studied. The DOE National Energy Technology Laboratory announced on July 15, 2015, that it has "selected four projects to receive funding to develop and advance the effectiveness of onshore and offshore carbon storage technologies, reduce the challenges associated with implementation, and prepare them for widespread commercial deployment in the 2025–2035 time frame" (DOE 2015b). The DOE's Carbon Storage Program continues to advance development of technologies that can address the current and future technical challenges of commercial deployment.

According to the DOE, the funded research projects will assess the prospective geologic storage potential of offshore subsurface depleted oil and natural gas reservoirs and saline formations on the East Coast and the Gulf of Mexico. These projects will use existing geologic and geophysical data to conduct a prospective storage resource assessment that will approximate the amount of CO_2 that can be safely stored.

Two of the four research projects focus on evaluating sequestration potential in the northern Gulf of Mexico. An "Assessment of CO_2 Storage Resources in Depleted Oil and Gas Fields in the Ship Shoal Area, Gulf of Mexico" is being performed for DOE by GeoMechanics Technologies (Monrovia, California). According to DOE, the project will produce a detailed characterization of the Neogene delta sands from the Ship Shoal field in the Gulf of Mexico for large-scale CO_2 storage. The proposed research project will use three-dimensional geologic modeling to predict the CO_2 storage capacity of the Ship Shoal area. The modeling approach will be used to validate and ensure 99% storage performance, ensuring containment effectiveness. Additionally, this research will analyze existing infrastructure of oil and gas for CO_2 transportation and recommend a transportation pipeline corridor (DOE 2015b).

The second project is being conducted by the University of Texas at Austin, entitled "Offshore CO_2 Storage Resource Assessment of the Northern Gulf of Mexico (Upper Texas-Western Louisiana Coastal Areas)." According to the DOE, this project will study the inner continental shelf portions of the Texas and Louisiana Gulf of Mexico coastal areas in order to assess the CO_2 storage capacity of depleted oil and natural gas reservoirs. This work will also assess the ability of regional saline formations to safely and permanently store nationally significant amounts of CO_2. The results of this work will improve the current understanding of CO_2 storage potential for a large area of the Gulf of Mexico adjacent to significant industrial emissions sources (DOE 2015b).

The potential for ocean acidification resulting from leakage of CO_2 into seawater is also a concern when considering CO_2 sequestration under the floor of the Gulf of Mexico. Seawater and CO_2 chemically react; resulting in a lowering of seawater's pH, that is, the seawater becomes more acidic. As seawater acidifies, it reduces the amount of calcium carbonate available to various sea organisms. These organisms rely on abundant calcium carbonate to build their skeletons and shells. Some organisms may not be able to produce or maintain their skeletons or shells if the calcium carbonate concentration drops too much (NOAA 2015).

As noted above, these studies were awarded in July 2015 and the DOE anticipates that these studies will not be complete until at least 2025, with the outcome on the viability of carbon storage in these offshore locations undetermined until completion of the studies. SPOT DWP expects operation of the platform would commence in 2022, well before these studies are complete. Therefore, carbon storage under the Gulf of Mexico near the SPOT DWP is not technically feasible in the period of operation of the platform.

Because CCS is not considered commercially available for SPOT DWP's vapor combustors, the compression power and installation needs of CCS would require gas supply and/or additional electricity generation, significantly larger platform or an entirely separate platform to house the CCS equipment and redesign of the facility, CCS is considered technically infeasible. Therefore, this technology is not carried forward in discussion and its additional expected energy, environmental and economic impacts are not assessed.

Low Carbon Fuel

The vapor combustors would primarily burn VOCs generated during offshore ship loading. This is supplemented by propane, as an enrichment fuel during early stages of loading to maintain high combustion efficiency. Propane fuel has one of the lowest direct GHG emissions of all common fuels. Therefore, low-carbon fuel is a feasible control measure.

Good Combustion, Operating, and Maintenance Practices

Good combustion practices are considered technically feasible as a GHG control option and will be considered further.

Step 3 - Ranking of Remaining Control Technologies by Control Effectiveness

All feasible technologies for vapor combustors are listed in Table 14. Their control efficiencies are not analyzed.

Table 14
Ranking of Vapor Combustor GHG Control Effectiveness

Technology	Efficiency	Rank
Low-Carbon Fuel	N/A	1
Good Combustion Practices	N/A	1

Key:
N/A = not analyzed

Step 4 - Evaluation of Most Effective Controls

Fuel Selection/Good Combustion, Operating, and Maintenance Practices

The remaining control technologies are proposed as BACT and, therefore, do not require additional evaluation. No adverse collateral impacts are associated with use of propane gas as a low-carbon fuel or with implementing good combustion, operating, and maintenance practices.

Step 5 - Selection of BACT

Low-carbon fuel and good combustion, operating, and maintenance practices are considered the BACT for the vapor combustors to minimize GHG emission rates.

Good combustion, operating, and maintenance practices will include:

- Operating and maintaining the vapor combustor in accordance with vendor-recommended procedures;
- Conducting preventive maintenance checks of oxygen analyzers on annual basis;
- Monitoring and maintenance of proper operating temperature;
- Maintaining propane gas supply system design and operation; and
- Maintaining proper excess air and good air/fuel mixing during combustion, to minimize emissions

3.8.5.2 Emergency (Backup) Diesel Generator and Diesel Fire Water Pumps

Step 1 - Identification of All Control Technologies

The following control options are identified as potential GHG control options for the emergency generator and fire water pumps:

- Fuel selection; and
- Good combustion, operating, and maintenance, practices.

Fuel Selection

Fuel selection is described in Section 3.8.5.1.

Good Combustion, Operating, and Maintenance Practices

Good combustion, operating, and maintenance practices are described in Section 3.8.5.1.

Step 2 - Eliminate Technically Infeasible Options

This step addresses the feasibility of each identified control option.

Fuel Selection

While natural gas-fueled engines may provide lower GHG emissions per unit of power output compared to diesel-fueled engines, there is no gas source available for fueling these engines on the platform. Additionally, natural gas is not considered a technically feasible fuel for the emergency generator and firewater pump engines since they would need to be used in the event of facility-wide power outage or in case of fire, when natural gas supplies from a pipeline may be interrupted. Therefore, fuel selection of natural gas is considered technically infeasible as a control option.

Good Combustion, Operating, and Maintenance Practices

Most engine manufacturers incorporate good combustion practices into the design of diesel engines to meet USEPA emission standards. Therefore, good combustion practices are considered technically feasible and will be considered further.

Step 3 - Ranking of Remaining Control Technologies by Control Effectiveness

Good combustion, operating, and maintenance practices were the only control option considered to be technically feasible for the emergency (backup) diesel generator and diesel fire water pump engines. Therefore, no ranking of control technologies is necessary.

Step 4 - Evaluation of Most Effective Controls

There are no issues regarding collateral environmental impacts with the use of good combustion practices.

Step 5 - Selection of BACT

The use of engine good combustion practices is proposed as GHG BACT for the emergency backup diesel generator and diesel fire water pumps engines.

3.8.5.3 Diesel Generator Engines

Step 1 - Identification of All Control Technologies

The following control options are identified as potential GHG control options for the essential service generator engines:

- Fuel selection; and
- Good combustion, operating, and maintenance, practices.

Fuel Selection

Fuel selection is described in Section 3.8.5.1.

Good Combustion, Operating, and Maintenance Practices

Good combustion, operating, and maintenance practices are described in Section 3.8.5.1.

Step 2 - Eliminate Technically Infeasible Options

This step addresses the feasibility of each identified control option.

Fuel Selection

The amount of air pollutant emissions generated (per heating value) for a combustion source is dependent upon the fuel type chosen. While natural gas-fueled engines may provide lower GHG emissions per unit of power output compared to diesel engines, there is no gas source available for fueling these engines on the platform. Therefore, fuel selection of natural gas is considered technically infeasible as a control option.

Good Combustion, Operating, and Maintenance Practices

Good combustion practices are typically incorporated into the design of diesel engines. These designs can include features such as electronic engine controls, injection systems, combustion chamber geometry, and turbocharger and after-cooler systems. Turbochargers and after coolers work to increase the overall thermal efficiency of the diesel cycle, thereby reducing emissions on a per unit basis. Therefore, good combustion practices are considered technically feasible and will be considered further.

Step 3 - Ranking of Remaining Control Technologies by Control Effectiveness

Good combustion, operating, and maintenance practices are found to be technically feasible for the diesel generator engines on SPOT DWP platform. Therefore, no ranking of control technologies is necessary.

Step 4 - Evaluation of Most Effective Controls

There are no issues regarding collateral environmental impacts with the use of good combustion practices for the diesel generators.

Step 5 - Selection of BACT

The use of good combustion practices is proposed as GHG BACT for the diesel generator engines at the SPOT DWP.

3.8.5.4 Fugitive Emissions

Steps 1 through 5 - Identify, Rank and Select BACT

During facility operation, there is a potential that fugitive emissions would be released from piping components, such as from pipe flanges and valves and other components. The primary fugitive emissions from the Project would be VOCs. However, there is a potential for small amount of CO_2 leakage from the vapor return lines and associated components containing inert gases during the loading process.

As discussed earlier in Section 3.7.5, no add-on control technologies are practical to control fugitive GHG emissions. The available VOC control options are limited to proper piping design and good work practices and is proposed as BACT for minimizing fugitive GHG emissions.

4 REFERENCES

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APPENDICES

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APPENDIX A
TCEQ ADMINISTRATIVE FORMS

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TCEQ

TCEQ Use Only

TCEQ Core Data Form

For detailed instructions regarding completion of this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission *(If other is checked please describe in space provided.)*

☒ New Permit, Registration or Authorization (*Core Data Form should be submitted with the program application.)*

☐ Renewal *(Core Data Form should be submitted with the renewal form)* ☐ Other

2. Customer Reference Number ***(if issued)***	Follow this link to search for CN or RN numbers in Central Registry**	**3. Regulated Entity Reference Number** ***(if issued)***
CN 605600519		RN

SECTION II: Customer Information

4. General Customer Information | **5. Effective Date for Customer Information Updates** (mm/dd/yyyy)

☒ New Customer ☐ Update to Customer Information ☐ Change in Regulated Entity Ownership

☐ Change in Legal Name (Verifiable with the Texas Secretary of State or Texas Comptroller of Public Accounts)

The Customer Name submitted here may be updated automatically based on what is current and active with the Texas Secretary of State (SOS) or Texas Comptroller of Public Accounts (CPA).

6. Customer Legal Name *(If an individual, print last name first: eg: Doe, John)*	*If new Customer, enter previous Customer below:*
SPOT Terminal Services LLC	

7. TX SOS/CPA Filing Number	**8. TX State Tax ID** (11 digits)	**9. Federal Tax ID** (9 digits)	**10. DUNS Number** *(if applicable)*
803093387	32068089278	83-1791847	

11. Type of Customer: ☐ Corporation ☐ Individual Partnership: ☐ General ☐ Limited

Government: ☐ City ☐ County ☐ Federal ☐ State ☐ Other ☐ Sole Proprietorship ☒ Other: Limited Liability Company

12. Number of Employees

☒ 0-20 ☐ 21-100 ☐ 101-250 ☐ 251-500 ☐ 501 and higher

13. Independently Owned and Operated?

☒ Yes ☐ No

14. Customer Role (Proposed or Actual) – *as it relates to the Regulated Entity listed on this form. Please check one of the following:*

☐ Owner ☐ Operator ☒ Owner & Operator

☐ Occupational Licensee ☐ Responsible Party ☐ Voluntary Cleanup Applicant ☐ Other:

15. Mailing Address:							
	SPOT Terminal Services LLC						
	P.O. Box 4324						
	City	Houston	State	TX	ZIP	77210	ZIP + 4: 4324

16. Country Mailing Information *(if outside USA)*	**17. E-Mail Address** *(if applicable)*
	environmental@eprod.com

18. Telephone Number	**19. Extension or Code**	**20. Fax Number** *(if applicable)*
(713) 381-6595		( ) -

SECTION III: Regulated Entity Information

21. General Regulated Entity Information *(If 'New Regulated Entity" is selected below this form should be accompanied by a permit application)*

☒ New Regulated Entity ☐ Update to Regulated Entity Name ☐ Update to Regulated Entity Information

The Regulated Entity Name submitted may be updated in order to meet TCEQ Agency Data Standards (removal of organizational endings such as Inc, LP, or LLC.)

22. Regulated Entity Name *(Enter name of the site where the regulated action is taking place.)*

SPOT Terminal Services LLC

23. Street Address of the Regulated Entity: *(No PO Boxes)*	See section 25						
	City	N/A	State	NA	ZIP		ZIP + 4
24. County							

Enter Physical Location Description if no street address is provided.

25. Description to Physical Location:	Deepwater port located in federal waters within the Outer Continental Shelf in Galveston Area Lease Blocks 463 and A-59, between 27.2 - 30.8 nautical miles (31.3 - 35.4 statute miles), off the coast of Brazoria County, TX, in Gulf of Mexico.

26. Nearest City	State	Nearest ZIP Code
Freeport	TX	77541

27. Latitude (N) In Decimal:			28. Longitude (W) In Decimal:		
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
28°	27'	59.22"N	95°	07'	24.49"W

29. Primary SIC Code (4 digits)	30. Secondary SIC Code (4 digits)	31. Primary NAICS Code (5 or 6 digits)	32. Secondary NAICS Code (5 or 6 digits)
4612		486110	

33. What is the Primary Business of this entity? *(Do not repeat the SIC or NAICS description.)*
Offshore Marine Terminal

34. Mailing Address:	SPOT Terminal Services LLC							
	P.O. Box 4324							
	City	Houston	State	TX	ZIP	77210	ZIP + 4	4324
35. E-Mail Address:	environmental@eprod.com							

36. Telephone Number	37. Extension or Code	38. Fax Number *(if applicable)*
(713) 381-6595		( ) -

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form. See the Core Data Form instructions for additional guidance.

☐ Dam Safety	☐ Districts	☐ Edwards Aquifer	☐ Emissions Inventory Air	☐ Industrial Hazardous Waste
☐ Municipal Solid Waste	☒ New Source Review Air	☐ OSSF	☐ Petroleum Storage Tank	☐ PWS
☐ Sludge	☐ Storm Water	☐ Title V Air	☐ Tires	☐ Used Oil
☐ Voluntary Cleanup	☐ Waste Water	☐ Wastewater Agriculture	☐ Water Rights	☐ Other:

SECTION IV: Preparer Information

40. Name:	Bradley Cooley	41. Title:	Senior Manager, Permitting

42. Telephone Number	43. Ext./Code	44. Fax Number	45. E-Mail Address
(713) 381-5828		( ) -	bjcooley@eprod.com

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 6 and/or as required for the updates to the ID numbers identified in field 39.

Company:	SPOT Terminal Services LLC	Job Title:	Vice President
Name*(In Print)*:	Ivan W. Zirbes	Phone:	(713) 381-6595
Signature:	[signature]	Date:	1/28/19

Texas Commission on Environmental Quality
Form PI-1 General Application for
Air Preconstruction Permit and Amendment

Table of Contents

Overview

This form supersedes all previous versions of the Form PI-1. Use this form to provide administrative and technical information needed by the TCEQ to evaluate the following types of New Source Review (NSR) permit actions.

1. Initial state minor source permits and amendments. A new state permit or amendment to an existing state permit is required before:
   a. building a new facility that cannot be authorized under a permit by rule (PBR), standard permit, or other available authorization mechanism identified in Title 30 Texas Administrative Code (TAC) § 116.110;
   b. changing an existing facility and the changes cannot be authorized under a PBR, standard permit, qualified facility change, or other available authorization mechanism as identified in 30 TAC § 116.116;
   c. authorizing planned maintenance, startup and shutdown (MSS) emissions and related activities at an existing facility and the changes cannot be authorized under a PBR, standard permit, or other available authorization mechanism as identified in 30 TAC § 116.116; or
   d. building a new source or facility that cannot meet the conditions of 30 TAC § 116.119 (De Minimis Facilities or Sources).
2. Initial Federal Clean Air Act (FCAA) major source or major source modification permits, for nonattainment, Prevention of Significant Deterioration (PSD) (PSD includes greenhouse gases (GHGs)), and FCAA § 112(g) hazardous air pollutants (HAPs), as applicable. A new major source permit or major modification to an existing major source permit is required before:
   a. building a new facility or group of related facilities, which result in emissions equal to or greater than a major source threshold. A summary of these thresholds can be found at www.tceq.texas.gov/permitting/air/guidance/permit-factsheets.html;
   b. changing an existing facility which result in emissions equal to or greater than significant emission rates. A summary of these significant emission rates can be found at www.tceq.texas.gov/permitting/air/guidance/permit-factsheets.html; or
   c. authorizing planned MSS emissions and related activities, which result in emissions equal to or greater than significant emission rates. A summary of these significant emission rates can be found at www.tceq.texas.gov/permitting/air/guidance/permit-factsheets.html.
3. Change of location/relocation requests. A change of location is required when facilities, which have a state air permit, are moving to a new site and the existing permit does not allow for the necessary movement of the facilities. This process of gaining approval and moving permitted facilities and associated sources to a new location requires a best available control technology analysis, health impacts review, and public notice in accordance with the requirements of 30 TAC Chapter 39. Additionally, requirements for changes of location and relocations of portable facilities can be found in 30 TAC § 116.20 and § 116.178 and at www.tceq.texas.gov/permitting/air/newsourcereview/portable.html.

A change of location has distinct differences from the relocation of a portable facility, as specified in 30 TAC § 116.20 and § 116.178. Relocation requests, as defined in 30 TAC § 116.178(b), are submitted to the applicable Regional Office and are not submitted to the Air Permits Division in Austin, unless there is an associated permit action or alteration required.

To apply for a permit, permit amendment, or change of location, perform the following.

1. Read the Form PI-1 instructions and associated 30 TAC Chapter 116 requirements.
2. Determine if the facility meets all state and federal requirements to obtain a permit, permit amendment, or change of location. Note that some federal regulations apply to minor sources. See Sections VIII and IX of this form for more applicability information.
3. Determine the type of permit authorization or action needed.
   a. Permit amendments are for modifications to existing permitted facilities that result in a change in method of control, a change in character of emissions, or an increase in emission rate of any air contaminant as noted in 30 TAC § 116.116(b).
   b. A change of location is a new permit and requires the submittal of a Form PI-1.
4. Verify whether or not public notice will be needed. See Section IV of this form and 30 TAC Chapter 39 for more public notice applicability information.
5. Complete the TCEQ Core Data Form and Form PI-1 and attach all requested information. Send this information to the TCEQ as indicated in the Copies of This Application section at the end of the Form PI 1 instructions.
6. Do not begin construction until notified by the TCEQ. If the facility is already operating, an air authorization is still needed. Seek an authorization as soon as you become aware that this requirement applies. Also see Section I.G of this document.

Tips for a Speedy Administrative Review

The administrative review process will be more efficient and streamlined if you follow the suggestions outlined in the Fact Sheet – Tips for a Speedy Administrative Review at www.tceq.texas.gov/permitting/air/guidance/permit-factsheets.html.

Small Business Information and Agency Contacts

For additional agency contacts, see Contact Information for Air Permit Applications (including environmental assistance for small businesses) at www.tceq.texas.gov/assets/public/permitting/air/airapp-contacts.pdf.

The TCEQ also has an Air Quality Permitting fact sheet available to assist you in determining some of the other state or federal requirements you may need to know at www.tceq.texas.gov/assets/public/permitting/air/factsheets/permit_factsheet.pdf.

Instructions for Form PI-1

I. Applicant Information

A. Company or Other Legal Name: Permits are issued to either the facility owner or operator, commonly referred to as the applicant or permit holder. List the legal name of the company, corporation, partnership, or person who is applying for the permit. We will verify the legal name with the Texas Secretary of State at (512) 463-5555 or at www.sos.state.tx.us. You may be asked to correct the name provided on the Form PI-1, if found to be different. In some cases, we may request a copy of the legal document forming the entity to verify the legal name; for example: general partnership or trust filed with the county.

B. Company Official Contact Name and Title: Provide the name, title, mailing address, telephone number, fax number, and e-mail address of the company official contact. The company official must not be a consultant. All correspondence will be sent via electronic copies unless hard copies are specifically requested through regular mail. The company official must initial section I.B. of the form if hard copies are requested. Please ensure that the e-mail address provided for the company official is the most appropriate to receive time-sensitive correspondence from the TCEQ.

C. Technical Contact Name and Title: Provide the name, title, company, mailing address, telephone number, fax number, and e-mail address of the person we should contact for technical questions. This person must have the authority to make binding agreements and representations on behalf of the applicant. This technical contact may be a consultant.

D. Site Name: Enter the name of the site for which the application is being submitted. Please be consistent with other agency correspondence.

E. Area Name/Type of Facility: Indicate the name of the area to be permitted. This name should be descriptive and indicate the general type of operation, manufacturing process, and equipment or facility that would be authorized under the permit. Include any numerical designation, if appropriate. Examples of acceptable names are Sulfuric Acid Plant, No. 5 Steam Boiler, Electric Arc Furnace No. 2, and Fiberglass Boat Manufacturing Facility. Vague names such as Chemical Plant and North Process Area are not acceptable names. Also, check the appropriate box indicating whether the facility is permanent or portable. Hot mix asphalt plants and trench burners are typical portable facilities; a petroleum storage tank would be considered a permanent facility. For portable units, please provide the serial number of the equipment being authorized.

F. Principal Company Product or Business, Principal Standard Industrial Classification (SIC) Code, and Principal North American Industry Code (NAICS): All industries should have a SIC and NAICS code that describes the main business activity at the site. A list of SIC codes can be found through the Federal Government's Web site at www.osha.gov/pls/imis/sicsearch.html. NAICS Codes and conversions between NAICS and SIC Codes are available at www.census.gov/eos/www/naics/.

G. Projected Start of Construction and Projected Start of Operation Dates: You must obtain an air authorization before beginning construction. Construction is broadly interpreted as anything other than site clearance or site preparation. Activities such as land clearing, soil load-bearing tests, leveling of the area, sewers and utility lines, road building, power line installation, fencing, and construction shack building are considered site clearance or preparation. Equipment may be received at a plant site and stored, provided no attempt is made to assemble the equipment or connect it to any electrical, plumbing, or other utility system. All work, such as excavation, form erection, or foundations upon which facilities will rest is considered construction. Submit any questions regarding the definition of start of construction to airperm@tceq.texas.gov with copies to the appropriate TCEQ regional office and any local air pollution control program(s) having jurisdiction. Each request for clarification must be in writing with sufficient detail to identify the specific activity in question, and the agency response to this request must be in writing for the authorization to be valid. Additional information can be found at www.tceq.texas.gov/permitting/air/newsourcereview/before.html.

H. Facility and Site Location Information: Provide the street address of the facility, if available. If there is no street address, provide written driving directions to the site. Identify the location by distance and direction from well-known landmarks such as major highway intersections. Enter the city or town where the facility is located. If the address is not located in a city, then enter the city or town closest to the facility, even if it is not in the same county as the facility. Enter the county where the facility is physically located. Please include the ZIP Code of the physical facility site, not the ZIP Code of the applicant's mailing address.

For change of location applications and relocations, provide the location information of the proposed site for which the application is being submitted.

Enter the latitude and longitude coordinates in degrees, minutes, and nearest second (DDD:MM:SS) or in decimal form for the street address or the destination point of the driving directions. Latitude indicates the angular distance of a location north of the equator and will always be between 25 and 37 degrees north (N) in Texas. Longitude indicates the angular distance of a location west of the prime meridian and will always be between 93 and 107 degrees west (W) in Texas. For help obtaining the latitude and longitude, you may view USGS maps, county maps prepared by the Texas Department of Transportation, or an online software application such as Google Earth.

I. Account Identification Number: We assigned this number to the entire property owned or controlled by the applicant at a specific location. A typical example of an air quality account number is JB 1234-R for stationary sources or 92-1234-K for portable facilities. Existing account identification numbers will be replaced with a Regulated Entity Number for new applications. Until you have been officially notified by Central Registry of the Regulated Entity Number, you must provide the account number, if one exists for the site. You may call (512) 239-1250 for assistance to obtain or verify the account number.

J. Core Data Form: We require that you submit a Core Data Form (TCEQ Form No. 10400) on all incoming applications unless all of the following are met.

- We issued you a Regulated Entity Number (RN) and Customer Reference Number (CN);
- You know the RN and CN and they are indicated on the Form PI-1; and
- Core data information has not changed.

Important Note: The company and facility site information provided on the Core Data Form must be the same as provided on the Form PI-1.

K. Customer Reference Number (CN): This is a unique number given to each business, governmental body, association, individual, or other entity that owns, operates, is responsible for, or is affiliated with a regulated entity. We assign the CN when a Core Data Form is initially submitted to the Central Registry.

L. Regulated Entity Number (RN): This is a unique agency assigned number given to each person, organization, place, or thing that is of environmental interest to us and where regulated activities will occur. The RN is assigned when a Core Data Form is initially submitted to the Central Registry, if the agency has conducted an investigation, or if the agency has issued an enforcement action. The RN replaces existing air account numbers. The RN for portable units is assigned to the unit itself, and that same RN should be used when applying for authorization at a different location.

II. General Information

A. Confidential Information: Texas Health and Safety Code (THSC) § 382.041 requires us not to disclose any information related to manufacturing processes that is marked Confidential. Mark any information related to secret or proprietary processes or methods of manufacture Confidential. If you do not want this information in the public file. All confidential information should be separated from the permit or amendment application and submitted as a separate file. Additional information regarding confidential information can be found at www.tceq.texas.gov/permitting/air/confidential.html.

B. Investigation or Enforcement Action: Indicate whether the application is being submitted in response to, or is related to, an agency investigation, notice of violation, or enforcement action for this facility. If so, attach copies of any correspondence from the agency and provide the RN associated with the investigation, notice of violation, or enforcement action in section I.L. of this form.

C. Number of New Jobs: Estimate the anticipated number of new jobs that will be created in the community as a result of the new facility, changes to an existing facility, or a change in location of the facility

D. Name of State Senator and Representative: THSC § 382.0516 requires the agency to notify the state representative and senator of the area when a permit or permit amendment application is received. Provide the names and district numbers for these state officials who represent the location where the facility is or will be located. This information can be obtained at www.capitol.state.tx.us.

III. Type of Permit Action Requested

A. Permit Action: Mark the appropriate box indicating what type of action is requested. Additional information regarding the different NSR authorizations can be found at www.tceq.texas.gov/permitting/air/guidance/authorize.html.

B. Permit Number: If the application is for an existing permitted facility, list the current permit number. Please confirm that the permit number is accurate before submitting your application. If this application is for a new facility, leave blank. For assistance, call (512) 239-1250.

C. Permit Type: Mark the appropriate box indicating what type of permit is requested. Additional information regarding air quality authorizations can be found at www.tceq.texas.gov/permitting/air/guidance/authorize.html.

D. Associated Renewal Application: It is possible to process a renewal application at the same time as an amendment for preconstruction permits under THSC § 382.055. A renewal application may accompany a permit amendment application if the permit is within three years of its expiration date and if the permit amendment is subject to public notice requirements. If you wish to pursue this option, also submit a complete permit renewal application, including the Form PI-1R, Table 30R, renewal fee, and any supporting documentation.

E. Change of Location of Previously Permitted Facility:

Required Information: If you are requesting to relocate a portable facility and associated sources and cannot meet the relocation conditions of your portable facility permit, a change of location is required, as specified in 30 TAC § 116.178(f). For a change of location, you must submit the required form and attachments to the Air Permits Division in Austin. The following information must be included.

- Current Location of Facility: To properly track how facilities move throughout the state, include the current address.
- Proposed Location of Facility: To properly track how facilities move throughout the state, include the proposed address where the facility will be relocated.
- Current Technical Requirements: All change of location applications must include an evaluation of best available control technology and protection of public health and welfare as described in 30 TAC § 116.111(a)(2)(C).
- Major Source Status: Is the location where the facility is moving considered to be a major source? Moving a facility to a major source will require special consideration and may involve additional permitting actions.

Additional instructions for change of location applications: Complete all other sections of the Form PI-1 with the exception of Sections VII.A. - Maximum Emissions Data and Calculations, VII.C, and XI. No fee is required for a change of location application.

If you are requesting relocation of a portable facility, but the relocation conditions in the portable permit are outdated, you must request a permit alteration from the Air Permits Division in Austin. You may also submit a simultaneous application, which should include a completed Form PI-1, the current permit special conditions and maximum allowable emission rates table, and all associated information including a detailed plot plan and area map. No fee is required for these types of applications.

F. Incorporation into this Permit: To ensure protectiveness, previously issued authorizations (standard permits, exemptions, or PBRs) including those for MSS, are incorporated into a permit either by consolidation or by reference. Consolidation (in some cases) may be voluntary and referencing is mandatory. Emission calculations, a BACT analysis, and an impacts analysis must be attached to this application at the time of submittal for any authorization to be incorporated by consolidation. If any required information is not provided, the authorization will be incorporated by reference. More guidance regarding incorporation can be found at www.tceq.texas.gov/assets/public/permitting/air/memos/pbr_spc06.pdf.

G. Permitting of Emissions from Planned MSS Facilities and Related Activities: Unless you have filed an application to authorize the emissions or opacity for planned MSS activities by the dates required in 30 TAC § 101.222(h)(1), you will not be able to claim an affirmative defense for the MSS emissions. The deadlines have passed for facilities in SIC codes 2911 (Petroleum Refining), 28 (Chemicals and Allied Products), 2895 (Carbon Black), and 4911 (Electric Services).

Important Note: The date for all remaining facilities is January 5, 2013, except for those in SIC codes:

- 1311 (Crude Petroleum and Natural Gas),
- 1321 (Natural Gas Liquids),

- 4612 (Crude Petroleum Pipelines),
- 4613 (Refined Petroleum Pipelines),
- 4922 (Natural Gas Transmission), and
- 4923 (Natural Gas Transmission and Distribution).

Senate Bill 1134, 82nd Legislative Session (2011), extended the date for the industry codes listed above. The extended date is on or before the earlier of January 5, 2014 or the 120th day after the effective date of a new or amended PBR or standard permit.

H. Federal Operating Permit (FOP) Requirements (30 TAC Chapter 122, Applicability):

- Information and guidance on applicability of 30 TAC 122 can be accessed at www.tceq.texas.gov/permitting/air/titlev/pro_applicability.html. If this application results in an increase in the site's potential-to-emit and renders the site a major source as defined in 30 TAC 122, an FOP application is required. Guidance on submitting applications is available at www.tceq.texas.gov/permitting/air/nav/air_titlevopperm.html.
- Identify the type(s) of FOP(s) issued for the site by checking the appropriate box. In addition, check the appropriate box if any General Operating Permit (GOP) or Site Operating Permit (SOP) application(s) for the site, including revision applications, is currently under review. Check the appropriate box if you are submitting a GOP or SOP application or revision application.

If you have questions about the applicability of 30 TAC 122 or impact of this Form PI-1 on your existing FOP, contact the Operating Permits staff at (512) 239-1250.

IV. Public Notice Applicability

Overview of Requirements: The THSC § 382.056 and corresponding rules in 30 TAC Chapter 39 (Public Notice) require that you publish a notice of intent to obtain a permit and in certain circumstances, notice of preliminary decision. Notices must be published in a newspaper of general circulation in the municipality where the proposed facility is or will be located. The notices must include a description of the facility and the fact that a person who may be affected by emissions from the facility may request a public hearing and any other information the TCEQ requires by rule. Signs must also be posted around the proposed facility location. Additional information regarding public notice such as an overview of requirements, an applicability table, and a list of some common errors that may cause re-notice and delays in processing your application can be found at www.tceq.texas.gov/permitting/air/bilingual/how1_2_pn.html.

The Form PI-1 requires the following information for us to determine whether public notice is required.

A. New Permit Application (Including Change of Location Applications): All new state or federal permit applications must go through public notice.

B. Application for Concrete Batch Plant: All applications for concrete batch plants must complete Sections V.D.1 and V.D.2, regardless of public notice applicability.

C. Major Modification of a PSD, Nonattainment, FCAA § 112(g) Permit, or exceedance of Plant-wide Applicability Limit (PAL): All federal permit major modification applications and reconstruction applications under § 112(g) must go through public notice.

D. GHG PSD – All GHG PSD applications are subject to public notice requirements. Applicants may choose to publish separate public notices for the GHG PSD application and associated non-GHG application or may choose to publish consolidated notices. If you wish to have a separate notice for your GHG PSD authorization, then a separate PI-1 application is required for this authorization request. You may submit a single (consolidated) PI-1 application (with GHG information clearly indicated) to be eligible for a consolidated public notice. Please consider your options because once one is chosen it cannot be changed without resubmitting your application(s).

E. Application for a PSD or major modification of a PSD: All applications for a PSD or major modification of a PSD located within 100 kilometers (km) or less of an affected state or Class I Area must notify the affected state(s) or Federal Land Manager(s).

F. Permit Amendment Application: In certain circumstances, permit amendment applications must go through public notice. The requirements for a permit amendment public notice are listed in 30 TAC § 39.402. The following specific issues determine whether notice is required.

- Change in Character of Emissions: Base this determination on a specific chemical compound (example: formaldehyde), not a class of chemicals (example: aldehydes) or a category of criteria air pollutants (example: VOC).
- New Air Contaminant: Indicate whether there will be any new air contaminants associated with the amendment application.
- Agricultural Facilities: Indicate if the facilities are considered agricultural facilities under THSC § 382.020. If a facility is considered agricultural, annual emission increases must be compared to the appropriate significant levels for agricultural facilities to determine public notice applicability. (For nonagricultural facilities, annual emission increases must be compared to the appropriate de minimis levels).
- Emission Changes: Summarize the proposed emission changes which are a result of the application. To determine the total emissions increase in an amended permit, include:
  - increases in emissions as a result of construction of new facilities at an existing permitted site, changes to permitted allowable emission rates as a result of physical or operational changes, and modifications to existing facilities;
  - changes to allowable emission rates as a result of incorporation of a previous authorization when above that authorization's current limitations or authorized actual emission rates;
  - changes to allowable emission rates identified by sampling of the waste stream when above that facility's current limitations or authorized actual emission rates;
  - emissions due to routine maintenance, startups or shutdowns not currently authorized; and subtraction of permitted and enforceable emission reductions which are included as a part of the permit amendment application; and
  - increases of total particulate matter (PM) at the facility. Additionally, PM with an aerodynamic diameter of 10 microns (PM10) or less and PM with an aerodynamic diameter of 2.5 microns (PM2.5) or less must be quantified. Total PM10 includes emissions of PM10 and PM2.5.

For public notice applicability, the agency does not intend the total emissions increase in an amended permit to include:

- consolidation or incorporation of any previously authorized facility or activity (PBR, standard permits, etc.);
- changes to permitted allowable emission rates when exclusively due to changes to standardized emission factors. Examples of established factors include those in AP-42, American Petroleum Institute Documents, and Tanks Program. If you initiate a change to factors or calculation techniques that you developed, any resulting emission rate increases at a facility is a modification that requires a permit amendment and possible public notice; or
- reductions in emissions which are not enforceable through the amended permit.

Thus, the total emissions increase would be the sum of emissions increases under the amended permit and the emissions decreases under the amended permit for each air contaminant.

V. Public Notice Information (if applicable)

If public notice applies, we will request additional information to meet the requirements of THSC § 382.056. If you are unsure whether public notice applies, we encourage you to complete this section to expedite review of the application.

A. Responsible Person: A designated representative for the applicant should be identified as the person responsible for ensuring public notice is properly published in the appropriate newspaper and signs are posted at the facility site. This person will be contacted directly when the TCEQ is ready to authorize public notice for the application. To expedite contact, e-mail and fax numbers are requested.

B. Technical Contact: The TCAA § 382.056 requires that each public notice contain a technical contact to represent the applicant during the public comment period. This person is responsible for answering any questions from the general public regarding the application and their name and phone number will be listed in the public notice. This person may or may not be the technical contact for the permit application review.

C. Application in Public Place: Place a copy of the application at a public place in the county where the facilities are or will be located. You must state where in the county the application will be available for public review and comment. The location must be a public place and described in the notice. A public place is a location which is owned and operated by public funds (such as libraries, county courthouses, city halls) and cannot be a commercial enterprise. You are required to pre-arrange this availability with the public place indicated on the Form PI-1. In addition, if public notice is required for a PSD, nonattainment, or FCAA § 112(g) permit, the public place must have internet access available for the public as required in 30 TAC § 39.411(f)(3).

The application must remain available from the first day of publication through the designated comment period. If the application is submitted to the agency with information marked as Confidential, you are required to indicate which specific portions of the application are not being made available to the public. These portions of the application must be accompanied with the following statement:

Any request for portions of this application that are marked as confidential must be submitted in writing, pursuant to the Public Information Act, to the TCEQ Public Information Coordinator, MC 197, P.O. Box 13087, Austin, Texas 78711-3087.

D. Concrete Batch Plants, PSD and Nonattainment Permits:

- County Judge: We must notify the applicable county judge when a permit or permit amendment application for a concrete batch plant is received. Notification of the county judge is also required for PSD and Nonattainment Permits that require public notice. Provide the name and mailing address of the county judge for the location where the facility is or will be located. This information can be obtained at www.txdirectory.com.
- Presiding Officer (for Concrete Batch Plants): If the facility is, or will be, located in a municipality or the extraterritorial jurisdiction of a municipality, we must notify the presiding officer of the municipality's governing body of the area when a permit or permit amendment application for a concrete batch plant is received. Indicate whether the facility is located in a municipality or the extraterritorial jurisdiction of a municipality. Provide the name(s) and

mailing address of the presiding officer(s) (example: mayor, city manager) for the location where the facility is or will be located.

- Chief executive, State, Federal Land Manager, or Indian Governing Body: 30 TAC § 39.605(1)(D) requires a copy of the notice and affidavit to be furnished to the chief executives of the city and county where the source will be located, such as the mayor; State, Federal Land Manager (within 100 km or less of a federal Class 1 Area); or Indian Governing Body (within 100 km or less of Indian Tribal Lands) whose lands may be affected by emissions from the source or modification. Provide the name and mailing address of the chief executive and Indian Governing Body; and identify the Federal Land Manager(s) for the location where the facility is or will be located. This information can be obtained at www.txdirectory.com, www.nature.nps.gov/air/Maps/classILoc.cfm, and www.epa.gov/tribal/region-6-tribal-program#Tribes

E. Bilingual Notice: In some cases, public notice in an alternate language is required. The questions on the Form PI-1 are designed to assist you in determining if a bilingual notice is required. If an elementary or middle school nearest to the facility is in a school district required by the Texas Education Code to have a bilingual program, a bilingual notice will be required. If there is no bilingual program required in the school nearest the facility, but children who would normally attend those schools are eligible to attend bilingual programs elsewhere in the school district, the bilingual notice will also be required. If it is determined that alternate language notice is required, you are responsible for ensuring that the publication in the alternate language is complete and accurate in that language.

VI. Small Business Classification (required)

Small Business Classification: House Bill 3430, 80th Regular Session changed Texas Government Code § 2006.001(2) and (3). If a small business requests a permit, agency rules [30 TAC § 39.603(d)(1)(A)] allow for alternative public notification requirements if all of the following criteria are met.

A. The company has fewer than 100 employees or less than $6 million in annual gross receipts;

B. The source is not a major stationary source for federal air quality permitting;

C. The source does not emit 50 tons or more per year of any regulated air pollutant; and

D. The source emits less than 75 tons per year of all regulated air pollutants combined.

If these requirements are met, public notice does not have to include publication of the prominent (12 square inch) newspaper notice.

VII. Technical Information

We require certain technical information to be submitted with the Form PI-1. Be aware that the labeling used to identify information such as emission points (identified with a unique ten-character code), buildings, and tanks, must be consistent with other representations in the permit application such as emission calculations, process flow diagrams, Table 1(a), air dispersion modeling, and air quality analysis reports. In addition, the technical information submitted must agree with the separately filed TCEQ emissions inventory, if required. Emissions inventory requirements are located in 30 TAC § 101.10.

A. The following information must be submitted with your Form PI-1.

- *Current Area Map:* An area map that is adequate for a person who has never visited the area to be able to find the proposed site and determine the nature of the surrounding land use. The area map must clearly show features present on a United States Geological Survey (USGS) map, which include: a true north arrow, an accurate scale, the entire plant property, the location of the property relative to prominent geographical features including, but not limited to, highways, roads, streams, and significant landmarks such as buildings, residences, schools, parks, hospitals, day care centers, and churches. The map must also include a circle with a 3,000-foot radius from the property boundary to ensure adequate coverage on all sides of the facility.

- *Plot Plan:* A plot plan that clearly shows a north arrow, an accurate scale, all property lines, all emission points (identified with a unique ten-character code), buildings, tanks, process vessels, other process equipment, and two bench mark locations (preferably Universal Transverse Mercator (UTM) coordinates). Should you submit the plot plan electronically, the preferred format to use are drawing interchange format (*.dxf), drawing format (*.dwg), or any other computer aided drawing format.

  Identify all emission points, identified with a unique ten-character code, on the affected property. This includes all emission points authorized by other air authorizations, including construction permits, PBRs, special permits, and standard permits. For sites with a large number of emission points, the drawing may include a table that includes the emission point number, source name, and UTM coordinates for each emission point.

- *Existing Authorizations:* Provide a table of emission points indicating the authorization type and authorization identifier, such as a permit number, registration number, or rule citation under which each emission point is currently authorized.

- *Process Flow Diagram:* Provide a process flow diagram for all permit applications so that the permit reviewer can verify all technical information regarding the affected facility. The process flow diagram should be sufficiently descriptive so the permit reviewer can determine the raw materials to be used in the process; all major processing steps and major equipment items; individual emission points ,identified with a unique ten-character code, associated with each process step; the location and identification of all emission abatement devices; and the location and identification of all waste streams (including wastewater streams that may have associated air emissions). Block flow diagrams generally are not sufficient except for very simple facilities such as boilers.

  Alternate material flows and changes in routing of emissions during periods of planned MSS should be depicted as well as any alternate emission control devices that will be used during these periods.

- *Process Description:* Provide a process description to accompany the process flow diagram that discusses each step in the process and provides a step-by-step explanation of exactly how your business operates. The description should assist the permit reviewer through the process with emphasis on where the emissions are generated, why the emissions must be generated, what air pollution controls are used (including process design features that minimize emissions), and where the emissions enter the atmosphere.

  The process description must also explain how the facility or facilities will be operating when the maximum possible emissions are produced. For some source types, this will probably be the highest production rate. For other source types, the maximum emission rates may occur at partial load. When applicable, discuss cycle times, reaction times, temperatures, pressures, material flow rates, and production rates. Be specific, and do not use generalities such as a small amount, sometimes, and occasionally opened. The process description must also include how the facility is operated during periods of planned MSS and what emission reduction techniques will be used to limit emissions, changes in character of emissions, and the frequency and duration of each type of planned MSS activity.

All information in the process description is an enforceable representation and will be used to develop custom permit conditions

- *Maximum Emissions Data and Calculations:* Represent the maximum hourly and annual emission rates of new or modified facilities, including emission rates for planned MSS facilities and related activities. The permit reviewer must be able to duplicate all emission calculations to verify and confirm emissions data and rates represented in the application. Supporting calculations and the technical bases for the emission rates are required. Include all emission rates calculations and any assumptions made in determining the emission rates.

  List and discuss planned MSS activities separately. Provide emission rates and supporting emissions information from planned MSS activities, frequency, and duration of all planned MSS activities, and all planned MSS activity effects on emission rates. Additionally, note all emission points unique to MSS activities. Maximum hourly emission rates, in pounds per hour, from planned MSS should be based on the maximum rates expected from the MSS activities. In most cases MSS emission rates will be given their own entry on the Maximum Allowable Emission Rate Table (MAERT). Annual planned MSS emission rates, in tons per year, should be based on the number of expected MSS activities during any consecutive 12-month period.

  Maximum hourly emission rates, in pounds per hour, should be based on the maximum (design) production capacity of the facility. Dividing the annual emissions in tons per year by the annual hours of operation in order to determine hourly emissions in pounds per hour is often unacceptable and inaccurate since this approach typically underestimates hourly emissions.

  Maximum annual emission rates, in tons per year, should reflect the operation of the facility throughout any consecutive 12-month period with consideration given to future facility growth.

  Include a discussion of the hours of operation and how the hours of operation relate to emission rates on an hourly and annual basis.

  If the process is a non-continuous batch operation, or there are widely varying operating scenarios, variations in emissions must be clearly identified and accounted for in the maximum hourly and annual emission rates. Supply additional information to describe the emission variations, particularly for emissions from MSS facilities and related activities.

  Include emission rate information for each air contaminant during production operations and during periods of planned MSS. Contaminants must be specifically identified. For example: Methanol rather than hydrocarbons or polyester/styrene resin dust and iron dust rather than dust. Provide applicable Material Safety Data Sheets (MSDS), Safety Data Sheets (SDS), Air Quality Data Sheets, or equivalent supporting documents that provide complete speciation for all mixtures that contain potential air contaminants.

  If spreadsheets are used to estimate emissions, they should be formatted such that they are clear and easy to follow and include example calculations with units and the data sources for the inputs. The permit reviewer may request an electronic version of the spreadsheet to verify the emission calculations are correct.

- Air Permit Application Tables: To facilitate review of applications, we developed tables to assist you with submitting a complete air permit application. These tables are available at www.tceq.texas.gov/permitting/air/nav/air_reftablenewsource.html.

  - Table 1(a) (Form 10153), entitled Emission Point Summary: A Table 1(a) is required for all applications to confirm technical emissions information. The Table 1(a) summarizes all emission points and associated hourly (except for GHGs) and annual emissions; it also describes the physical parameters of each emission point during production operations as well as planned MSS. These values will be the basis for the technical review and ultimately for the development of the maximum allowable emission rate table (MAERT). The Table 1(a) is located at www.tceq.texas.gov/permitting/air/forms/newsourcereview/tables/nsr_table1.html.

Please adhere to the following guidelines when completing the Table 1(a).

- Identify emission points with a unique alphanumeric identification of no more than ten characters. An emission point is defined as the point from which air contaminants enter the ambient air.
- For a modified facility, list all emission sources, existing as well as new. For planned MSS, list all emission points, existing as well as new.
- Specifically identify each air contaminant. For example: Methanol rather than hydrocarbons or polyester/styrene resin dust and iron dust rather than dust. Provide applicable MSDS, SDS, Air Quality Data Sheets, or equivalent supporting documents for all materials which contain potential air contaminants unless an alternative method of identification and quantification of specific air contaminants has been approved before submittal of the application. Large amounts of data may be attached to the application as appendices.
- Identify and include hazardous air pollutants on the Table 1(a) if these contaminants will be evaluated as part of the application. In addition, an individual hazardous air pollutant of one ton per year or more should be speciated on the Table 1(a). The list of 187 HAPs may be found at www.tceq.texas.gov/permitting/air/forms/newsourcereview/tables/nsr_table7.html and is subject to change without notice.
- Clearly discuss and document the total emissions in tons per year of each contaminant for which the application is to be evaluated. You may provide a separate table that contains the emission rates by emission point broken into separate species for facilities with a large number of emission points, as well as multiple species of air contaminants per emission point. Clearly identify on the Table 1(a) where the separate table is located within the application; for example, the page number or appendix, etc.).
- Identify emission points by UTM coordinates in meters using the North American Datum 1983 (NAD 83). UTM reference coordinates may be obtained from USGS topographical maps or others, if applicable. Accurate coordinates for each emission point are essential for air dispersion modeling activities.
    - Table 2 (Form 10155), entitled Material Balance: We require a material balance representation for all applications to confirm technical emissions information. The permit reviewer will evaluate the project based on a total material balance; that is, all streams into the system and all streams out, Table 2 is adequate for most process material balances, and additional sheets may be attached if necessary. Complex material balances may be presented on spreadsheets or indicated using process flow diagrams. All materials in the process should be addressed whether or not they directly result in the emission of an air contaminant. All production rates must be based on maximum operating conditions. All data submitted in the Table 2 are enforceable representations.
    - Equipment, Process, and Control Device Tables: Depending on the type of facility to be permitted, one or more of the equipment, process, and control device tables may be required as a part of your application. Examples of these tables include but are not limited to: Combustion Units Table 4 (Form 10159), Vertical Fixed Roof Storage Tanks Table 7(a) (Form 10165), and Fabric Filters Table 11 (Form 10179).

B. Schools Within 3,000 Feet [30 TAC § 116.111(a)(2)(A)(ii)]: In addition to marking the appropriate box on the Form PI-1, note whether there are any schools within 3,000 feet of the facility fence line and plot the location of the schools on the area map.

C. Maximum Operating Schedule: Provide the maximum operating schedule of the facility in terms of maximum hours per day, maximum days per week, maximum weeks per year, and total hours per year. If process units are operated at varying schedules throughout the year, the overall schedule must account for these variations. For example, if a facility, which is normally operated 8 hours per day (hrs/day) and 5 days per week (day/wk), is operated on a weekend or more than 8 hours per day, the schedule that will provide adequate flexibility should be listed. If the facility only operates seasonally, please provide a short description on when operations occur. For example: March through September 10 hrs/day, 7 days/wk; October through February 2 hrs/day, 1 day/wk.

D. Inclusion in Emissions Inventory Submittals: Provide a list of each planned MSS source/activity that has been previously submitted as part of an emissions inventory if the site is subject to emissions inventory requirements under 30 TAC § 101.10. Indicate which years the planned MSS activities have been included in emissions inventories.

E. Disaster Review: If the proposed facility will handle sufficient quantities of certain chemicals which, if released accidentally, would cause off-property impacts that could be immediately dangerous to life and health, a disaster review analysis may be required as part of the application. Please contact the appropriate NSR permitting section for assistance at (512) 239-1250. Additional Guidance can be found at www.tceq.texas.gov/assets/public/permitting/air/Guidance/NewSourceReview/disrev-factsheet.pdf.

Important Note: If the effects of a catastrophic release cannot be mitigated due the proximity of citizens and nature of the project, the agency may recommend that the permit not be issued.

F. Air Pollutant Watch List (APWL): Certain areas of the state have concentrations of specific pollutants that are of concern. The TCEQ has designated these portions of the state as watch list areas. Location of a facility in a watch list area could result in additional restrictions on emissions of the affected air pollutant(s) or additional permit requirements. The location of the areas and pollutants of interest can be found at www.tceq.texas.gov/toxicology/apwl/apwl.html.

G. GHGs: If the emissions of GHGs from the proposed facility will exceed the thresholds in 30 TAC § 116.164, authorization of GHGs is required. If authorization of GHGs is required, provide a list of the applications to authorize emissions of non-GHGs that are associated with the project. Include associated applications that are pending or are being submitted in addition to this application. All preconstruction authorizations (including authorization for emissions of greenhouse gases, if applicable) must be obtained prior to start of construction.

H. Impacts Analysis. An impacts analysis is required for all projects with new and/or modified facilities or sources of emissions of air contaminants. If required for the project, you must submit a summary demonstrating compliance with all state and federal requirements with the application. If an impact analysis is not required, a description of why an impacts analysis is not required must be included.

- Prevention of Significant Deterioration (PSD). PSD projects require a modeling protocol.
- Non-Federal Projects. Non-federal projects require an attachment detailing how the project meets all applicable impacts requirements, including which MERA step was met (if applicable), how the modeling was conducted (if applicable), and the results

demonstrating compliance with all applicable impacts requirements following the Initial Modeling Summary for Minor New Source Review Projects guidance document. Note: for projects with modeling, utilizing APD's Electronic Modeling Evaluation Workbook to complete this analysis will help streamline the modeling review and is strongly encouraged. For applicants using the impacts analysis feature of the Paint Emission Calculation and Impacts Analysis Spreadsheet, no additional impacts analysis needs to be submitted at this time.

VIII. State Regulatory Requirements

Submit itemized information and analyses, as applicable that demonstrates that all general application requirements, as specified in 30 TAC § 116.111 are met. Each of the following requirements must be addressed.

A. Protection of Public Health and Welfare [30 TAC § 116.111(a)(2)(A)]: Address each of the air quality rules and regulations for applicability and explain the basis for expected compliance. Include a demonstration for every emission point, facility, or control device, etc. on the Table 1(a) or other emission documentation. This demonstration must identify the particular section or sections of 30 TAC that apply and how compliance with the section will be accomplished. If a particular rule or regulation is not applicable, give the basis for non-applicability. Not all air quality regulations are appropriate for every application. The permitting rules in 30 TAC Chapter 116 require a demonstration of compliance with all air quality rules and regulations by the proposed facility, even if that demonstration is by reason that the rule or regulation does not apply.

This demonstration must be consistent with information provided in the plot plan, emission tables, and other facility information submitted. A sample application is located at www.tceq.texas.gov/permitting/air/guidance/newsourcereview/paint/nsr_fac_paint.html.

- 30 TAC Chapter 101 General Rules
- 30 TAC Chapter 111 Visible Emissions and Particulate Matter
- 30 TAC Chapter 112 Sulfur Compounds
- 30 TAC Chapter 113 Toxic Materials
- 30 TAC Chapter 115 Volatile Organic Compounds - applicable only in certain counties
- 30 TAC Chapter 117 Nitrogen Compounds - applicable only in certain counties
- 30 TAC Chapter 122 Federal Operating Permits

B. Measurement of Significant Air Contaminants [30 TAC § 116.111(a)(2)(B)]: Propose how significant emissions, as determined by the executive director, will be measured (stack sampling, ambient monitoring, continuous emissions monitoring, leak detection and repair program for fugitive emissions, etc.) to demonstrate initial and ongoing compliance with permit limitations. Enforceable permit conditions will be based on measures, which will provide for adequate demonstration of continuous compliance. These conditions are a critical part of the permit.

C. Best Available Control Technology (BACT) [30 TAC § 116.111(a)(2)(C)]: Demonstrate that the facilities will use the best available control technology with consideration given to the technical practicability and the economic reasonableness of reducing or eliminating emissions from the facility.

Provide an analysis that includes all information required to demonstrate that BACT will be applied to the processes that are part of the application. Your analysis must address all air contaminants subject to review from the affected emission units under normal production operating conditions as well as during planned MSS activities. For each contaminant, identify the emission reduction option(s) proposed to satisfy BACT. Describe in detail the technique used for emission reduction, discuss proposed performance of the option(s) chosen, and provide supporting information as necessary for the proposal. Additional information regarding BACT can be found in the Air Pollution Control Guidance Document, APDG 6110 and at www.tceq.texas.gov/assets/public/permitting/air/Guidance/NewSourceReview/airpoll_guidance.pdf.

D. Achieve Performance [30 TAC § 116.111(a)(2)(G)]: Provide sufficient information representing a clear technical justification that the facility will perform as indicated. All assumptions and calculations must be provided. This information must include, but is not limited to, the useful life of the equipment, proper maintenance programs, and original design criteria such as process flow diagrams, material balances, emissions calculations, vendor data on pollution control equipment, control efficiencies, or test data from similar facilities.

Describe how process and abatement equipment operational parameters will be monitored. If a specific capture or collection efficiency is proposed, you must submit data or design information to support this claim, including design drawings on hoods, etc. Explain how captured emissions will be handled and procedures to be followed during upsets, spills, etc. The facilities covered by a permit must continuously perform as represented. This means that proper equipment maintenance procedures must be implemented and followed, spills cleaned up promptly, fugitive emissions reduced, equipment covers maintained in place, leaks fixed, etc. The design of emission capture systems must be adequate to ensure that good emission capture techniques are initially constructed. You must provide design calculations and drawings to demonstrate that good capture techniques will be used. Examples of other areas that should be addressed, when applicable, include disposal of bag-filter dust and scrubber waste, spills cleanup, plant road and parking area maintenance, storage pile maintenance, general plant housekeeping, and maintenance of air pollution control equipment.

IX. Federal Regulatory Requirements

Indicate if any of the following requirements apply to the permitted facility, and demonstrate that the permitted facility can, or is complying with the applicable requirements. Demonstrate how compliance with each of the applicable requirements will be met. Your demonstration must include: a discussion of how emission controls, if required, meet rule requirements; how work practices meet rule requirements; calculations, sampling, or test data demonstrating compliance with any numerical standards, for example parts per million and gram per horsepower hour; or continuous emissions monitoring system data.

You must review baseline actual emissions, 30 TAC § 116.150 and 30 TAC § 116.160, for existing facilities regarding potential federal permit applicability. In order to allow evaluation of federal applicability, please submit baseline actual emissions in tons per year for each facility affected by the proposed modification. Clearly identify the baseline actual emissions from each facility affected by the proposed modification. Identify baseline actual emission rates as normal production emissions and planned MSS, as applicable. The applicability of nonattainment and PSD to a specific new source or a modification of an existing source is addressed in the Federal New Source Review guidance document available at www.tceq.texas.gov/permitting/air/nav/air_docs_newsource.html.

A. New Source Performance Standards (NSPS) [30 TAC § 116.111(a)(2)(D)]: A list of NSPS subparts may be found at www.tceq.texas.gov/permitting/air/forms/newsourcereview/tables/nsr_table7.html and is subject to change without notice. Refer to the current version of 40 Code of Federal Regulations (CFR) Part 60 for specific details concerning applicability of the standards. Generally, the effective date of an NSPS subpart is the date of proposal. Copies of these standards can be found at www.ecfr.gov.

B. National Emission Standards for Hazardous Air Pollutants (NESHAP) [30 TAC § 116.111(a)(2)(E)]: A list of NESHAP subparts may be found at www.tceq.texas.gov/permitting/air/forms/newsourcereview/tables/nsr_table7.html and is subject to change without notice. Refer to the current version of 40 CFR Part 61 for specific details concerning applicability of the standards. Copies of these standards can be found at www.ecfr.gov.

C. Maximum Achievable Control Technology (MACT) [30 TAC § 116.111(a)(2)(F)]: A list of MACT subparts may be found at www.tceq.texas.gov/permitting/air/forms/newsourcereview/tables/nsr_table7.html and is subject to change without notice. Refer to the current version of 40 CFR Part 63 for specific details concerning applicability of the standards. Copies of these standards can be found on the Government Printing Office Web site at www.ecfr.gov

D. Nonattainment Permitting Requirements [30 TAC § 116.111(a)(2)(H)]: You must address requirements contained in 30 TAC § 116.150 and § 116.151 for the affected pollutant if the facility is located or proposed to be located in a designated nonattainment area of Texas. Include planned MSS emissions in this review. You are encouraged to consult the New Source Review – Federal Applicability Determination document available at www.tceq.texas.gov/assets/public/permitting/air/Guidance/NewSourceReview/fnsr_app_determ.pdf for detailed guidance in determining the applicability and requirements of nonattainment review in Texas.

By signing the Form PI-1, you certify compliance with all applicable nonattainment permitting requirements. Additional information on major source significant emission rates for nonattainment reviews is located at www.tceq.texas.gov/permitting/air/guidance/permit-factsheets.html.

E. Prevention of Significant Deterioration (PSD) Permitting Requirements [30 TAC § 116.111(a)(2)(I)]: If the facility is located or proposed to be located in an attainment or unclassified area of Texas, 30 TAC § 116.160 and § 116.162 must be addressed for the affected pollutants. GHG PSD requirements apply statewide. New sources and modifications classified as major under the PSD rules must submit additional information required for review pursuant to those rules. Planned MSS emissions must also be taken into consideration in this review. More information on these major source thresholds can be found at www.tceq.texas.gov/permitting/air/guidance/permit-factsheets.html.

Effective July 24, 1992, TCEQ has full delegation of PSD permitting in Texas. The PSD rules are provided in 40 CFR § 52.21. Monitoring, modeling, and BACT requirements will vary with the magnitude, location, and type of emissions of a new source or modification. These considerations also apply to planned MSS emissions.

Effective November 10, 2014, TCEQ has State Implementation Plan approval of PSD permitting for emissions of GHGs in Texas.

Title 30 TAC § 116.160 addresses the applicability of the PSD air quality regulations at 40 CFR § 52.21 and protection of visibility at 40 CFR § 51.301. PSD applicability for GHGs is in 30 TAC § 116.164. By signing the Form PI-1, you certify compliance with all provisions of 30 TAC § 116.160.

F. Hazardous Air Pollutant Major Source [30 TAC § 116.111(a)(2)(K)]: If the facility is a major source of HAPs and EPA has not promulgated a MACT standard under 40 CFR 63 for a required source category, the FCAA § 112(g) requires states to perform a case-by-case control technology review. Any construction or reconstruction of a facility which has the potential to emit major amounts of HAPs must comply with the requirements in 30 TAC Chapter 116, Subchapter C. If necessary, all required documentation and analysis must be part of the permit application. The signature on the Form PI-1 indicates compliance with these requirements. A major source of HAPs emits 10 tpy or more of any particular HAP or 25 tpy or more of any combination of HAPs. The list of 187 HAPs can be found at www.tceq.texas.gov/permitting/air/forms/newsourcereview/tables/nsr_table7.html and is subject to change without notice.

G. Plant-wide Applicability Limit (PAL) [30 TAC Chapter 116, Subchapter C]: The permit holder has the option of establishing a PAL for all facilities at an existing major source. The PAL will impose an annual emission limit for all facilities emitting the pollutant for which a PAL is requested. Changes taking place below the PAL are not subject to major NSR applicability. The initial PAL emission rate will be calculated through the use of baseline actual emission rates.

X. Professional Engineer (P.E.) Seal

Per 30 TAC § 116.110(f) you must submit your application under the seal of a Texas licensed professional engineer when the estimated capital cost of a project, as defined by 30 TAC § 116.141, exceeds two million dollars. If you claim an exemption from this requirement pursuant to the Texas Engineering Practice Act, please cite the section in the act under which exemption is claimed.

XI. Permit Fee Information

Permit Fees [30 TAC § 116.141 or § 116.163]: Most permit and amendment applications require an application fee at the time of application submittal. Applications for special permit amendments, changes of location, and relocations do not require a fee. In addition, recent legislation provided exemptions from fee payment for research projects by state agencies or institutions of higher education.

We will not review an application until we receive the required fee. For minor source permits, the minimum fee is $900, and the maximum fee is $75,000. For PSD, the minimum fee is $3,000 and the maximum fee is $75,000. For most actions, the required fee and Table 30 Estimated Capital Cost and Fee Verification (Form -10196) is required to ensure the application is consistent with the requirements of 30 TAC § 116.141 or § 116.163. Make checks or money orders payable to TCEQ. The State Treasury will not accept checks drawn on foreign banks. Instructions for online payment through the ePay system can be found at www3.tceq.texas.gov/epay/.

Attach the following items to the application.

- Table 30 (Form-10196)
- Table 30 is available at www.tceq.texas.gov/permitting/air/forms/newsourcereview/tables/nsr_table6.html. Signatures must be original and in ink.
- If the application is for a multiple plant permit, the fee is $900 per application, not per plant site.
- If the application is for a flexible permit, the fee is based on the total annual allowable emissions from the permitted facility, group of facilities, or account for which the flexible permit is being sought. For flexible permits subject to PSD requirements, the fee shall be 1.0 percent of the capital cost of the project with a minimum fee of $3,000 and a maximum fee of $75,000. For flexible permits subject to minor NSR requirements, the fee shall be 0.3 percent of the capital cost of the project with the minimum fee being $900 and the maximum fee $75,000.
- A single PSD fee (calculated on the capital cost of the project per 30 TAC § 116.163) will be required for all of the associated permitting actions for a GHG PSD project. Other NSR permit fees related to the project that have already been remitted to the TCEQ can be subtracted when

determining the appropriate fee to submit with the GHG PSD application; please identify these other fees in the GHG PSD permit application.

- The amount of the application fee cannot be held as confidential. If you choose not to disclose the estimated capital cost of the project, you are not required to submit Table 30; however, in this case, you must pay the maximum fee of $75,000, per 30 TAC § 116.141(d).
- Discuss questions relating to direct costs and indirect costs as defined by 30 TAC § 116.141 at a pre-permit meeting and, if unresolved, further inquiries should be made in writing to the Office of Legal Services.
- To verify receipt of payment or any other questions regarding payment of fees, please call the Financial Administration Division, Cashiers Office at (512) 239-0357.

XII. Delinquent Fees and Penalties

We will not process your application until all delinquent fees and applicable penalties owed to the TCEQ or the Office of the Attorney General on behalf of the TCEQ are paid in accordance with the Delinquent Fee and Penalty Protocol. More information regarding delinquent fee and penalties can be found at www.tceq.texas.gov/agency/financial/fees/delin.

XIII. Signature

The owner or operator of the facility must apply for authority to construct. The appropriate company official (owner, plant manager, president, vice president, or environmental director) must sign all copies of the application. The applicant's consultant cannot sign the application.

Important Note: Signatures must be original in ink, not reproduced by photocopy, fax, or other means, and must be received before any permit is issued.

Applicants may check application receipt and status throughout the process at www2.tceq.texas.gov/airperm/index.cfm as well as obtain guidance and application documents relating to air permitting at www.tceq.texas.gov/permitting/air/nav/air_nsrpermits.html.

For questions relating to the initial receipt and administrative review of the application, please contact the Air Permits Initial Review Team at (512) 239-1250, Fax: (512) 239-4500.

For questions relating to the technical review or any other questions relating to air permitting, please contact the Air Permits Division at (512) 239-1250, Fax: (512) 239-1300.

Copies of This Application

Please submit copies of the Form PI-1 and all other required attachments as indicated below. Retain a copy of the application for your own records. Also, provide copies of all subsequent correspondence to the TCEQ regional office and local Air Pollution Control Program(s), as appropriate. Indicate to whom copies have been sent on the cover letter of any subsequent correspondence. Do not attach a copy of Form PI-1 to subsequent correspondence unless specifically requested, as this may cause another registration file to be created. Indicate the assigned permit number, air quality account number, RN, CN, and permit reviewer, if known, on all subsequent correspondence. Submit the following with a copy of the Form PI-1:

The required fee to the Financial Administrative Division, Revenue Operations Section (512-239-6260) (not required if paid through ePay).

- A copy of the Core Data Form, and all attachments to:
- the TCEQ headquarters in Austin, Air Permits Division - Air Permits Initial Review Team, MC 161,

- the appropriate regional office,
- each local air pollution control program(s) having jurisdiction, and
- A copy of the Core Data Form, the Form PI-1, and all attachments to the Environmental Protection Agency (EPA) Region 6 office in Dallas, Texas (without confidential information) for federal applications (PSD, nonattainment, FCAA § 112(g), and PAL).

Important Note: EPA Region 6 office has requested that all applications, including any updates, submitted to EPA be provided in electronic format via email or as a readable media via CD, DVD, or flash drive by mail. Microsoft Word for text, Excel for spreadsheets, and a searchable Adobe Acrobat (pdf) file are the preferred formats. Do not submit any compressed or zip files, files with an ".exe" extension or files that contain any confidential information. Do not submit any individual files larger than 10 megabytes via email, and the total size of all attachments cannot exceed 25 megabytes per email. With the exception of any document that requires an original signature or confidential information, no hard copies of the information contained in the application should be submitted to EPA.

Any application, including any updates, submitted via email should be submitted to EPA at: R6AirPermitsTX@epa.gov. Identify the associated permit number when submitting information.

All confidential information, documents with original signature, and readable media, CD, DVD, or flash drive, should be mailed to EPA Region 6.

Please contact Ms. Aimee Wilson (wilson.aimee@epa.gov) at (214) 665-7596 if you have any questions pertaining to electronic submittals to the EPA.

- If the new construction is proposed within 100 km (62.14 miles) of the Rio Grande River submit a copy of the Form PI-1, and all attachments to the International Boundary and Water Commission (IBWC).
- If PSD initial or major modification of a proposed or existing facility is located within 100 km or less of a Class I Area, notify the appropriate Federal Land Manager(s). The 100 km measurement should occur with the nearest point of the facility boundary in the direction of the Class I area to the nearest point of the Class I area boundary. Class I Areas are areas of special national or regional value from a natural, scenic, recreational, or historic perspective. If a facility may affect a Class I Area, submit a copy of the Form PI 1, and all attachments to:
  - If located within 100 km or less of National Park Service (NPS) Class I area boundary (Carlsbad Caverns National Park (NP), Guadalupe Mountains NP, or Big Bend NP) notify:

    National Park Service
    Air Resources Division
    Environmental Protection Specialist
    P.O. Box 25287
    Denver, CO 80225-0287

  - If located within 100 km or less of a National Wildlife Refuge Class I area boundary (Wichita Mountains National Wildlife) notify:

    USFWS, National Wildlife Refuge System
    Branch of Air Quality
    Meteorologist/Modeler
    7333 West Jefferson Avenue, Suite 375
    Lakewood, CO 80235-2017

  - If located within 100 km or less of a National Wilderness Class I area boundary (Caney Creek Wilderness) notify:

    USDA Forest Service

National Air Modeling Coordinator
2150A Centre Avenue, Suite 368
Fort Collins, CO 80526-1891

If the proposed facilities are located within 100 km or less of Indian Tribal Lands, submit a copy of the Form PI 1 and all attachments to Indian Governing Body. Tribes in Texas include the following:

- Alabama-Coushatta Tribe of Texas
- Kickapoo Traditional Tribe of Texas
- Ysleta del Sur Pueblo of Texas

If the new construction or major modification is for a PSD within 100 km or less of an affected state, submit a copy of the Form PI-1 and all attachments to the affected state(s). Affected states around Texas include the following:

- Arkansas
- Colorado
- Kansas
- Louisiana
- New Mexico
- Oklahoma

Who	Where	What
Financial Administrative Division Revenue Operations Section	**Regular, Certified, Priority Mail** MC 214, P.O. Box 13088, Austin, Texas 78711-3088 or **Hand Delivery, Overnight Mail** Mail Code 214, 12100 Park 35 Circle, Building A, Third Floor, Austin, Texas 78753 Note: The official application cannot be faxed	Fee: 1 copy of Form PI-1; and 1 copy of the Core Data Form. Not required if fee was paid using ePay[1].
Air Permits Division Air Permits Initial Review Team (APIRT)	Regular, Certified, Priority Mail MC 161, P.O. Box 13087, Austin, Texas 78711-3087 or Hand Delivery, Overnight Mail Mail Code 161, 12100 Park 35 Circle, Building C, Third Floor, Room 300W, Austin, Texas 78753 Note: The official application cannot be faxed	Original Form PI-1; Original Core Data Form; and Original attachments
Appropriate TCEQ Regional Office	To find your regional office address go to www.tceq.texas.gov/agency/directory/region or call (512) 239-1250	1 copy of the Form PI-1; 1 copy of Core Data Form; and 1 copy of all attachments
Local Air Pollution Control Program(s), having jurisdiction	To find your local air pollution control programs go to www.tceq.texas.gov/permitting/air/local_programs.html	1 copy of the Form PI-1; 1 copy of Core Data Form; and 1 copy of all attachments
U.S. Environmental Protection Agency (Federal Permit and Major Modification Applications Only)	For all applications, including any updates, submitted via email: R6AirPermitsTX@EPA.gov For all confidential information, documents with original signature, and readable media, CD, DVD, or flash drive: EPA Region 6, Air Permits Section 6MM-AP 1445 Ross Avenue, Suite 1200 Dallas, Texas 75202-2733	1 copy of the Form PI-1; and 1 copy of all attachments
Alabama-Coushatta Tribe of Texas	571 State Park Road 56, Livingston, Texas 77351	1 copy of the Form PI-1; and 1 copy of all attachments
Kickapoo Traditional Tribe of Texas	Box HC 1, 9700, Eagle Pass, Texas 78852	1 copy of the Form PI-1; and 1 copy of all attachments
Ysleta del Sur Pueblo of Texas	119 S. Old Pueblo Rd., El Paso, Texas 79907	1 copy of the Form PI-1; and 1 copy of all attachments
EMD Division Chief International Boundary and Water Commission United States Section	4171 N. Mesa, Suite C-100, El Paso, Texas 79902-1441	1 copy of the Form PI-1; and 1 copy of all attachments

[1] ePay located at www3.tceq.texas.gov/epay/

Who	Where	What
Bureau of Land Management, Oklahoma, Texas, Kansas	P.O. Box 27115, Santa Fe, NM 87502-0115	1 copy of the Form PI-1; and 1 copy of all attachments
Bureau of Land Management, Eastern States (Arkansas)	7450 Boston Boulevard, Springfield, VA 22153-3121	1 copy of the Form PI-1; and 1 copy of all attachments
Arkansas Department of Environmental Quality	Air Division 5301 Northshore Drive North Little Rock, Arkansas 72118-5317	1 copy of the Form PI-1; and 1 copy of all attachments
Colorado Department of Public Health and Environment	Air Pollution Control Division 4300 Cherry Creek Drive South Denver, Colorado 80246-1530	1 copy of the Form PI-1; and 1 copy of all attachments
The Kansas Department of Health and Environment	Bureau of Air and Radiation – Air Permit Section Curtis State Office Building 1000 Southwest Jackson, Suite 330 Topeka, Kansas 66612-1366	1 copy of the Form PI-1; and 1 copy of all attachments
Louisiana Department of Environmental Quality	Air Permits Division P.O. Box 4313 Baton Rouge, Louisiana 70821-4313	1 copy of the Form PI-1; and 1 copy of all attachments
New Mexico Environmental Department	Air Quality Bureau 525 Camino de los Marquez, Ste 1 Santa Fe, New Mexico 87507-1816	1 copy of the Form PI-1; and 1 copy of all attachments
Oklahoma Department of Environmental Quality	Air Quality Division P.O. Box 1677 Oklahoma City, Oklahoma 73101-1677	1 copy of the Form PI-1; and 1 copy of all attachments

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Important Note: The agency requires that a Core Data Form be submitted on all incoming applications unless a Regulated Entity and Customer Reference Number have been issued and no core data information has changed. For more information regarding the Core Data Form, call (512) 239-5175 or go to www.tceq.texas.gov/permitting/central_registry/guidance.html.

I. Applicant Information		
A. Company or Other Legal Name: SPOT Terminal Services LLC		
Texas Secretary of State Charter/Registration Number (if applicable):		
B. Company Official Contact Information: (☒ Mr. ☐ Mrs. ☐ Ms. ☐ Other:) ________		
Name: Ivan W. Zirbes		
Title: Vice President		
Mailing Address: P.O. Box 4324		
City: Houston	State: TX	ZIP Code: 77210-4324
Telephone No.: (713) 381 – 6595	Fax No.: (713) 381-6660	
E-mail Address: environmental@eprod.com		
All permit correspondence will be sent via electronic copies unless hard copies are specifically requested through regular mail. The company official must initial here if hard copy correspondence is requested. ________		
C. Technical Contact Name Information: (☒ Mr. ☐ Mrs. ☐ Ms. ☐ Other:) ________		
Name: Bradley Cooley		
Title: Senior Manager, Permitting		
Company Name: SPOT Terminal Services LLC		
Mailing Address: P.O. Box 4324		
City: Houston	State: TX	ZIP Code: 77210-4324
Telephone No.: (713) 381-5828	Fax No.: (713) 381-6660	
E-mail Address: bjcooley@eprod.com		
D. Site Name: SPOT Deepwater Port		
E. Area Name/Type of Facility: Offshore Marine Terminal		☒ Permanent ☐ Portable
For portable units, please provide the serial number of the equipment being authorized below.		
Serial No:	Serial No:	
F. Principal Company Product or Business: Offshore Marine Terminal		
Principal Standard Industrial Classification Code (SIC): 4612		
Principal North American Industry Classification System (NAICS): 486110		
G. Projected Start of Construction Date: 2021		
Projected Start of Operation Date: 2022		

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Air Preconstruction Permit and Amendment

I. Applicant Information (continued)			
H. Facility and Site Location Information (If no street address, provide clear driving directions to the site in writing.):			
Street Address: Deepwater port (DWP) located in federal waters within the Outer Continental Shelf (OCS) in Galveston Area Lease Blocks 463 and A-59, approximately between 27.2 and 30.8 nautical miles (31.3 and 35.4 statute miles, or 50.4 and 57.0 kilometers), respectively, off the coast of Brazoria County, Texas, in Gulf of Mexico			
City/Town: N/A	County: N/A	ZIP Code: N/A	
Latitude (nearest second): 28° 27' 59.22"N	Longitude (nearest second): 95° 07' 24.49"W		
I. Account Identification Number (leave blank if new site or facility):			
J. Core Data Form			
Is the Core Data Form (Form 10400) attached? If No, provide customer reference number and regulated entity number (complete K and L).	☒ YES ☐ NO		
K. Customer Reference Number (CN): See attached Core Data Form			
L. Regulated Entity Number (RN): To be assigned			
II. General Information			
A. Is confidential information submitted with this application? If Yes, mark each confidential page confidential in large red letters at the bottom of each page.	☐ YES ☒ NO		
B. Is this application in response to an investigation, notice of violation, or enforcement action?	☐ YES ☒ NO		
If Yes, attach a copy of any correspondence from the agency and provide the RN in section I.L. above.			
C. Number of New Jobs: 10 to 12 permanent offshore operating crew, 300 to 525 during peak construction			
D. Provide the name of the State Senator and State Representative and district numbers for this facility site:			
State Senator: Joan Huffman	District No.: 17		
State Representative: Dennis Bonnen	District No.: 25		
III. Type of Permit Action Requested			
A. Mark the appropriate box indicating what type of action is requested.			
☒ Initial	☐ Amendment	☐ Revision (30 TAC § 116.116(e)	
☐ Change of Location		☐ Relocation	
B. Permit Number (if existing):			
C. Permit Type: Mark the appropriate box indicating what type of permit is requested. *(check all that apply, skip for change of location)*			
☒ Construction	☐ Flexible	☐ Multiple Plant	☐ Nonattainment ☐ Plant-Wide Applicability Limit
☒ Prevention of Significant Deterioration (PSD)		☒ Hazardous Air Pollutant Major Source	
☒ PSD for greenhouse gases (GHGs)		☐ Other:______	

III. Type of Permit Action Requested *(continued)*			
D. Is a permit renewal application being submitted in conjunction with this amendment in accordance with 30 TAC § 116.315(c).			☐ YES ☒ NO
E. Is this application for a change of location of previously permitted facilities?			☐ YES ☒ NO
If Yes, complete all parts of III.E.			
Current Location of Facility (If no street address, provide clear driving directions to the site in writing.):			
Street Address:			
City:	County:	ZIP Code:	
Proposed Location of Facility (If no street address, provide clear driving directions to the site in writing.):			
Street Address:			
City:	County:	ZIP Code:	
Will the proposed facility, site, and plot plan meet all current technical requirements of the permit special conditions? If "NO," attach detailed information.			☐ YES ☐ NO
Is the site where the facility is moving considered a major source of criteria pollutants or HAPs?			☐ YES ☐ NO
F. Are there any standard permits, standard exemptions, or PBRs to be incorporated by reference?			☐ YES ☒ NO
If Yes, list any PBR, standard exemptions, or standard permits that need to be referenced. *(attach pages as needed)*			
Are there any PBR, standard exemptions, or standard permits associated to be incorporated by consolidation?			☐ YES ☐ NO
If Yes, list any PBR, standard exemptions, or standard permits that need to be consolidated. *(attach pages as needed)*			
If Yes, are emission calculations, a BACT analysis, and an impacts analysis attached to this application for any authorization to be incorporated by consolidation.			☐ YES ☐ NO
G. Are you permitting planned maintenance, startup, and shutdown emissions?			☒ YES ☐ NO
If Yes, attach information on any changes to emissions under this application as specified in VII and VIII.			

III. Type of Permit Action Requested		
H. Federal Operating Permit Requirements (30 TAC Chapter 122 Applicability)		
Is this facility located at a site required to obtain a federal operating permit?		☒ YES ☐ NO ☐ To Be Determined
If Yes, list all associated permit number(s), attach pages as needed).		
Not applicable, applying for initial construction permit		
Identify the requirements of 30 TAC Chapter 122 that will be triggered if this application is approved.		
☐ FOP Significant Revision	☐ FOP Minor	☐ Application for an FOP Revision
☐ Operational Flexibility/Off-Permit Notification		☐ Streamlined Revision for GOP
☐ To be Determined		☒ None
Identify the type(s) of FOP(s) issued and/or FOP application(s) submitted/pending for the site. ***(check all that apply)***		
☐ GOP Issued	☐ GOP application/revision application submitted or under APD review	
☐ SOP Issued	☐ SOP application/revision application submitted or under APD review	

IV. Public Notice Applicability	
A. Is this a new permit application or a change of location application?	☒ YES ☐ NO
B. Is this application for a concrete batch plant? If Yes, complete all parts of V.D.	☐ YES ☒ NO
C. Is this an application for a major modification of a PSD, nonattainment, FCAA § 112(g) permit, or exceedance of a PAL permit?	☐ YES ☒ NO
D. If this is an application for emissions of GHGs, select one of the following:	
☐ Separate Public Notice (requires a separate application)	☒ Consolidated Public Notice
E. Is this application for a PSD or major modification of a PSD located within 100 kilometers or less of an affected state or Class I Area?	☐ YES ☒ NO
If Yes, list the affected state(s) and/or Class I Area(s).	

State	**Class I Area**

IV. Public Notice Applicability *(continued)*	
F. Is this a state permit amendment application? If Yes, complete all parts of IV.F.	☐ YES ☒ NO
Is there any change in character of emissions in this application?	☐ YES ☐ NO
Is there a new air contaminant in this application?	☐ YES ☐ NO
Do the facilities handle, load, unload, dry, manufacture, or process grain, seed, legumes, or vegetables fibers (agricultural facilities)?	☐ YES ☐ NO
List the total annual emission increases associated with the application ***(List all that apply and attach additional sheets as needed):***	
Volatile Organic Compounds (VOC):	
Sulfur Dioxide (SO_2):	
Carbon Monoxide (CO):	
Nitrogen Oxides (NO_x):	
Particulate Matter (PM):	
PM 10 microns or less (PM_{10}):	
PM 2.5 microns or less ($PM_{2.5}$):	
Lead (Pb):	
Hazardous Air Pollutants (HAPs):	
Below list other speciated air contaminants not listed above:	

V. Public Notice Information *(complete if applicable)*		
A. Responsible Person: (☒ Mr. ☐ Mrs. ☐ Ms. ☐ Other:)		
Name: Bradley Cooley		
Title: Senior Manager, Permitting		
Company Name: SPOT Terminal Services LLC		
Mailing Address: P.O. Box 4324		
City: Houston	State: TX	ZIP Code: 77210-4324
Telephone No.:	Fax No.:	
E-mail Address: bjcooley@eprod.com		

V. Public Notice Information *(complete if applicable) (continued)*			
B. Technical Contact: (☒ Mr. ☐ Mrs. ☐ Ms. ☐ Other:)			
Name: Bradley Cooley			
Title: Senior Manager, Permitting			
Mailing Address: P.O. Box 4324			
City: Houston	State: TX	ZIP Code: 77210-4324	
Telephone No.: (713) 381 5828	Fax No.: (713) 381-6660		
E-mail Address: bjcooley@eprod.com			
C. Name of the Public Place: Freeport Public Library			
Physical Address *(No P.O. Boxes)*: 410 Brazosport Blvd.			
City: Freeport	County: Brazoria	ZIP Code: 77541	
The public place has granted authorization to place the application for public viewing and copying.			☒ YES ☐ NO
The public place has internet access available for the public.			☒ YES ☐ NO
D. Concrete Batch Plants, PSD, and Nonattainment Permits			
County Judge Information (For Concrete Batch Plants and PSD and/or Nonattainment Permits) for this facility site.			
The Honorable: L.M. Sebesta, Jr.			
Mailing Address: Brazoria County Courthouse, 111 E. Locust Street			
City: Angleton	State: TX	ZIP Code: 77515	
For Concrete Batch Plants			
Is the facility located in a municipality or an extraterritorial jurisdiction of a municipality?			☐ YES ☒ NO
Presiding Officers Name(s):			
Title:			
Mailing Address:			
City:	State:	ZIP Code:	
Provide the name, mailing address of the chief executive for the location where the facility is or will be located.			
Chief Executive:			
Mailing Address:			
City:	State:	ZIP Code:	

V. Public Notice Information ***(complete if applicable) (continued)***		
D. Concrete Batch Plants, PSD, and Nonattainment Permits ***(continued)***		
Provide the name, mailing address of the Indian Governing Body for the location where the facility is or will be located.		
Indian Governing Body: Not applicable		
Mailing Address:		
City:	State:	ZIP Code:
Identify the Federal Land Manager(s) for the location where the facility is or will be located.		
Federal Land Manager(s): Not applicable		
E. Bilingual Notice		

Is a bilingual program required by the Texas Education Code in the School District?	☒ YES ☐ NO
Are the children who attend either the elementary school or the middle school closest to your facility eligible to be enrolled in a bilingual program provided by the district?	☒ YES ☐ NO
If Yes, list which languages are required by the bilingual program?	
Spanish	

VI. Small Business Classification ***(Required)***	
A. Does this company (including parent companies and subsidiary companies) have fewer than 100 employees or less than $6 million in annual gross receipts?	☐ YES ☒ NO
B. Is the site a major stationary source for federal air quality permitting?	☒ YES ☐ NO
C. Are the site emissions of any regulated air pollutant greater than or equal to 50 tpy?	☒ YES ☐ NO
D. Are the site emissions of all regulated air pollutants combined less than 75 tpy?	☐ YES ☒ NO

VII. Technical Information		
A. The following information must be submitted with your Form PI-1 ***(this is just a checklist to make sure you have included everything)***		
☒ Current Area Map		
☒ Plot Plan		
☐ Existing Authorizations		
☒ Process Flow Diagram		
☒ Process Description		
☒ Maximum Emissions Data and Calculations		
☒ Air Permit Application Tables		
☒ Table 1(a) (Form 10153) entitled, Emission Point Summary		
☒ Table 2 (Form 10155) entitled, Material Balance		
☒ Other equipment, process or control device tables		
B. Are any schools located within 3,000 feet of this facility?		☐ YES ☒ NO
C. Maximum Operating Schedule:		
Hour(s): 24	Day(s): 7	
Week(s): 52	Year(s): 8,760 hours/year	
Seasonal Operation? If Yes, please describe in the space provide below.		☐ YES ☒ NO
Hour(s):	Day(s):	
Week(s):	Year(s):	
D. Have the planned MSS emissions been previously submitted as part of an emissions inventory?		☐ YES ☒ NO
Provide a list of each planned MSS facility or related activity and indicate which years the MSS activities have been included in the emissions inventories. Attach pages as needed.		

MSS Facility(s) or Activity	Year(s)
Not applicable	

VII. Technical Information *(continued)*	
E. Does this application involve any air contaminants for which a disaster review is required?	☐ YES ☒ NO
If Yes, list which air contaminants require a disaster review	
F. Does this application include a pollutant of concern on the Air Pollutant Watch List (APWL)?	☐ YES ☒ NO
G. Are emissions of GHGs associated with this project subject to PSD?	☒ YES ☐ NO
If Yes, provide a list of all associated applications for this project:	
PSD application included.	
H. Does this project require an impacts analysis?	☒ YES ☐ NO
If No, is a description of why an impacts analysis is not required attached?	☐ YES ☐ NO
For Non-Federal Projects	
Is an attachment included detailing how the project meets all applicable impacts requirements, including which MERA step was met (if applicable), how the modeling was conducted (if applicable), and the results demonstrating compliance with all applicable impacts requirements following the Initial Modeling Summary guidance document?	☐ YES ☐ NO
Note: for projects with modeling, utilizing APD's Electronic Modeling Evaluation Workbook to complete this analysis will help streamline the modeling review and is strongly encouraged.	
VIII. State Regulatory Requirements **Applicants must demonstrate compliance with all applicable state regulations to obtain a permit or amendment.** *The application must contain detailed attachments addressing applicability or non-applicability; identify state regulations; show how requirements are met; and include compliance demonstrations.*	
A. Will the emissions from the proposed facility protect public health and welfare, and comply with all rules and regulations of the TCEQ?	☒ YES ☐ NO
B. Will emissions of significant air contaminants from the facility be measured?	☒ YES ☐ NO
C. Is the Best Available Control Technology (BACT) demonstration attached?	☒ YES ☐ NO
D. Will the proposed facilities achieve the performance represented in the permit application as demonstrated through recordkeeping, monitoring, stack testing, or other applicable methods?	☒ YES ☐ NO
IX. Federal Regulatory Requirements **Applicants must demonstrate compliance with all applicable federal regulations to obtain a permit or amendment.** *The application must contain detailed attachments addressing applicability or non-applicability; identify federal regulation subparts; show how requirements are met; and include compliance demonstrations.*	
A. Does Title 40 Code of Federal Regulations Part 60, (40 CFR Part 60) New Source Performance Standard (NSPS) apply to a facility in this application?	☒ YES ☐ NO
B. Does 40 CFR Part 61, National Emissions Standard for Hazardous Air Pollutants (NESHAP) apply to a facility in this application?	☐ YES ☒ NO
C. Does 40 CFR Part 63, Maximum Achievable Control Technology (MACT) standard apply to a facility in this application?	☒ YES ☐ NO

IX.	**Federal Regulatory Requirements *(continued)*** **Applicants must demonstrate compliance with all applicable federal regulations to obtain a permit or amendment.** *The application must contain detailed attachments addressing applicability or non-applicability; identify federal regulation subparts; show how requirements are met; and include compliance demonstrations.*	
D.	Do nonattainment permitting requirements apply to this application?	☐ YES ☒ NO
E.	Do prevention of significant deterioration permitting requirements apply to this application?	☒ YES ☐ NO
F.	Do Hazardous Air Pollutant Major Source [FCAA § 112(g)] requirements apply to this application?	☒ YES ☐ NO
G.	Is a Plant-wide Applicability Limit permit being requested?	☐ YES ☒ NO
X.	**Professional Engineer (P.E.) Seal**	
Is the estimated capital cost of the project greater than $2 million dollars?		☒ YES ☐ NO
If Yes, submit the application under the seal of a Texas licensed P.E. – PSD application submitted to USEPA Region 6. P.E. Seal is not needed as per Region 6.		
XI.	**Permit Fee Information**	
Check, Money Order, Transaction Number, ePay Voucher Number:		
Fee Amount: N/A		
Paid online? N/A		☐ YES ☒ NO
Company name on check:		
Is a Table 30 (Form 10196) entitled, Estimated Capital Cost and Fee Verification, attached?		☐ YES ☐ NO ☒ N/A
XII.	**Delinquent Fees and Penalties**	
This form will not be processed until all delinquent fees and/or penalties owed to the TCEQ or the Office of the Attorney General on behalf of the TCEQ is paid in accordance with the Delinquent Fee and Penalty Protocol. For more information regarding Delinquent Fees and Penalties, go to the TCEQ Web site at: www.tceq.texas.gov/agency/financial/fees/delin.		
XIII.	**Signature**	
The signature below confirms that I have knowledge of the facts included in this application and that these facts are true and correct to the best of my knowledge and belief. I further state that to the best of my knowledge and belief, the project for which application is made will not in any way violate any provision of the Texas Water Code (TWC), Chapter 7; the Texas Health and Safety Code, Chapter 382, the Texas Clean Air Act (TCAA) the air quality rules of the Texas Commission on Environmental Quality; or any local governmental ordinance or resolution enacted pursuant to the TCAA. I further state that I understand my signature indicates that this application meets all applicable nonattainment, prevention of significant deterioration, or major source of hazardous air pollutant permitting requirements. The signature further signifies awareness that intentionally or knowingly making or causing to be made false material statements or representations in the application is a criminal offense subject to criminal penalties.		
Name: Ivan W. Zirbes		
Signature: [signature] *Original Signature Required*		
Date: 1/28/19		

Texas Commission on Environmental Quality
Table 1(a)
Emission Point Summary
Instructions

1. Emission Point Number and Name:

   A. Identify each emission point with a unique number for this plant site. The emission point numbers (EPN) must be consistent with the emission point identification used on the plot plan, any previous permits, and "Emissions Inventory Questionnaire."

   B. Associate the EPN to the appropriate facility with a facility identification number (FIN). These numbers can be alphanumeric and maximum of 10 characters.

   C. Examples of emission point names are; "heater," "vent," 'boiler," "tank," "reactor," "separator," "baghouse," or "fugitive." Examples of EPN and/or FIN numbers are, "BOILER1," "100B1," "BH1." If appropriate, a FIN can be the same as the EPN. Abbreviations are acceptable.

2. Component or Air Contaminant Name: List each component or air contaminant name. Examples of component names are; "air," "H_2O," "nitrogen," "oxygen," "CO_2," "CO," "NO_x," "SO_2," "hexane," or "particulate matter (PM)." Abbreviations are acceptable.

3. Air Contaminant Emission Rate:

   A. Pounds per hour is the maximum short-term emission rate expected to occur in any one-hour period.

   B. Tons per year (tpy) is the annual (any rolling 12 month period) total maximum emissions expected by the facility, taking the process operating schedule into account.

4. Universal Transverse Mercator (UTM) Coordinates of Emission Points: The applicant must furnish a facility plot plan drawn to scale showing a plant benchmark. Latitude and longitude must be correct and to the nearest second for the benchmark, and the dimension of all emission points with respect to the benchmark as required by the Form PI-1 (General Application for Air Preconstruction Permits and Amendments). This information is essential for the calculation of emission point UTM coordinates. Please show emission point UTM coordinates if known. Use the southwest corner as the emission point coordinate for each area source.

5. Building Height: Enter the height of the building.

6. Height Above Ground: Enter the height of the stacks above the ground.

7. Stack Exit Data:

   A. Enter the length, width and equivalent diameter for rectangular stacks. Also indicate horizontal discharge or covered stacks (raincap).

   B. Enter the velocity of emissions in actual feet per second.

   C. Enter the actual temperature if the exit temperature is "room" or "climate controlled." Enter "ambient" to represent exit temperatures that are the same as the outdoor environment. Flare exit temperatures are not required.

8. Fugitives:

   A. For area fugitive sources, enter the dimensions of a rectangle, which will "enclose" all fugitive sources included in this EPN. Length to width ratio should be 10:1 or less. Subdivide larger areas to meet this requirement.

   B. Enter the width of the fugitive source area.

   C. Enter the number of degrees the long axis of the fugitive area is offset from north south.

NOTE: The TCEQ standard conditions are 68° F and 14.7 PSIA (Title 30 Texas Administrative Code § 101.1)

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Table 1(a) Emission Point Summary

Date: 01/11/2019	**Permit No.: TBD**	**Regulated Entity No.: TBD**
Area Name: SPOT Deepwater Port (DWP)		**Customer Reference No.: TBD**

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA					
1. Emission Point			**2. Component or Air Contaminant Name**	**3. Air Contaminant Emission Rate**	
(A) EPN	**(B) FIN**	**(C) Name**		**(A) Pound Per Hour**	**(B) TPY**
VC1	VC1	Vapor Combustor #1	NO_X	37.58	43.32
			CO	75.14	86.64
			VOC	198.22	472.84
			PM_{10}	2.08	2.40
			$PM_{2.5}$	2.08	2.40
			SO_2	39.46	12.24
			HAPs	9.25	22.16
			CO_2e	35,084	53,086
VC2	VC2	Vapor Combustor #2	NO_X	37.58	43.32
			CO	75.14	86.64
			VOC	198.22	472.84

			PM_{10}	2.08	2.40
			$PM_{2.5}$	2.08	2.40
			SO_2	39.46	12.24
			HAPs	9.25	22.16
			CO_2e	35,084	53,086
VC3	VC3	Vapor Combustor #3	NO_X	37.58	43.32
			CO	75.14	86.64
			VOC	198.22	472.84
			PM_{10}	2.08	2.40
			$PM_{2.5}$	2.08	2.40
			SO_2	39.46	12.24
			HAPs	9.25	22.16
			CO_2e	35,084	53,086
DGEN1	DGEN1	Diesel Generator #1	NO_X	20.63	45.17
			CO	3.48	7.63
			VOC	0.18	0.40
			PM_{10}	0.18	0.40
			$PM_{2.5}$	0.18	0.40
			SO_2	0.025	0.05
			HAPs	0.024	0.052
			CO_2e	2,408	5,273

DGEN2	DGEN2	Diesel Generator #2	NO_X	20.63	45.17
			CO	3.48	7.63
			VOC	0.18	0.40
			PM_{10}	0.18	0.40
			$PM_{2.5}$	0.18	0.40
			SO_2	0.025	0.05
			HAPs	0.024	0.052
			CO_2e	2,408	5,273
EDGEN	EDGEN	Emergency Generator	NO_X	6.89	0.34
			CO	6.15	0.31
			VOC	6.89	0.34
			PM_{10}	0.12	0.01
			$PM_{2.5}$	0.12	0.01
			SO_2	0.01	0.0005
			HAPs	0.009	0.0004
			CO_2e	889	44
PC1	PC1	Crane Engine #1	NO_X	0.39	0.85
			CO	3.39	7.43
			VOC	0.18	0.40
			PM_{10}	0.02	0.04
			$PM_{2.5}$	0.02	0.04

			SO_2	0.01	0.02
			HAPs	0.007	0.015
			CO_2e	691	1,514
PC2	PC2	Crane Engine #2	NO_X	0.39	0.85
			CO	3.39	7.43
			VOC	0.18	0.40
			PM_{10}	0.02	0.04
			$PM_{2.5}$	0.02	0.04
			SO_2	0.01	0.02
			HAPs	0.007	0.015
			CO_2e	691	1,514
DFP1	DFP1	Diesel Firewater Pump #1	NO_X	11.43	0.57
			CO	6.19	0.31
			VOC	11.43	0.57
			PM_{10}	0.36	0.018
			$PM_{2.5}$	0.36	0.018
			SO_2	0.01	0.0007
			HAPs	0.012	0.0006
			CO_2e	1,267	63
DFP2	DFP2	Diesel Firewater Pump #2	NO_X	11.43	0.57
			CO	6.19	0.31

			VOC	11.43	0.57
			PM_{10}	0.36	0.018
			$PM_{2.5}$	0.36	0.018
			SO_2	0.01	0.0007
			HAPs	0.012	0.0006
			CO_2e	1,267	63
VB	VB	Vent Boom	NO_X	0.00	0.00
			CO	0.00	0.00
			VOC	19.59	2.04
			PM_{10}	0.00	0.00
			$PM_{2.5}$	0.00	0.00
			SO_2	0.00	0.00
			HAPs	0.00	0.00
			CO_2e	0.00	0.00
DST1	DST1	Diesel Storage Tank #1	NO_X	0.00	0.00
			CO	0.00	0.00
			VOC	0.0031	0.010
			PM_{10}	0.00	0.00
			$PM_{2.5}$	0.00	0.00
			SO_2	0.00	0.00
			HAPs	0.00	0.00

			CO_2e		0.00
DST2	DST2	Diesel Storage Tank #2	NO_X	0.00	0.00
			CO	0.00	0.00
			VOC	0.0031	0.010
			PM_{10}	0.00	0.00
			$PM_{2.5}$	0.00	0.00
			SO_2	0.00	0.00
			HAPs	0.00	0.00
			CO_2e	0.00	0.00
DST3	DST3	Diesel Storage Tank #3	NO_X	0.00	0.00
			CO	0.00	0.00
			VOC	0.0011	0.0029
			PM_{10}	0.00	0.00
			$PM_{2.5}$	0.00	0.00
			SO_2	0.00	0.00
			HAPs	0.00	0.00
			CO_2e	0.00	0.00
FUG	FUG	Fugitives	NO_X	0.00	0.00
			CO	0.00	0.00
			VOC	5.21	22.81
			PM_{10}	0.00	0.00

			$PM_{2.5}$	0.00	0.00
			SO_2	0.00	0.00
			HAPs	0.71	3.12
			CO_2e	0.43	2
UL1	UL1	Uncaptured Loading Emissions	NO_X	0.00	0.00
			CO	0.00	0.00
			VOC	114.61	283.41
			PM_{10}	0.00	0.00
			$PM_{2.5}$	0.00	0.00
			SO_2	0.00	0.00
			HAPs	5.48	13.37
			CO_2e	57.74	253

EPN = Emission Point Number
FIN = Facility Identification Number

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Table 1(a) Emission Point Summary

Date:	Permit No.: TBD	Regulated Entity No.: TBD
Area Name: SPOT DWP		Customer Reference No.: TBD

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA						EMISSION POINT DISCHARGE PARAMETERS							
1. Emission Point			4. UTM Coordinates of Emission Point			Source							
						5. Building Height (Ft.)	6. Height Above Ground (Ft.)*	7. Stack Exit Data			8. Fugitives		
(A) EPN	(B) FIN	(C) NAME	Zone	East (meters)	North (meters)			(A) Diameter (Ft.)	(B) Velocity (FPS)	(C) Temperature (°F)	(A) Length (Ft.)	(B) Width (Ft.)	(C) Axis Degrees
VC1	VC1	Vapor Combustor #1	15	292147.485	3151546.545		185	10	62	1,200			
VC2	VC2	Vapor Combustor #2	15	292147.485	3151546.545		185	10	62	1,200			
VC3	VC3	Vapor Combustor #3	15	292147.485	3151546.545		185	10	62	1,200			
DGEN1	DGEN1	Diesel Generator #1	15	292136.179	3151536.687		118	1	143	683 (normal)			
DGEN2	DGEN2	Diesel Generator #2	15	292136.179	3151536.687		118	1	143	683 (normal)			
EDGEN	EDGEN	Emergency Generator	15	292196.570	3151505.971		155	0.67	79	599 (normal)			
PC1	PC1	Crane Engine #1	15	292189.787	3151521.596		185	0.5	45	870 (normal)			

PC2	PC2	Crane Engine #2	15	292189.787	3151521.596		185	0.5	45	870 (normal)			
DFP1	DFP1	Firewater Pump #1	15	292157.292	3151539.482		112	0.67	146	620 (normal)			
DFP2	DFP2	Firewater Pump #2	15	292157.292	3151539.482		112	0.67	146	620 (normal)			
VB	VB	Vent Boom	15	292179.373	3151763.753		159	0.67	<1.0	75 (normal)			
DST1	DST1	Diesel Storage Tank #1	15	292194.451	3151705.911		124	0.3					
DST2	DST2	Diesel Storage Tank #2	15	292195.451	3151706.911		124	0.3					
DST3	DST3	Diesel Storage Tank #3	15	292189.787	3151521.596		172	0.3					
UL1	UL1	Uncaptured Loading Emissions	15	293014.988	3152812.640				<1.0	75 (normal)			
FUG	FUG	Fugitive Emissions	15	292169.247	3151512.699		Varies						

***Stack height above mean sea level.**

EPN = Emission Point Number
FIN = Facility Identification Number

Texas Commission on Environmental Quality
Table 2
Material Balance

This material balance table is used to quantify possible emissions of air contaminants and special emphasis should be placed on potential air contaminants, for example: If feed contains sulfur, show distribution to all products. Please relate each material (or group of materials) listed to its respective location in the process flow diagram by assigning emission point numbers (taken from the flow diagram) to each material.

List every material involved in each of the following groups	Emission Point No. from Flow Diagram	Process Rate[1] Check appropriate column at right to indicate process rate method.	Measurement	Estimation	Calculation
Raw Materials - Input Crude Oil (ultralight to heavy)		85,000 barrels/hour Onshore Terminal to Deepwater Port (DWP)		X	
Fuels - Input Diesel - Diesel Generators (2), Firewater Pump, Emergency Generator, Pedestal Cranes (2),	DG1, DG2 DFP1, DFP2 EGEN PC1, PC2	Diesel Generators (2): 14.36 MMBtu/hr (each) Firewater Pumps (2): 7.56 MMBtu/hr (each) Emergency Generator (1) : 5.3 MMBtu/hr Pedestal Cranes (2): 4.12 MMBtu/hr (each)		X	
Products and By-Products - Output Crude Oil (ultralight to heavy)		85,000 barrels/hour DWP PLEMs to VLCCs		X	
Solid Wastes - Output					
Liquid Wastes - Output					
Airborne Waste (Solid) - Output PM_{10}, $PM_{2.5}$		See Table 1(a)			X
Airborne Wastes (Gaseous) - Output NO_X, CO, VOC, SO_2, HAPs		See Table 1(a)			X

[1] Specify the process rate of the facility using conventional engineering units (e.g., bbl/d, lb/yr, SCFM), and indicate the units next to each number. Standard Conditions: are 68°F 14.7 psia (30 Texas Administrative Code, Section 101.1(99).

APPENDIX B
FACILITY MAPS AND PLOT PLANS

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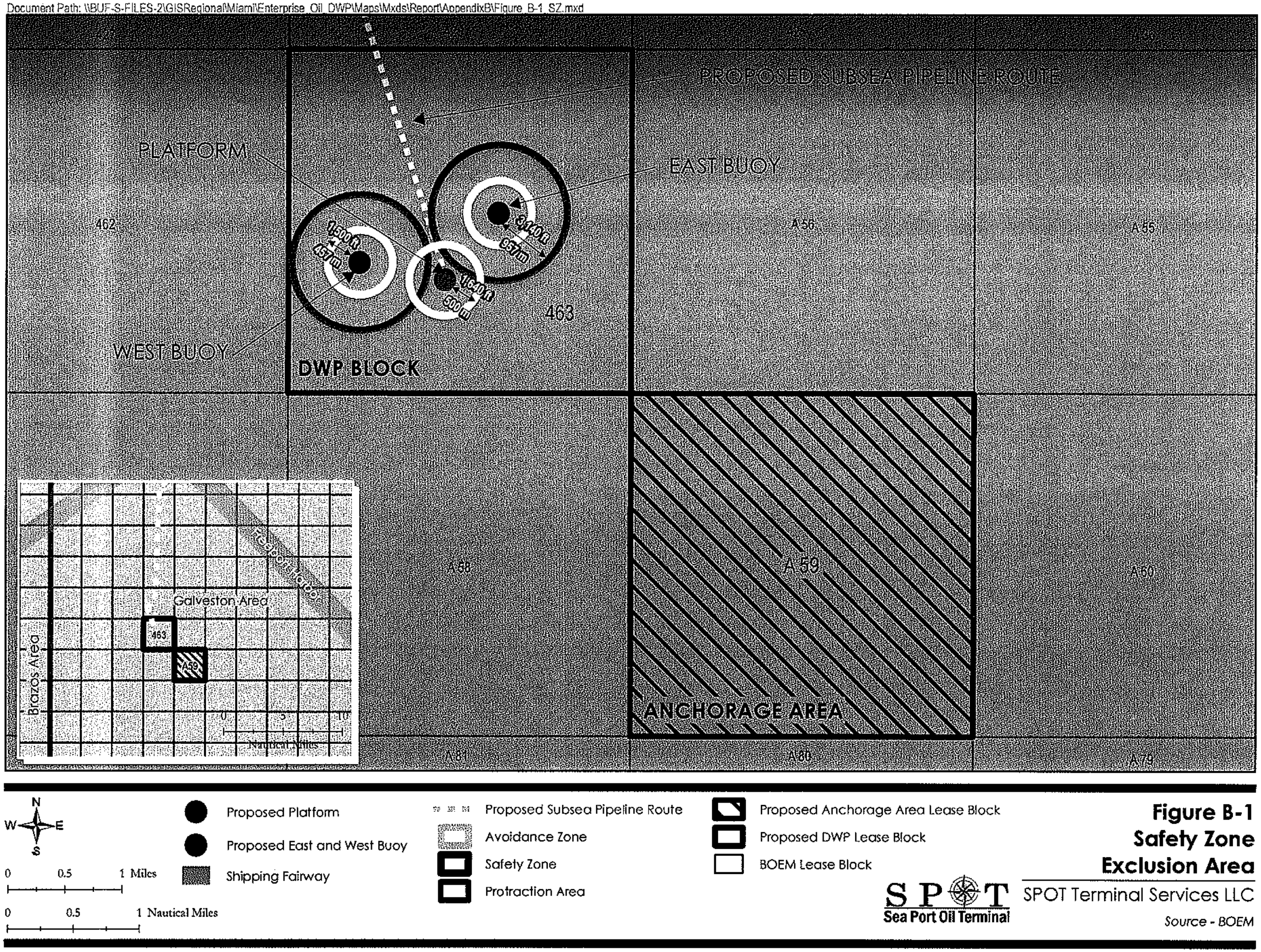


Figure B-1
Safety Zone
Exclusion Area

SPOT Terminal Services LLC

Source - BOEM

LIST OF FIGURES

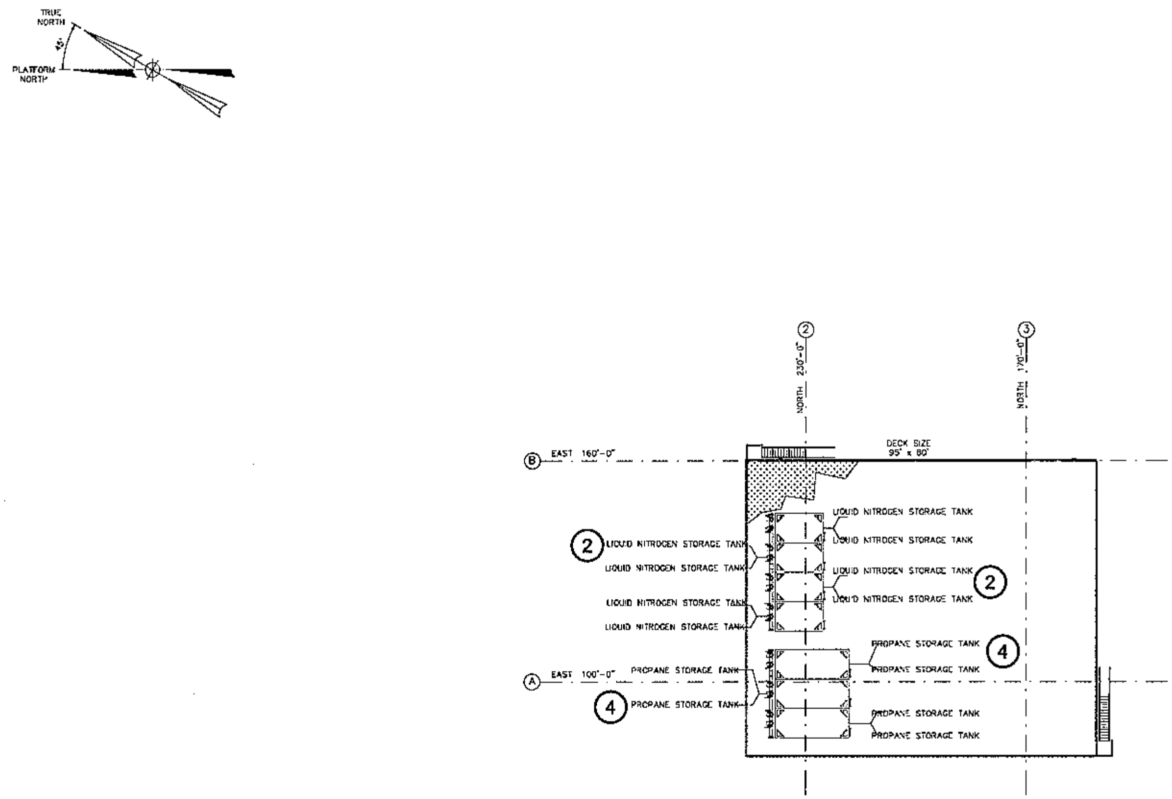
Equipment List and Location
(for use with Figures 1 through 4)

Item #	Equipment	System	Deck Level
1	Two (2) Pedestal Cranes with one (1) Diesel Storage Tank	Utilities	Main Deck
2	One (1) Nitrogen System - Storage Tanks, Vaporizers, and Transfer Pumps	Utilities	Main Deck
3	Three (3) Combustor Exhaust Stacks	Vapor Combustion System	Main Deck
4	One (1) Propane System - Storage Tanks, Vaporizers, and Transfer Pumps	Utilities	Main Deck
5	One (1) Oil Lease Automatic Custody Transfer (LACT) Unit	Metering	Main Deck
6	One (1) Oil LACT Prover	Metering	Main Deck
7	One (1) Utility and Potable Water System - Storage Tanks, Pumps, Pressure Tank, and Water Maker Package	Utilities	Main Deck
8	One (1) Utility and Instrument Air System - Compressors, Coolers, Separators, Filters, Dryers, and Receivers	Utilities	Main Deck
9	One (1) Chemical Injection System - Storage Tanks and Pumps	Utilities	Main Deck
10	One (1) Emergency Generator Package	Life Support/Life Saving	Main Deck
11	One (1) Totally Enclosed Motor Propelled Survival Craft (TEMPSC)	Life Support/Life Saving	Main Deck
12	One (1) Living Quarters	Buildings & Structures	Main Deck
13	One (1) Electrical and Instrument Building with Laboratory	Buildings & Structures	Main Deck
14	One (1) Maintenance Building	Buildings & Structures	Main Deck
15	One (1) Communications Tower	Life Support/Life Saving	Main Deck
16	Two (2) Vapor Safety & Injection Skids (i.e., Dock Safety Skid)	Vapor Combustion System	Main Deck
17	One (1) Helideck	Life Support/Life Saving	Main Deck[1]
18	Two (2) Diesel Generator Packages	Utilities	Cellar Deck
19	Two (2) Vapor Blower Skids	Vapor Combustion System	Main Deck
20	Three (3) Vapor Combustors	Vapor Combustion System	Cellar Deck
21	One (1) Vent Boom	Utilities	Main Deck
22	Two (2) High Integrity Pressure Protection Skids (HIPPS)	Process Safety & Control	Cellar Deck
23	Four (4) Crude Oil Loading Pipeline Pig Launchers/Receivers	Pig Launchers/Receivers	Cellar Deck
24	Four (4) Incoming Vapor Recovery Pipeline Pig Launchers/Receivers	Pig Launchers/Receivers	Cellar Deck
25	One (1) Topsides Hydraulic Power Unit (HPU)	Utilities	Cellar Deck
26	Two (2) Diesel Tanks	Utilities	Cellar Deck
27	Two (2) Diesel Transfer Pumps and Two (2) Diesel Storage Pumps	Utilities	Cellar Deck

Equipment List and Location
(for use with Figures 1 through 4)

Item #	Equipment	System	Deck Level
28	One (1) Sewage Treatment Unit	Utilities	Cellar Deck
29	Two (2) Diesel Firewater Pumps	Life Support/Life Saving	Cellar Deck
30	Two (2) Firewater Jockey Pumps	Life Support/Life Saving	Cellar Deck
31	One (1) Closed Drain/Vent Scrubber	Utilities	Cellar Deck
32	Two (2) Closed Drain/Vent Scrubber Pumps	Utilities	Cellar Deck
33	One (1) Aqueous Film-Forming Foam (AFFF) Tank	Life Support/Life Saving	Cellar Deck
34	One (1) Open Drain Sump	Utilities	Sump Deck
35	Two (2) Open Drain Collection System Pumps	Utilities	Sump Deck
36	Four (4) Incoming 36-inch Oil Export Pipeline Shutdown Valves (SDVs)	Process Safety & Control	Sump Deck
37	Four (4) 30-inch Crude Oil Loading Pipeline SDVs	Process Safety & Control	Cellar Deck
38	Four (4) Incoming 16-inch Vapor Recovery Pipeline SDVs	Process Safety & Control	Cellar Deck
39	One (1) Deluge Valve Skid	Life Support/Life Saving	Cellar Deck
40	Navigational Aids - Four (4) Marine Lanterns	Safety	Cellar Deck
41	Navigational Aids - Four (4) Marine Lanterns (Temporary)	Safety	Jacket
42	Navigational Aids - One (1) Foghorn and Fog Detector	Safety	Cellar Deck
43	Navigational Aids - One (1) Foghorn and Fog Detector (Temporary)	Safety	Jacket
44	Navigational Aids - One (1) Rotating Beacon	Safety	Main Deck
45	Navigational Aids - One (1) Radar Beacon	Safety	Main Deck
46	Safety Shower/Eyewash Station	Safety	Main Deck
47	Incoming Oil Export Pipeline Pig Launchers/Receivers (Future)	Pig Launchers/Receivers	Cellar Deck
48	Four (4) Incoming Vapor Recovery Pipeline Collection System Pumps	Pipeline Maintenance	Sump Deck

Note: [1] The helideck is located above the main deck.



LAYDOWN DECK
T.O.S. EL. (+)187'-0"

27 NOV 18
ISSUED FOR USE

PRELIMINARY
NOT FOR
CONSTRUCTION OR
FINAL RELEASE
GIOVANNI P. ESTRADA, P.E.
TX. LICENSE NO. 100966

EDG, INC. F-2480

NOTES:
1. DECK IS PLATED EXCEPT WHERE NOTED OTHERWISE.

REFERENCE NO.	REFERENCE TITLE	REV	DESCRIPTION	REVISION DATE	REV'D BY	RVW'D BY	CHK'D BY	APP'D BY	APPLICANT APP'D
		A	ISSUED FOR USE	11/07/18	EGC	JWC	GPE	GGS	

APPLICANT: SPOT Terminal Services LLC

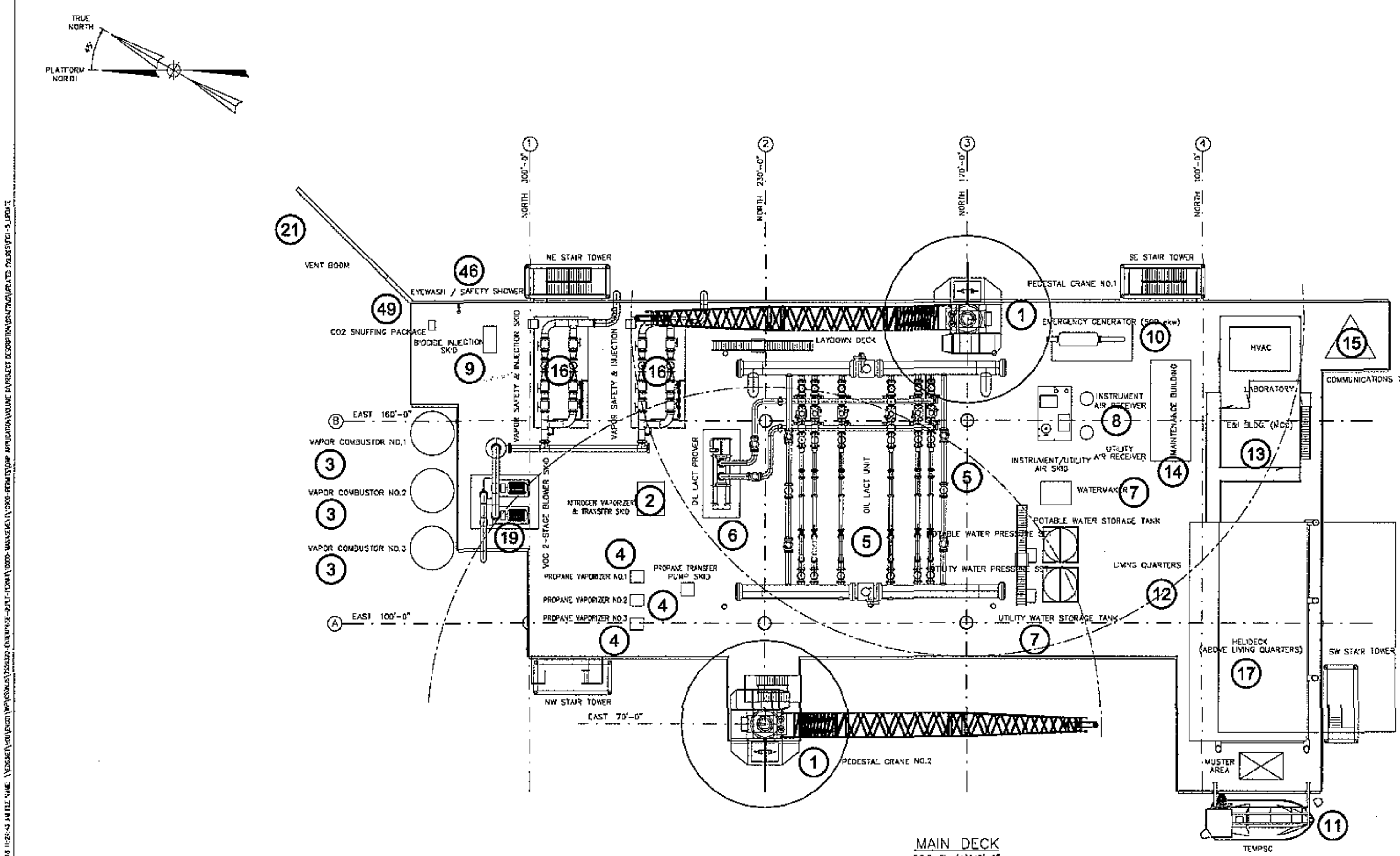
PROJECT: SPOT Sea Port Oil Terminal

EDG DRAWING NO.: 7559310-70310-00004

TITLE: SPOT DWP PLATFORM
GENERAL ARRANGEMENT LAYDOWN DECK

FIGURE 1

SHEET	SIZE	SCALE	CTI DRAWING NO.	REV
1 OF 1	D	1/16"=1'	1825-EDG-STR-DWG-001516	B



MAIN DECK
T.O.S. EL. (+)140'-0"

27 NOV 18
ISSUED FOR USE

PRELIMINARY
NOT FOR CONSTRUCTION OR FINAL RELEASE
GIOVANNI P. ESTRADA, P.E.
TX LICENSE NO. 100166
EDG, INC. F-2480

NOTES:
1. DECK IS PLATED EXCEPT WHERE NOTED OTHERWISE.

REFERENCE NO.	REFERENCE TITLE	REV	DESCRIPTION	REVISION DATE	REV'D BY	RVW'D BY	CHK'D BY	APP'D BY	APPLICANT APP'D
		C	ISSUED FOR USE	11/27/18	EGC	JWC	GPE	GGS	
		B	ISSUED FOR USE	11/07/18	EGC	JWC	GPE	GGS	
		A	ISSUED FOR REVIEW	10/12/18	EGC	JC	GPE	GGS	

APPLICANT: SPOT Terminal Services LLC

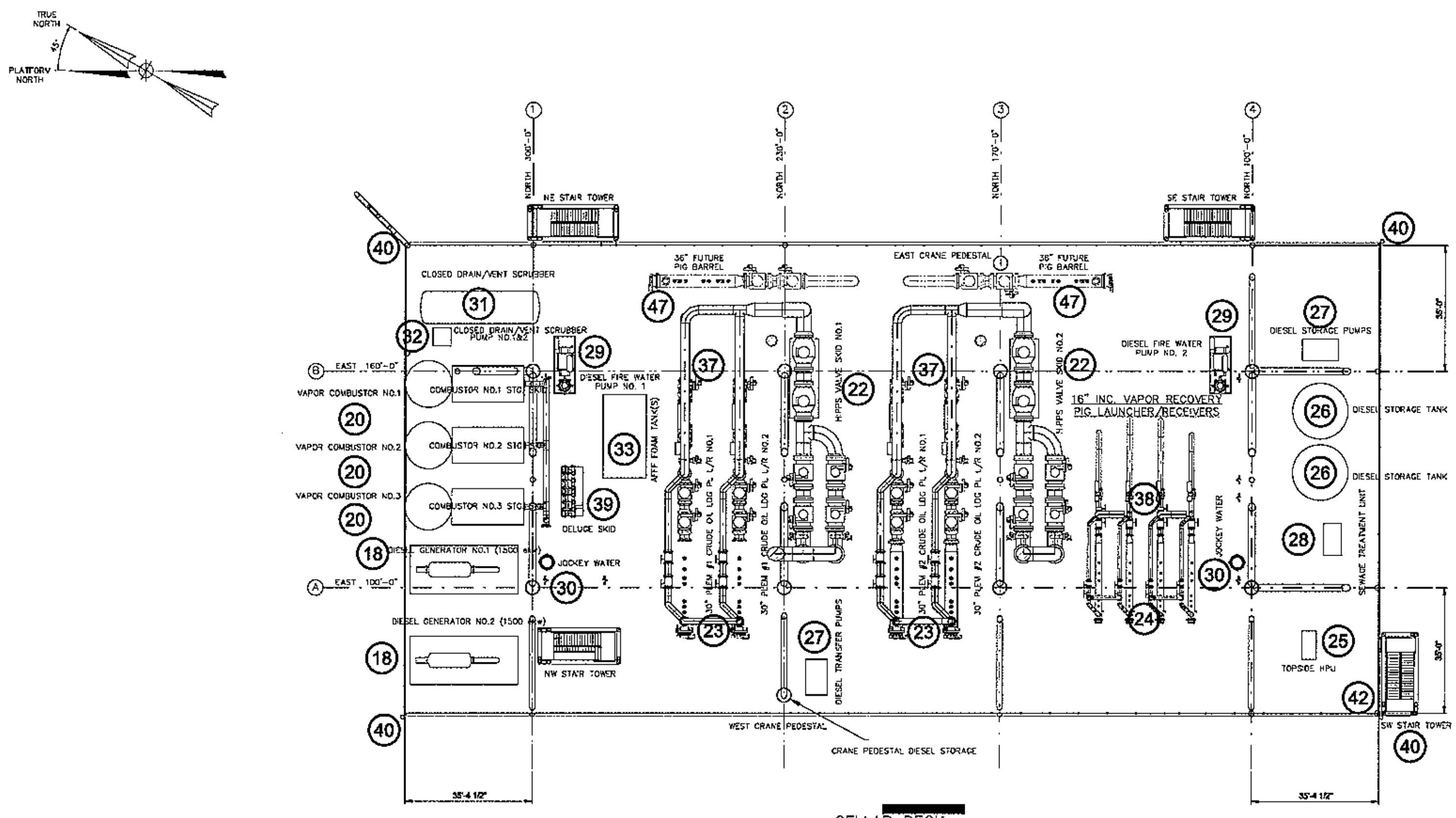
PROJECT: SPOT Sea Port Oil Terminal

EDG DRAWING NO.: 7559310-70310-00001

TITLE: SPOT DWP PLATFORM GENERAL ARRANGEMENT MAIN DECK

FIGURE 2

SHEET	SIZE	SCALE	CTI DRAWING NO.	REV
1 OF 1	D	1/16"=1'	1825-EDG-STR-DWG-001501	C



[redacted]

CELLAR DECK

T.O.S. EL. (+)100'-0"

27 NOV 16
ISSUED FOR USE

PRELIMINARY
NOT FOR
CONSTRUCTION OR
FINAL RELEASE
GIOVANNI P. ESTRADA, P.E.
TX. LICENSE NO. 132066

EDG, INC. F-2480

NOTES:
1. DECK IS PLATED EXCEPT WHERE NOTED OTHERWISE.

REFERENCE NO.	REFERENCE TITLE	REV	DESCRIPTION	REVISION DATE	REV'D BY	RVW'D BY	CHK'D BY	APP'D BY	APPLICANT APP'D
		C	ISSUED FOR USE	11/27/16	EGC	JWC	GPE	GGS	
		B	ISSUED FOR USE	11/07/16	EGC	JWC	GPE	GGS	
		A	ISSUED FOR REVIEW	10/12/16	EGC	JC	GPE	GGS	

APPLICANT: SPOT Terminal Services LLC

PROJECT: SPOT Sea Port Oil Terminal

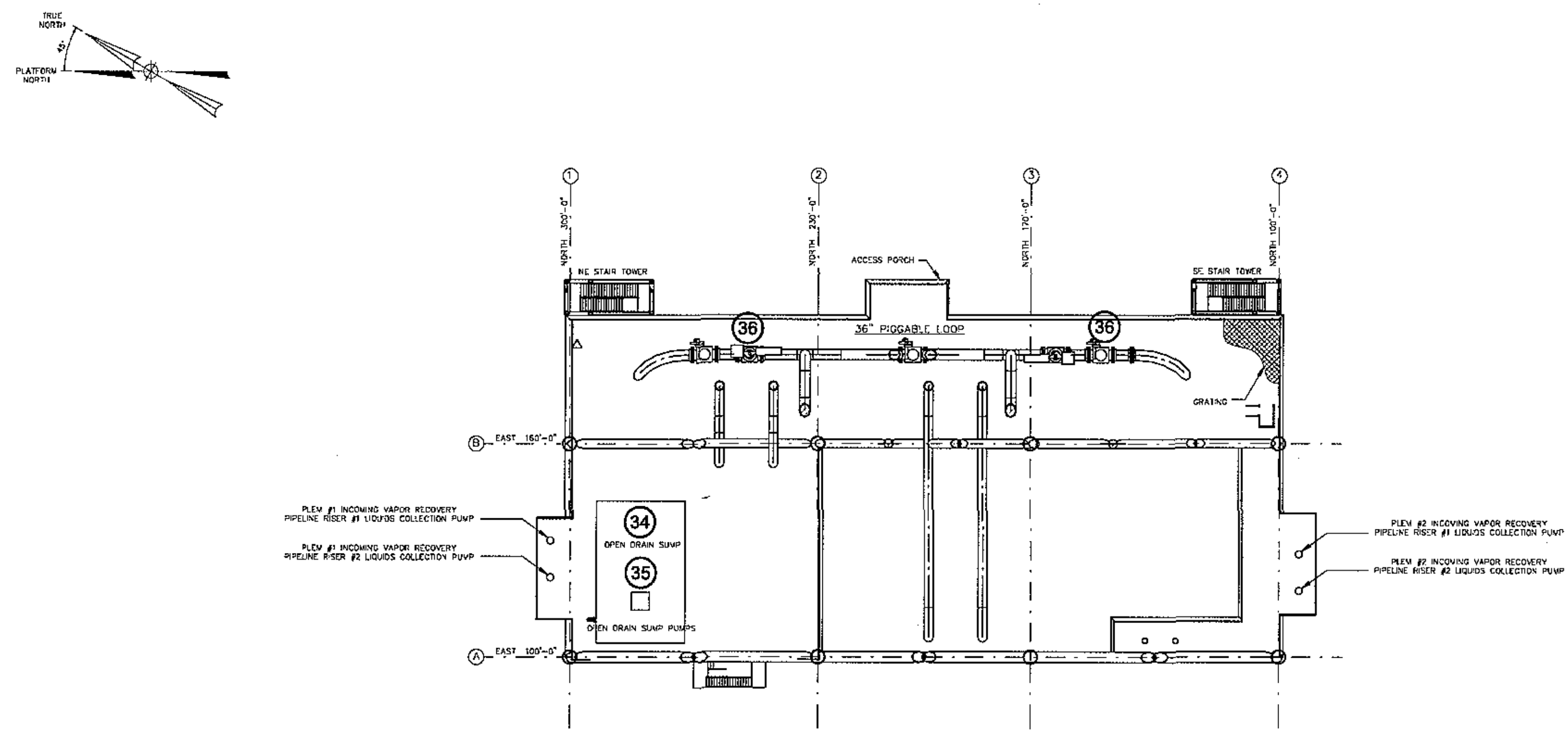
EDG DRAWING NO. 7559310-70310-00002

CTi — EDG

TITLE: SPOT DWP PLATFORM
GENERAL ARRANGEMENT CELLAR DECK

FIGURE 3

SHEET	SIZE	SCALE	CTI DRAWING NO.	REV
1 OF 1	D	1/16"=1'	1825-EDG-STR-DWG-001502	C



SUMP DECK
T.O.S. EL. (+)68'-0"

27 NOV 18
ISSUED FOR USE

PRELIMINARY
NOT FOR CONSTRUCTION OR FINAL RELEASE
GIOVANNI P. ESTRADA, P.E.
TX. LICENSE NO. 100656
EDG, INC. F-2480

NOTES:
1. DECK IS PLATED EXCEPT WHERE NOTED OTHERWISE.

REFERENCE NO.	REFERENCE TITLE	REV	DESCRIPTION	REVISION DATE	REV'D BY	RWWD BY	CHK'D BY	APP'D BY	APPLICANT APP'D
		C	ISSUED FOR USE	11/27/18	EGC	JWC	GPE	GGS	
		B	ISSUED FOR USE	11/07/18	EGC	JWC	GPE	GGS	
		A	ISSUED FOR REVIEW	10/12/18	EGC	JC	GPE	GGS	

APPLICANT: SPOT Terminal Services LLC

PROJECT: SPOT Sea Port Oil Terminal

EDG DRAWING NO. 7559310-70310-001503

TITLE: SPOT DWP PLATFORM GENERAL ARRANGEMENT SUMP DECK

FIGURE 4

SHEET	SIZE	SCALE	CTI DRAWING NO.	REV
1 OF 1	D	1/16"=1'	1825-EDG-STR-DWG-001503	C

APPENDIX C
EMISSIONS SOURCE FLOW DIAGRAMS

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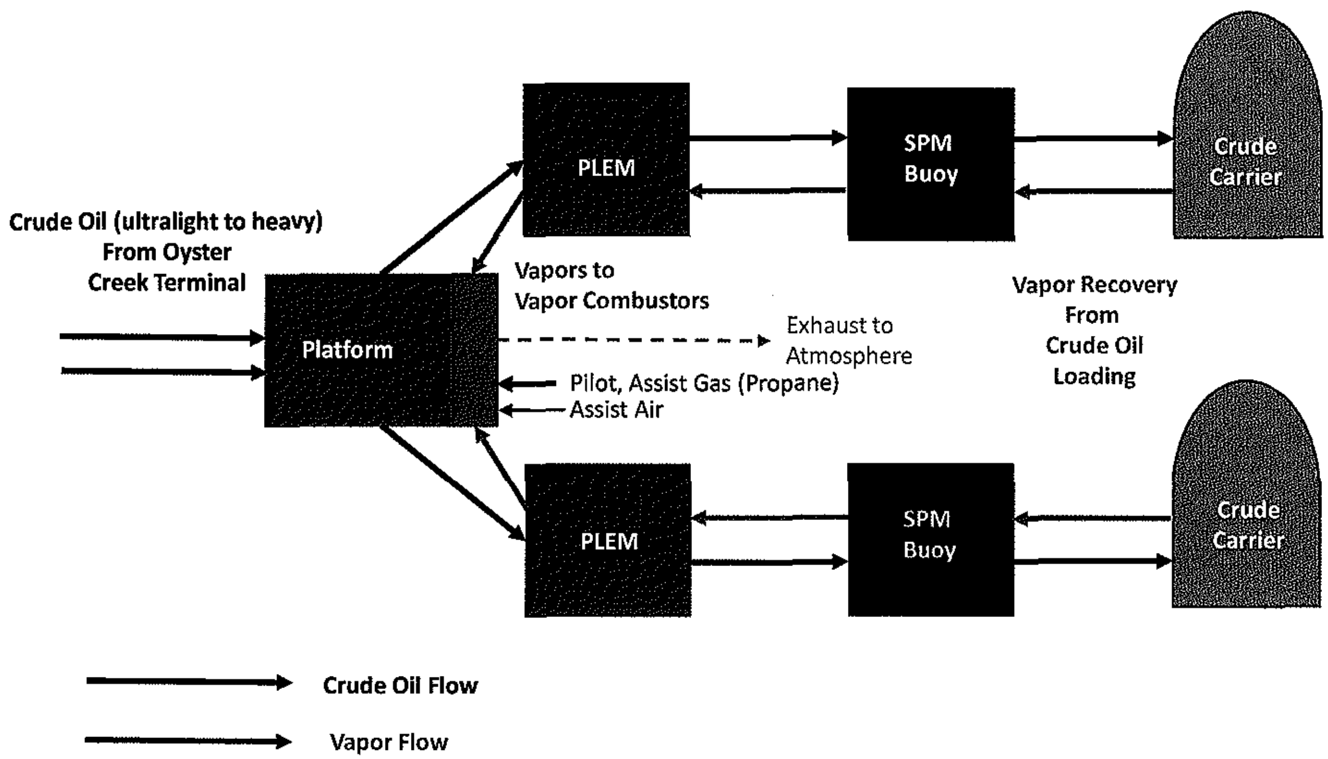
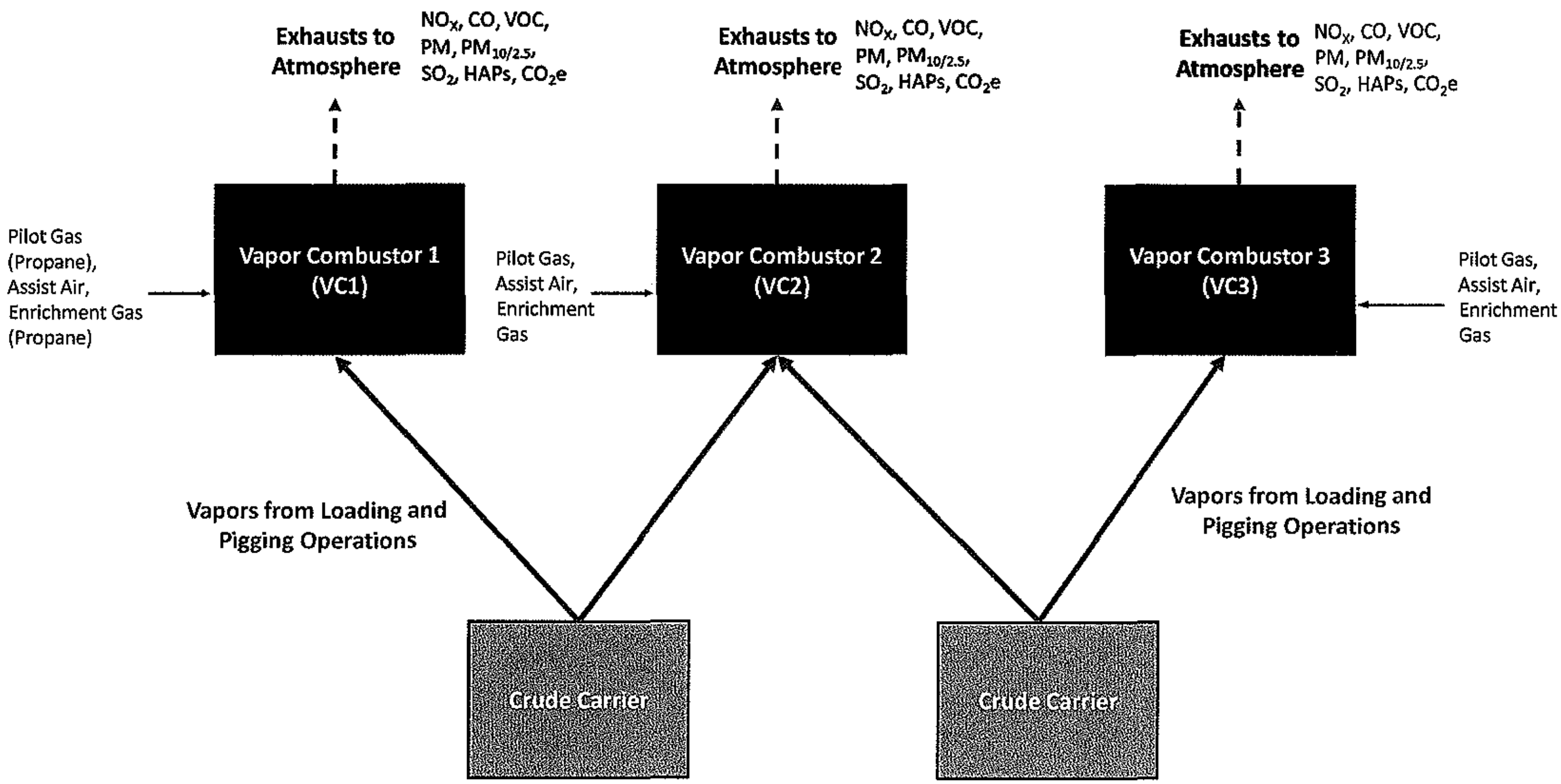
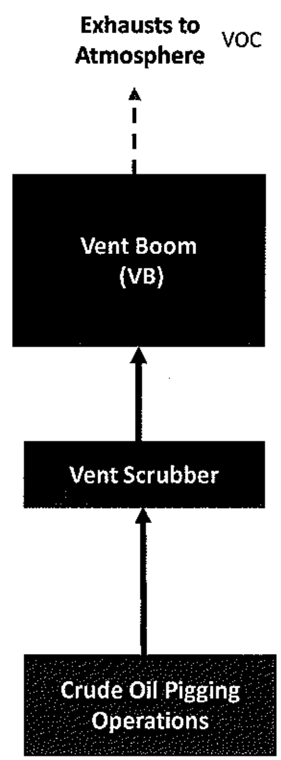
Overview of Crude Oil Loading Process



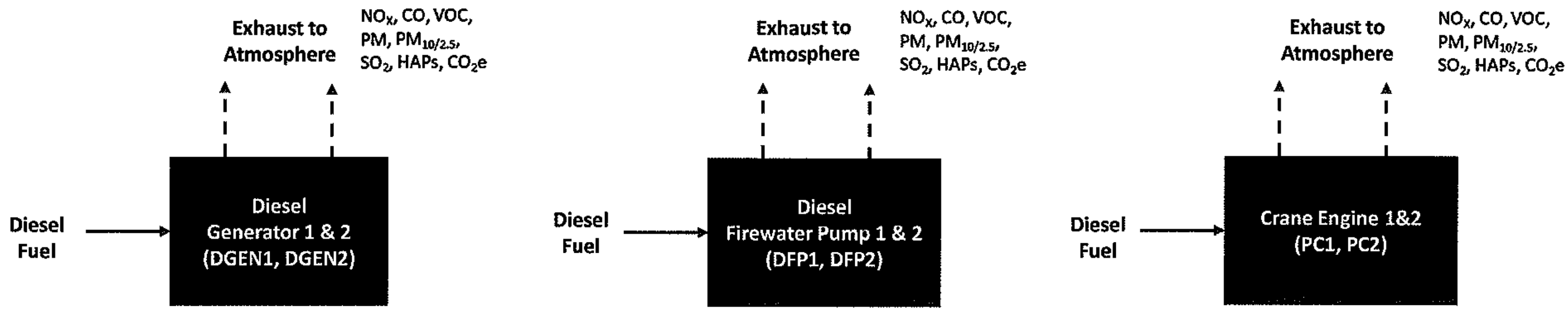
Platform Emission Sources Flow Diagram



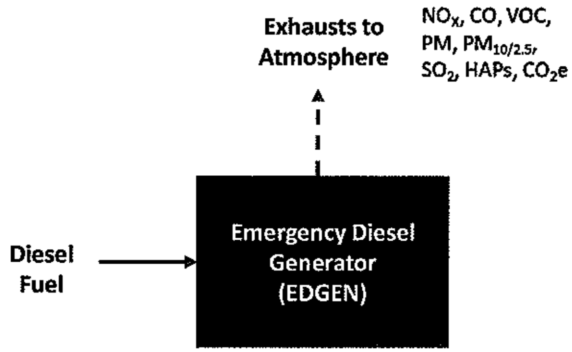
Platform Emission Sources Flow Diagram

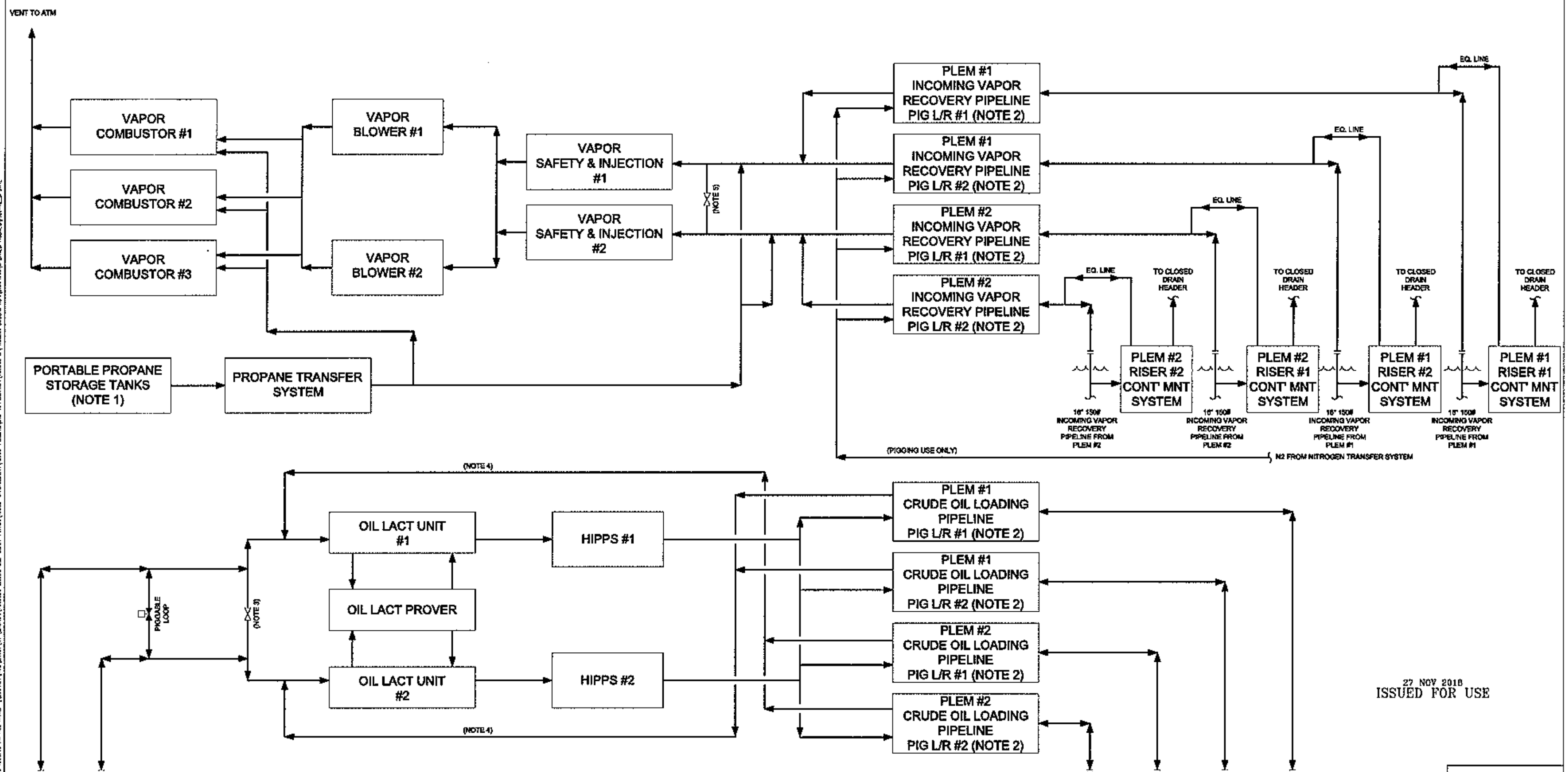


Platform Emission Sources Flow Diagram



Platform Emission Sources Flow Diagram





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NOTES:

1. EMPTY PROPANE STORAGE TANKS WILL BE REPLACED WITH FULLY LOADED PROPANE STORAGE TANKS VIA CRANES.
2. "L/R" = LAUNCHER / RECEIVER
3. OIL LACT INLET HEADER BLOCK VALVE USED TO SEGREGATE INCOMING OIL WHEN TWO DIFFERENT CRUDE BLENDS ARE BEING RECEIVED FROM ONSHORE.
4. PLEM PIGGING RETURN LINES.
5. JUMPER LINE PROVIDED TO ALLOW EITHER INCOMING PLEM VAPOR RECOVERY PIPELINE PAIR TO BE SERVED BY EITHER VAPOR SAFETY AND INJECTION SKID.

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		F	ISSUED FOR USE	11/27/18	EGC	GPE	PES	GGS	
		E	ISSUED FOR USE	11/07/18	SAS	GPE	PES	GGS	
		D	ISSUED FOR REVIEW	10/26/18	SAS	GPE	PES	GGS	
		C	ISSUED FOR REVIEW	10/16/18	SAS	GPE	PES	GGS	
		B	ISSUED FOR REVIEW	10/05/18	SAS	PES	GPE	GGS	
		A	ISSUED FOR REVIEW	09/14/18	AIS	PES	GPE	GGS	

APPLICANT
SPOT Terminal Services LLC

PROJECT
SPOT Sea Port Oil Terminal

EDG DRAWING NO.
7559310-20210-00001

TITLE
SPOT DWP PLATFORM
BLOCK FLOW DIAGRAM

FIGURE 1-5

SHEET	SIZE	SCALE	CTI DRAWING NO.	REV
1 OF 5	D	N.T.S.	1825-EDG-PRO-DWG-001601	F

LIST OF FIGURES

Equipment List and Location
(for use with Figures 1 through 4)

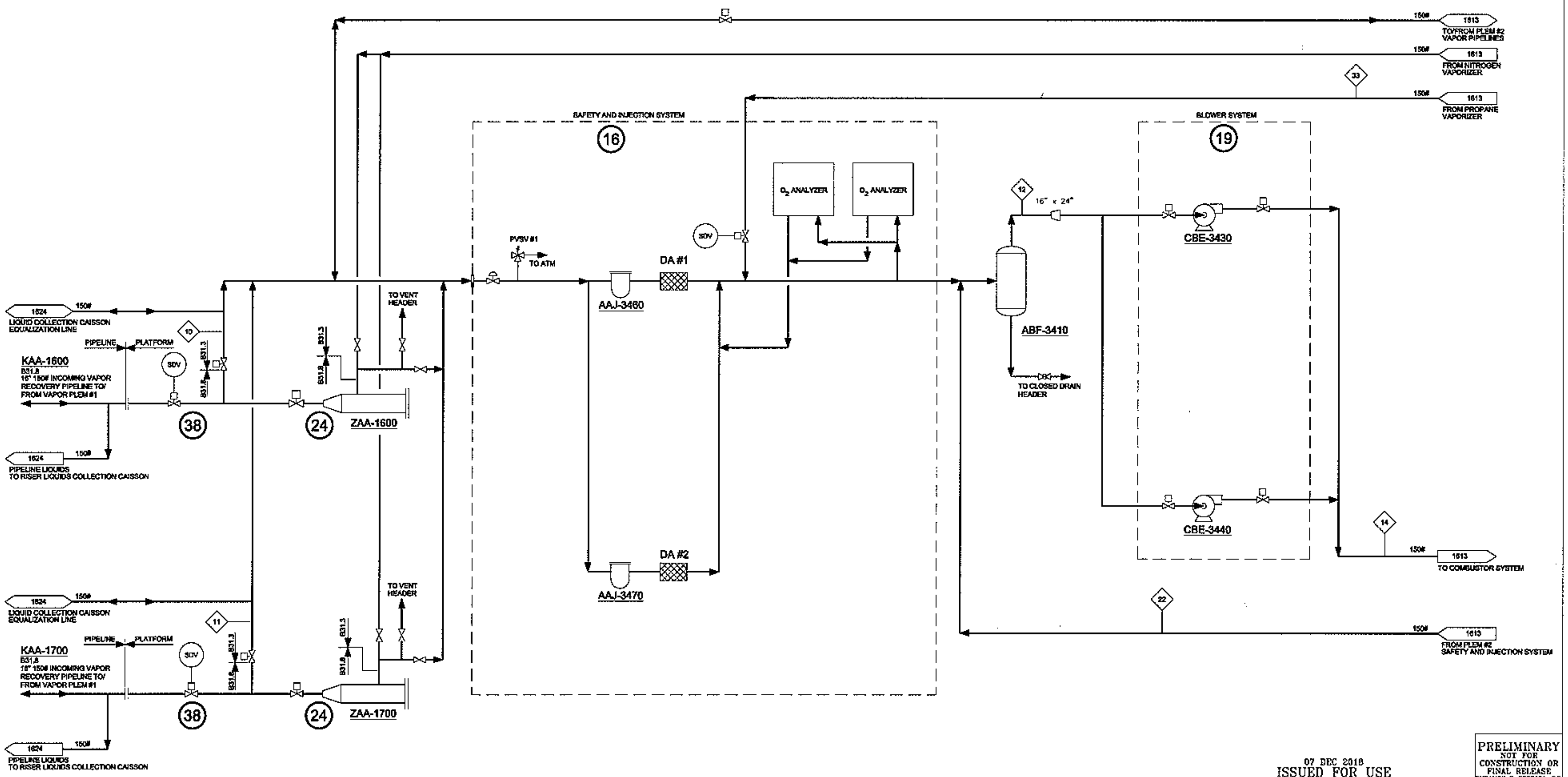
Item #	Equipment	System	Deck Level
1	Two (2) Pedestal Cranes with one (1) Diesel Storage Tank	Utilities	Main Deck
2	One (1) Nitrogen System - Storage Tanks, Vaporizers, and Transfer Pumps	Utilities	Main Deck
3	Three (3) Combustor Exhaust Stacks	Vapor Combustion System	Main Deck
4	One (1) Propane System - Storage Tanks, Vaporizers, and Transfer Pumps	Utilities	Main Deck
5	One (1) Oil Lease Automatic Custody Transfer (LACT) Unit	Metering	Main Deck
6	One (1) Oil LACT Prover	Metering	Main Deck
7	One (1) Utility and Potable Water System - Storage Tanks, Pumps, Pressure Tank, and Water Maker Package	Utilities	Main Deck
8	One (1) Utility and Instrument Air System - Compressors, Coolers, Separators, Filters, Dryers, and Receivers	Utilities	Main Deck
9	One (1) Chemical Injection System - Storage Tanks and Pumps	Utilities	Main Deck
10	One (1) Emergency Generator Package	Life Support/Life Saving	Main Deck
11	One (1) Totally Enclosed Motor Propelled Survival Craft (TEMPSC)	Life Support/Life Saving	Main Deck
12	One (1) Living Quarters	Buildings & Structures	Main Deck
13	One (1) Electrical and Instrument Building with Laboratory	Buildings & Structures	Main Deck
14	One (1) Maintenance Building	Buildings & Structures	Main Deck
15	One (1) Communications Tower	Life Support/Life Saving	Main Deck
16	Two (2) Vapor Safety & Injection Skids (i.e., Dock Safety Skid)	Vapor Combustion System	Main Deck
17	One (1) Helideck	Life Support/Life Saving	Main Deck[1]
18	Two (2) Diesel Generator Packages	Utilities	Cellar Deck
19	Two (2) Vapor Blower Skids	Vapor Combustion System	Main Deck
20	Three (3) Vapor Combustors	Vapor Combustion System	Cellar Deck
21	One (1) Vent Boom	Utilities	Main Deck
22	Two (2) High Integrity Pressure Protection Skids (HIPPS)	Process Safety & Control	Cellar Deck
23	Four (4) Crude Oil Loading Pipeline Pig Launchers/Receivers	Pig Launchers/Receivers	Cellar Deck
24	Four (4) Incoming Vapor Recovery Pipeline Pig Launchers/Receivers	Pig Launchers/Receivers	Cellar Deck
25	One (1) Topsides Hydraulic Power Unit (HPU)	Utilities	Cellar Deck
26	Two (2) Diesel Tanks	Utilities	Cellar Deck
27	Two (2) Diesel Transfer Pumps and Two (2) Diesel Storage Pumps	Utilities	Cellar Deck

Equipment List and Location
(for use with Figures 1 through 4)

Item #	Equipment	System	Deck Level
28	One (1) Sewage Treatment Unit	Utilities	Cellar Deck
29	Two (2) Diesel Firewater Pumps	Life Support/Life Saving	Cellar Deck
30	Two (2) Firewater Jockey Pumps	Life Support/Life Saving	Cellar Deck
31	One (1) Closed Drain/Vent Scrubber	Utilities	Cellar Deck
32	Two (2) Closed Drain/Vent Scrubber Pumps	Utilities	Cellar Deck
33	One (1) Aqueous Film-Forming Foam (AFFF) Tank	Life Support/Life Saving	Cellar Deck
34	One (1) Open Drain Sump	Utilities	Sump Deck
35	Two (2) Open Drain Collection System Pumps	Utilities	Sump Deck
36	Four (4) Incoming 36-inch Oil Export Pipeline Shutdown Valves (SDVs)	Process Safety & Control	Sump Deck
37	Four (4) 30-inch Crude Oil Loading Pipeline SDVs	Process Safety & Control	Cellar Deck
38	Four (4) Incoming 16-inch Vapor Recovery Pipeline SDVs	Process Safety & Control	Cellar Deck
39	One (1) Deluge Valve Skid	Life Support/Life Saving	Cellar Deck
40	Navigational Aids - Four (4) Marine Lanterns	Safety	Cellar Deck
41	Navigational Aids - Four (4) Marine Lanterns (Temporary)	Safety	Jacket
42	Navigational Aids - One (1) Foghorn and Fog Detector	Safety	Cellar Deck
43	Navigational Aids - One (1) Foghorn and Fog Detector (Temporary)	Safety	Jacket
44	Navigational Aids - One (1) Rotating Beacon	Safety	Main Deck
45	Navigational Aids - One (1) Radar Beacon	Safety	Main Deck
46	Safety Shower/Eyewash Station	Safety	Main Deck
47	Incoming Oil Export Pipeline Pig Launchers/Receivers (Future)	Pig Launchers/Receivers	Cellar Deck
48	Four (4) Incoming Vapor Recovery Pipeline Collection System Pumps	Pipeline Maintenance	Sump Deck

Note: [1] The helideck is located above the main deck.

KAA-1600	KAA-1700	ZAA-1600	ZAA-1700	AAJ-3460/3470	ABF-3410	CBE-3430/3440
PLEM #1 INCOMING VAPOR RECOVERY PIPELINE NO. 1 SIZE: 16" MAOP: 280 PSIG AT 120° F	PLEM #1 INCOMING VAPOR RECOVERY PIPELINE NO. 2 SIZE: 16" MAOP: 280 PSIG AT 120° F	PLEM #1 INCOMING VAPOR RECOVERY PIPELINE PIG LAUNCHER / RECEIVER NO. 1 SIZE: 16" O.D. x 20"O.D. x 26'-7" F/E DESIGN: 285 PSIG AT 100°F	PLEM #1 INCOMING VAPOR RECOVERY PIPELINE PIG LAUNCHER / RECEIVER NO. 2 SIZE: 16" O.D. x 20"O.D. x 26'-7" F/E DESIGN: 285 PSIG AT 100°F	VAPOR FILTER NO. 1/2 DESIGN: 15 PSIG AT 100°F CAPACITY: 14.3 MMSCFD (EACH)	VAPOR SCRUBBER SIZE: 72" O.D. x 8'-0" S/S DESIGN: 50 PSIG AT 100°F CAPACITY: 14.3 MMSCFD	VAPOR BLOWER NO. 1/2 CAPACITY: 14.3 MMSCFD AT 6 IN/WC (EACH) DESIGN: 15 PSIG AT 100°F POWER: 250 HP (EACH)



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		F	ISSUED FOR USE	12/07/18	EGC	MFS	GPE	GGS	
		E	ISSUED FOR USE	11/30/18	EGC	MFS	GPE	GGS	
		D	ISSUED FOR USE	11/07/18	ARG	MFS	GPE	GGS	
		C	ISSUED FOR REFERENCE	11/02/18	ARG	MFS	GPE	GGS	
		B	ISSUED FOR REVIEW	10/12/18	SAS	MFS	GPE	GGS	
		A	ISSUED FOR REVIEW	09/21/18	ARG	MFS	GPE	GGS	

APPLICANT: SPOT Terminal Services LLC

PROJECT: SPOT Sea Port Oil Terminal

EDG DRAWING NO.: 7559310-70410-00102

CTI — EDG

TITLE: SPOT DWP PLATFORM PROCESS FLOW DIAGRAM VAPOR COMBUSTION SYSTEM No 1 FIGURE 1

SHEET	SIZE	SCALE	CTI DRAWING NO.	REV
1 OF 1	D	N.T.S.	1825-EDG-PRO-DWG-001612	F

KAA-1800
PLEM #2 INCOMING VAPOR RECOVERY PIPELINE NO.1
SIZE: 16"
MAOP: 280 PSIG AT 120° F

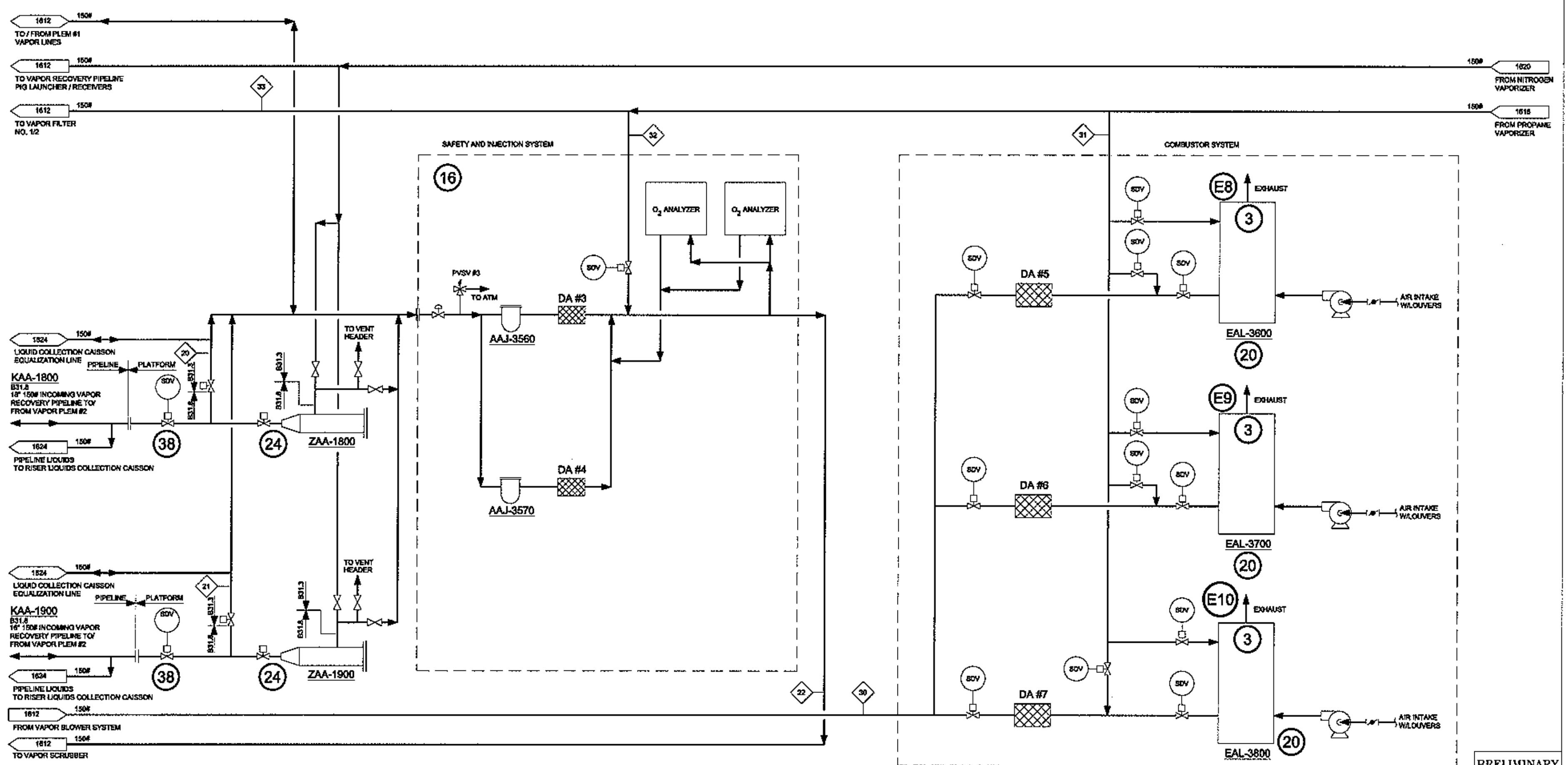
KAA-1900
PLEM #2 INCOMING VAPOR RECOVERY PIPELINE NO.2
SIZE: 16"
MAOP: 280 PSIG AT 120° F

ZAA-1800
PLEM #2 INCOMING VAPOR RECOVERY PIPELINE PIG LAUNCHER / RECEIVER NO. 1
SIZE: 16" O.D. x 20" O.D. x 26'-7" F/E
DESIGN: 285 PSIG AT 100°F

ZAA-1900
PLEM #2 INCOMING VAPOR RECOVERY PIPELINE PIG LAUNCHER / RECEIVER NO. 2
SIZE: 16" O.D. x 20" O.D. x 26'-7" F/E
DESIGN: 285 PSIG AT 100°F

AAJ-3560/3570
VAPOR FILTER NO. 3/4
DESIGN: 15 PSIG AT 100°F
CAPACITY: 14.3 MMSCFD (EACH)

EAL-3600/3700/3800
VAPOR COMBUSTOR NO. 1/2/3
CAPACITY: 14.3 MMSCFD



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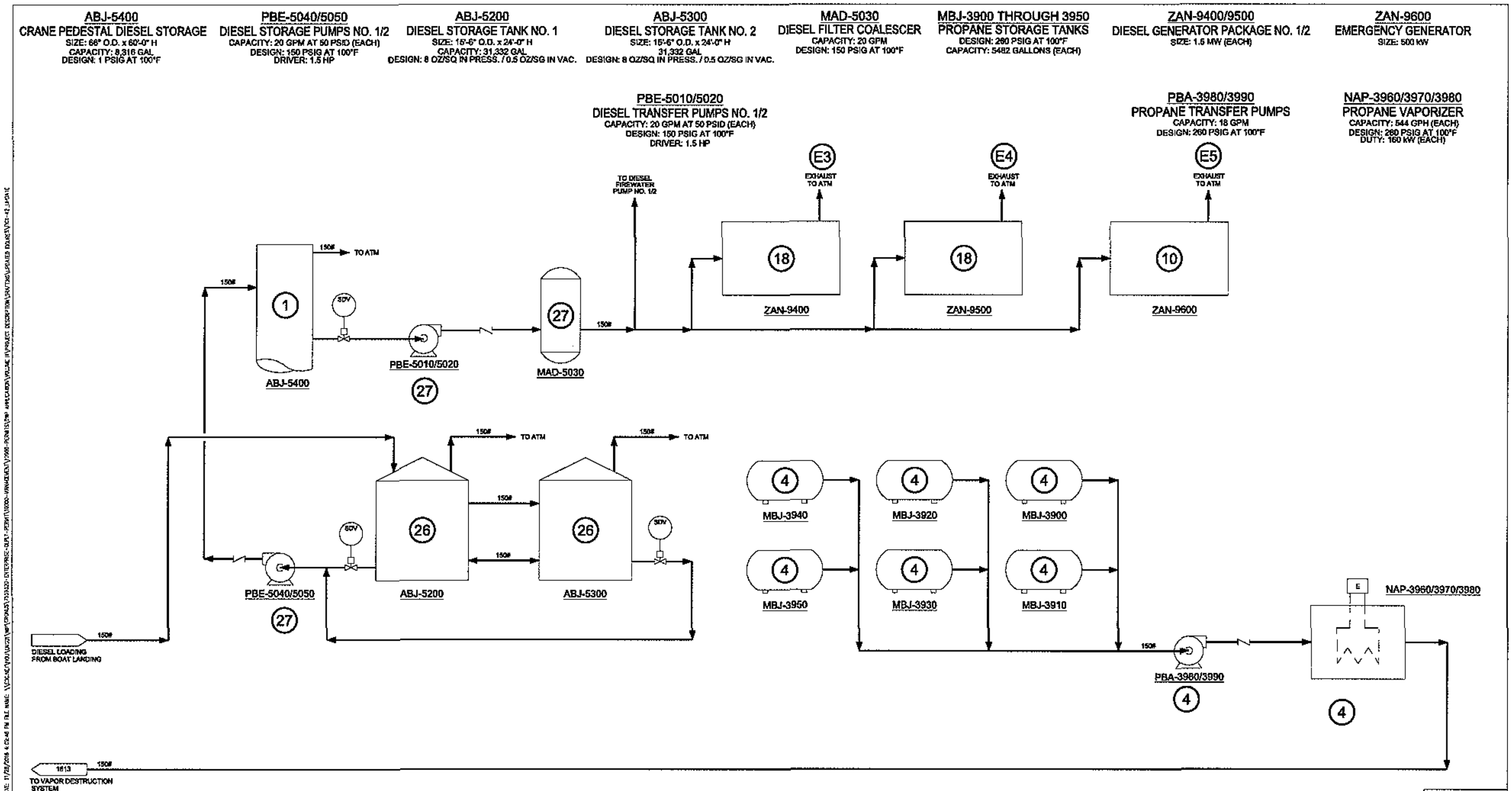
		F	ISSUED FOR USE	12/07/18	EQC	MFS	GPE	GGS	
		E	ISSUED FOR USE	11/30/18	EQC	MFS	GPE	GGS	
		D	ISSUED FOR USE	11/07/18	SAS	MFS	GPE	GGS	
		C	ISSUED FOR REFERENCE	11/02/18	SAS	MFS	GPE	GGS	
		B	ISSUED FOR REVIEW	10/12/18	SAS	MFS	GPE	GGS	
		A	ISSUED FOR REVIEW	09/21/18	SBJ	MFS	GPE	GGS	

APPLICANT: SPOT Terminal Services LLC
PROJECT: SPOT Sea Port Oil Terminal
EDG DRAWING NO. 7559310-70410-00103

TITLE
SPOT DWP PLATFORM PROCESS FLOW DIAGRAM
VAPOR COMBUSTION SYSTEM No 2
FIGURE 2

SHEET	SIZE	SCALE	CTI DRAWING NO.	REV
1 OF 1	D	N.T.S.	1825-EDG-PRO-DWG-001613	F



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REFERENCE NO.	REFERENCE TITLE	REV	DESCRIPTION	REVISION DATE	REV'D BY	RVW'D BY	CHK'D BY	APP'D BY	APPLICANT APP'D
		D	ISSUED FOR USE	11/27/18	EGC	MFS	GPE	GGS	
		C	ISSUED FOR USE	11/07/18	SBJ	MFS	GPE	GGS	
		B	ISSUED FOR REVIEW	10/12/18	SBJ	MFS	GPE	GGS	
		A	ISSUED FOR REVIEW	09/21/18	AIS	MFS	GPE	GGS	

APPLICANT: SPOT Terminal Services LLC

PROJECT: SPOT Sea Port Oil Terminal

EDG DRAWING NO. 7559310-70410-00112

TITLE: SPOT DWP PLATFORM
UTILITY FLOW DIAGRAM
PROPANE, DIESEL FUEL SYSTEM AND GENERATOR PACKAGES
FIGURE 3

SHEET	SIZE	SCALE	CTI DRAWING NO.	REV
1 OF 1	D	N.T.S.	1825-EDG-PRO-DWG-001616	D

ABH-4400
OPEN DRAIN SUMP
SIZE: 40'-0" L x 25'-0" W x 6'-0" H
DESIGN: ATM AT 100°F

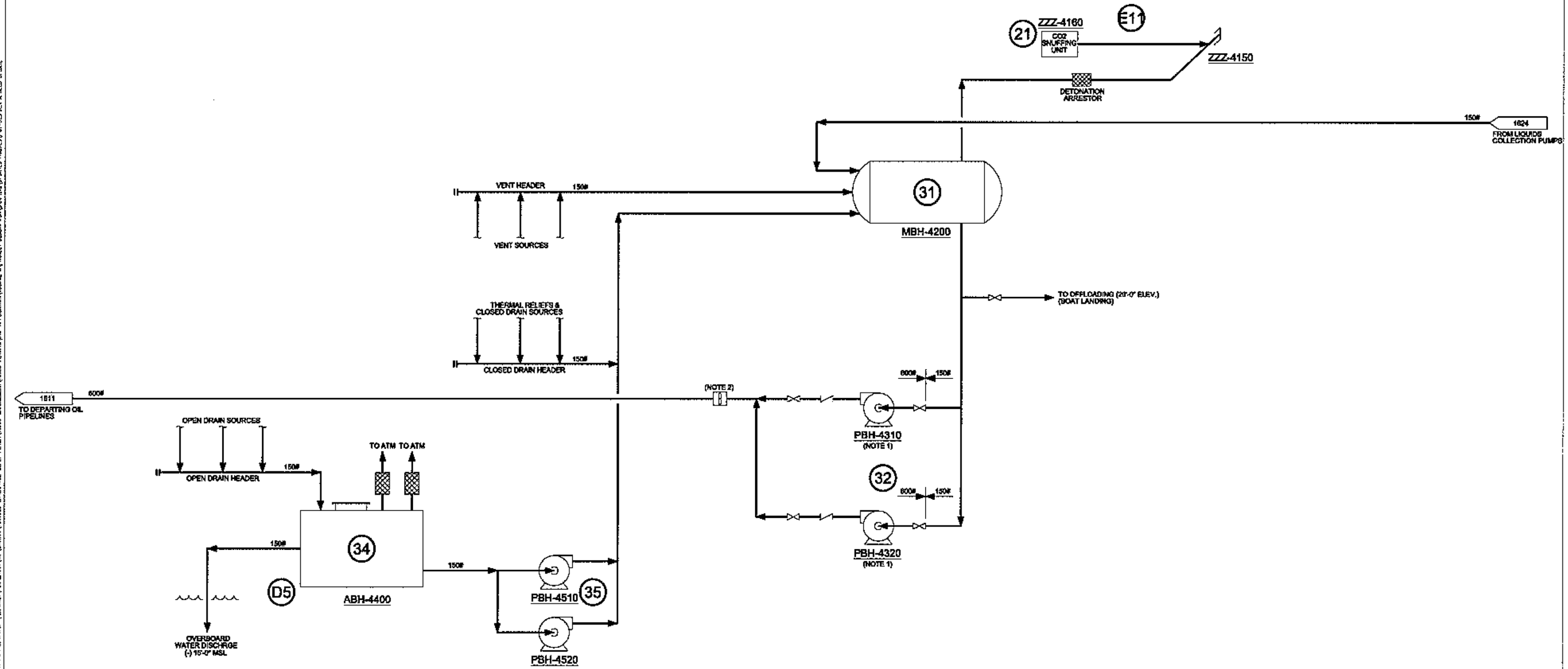
PBH-4510/4520
OPEN DRAIN SUMP PUMPS 1/2
CAPACITY: 150 GPM AT 20 PSID (EACH)
DESIGN: 150 PSIG AT 100°F
DRIVER: 5 HP (EACH)

MBH-4200
CLOSED DRAIN/VENT SCRUBBER
SIZE: 108" O.D. x 30'-0" S/S
DESIGN: 285 PSIG AT 100°F

PBH-4310/4320
CLOSED DRAIN/VENT SCRUBBER PUMPS
CAPACITY: 250 GPM AT 200 PSID (EACH)
DESIGN: 285 PSIG AT 100°F
DRIVER: 75 HP (EACH)

ZZZ-4160
CO2 SNUFFING UNIT

ZZZ-4150
VENT BOOM
SIZE: 50'-0" L
DESIGN: 50 PSIG AT 100°F



NOTES:
1. CLOSED DRAIN/VENT SCRUBBER PUMPS SHALL EMPTY CONTENTS OF CLOSED DRAIN SUMP/VENT SCRUBBER TO THE DEPARTING OIL PIPELINES WHENEVER CONDUCTING VLCC OR OTHER CRUDE OIL CARRIERS LOADING.
2. SPARE CALIBRATED TURBINE METER WILL BE STORED ON PLATFORM.

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REFERENCE NO.	REFERENCE TITLE	REV	DESCRIPTION	REVISION DATE	REV'D BY	RVW'D BY	CHK'D BY	APP'D BY	APPLICANT APP'D
		D	ISSUED FOR USE	11/27/18	EGC	MFS	GPE	GGS	
		C	ISSUED FOR USE	11/07/18	SBJ	MFS	GPE	GGS	
		B	ISSUED FOR REVIEW	10/12/18	SBJ	MFS	GPE	GGS	
		A	ISSUED FOR REVIEW	09/21/18	AJS	MFS	GPE	GGS	

APPLICANT: SPOT Terminal Services LLC
PROJECT: SPOT Sea Port Oil Terminal
EDG DRAWING NO.: 7559310-70410-00111

TITLE: SPOT DWP PLATFORM
UTILITY FLOW DIAGRAM
OPEN/CLOSED DRAIN, SLOP TANK & VENT SCRUBBER
FIGURE 4

SHEET	SIZE	SCALE	CTI DRAWING NO.	REV
1 OF 1	D	N.T.S.	1825-EDG-PRO-DWG-001615	D

APPENDIX D

EMISSION ESTIMATION METHODOLOGY AND CALCULATIONS

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EMISSION ESTIMATION BASIS AND METHODOLOGY

The bases and methodology for calculating the emissions proposed in this application are explained in this Appendix. The summary of the short-term (lb/hr) and long-term (tpy) emissions and detailed emission calculations are also provided.

Marine Loading Operations

- The maximum annual throughput associated with the marine loading operations would be 730,000,000 barrels per year (bbl/yr). The maximum loading rate would be 85,000 barrels per hour (bbl/hr).
- The SPOT DWP would allow for up to two (2) VLCCs or other crude oil carriers to moor at the single point mooring (SPM) buoys. The crude oils to be exported by the SPOT Project range from ultralight crude to light crude to heavy grade crude oil (i.e., condensate and crude). If two ships were loaded at the same time, the loading rate of 85,000 bbl/h would be the maximum to both SPM buoys combined, not individually. The maximum frequency of loading VLCCs or other crude oil carriers would be up to 365 per year.
- The 305 crude and 60 condensate loadings scenarios included in Table 4D, of this Appendix (Appendix D) are representative for purposes of determining worst-case hourly and annual emissions but should not be considered as permit limitations. SPOT DWP will comply with all short and long-term emission limits related to ship loading.
- The uncontrolled VOC loading losses are calculated using Equation 1 of Section 5.2 of AP-42, Transportation and Marketing of Petroleum Liquids. The saturation factor used in Equation 1 is 0.2 for submerged loading - ships. The annual loading loss is based on annual throughput and average TVP of 7.60 psia for crude and 7.09 psia for condensate. The average TVP for crude and condensate are based on RVP of 9 psia and 11.19 psia, respectively. The maximum hourly loading loss is based on maximum loading rate (85,000 bbl/hr) and maximum TVP of 11 psia for crude and condensate.
- The maximum (short-term) sulfur content in crude and condensate is conservatively assumed at 66 ppmw. Annual average sulfur content is assumed at 5 ppmw for 365 loading events per year. H_2S content of the crude oil and condensate will vary by load. For 365 loading events per year, the average H_2S content will be 5 ppmw or less. SPOT DWP will comply with the short and long term emission limits for SO_2 related to ship loading activities. Therefore, the annual average H_2S content could vary and be above 5 ppmw for fewer ship loading events. For instance, for 182 annual ship loading events, H_2S content could average 10 ppmw and also meet the annual SO_2 limit at the vapor combustors.
- The vapors from ship loading operations would be collected using methods that achieve a 99% collection efficiency. The collection efficiency of 99% (Category 1) as listed in TCEQ's Marine Loading Collection Efficiency Guidance would be implemented. The uncaptured marine loading VOC emissions are estimated as 1% of total marine loading VOCs.

Vapor Combustors

- The collected vapors from marine loading would be routed to the vapor combustors with a minimum VOC Destruction Removal Efficiency (DRE) of 95%. The VOC emissions from the vapor combustors are based on the remaining 5% of loading vapors passing through uncombusted.

- Two separate emission calculations for vapor combustors are presented - (1) loading scenario of 305 ships of crude oil and (2) loading scenario of 60 ships of condensate. Annual emissions from vapor combustors are calculated by adding emission estimates from the two scenarios. Maximum hourly emissions are based on the highest short-term emission rate from the two scenarios. The 305 crude and 60 condensate loadings scenarios included in Table 4D, of this Appendix (Appendix D) are representative for purposes of determining worst-case hourly and annual emissions but should not be considered as permit limitations. SPOT DWP will comply with all short and long-term emission limits related to ship loading

- All (3) three combustors are required to handle the full ship load of 2,000,000 barrels (bbl), i.e. maximum ship capacity. All three (3) vapor combustors are typically required after first 45 minutes of loading operation. For conservative estimates, all three (3) are assumed to be operating all the time during loading. All three (3) vapor combustors can handle the vapor rate when loading the maximum rate of 85,000 bbl/hr regardless of the number of ships being loaded. The design of vapor combustors would be finalized during detailed engineering.

- Loading of one (1) crude carrier would take approximately 24hrs at the maximum rate of 85,000 barrels/hr. Therefore, vapor combustors are assumed to operate 8,760 hour per year to load a maximum of 365 ships.

- NOx, CO, and PM emissions are calculated using lb/MMBtu emission factors and maximum hourly and annual average heat release estimates provided by the vapor combustor manufacturer. NOx and CO emissions are calculated using the emission factors of 0.15 lb/MMBtu and 0.3 lb/MMBtu, respectively, guaranteed by the vendor at 1,200°F. PM emissions factors are from USEPA AP-42 - Section 1.4 - Natural Gas Combustion.

- The maximum (short-term) sulfur content in crude and condensate is conservatively assumed at 66 ppmw. Annual average sulfur content is assumed at 5 ppmw for 365 loading events per year. H_2S content of the crude oil and condensate will vary by load. For 365 loading events per year, the average H_2S content will be 5 ppmw or less. SPOT DWP will comply with the short and long term emission limits for SO_2 related to ship loading activities. Therefore, the annual average H_2S content could vary and be above 5 ppmw for fewer ship loading events. For instance, for 182 annual ship loading events, H_2S content could average 10 ppmw and also meet the annual SO_2 limit at the vapor combustors.

- The CO_2 emission factor is based on 40 CFR Part 98, Subpart C, Table C-1 for petroleum products-crude oil. N_2O, CH_4 emission factors are from Table C-2 for petroleum products-crude oil.

- The Hazardous Air Pollutants (HAP) speciation in crude oil is based on sample obtained for Enterprise Products - Sealy Tank 3506 on October 9, 2018 (West Texas Intermediate [WTI]). HAP speciation is supplemented by liquid-phase speciation profile from USEPA TANKS program (Version 4.09d) for crude oil; highest value (weight percent) was used for each individual HAP.

- The HAP speciation in condensate is based on sample obtained for Enterprise Products – Sealy Tank 3503 on November 26, 2018. HAP speciation supplemented by liquid-phase speciation profile from USEPA TANKS program (Version 4.09d) for crude oil; an additional margin of 25% is added to come up with concentrations (weight percent) in condensate for each individual HAP.

- Additional CO_2 emissions from inert gas during ship loading is based on average CO_2 concentration in vapor leaving crude carrier i.e. approximately 10.36 mol% (14.90 wt%) and total vapor mass flow rate of 38,738 lb/hr at 50% loading.

Component Fugitive Emissions

- The component count consisting primarily of number of valves, flanges and pumps is based on proposed process equipment to be installed at the SPOT DWP, obtained from engineering contractor.
- The TCEQ's Fugitive Guidance (June 2018) is used to estimate fugitive emissions. The Oil and Gas Production Operations specific factors from Table II of this document were used to obtain emission factors for various components. No emission reduction credits are applied in calculations.
- The liquid and gas streams are conservatively assumed to be 100% VOCs. H_2S emissions are based on average sulfur content of 5 ppmw for annual average emission calculations and 66 ppmw for maximum hourly calculations.

Diesel Generator

- Each of two (2) diesel generator engine would have a maximum rating of 1,530 kilowatts (kW) or 2,052 horsepower (hp) (2 x 100%). Only one generator would operate at a time; each generator would be rotated into service to allow for maintenance. The total operating hours for both diesel generators combined is 8,760 hours per year.
- The emission calculations for NOx, CO, PM and VOC are based on vendor guarantees. The diesel generator engines will comply with NSPS Subpart IIII requirements.
- HAP, SO_2, CO_2, and CH_4 emission factors are based on USEPA AP 42 Section 3.4 - Large Stationary Diesel and All Stationary Dual-Fuel (Diesel fuel) Engines, October 1996. SO_2 emissions are calculated based on low sulfur diesel with 0.0015% sulfur content (15 ppmw). N_2O emission factor is obtained from 40 CFR 98 Table C-2 to Subpart C.

Emergency (Backup) Diesel Generator

- The emergency generator would have a routine operational limit of 100 hours per year to accommodate required maintenance/testing operation.
- The emission calculations for NOx, CO, PM and VOC are based on Marine Diesel Tier III standards. Emergency diesel generator will comply with NSPS Subpart IIII requirements.
- HAP, SO_2, CO_2, and CH_4 emission factors are based on USEPA AP 42 Section 3.4 - Large Stationary Diesel and All Stationary Dual-Fuel (Diesel fuel) Engines, October 1996. SO_2 emissions are calculated based on low sulfur diesel with 0.0015% sulfur content (15 ppmw). N_2O emission factor is obtained from 40 CFR 98 Table C-2 to Subpart C.

Pedestal Cranes

- Each of two (2) pedestal crane engines would operate 12 hours per day (total 4,380 hours per year).
- The emissions calculations for NOx, CO, VOC and PM are based on EPA's Tier IIII non-road engine standards. Pedestal cranes will comply with NSPS Subpart IIII requirements.
- HAPs, SO_2, CO_2, and CH_4 emission factors are based on USEPA AP 42 Section 3.4 - Large Stationary Diesel and All Stationary Dual-Fuel (Diesel fuel) Engines, October 1996. SO_2 emissions are calculated based on low sulfur diesel with 0.0015% sulfur content (15 ppmw). N_2O emission factor is obtained from 40 CFR 98 Table C-2 to Subpart C.

Fire Water Pumps

- The firewater pumps would have a routine operational limit of 100 hours per year to accommodate required maintenance/testing operation.
- The emissions calculations for NOx, CO, VOC and PM are based upon emission factors from Table 4, NSPS Subpart IIII. Fire water pumps will comply with NSPS Subpart IIII requirements.
- HAPs, SO_2, CO_2, and CH_4 emission factors are based on USEPA AP 42 Section 3.4 - Large Stationary Diesel and All Stationary Dual-Fuel (Diesel fuel) Engines, October 1996. SO_2 emissions are calculated based on low sulfur diesel with 0.0015% sulfur content (15 ppmw). N_2O emission factor is obtained from 40 CFR 98 Table C-2 to Subpart C.

Pipeline Pigging Activities Emissions

- Crude Oil Pipeline Pigging
  - Four (4) crude oil loading pipeline pig launchers/receivers would serve pigging operations through the loading pipelines from the SPOT DWP platform to the PLEMs (round-trip pigging). Each pipeline loop is assumed to be pigged once per week. Each pig trap would be drained once per week (four (4) pig traps), a total of 208 events per year.
  - The crude oil loading pipeline pigging only contributes emissions when the pig trap is drained into the closed drain/vent scrubber. The evaporative losses expected from the vent scrubber are released to the atmosphere via a vent boom. The evaporative losses are calculated based on ideal gas Law $PV = nRT$.
- Vapor Recovery Pipeline Pigging
  - Similarly, four (4) incoming vapor recovery pipeline pig launchers/receivers would serve round-trip pigging operations through the vapor recovery pipelines between the platform and PLEMs. Each incoming vapor pipeline is assumed to be pigged once per week, a total of 208 events annually. The vented gas coming from either the pig receiver or the pig launcher would be nitrogen, which is used to move the pig through the pipe, while hydrocarbon vapors that are pushed ahead of the pig would be directed to the vapor combustors with VOC control efficiency of 95%.

- Gas volume vented per event is conservatively estimated using the ideal gas law based on pipeline temperature and pressure as compared to atmospheric temperature and pressure. Annual emissions account for the pigging of four (4) vapor pipelines. The vapor composition and heat rate (MMBtu/hr) is based on vendor provided vapor properties leaving ship, at approximately 50% loading.

Diesel Storage Tanks

- The diesel storage tank emissions are estimated using USEPA's TANKS Program (Version 4.09d), from equations in AP42 Section 7.1, Organic Liquid Storage Tanks

- Maximum hourly loss is estimated based on highest monthly total loss from TANKS Program (Ver 4.09d).

- The size of diesel storage on the SPOT DWP is based on about 18 days of storage capacity for use in pedestal crane engines and diesel generators for power generation.

Table No	Appendix D Tables
Table 1D	Facility-Wide Emissions
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Table 16D	Emissions for Component Fugitives

Table 1D
Facility-Wide Emissions
Sea Port Oil Terminal Project

Pollutant Type	Pollutant	Annual Emissions (tpy)	
		Stationary Sources	
		Platform Emissions	TOTAL
Criteria	NO_x	223.48	**223.48**
	CO	290.95	**290.95**
	VOC	1,729.89	**1,729.89**
	PM	8.11	**8.11**
	PM_{10}	8.11	**8.11**
	$PM_{2.5}$	8.11	**8.11**
	SO_2	36.85	**36.85**
HAPs	Acetaldehyde	0.00	**0.00**
	Acrolein	0.01	**0.01**
	Benzene	8.44	**8.44**
	Cumene	0.12	**0.12**
	Ethylbenzene	0.89	**0.89**
	Formaldehyde	0.01	**0.01**
	Hexane	62.63	**62.63**
	i-Octane	0.16	**0.16**
	PAH	0.017	**0.02**
	Toluene	7.62	**7.62**
	m & p Xylenes	2.59	**2.59**
	o Xylene	0.65	**0.65**
	Total HAPs	**83.11**	**83.11**
	H_2S	1.19	**1.19**
Greenhouse Gas	CO_2	171,420	**171,420**
	N_2O	5.45	**5.45**
	CH_4	8.57	**8.57**

	Pollutant	Annual Emissions (ton CO_2e/yr)	
		Stationary Sources	
		Platform Emissions	TOTAL
Greenhouse Gas (CO_2e)	CO_2	171,420	**171,420**
	N_2O	1,623.19	**1,623.19**
	CH_4	214.14	**214.14**
	Total GHGs	**173,257**	**173,257**

Table 2D
Stationary Sources Emissions Summary - Short Term (lb/hr)
Sea Port Oil Terminal Project

Pollutant Type	Pollutant	Vapor Combustor 1[1]	Vapor Combustor 2[1]	Vapor Combustor 3[1]	Diesel Generator 1 and 2[2]	Emergency Backup Diesel Generator	Pedestal Crane 1 and 2[3]	Diesel Fire Water Pump 1	Diesel Fire Water Pump 2	Diesel Storage Tank 1	Diesel Storage Tank 2	Diesel Storage Tank 3	Vent Boom	Uncaptured Loading Emissions	Component Fugitives	TOTAL
		Maximum Hourly Emissions (lb/hr)														
Criteria	NO_x	37.57	37.57	37.57	20.63	6.89	0.39	11.43	11.43	0.00	0.00	0.00	0.00	0.00	0.00	163.47
	CO	75.14	75.14	75.14	3.48	6.15	3.39	6.19	6.19	0.00	0.00	0.00	0.00	0.00	0.00	250.83
	VOC	198.22	198.22	198.22	0.18	6.89	0.18	11.43	11.43	0.0031	0.00	0.00	19.59	114.61	5.21	764.19
	PM	2.08	2.08	2.08	0.18	0.12	0.02	0.36	0.36	0.00	0.00	0.00	0.00	0.000	0.000	7.27
	PM_{10}	2.08	2.08	2.08	0.18	0.12	0.02	0.36	0.36	0.00	0.00	0.00	0.00	0.000	0.000	7.27
	$PM_{2.5}$	2.08	2.08	2.08	0.18	0.12	0.02	0.36	0.36	0.00	0.00	0.00	0.00	0.000	0.000	7.28
	SO_2	39.46	39.46	39.46	0.02	0.01	0.01	0.0131	0.0131	0.00	0.00	0.00	0.00	0.0000	0.0000	118.44
HAPs	Acetaldehyde	0.000	0.000	0.000	0.000	0.000	0.000	0.0002	0.0002	0.00	0.00	0.00	0.00	0.000	0.000	0.00
	Acrolein	0.000	0.000	0.000	0.001	0.000	0.000	0.0006	0.0006	0.00	0.00	0.00	0.00	0.000	0.000	0.00
	Benzene	0.759	0.759	0.759	0.011	0.004	0.003	0.0059	0.0059	0.00	0.00	0.00	0.00	0.448	0.051	2.81
	Cumene	0.009	0.009	0.009	0.000	0.000	0.000	0.0000	0.0000	0.00	0.00	0.00	0.00	0.006	0.007	0.04
	Ethylbenzene	0.093	0.093	0.093	0.000	0.000	0.000	0.0000	0.0000	0.00	0.00	0.00	0.00	0.050	0.012	0.34
	Formaldehyde	0.000	0.000	0.000	0.001	0.000	0.000	0.0006	0.0006	0.00	0.00	0.00	0.00	0.000	0.000	0.00
	Hexane	7.335	7.335	7.335	0.000	0.000	0.000	0.0000	0.0000	0.00	0.00	0.00	0.00	4.422	0.312	26.74
	i-Octane	0.014	0.014	0.014	0.000	0.000	0.000	0.0000	0.0000	0.00	0.00	0.00	0.00	0.008	0.007	0.06
	PAH	0.000	0.000	0.000	0.003	0.001	0.001	0.0016	0.0016	0.00	0.00	0.00	0.00	0.000	0.000	0.01
	Toluene	0.688	0.688	0.688	0.004	0.001	0.001	0.0021	0.0021	0.00	0.00	0.00	0.00	0.378	0.143	2.60
	m & p Xylenes	0.286	0.286	0.286	0.003	0.001	0.001	0.0015	0.0015	0.00	0.00	0.00	0.00	0.143	0.154	1.16
	o Xylene	0.063	0.063	0.063	0.000	0.000	0.000	0.0000	0.0000	0.00	0.00	0.00	0.00	0.029	0.027	0.24
	Total HAPs	9.248	9.248	9.248	0.0236	0.0087	0.0068	0.0124	0.0124	0.00	0.00	0.00	0.00	5.48	0.71	34.00
	H_2S	1.81	1.81	1.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	5.47
Greenhouse Gas	CO_2	34,648	34,648	34,648	2,370	875	680	1,247	1,247	0.00	0.00	0.00	0.00	57.739	0.43	110,421
	N_2O	1.42	1.42	1.42	0.02	0.0070	0.005	0.0100	0.0100	0.00	0.00	0.00	0.00	0.000	0.000	4.32
	CH_4	0.47	0.47	0.47	1.29	0.477	0.371	0.680	0.680	0.00	0.00	0.00	0.00	0.000	0.000	4.93

	Pollutant	Vapor Combustor 1	Vapor Combustor 2	Vapor Combustor 3	Diesel Generator 1	Emergency Backup Diesel Generator	Pedestal Crane 1	Diesel Fire Water Pump 1	Diesel Fire Water Pump 2	Diesel Storage Tank 1	Diesel Storage Tank 2	Diesel Storage Tank 3	Vent Boom	Uncaptured Loading Emissions	Component Fugitives	TOTAL
Greenhouse Gas (CO_2e)	CO_2	34,648	34,648	34,648	2,370	875	680	1,247	1,247	0.00	0.00	0.00	0.00	57.74	0.43	110,421
	N_2O	424.17	424.17	424.17	5.66	2.09	1.63	2.98	2.98	0.00	0.00	0.00	0.00	0.00	0.00	1,287.85
	CH_4	11.87	11.87	11.87	32.31	11.93	9.28	17.01	17.01	0.00	0.00	0.00	0.00	0.00	0.00	123.16
	Total GHGs	35,084	35,084	35,084	2,408	889	691	1,267	1,267	0.00	0.00	0.00	0.00	57.74	0.43	111,832

Notes:

1. The maximum hourly emission rates presented for vapor combustors are the worst case short term emissions during either crude or condensate loading scenario.
2. The hourly emissions are for one of the two identical diesel generators. Only one generator would operate at a time; each generator would be rotated into service to allow for maintenance. The total operating hours for both diesel generators combined is 8,760 hours per year.
3. The hourly emissions are for one of the two identical pedestal cranes. Each pedestal crane will operate 12 hours per day (total 4,380 hours per year).

Table 3D
Stationary Sources Emissions Summary - Long Term (tpy)
Sea Port Oil Terminal Project

Pollutant Type	Pollutant	Vapor Combustor 1[1]	Vapor Combustor 2[1]	Vapor Combustor 3[1]	Diesel Generator 1[2]	Diesel Generator 2[2]	Emergency Backup Diesel Generator	Pedestal Crane 1	Pedestal Crane 2	Diesel Fire Water Pump 1	Diesel Fire Water Pump 2	Diesel Storage Tank 1	Diesel Storage Tank 2	Diesel Storage Tank 3	Vent Boom	Uncaptured Loading Emissions	Component Fugitives	TOTAL
		Annual Emissions (tpy)																
Annual Operating Hours		8,760	8,760	8,760	4,380	4,380	100	4,380	4,380	100	100	8,760	8,760	8,760	208 events/yr	8,760	8,760	
Criteria	NO_x	43.32	43.32	43.32	45.17	45.17	0.34	0.85	0.85	0.57	0.57	0.00	0.00	0.00	0.00	0.00	0.00	223.48
	CO	86.64	86.64	86.64	7.63	7.63	0.31	7.43	7.43	0.31	0.31	0.00	0.00	0.00	0.00	0.00	0.00	290.95
	VOC	472.84	472.84	472.84	0.40	0.40	0.34	0.40	0.40	0.57	0.57	0.0100	0.0100	0.0029	2.04	283.41	22.81	1,729.89
	PM	2.40	2.40	2.40	0.40	0.40	0.01	0.04	0.04	0.018	0.018	0.00	0.00	0.00	0.00	0.00	0.00	8.11
	PM_{10}	2.40	2.40	2.40	0.40	0.40	0.01	0.04	0.04	0.018	0.018	0.00	0.00	0.00	0.00	0.00	0.00	8.11
	$PM_{2.5}$	2.40	2.40	2.40	0.40	0.40	0.01	0.04	0.04	0.018	0.018	0.00	0.00	0.00	0.00	0.00	0.00	8.11
	SO_2	12.24	12.24	12.24	0.05	0.05	0.0005	0.02	0.02	0.0007	0.0007	0.00	0.00	0.00	0.00	0.00	0.00	36.85
HAPs	Acetaldehyde	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.0000	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Acrolein	0.000	0.000	0.000	0.002	0.002	0.000	0.001	0.001	0.0000	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	Benzene	2.261	2.261	2.261	0.024	0.024	0.000	0.007	0.007	0.0003	0.0003	0.00	0.00	0.00	0.00	1.37	0.22	8.44
	Cumene	0.025	0.025	0.025	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000	0.00	0.00	0.00	0.00	0.02	0.03	0.12
	Ethylbenzene	0.233	0.233	0.233	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000	0.00	0.00	0.00	0.00	0.13	0.05	0.89
	Formaldehyde	0.000	0.000	0.000	0.002	0.002	0.000	0.001	0.001	0.0000	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	Hexane	16.994	16.994	16.994	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000	0.00	0.00	0.00	0.00	10.28	1.37	62.63
	i-Octane	0.036	0.036	0.036	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000	0.00	0.00	0.00	0.00	0.02	0.03	0.16
	PAH	0.000	0.000	0.000	0.007	0.007	0.000	0.002	0.002	0.0001	0.0001	0.00	0.00	0.00	0.00	0.00	0.00	0.02
	Toluene	1.936	1.936	1.936	0.009	0.009	0.000	0.003	0.003	0.0001	0.0001	0.00	0.00	0.00	0.00	1.16	0.63	7.62
	m & p Xylenes	0.531	0.531	0.531	0.006	0.006	0.000	0.002	0.002	0.0001	0.0001	0.00	0.00	0.00	0.00	0.31	0.67	2.59
	o Xylene	0.148	0.148	0.148	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000	0.00	0.00	0.00	0.00	0.09	0.12	0.65
	Total HAPs	22.164	22.164	22.164	0.0517	0.0517	0.0004	0.0149	0.0149	0.0006	0.0006	0.00	0.00	0.00	0.00	13.37	3.12	83.11
	H_2S	0.39	0.39	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	1.19
Greenhouse Gas	CO_2	52,546	52,546	52,546	5,190	5,190	44	1,490	1,490	62	62	0.00	0.00	0.00	0.00	252.90	1.89	171,420
	N_2O	1.78	1.78	1.78	0.04	0.04	0.0004	0.012	0.01	0.0005	0.0005	0.00	0.00	0.00	0.00	0.00	0.00	5.45
	CH_4	0.40	0.40	0.40	2.83	2.83	0.024	0.813	0.81	0.034	0.034	0.00	0.00	0.00	0.00	0.00	0.00	8.57

	Pollutant	Vapor Combustor 1	Vapor Combustor 2	Vapor Combustor 3	Diesel Generator 1	Diesel Generator 2	Emergency Backup Diesel Generator	Pedestal Crane 1	Pedestal Crane 2	Diesel Fire Water Pump 1	Diesel Fire Water Pump 2	Diesel Storage Tank 1	Diesel Storage Tank 2	Diesel Storage Tank 3	Vent Boom	Uncaptured Loading Emissions	Component Fugitives	TOTAL
Greenhouse	CO_2	52,546	52,546	52,546	5,190	5,190	44	1,490	1,490	62	62	0.00	0.00	0.00	0	252.90	1.89	171,420
Gas	N_2O	530.29	530.29	530.29	12.40	12.40	0.10	3.56	3.56	0.15	0.15	0.00	0.00	0.00	0.00	0.00	0.00	1,623.19
(CO_2e)	CH_4	9.89	9.89	9.89	70.77	70.77	0.60	20.32	20.32	0.85	0.85	0.00	0.00	0.00	0.00	0.000	0.000	214.14
	Total GHGs	53,086	53,086	53,086	5,273	5,273	44	1,514	1,514	63	63	0.00	0.00	0.00	0.00	253	2	173,257

Notes:
1. Vapor combustors emissions include emissions generated from vapor line pigging activities.
2. Only one of two diesel generator would operate at a time; each generator would be rotated into service to allow for maintenance. The total operating hours for both diesel generators combined is 8,760 hours per year.

Table 4D
Marine Loading Uncontrolled Emission Calculations - Crude and Condensate Loading
Sea Port Oil Terminal Project

Parameters	Data	Data	Units	Information Source
Product Loaded	**Crude Oil**	**Condensate**		
Maximum Hourly Loading Rate	85,000	85,000	barrels/hr	
Maximum Ship Load	2,000,000	2,000,000	barrels/ship	
Ships per Year	305	60	ships	
Maximum Annual Throughput	610,000,000	120,000,000	barrels/yr	
Average Hydrogen Sulfide Content	5	5	ppmw	
Maximum Hydrogen Sulfide Content	66	66	ppmw	
Physical Properties				
Maximum True Vapor Pressure (P_{max})	11.00	11.00	psia at 95°F	Crude and Condensate Max TVP conservatively assumed at 11 psia at Max loading temperature.
Average True Vapor Pressure (P_{ave})	7.60	7.09	psia at 70°F	Per Figure 7.1-13b (for crude) and Figure 7.1-14b (for condensate) from AP-42, Chapter 7, Section 7.1. Avg TVP of crude and condensate is based on RVP of 9 psi and 11.19 psi, respectively.
Vapor Molecular Weight (M)	50	65	lb/lb-mole	Based on AP-42, Table 7.1-2.
Maximum Loading Temperature (T_{max})	95	95	deg. F	
	555	555	deg. R	
Average Loading Temperature (T_{ave})	70	70	deg. F	
	530	530	deg. R	
Saturation Factor (S)	0.2	0.2		Saturation factor for submerged loading: ships per AP-42 Section 5.2, Table 5.2-1.
Uncontrolled Loading Loss				
VOC Emission Factor at Maximum Loading Temp. (LL_{max})	2.47	3.21	lb/1,000 gals loaded	Per AP-42 Section 5.2, Equation 1. $LL_{max} = 12.46 \times S \times P_{max} \times M / T_{max}$
VOC Emission Factor at Average Loading Temp. (LL_{ave})	1.79	2.17	lb/1,000 gals loaded	Per AP-42 Section 5.2, Equation 1. $LL_{ave} = 12.46 \times S \times P_{avg} \times M / T_{avg}$
Maximum Hourly Loading Loss	8,816.29	11,461.18	lb/hr	Maximum hourly throughput (bbl/hr) x (42 gal/bbl) x $L_{L\,(max)}$ (lb/1,000 gal loaded)
Maximum Loading Loss per Ship	207,442.16	269,674.81	lb/ship	Maximum Ship Load (bbl/ship) x (42 gal/bbl) x $L_{L\,(max)}$ (lb/1,000 gal loaded)
Annual Loading Loss	22,880.82	5,460.50	tpy	Maximum annual throughput (bbl/yr) x (42 gal/bbl) x $L_{L\,(ave)}$ (lb/1,000 gal loaded) / (2,000 lb/ton)
Vapor Collection System				
Collection Efficiency (CE)	99.00	99.00	%	Vapor collection efficiency.

Table 4D

Marine Loading Uncontrolled Emission Calculations - Crude and Condensate Loading

Sea Port Oil Terminal Project

Uncaptured Loading Emissions				
Maximum Hourly Emissions	88.16	114.61	lb/hr	Maximum hourly loading loss (lb/hr) x (1-CE/100)
Maximum Ship Emissions	2074.42	2696.75	lb/ship	Maximum loading loss per Ship (lb/ship) x (1-CE/100)
Annual Emissions	228.81	54.60	tpy	Annual loading loss (tpy) x (1- CE/100)
Vapor Combustion				
Destruction Removal Efficiency (DRE)	95.0	95.0	%	
Uncombusted Loading Emissions				
Maximum Hourly Emissions	436.41	567.33	lb/hr	Maximum hourly loading loss (lb/hr) x (CE/100) x (1 - DRE/100)
Maximum Ship Emissions	10268.39	13348.90	lb/ship	Maximum loading loss per Ship (lb/ship) x (CE/100) x (1 - DRE/100)
Annual Emissions	1132.60	270.29	tpy	Annual loading loss (tpy) x (CE/100) x (1 - DRE/100)
Hourly Average Heat Rate to Vapor Combustors	193	193	MMBtu/hr	Vendor provided information
Hourly Maximum Heat Rate to Vapor Combustors	661	661	MMBtu/ship	Vendor provided information
Total Annual Heat Rate to Vapor Combustors	1,413,492	278,064	MMBtu/yr	Based on Vendor provided information
Maximum Vapor wt Fraction H2S at T_{max}	0.00717	0.00245	lb H_2S/lb VOC	Max Vapor mole fraction H_2S / Vapor mole fraction VOC T_{max} / VOC Vapor MW x H_2S Vapor MW
Average Vapor wt Fraction H2S at T_{ave}	0.00079	0.00029	lb H_2S/lb VOC	Avg Vapor mole fraction H_2S / Vapor mole fraction VOC T_{ave} / VOC Vapor MW x H_2S Vapor MW

Notes:

1. The maximum TVP of crude oil and condensate loaded is conservatively assumed at 11 psia, Maximum loading rate of 85,000 bbl/hr, and Maximum number of ships loaded per year is 365. The 305 crude and 60 condensate ship loadings are representative for purposes of determining worst case hourly and annual emissions but should not be considered as permit limitations. SPOT DWP will comply with all short and long term emission limits related to ship loading.

2. The maximum uncontrolled loading losses calculated using Equation 1 of Section 5.2 of AP-42, Saturation factor used in Equation 1 is 0.2.

3. The maximum sulfur content conservatively calculated at 66 ppmw. H_2S content of the crude oil and condensate will vary by load. For 365 loading events per year, the average H_2S content will be 5 ppmw or less. SPOT DWP will comply with the short and long term emission limits for SO_2 related to ship loading activities. Therefore, the annual average H_2S content could vary and be above 5 ppmw for fewer ship loading events. For instance for 182 annual ship loading events, H_2S content could average 10 ppmw and also meet the annual SO_2 limit at the vapor combustors.

4. The maximum hourly and annual average heat release rate to vapor combustors is obtained from vendor provided data.

5. Vapors evolved from loading are collected at 99% collection efficiency and routed to vapor combustors with a minimum DRE of 95%. Marine loading emissions via vapor combustors are provided in vapor combustor calculation sheets for crude oil and condensate products loading.

Table 5D

Crude Oil VOC Emissions Speciation - Uncombusted (Vapor Combustor) and Uncaptured Emissions

Sea Port Oil Terminal Project

WTI Crude Speciation[1]	Molecular Weight (MW)	Liquid Weight %	Vapor wt% (normalized)	Uncombusted VOC Loading Emissions	Uncombusted VOC Loading Emissions	Uncaptured VOC Loading Emissions	Uncaptured VOC Loading Emissions
Compound	Mi, (lb/lbmole)	(%)	Zvi	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Methane (CH4)	16.04	0.0000	0.0000	0.00	0.00	0.00	0.00
Ethane (C2H6)	30.07	0.0000	0.0000	0.00	0.00	0.00	0.00
Propane (C3H8)	44.10	0.2600	11.3916	49.71	129.02	10.04	26.06
Butane (C4H10)	58.12	2.4900	40.6864	177.56	460.81	35.87	93.09
Pentane (C5H12)	72.15	7.6000	23.1757	101.14	262.49	20.43	53.03
Hexane (C6H14)[1]	86.20	4.0500	3.5702	15.58	40.44	3.15	8.17
i-Hexane	86.18	14.4500	12.7383	55.59	144.27	11.23	29.15
Heptane (C7H16)	100.21	21.2000	5.5248	24.11	62.57	4.87	12.64
n-Octane (C8H18)	114.23	18.1200	1.4219	6.21	16.10	1.25	3.25
i-Octane (2,2,4 trimethylpentane)[2]	114.22	0.1000	0.0078	0.03	0.09	0.01	0.02
Nonane (C9H20)	128.26	14.0200	0.3251	1.42	3.68	0.29	0.74
Decane (C10H22)	142.29	10.56	0.0259	0.11	0.29	0.02	0.06
C11+	156.31	0	0.0000	0.00	0.00	0.00	0.00
Benzene[1]	78.11	0.9200	0.5035	2.20	5.70	0.44	1.15
Cumene (isopropylbenzne)[2]	120.20	0.1000	0.0054	0.02	0.06	0.00	0.01
Toluene[1]	92.14	2.6700	0.4288	1.87	4.86	0.38	0.98
Ethylbenzene[1]	106.17	1.0800	0.0568	0.25	0.64	0.05	0.13
m & p Xylene[1]	106.16	1.8200	0.1053	0.46	1.19	0.09	0.24
o-Xylene[1]	106.16	0.5600	0.0324	0.14	0.37	0.03	0.07
Total VOC	-	100.00	100.00	**436**	**1,133**	**88**	**229**
Total HAP	-	11.30	4.71	**20.56**	**53.35**	**4.15**	**10.78**

Notes:

1. HAP speciation and % based on WTI (Sealy Tank 3506) Crude Speciation from Enterprise Products, Sample date 10/09/2018
2. HAP speciation supplemented by liquid-phase speciation profile from USEPA TANKS program (Version 4.09d) for crude oil; the highest value (weight percent) used for each individual HAP.

Table 6D

Condensate VOC Emissions Speciation - Uncombusted (Vapor Combustor) and Uncaptured Emissions

Sea Port Oil Terminal Project

WTI Crude Speciation[1]	Molecular Weight (MW)	Liquid Weight %	Vapor wt% (normalized)	Uncombusted VOC Loading Emissions	Uncombusted VOC Loading Emissions	Uncaptured VOC Loading Emissions	Uncaptured VOC Loading Emissions
Compound	Mi, (lb/lbmole)	(%)	Zvi	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Methane (CH4)	16.04	0.0000	0.0000	0.00	0.00	0.00	0.00
Ethane (C2H6)	30.07	0.0000	0.0000	0.00	0.00	0.00	0.00
Propane (C3H8)	44.10	0.1400	4.4749	25.39	12.10	5.13	2.44
Butane (C4H10)	58.12	2.8200	33.6158	190.71	90.86	38.53	18.36
Pentane (C5H12)	72.15	20.0300	44.5600	252.80	120.44	51.07	24.33
Hexane (C6H14)[1]	86.20	6.0000	3.8587	21.89	10.43	4.42	2.11
i-Hexane	86.18	12.6400	8.1289	46.12	21.97	9.32	4.44
Heptane (C7H16)	100.21	18.1200	3.4450	19.54	9.31	3.95	1.88
n-Octane (C8H18)	114.23	14.8500	0.8501	4.82	2.30	0.97	0.46
i-Octane (2,2,4 trimethylpentane)[2]	114.22	0.1250	0.0072	0.04	0.02	0.01	0.00
Nonane (C9H20)	128.26	10.2100	0.1727	0.98	0.47	0.20	0.09
Decane (C10H22)	142.29	7.52	0.0135	0.08	0.04	0.02	0.01
C11+	156.31	0	0.0000	0.00	0.00	0.00	0.00
Benzene[1]	78.11	0.9800	0.3912	2.22	1.06	0.45	0.21
Cumene (isopropylbenzne)[2]	120.20	0.1250	0.0049	0.03	0.01	0.01	0.00
Toluene[1]	92.14	2.7500	0.3222	1.83	0.87	0.37	0.18
Ethylbenzene[1]	106.17	0.2300	0.0088	0.05	0.02	0.01	0.00
m & p Xylene[1]	106.16	2.9500	0.1246	0.71	0.34	0.14	0.07
o-Xylene[1]	106.16	0.5100	0.0215	0.12	0.06	0.02	0.01
Total VOC	-	100.00	100.00	**567**	**270**	**115**	**55**
Total HAP	-	13.67	4.74	**26.89**	**12.81**	**5.43**	**2.59**

Notes:

1. HAP speciation and % based on WTI (Sealy Tank 3503) Crude Speciation from Enterprise Products, Sample date 11/26/2018.

2. HAP speciation supplemented by liquid-phase speciation profile from USEPA TANKS program (Version 4.09d) for crude oil; an additional margin of 25% is added to come up with concentrations (weight percent) in condensate for each individual HAP.

Table 7D
Emissions for Vapor Combustor 1, 2, and 3 for Crude Loading
Sea Port Oil Terminal Project

Input Parameters	Value	Units
Maximum Hourly Loading Rate	85,000	bbl/hr
Ships per Year	305	ships
Maximum Uncontrolled Hourly Loading Loss[1]	8,816	lb/hr
Yearly Uncontrolled Loading Loss[1]	22,881	tpy
Vapor Collection Efficiency	99	%
Vapor Destruction Efficiency	95	%
Heat Content of Crude Oil	18,352	Btu/lb
Hourly Maximum Heat Rate to Vapor Combustor[1]	661	MMBtu/hr
Annual Heat Rate to Vapor Combustor[1]	1,413,492	MMBtu/yr
No. of Vapor Combustors	3	
Loading Hours of Operation[2]	7,320	hr/yr
Average H_2S Content[3]	5	ppmw
Maximum H_2S Content[3]	66	ppmw
Average Vapor Weight Fraction H_2S	0.0008	lb H_2S/lb VOC
Maximum Vapor Weight Fraction H_2S	0.0072	lb H_2S/lb VOC
Methane Content[4]	0	Mol%
Average CO_2 in Ship Inert Gases[5]	10.36	mol%
Input Parameters for Pilot Emissions		
Total Pilot Gas (Propane) Flow Rate (for 3 Pilots)[6]	180	scfh
Pilot Gas Hourly Heat Rate	0.4630	MMBtu/hr
Total Hours of Operation	7,320	hr/yr
Heating Value of Propane	2,572	Btu/scf

Pollutant Type	Pollutant	Emission Factor Pilot Gas (Propane)[7]	Emission Factor Loading Vapor[8, 11]	Emission Rate[9, 10, 12] (lb/hr)			Annual Emissions (tpy)		
		(lb/MMBtu)	(lb/MMBtu)	Pilot Gas	Loading Vapor	Total	Pilot Gas	Loading Vapor	Total
Criteria	NO_x	0.138	0.15	0.06	99.15	99.21	0.23	106.01	106.25
	CO	0.28	0.30	0.13	198.30	198.43	0.47	212.02	212.49
	VOC	0.000	See Note 10	1.07	436.41	437.48	3.93	1132.60	1136.53
	PM	0.0083	0.0083	0.00	5.49	5.49	0.01	5.87	5.88
	PM_{10}	0.0083	0.0083	0.00	5.49	5.49	0.01	5.87	5.88
	$PM_{2.5}$	0.0083	0.0083	0.00	5.49	5.49	0.01	5.87	5.88
	SO_2	0.00	See Note 9	0.00	117.75	117.75	0.00	33.52	33.52
HAPs			Vapor Wt%						
	Hexane	0.00	3.57	0.00	15.58	15.58	0.00	40.44	40.44
	i-Octane (2,2,4 trimethylpentane)	0.00	0.01	0.00	0.03	0.03	0.00	0.09	0.09
	Benzene	0.00	0.50	0.00	2.20	2.20	0.00	5.70	5.70
	Cumene	0.00	0.01	0.00	0.02	0.02	0.00	0.06	0.06
	Toluene	0.00	0.43	0.00	1.87	1.87	0.00	4.86	4.86
	Ethylbenzene	0.00	0.06	0.00	0.25	0.25	0.00	0.64	0.64
	m & p Xylene	0.00	0.11	0.00	0.46	0.46	0.00	1.19	1.19
	o-Xylene	0.00	0.56	0.00	0.14	0.14	0.00	0.37	0.37
	Total HAPs	0.00	4.71	0.00	20.56	20.56	0.00	53.35	53.35
			(lb H_2S/lb VOC)						
	H_2S	0.00	0.0072 - 0.0008	0.00	3.76	3.76	0.00	1.07	1.07
			(kg/MMBtu)						
Greenhouse Gas	CO_2	-	74.54	62.66	103,193	103,255	229.32	110,334	110,564
	N_2O	-	0.0030	0.00	4.1532	4.15	0.00	4.4406	4.44
	CH_4	-	0.0006	0.00	0.8306	0.83	0.00	0.8881	0.89
	Inert Gas CO_2[12]	-	-	0.00	5,716	5,716	0.00	20,921	20,921
	Uncaptured CO_2	-	-	0.00	58	58	0.00	211	211

Pollutant Type	Pollutant	Global Warming Potential (GWP)	Hourly Emission Rate (lb/hr)	Annual Emissions (tpy)
Greenhouse Gas (CO_2e)	CO_2	1	103,255	131,485
	N_2O	298	1,238	1,323
	CH_4	25	21	22
	Total GHGs	-	104,514	132,830

Notes:

1. From Marine Loading Uncontrolled Emission Calculations
2. Based on 24 hrs to load one crude carrier at maximum loading rate of 85,000 bbl/hr; a total of 305 ships in this scenario
3. Average sulfur content of 5 ppmw used for annual average emission calculations. Maximum sulfur content of 66 ppmw conservatively assumed for hourly calculations.
4. No methane content in vapor leaving crude carrier - based on information provided by engineering (CTI), on 10/08/2018
6. Average CO_2 concentration in vapor leaving crude carrier at 50% loading. Based on data provided by engineering (CTI), on 10/08/2018
5. Propane used as pilot gas. Pilot gas is required continuously during loading at a rate of approximately 1.0 scfm per pilot (vendor provided information).
7. NOx, CO emission factors from TCEQ flare emission calculation guidance document. PM emissions factors from USEPA AP-42 - Section 1.4 - Natural Gas Combustion.
8. NOx and CO emission factors are based on vendor guarantees - based on information provided by engineering (CTI/EDG). PM emissions factors from USEPA AP-42 - Section 1.4 - Natural Gas Combustion.
9. SO_2 emissions are based on maximum and average vapor weight fraction of H_2S in VOC (lb H_2S/lb VOC). The maximum and average vapor weight fractions are based on 66 ppmw and 5 ppmw of sulfur in crude, respectively (see calculation basis below).
10. VOC emissions are based on uncontrolled VOC loading losses, collection efficiency of 99% and destruction efficiency of 95% (see calculations basis below). HAP emissions based in crude VOC speciation (see VOC Emissions Speciation)
11. CO_2 emission factor based per 40 CFR Part 98, Subpart C, Table C-1 for petroleum products-crude oil. N_2O, CH_4 emission factors Table C-2 for petroleum products-crude oil.
12. Additional CO_2 emissions from inert gas during ship loading based on average CO_2 concentration in vapor leaving crude carrier i.e. 10.36 mol% (14.90 wt%) and total vapor mass flow rate of 38,738 lb/hr at 50% loading.

Basis of Calculation:

VOC Hourly Emissions (lb/hr) = Maximum Uncontrolled Hourly Loading Loss (lb/hr) x Vapor Collection Efficiency (%) x (1-Vapor Destruction Efficiency) (%)

VOC Annual Emissions (tpy) = Yearly Uncontrolled Loading Loss (tpy) x Vapor Collection Efficiency (%) x (1-Vapor Destruction Efficiency) (%)

NOx, CO, and PM Hourly Emissions (lb/hr) = Emission Rate (lb/MMBtu) x Hourly Maximum Heat Rate to Vapor Combustor (MMBtu/hr)

NOx, CO, and PM Annual Emissions (tpy) = Emission Rate (lb/MMBtu) x Annual Heat Rate to Vapor Combustor (MMBtu/yr)

SO_2 emissions (lb/hr) = Max Uncontrolled Hourly Loading Loss (lb/hr) x Vapor Collection Efficiency (%) x H_2S Emission Factor (lb H_2S/lb VOC) x MW of SO_2/MW of H_2S

Table 8D
Emissions for Vapor Combustor 1, 2, and 3 for Condensate Loading
Sea Port Oil Terminal Project

Input Parameter	Value	Units
Maximum Hourly Loading Rate	85,000	bbl/hr
Ships per Year	60	ships
Maximum Uncontrolled Hourly Loading Loss[1]	11,461	lb/hr
Yearly Uncontrolled Loading Loss[1]	5,460	tpy
Vapor Collection Efficiency	99	%
Vapor Destruction Efficiency	95	%
Heat Content of Condensate	18,679	Btu/lb
Hourly Maximum Heat Rate to Vapor Combustor[1]	661	MMBtu/hr
Annual Heat Rate to Vapor Combustor[1]	278,064	MMBtu/yr
No. of Vapor Combustors	3	
Loading Hours of Operation[2]	1,440	hr/yr
Average H_2S Content[3]	5	ppmw
Maximum H_2S Content[3]	66	ppmw
Average Vapor Weight Fraction H_2S	0.0003	lb H_2S/lb VOC
Maximum Vapor Weight Fraction H_2S	0.0025	lb H_2S/lb VOC
Methane Content[4]	0	Mol%
Average CO_2 in Ship Inert Gases[5]	10.36	mol%
Input Parameters for Pilot Emissions		
Total Pilot Gas (Propane) Flow Rate (for 3 Pilots)[6]	180	scfh
Pilot Gas Hourly Heat Rate	0.4630	MMBtu/hr
Total Hours of Operation	1,440	hr/yr
Heating Value of Propane	2,572	Btu/scf

Pollutant Type	Pollutant	Emission Factor Pilot Gas (Propane)[7]	Emission Factor Loading Vapor[8, 11]	Emission Rate[9, 10, 12] (lb/hr)			Annual Emissions (tpy)		
		(lb/MMBtu)	(lb/MMBtu)	Pilot Gas	Loading Vapor	Total	Pilot Gas	Loading Vapor	Total
Criteria	NO_x	0.138	0.15	0.06	99.15	99.21	0.05	20.85	20.90
	CO	0.28	0.30	0.13	198.30	198.43	0.09	41.71	41.80
	VOC	0.000	See Note 10	1.07	567.33	568.40	0.77	270.29	271.07
	PM	0.0083	0.0083	0.00	5.49	5.49	0.00	1.15	1.16
	PM_{10}	0.0083	0.0083	0.00	5.49	5.49	0.00	1.15	1.16
	$PM_{2.5}$	0.0083	0.0083	0.00	5.49	5.49	0.00	1.15	1.16
	SO_2	0.0000	See Note 9	0.00	52.33	52.33	0.00	2.93	2.93
HAPs			Vapor Wt%						
	Hexane	0.000	3.86	0.00	21.89	21.89	0.00	10.43	10.43
	i-Octane (2,2,4 trimethylpentane)	0.000	0.01	0.00	0.04	0.04	0.00	0.02	0.02
	Benzene	0.000	0.39	0.00	2.22	2.22	0.00	1.06	1.06
	Cumene	0.000	0.00	0.00	0.03	0.03	0.00	0.01	0.01
	Toluene	0.000	0.32	0.00	1.83	1.83	0.00	0.87	0.87
	Ethylbenzene	0.000	0.01	0.00	0.05	0.05	0.00	0.02	0.02
	m & p Xylene	0.000	0.12	0.00	0.71	0.71	0.00	0.34	0.34
	o-Xylene	0.000	0.02	0.00	0.12	0.12	0.00	0.06	0.06
	Total HAPs	0.000	4.74	0.00	26.89	26.89	0.00	12.81	12.81
		--	(lb H_2S/lb VOC)						
	H_2S	0.000	0.0003 - 0.0025	0.00	1.67	1.67	0.00	0.09	0.09
			(kg/MMBtu)						
Greenhouse Gas	CO_2	-	74.54	62.66	103,193	103,255	45.11	21,705	21,750
	N_2O	-	0.0030	0.00	4.1532	4.15	0.00	0.8736	0.87
	CH_4	-	0.0006	0.00	0.8306	0.83	0.00	0.1747	0.17
	Inert Gas CO_2[12]	-	-	0.00	5,716	5,716	0.00	4,116	4,116
	Uncaptured CO_2	-	-	0.00	58	58	0.00	42	42

Pollutant Type	Pollutant	Global Warming Potential (GWP)	Hourly Emission Rate (lb/hr)	Annual Emissions (tpy)
Greenhouse Gas (CO_2e)	CO_2	1	103,255	25,866
	N_2O	298	1,238	260
	CH_4	25	21	4
	Total GHGs	-	104,514	26,131

Notes:

1. From Marine Loading Uncontrolled Emission Calculations
2. Based on 24 hrs to load one condensate carrier at maximum loading rate of 85,000 bbl/hr; a total of 60 ships in this scenario
3. Average sulfur content of 5 ppmw used for annual average emission calculations. Maximum sulfur content of 66 ppmw conservatively assumed for hourly calculations.
4. No methane content in vapor leaving crude carrier - based on information provided by engineering (CTI), on 10/08/2018
5. Average CO_2 concentration in vapor leaving crude/condensate carrier at 50% loading. Based on data provided by engineering (CTI), on 10/08/2018
6. Propane used as pilot gas. Pilot gas is required continuously during loading at a rate of approximately 1.0 scfm per pilot (vendor provided information).
7. NOx, CO emission factors from TCEQ flare emission calculation guidance document. PM emissions factors from USEPA AP-42 - Section 1.4 - Natural Gas Combustion.
8. NOx and CO emission factors are based on vendor guarantees - based on information provided by engineering (CTI/EDG). PM emissions factors from USEPA AP-42 - Section 1.4 - Natural Gas Combustion.
9. SO_2 emissions are based on maximum and average vapor weight fraction of H_2S in VOC (lb H_2S/lb VOC). The maximum and average vapor weight fractions are based on 66 ppmw and 5 ppmw of sulfur in condensate, respectively (see calculation basis below).
10. VOC emissions are based on uncontrolled VOC loading losses, collection efficiency of 99% and destruction efficiency of 95% (see calculations basis below). HAP emissions based in condensate VOC speciation (see VOC Emissions Speciation)
11. CO_2 emission factor based per 40 CFR Part 98, Subpart C, Table C-1 for petroleum products-crude oil. N_2O, CH_4 emission factors Table C-2 for petroleum products-crude oil.
12. Additional CO_2 emissions from inert gas during ship loading based on average CO_2 concentration in vapor leaving crude/condensate carrier i.e. 10.36 mol% (14.90 wt%) and total vapor mass flow rate of 38,738 lb/hr at 50% loading.

Basis of Calculation:

VOC Hourly Emissions (lb/hr) = Maximum Uncontrolled Hourly Loading Loss (lb/hr) x Vapor Collection Efficiency (%) x (1-Vapor Destruction Efficiency) (%)

VOC Annual Emissions (tpy) = Yearly Uncontrolled Loading Loss (tpy) x Vapor Collection Efficiency (%) x (1-Vapor Destruction Efficiency) (%)

NOx, CO, and PM Hourly Emissions (lb/hr) = Emission Rate (lb/MMBtu) x Hourly Maximum Heat Rate to Vapor Combustor (MMBtu/hr)

NOx, CO, and PM Annual Emissions (tpy) = Emission Rate (lb/MMBtu) x Annual Heat Rate to Vapor Combustor (MMBtu/yr)

SO_2 emissions (lb/hr) = Max Uncontrolled Hourly Loading Loss (lb/hr) x Vapor Collection Efficiency (%) x H_2S Emission Factor (lb H_2S/lb VOC) x MW of SO_2/MW of H_2S

Table 9D
Emissions for Each Diesel Generator
Sea Port Oil Terminal Project

Parameter	Value	Units
Fuel	diesel	-
Power Rating[1]	1530	kW
	2052	hp
Fuel Flow[1]	110.9	gal/hr
Heating Value of Low-Sulfur Diesel	129,488	Btu/gal
Engine Heat Rate	14.36	MMBtu/hr
Maximum Yearly Operation[1]	4380	hr/yr

Pollutant Type	Pollutant	Emission Factor[3] (lb/MMBtu)	Emission Factor[2,3] (g/hp-hr)	Maximum Hourly Emission Rate (lb/hr)	Annual Emissions (tpy)
Criteria	NO_x		4.56	20.63	45.17
	CO		0.770	3.48	7.63
	VOC		0.04	0.18	0.40
	PM		0.04	0.18	0.40
	PM_{10}		0.04	0.18	0.40
	$PM_{2.5}$		0.04	0.18	0.40
	SO_2		0.006	0.02	0.05
HAPs	Benzene	7.76E-04		0.011	0.0244
	Toluene	2.81E-04		0.004	0.0088
	Xylenes	1.93E-04		0.003	0.0061
	Formaldehyde	7.89E-05		0.001	0.0025
	Acetaldehyde	2.52E-05		0.000	0.0008
	Acrolein	7.88E-05		0.001	0.0025
	PAH	2.12E-04		0.003	0.0067
	Total HAPs	-		**0.02**	**0.0517**
Greenhouse Gas	CO_2	165		2,369.75	5,189.75
	N_2O	0.00132		0.02	0.0416
	CH_4	0.0900		1.29	2.831

Pollutant Type	Pollutant	Global Warming Potential (GWP)	Maximum Hourly Emission Rate (lb CO_2e/hr)	Annual Emissions (ton CO_2e/yr)
Greenhouse Gas (CO_2e)	CO_2	1	2,369.75	5,189.75
	N_2O	298	5.66	12.40
	CH_4	25	32.31	70.77
	Total GHGs	-	**2,407.72**	**5,272.92**

Notes:

1. Based on information provided by engineering (CTI), on 09/27/2018. The total operating hours for both diesel generators combined is 8,760 hours per year. Each engine can run full time up to 8,760 hours per year. For emission estimation, each engine operation is calculated using 4,380 hours per year (12hrs/day). Fuel consumption (flow) rate is an engineering estimate based on representative engine, vendor provided data.

2. Emission factors for NOx, CO, PM and VOC are based on vendor guarantees (vendor will comply with NSPS Subpart IIII requirements).

3. Emission factors for HAPs, SO_2, CO_2, and CH_4 from USEPA AP 42 Section 3.4 - Large Stationary Diesel and All Stationary Dual-Fuel (Diesel fuel) Engines, October 1996. SO_2 emission factor based on low sulfur diesel with 0.0015% sulfur content (15 ppm). N_2O emission factor based on 40 CFR 98 Table C-2 to Subpart C.

Table 10D

Emissions for Emergency Backup Diesel Generator

Sea Port Oil Terminal Project

Parameter	Value	Units
Fuel	diesel	-
Power Rating	565	kW
	758	hp
Fuel Flow[1]	41.0	gal/hr
Heating Value of Low-Sulfur Diesel	129,488	Btu/gal
Engine Heat Rate	5.30	MMBtu/hr
Maximum Yearly Operation	100	hr/yr

Pollutant Type	Pollutant	Emission Factor[2,3] (lb/MMBtu)	Emission Factor[2] (g/hp-hr)	Maximum Hourly Emission Rate (lb/hr)	Annual Emissions (tpy)
Criteria	NO_x	-	4.122	6.89	0.34
	CO	-	3.681	6.15	0.31
	VOC	-	4.122	6.89	0.34
	PM	-	0.074	0.12	0.01
	PM_{10}	-	0.074	0.12	0.01
	$PM_{2.5}$	-	0.074	0.12	0.006
	SO_2	-	0.006	0.01	0.0005
HAPs	Benzene	7.76E-04	-	0.004	0.00021
	Toluene	2.81E-04	-	0.001	0.00007
	Xylenes	1.93E-04		0.001	0.00005
	Formaldehyde	7.89E-05		0.000	0.00002
	Acetaldehyde	2.52E-05		0.000	0.00001
	Acrolein	7.88E-05		0.000	0.00002
	PAH	2.12E-04		0.001	0.00006
	Total HAPs	-	-	**0.0087**	**0.00044**
Greenhouse Gas	CO_2	165	-	875.10	43.76
	N_2O	0.00132		0.01	0.0004
	CH_4	0.0900	-	0.48	0.024

Pollutant Type	Pollutant	Global Warming Potential (GWP)	Maximum Hourly Emission Rate (lb CO_2e/hr)	Annual Emissions (ton CO_2e/yr)
Greenhouse Gas (CO_2e)	CO_2	1	875.10	43.76
	N_2O	298	2.09	0.10
	CH_4	25	11.93	0.60
	Total GHGs	-	**889.13**	**44.46**

Notes:

1. Based on information provided by engineering (CTI), on 09/27/2018. Maximum hours of operation are 100hrs/yr. Fuel consumption (flow) rate is an engineering estimate based on representative engine, vendor provided data.

2. Emission factors for NOx, CO, PM and VOC are based on vendor guarantees (vendor will comply with NSPS Subpart IIII requirements).

3. Emission factors for HAPs, SO_2, CO_2, and CH_4 from USEPA AP 42 Section 3.4 - Large Stationary Diesel and All Stationary Dual-Fuel (Diesel fuel) Engines, October 1996. SO_2 emission factor based on low sulfur diesel with 0.0015% sulfur content (15 ppm). N_2O emission factor based on 40 CFR 98 Table C-2 to Subpart C.

Table 11D
Emissions for Each Pedestal Crane Diesel Engine
Sea Port Oil Terminal Project

Parameter	Value	Units
Fuel	diesel	-
Power Rating	439	kW
	589	hp
Fuel Flow[1]	31.8	gal/hr
Heating Value of Low-Sulfur Diesel	129,488	Btu/gal
Engine Heat Rate	4.12	MMBtu/hr
Maximum Yearly Operation	4380	hr/yr

Pollutant Type	Pollutant	Emission Factor[3] (lb/MMBtu)	Emission Factor[2,3] (g/hp-hr)	Maximum Hourly Emission Rate (lb/hr)	Annual Emissions (tpy)
Criteria	NO_x	-	0.299	0.39	0.85
	CO	-	2.612	3.39	7.43
	VOC	-	0.142	0.18	0.40
	PM	-	0.015	0.02	0.04
	PM_{10}	-	0.015	0.02	0.04
	$PM_{2.5}$	-	0.015	0.02	0.042
	SO_2	-	0.006	0.01	0.02
HAPs	Benzene	7.76E-04	-	0.003	0.0070
	Toluene	2.81E-04	-	0.001	0.0025
	Xylenes	1.93E-04		0.001	0.0017
	Formaldehyde	7.89E-05		0.000	0.0007
	Acetaldehyde	2.52E-05		0.000	0.0002
	Acrolein	7.88E-05		0.000	0.0007
	PAH	2.12E-04		0.001	0.0019
	Total HAPs	-	-	**0.01**	**0.0149**
Greenhouse Gas	CO_2	165	-	680.45	1,490.18
	N_2O	0.00132		0.01	0.0119
	CH_4	0.0900	-	0.37	0.813

Pollutant Type	Pollutant	Global Warming Potential (GWP)	Maximum Hourly Emission Rate (lb CO_2e/hr)	Annual Emissions (ton CO_2e/yr)
Greenhouse Gas (CO_2e)	CO_2	1	680.45	1,490.18
	N_2O	298	1.63	3.56
	CH_4	25	9.28	20.32
	Total GHGs	-	**691.35**	**1,514.07**

Notes:

1. Based on information provided by engineering (CTI), on 09/27/2018. Fuel consumption (flow) rate is an engineering estimate based on representative engine, vendor provided data.

2. Emission factors (except for HAPs, CO_2 and CH_4) based on EPA's Tier IIII non-road engine standards (NSPS Subpart IIII compliance, vendor guaranteed).

3. Emission factors for HAPs, CO_2, and CH_4 from USEPA AP 42 Section 3.4 - Large Stationary Diesel and All Stationary Dual-Fuel (Diesel fuel) Engines, October 1996. SO_2 emission factor based on low sulfur diesel with 0.0015% sulfur content (15 ppm). N_2O emission factor based on 40 CFR 98 Table C-2 to Subpart C.

Table 12D

Emissions for Each Diesel Fire Water Pump Engine

Sea Port Oil Terminal Project

Parameter	Value	Units
Fuel	diesel	-
Power Rating	805	kW
	1080	hp
Fuel Flow[1]	58.4	gal/hr
Heating Value of Low-Sulfur Diesel	129,488	Btu/gal
Engine Heat Rate	7.56	MMBtu/hr
Maximum Yearly Operation	100	hr/yr

Pollutant Type	Pollutant	Emission Factor[2,3] (lb/MMBtu)	Emission Factor[2] (g/hp-hr)	Maximum Hourly Emission Rate (lb/hr)	Annual Emissions (tpy)
Criteria	NO_x	-	4.800	11.43	0.57
	CO	-	2.600	6.19	0.31
	VOC	-	4.800	11.43	0.57
	PM	-	0.150	0.36	0.018
	PM_{10}	-	0.150	0.36	0.018
	$PM_{2.5}$	-	0.150	0.36	0.0179
	SO_2	-	0.006	0.01	0.0007
HAPs	Benzene	0.000776	-	0.006	0.0003
	Toluene	0.000281	-	0.002	0.0001
	Xylenes	1.93E-04		0.001	0.0001
	Formaldehyde	7.89E-05		0.001	0.0000
	Acetaldehyde	2.52E-05		0.000	0.0000
	Acrolein	7.88E-05		0.001	0.0000
	PAH	2.12E-04		0.002	0.0001
	Total HAPs	-	-	**0.012**	**0.0006**
Greenhouse Gas	CO_2	165	-	1,247	62
	N_2O	0.00132		0.010	0.0005
	CH_4	0.0900	-	0.68	0.034

Pollutant Type	Pollutant	Global Warming Potential (GWP)	Maximum Hourly Emission Rate (lb CO_2e/hr)	Annual Emissions (ton CO_2e/yr)
Greenhouse Gas (CO_2e)	CO_2	1	1,247	62.36
	N_2O	298	2.98	0.15
	CH_4	25	17.01	0.85
	Total GHGs	-	**1,267**	**63.36**

Notes:

1. Based on information provided by engineering (CTI), on 09/27/2018. Maximum hours of operation are 100hrs/yr. Fuel consumption (flow) rate is an engineering estimate based on representative engine, vendor provided data.

2. Emission factors (except for HAPs, CO_2 and CH_4) obtained from Table 4, NSPS Subpart IIII.

3. HAPs, CO_2, CH_4 factors from USEPA AP 42 Section 3.4 - Large Stationary Diesel and All Stationary Dual-Fuel (Diesel fuel) Engines, October 1996. SO_2 emission factor based on low sulfur diesel with 0.0015% sulfur content (15 ppm). N_2O emission factor based on 40 CFR 98 Table C-2 to Subpart C.

Table 13D

VOC Emissions for Diesel Storage Tanks

Sea Port Oil Terminal Project

Diesel Storage Tank 1

Parameter	Value	Units
Type of Tank	Vertical Fixed Roof Tank	
Description	Diesel Storage Tank	
Shell Height	24	ft
Diameter	15.5	ft
Tank Volume	31,332.00	gal
Turnovers	20	
Net Throughput	635,343.33	gal/yr
Working Loss	18.35	lb/yr
Breathing Loss	1.6	lb/yr
Total Losses (emissions)	19.95	lb/yr
Total Losses (emissions)	**0.0100**	**tpy**
Max Hourly Loss	**0.0031**	**lb/hr**

Crane Pedestal Diesel Storage Tank

Parameter	Value	Units
Type of Tank	Vertical Fixed Roof Tank	
Description	Diesel Storage Tank	
Shell Height	15	ft
Diameter	10	ft
Tank Volume	8,316.00	gal
Turnovers	20	
Net Throughput	168,630.00	gal/yr
Working Loss	4.56	lb/yr
Breathing Loss	1.26	lb/yr
Total Losses (emissions)	5.82	lb/yr
Total Losses (emissions)	**0.0029**	**tpy**
Max Hourly Loss	**0.0011**	**lb/hr**

Notes:

1. The emissions estimate is based on TANKS Program (Version 4.09d), from equations in AP42 Section 7.1, Organic Liquid Storage Tanks

2. The size of diesel storage is based on about 18 days of storage capacity for use in pedestal crane engines and diesel generators for power generation.

3. Maximum hourly loss based on highest monthly total loss from TANKS Program (Ver 4.09d).

Table 14D
Emissions for Vapor Combustors from Pigging of Vapor Recovery Pipelines
Sea Port Oil Terminal Project

Parameter	Value	Units
Atmospheric Pressure	13	psia
Pipe Pressure	100	psia
Atmospheric Temperature	95	°F
Pipe Temperature	70	°F
Number of Pipelines/Receivers	4	
Vapor Line Diameter	16	in
Vapor Line Length	4,000	ft
Total Pigging Volume	5,585	cf
Pigging Frequency - Annual Number of Events[1]	208	events/yr
Pigging Expanded Gas Volume Vented[3]	56,734	cf/event
Maximum Number of Hourly Pigging Events	1	events/hr
Pipelines Pigged Simultaneously	1	lines

Vapor Return Line Gas Composition (from Pigging)[4]	Molecular Weight (MW)	Composition[4]	Composition[4]	Maximum Uncontrolled Hourly Emissions	Maximum Uncontrolled Annual Emissions	Control Efficiency	Maximum Controlled Annual Emissions	Maximum Controlled Annual Emissions
		(mol %)	(wt %)	(lb/hr)	(tpy)	%	(lb/hr)	(tpy)
Carbon Dioxide	44.01	10.46	14.99	688.20	286.29	--	688.20	286.29
Nitrogen	28.01	70.77	64.53	--	--	--	--	--
Oxygen	31.99	2.85	2.96	--	--	--	--	--
Water	18.015	9.69	5.68	--	--	--	--	--
Methane (CH4)	16.04	0.00	0.00	0.00	0.00	0.95	0.00	0.00
Ethane (C2H6)	30.07	0.42	0.41	18.70	7.78	0.95	0.93	0.39
Propane (C3H8)	44.10	2.48	3.56	163.34	67.95	0.95	8.17	3.40
Butane (C4H10)	58.12	2.37	4.49	206.23	85.79	0.95	10.31	4.29
Pentane (C5H12)	72.15	0.01	0.02	1.02	0.43	0.95	0.05	0.02
Hexane (C6H14)	86.20	0.04	0.12	5.50	2.29	0.95	0.28	0.11
i-Hexane	86.18	0.16	0.43	19.98	8.31	0.95	1.00	0.42
Heptane (C7H16)	100.21	0.22	0.73	33.48	13.93	0.95	1.67	0.70
Octane (C8H18)	114.23	0.19	0.71	32.80	13.64	0.95	1.64	0.68
Nonane (C9H20)	128.26	0.15	0.62	28.34	11.79	0.95	1.42	0.59
Decane (C10H22)	142.29	0.11	0.52	23.68	9.85	0.95	1.18	0.49
C11+	156.31	0.00	0.00	--	--	0.95	--	--
Benzene	78.11	0.01	0.02	1.13	0.47	0.95	0.06	0.02
Toluene	92.14	0.03	0.08	3.88	1.61	0.95	0.19	0.08
Ethylbenzene	106.17	0.01	0.03	1.54	0.64	0.95	0.08	0.03
m & p Xylene	106.16	0.02	0.07	3.04	1.27	0.95	0.15	0.06
o-Xylene	106.16	0.01	0.02	0.94	0.39	0.95	0.05	0.02
Max H_2S	34	--	0.0072	0.33	0.14	0.95	0.0165	0.0068
Total VOC	--	5.81	11.44	525.22	218.49	--	26.26	10.92
H_2S	--	--	0.0072	0.33	0.14	--	0.02	0.0068
Total HAP	--	0.12	0.35	16.03	6.67	--	0.80	0.33

Pigging Vapor Combustion Emissions

Hourly Maximum Heat Rate to Vapor Combustor[4]	90	MMBtu/hr
Annual Hours of Operation for Pigging of Four (4) Vapor Pipelines	416	hr/yr
Annual Heat Rate to Vapor Combustor[4]	37,440	MMBtu/yr

Pollutant	lb/MMBtu[5, 6, 7]	Hourly Emissions (lb/hr)	Annual Emissions (tpy)
NO_x	0.15	13.50	2.81
CO	0.30	27.00	5.62
PM	0.0083	0.75	0.16
PM_{10}	0.0083	0.75	0.16
$PM_{2.5}$	0.0083	0.75	0.16
SO_2	0.0072	0.62	0.26
CO_2	--	688.20	286.29
N_2O	0.00130	0.12	0.02
CH_4	0.0066	0.59	0.12

Pollutant Type	Pollutant	Global Warming Potential (GWP)	Maximum Hourly Emission Rate ($lb\ CO_2e/hr$)	Annual Emissions ($ton\ CO_2e/yr$)
Greenhouse Gas (CO_2e)	CO_2	1	688	286.29
	N_2O	298	35	7.25
	CH_4	25	15	3.09
	Total GHGs	-	738	296.63

Basis of Calculation:

Emissions from pigging operations are calculated based on a mass balance as follows:

Volume of gas released (scf/event) = [Volume of Pressurized Gas in Pipe (scf)] * [Pipe Pressure (psia)] / [Atmospheric Pressure (psia)]

Maximum Uncontrolled Hourly Emissions for each Unit (lb/hr) = [Volume of gas released (scf/event)] x [MW of stream (lb/lb-mol)] x [wt % VOC or speciated constituent] * [events per hour (event/hr) / [379.5 (scf/lb-mol)]

Maximum Uncontrolled Annual Emissions for each Unit (tpy) = [Volume of gas released (scf/event)] x [MW of stream (lb/lb-mol)] x [wt % VOC or speciated constituent] x [frequency of events (events/yr)] / [379.5 (scf/lb-mol)] / [2,000 (lb/ton)]

NOx and CO Hourly Emissions (lb/hr) = Emission Rate (lb/MMBtu) x Hourly Gas Stream Heat Input (MMBtu/hr)

NO_x and CO Annual Emissions (tpy) = Emission Rate (lb/MMBtu) x Annual Gas Stream Heat Input (MMBtu/yr)

Notes:

[1] Four (4) incoming vapor recovery pipeline pig launchers/receivers launch/receive the pigs from the platform through the two (2) PLEMs and back to platform (round-trip pigging). Each incoming vapor pipeline is assumed to be pigged once per week, a total of 208 events annually.

[2] The vented gas from pig receiver will be nitrogen, which is used as a motive force for pigging. The hydrocarbon vapors in the vapor recovery pipeline loop will be pushed ahead of the pig and be forced into vapor combustors destruction system i.e. vapor combustors. Vapor combustor destruction efficiency at 95%. Emissions presented for vapor combustor in Table 3D (Overall Emissions for Platform) include emissions from the vapor pipelines.

[3] Gas volume vented per event is conservatively estimated using the ideal gas law based on pipeline temperature and pressure as compared to atmospheric temperature and pressure. Annual emissions account for the pigging of four (4) vapor pipelines.

[4] Vapor composition and heat rate based on vendor provided crude vapor properties leaving ship, at approximately 50% loading

[5] NOx and CO emission factors are based on vendor guarantees - based on information provided by engineering (CTI/EDG). PM emissions factors from USEPA AP-42 - Section 1.4 - Natural Gas Combustion.

[6] SO_2 emission based on maximum sulfur content of 66 ppmw. Normally negligible amount of sulfur is expected in the crude oil/condensate vapor.

[7] N_2O, CH_4 emission factors 40 CFR 98 Table C-2 to Subpart C for petroleum products-crude oil.

Table 15D
Emissions for Vent Boom from Pigging of Crude Oil Pipelines
Sea Port Oil Terminal Project

Parameter	Value	Units
Volume of Equipment	212	cf
Average True Vapor Pressure	7.60	psia (at $70^0F/530^0R$)
Maximum True Vapor Pressure	11.00	psia (at $95^0F/555^0R$)
Molecular Weight\Gas Constant	50	lb/lb-mol
Gas Constant	11	psia.ft^3/lb-mol.^0R
Average Temperature	530	°R
Maximum Temperature	555	°R
Number of Pipelines/Receivers	4	
Pigging Frequency - Annual Number of Events	208	events/yr
Maximum Hourly Emissions	**19.59**	**lb/hr**
Annual Emissions	**2.04**	**tpy**

Basis of Calculation:

The following empirical equation is used to calculate emissions: Emissions (lb/hr) = P(psia)*V(ft^3)*M.W(lb/lb-mol)/R(psia.ft^3/lb-mol^{0}R)/T(^{0}R)

Notes:

1. Four (4) departing oil pipeline pig launchers/receivers launch/receive the pigs from the platform through the two (2) PLEMs and back to platform (round-trip pigging). Each pipeline is assumed to be pigged once per week, total 208 events annually.

2. A pig will be launched from the pig trap serving as a launcher using crude oil as the motive force. The departing oil pipeline only contributes emissions when the pig trap is drained into the closed drain header and causes hydrocarbon vapor venting into in that vessel. The drained oil is sent to offloading tank and evaporative losses (hydrocarbons) pass through a vent scrubber to the atmosphere via vent boom.

3. Max TVP (11 psia) is used in hourly calculations. Annual emissions are conservatively based on maximum hourly emissions for 208 event per year.

Table 16D
Emissions for Component Fugitives
Sea Port Oil Terminal Project

					VOC Emissions[5]		H_2S Emissions (Crude Oil/Condensate)[6]		CO_2 Emissions (Crude Oil/Condensate)[7]	
Equipment/ Service	EPN	Service Type[1]	Component Count[2]	Emission Factor[3] (lb/hr-component)	Maximum Hourly Emissions (lb/hr)	Annual Emissions (tpy)	Maximum Hourly Emissions (lb/hr)	Annual Emissions (tpy)	Maximum Hourly Emissions (lb/hr)	Annual Emissions (tpy)
Valves	FUG	Gas/Vapor	226	0.00992	2.24	9.82	0.02	7.72E-03	0.34	1.47
	FUG	Light Liquid	328	0.0055	1.80	7.90	0.01	6.21E-03	0.00E+00	0.00E+00
Pumps	FUG	Gas/Vapor	42	0.00529	0.22	0.97	1.59E-03	7.65E-04	0.03	0.15
	FUG	Light Liquid	4	0.02866	0.11	0.50	8.22E-04	3.95E-04	0.00E+00	0.00E+00
Flanges	FUG	Gas/Vapor	230	0.00086	0.20	0.87	1.42E-03	6.81E-04	0.03	0.13
	FUG	Light Liquid	276	0.000243	0.07	0.29	4.81E-04	2.31E-04	0.00E+00	0.00E+00
Relief Valves	FUG	Gas/Vapor	11	0.0194	0.21	0.93	1.53E-03	7.35E-04	0.03	0.14
	FUG	Light Liquid	13	0.0165	0.21	0.94	1.54E-03	7.39E-04	0.00E+00	0.00E+00
Other[4]	FUG	Light Liquid	8	0.0165	0.13	0.58	9.46E-04	4.54E-04	0.00E+00	0.00E+00
				Total VOC	5.21	22.81	0.04	0.02	0.43	1.89

Fugitive Speciated Emissions

Compound	Worst Case Wt%[5]	VOC Emissions		Speciated Emissions	
		Maximum Hourly Emissions (lb/hr)	Annual Emissions (tpy)	Maximum Hourly Emissions (lb/hr)	Annual Emissions (tpy)
Hexane	6.000	5.21	22.81	0.3125	1.3685
i-Octane (2,2,4 trimethylpentane)	0.125			0.0065	0.0285
Benzene	0.980			0.0510	0.2235
Cumene (isopropylbenzne)	0.125			0.0065	0.0285
Toluene	2.750			0.1432	0.6272
Ethylbenzene	0.230			0.0120	0.0525
m & p Xylene	2.950			0.1536	0.6729
o-Xylene	0.510			0.0266	0.1163
Total HAP				0.7119	3.1180

	Max Vapor wt Fraction	Avg Vapor wt Fraction	Unit
H_2S Emission Factor[6]	0.0072	0.0008	lb H_2S/lb VOC

Notes:

[1] Light liquids are those with a vapor pressure > 0.044 psia at 68°F, according to TCEQ Air Permit Technical Guidance for Chemical Sources: Fugitive Guidance (June 2018).

[2] Based on engineering (CTI) provided component count, on 11/01/2018.

[3] Used Gas and Oil Production Operations, Gas factors for gas and Light Oil > 20° API gravity factors for light liquids from Table II: Facility/Compound Specific Fugitive Emission Factors, TCEQ Fugitive Guidance (June 2018)

[4] Used emission factor (lb/hr-component) for "Other" from Table II: Facility/Compound Specific Fugitive Emission Factors, TCEQ Fugitive Guidance (June 2018)

[5] VOC emissions based on conservative assumption that vapor lines will contain only VOCs during the entire loading operation. VOC speciation conservatively based on condensate speciation.

[6] Based on hourly maximum 66 ppmw H_2S and annual average 5 ppmw H_2S in liquid product. H_2S emissions calculated using the following equation:
Uncontrolled Emissions (lb/hr or tpy) x H_2S Emission Factor (lb H_2S/lb VOC)

[7] CO_2 emissions from vapor lines based on approximate 15wt% of CO_2 in vapor composition, at approximately 50% loading

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification	
User Identification:	DT1
City:	Galveston
State:	Texas
Company:	SPOT Terminal Services, LLC
Type of Tank:	Vertical Fixed Roof Tank
Description:	Diesel Storage Tank 1
Tank Dimensions	
Shell Height (ft):	24.00
Diameter (ft):	15.50
Liquid Height (ft) :	22.20
Avg. Liquid Height (ft):	20.00
Volume (gallons):	31,332.00
Turnovers:	20.00
Net Throughput(gal/yr):	626,640.00
Is Tank Heated (y/n):	N
Paint Characteristics	
Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good
Roof Characteristics	
Type:	Dome
Height (ft)	0.00
Radius (ft) (Dome Roof)	0.00
Breather Vent Settings	
Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Galveston, Texas (Avg Atmospheric Pressure = 14.7 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

DT1 - Vertical Fixed Roof Tank
Galveston, Texas

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	Jan	63.27	60.30	66.24	69.66	0.0073	0.0066	0.0081	130.0000			188.00	Option 1: VP60 = .0065 VP70 = .009
Distillate fuel oil no. 2	Feb	64.74	61.55	67.92	69.66	0.0077	0.0069	0.0085	130.0000			188.00	Option 1: VP60 = .0065 VP70 = .009
Distillate fuel oil no. 2	Mar	67.98	64.57	71.39	69.66	0.0085	0.0076	0.0094	130.0000			188.00	Option 1: VP60 = .0065 VP70 = .009
Distillate fuel oil no. 2	Apr	71.64	68.20	75.09	69.66	0.0095	0.0085	0.0105	130.0000			188.00	Option 1: VP70 = .009 VP80 = .012
Distillate fuel oil no. 2	May	74.87	71.21	78.54	69.66	0.0105	0.0094	0.0116	130.0000			188.00	Option 1: VP70 = .009 VP80 = .012
Distillate fuel oil no. 2	Jun	77.40	73.60	81.19	69.66	0.0112	0.0101	0.0125	130.0000			188.00	Option 1: VP70 = .009 VP80 = .012
Distillate fuel oil no. 2	Jul	78.12	74.46	81.77	69.66	0.0114	0.0103	0.0127	130.0000			188.00	Option 1: VP70 = .009 VP80 = .012
Distillate fuel oil no. 2	Aug	78.06	74.46	81.68	69.66	0.0114	0.0103	0.0127	130.0000			188.00	Option 1: VP70 = .009 VP80 = .012
Distillate fuel oil no. 2	Sep	76.24	72.78	79.69	69.66	0.0109	0.0098	0.0119	130.0000			188.00	Option 1: VP70 = .009 VP80 = .012
Distillate fuel oil no. 2	Oct	72.79	69.51	76.08	69.66	0.0098	0.0089	0.0108	130.0000			188.00	Option 1: VP70 = .009 VP80 = .012
Distillate fuel oil no. 2	Nov	68.52	65.53	71.50	69.66	0.0086	0.0079	0.0095	130.0000			188.00	Option 1: VP60 = .0065 VP70 = .009
Distillate fuel oil no. 2	Dec	64.64	61.96	67.72	69.66	0.0077	0.0070	0.0084	130.0000			188.00	Option 1: VP60 = .0065 VP70 = .009

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

DT1 - Vertical Fixed Roof Tank
Galveston, Texas

Month:	January	February	March	April	May	June	July	August	September	October	November	December
Standing Losses (lb):	0.0938	0.0962	0.1261	0.1360	0.1645	0.1761	0.1769	0.1733	0.1534	0.1369	0.1058	0.0945
Vapor Space Volume (cu ft):	955.3758	955.3758	955.3758	955.3758	955.3758	955.3758	955.3758	955.3758	955.3758	955.3758	955.3758	955.3758
Vapor Density (lb/cu ft):	0.0002	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0003	0.0002	0.0002	0.0002	0.0002
Vapor Space Expansion Factor:	0.0187	0.0203	0.0219	0.0220	0.0235	0.0244	0.0233	0.0228	0.0218	0.0207	0.0187	0.0180
Vented Vapor Saturation Factor:	0.9980	0.9979	0.9977	0.9975	0.9972	0.9970	0.9969	0.9969	0.9971	0.9974	0.9977	0.9979
Tank Vapor Space Volume:												
Vapor Space Volume (cu ft):	955.3758	955.3758	955.3758	955.3758	955.3758	955.3758	955.3758	955.3758	955.3758	955.3758	955.3758	955.3758
Tank Diameter (ft):	15.5000	15.5000	15.5000	15.5000	15.5000	15.5000	15.5000	15.5000	15.5000	15.5000	15.5000	15.5000
Vapor Space Outage (ft):	5.0632	5.0632	5.0632	5.0632	5.0632	5.0632	5.0632	5.0632	5.0632	5.0632	5.0632	5.0632
Tank Shell Height (ft):	24.0000	24.0000	24.0000	24.0000	24.0000	24.0000	24.0000	24.0000	24.0000	24.0000	24.0000	24.0000
Average Liquid Height (ft):	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000
Roof Outage (ft):	1.0632	1.0632	1.0632	1.0632	1.0632	1.0632	1.0632	1.0632	1.0632	1.0632	1.0632	1.0632
Roof Outage (Dome Roof)												
Roof Outage (ft):	1.0632	1.0632	1.0632	1.0632	1.0632	1.0632	1.0632	1.0632	1.0632	1.0632	1.0632	1.0632
Dome Radius (ft):	15.5000	15.5000	15.5000	15.5000	15.5000	15.5000	15.5000	15.5000	15.5000	15.5000	15.5000	15.5000
Shell Radius (ft):	7.7500	7.7500	7.7500	7.7500	7.7500	7.7500	7.7500	7.7500	7.7500	7.7500	7.7500	7.7500
Vapor Density												
Vapor Density (lb/cu ft):	0.0002	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0003	0.0002	0.0002	0.0002	0.0002
Vapor Molecular Weight (lb/lb-mole):	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0073	0.0077	0.0085	0.0095	0.0105	0.0112	0.0114	0.0114	0.0109	0.0098	0.0086	0.0077
Daily Avg. Liquid Surface Temp. (deg. R):	522.9429	524.4055	527.8456	531.3114	534.5439	537.0653	537.7897	537.7300	535.9093	532.4846	528.1864	524.5092
Daily Average Ambient Temp. (deg. F):	52.7000	55.2000	61.7000	69.2500	75.8000	81.1000	83.2500	83.4500	79.9500	72.7500	64.1500	56.4000
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731
Liquid Bulk Temperature (deg. R):	529.3317	529.3317	529.3317	529.3317	529.3317	529.3317	529.3317	529.3317	529.3317	529.3317	529.3317	529.3317
Tank Paint Solar Absorptance (Shell):	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	800.0000	1,070.0000	1,353.0000	1,609.0000	1,870.0000	2,011.0000	1,846.0000	1,736.0000	1,527.0000	1,321.0000	953.0000	754.0000
Vapor Space Expansion Factor												
Vapor Space Expansion Factor:	0.0187	0.0203	0.0219	0.0220	0.0235	0.0244	0.0233	0.0228	0.0218	0.0207	0.0187	0.0180
Daily Vapor Temperature Range (deg. R):	11.8720	12.7252	13.6403	13.7788	14.6612	15.1864	14.6190	14.3834	13.8205	13.1280	11.9523	11.5090
Daily Vapor Pressure Range (psia):	0.0015	0.0016	0.0018	0.0020	0.0022	0.0024	0.0024	0.0023	0.0021	0.0019	0.0016	0.0014
Breather Vent Press. Setting Range(psia):	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0073	0.0077	0.0085	0.0095	0.0105	0.0112	0.0114	0.0114	0.0109	0.0098	0.0086	0.0077
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0066	0.0069	0.0076	0.0085	0.0094	0.0101	0.0103	0.0103	0.0098	0.0089	0.0079	0.0070
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0081	0.0085	0.0094	0.0105	0.0116	0.0125	0.0127	0.0127	0.0119	0.0108	0.0095	0.0084
Daily Avg. Liquid Surface Temp. (deg R):	522.9429	524.4055	527.8456	531.3114	534.5439	537.0653	537.7897	537.7300	535.9093	532.4846	528.1864	524.5092
Daily Min. Liquid Surface Temp. (deg R):	519.9749	521.2242	524.2355	527.8667	530.8786	533.2682	534.1350	534.1341	532.4542	529.1826	525.1983	521.6319
Daily Max. Liquid Surface Temp. (deg R):	525.9109	527.5868	531.0557	534.7561	538.2092	540.8624	541.4445	541.3258	539.3644	535.7466	531.1745	527.3864
Daily Ambient Temp. Range (deg. R):	11.2000	10.6000	10.0000	8.5000	8.0000	7.8000	8.1000	8.5000	9.1000	9.5000	10.3000	11.0000
Vented Vapor Saturation Factor												
Vented Vapor Saturation Factor:	0.9980	0.9979	0.9977	0.9975	0.9972	0.9970	0.9969	0.9969	0.9971	0.9974	0.9977	0.9979
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0073	0.0077	0.0085	0.0095	0.0105	0.0112	0.0114	0.0114	0.0109	0.0098	0.0086	0.0077
Vapor Space Outage (ft):	5.0632	5.0632	5.0632	5.0632	5.0632	5.0632	5.0632	5.0632	5.0632	5.0632	5.0632	5.0632
Working Losses (lb):	1.1828	1.2420	1.3729	1.5343	1.6910	1.8133	1.8484	1.8455	1.7572	1.5902	1.3948	1.2462
Vapor Molecular Weight (lb/lb-mole):	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0073	0.0077	0.0085	0.0095	0.0105	0.0112	0.0114	0.0114	0.0109	0.0098	0.0086	0.0077
Net Throughput (gal/mo.):	52,220.0000	52,220.0000	52,220.0000	52,220.0000	52,220.0000	52,220.0000	52,220.0000	52,220.0000	52,220.0000	52,220.0000	52,220.0000	52,220.0000
Annual Turnovers:	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000
Turnover Factor:	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Maximum Liquid Volume (gal):	31,332.0000	31,332.0000	31,332.0000	31,332.0000	31,332.0000	31,332.0000	31,332.0000	31,332.0000	31,332.0000	31,332.0000	31,332.0000	31,332.0000
Maximum Liquid Height (ft):	22.1974	22.1974	22.1974	22.1974	22.1974	22.1974	22.1974	22.1974	22.1974	22.1974	22.1974	22.1974
Tank Diameter (ft):	15.5000	15.5000	15.5000	15.5000	15.5000	15.5000	15.5000	15.5000	15.5000	15.5000	15.5000	15.5000
Working Loss Product Factor:	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total Losses (lb):	1.2767	1.3381	1.4990	1.6703	1.8556	1.9894	2.0254	2.0189	1.9107	1.7271	1.5003	1.3407

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: January, February, March, April, May, June, July, August, September, October, November, December

DT1 - Vertical Fixed Roof Tank
Galveston, Texas

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	18.52	1.63	20.15

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification		
User Identification:	DT1	
City:	Galveston	
State:	Texas	
Company:	SPOT Terminal Services, LLC	
Type of Tank:	Vertical Fixed Roof Tank	
Description:	Diesel Storage Tank 1	
Tank Dimensions		
Shell Height (ft):		24.00
Diameter (ft):		15.50
Liquid Height (ft) :		22.20
Avg. Liquid Height (ft):		20.00
Volume (gallons):		31,332.00
Turnovers:		20.00
Net Throughput(gal/yr):		626,640.00
Is Tank Heated (y/n):	N	
Paint Characteristics		
Shell Color/Shade:	White/White	
Shell Condition	Good	
Roof Color/Shade:	White/White	
Roof Condition:	Good	
Roof Characteristics		
Type:	Dome	
Height (ft)		0.00
Radius (ft) (Dome Roof)		0.00
Breather Vent Settings		
Vacuum Settings (psig):		-0.03
Pressure Settings (psig)		0.03

Meterological Data used in Emissions Calculations: Galveston, Texas (Avg Atmospheric Pressure = 14.7 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

DT1 - Vertical Fixed Roof Tank
Galveston, Texas

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	71.54	68.18	74.90	69.66	0.0095	0.0085	0.0105	130.0000			188.00	Option 1: VP70 = .009 VP80 = .012

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

DT1 - Vertical Fixed Roof Tank
Galveston, Texas

Annual Emission Calcaulations	
Standing Losses (lb):	1.6022
Vapor Space Volume (cu ft):	955.3758
Vapor Density (lb/cu ft):	0.0002
Vapor Space Expansion Factor:	0.0213
Vented Vapor Saturation Factor:	0.9975
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	955.3758
Tank Diameter (ft):	15.5000
Vapor Space Outage (ft):	5.0632
Tank Shell Height (ft):	24.0000
Average Liquid Height (ft):	20.0000
Roof Outage (ft):	1.0632
Roof Outage (Dome Roof)	
Roof Outage (ft):	1.0632
Dome Radius (ft):	15.5000
Shell Radius (ft):	7.7500
Vapor Density	
Vapor Density (lb/cu ft):	0.0002
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0095
Daily Avg. Liquid Surface Temp. (deg. R):	531.2087
Daily Average Ambient Temp. (deg. F):	69.6417
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	529.3317
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,404.1667
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0213
Daily Vapor Temperature Range (deg. R):	13.4398
Daily Vapor Pressure Range (psia):	0.0019
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0095
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0085
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0105
Daily Avg. Liquid Surface Temp. (deg R):	531.2087
Daily Min. Liquid Surface Temp. (deg R):	527.8487
Daily Max. Liquid Surface Temp. (deg R):	534.5686
Daily Ambient Temp. Range (deg. R):	9.3833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9975
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0095
Vapor Space Outage (ft):	5.0632
Working Losses (lb):	18.3517

Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0095
Annual Net Throughput (gal/yr.):	626,640.0000
Annual Turnovers:	20.0000
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	31,332.0000
Maximum Liquid Height (ft):	22.1974
Tank Diameter (ft):	15.5000
Working Loss Product Factor:	1.0000
Total Losses (lb):	19.9540

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

DT1 - Vertical Fixed Roof Tank
Galveston, Texas

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	18.35	1.60	19.95

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification		
User Identification:	DT3	
City:	Galveston	
State:	Texas	
Company:	SPOT Terminal Services, LLC	
Type of Tank:	Vertical Fixed Roof Tank	
Description:	SPOT Crane Pedestal Diesel Storage Tank	
Tank Dimensions		
Shell Height (ft):		15.00
Diameter (ft):		10.00
Liquid Height (ft) :		14.00
Avg. Liquid Height (ft):		10.00
Volume (gallons):		8,225.29
Turnovers:		20.00
Net Throughput(gal/yr):		164,505.76
Is Tank Heated (y/n):	N	
Paint Characteristics		
Shell Color/Shade:	White/White	
Shell Condition	Good	
Roof Color/Shade:	White/White	
Roof Condition:	Good	
Roof Characteristics		
Type:	Dome	
Height (ft)		0.00
Radius (ft) (Dome Roof)		0.00
Breather Vent Settings		
Vacuum Settings (psig):		-0.03
Pressure Settings (psig)		0.03

Meterological Data used in Emissions Calculations: Houston, Texas (Avg Atmospheric Pressure = 14.7 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

DT3 - Vertical Fixed Roof Tank
Galveston, Texas

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	69.81	64.30	75.32	67.93	0.0090	0.0076	0.0106	130.0000			188.00	Option 1: VP60 = .0065 VP70 = .009

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

DT3 - Vertical Fixed Roof Tank
Galveston, Texas

Annual Emission Calcaulations	
Standing Losses (lb):	1.2565
Vapor Space Volume (cu ft):	446.5699
Vapor Density (lb/cu ft):	0.0002
Vapor Space Expansion Factor:	0.0377
Vented Vapor Saturation Factor:	0.9973
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	446.5699
Tank Diameter (ft):	10.0000
Vapor Space Outage (ft):	5.6859
Tank Shell Height (ft):	15.0000
Average Liquid Height (ft):	10.0000
Roof Outage (ft):	0.6859
Roof Outage (Dome Roof)	
Roof Outage (ft):	0.6859
Dome Radius (ft):	10.0000
Shell Radius (ft):	5.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0002
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0090
Daily Avg. Liquid Surface Temp. (deg. R):	529.4813
Daily Average Ambient Temp. (deg. F):	67.9125
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	527.6025
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,405.5061
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0377
Daily Vapor Temperature Range (deg. R):	22.0322
Daily Vapor Pressure Range (psia):	0.0030
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0090
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0076
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0106
Daily Avg. Liquid Surface Temp. (deg R):	529.4813
Daily Min. Liquid Surface Temp. (deg R):	523.9732
Daily Max. Liquid Surface Temp. (deg R):	534.9893
Daily Ambient Temp. Range (deg. R):	21.3083
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9973
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0090
Vapor Space Outage (ft):	5.6859
Working Losses (lb):	4.5586

Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0090
Annual Net Throughput (gal/yr.):	164,505.7600
Annual Turnovers:	20.0000
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	8,225.2880
Maximum Liquid Height (ft):	14.0000
Tank Diameter (ft):	10.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	5.8151

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

DT3 - Vertical Fixed Roof Tank
Galveston, Texas

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	4.56	1.26	5.82

APPENDIX E
TCEQ TECHNICAL APPLICATION TABLES

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Texas Commission on Environmental Quality
Table 4
Combustion Units

Operational Data			
Emission Point Number (from Flow Diagram): VC1 (same as VC2, VC3)			
Model Number *(if available):* Zm-333-1365-3/09/08-DB/K/SS			
Name of Device: Vapor Combustor			
Manufacturer: John Zink Hamworthy Combustion			
Characteristics of Input			
Chemical Composition of Waste Material*			
Material	**Minimum Value Expected lb/hr**	**Average Value Expected lb/hr**	**Design Maximum lb/hr**
Crude oil Vapor	See Table 5D, 6D (Appendix		
Gross heating value of waste material as Btu/lb *(Wet Basis if applicable):* 18,352 Btu/lb (crude oil)			
Air Supplied for Waste Material in SCFM (70°F and 14.7 psia)			
Minimum:		Maximum:	
Waste Material of Contaminated Gas – Total Flow Rate			
Minimum Expected (lb/hr): See Table 7D, 8D, App. D		Design Maximum (lb/hr):	
Waste Material of Contaminated Gas – Inlet Temperature			
Minimum Expected (°F): Ambient		Design Maximum (°F):	
Chemical Composition of Fuel			
Material	**Minimum Value Expected lb/hr**	**Average Value Expected lb/hr**	**Design Maximum lb/hr**
Propane (enrichment gas)			Variable
Propane (pilot gas)			1scfm per pilot (3 pilots)
Gross heat value of fuel (Btu/lb): 21,564			
Air Supplied for Fuel in SCFM (70°F and 14.7 psia)			
Minimum: 3 - 5 HP 480 V TEFC motor drives the blowers		Maximum:	
*Describe how waste material is introduced into combustion unit on an attached sheet. Supply drawings, dimensioned and to scale to show clearly the design and operation of the unit.			

Texas Commission on Environmental Quality
Table 4
Combustion Units

Characteristics of Output			
Chemical Composition of Flue Gas Released			
Material	**Minimum Value Expected lb/hr**	**Average Value Expected lb/hr**	**Design Maximum lb/hr**
Approx. CO2 - 3.92 mol%			7.26 MMscfh per stack
Approx. H2O - 5.23 mol%			(total 3 stacks for 3 units)
Approx. N2 - 77.11 mol%			
O2:14.18mol%, HC:0.08m%			
Temperature at stack exit (°F): 1,200 min operating temperature for VCU			
Total Flow Rate of Flue Gas Released (lb/hr)			
Minimum Expected:		Maximum Expected: 7.26 MMscfh per stack	
Velocity at Stack Exit of Flue Gas Released (ft/sec)			
Minimum Expected:		Maximum Expected: 62	
Combustion Unit Characteristics			
Chamber Volume from Drawing (ft^3): Available during detailed engineering			
Chamber Velocity at Average Chamber Temperature (ft/sec):			
Average Chamber Temperature (°F):		Average Residence Time (sec):	
Exhaust Stack Height (ft): 185 (above mean sea level)		Exhaust Stack Diameter (ft): 10	
Additional Information for Catalytic Combustion Units			
Number and Type of Catalyst Elements: Not applicable			
Catalyst Bed Velocity (ft/sec):			
Maximum Flow Rate per Catalytic Unit (Manufacturer's Specifications) Specify Units: Not applicable			
Attach separate sheets as necessary providing a description of the combustion unit, including details regarding principle of operation and the basis for calculating its efficiency. Supply an assembly drawing, dimensioned and to scale, to show clearly the design and conditions. Submit explanations on control for temperature, air flow rates, fuel rates, and other operation variables.			

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Texas Commission on Environmental Quality
Table 7(a)
Vertical Fixed Roof Storage Tank Summary

I. Tank Identification *(Use a separate form for each tank)*			
Applicant's Name: SPOT DWP			
Location *(indicate on plot plan and provide coordinates)*:			
Tank No.: 1 (Same as DST2)		Emission Point No. (EPN) *(from flow diagram)*: DST1	
FIN:		CIN:	
Status: ☒ New Tank	☐ Altered Tank	☐ Relocation	☐ Change of Service
Previous Permit No., Permit by Rule No., or Exemption No.:			
II. Tank Physical Characteristics			
Dimensions			
Shell Height *(ft.)*: 24	Diameter *(ft.)*: 15.5	Maximum Liquid Height *(ft.)*: 22.2	
Nominal Capacity or Working Volume *(gallons)*: 31,332		Turnovers per year: 20	
Net Throughput *(gallons/year)*: 635,343.33	Maximum Filling Rate *(gallons/hour)*:		
Paint Characteristics			
Shell Color/Shade:	☒ White/White	☐ Aluminum/Specular	☐ Aluminum/Diffuse
	☐ Gray/Light	☐ Gray/Medium	☒ Red/Primer
☐ Other:			
Shell Condition:	☒ Good	☐ Poor	
Roof Color/Shade:	☒ White/White	☐ Aluminum/Specular	☐ Aluminum/Diffuse
	☐ Gray/Light	☐ Gray/Medium	☐ Red/Primer
☐ Other:			
Roof Condition:	☒ Good	☐ Poor	
Rood Characteristics			
Roof Type:	☒ Dome	☐ Cone	
Roof Height *(not including shell height) (ft.)*: See TANKS Program run provided in Appendix D			
Radius *(Dome Roof Only) (ft.)*		Slope *(Cone Roof Only) (ft/ft)*	
Breather Vent Settings			
Combination Vent Valve Number:			
Combination Vent Valve Pressure Setting *(psig)*:			
Combination Vent Valve Vacuum Setting *(psig)*:			
SPECIFY "Atmosphere" or Discharging to *(name of abatement device)*:			
Pressure Vent Valve Number:			
Pressure Vent Valve Pressure Setting *(psig)*:			
SPECIFY "Atmosphere" or Discharging to *(name of abatement device)*:			

Texas Commission on Environmental Quality
Table 7(a)
Vertical Fixed Roof Storage Tank Summary

Permit No.:	Tank No.: 1
II. Tank Physical Characteristics	
Breather Vent Settings *(continued)*	
Vacuum Vent Valve Number:	
Vacuum Vent Valve Vacuum Setting *(psig)*:	
Open Vent Valve Number:	
SPECIFY "Atmosphere" or Discharging to *(name of abatement device)*:	
III. Liquid Properties of Stored Material	
Chemical Category: ☐ Organic Liquid	☐ Petroleum Distillates ☐ Crude Oils
☒ Single *(Complete Section III.1.)*	☐ Multi-Component Liquid *(Complete Section III.2.)*
1. Single Component Information	
Chemical Name: Distillate fuel oil no. 2	
CAS Number:	
Average Liquid Surface Temperature *(°F)*: 71.54	
True Vapor Pressure at Average Liquid Surface Temperature *(psia)*: 0.0095	
Liquid Molecular Weight: 130	
2. Multiple Component Information	
Mixture Name:	
Average Liquid Surface Temperature *(°F)*:	
Minimum Liquid Surface Temperature *(°F)*:	
Maximum Liquid Surface Temperature *(°F)*:	
True Vapor Pressure at Average Liquid Surface Temperature *(psia)*:	
True Vapor Pressure at Minimum Liquid Surface Temperature *(psia)*:	
True Vapor Pressure at Maximum Liquid Surface Temperature *(psia)*:	
Liquid Molecular Weight:	
Vapor Molecular Weight:	

Chemical Components Information

Chemical Name	CAS No.	Percent of Total Liquid Weight *(typical)*	Percent of Total Vapor Weight *(typical)*	Molecular Weight

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Texas Commission on Environmental Quality
Table 7(a)
Vertical Fixed Roof Storage Tank Summary

I. Tank Identification *(Use a separate form for each tank)*		
Applicant's Name: SPOT DWP		
Location *(indicate on plot plan and provide coordinates)*:		
Tank No.: 3 (Crane Storage Tank)	Emission Point No. (EPN) *(from flow diagram)*: DST3	
FIN:	CIN:	
Status: ☒ New Tank ☐ Altered Tank ☐ Relocation ☐ Change of Service		
Previous Permit No., Permit by Rule No., or Exemption No.:		
II. Tank Physical Characteristics		
Dimensions		
Shell Height *(ft.)*: 15	Diameter *(ft.)*: 10	Maximum Liquid Height *(ft.)*: 14
Nominal Capacity or Working Volume *(gallons)*: 8,316		Turnovers per year: 20
Net Throughput *(gallons/year)*: 168,630.00	Maximum Filling Rate *(gallons/hour)*:	
Paint Characteristics		
Shell Color/Shade: ☒ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse ☐ Gray/Light ☐ Gray/Medium ☒ Red/Primer ☐ Other:____		
Shell Condition: ☒ Good ☐ Poor		
Roof Color/Shade: ☒ White/White ☐ Aluminum/Specular ☐ Aluminum/Diffuse ☐ Gray/Light ☐ Gray/Medium ☐ Red/Primer ☐ Other:____		
Roof Condition: ☒ Good ☐ Poor		
Rood Characteristics		
Roof Type: ☒ Dome ☐ Cone		
Roof Height *(not including shell height) (ft.)*:		
Radius *(Dome Roof Only) (ft.)*	Slope *(Cone Roof Only) (ft/ft)*	
Breather Vent Settings		
Combination Vent Valve Number:		
Combination Vent Valve Pressure Setting *(psig)*:		
Combination Vent Valve Vacuum Setting *(psig)*:		
SPECIFY "Atmosphere" or Discharging to *(name of abatement device)*:		
Pressure Vent Valve Number:		
Pressure Vent Valve Pressure Setting *(psig)*:		
SPECIFY "Atmosphere" or Discharging to *(name of abatement device)*:		

Texas Commission on Environmental Quality
Table 7(a)
Vertical Fixed Roof Storage Tank Summary

Permit No.:	Tank No.:

II. Tank Physical Characteristics

Breather Vent Settings *(continued)*

Vacuum Vent Valve Number:

Vacuum Vent Valve Vacuum Setting *(psig)*:

Open Vent Valve Number:

SPECIFY "Atmosphere" or Discharging to *(name of abatement device)*:

III. Liquid Properties of Stored Material

Chemical Category: ☐ Organic Liquid ☐ Petroleum Distillates ☐ Crude Oils

☒ Single *(Complete Section III.1.)* ☐ Multi-Component Liquid *(Complete Section III.2.)*

1. Single Component Information

Chemical Name: Distillate fuel oil no. 2

CAS Number:

Average Liquid Surface Temperature *(°F)*: 69.81

True Vapor Pressure at Average Liquid Surface Temperature *(psia)*: 0.0090

Liquid Molecular Weight: 130

2. Multiple Component Information

Mixture Name:

Average Liquid Surface Temperature *(°F)*:

Minimum Liquid Surface Temperature *(°F)*:

Maximum Liquid Surface Temperature *(°F)*:

True Vapor Pressure at Average Liquid Surface Temperature *(psia)*:

True Vapor Pressure at Minimum Liquid Surface Temperature *(psia)*:

True Vapor Pressure at Maximum Liquid Surface Temperature *(psia)*:

Liquid Molecular Weight:

Vapor Molecular Weight:

Chemical Components Information

Chemical Name	CAS No.	Percent of Total Liquid Weight *(typical)*	Percent of Total Vapor Weight *(typical)*	Molecular Weight

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Texas Commission on Environmental Quality
Table 29 Reciprocating Engines

I. Engine Data

Manufacturer:	Model No.	Serial No.	Manufacture Date:
Caterpillar	3516C		
Rebuilds Date:	No. of Cylinders:	Compression Ratio: 14.7:1	EPN: DGEN1 (also DGEN2)

Application: [ ] Gas Compression [X] Electric Generation [ ] Refrigeration [ ] Emergency/Stand by

[X] 4 Stroke Cycle [ ] 2 Stroke Cycle [ ] Carbureted [ ] Spark Ignited [ ] Dual Fuel [X] Fuel Injected

[X] Diesel [ ] Naturally Aspirated [ ] Blower /Pump Scavenged [ ] Turbo Charged and I.C. [X] Turbo Charged

[ ] Intercooled [ ] I.C. Water Temperature [X] Lean Burn [ ] Rich Burn

Ignition/Injection Timing: Fixed: Variable:

Manufacture Horsepower Rating: 2,052 Proposed Horsepower Rating:

Discharge Parameters

Stack Height (Feet)	Stack Diameter (Feet)	Stack Temperature (°F)	Exit Velocity (FPS)
118 from mean sea level	1	885 norm/1,105 max	143 norm/250 max

II. Fuel Data

Type of Fuel: [ ] Field Gas [ ] Landfill Gas [ ] LP Gas [ ] Natural Gas [ ] Digester Gas [X] Diesel

Fuel Consumption (BTU/bhp-hr): Heat ing Value: 129,488 Btu/gal Lower Heating Value:

Sulfur Content (grains/100 scf - weight %):

III. Emission Factors (Before Control)

NO_X		CO		SO_2		VOC		Formaldehyde		PM_{10}	
g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv

Source of Emission Factors: [X] Manufacturer Data [X] AP-42 [ ] Other (specify):

IV. Emission Factors (Post Control)

NO_X		CO		SO_2		VOC		Formaldehyde		PM_{10}	
g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv
4.56		0.770		0.006		0.04		0.000078	lb/mbtu	0.04	

Method of Emission Control: [ ] NSCR Catalyst [X] Lean Operation [ ] Parameter Adjustment

[ ] Stratified Charge [ ] JLCC Catalyst [X] Other (Specify): Oxidation Catalyst

Note: *Must submit a copy of any manufacturer control information that demonstrates control efficiency.*

Is Formaldehyde included in the VOCs? [X] Yes [ ] No

V. Federal and State Standards (Check all that apply)

[ ] NSPS JJJJ [ ] MACT ZZZZ [X] NSPS IIII [ ] Title 30 Chapter 117 - List County: ____

VI. Additional Information

1. Submit a copy of the engine manufacturer's site rating or general rating specification data.
2. Submit a typical fuel gas analysis, including sulfur content and heating value. For gaseous fuels, provide mole percent of constituents.
3. Submit description of air/fuel ratio control system (manufacturer information is acceptable).

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Texas Commission on Environmental Quality
Table 29 Reciprocating Engines

I. Engine Data			
Manufacturer: Caterpillar	Model No. C15	Serial No.	Manufacture Date:
Rebuilds Date:	No. of Cylinders: 6	Compression Ratio: 17:1	EPN: PC1 (also PC2)

Application: ☐ Gas Compression ☐ Electric Generation ☐ Refrigeration ☐ Emergency/Stand by

☒ 4 Stroke Cycle ☐ 2 Stroke Cycle ☐ Carbureted ☐ Spark Ignited ☐ Dual Fuel ☒ Fuel Injected

☒ Diesel ☐ Naturally Aspirated ☐ Blower /Pump Scavenged ☐ Turbo Charged and I.C. ☒ Turbo Charged

☐ Intercooled ☐ I.C. Water Temperature ☐ Lean Burn ☐ Rich Burn

Ignition/Injection Timing: Fixed: Variable:

Manufacture Horsepower Rating: 589 | Proposed Horsepower Rating:

Discharge Parameters

Stack Height (Feet)	Stack Diameter (Feet)	Stack Temperature (°F)	Exit Velocity (FPS)
185 above mean sea level	6 inches	1,170 norm/1,225 max	45 norm/175 max

II. Fuel Data

Type of Fuel: ☐ Field Gas ☐ Landfill Gas ☐ LP Gas ☐ Natural Gas ☐ Digester Gas ☒ Diesel

Fuel Consumption (BTU/bhp-hr):	Heat ing Value: 129,488 Btu/gal	Lower Heating Value:

Sulfur Content (grains/100 scf - weight %):

III. Emission Factors (Before Control)

NO_X		CO		SO_2		VOC		Formaldehyde		PM_{10}	
g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv
0.299		2.61		0.006		0.142				0.015	

Source of Emission Factors: ☒ Manufacturer Data ☒ AP-42 ☐ Other (specify):

IV. Emission Factors (Post Control)

NO_X		CO		SO_2		VOC		Formaldehyde		PM_{10}	
g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv

Method of Emission Control: ☐ NSCR Catalyst ☐ Lean Operation ☐ Parameter Adjustment

☐ Stratified Charge ☐ JLCC Catalyst ☐ Other (Specify):______

Note: *Must submit a copy of any manufacturer control information that demonstrates control efficiency.*

Is Formaldehyde included in the VOCs? ☐ Yes ☐ No

V. Federal and State Standards (Check all that apply)

☐ NSPS JJJJ ☐ MACT ZZZZ ☒ NSPS IIII ☐ Title 30 Chapter 117 - List County: ______

VI. Additional Information

1. Submit a copy of the engine manufacturer's site rating or general rating specification data.
2. Submit a typical fuel gas analysis, including sulfur content and heating value. For gaseous fuels, provide mole percent of constituents.
3. Submit description of air/fuel ratio control system (manufacturer information is acceptable).

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Texas Commission on Environmental Quality
Table 29 Reciprocating Engines

I. Engine Data			
Manufacturer: Caterpillar	Model No. C18	Serial No.	Manufacture Date:
Rebuilds Date:	No. of Cylinders:	Compression Ratio: 16.5:1	EPN: EDGEN

Application: ☐ Gas Compression ☐ Electric Generation ☐ Refrigeration ☒ Emergency/Stand by

☒ 4 Stroke Cycle ☐ 2 Stroke Cycle ☐ Carbureted ☐ Spark Ignited ☐ Dual Fuel ☐ Fuel Injected

☒ Diesel ☐ Naturally Aspirated ☐ Blower /Pump Scavenged ☐ Turbo Charged and I.C. ☒ Turbo Charged

☐ Intercooled ☐ I.C. Water Temperature ☐ Lean Burn ☐ Rich Burn

Ignition/Injection Timing: Fixed: Variable:

Manufacture Horsepower Rating: 758 | Proposed Horsepower Rating:

Discharge Parameters

Stack Height (Feet)	Stack Diameter (Feet)	Stack Temperature (°F)	Exit Velocity (FPS)
155 above mean sea level	8 inches	930 norm/1,160 max	79 norm/127 max

II. Fuel Data

Type of Fuel: ☐ Field Gas ☐ Landfill Gas ☐ LP Gas ☐ Natural Gas ☐ Digester Gas ☒ Diesel

Fuel Consumption (BTU/bhp-hr): | Heat ing Value: 129,488 Btu/gal | Lower Heating Value:

Sulfur Content (grains/100 scf - weight %):

III. Emission Factors (Before Control)

NO_X		CO		SO_2		VOC		Formaldehyde		PM_{10}	
g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv
4.122		3.681		0.006		4.122		0.000079	lb/mb	0.074	

Source of Emission Factors: ☒ Manufacturer Data ☒ AP-42 ☐ Other (specify):

IV. Emission Factors (Post Control)

NO_X		CO		SO_2		VOC		Formaldehyde		PM_{10}	
g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv

Method of Emission Control: ☐ NSCR Catalyst ☐ Lean Operation ☐ Parameter Adjustment

☐ Stratified Charge ☐ JLCC Catalyst ☐ Other (Specify):____________________

Note: *Must submit a copy of any manufacturer control information that demonstrates control efficiency.*

Is Formaldehyde included in the VOCs? ☐ Yes ☐ No

V. Federal and State Standards (Check all that apply)

☐ NSPS JJJJ ☐ MACT ZZZZ ☒ NSPS IIII ☐ Title 30 Chapter 117 - List County: ________________

VI. Additional Information

1. Submit a copy of the engine manufacturer's site rating or general rating specification data.
2. Submit a typical fuel gas analysis, including sulfur content and heating value. For gaseous fuels, provide mole percent of constituents.
3. Submit description of air/fuel ratio control system (manufacturer information is acceptable).

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Texas Commission on Environmental Quality
Table 29 Reciprocating Engines

I. Engine Data

Manufacturer:	Model No.	Serial No.	Manufacture Date:
Caterpillar	3508		
Rebuilds Date:	No. of Cylinders: 8	Compression Ratio: 13:1	EPN: DFP1(same as DFP2)

Application: ☐ Gas Compression ☐ Electric Generation ☐ Refrigeration ☒ Emergency/Stand by

☒ 4 Stroke Cycle ☐ 2 Stroke Cycle ☐ Carbureted ☐ Spark Ignited ☐ Dual Fuel ☒ Fuel Injected

☒ Diesel ☐ Naturally Aspirated ☐ Blower /Pump Scavenged ☐ Turbo Charged and I.C. ☒ Turbo Charged

☐ Intercooled ☐ I.C. Water Temperature ☐ Lean Burn ☐ Rich Burn

Ignition/Injection Timing: Fixed: Variable:

Manufacture Horsepower Rating: 1080 | Proposed Horsepower Rating:

Discharge Parameters

Stack Height (Feet)	Stack Diameter (Feet)	Stack Temperature (°F)	Exit Velocity (FPS)
112 (above mean sea level)	8 inches	790 norm/1,110 max	146 norm/246 max

II. Fuel Data

Type of Fuel: ☐ Field Gas ☐ Landfill Gas ☐ LP Gas ☐ Natural Gas ☐ Digester Gas ☒ Diesel

Fuel Consumption (BTU/bhp-hr): | Heat ing Value: 129,488 Btu/gal | Lower Heating Value:

Sulfur Content (grains/100 scf - weight %):

III. Emission Factors (Before Control)

NO_X		CO		SO_2		VOC		Formaldehyde		PM_{10}	
g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv
4.80		2.60		0.006		4.80		0.000079	lb/mb	0.150	

Source of Emission Factors: ☒ Manufacturer Data ☒ AP-42 ☐ Other (specify):

IV. Emission Factors (Post Control)

NO_X		CO		SO_2		VOC		Formaldehyde		PM_{10}	
g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv

Method of Emission Control: ☐ NSCR Catalyst ☐ Lean Operation ☐ Parameter Adjustment
☐ Stratified Charge ☐ JLCC Catalyst ☐ Other (Specify):____________

Note: *Must submit a copy of any manufacturer control information that demonstrates control efficiency.*

Is Formaldehyde included in the VOCs? ☐ Yes ☐ No

V. Federal and State Standards (Check all that apply)

☐ NSPS JJJJ ☐ MACT ZZZZ ☒ NSPS IIII ☐ Title 30 Chapter 117 - List County: ____________

VI. Additional Information

1. Submit a copy of the engine manufacturer's site rating or general rating specification data.
2. Submit a typical fuel gas analysis, including sulfur content and heating value. For gaseous fuels, provide mole percent of constituents.
3. Submit description of air/fuel ratio control system (manufacturer information is acceptable).

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APPENDIX F
RBLC DATABASE SEARCH RESULTS

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RBLC ENTRIES FOR MARINE LOADING 1/1/2008 - 11/5/2018

RBLC ID	FACILITY NAME Location	PROCESS NAME PROCESS TYPE - THROUGHPUT	PRIMARY FUEL	POLLUTANT	EMISSION LIMIT	UNITS	CONTROL METHOD DESCRIPTION	CASE-BY-CASE BASIS	PERMIT DATE	Location
TX-0799	Beaumont Terminal Jefferson Co, TX	Marine Loading 42.010		VOC	24.5	Tons/Yr	Vapor combustor unit, 99.8% cap. efficiency for ocean ships	BACT-PSD MACT	6/8/2016	Onshore
				CO	0.3 180.3	Lb/MMBtu Tons/Yr	Good combustion practices	BACT-PSD		
				CO_2e	92,415	Tons/Yr	Vapor combustor unit, 99.8% cap. efficiency for ocean ships	BACT-PSD		
TX-0752	Ingleside Terminal-Oxy Oil San Patricio Co, TX	Loading (barge and ship loading) 42.010		VOC	126.1	Tons/Yr	Vapor combustor unit, 99% collection efficiency for ships, 99% DRE	BACT-PSD NSPS, MACT, SIP	6/22/2015	Onshore
TX-0825	Pasedena Terminal Harris Co, TX	Marine Vessel Ship Loading (Crude oil and condensate) 42.004 - 30,000 Bbl/Hr		VOC	1 71.36	Mg/Ltr Tons/Yr	Captured vapors routed to vapor recovery unit (VRU).	LAER MACT	7/14/2017	Onshore
		Marine Barge Loading 42.004 - 10,000 Bbl/Hr at barge docks, 20,000 Bbl/Hr at ship docks		VOC	71.36	Tons/Yr	100% of vapors captured with vacuum loading and routed to VRU.	LAER MACT		
		Uncaptured Marine Loading Fugitives from Ships 42.004		VOC	23.66	Tons/Yr	99.89% collection efficiency, test 3 ships/yr for 5 years	LAER MACT		
TX-0818	Fuel Oil Terminal - HFOTCO Harris Co, TX	Marine Loading 42.004 - 30,000 Bbl/Hr		VOC			VCU with 99.9% DRE, 99.5 % collection efficiency	LAER SIP	4/26/2017	Onshore
TX-0808	Houston Fuel Oil Terminal - HFOTCO Harris Co, TX	Marine Loading 42.004 - 67,600,600 Bbl/Yr		VOC			VCU with 99.9% DRE, 99.5 % collection efficiency	LAER SIP	9/2/2016	Onshore
TX-0800	Corpus Crude Oil Terminal Nueces Co, TX	Marine Loading 42.004 - 20,000,000 Bbl/Yr		VOC	351	Tons/Yr	VCU with 95 % capture efficiency for ocean-going vessels	BACT-PSD MACT	6/22/2016	Onshore
TX-0772	Port of Beaumont Petroleum Transload Terminal (PBPTT) Orange Co, TX	Petroleum Liquid Marketing 42.004 - 45,000 Bbl/Hr		VOC	755 660.32	Tons/Yr Tons/Yr	VCU with 99% DRE for inerted vessels	BACT-PSD MACT	11/6/2015	Onshore
				CO_2e	221,357	Tons/Yr	Three VCUs for crude oil loading into marine vessels. Temporary VCUs fo pigging.	BACT-PSD		
TX-0765	Sunoco Marine Vessel Loading Operations Jefferson Co, TX	Petroleum Liquid Marketing 42.004 - 100 MMbbl/Yr Loading crude oil/etc. into marine vessels		VOC	97.36	Tons/Yr	VCU with 99% DRE for inerted vessels	BACT-PSD NESHAP	9/18/2015	Onshore
TX-0745	Texas Dock and Rail Nueces Co, TX	Petroleum Liquid Marketing 42.004 - 157 MMbbl/Yr Loading crude oil/etc. into marine vessels (ships and barges).		VOC	74.35 126.32	Tons/Yr Tons/Yr	Vapor recovery unit with 95% capture	BACT-PSD MACT	6/3/2015	Onshore

TX-0731	Corpus Christi Terminal Condensate Splitter Nueces Co, TX	Petroleum Liquid Marketing 42.004 - 20,000 Bbl/Hr/vessel Loading crude oil/etc. into marine vessels (ships and barges).	VOC	Marine vessel loading using bottom or submerged fill. VCU with 99.5% DRE.	BACT-PSD	4/10/2015	Onshore

Key:

BACT = Best Available Control Technology.
BBl = Barrels
Btu = British Thermal Units
CO = Carbon monoxide.
CO_2e = Carbon dioxide equivalents
DRE = Destruction efficiency
G = Grams
Hp = Horsepower
Hr = Hour
LAER = Lowest Acheivable Emission Rate
Lb = Pound
Ltr = Liter
MACT = Most Available Control Technology

Mg =
MM = Million
NESHAP = National Emission Standard for Hazardous Air Pollutants
NSPS = New Source Performance Standards
PSD = Prevention of Significant Deterioration
SIP = State Implementation Plan
SO_2 = Sulfur dioxide
TX = Texas
VCU = Vapor Combustion Unit
VOC = Volatile organic compounds
VRU = Vapor Recovery Unit
Yr = Year

RBLC ENTRIES FOR OTHER COMBUSTION 1/1/2008 - 11/5/2018

RBLC ID	FACILITY NAME	PROCESS NAME PROCESS TYPE - THROUGHPUT	PRIMARY FUEL	POLLUTANT	EMISSION LIMIT	UNITS	CONTROL METHOD DESCRIPTION	CASE-BY-CASE BASIS	PERMIT DATE	Location
TX-0811	Linear Alpha Olefins Plant Brazoria Co, TX	Other Combustion (TO and VCU) 19.900		NO_X	0.06	Lb/MMBtu	Low NO_X burners	LAER SIP	11/3/2016	Onshore
TX-0682	Galena Park Terminal Harris Co, TX	Vapor Combustion Units 19.900		NO_X			VCU minimize VOC emissions from marine loading. 99.8%	LAER NSPS	6/12/2013	Onshore

Key:

Btu = British Thermal Units
LAER = Lowest Acheivable Emission Rate
Lb = Pound
MM = Million
NO_X = Nitrogen oxide
NSPS = New Source Performance Standards
SIP = State Implementation Plan
TO = Thermal oxidizer
TX = Texas
ULSD = Ultra low sulfur diesel
VCU = Vapor combustion units
VOC = Volatile organic compounds
Yr = Year

RBLC ENTRIES FOR IC ENGINES >500 HP 1/1/2008 - 11/28/2018

RBLC ID	FACILITY NAME	PERMIT ISSUANCE	PROCESS_NAME	PROCCESST	PRIMARY FUEL	THROUGH	UNITs	POLLUTANT	CONTROL_METHOD_DESCRIPTION	CASE-BY-CASE	OTHER
AK-0071	INTERNATIONAL STATION	12/20/2010 ACT	Cat 3215C Black Start Generator (:	17.11	ULSD	1500	KW-e	NOx	Turbocharger and Aftercooler	BACT-PSD	
	POWER PLANT	12/20/2010 ACT	Cat 3215C Black Start Generator (:	17.11	ULSD	1500	KW-e	Particulate matter	Good Combustion Practices	BACT-PSD	
		12/20/2010 ACT	Cat 3215C Black Start Generator (:	17.11	ULSD	1500	KW-e	Particulate matter, total &	Good Combustion Practices	BACT-PSD	
		12/20/2010 ACT	Cat 3215C Black Start Generator (:	17.11	ULSD	1500	KW-e	Particulate matter, total &	Good Combustion Practices	BACT-PSD	
AK-0072	DUTCH HARBOR POWER	07/14/2011 ACT	EU 15 Caterpillar C-280-16	17.11	ULSD	4400	KW	NOx	Engine has turbo charger and after cooler installe	BACT-PSD	NSPS
	PLANT	07/14/2011 ACT	EU 15 Caterpillar C-280-16	17.11	ULSD	4400	KW	Particulate matter, filtera	Positive Crankcase Ventilation Installed as part of	BACT-PSD	NSPS
AK-0073	INTERNATIONAL STATION	12/20/2010 ACT	Fuel Combustion	17.11	Diesel	1500	kW-e	NOx	Black Start diesel fired engine EU 13 shall be equi	BACT-PSD	NSPS
	POWER PLANT	12/20/2010 ACT	Fuel Combustion	17.11	Diesel	1500	kW-e	Particulate matter, total &	Black Start diesel fired engine EU 13 shall be equi	BACT-PSD	
AK-0076	POINT THOMSON	08/20/2012 ACT	Combustion of Diesel by ICEs	17.11	ULSD	1750	kW	NOx		BACT-PSD	NSPS
	PRODUCTION FACILITY	08/20/2012 ACT	Combustion of Diesel by ICEs	17.11	ULSD	1750	kW	Carbon Monoxide		BACT-PSD	NSPS
		08/20/2012 ACT	Combustion of Diesel by ICEs	17.11	ULSD	1750	kW	Particulate matter, total < 2.5 Âµ (TPM2.5)		BACT-PSD	NSPS
		08/20/2012 ACT	Combustion of Diesel by ICEs	17.11	ULSD	1750	kW	Carbon Dioxide	Good Combustion Practices and 40 CFR 60 Subpar	BACT-PSD	
AK-0081	POINT THOMSON	06/12/2013 ACT	Combustion	17.11	ULSD	610	hp	Particulate matter, total &	Good operation and combustion practices	OTHER CASE-BY-	NSPS
	PRODUCTION FACILITY	06/12/2013 ACT	Combustion	17.11	ULSD	610	hp	Carbon Dioxide Equivalen	Good Combustion and Operating Practices	OTHER CASE-BY-CASE	
AK-0082	POINT THOMSON	01/23/2015 ACT	Emergency Camp Generators	17.11	ULSD	2695	hp	NOx		BACT-PSD	
	PRODUCTION FACILITY	01/23/2015 ACT	Emergency Camp Generators	17.11	ULSD	2695	hp	Carbon Monoxide		BACT-PSD	
		01/23/2015 ACT	Emergency Camp Generators	17.11	ULSD	2695	hp	Particulate matter, filterable < 10 Âµ (FPM10)		BACT-PSD	
		01/23/2015 ACT	Emergency Camp Generators	17.11	ULSD	2695	hp	Particulate matter, filterable < 2.5 Âµ (FPM2.5)		BACT-PSD	
		01/23/2015 ACT	Emergency Camp Generators	17.11	ULSD	2695	hp	VOC		BACT-PSD	
		01/23/2015 ACT	Emergency Camp Generators	17.11	ULSD	2695	hp	Carbon Dioxide Equivalent (CO2e)		BACT-PSD	
		01/23/2015 ACT	Fine Water Pumps	17.11	ULSD	610	hp	NOx		BACT-PSD	
		01/23/2015 ACT	Fine Water Pumps	17.11	ULSD	610	hp	Carbon Monoxide		BACT-PSD	
		01/23/2015 ACT	Fine Water Pumps	17.11	ULSD	610	hp	Particulate matter, filterable < 10 Âµ (FPM10)		BACT-PSD	
		01/23/2015 ACT	Fine Water Pumps	17.11	ULSD	610	hp	Particulate matter, filterable < 2.5 Âµ (FPM2.5)		BACT-PSD	
		01/23/2015 ACT	Fine Water Pumps	17.11	ULSD	610	hp	VOC		BACT-PSD	
		01/23/2015 ACT	Fine Water Pumps	17.11	ULSD	610	hp	Carbon Dioxide Equivalent (CO2e)		BACT-PSD	
		01/23/2015 ACT	Bulk Tank Generator Engines	17.11	ULSD	891	hp	NOx		BACT-PSD	
		01/23/2015 ACT	Bulk Tank Generator Engines	17.11	ULSD	891	hp	Carbon Monoxide		BACT-PSD	
		01/23/2015 ACT	Bulk Tank Generator Engines	17.11	ULSD	891	hp	Particulate matter, filterable < 10 Âµ (FPM10)		BACT-PSD	
		01/23/2015 ACT	Bulk Tank Generator Engines	17.11	ULSD	891	hp	Particulate matter, filterable < 2.5 Âµ (FPM2.5)		BACT-PSD	
		01/23/2015 ACT	Bulk Tank Generator Engines	17.11	ULSD	891	hp	VOC		BACT-PSD	
		01/23/2015 ACT	Bulk Tank Generator Engines	17.11	ULSD	891	hp	Carbon Dioxide Equivalent (CO2e)		BACT-PSD	
*AK-0084	DONLIN GOLD PROJECT	06/30/2017 ACT	Black Start and Emergency Interna	17.11	Diesel	1500	kWe	NOx	Good Combustion Practices	BACT-PSD	NSPS
		06/30/2017 ACT	Black Start and Emergency Interna	17.11	Diesel	1500	kWe	Carbon Monoxide	Good Combustion Practices	BACT-PSD	NSPS
		06/30/2017 ACT	Black Start and Emergency Interna	17.11	Diesel	1500	kWe	Particulate matter, total (	Clean Fuel and Good Combustion Practices	BACT-PSD	NSPS
		06/30/2017 ACT	Black Start and Emergency Interna	17.11	Diesel	1500	kWe	Particulate matter, total &	Clean Fuel and Good Combustion Practices	BACT-PSD	NSPS
		06/30/2017 ACT	Black Start and Emergency Interna	17.11	Diesel	1500	kWe	Particulate matter, total &	Clean Fuel and Good Combustion Practices	BACT-PSD	NSPS
		06/30/2017 ACT	Black Start and Emergency Interna	17.11	Diesel	1500	kWe	Carbon Dioxide Equivalen	Good Combustion Practices	BACT-PSD	NSPS
		06/30/2017 ACT	Fire Pump Diesel Internal Combus	17.21	Diesel	252	hp	NOx	Good Combustion Practices	BACT-PSD	NSPS
		06/30/2017 ACT	Fire Pump Diesel Internal Combus	17.21	Diesel	252	hp	Carbon Dioxide Equivalen	Good Combustion Practices	BACT-PSD	NSPS
		06/30/2017 ACT	Fire Pump Diesel Internal Combus	17.21	Diesel	252	hp	Carbon Monoxide	Good Combustion Practices	BACT-PSD	NSPS
		06/30/2017 ACT	Fire Pump Diesel Internal Combus	17.21	Diesel	252	hp	Particulate matter, total (	Clean Fuel and Good Combustion Practices	BACT-PSD	NSPS
		06/30/2017 ACT	Fire Pump Diesel Internal Combus	17.21	Diesel	252	hp	Particulate matter, total &	Clean Fuel and Good Combustion Practices	BACT-PSD	NSPS
		06/30/2017 ACT	Fire Pump Diesel Internal Combus	17.21	Diesel	252	hp	Particulate matter, total &	Clean Fuel and Good Combustion Practices	BACT-PSD	NSPS
		06/30/2017 ACT	Twelve (12) Large ULSD/Natural G	17.11	Diesel and NG	143.5	MMBtu/hr	VOC	Oxidation Catalyst and Good Combustion Practice	BACT-PSD	

RBLC ID	FACILITY NAME	PERMIT ISSUANCE	PROCESS_NAME	PROCCESST	PRIMARY FUEL	THROUGH	UNITs	POLLUTANT	CONTROL_METHOD_DESCRIPTION	CASE-BY-CASE	OTHER
		06/30/2017 ACT	Twelve (12) Large ULSD/Natural G	17.11	Diesel and NG	143.5	MMBtu/hr	Particulate matter, total (	Clean Fuel and Good Combustion Practices	BACT-PSD	
		06/30/2017 ACT	Twelve (12) Large ULSD/Natural G	17.11	Diesel and NG	143.5	MMBtu/hr	Particulate matter, filtera	Clean Fuel and Good Combustion Practices	BACT-PSD	
		06/30/2017 ACT	Twelve (12) Large ULSD/Natural G	17.11	Diesel and NG	143.5	MMBtu/hr	Particulate matter, total (	Clean Fuel and Good Combustion Practices	BACT-PSD	
		06/30/2017 ACT	Twelve (12) Large ULSD/Natural G	17.11	Diesel and NG	143.5	MMBtu/hr	Particulate matter, filtera	Clean Fuel and Good Combustion Practices	BACT-PSD	
		06/30/2017 ACT	Twelve (12) Large ULSD/Natural G	17.11	Diesel and NG	143.5	MMBtu/hr	Particulate matter, total (	Clean Fuel and Good Combustion Practices	BACT-PSD	
		06/30/2017 ACT	Twelve (12) Large ULSD/Natural G	17.11	Diesel and NG	143.5	MMBtu/hr	Particulate matter, filtera	Clean Fuel and Good Combustion Practices	BACT-PSD	
		06/30/2017 ACT	Twelve (12) Large ULSD/Natural G	17.11	Diesel and NG	143.5	MMBtu/hr	NOx	Selective Catalytic Reduction (SCR) and Good Com	BACT-PSD	
		06/30/2017 ACT	Twelve (12) Large ULSD/Natural G	17.11	Diesel and NG	143.5	MMBtu/hr	Carbon Monoxide	Oxidation Catalyst and Maintain Good Combustio	BACT-PSD	
		06/30/2017 ACT	Twelve (12) Large ULSD/Natural G	17.11	Diesel and NG	143.5	MMBtu/hr	Carbon Dioxide Equivalen	Good Cumbustion Practices	BACT-PSD	
AL-0251	HILLABEE ENERGY CENTER	09/24/2008 ACT	EMERGENCY GENERATOR	17.11	DIESEL	600	EKW	NOx	GOOD COMBUSTION PRACTICES	BACT-PSD	
		09/24/2008 ACT	EMERGENCY GENERATOR	17.11	DIESEL	600	EKW	Particulate matter, total (	LOW SULFUR DIESEL FUEL	BACT-PSD	
		09/24/2008 ACT	EMERGENCY GENERATOR	17.11	DIESEL	600	EKW	Sulfur Dioxide (SO2)	LOW SULFUR DIESEL FUEL	BACT-PSD	
		09/24/2008 ACT	EMERGENCY GENERATOR	17.11	DIESEL	600	EKW	Carbon Monoxide	GOOD COMBUSTION PRACTICES	BACT-PSD	
		09/24/2008 ACT	EMERGENCY GENERATOR	17.11	DIESEL	600	EKW	VOC	GOOD COMBUSTION PRACTICES	BACT-PSD	
AL-0301	NUCOR STEEL TUSCALOOSA, INC.	07/22/2014 ACT	DIESEL FIRED EMERGENCY GENER	17.11	DIESEL	800	HP	Particulate matter, filterable (FPM)		BACT-PSD	NSPS , MACT
		07/22/2014 ACT	DIESEL FIRED EMERGENCY GENER	17.11	DIESEL	800	HP	NOx		BACT-PSD	NSPS , MACT
		07/22/2014 ACT	DIESEL FIRED EMERGENCY GENER	17.11	DIESEL	800	HP	Carbon Monoxide		BACT-PSD	NSPS , MACT
*AL-0318	TALLADEGA SAWMILL	12/18/2017 ACT	250 Hp Emergency CI, Diesel-fired	17.11	Diesel	0		Particulate matter, total (TPM)		N/A	
		12/18/2017 ACT	250 Hp Emergency CI, Diesel-fired	17.11	Diesel	0		Particulate matter, total < 10 Âµ (TPM10)		N/A	
		12/18/2017 ACT	250 Hp Emergency CI, Diesel-fired	17.11	Diesel	0		Particulate matter, total < 2.5 Âµ (TPM2.5)		N/A	
		12/18/2017 ACT	250 Hp Emergency CI, Diesel-fired	17.11	Diesel	0		Carbon Monoxide		N/A	
		12/18/2017 ACT	250 Hp Emergency CI, Diesel-fired	17.11	Diesel	0		NOx		N/A	
		12/18/2017 ACT	250 Hp Emergency CI, Diesel-fired	17.11	Diesel	0		Sulfur Oxides (SOx)		N/A	
		12/18/2017 ACT	250 Hp Emergency CI, Diesel-fired	17.11	Diesel	0		VOC		N/A	
		12/18/2017 ACT	250 Hp Emergency CI, Diesel-fired	17.11	Diesel	0		Formaldehyde		N/A	
		12/18/2017 ACT	250 Hp Emergency CI, Diesel-fired	17.11	Diesel	0		Acetaldehyde		N/A	
AR-0140	BIG RIVER STEEL LLC	09/18/2013 ACT	EMERGENCY GENERATORS	17.11	DIESEL	1500	KW	Particulate matter, filtera	GOOD OPERATING PRACTICES, LIMITED HOURS O	BACT-PSD	
		09/18/2013 ACT	EMERGENCY GENERATORS	17.11	DIESEL	1500	KW	Particulate matter, total (	GOOD OPERATING PRACTICES, LIMITED HOURS O	BACT-PSD	
		09/18/2013 ACT	EMERGENCY GENERATORS	17.11	DIESEL	1500	KW	Particulate matter, total (	GOOD OPERATING PRACTICES, LIMITED HOURS O	BACT-PSD	
		09/18/2013 ACT	EMERGENCY GENERATORS	17.11	DIESEL	1500	KW	Nitrous Oxide (N2O)	GOOD COMBUSTION PRACTICES	BACT-PSD	
		09/18/2013 ACT	EMERGENCY GENERATORS	17.11	DIESEL	1500	KW	Visible Emissions (VE)	GOOD OPERATING PRACTICES, LIMITED HOURS O	BACT-PSD	
		09/18/2013 ACT	EMERGENCY GENERATORS	17.11	DIESEL	1500	KW	Sulfur Dioxide (SO2)	GOOD O	BACT-PSD	
CA-1191	VICTORVILLE 2 HYBRID POWER PROJECT	03/11/2010 ACT	EMERGENCY ENGINE	17.11	DIESEL	2000	KW	Carbon Monoxide	OPERATIONAL RESTRICTION OF 50 HR/YR	BACT-PSD	
		03/11/2010 ACT	EMERGENCY ENGINE	17.11	DIESEL	2000	KW	NOx	OPERATIONAL RESTRICTION OF 50 HR/YR	BACT-PSD	
		03/11/2010 ACT	EMERGENCY ENGINE	17.11	DIESEL	2000	KW	Particulate matter, total (	OPERATIONAL RESTRICTION OF 50 HR/YR; USE OF	BACT-PSD	
		03/11/2010 ACT	EMERGENCY ENGINE	17.11	DIESEL	2000	KW	Particulate matter, total (	OPERATIONAL RESTRICTION OF 50 HR/YR; USE OF	BACT-PSD	
CA-1212	PALMDALE HYBRID POWER PROJECT	10/18/2011 ACT	EMERGENCY IC ENGINE	17.11	DIESEL	2683	HP	NOx		BACT-PSD	
		10/18/2011 ACT	EMERGENCY IC ENGINE	17.11	DIESEL	2683	HP	Carbon Monoxide		BACT-PSD	
		10/18/2011 ACT	EMERGENCY IC ENGINE	17.11	DIESEL	2683	HP	Particulate matter, total (	USE ULTRA LOW SULFUR FUEL	BACT-PSD	
		10/18/2011 ACT	EMERGENCY IC ENGINE	17.11	DIESEL	2683	HP	Particulate matter, total (	USE ULTRA LOW SULFUR FUEL	BACT-PSD	
		10/18/2011 ACT	EMERGENCY IC ENGINE	17.11	DIESEL	2683	HP	Particulate matter, total (	USE ULTRA LOW SULFUR FUEL	BACT-PSD	
CA-1219	CITY OF SAN DIEGO PUD (PUMP STATION 1)	07/09/2012 ACT	IC engine	17.11	diesel	2722	bhp	NOx	Tier 2 certified engine and 50 hr/yr for M&T	OTHER CASE-BY-	OTHER
CA-1220	SAN DIEGO INTERNATIONAL AIRPORT	10/03/2011 ACT	ICE:Emergency-Compression Igniti	17.11	diesel	1881	BHP	NOx	Tier 2 certified and 50 hr/y M&T limit	OTHER CASE-BY-	OTHER
CA-1221	PACIFIC BELL	12/05/2011 ACT	ICE:Emergency-Compression Igniti	17.11	diesel	3634	bhp	NOx	Tier 2 certified and 50 hr/yr for M&T limit	OTHER CASE-BY-	OTHER
CO-0067	LANCASTER PLANT	06/04/2013 ACT	Emergency Generator	17.11	diesel	19950	gal per year	Carbon Dioxide Equivalen	NSPS IIII compliant.	BACT-PSD	NSPS , MACT , OPERATING PE

RBLC ID	FACILITY NAME	PERMIT ISSUANCE	PROCESS_NAME	PROCCESST	PRIMARY FUEL	THROUGH	UNITs	POLLUTANT	CONTROL_METHOD_DESCRIPTION	CASE-BY-CASE	OTHER
DC-0009	BLUE PLAINS ADVANCED WASTEWATER TREATEMENT PLANT	03/15/2012 ACT	Diesel Emergency Generator	17.11	ULSD	2682	hp	NOx		LAER	NSPS , SIP , OPERATING PERN
FL-0310	SHADY HILLS GENERATING STATION	01/12/2009 ACT	2.5 MW EMERGENCY GENERATOR	17.11	ULTRA LOW S OIL	2.5	MW	Particulate matter, total <	FIRING ULSO WITH A MAXIMUM SULFUR CONTEN	BACT-PSD	NSPS
		01/12/2009 ACT	2.5 MW EMERGENCY GENERATOR	17.11	ULTRA LOW S OIL	2.5	MW	Sulfur Dioxide (SO2)	FIRING ULTRA LOW SULFUR OIL WITH A MAXIMU	BACT-PSD	
		01/12/2009 ACT	2.5 MW EMERGENCY GENERATOR	17.11	ULTRA LOW S OIL	2.5	MW	Hydrocarbons, Total	FIRING OF ULTRA LOW SULFUR OIL (ULSO).	BACT-PSD	
		01/12/2009 ACT	2.5 MW EMERGENCY GENERATOR	17.11	ULTRA LOW S OIL	2.5	MW	Particulate matter, total <	FIRING ULSO WITH A MAXIMUM SULFUR CONTEN	BACT-PSD	NSPS
		01/12/2009 ACT	2.5 MW EMERGENCY GENERATOR	17.11	ULTRA LOW S OIL	2.5	MW	NOx	PURCHASE MODEL IS AT LEAST AS STRINGENT AS	BACT-PSD	NSPS
		01/12/2009 ACT	2.5 MW EMERGENCY GENERATOR	17.11	ULTRA LOW S OIL	2.5	MW	Carbon Monoxide	PURCHASED MODEL IS AT LEAST AS STRINGENT A	BACT-PSD	NSPS
FL-0322	SWEET SORGHUM-TO-ETHANOL ADVANCED BIOREFINERY	12/23/2010 ACT	Emergency Generators, Two 2682	17.11	ULSD			Carbon Monoxide		BACT-PSD	
		12/23/2010 ACT	Emergency Generators, Two 2682	17.11	ULSD			Particulate matter, total (TPM)		BACT-PSD	
		12/23/2010 ACT	Emergency Generators, Two 2682	17.11	ULSD			NOx		BACT-PSD	
FL-0327	ANADARKO - PHEONIX PROSPECT	06/13/2011 ACT	Main Propulsion Engines	17.11	Diesel			NOx	Use of good combustion and maintenance practic	BACT-PSD	
		06/13/2011 ACT	Emergency Engine	17.11	Diesel			NOx	Limited use of 24 hours/week and recordkeeping	BACT-PSD	
FL-0328	ENI - HOLY CROSS DRILLING PROJECT	10/27/2011 ACT	Main Propulsion Engines	17.11	Diesel			NOx	Use of good combustion practices based on the c	BACT-PSD	
		10/27/2011 ACT	Main Propulsion Engines	17.11	Diesel			Carbon Monoxide	Use of good combustion practices based on the c	BACT-PSD	
		10/27/2011 ACT	Main Propulsion Engines	17.11	Diesel			Particulate matter, filtera	Use of good combustion practices based on the c	BACT-PSD	
		10/27/2011 ACT	Main Propulsion Engines	17.11	Diesel			Particulate matter, total <	Use of good combustion practices based on the c	BACT-PSD	
		10/27/2011 ACT	Main Propulsion Engines	17.11	Diesel			Particulate matter, total <	Use of good combustion practices based on the c	BACT-PSD	
		10/27/2011 ACT	Main Propulsion Engines	17.11	Diesel			VOC	Use of good combustion practices based on the c	BACT-PSD	
		10/27/2011 ACT	Main Propulsion Engines	17.11	Diesel			Carbon Dioxide	Use of good combustion practices based on the c	BACT-PSD	
		10/27/2011 ACT	Crane Engines (units 1 and 2)	17.11	Diesel			NOx	Use of certified EPA Tier 1 engines and good coml	BACT-PSD	
		10/27/2011 ACT	Crane Engines (units 1 and 2)	17.11	Diesel			Carbon Monoxide	Use of certified EPA Tier 1 engines and good coml	BACT-PSD	
		10/27/2011 ACT	Crane Engines (units 1 and 2)	17.11	Diesel			VOC	Use of certified EPA Tier 1 engines and good coml	BACT-PSD	
		10/27/2011 ACT	Crane Engines (units 1 and 2)	17.11	Diesel			Particulate matter, total (	Use of certified EPA Tier 1 engines and good coml	BACT-PSD	
		10/27/2011 ACT	Crane Engines (units 1 and 2)	17.11	Diesel			Carbon Dioxide	Use of certified EPA Tier 1 engines and good coml	BACT-PSD	
		10/27/2011 ACT	Crane Engines (units 1 and 2)	17.11	Diesel			Particulate matter, total <	Use of certified EPA Tier 1 engines and good coml	BACT-PSD	
		10/27/2011 ACT	Crane Engines (units 1 and 2)	17.11	Diesel			Particulate matter, total <	Use of certified EPA Tier 1 engines and good coml	BACT-PSD	
		10/27/2011 ACT	Crane Engines (units 3 and 4)	17.11	Diesel			NOx	Use of good combustion practices, based on the c	BACT-PSD	
		10/27/2011 ACT	Crane Engines (units 3 and 4)	17.11	Diesel			Carbon Monoxide	Use of good combustion practices, based on the c	BACT-PSD	
		10/27/2011 ACT	Crane Engines (units 3 and 4)	17.11	Diesel			VOC	Use of good combustion practices, based on the c	BACT-PSD	
		10/27/2011 ACT	Crane Engines (units 3 and 4)	17.11	Diesel			Particulate matter, total (	Use of good combustion practices, based on the c	BACT-PSD	
		10/27/2011 ACT	Crane Engines (units 3 and 4)	17.11	Diesel			Carbon Dioxide	Use of good combustion practices, based on the c	BACT-PSD	
		10/27/2011 ACT	Crane Engines (units 3 and 4)	17.11	Diesel			Particulate matter, total <	Use of certified EPA Tier 1 engines and good coml	BACT-PSD	
		10/27/2011 ACT	Crane Engines (units 3 and 4)	17.11	Diesel			Particulate matter, total <	Use of certified EPA Tier 1 engines and good coml	BACT-PSD	
		10/27/2011 ACT	Emergency Engine	17.11	Diesel			NOx	Use of good combustion practices, based on the c	BACT-PSD	
		10/27/2011 ACT	Emergency Engine	17.11	Diesel			Carbon Monoxide	Use of good combustion practices, based on the c	BACT-PSD	
		10/27/2011 ACT	Emergency Engine	17.11	Diesel			VOC	Use of good combustion practices, based on the c	BACT-PSD	
		10/27/2011 ACT	Emergency Engine	17.11	Diesel			Particulate matter, total (	Use of good combustion practices, based on the c	BACT-PSD	
		10/27/2011 ACT	Emergency Engine	17.11	Diesel			Carbon Dioxide	Use of good combustion practices, based on the c	BACT-PSD	
		10/27/2011 ACT	Emergency Engine	17.11	Diesel			Particulate matter, total <	Use of certified EPA Tier 1 engines and good coml	BACT-PSD	
		10/27/2011 ACT	Emergency Engine	17.11	Diesel			Particulate matter, total <	Use of certified EPA Tier 1 engines and good coml	BACT-PSD	
		10/27/2011 ACT	Emergency Fire Pump Engine	17.11	Diesel			NOx	Use of good combustion practices, based on the c	BACT-PSD	
		10/27/2011 ACT	Emergency Fire Pump Engine	17.11	Diesel			VOC	Use of good combustion practices, based on the c	BACT-PSD	
		10/27/2011 ACT	Emergency Fire Pump Engine	17.11	Diesel			Carbon Monoxide	Use of good combustion practices, based on the c	BACT-PSD	
		10/27/2011 ACT	Emergency Fire Pump Engine	17.11	Diesel			Particulate matter, total (	Use of good combustion practices, based on the c	BACT-PSD	
		10/27/2011 ACT	Emergency Fire Pump Engine	17.11	Diesel			Carbon Dioxide	Use of good combustion practices, based on the c	BACT-PSD	
		10/27/2011 ACT	Emergency Fire Pump Engine	17.11	Diesel			Particulate matter, total <	Use of certified EPA Tier 1 engines and good coml	BACT-PSD	

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		10/27/2011 ACT	Emergency Fire Pump Engine	17.11	Diesel			Particulate matter, total ‹	Use of certified EPA Tier 1 engines and good coml	BACT-PSD	
FL-0332	HIGHLANDS BIOREFINERY AND COGENERATION PLANT	09/23/2011 ACT	2000 KW Emergency Equipment	17.11				Sulfur Dioxide (SO2)	See Pollutant Notes.	BACT-PSD	
		09/23/2011 ACT	2000 KW Emergency Equipment	17.11				Carbon Monoxide	See Pollutant Notes.	BACT-PSD	NSPS
		09/23/2011 ACT	2000 KW Emergency Equipment	17.11				Particulate matter, total (	See Pollutant Notes.	BACT-PSD	NSPS
		09/23/2011 ACT	2000 KW Emergency Equipment	17.11				NOx	See Pollutant Notes.	BACT-PSD	NSPS
		09/23/2011 ACT	600 HP Emergency Equipment	17.11	Ultra-Low Sulfur Oil			Carbon Monoxide	See Pollutant Notes.	BACT-PSD	NSPS
		09/23/2011 ACT	600 HP Emergency Equipment	17.11	Ultra-Low Sulfur Oil			NOx	See Pollutant Notes.	BACT-PSD	NSPS
		09/23/2011 ACT	600 HP Emergency Equipment	17.11	Ultra-Low Sulfur Oil			Sulfur Dioxide (SO2)	See Pollutant Notes.	BACT-PSD	
		09/23/2011 ACT	600 HP Emergency Equipment	17.11	Ultra-Low Sulfur Oil			Particulate matter, total (	See Pollutant Notes.	BACT-PSD	NSPS
FL-0338	SAKE PROSPECT DRILLING PROJECT	05/30/2012 ACT	Main Propulsion Engines - Develo;	17.11	Diesel			NOx	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Main Propulsion Engines - Develo;	17.11	Diesel			Carbon Monoxide	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Main Propulsion Engines - Develo;	17.11	Diesel			VOC	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Main Propulsion Engines - Develo;	17.11	Diesel			Particulate matter, filtera	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Main Propulsion Engines - Develo;	17.11	Diesel			Particulate matter, filtera	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Main Propulsion Engines - Develo;	17.11	Diesel			Particulate matter, filtera	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Main Propulsion Engines - Develo;	17.11	Diesel			Carbon Dioxide Equivalen	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Source-Wide Limits	17.11	Diesel			Sulfur Dioxide (SO2)	Use of ultra low sulfur oil fuel.	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Main Propulsion Engines - C.R. Lui	17.11	Diesel	5875	hp	NOx	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Main Propulsion Engines - C.R. Lui	17.11	Diesel	5875	hp	Carbon Monoxide	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Main Propulsion Engines - C.R. Lui	17.11	Diesel	5875	hp	VOC	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Main Propulsion Engines - C.R. Lui	17.11	Diesel	5875	hp	Particulate matter, filtera	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Main Propulsion Engines - C.R. Lui	17.11	Diesel	5875	hp	Particulate matter, filtera	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Main Propulsion Engines - C.R. Lui	17.11	Diesel	5875	hp	Particulate matter, filtera	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Main Propulsion Engines - C.R. Lui	17.11	Diesel	5875	hp	Carbon Dioxide Equivalen	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Fast Rescue Craft Diesel Engine - C	17.11	diesel	142	hp	NOx	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Fast Rescue Craft Diesel Engine - C	17.11	diesel	142	hp	Carbon Dioxide Equivalen	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Fast Rescue Craft Diesel Engine - C	17.11	diesel	142	hp	Carbon Monoxide	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Fast Rescue Craft Diesel Engine - C	17.11	diesel	142	hp	Particulate matter, total (	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Fast Rescue Craft Diesel Engine - C	17.11	diesel	142	hp	VOC	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Emergency Generator Diesel Engir	17.11	Diesel	2229	hp	NOx	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Emergency Generator Diesel Engir	17.11	Diesel	2229	hp	VOC	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Emergency Generator Diesel Engir	17.11	Diesel	2229	hp	Carbon Monoxide	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Emergency Generator Diesel Engir	17.11	Diesel	2229	hp	Particulate matter, total (	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Emergency Generator Diesel Engir	17.11	Diesel	2229	hp	Particulate matter, total ‹	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Emergency Generator Diesel Engir	17.11	Diesel	2229	hp	Particulate matter, total ‹	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Emergency Generator Diesel Engir	17.11	Diesel	2229	hp	Carbon Dioxide Equivalen	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Emergency Generator Diesel Engir	17.11	diesel	2064	hp	NOx	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Emergency Generator Diesel Engir	17.11	diesel	2064	hp	Carbon Monoxide	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Emergency Generator Diesel Engir	17.11	diesel	2064	hp	VOC	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Emergency Generator Diesel Engir	17.11	diesel	2064	hp	Particulate matter, total (	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Emergency Generator Diesel Engir	17.11	diesel	2064	hp	Particulate matter, total ‹	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Emergency Generator Diesel Engir	17.11	diesel	2064	hp	Particulate matter, total ‹	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
		05/30/2012 ACT	Emergency Generator Diesel Engir	17.11	diesel	2064	hp	Carbon Dioxide Equivalen	Use of good combustion practices based on the ci	BACT-PSD	OPERATING PERMIT
FL-0346	LAUDERDALE PLANT	04/22/2014 ACT	Four 3100 kW black start emerger	17.11	ULSD	2.32	MMBtu/hr (H	Sulfur Dioxide (SO2)	ULSD required	BACT-PSD	NSPS
		04/22/2014 ACT	Four 3100 kW black start emerger	17.11	ULSD	2.32	MMBtu/hr (H	Carbon Monoxide	Good combustion practice	BACT-PSD	NSPS
		04/22/2014 ACT	Four 3100 kW black start emerger	17.11	ULSD	2.32	MMBtu/hr (H	Particulate matter, total (	Good combustion practice	BACT-PSD	NSPS
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	09/16/2014 ACT	Main Propulsion Generator Diesel	17.11	Diesel	9910	hp	Particulate matter, total ‹	Use of good combustion practices based on the m	BACT-PSD	OPERATING PERMIT
		09/16/2014 ACT	Main Propulsion Generator Diesel	17.11	Diesel	9910	hp	NOx	Use of good combustion practices based on the m	BACT-PSD	OPERATING PERMIT

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		09/16/2014 ACT	Main Propulsion Generator Diesel	17.11	Diesel	9910	hp	Carbon Monoxide	Use of good combustion practices based on the r	BACT-PSD	OPERATING PERMIT
		09/16/2014 ACT	Main Propulsion Generator Diesel	17.11	Diesel	9910	hp	Particulate matter, total (	Use of good combustion practices based on the r	BACT-PSD	OPERATING PERMIT
		09/16/2014 ACT	Main Propulsion Generator Diesel	17.11	Diesel	9910	hp	VOC	Use of good combustion practices based on the r	BACT-PSD	OPERATING PERMIT
		09/16/2014 ACT	Main Propulsion Generator Diesel	17.11	Diesel	9910	hp	Particulate matter, total {	Use of good combustion practices based on the r	BACT-PSD	OPERATING PERMIT
		09/16/2014 ACT	Emergency Diesel Engine	17.11	Diesel	3300	hp	VOC	Use of good combustion practices based on the m	BACT-PSD	OPERATING PERMIT
		09/16/2014 ACT	Emergency Diesel Engine	17.11	Diesel	3300	hp	Carbon Monoxide	Use of good combustion practices based on the m	BACT-PSD	OPERATING PERMIT
		09/16/2014 ACT	Emergency Diesel Engine	17.11	Diesel	3300	hp	Particulate matter, total (	Use of good combustion practices based on the m	BACT-PSD	OPERATING PERMIT
		09/16/2014 ACT	Emergency Diesel Engine	17.11	Diesel	3300	hp	NOx	Use of good combustion practices based on the m	BACT-PSD	OPERATING PERMIT
		09/16/2014 ACT	Source Wide Emissions	17.11	Diesel			Sulfur Dioxide (SO2)	Use diesel fuel with a sulfur content no greater th	BACT-PSD	OPERATING PERMIT
		09/16/2014 ACT	Source Wide Emissions	17.11	Diesel			Carbon Dioxide Equivalen	good combustion practices based on the most rec	BACT-PSD	OPERATING PERMIT
FL-0348	MURPHY EXPLORATION &	05/15/2012 ACT	Source Wide Emission Limit	17.11	Diesel			Particulate matter, total (	PSD Avoidance Limit	BACT-PSD	OPERATING PERMIT
	PRODUCTION CO.	05/15/2012 ACT	Source Wide Emission Limit	17.11	Diesel			Sulfur Dioxide (SO2)	Determine and record sulfur content by certificati	BACT-PSD	OPERATING PERMIT
		05/15/2012 ACT	Source Wide Emission Limit	17.11	Diesel			VOC	PSD Avoidance	BACT-PSD	OPERATING PERMIT
		05/15/2012 ACT	Main Propulsion Generators	17.21	Diesel	4425	hp	NOx	Use of engine with turbo charger with after coole	BACT-PSD	OPERATING PERMIT
		05/15/2012 ACT	Drill Floor and Crew Quarters Elec	17.11	Diesel	6789	hp	NOx	Use of engine with turbo charger with after coole	BACT-PSD	OPERATING PERMIT
		05/15/2012 ACT	Emergency Electrical Generator	17.11	Diesel	1100	hp	NOx	Use of good combustion and maintenance practic	BACT-PSD	OPERATING PERMIT
FL-0349	STATOIL GULF SERVICES, LLC	08/14/2014 ACT	Source Wide Limits	17.11	diesel			Sulfur Dioxide (SO2)	Certification of sulfur content of fuel from fuel su	BACT-PSD	OPERATING PERMIT
		08/14/2014 ACT	Source Wide Limits	17.11	diesel			Particulate matter, total (	PSD Avoidance	BACT-PSD	OPERATING PERMIT
FL-0350	ANADARKO PETROLEUM, INC	12/31/2014 ACT	Sourcewide Limits	17.11	Diesel			Sulfur Dioxide (SO2)	Obtain certification of sulfur content from the fue	BACT-PSD	OPERATING PERMIT
	DIAMOND BLACKHAWK	12/31/2014 ACT	Main Propulsion Generator Engine	17.11	Diesel			NOx	Use of good combustion practices based on the m	BACT-PSD	OPERATING PERMIT
FL-0356	OKEECHOBEE CLEAN ENERGY	03/09/2016 ACT	Three 3300-kW ULSD emergency g	17.11	ULSD			Sulfur Dioxide (SO2)	Use of ULSD	BACT-PSD	NSPS
	CENTER	03/09/2016 ACT	Three 3300-kW ULSD emergency g	17.11	ULSD			Carbon Monoxide	Use of clean engine	BACT-PSD	NSPS
		03/09/2016 ACT	Three 3300-kW ULSD emergency g	17.11	ULSD			Particulate matter, total (	Use of clean fuel	BACT-PSD	NSPS
*FL-0363	DANIA BEACH ENERGY	12/04/2017 ACT	Two 3300 kW emergency generat	17.11	ULSD			Carbon Monoxide	Certified engine	BACT-PSD	NSPS
	CENTER	12/04/2017 ACT	Two 3300 kW emergency generat	17.11	ULSD			Particulate matter, filtera	Clean fuel	BACT-PSD	NSPS
		12/04/2017 ACT	Two 3300 kW emergency generat	17.11	ULSD			Sulfur Dioxide (SO2)	Clean fuel	BACT-PSD	NSPS
IA-0095	TATE & LYLE INDGREDIENTS	09/19/2008 ACT	EMERGENCY GENERATOR	17.11	DIESEL	700	KW	VOC		BACT-PSD	NSPS
	AMERICAS, INC.	09/19/2008 ACT	EMERGENCY GENERATOR	17.11	DIESEL	700	KW	Particulate Matter (PM)		BACT-PSD	NSPS
		09/19/2008 ACT	EMERGENCY GENERATOR	17.11	DIESEL	700	KW	Particulate matter, filterable < 10 Âµ (FPM10)		BACT-PSD	NSPS
		09/19/2008 ACT	EMERGENCY GENERATOR	17.11	DIESEL	700	KW	Visible Emissions (VE)		BACT-PSD	NSPS
		09/19/2008 ACT	EMERGENCY GENERATOR	17.11	DIESEL	700	KW	Sulfur Dioxide (SO2)	FUEL SULFUR LIMIT	BACT-PSD	NSPS
		09/19/2008 ACT	EMERGENCY GENERATOR	17.11	DIESEL	700	KW	NOx		BACT-PSD	NSPS
		09/19/2008 ACT	EMERGENCY GENERATOR	17.11	DIESEL	700	KW	Carbon Monoxide		BACT-PSD	NSPS
		09/19/2008 ACT	FIRE PUMP ENGINE	17.11	DIESEL	575	HP	Particulate Matter (PM)		BACT-PSD	NSPS
		09/19/2008 ACT	FIRE PUMP ENGINE	17.11	DIESEL	575	HP	Particulate matter, filterable < 10 Âµ (FPM10)		BACT-PSD	NSPS
		09/19/2008 ACT	FIRE PUMP ENGINE	17.11	DIESEL	575	HP	Visible Emissions (VE)		BACT-PSD	NSPS
		09/19/2008 ACT	FIRE PUMP ENGINE	17.11	DIESEL	575	HP	Sulfur Dioxide (SO2)	LIMIT ON SULFUR IN FUEL	BACT-PSD	NSPS
		09/19/2008 ACT	FIRE PUMP ENGINE	17.11	DIESEL	575	HP	NOx		BACT-PSD	NSPS
		09/19/2008 ACT	FIRE PUMP ENGINE	17.11	DIESEL	575	HP	VOC		BACT-PSD	NSPS
		09/19/2008 ACT	FIRE PUMP ENGINE	17.11	DIESEL	575	HP	Carbon Monoxide		BACT-PSD	NSPS
IA-0105	IOWA FERTILIZER COMPANY	10/26/2012 ACT	Emergency Generator	17.11	diesel fuel	142	GAL/H	Particulate matter, total (	good combustion practices	BACT-PSD	
		10/26/2012 ACT	Emergency Generator	17.11	diesel fuel	142	GAL/H	Particulate matter, total {	good combustion practices	BACT-PSD	
		10/26/2012 ACT	Emergency Generator	17.11	diesel fuel	142	GAL/H	Particulate matter, total {	good combustion practices	BACT-PSD	
		10/26/2012 ACT	Emergency Generator	17.11	diesel fuel	142	GAL/H	Visible Emissions (VE)	good combustion practices	BACT-PSD	
		10/26/2012 ACT	Emergency Generator	17.11	diesel fuel	142	GAL/H	NOx	good combustion practices	BACT-PSD	
		10/26/2012 ACT	Emergency Generator	17.11	diesel fuel	142	GAL/H	VOC	good combustion practices	BACT-PSD	
		10/26/2012 ACT	Emergency Generator	17.11	diesel fuel	142	GAL/H	Carbon Monoxide	good combustion practices	BACT-PSD	
		10/26/2012 ACT	Emergency Generator	17.11	diesel fuel	142	GAL/H	Carbon Dioxide Equivalen	good combustion practices	BACT-PSD	

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		10/26/2012 ACT	Emergency Generator	17.11	diesel fuel	142	GAL/H	Carbon Dioxide	good combustion practices	BACT-PSD	
		10/26/2012 ACT	Emergency Generator	17.11	diesel fuel	142	GAL/H	Methane	good combustion practices	BACT-PSD	
IA-0106	CF INDUSTRIES NITROGEN, LLC	07/12/2013 ACT	Emergency Generators	17.11	diesel fuel	180	GAL/H	Particulate matter, total (	good combustion practices	BACT-PSD	
	- PORT NEAL NITROGEN	07/12/2013 ACT	Emergency Generators	17.11	diesel fuel	180	GAL/H	Particulate matter, total (	good combustion practices	BACT-PSD	SIP
	COMPLEX	07/12/2013 ACT	Emergency Generators	17.11	diesel fuel	180	GAL/H	Particulate matter, total (	good combustion practices	BACT-PSD	SIP
		07/12/2013 ACT	Emergency Generators	17.11	diesel fuel	180	GAL/H	Visible Emissions (VE)	good combustion practices	BACT-PSD	
		07/12/2013 ACT	Emergency Generators	17.11	diesel fuel	180	GAL/H	VOC	good combustion practices	BACT-PSD	
		07/12/2013 ACT	Emergency Generators	17.11	diesel fuel	180	GAL/H	Carbon Monoxide	good combustion practices	BACT-PSD	SIP
		07/12/2013 ACT	Emergency Generators	17.11	diesel fuel	180	GAL/H	Carbon Dioxide	good combustion practices	BACT-PSD	
		07/12/2013 ACT	Emergency Generators	17.11	diesel fuel	180	GAL/H	Methane	good combustion practices	BACT-PSD	
		07/12/2013 ACT	Emergency Generators	17.11	diesel fuel	180	GAL/H	Carbon Dioxide Equivalen	good combustion practices	BACT-PSD	
ID-0017	POWER COUNTY ADVANCED	02/10/2009 ACT	2 MW EMERGENCY GENERATOR, !	17.11	ASTM #1, 2, DIESEL	2000	KW	NOx	GOOD COMBUSTION PRACTICES. EPA CERTIFIED P	BACT-PSD	NSPS
	ENERGY CENTER	02/10/2009 ACT	2 MW EMERGENCY GENERATOR, !	17.11	ASTM #1, 2, DIESEL	2000	KW	Particulate Matter (PM)	ULSD FUEL, GOOD COMBUSTION PRACTICES, EPA	BACT-PSD	NSPS , NSPS
		02/10/2009 ACT	2 MW EMERGENCY GENERATOR, !	17.11	ASTM #1, 2, DIESEL	2000	KW	Particulate matter, filtera	ULSD FUEL, GOOD COMBUSTION PRACTICES, EPA	BACT-PSD	
		02/10/2009 ACT	2 MW EMERGENCY GENERATOR, !	17.11	ASTM #1, 2, DIESEL	2000	KW	Carbon Monoxide	GOOD COMBUSTION PRACTICES. EPA CERTIFIED F	BACT-PSD	NSPS
		02/10/2009 ACT	500 KW EMERGENCY GENERATOR	17.11	ASTM #1, 2, DIESEL	500	KW	Particulate Matter (PM)	ULSD FUEL, EPA CERTIFICATION PER NSPS IIII	BACT-PSD	NSPS
		02/10/2009 ACT	500 KW EMERGENCY GENERATOR	17.11	ASTM #1, 2, DIESEL	500	KW	Particulate matter, filtera	ULSD FUEL, EPA CERTIFICATION PER NSPS IIII	BACT-PSD	
		02/10/2009 ACT	500 KW EMERGENCY GENERATOR	17.11	ASTM #1, 2, DIESEL	500	KW	Carbon Monoxide	GOOD COMBUSTION PRACTICES. EPA CERTIFICAT	BACT-PSD	NSPS
		02/10/2009 ACT	500 KW EMERGENCY GENERATOR	17.11	ASTM #1, 2, DIESEL	500	KW	NOx	GOOD COMBUSTION PRACTICES. EPA CERTIFICAT	BACT-PSD	NSPS
ID-0018	LANGLEY GULCH POWER	06/25/2010 ACT	EMERGENCY GENERATOR ENGINE	17.11	DIESEL	750	KW	NOx	GOOD COMBUSTION PRACTICES (GCP)	BACT-PSD	NSPS
	PLANT	06/25/2010 ACT	EMERGENCY GENERATOR ENGINE	17.11	DIESEL	750	KW	VOC	GOOD COMBUSTION PRACTICES (GCP)	BACT-PSD	NSPS
		06/25/2010 ACT	EMERGENCY GENERATOR ENGINE	17.11	DIESEL	750	KW	Carbon Monoxide	GOOD COMBUSTION PRACTICES (GCP)	BACT-PSD	NSPS
		06/25/2010 ACT	EMERGENCY GENERATOR ENGINE	17.11	DIESEL	750	KW	Particulate Matter (PM)	GOOD COMBUSTION PRACTICES (GCP)	BACT-PSD	NSPS
IL-0114	CRONUS CHEMICALS, LLC	09/05/2014 ACT	Emergency Generator	17.11	distillate fuel oil	3755	HP	NOx	Tier IV standards for non-road engines at 40 CFR 1	BACT-PSD	
		09/05/2014 ACT	Emergency Generator	17.11	distillate fuel oil	3755	HP	Carbon Monoxide	Tier IV standards for non-road engines at 40 CFR 1	BACT-PSD	
		09/05/2014 ACT	Emergency Generator	17.11	distillate fuel oil	3755	HP	Particulate matter, filtera	Tier IV standards for non-road engines at 40 CFR 1	BACT-PSD	
		09/05/2014 ACT	Emergency Generator	17.11	distillate fuel oil	3755	HP	Particulate matter, total (	Tier IV standards for non-road engines at 40 CFR 1	BACT-PSD	
		09/05/2014 ACT	Emergency Generator	17.11	distillate fuel oil	3755	HP	Particulate matter, total (	Tier IV standards for non-road engines at 40 CFR 1	BACT-PSD	
		09/05/2014 ACT	Emergency Generator	17.11	distillate fuel oil	3755	HP	VOC	Tier IV standards for non-road engines at 40 CFR 1	BACT-PSD	
		09/05/2014 ACT	Emergency Generator	17.11	distillate fuel oil	3755	HP	Carbon Dioxide Equivalen	Tier IV standards for non-road engines at 40 CFR 1	BACT-PSD	
IN-0158	ST. JOSEPH ENEGRY CENTER,	12/03/2012 ACT	TWO (2) EMERGENCY DIESEL GENI	17.11	DIESEL	1006	HP EACH	Carbon Dioxide Equivalen	GOOD ENGINEERING DESIGN AND FUEL EFFICIEN1	BACT-PSD	
	LLC	12/03/2012 ACT	TWO (2) EMERGENCY DIESEL GENI	17.11	DIESEL	1006	HP EACH	Particulate matter, filtera	COMBUSTION DESIGN CONTROLS AND USAGE LIN	BACT-PSD	
		12/03/2012 ACT	TWO (2) EMERGENCY DIESEL GENI	17.11	DIESEL	1006	HP EACH	Particulate matter, filtera	COMBUSTION DESIGN CONTROLS AND USAGE LIN	BACT-PSD	
		12/03/2012 ACT	TWO (2) EMERGENCY DIESEL GENI	17.11	DIESEL	1006	HP EACH	Particulate matter, filtera	COMBUSTION DESIGN CONTROLS AND USAGE LIN	BACT-PSD	
		12/03/2012 ACT	TWO (2) EMERGENCY DIESEL GENI	17.11	DIESEL	1006	HP EACH	Carbon Monoxide	COMBUSTION DESIGN CONTROLS AND USAGE LIN	BACT-PSD	
		12/03/2012 ACT	TWO (2) EMERGENCY DIESEL GENI	17.11	DIESEL	1006	HP EACH	Sulfur Dioxide (SO2)	ULTRA LOW SULFUR DISTILLATE AND USAGE LIMI	BACT-PSD	
		12/03/2012 ACT	TWO (2) EMERGENCY DIESEL GENI	17.11	DIESEL	1006	HP EACH	VOC	COMBUSTION DESIGN CONTROLS AND USAGE LIN	BACT-PSD	
		12/03/2012 ACT	TWO (2) EMERGENCY DIESEL GENI	17.11	DIESEL	1006	HP EACH	NOx	COMBUSTION DESIGN CONTROLS AND USAGE LIN	BACT-PSD	
		12/03/2012 ACT	EMERGENCY DIESEL GENERATOR	17.11	DIESEL	2012	HP	Carbon Dioxide Equivalen	EFFICIENT DESIGN	BACT-PSD	
		12/03/2012 ACT	EMERGENCY DIESEL GENERATOR	17.11	DIESEL	2012	HP	Particulate matter, filtera	COMBUSTION DESIGN CONTROLS AND USAGE LIN	BACT-PSD	
		12/03/2012 ACT	EMERGENCY DIESEL GENERATOR	17.11	DIESEL	2012	HP	Particulate matter, filtera	COMBUSTION DESIGN CONTROLS AND USAGE LIN	BACT-PSD	
		12/03/2012 ACT	EMERGENCY DIESEL GENERATOR	17.11	DIESEL	2012	HP	Particulate matter, filtera	COMBUSTION DESIGN CONTROLS AND USAGE LIN	BACT-PSD	
		12/03/2012 ACT	EMERGENCY DIESEL GENERATOR	17.11	DIESEL	2012	HP	Carbon Monoxide	COMBUSTION DESIGN CONTROLS AND USAGE LIN	BACT-PSD	
		12/03/2012 ACT	EMERGENCY DIESEL GENERATOR	17.11	DIESEL	2012	HP	Sulfur Dioxide (SO2)	ULTRA LOW SULFUR DISTILLATE AND UASGE LIMI	BACT-PSD	
		12/03/2012 ACT	EMERGENCY DIESEL GENERATOR	17.11	DIESEL	2012	HP	VOC	COMBUSTION DESIGN CONTROLS AND USAGE LIN	BACT-PSD	
		12/03/2012 ACT	EMERGENCY DIESEL GENERATOR	17.11	DIESEL	2012	HP	NOx	COMBUSTION DESIGN CONTROLS AND USAGE LIN	BACT-PSD	
IN-0166	INDIANA GASIFICATION, LLC	06/27/2012 ACT	TWO (2) EMERGENCY GENERATOF	17.11	DIESEL	1341	HP, EACH	Particulate matter, total (	USE OF LOW-S DIESEL AND LIMITED HOURS OF NC	BACT-PSD	
		06/27/2012 ACT	TWO (2) EMERGENCY GENERATOF	17.11	DIESEL	1341	HP, EACH	Particulate matter, total (	USE OF LOW-S DIESEL	BACT-PSD	

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		06/27/2012 ACT	TWO (2) EMERGENCY GENERATOF	17.11	DIESEL	1341	HP, EACH	NOx	GOOD COMBUSTION PRACTICES AND LIMITED HO	BACT-PSD	
		06/27/2012 ACT	TWO (2) EMERGENCY GENERATOF	17.11	DIESEL	1341	HP, EACH	Carbon Monoxide	GOOD COMBUSTION PRACTICES AND LIMITED HO	BACT-PSD	
		06/27/2012 ACT	TWO (2) EMERGENCY GENERATOF	17.11	DIESEL	1341	HP, EACH	Sulfur Dioxide (SO2)	USE OF LOW-S DIESEL AND LIMITED HOURS OF NC	BACT-PSD	
		06/27/2012 ACT	TWO (2) EMERGENCY GENERATOF	17.11	DIESEL	1341	HP, EACH	Carbon Dioxide	USE OF GOOD ENGINEERING DESIGN AND EFFICIE	BACT-PSD	
		06/27/2012 ACT	TWO (2) EMERGENCY GENERATOF	17.11	DIESEL	1341	HP, EACH	Particulate matter, filtera	USE OF LOW-S DIESEL AND LIMITED HOURS OF NC	BACT-PSD	
		06/27/2012 ACT	THREE (3) FIREWATER PUMP ENGI	17.11	DIESEL	575	HP, EACH	NOx	GOOD COMBUSTION PRACTICES AND LIMITED HO	BACT-PSD	
		06/27/2012 ACT	THREE (3) FIREWATER PUMP ENGI	17.11	DIESEL	575	HP, EACH	Carbon Monoxide	GOOD COMBUSTION PRACTICES AND LIMITED HO	BACT-PSD	
		06/27/2012 ACT	THREE (3) FIREWATER PUMP ENGI	17.11	DIESEL	575	HP, EACH	Sulfur Dioxide (SO2)	USE OF LOW-S DIESEL AND LIMITED HOURS OF NC	BACT-PSD	
		06/27/2012 ACT	THREE (3) FIREWATER PUMP ENGI	17.11	DIESEL	575	HP, EACH	Particulate matter, filtera	USE OF LOW-S DIESEL AND LIMITED HOURS OF NC	BACT-PSD	
		06/27/2012 ACT	THREE (3) FIREWATER PUMP ENGI	17.11	DIESEL	575	HP, EACH	Particulate matter, total	USE OF LOW-S DIESEL AND LIMITED HOURS OF NC	BACT-PSD	
		06/27/2012 ACT	THREE (3) FIREWATER PUMP ENGI	17.11	DIESEL	575	HP, EACH	Particulate matter, total	USE OF LOW-S DIESEL AND LIMITED HOURS OF NC	BACT-PSD	
		06/27/2012 ACT	THREE (3) FIREWATER PUMP ENGI	17.11	DIESEL	575	HP, EACH	Carbon Dioxide	USE OF GOOD ENGINEERING DESIGN AND EFFICIE	BACT-PSD	
IN-0173	MIDWEST FERTILIZER CORPORATION	06/04/2014 ACT	DIESEL FIRED EMERGENCY GENER	17.11	NO. 2, DIESEL	3600	BHP	Particulate matter, filtera	GOOD COMBUSTION PRACTICES	BACT-PSD	
		06/04/2014 ACT	DIESEL FIRED EMERGENCY GENER	17.11	NO. 2, DIESEL	3600	BHP	Particulate matter, total	GOOD COMBUSTION PRACTICES	BACT-PSD	
		06/04/2014 ACT	DIESEL FIRED EMERGENCY GENER	17.11	NO. 2, DIESEL	3600	BHP	Particulate matter, total	GOOD COMBUSTION PRACTICES	BACT-PSD	
		06/04/2014 ACT	DIESEL FIRED EMERGENCY GENER	17.11	NO. 2, DIESEL	3600	BHP	NOx	GOOD COMBUSTION PRACTICES	BACT-PSD	
		06/04/2014 ACT	DIESEL FIRED EMERGENCY GENER	17.11	NO. 2, DIESEL	3600	BHP	Carbon Monoxide	GOOD COMBUSTION PRACTICES	BACT-PSD	
		06/04/2014 ACT	DIESEL FIRED EMERGENCY GENER	17.11	NO. 2, DIESEL	3600	BHP	VOC	GOOD COMBUSTION PRACTICES	BACT-PSD	
		06/04/2014 ACT	DIESEL FIRED EMERGENCY GENER	17.11	NO. 2, DIESEL	3600	BHP	Carbon Dioxide	GOOD COMBUSTION PRACTICES	BACT-PSD	
IN-0179	OHIO VALLEY RESOURCES, LLC	09/25/2013 ACT	DIESEL-FIRED EMERGENCY GENER	17.11	NO. 2 FUEL OIL	4690	B-HP	Particulate matter, filtera	GOOD COMBUSTION PRACTICES	BACT-PSD	
		09/25/2013 ACT	DIESEL-FIRED EMERGENCY GENER	17.11	NO. 2 FUEL OIL	4690	B-HP	Particulate matter, total	GOOD COMBUSTION PRACTICES	BACT-PSD	
		09/25/2013 ACT	DIESEL-FIRED EMERGENCY GENER	17.11	NO. 2 FUEL OIL	4690	B-HP	Particulate matter, total	GOOD COMBUSTION PRACTICES	BACT-PSD	
		09/25/2013 ACT	DIESEL-FIRED EMERGENCY GENER	17.11	NO. 2 FUEL OIL	4690	B-HP	NOx	GOOD COMBUSTION PRACTICES	BACT-PSD	
		09/25/2013 ACT	DIESEL-FIRED EMERGENCY GENER	17.11	NO. 2 FUEL OIL	4690	B-HP	Carbon Monoxide	GOOD COMBUSTION PRACTICES	BACT-PSD	
		09/25/2013 ACT	DIESEL-FIRED EMERGENCY GENER	17.11	NO. 2 FUEL OIL	4690	B-HP	VOC	GOOD COMBUSTION PRACTICES	BACT-PSD	
		09/25/2013 ACT	DIESEL-FIRED EMERGENCY GENER	17.11	NO. 2 FUEL OIL	4690	B-HP	Carbon Dioxide	GOOD COMBUSTION PRACTICES	BACT-PSD	
IN-0180	MIDWEST FERTILIZER CORPORATION	06/04/2014 ACT	DIESEL FIRED EMERGENCY GENER	17.11	NO. 2, DIESEL	3600	BHP	Particulate matter, filtera	GOOD COMBUSTION PRACTICES	BACT-PSD	
		06/04/2014 ACT	DIESEL FIRED EMERGENCY GENER	17.11	NO. 2, DIESEL	3600	BHP	Particulate matter, total	GOOD COMBUSTION PRACTICES	BACT-PSD	
		06/04/2014 ACT	DIESEL FIRED EMERGENCY GENER	17.11	NO. 2, DIESEL	3600	BHP	Particulate matter, total	GOOD COMBUSTION PRACTICES	BACT-PSD	
		06/04/2014 ACT	DIESEL FIRED EMERGENCY GENER	17.11	NO. 2, DIESEL	3600	BHP	NOx	GOOD COMBUSTION PRACTICES	BACT-PSD	
		06/04/2014 ACT	DIESEL FIRED EMERGENCY GENER	17.11	NO. 2, DIESEL	3600	BHP	Carbon Monoxide	GOOD COMBUSTION PRACTICES	BACT-PSD	
		06/04/2014 ACT	DIESEL FIRED EMERGENCY GENER	17.11	NO. 2, DIESEL	3600	BHP	VOC	GOOD COMBUSTION PRACTICES	BACT-PSD	
		06/04/2014 ACT	DIESEL FIRED EMERGENCY GENER	17.11	NO. 2, DIESEL	3600	BHP	Carbon Dioxide	GOOD COMBUSTION PRACTICES	BACT-PSD	
IN-0185	MAG PELLET LLC	04/24/2014 ACT	DIESEL FIRE PUMP	17.11	DIESEL	300	HP	Fluorides, Total		BACT-PSD	
		04/24/2014 ACT	DIESEL FIRE PUMP	17.11	DIESEL	300	HP	Particulate matter, filterable (FPM)		BACT-PSD	
		04/24/2014 ACT	DIESEL FIRE PUMP	17.11	DIESEL	300	HP	Particulate matter, filterable < 10 Âµ (FPM10)		BACT-PSD	
		04/24/2014 ACT	DIESEL FIRE PUMP	17.11	DIESEL	300	HP	Particulate matter, filterable < 2.5 Âµ (FPM2.5)		BACT-PSD	
		04/24/2014 ACT	DIESEL FIRE PUMP	17.11	DIESEL	300	HP	Carbon Dioxide Equivalent (CO2e)		BACT-PSD	
		04/24/2014 ACT	DIESEL FIRE PUMP	17.11	DIESEL	300	HP	NOx		BACT-PSD	
		04/24/2014 ACT	DIESEL FIRE PUMP	17.11	DIESEL	300	HP	Sulfur Dioxide (SO2)		BACT-PSD	
IN-0263	MIDWEST FERTILIZER COMPANY LLC	03/23/2017 ACT	EMERGENCY GENERATORS (EU01	17.11	DISTILLATE OIL	3600	HP EACH	Particulate matter, total (	GOOD COMBUSTION PRACTICES	BACT-PSD	
		03/23/2017 ACT	EMERGENCY GENERATORS (EU01	17.11	DISTILLATE OIL	3600	HP EACH	Particulate matter, total	GOOD COMBUSTION PRACTICES	BACT-PSD	
		03/23/2017 ACT	EMERGENCY GENERATORS (EU01	17.11	DISTILLATE OIL	3600	HP EACH	Particulate matter, total	GOOD COMBUSTION PRACTICES	BACT-PSD	
		03/23/2017 ACT	EMERGENCY GENERATORS (EU01	17.11	DISTILLATE OIL	3600	HP EACH	NOx	GOOD COMBUSTION PRACTICES	BACT-PSD	
		03/23/2017 ACT	EMERGENCY GENERATORS (EU01	17.11	DISTILLATE OIL	3600	HP EACH	Carbon Monoxide	GOOD COMBUSTION PRACTICES	BACT-PSD	
		03/23/2017 ACT	EMERGENCY GENERATORS (EU01	17.11	DISTILLATE OIL	3600	HP EACH	VOC	GOOD COMBUSTION PRACTICES	BACT-PSD	
		03/23/2017 ACT	EMERGENCY GENERATORS (EU01	17.11	DISTILLATE OIL	3600	HP EACH	Carbon Dioxide	GOOD COMBUSTION PRACTICES	BACT-PSD	
*KS-0036	WESTAR ENERGY - EMPORIA	03/18/2013 ACT	Caterpillar C18DITA Diesel Engine	17.11	No. 2 Fuel Oil	900	BHP	NOx	utilize efficient combustion/design technology	BACT-PSD	

RBLC ID	FACILITY NAME	PERMIT ISSUANCE	PROCESS_NAME	PROCCESST	PRIMARY FUEL	THROUGH	UNITs	POLLUTANT	CONTROL_METHOD_DESCRIPTION	CASE-BY-CASE	OTHER
	ENERGY CENTER	03/18/2013 ACT	Caterpillar C18DITA Diesel Engine	17.11	No. 2 Fuel Oil	900	BHP	Sulfur Dioxide (SO2)	use low sulfur fuel oil	BACT-PSD	
		03/18/2013 ACT	Caterpillar C18DITA Diesel Engine	17.11	No. 2 Fuel Oil	900	BHP	Sulfuric Acid (mist, vapor:	use low sulfur fuel oil	BACT-PSD	
		03/18/2013 ACT	Caterpillar C18DITA Diesel Engine	17.11	No. 2 Fuel Oil	900	BHP	Carbon Monoxide	utilize efficient combustion/design technology	BACT-PSD	
		03/18/2013 ACT	Caterpillar C18DITA Diesel Engine	17.11	No. 2 Fuel Oil	900	BHP	Particulate matter, total £	utilize efficient combustion/design technology	BACT-PSD	
		03/18/2013 ACT	Caterpillar C18DITA Diesel Engine	17.11	No. 2 Fuel Oil	900	BHP	Particulate matter, total (	utilize efficient combustion/design technology	BACT-PSD	
		03/18/2013 ACT	Caterpillar C18DITA Diesel Engine	17.11	No. 2 Fuel Oil	900	BHP	VOC	utilize efficient combustion/design technology	BACT-PSD	
LA-0204	PLAQUEMINE PVC PLANT	02/27/2009 ACT	LARGE EMERGENCY ENGINES	17.11	DIESEL			Carbon Monoxide	GOOD COMBUSTION PRACTICES AND GASEOUS FI	BACT-PSD	OPERATING PERMIT
		02/27/2009 ACT	LARGE EMERGENCY ENGINES	17.11	DIESEL			Particulate matter, total £	GOOD COMBUSTION PRACTICES AND GASEOUS FI	BACT-PSD	OPERATING PERMIT
		02/27/2009 ACT	LARGE EMERGENCY ENGINES	17.11	DIESEL			NOx	GOOD COMBUSTION PRACTICES AND GASEOUS FI	BACT-PSD	OPERATING PERMIT
LA-0231	LAKE CHARLES GASIFICATION FACILITY	06/22/2009 ACT	FIRE WATER DIESEL PUMPS (3)	17.11	DIESEL	575	HP EACH	Particulate matter, total £	COMPLY WITH 40 CFR 60 SUBPART IIII	BACT-PSD	NSPS , OPERATING PERMIT
		06/22/2009 ACT	FIRE WATER DIESEL PUMPS (3)	17.11	DIESEL	575	HP EACH	Sulfur Dioxide (SO2)	COMPLY WITH 40 CFR 60 SUBPART IIII	BACT-PSD	NSPS , OPERATING PERMIT
		06/22/2009 ACT	FIRE WATER DIESEL PUMPS (3)	17.11	DIESEL	575	HP EACH	NOx	COMPLY WITH 40 CFR 60 SUBPART IIII	BACT-PSD	OPERATING PERMIT , NSPS ,
		06/22/2009 ACT	FIRE WATER DIESEL PUMPS (3)	17.11	DIESEL	575	HP EACH	Carbon Monoxide	COMPLY WITH 40 CFR 60 SUBPART IIII	BACT-PSD	NSPS , OPERATING PERMIT
		06/22/2009 ACT	EMERGENCY DIESEL POWER GENE	17.11	DIESEL	1341	HP EACH	Particulate matter, total £	COMPLY WITH 40 CFR 60 SUBPART IIII	BACT-PSD	NSPS , OPERATING PERMIT
		06/22/2009 ACT	EMERGENCY DIESEL POWER GENE	17.11	DIESEL	1341	HP EACH	Sulfur Dioxide (SO2)	COMPLY WITH 40 CFR 60 SUBPART IIII	BACT-PSD	NSPS , OPERATING PERMIT
		06/22/2009 ACT	EMERGENCY DIESEL POWER GENE	17.11	DIESEL	1341	HP EACH	NOx	COMPLY WITH 40 CFR 60 SUBPART IIII	BACT-PSD	NSPS , OPERATING PERMIT
		06/22/2009 ACT	EMERGENCY DIESEL POWER GENE	17.11	DIESEL	1341	HP EACH	Carbon Monoxide	COMPLY WITH 40 CFR 60 SUBPART IIII	BACT-PSD	NSPS , OPERATING PERMIT
LA-0251	FLOPAM INC. FACILITY	04/26/2011 ACT	Large Generator Engines (17 units	17.11	Diesel			Particulate matter, filterable < 10 Âµ (FPM10)		BACT-PSD	NSPS
		04/26/2011 ACT	Large Generator Engines (17 units	17.11	Diesel			NOx		LAER	NSPS
		04/26/2011 ACT	Large Generator Engines (17 units	17.11	Diesel			Carbon Monoxide	no additional control	BACT-PSD	NSPS
LA-0254	NINEMILE POINT ELECTRIC GENERATING PLANT	08/16/2011 ACT	EMERGENCY DIESEL GENERATOR	17.11	DIESEL	1250	HP	Particulate matter, total £	ULTRA LOW SULFUR DIESEL AND GOOD COMBUS	BACT-PSD	OPERATING PERMIT
		08/16/2011 ACT	EMERGENCY DIESEL GENERATOR	17.11	DIESEL	1250	HP	Particulate matter, total £	ULTRA LOW SULFUR DIESEL AND GOOD COMBUS	BACT-PSD	OPERATING PERMIT
		08/16/2011 ACT	EMERGENCY DIESEL GENERATOR	17.11	DIESEL	1250	HP	Carbon Monoxide	ULTRA LOW SULFUR DIESEL AND GOOD COMBUS	BACT-PSD	OPERATING PERMIT
		08/16/2011 ACT	EMERGENCY DIESEL GENERATOR	17.11	DIESEL	1250	HP	VOC	ULTRA LOW SULFUR DIESEL AND GOOD COMBUS	BACT-PSD	OPERATING PERMIT
		08/16/2011 ACT	EMERGENCY DIESEL GENERATOR	17.11	DIESEL	1250	HP	Nitrous Oxide (N2O)	PROPER OPERATION AND GOOD COMBUSTION PF	BACT-PSD	OPERATING PERMIT
		08/16/2011 ACT	EMERGENCY DIESEL GENERATOR	17.11	DIESEL	1250	HP	Carbon Dioxide	PROPER OPERATION AND GOOD COMBUSTION PF	BACT-PSD	OPERATING PERMIT
		08/16/2011 ACT	EMERGENCY DIESEL GENERATOR	17.11	DIESEL	1250	HP	Methane	PROPER OPERATION AND GOOD COMBUSTION PF	BACT-PSD	OPERATING PERMIT
LA-0272	AMMONIA PRODUCTION FACILITY	03/27/2013 ACT	EMERGENCY DIESEL GENERATOR (	17.11	DIESEL	1200	HP	Particulate matter, total £	Compliance with 40 CFR 60 Subpart IIII; good com	BACT-PSD	OPERATING PERMIT , NSPS
		03/27/2013 ACT	EMERGENCY DIESEL GENERATOR (	17.11	DIESEL	1200	HP	Particulate matter, filtera	Compliance with 40 CFR 60 Subpart IIII; good com	BACT-PSD	NSPS , OPERATING PERMIT
		03/27/2013 ACT	EMERGENCY DIESEL GENERATOR (	17.11	DIESEL	1200	HP	NOx	Compliance with 40 CFR 60 Subpart IIII; good com	BACT-PSD	NSPS , OPERATING PERMIT
		03/27/2013 ACT	EMERGENCY DIESEL GENERATOR (	17.11	DIESEL	1200	HP	Carbon Monoxide	Compliance with 40 CFR 60 Subpart IIII; good com	BACT-PSD	NSPS , OPERATING PERMIT
		03/27/2013 ACT	EMERGENCY DIESEL GENERATOR (	17.11	DIESEL	1200	HP	VOC	Compliance with 40 CFR 60 Subpart IIII; good com	BACT-PSD	OPERATING PERMIT
		03/27/2013 ACT	EMERGENCY DIESEL GENERATOR (	17.11	DIESEL	1200	HP	Carbon Dioxide Equivalen	ENERGY EFFICIENCY MEASURES	BACT-PSD	OPERATING PERMIT
LA-0276	BATON ROUGE JUNCTION FACILITY	12/15/2016 ACT	Fire Pump Engines (2 units)	17.11	Diesel	700	hp	VOC	Comply with standards of NSPS Subpart IIII	BACT-PSD	NSPS , NESHAP
LA-0288	LAKE CHARLES CHEMICAL COMPLEX	05/23/2014 ACT	Emergency Diesel Generators (EQ	17.11		2682	HP	Particulate matter, total £	Comply with 40 CFR 60 Subpart IIII; operate the e	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Emergency Diesel Generators (EQ	17.11		2682	HP	Particulate matter, total £	Comply with 40 CFR 60 Subpart IIII; operate the e	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Emergency Diesel Generators (EQ	17.11		2682	HP	Sulfur Dioxide (SO2)	Comply with 40 CFR 60 Subpart IIII; operate the e	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Emergency Diesel Generators (EQ	17.11		2682	HP	NOx	Comply with 40 CFR 60 Subpart IIII; operate the e	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Emergency Diesel Generators (EQ	17.11		2682	HP	Carbon Monoxide	Comply with 40 CFR 60 Subpart IIII; operate the e	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Emergency Diesel Generators (EQ	17.11		2682	HP	VOC	Comply with 40 CFR 60 Subpart IIII; operate the e	BACT-PSD	OPERATING PERMIT
		05/23/2014 ACT	Emergency Diesel Generators (EQ	17.11		2682	HP	Carbon Dioxide Equivalen	Comply with 40 CFR 60 Subpart IIII; operate the e	BACT-PSD	
LA-0292	HOLBROOK COMPRESSOR STATION	01/22/2016 ACT	Emergency Generators No. 1 &am	17.11	Diesel	1341	HP	Particulate matter, total £	Use of a certified engine, low sulfur diesel, and lin	BACT-PSD	NSPS , OPERATING PERMIT
		01/22/2016 ACT	Emergency Generators No. 1 &am	17.11	Diesel	1341	HP	NOx	Good equipment design, proper combustion techi	BACT-PSD	NSPS , OPERATING PERMIT
		01/22/2016 ACT	Emergency Generators No. 1 &am	17.11	Diesel	1341	HP	VOC	Good combustion practices consistent with the m	BACT-PSD	OPERATING PERMIT
		01/22/2016 ACT	Emergency Generators No. 1 &am	17.11	Diesel	1341	HP	Carbon Dioxide Equivalent (CO2e)		BACT-PSD	OPERATING PERMIT
LA-0296	LAKE CHARLES CHEMICAL COMPLEX LDPE UNIT	05/23/2014 ACT	Emergency Diesel Generators (EQ	17.11	Diesel	2682	HP	Particulate matter, total £	Compliance with 40 CFR 60 Subpart IIII; operating	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Emergency Diesel Generators (EQ	17.11	Diesel	2682	HP	Particulate matter, total £	Compliance with 40 CFR 60 Subpart IIII; operating	BACT-PSD	OPERATING PERMIT , NSPS
		05/23/2014 ACT	Emergency Diesel Generators (EQ	17.11	Diesel	2682	HP	Sulfur Dioxide (SO2)	Compliance with 40 CFR 60 Subpart IIII; operating	BACT-PSD	NSPS , OPERATING PERMIT

RBLC ID	FACILITY NAME	PERMIT ISSUANCE	PROCESS_NAME	PROCCESST	PRIMARY FUEL	THROUGH	UNITs	POLLUTANT	CONTROL_METHOD_DESCRIPTION	CASE-BY-CASE	OTHER
		05/23/2014 ACT	Emergency Diesel Generators (EQ	17.11	Diesel	2682	HP	NOx	Compliance with 40 CFR 60 Subpart IIII; operating	BACT-PSD	OPERATING PERMIT , NSPS
		05/23/2014 ACT	Emergency Diesel Generators (EQ	17.11	Diesel	2682	HP	Carbon Monoxide	Compliance with 40 CFR 60 Subpart IIII; operating	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Emergency Diesel Generators (EQ	17.11	Diesel	2682	HP	VOC	Compliance with 40 CFR 60 Subpart IIII; operating	BACT-PSD	OPERATING PERMIT
		05/23/2014 ACT	Emergency Diesel Generators (EQ	17.11	Diesel	2682	HP	Carbon Dioxide Equivalen	Compliance with 40 CFR 60 Subpart IIII; operating	BACT-PSD	OPERATING PERMIT
LA-0305	LAKE CHARLES METHANOL FACILITY	06/30/2016 ACT	Diesel Engines (Emergency)	17.11	Diesel	4023	hp	Particulate matter, total (	Complying with 40 CFR 60 Subpart IIII	BACT-PSD	NSPS
		06/30/2016 ACT	Diesel Engines (Emergency)	17.11	Diesel	4023	hp	Particulate matter, total (	Complying with 40 CFR 60 Subpart IIII	BACT-PSD	NSPS
		06/30/2016 ACT	Diesel Engines (Emergency)	17.11	Diesel	4023	hp	Sulfur Dioxide (SO2)	Complying with 40 CFR 60 Subpart IIII	BACT-PSD	NSPS
		06/30/2016 ACT	Diesel Engines (Emergency)	17.11	Diesel	4023	hp	Nitrogen Oxides (NOx)	Complying with 40 CFR 60 Subpart IIII	BACT-PSD	NSPS
		06/30/2016 ACT	Diesel Engines (Emergency)	17.11	Diesel	4023	hp	Carbon Monoxide	Complying with 40 CFR 60 Subpart IIII	BACT-PSD	NSPS
		06/30/2016 ACT	Diesel Engines (Emergency)	17.11	Diesel	4023	hp	Carbon Dioxide Equivalen	Complying with 40 CFR 60 Subpart IIII	BACT-PSD	
LA-0308	MORGAN CITY POWER PLANT	09/26/2013 ACT	2000 KW Diesel Fired Emergency (	17.11	Diesel	20.4	MMBTU/hr	Particulate matter, filtera	Good combustion and maintenance practices, anc	BACT-PSD	OPERATING PERMIT
		09/26/2013 ACT	2000 KW Diesel Fired Emergency (	17.11	Diesel	20.4	MMBTU/hr	Particulate matter, filtera	Good combustion and maintenance practices, anc	BACT-PSD	OPERATING PERMIT
		09/26/2013 ACT	2000 KW Diesel Fired Emergency (	17.11	Diesel	20.4	MMBTU/hr	Carbon Dioxide	Good combustion practices	BACT-PSD	OPERATING PERMIT
		09/26/2013 ACT	2000 KW Diesel Fired Emergency (	17.11	Diesel	20.4	MMBTU/hr	Methane	Good combustion practices	BACT-PSD	OPERATING PERMIT
		09/26/2013 ACT	2000 KW Diesel Fired Emergency (	17.11	Diesel	20.4	MMBTU/hr	Nitrous Oxide (N2O)	Good combustion practices	BACT-PSD	OPERATING PERMIT
		09/26/2013 ACT	2000 KW Diesel Fired Emergency (	17.11	Diesel	20.4	MMBTU/hr	NOx	Good combustion and maintenance practices, anc	BACT-PSD	OPERATING PERMIT
LA-0309	BENTELER STEEL TUBE FACILITY	06/04/2015 ACT	Emergency Generator Engines	17.11	Diesel	2922	hp (each)	Carbon Dioxide Equivalent (CO2e)		BACT-PSD	
		06/04/2015 ACT	Emergency Generator Engines	17.11	Diesel	2922	hp (each)	Particulate matter, total (	Complying with 40 CFR 60 Subpart IIII	BACT-PSD	
		06/04/2015 ACT	Emergency Generator Engines	17.11	Diesel	2922	hp (each)	Particulate matter, total (	Complying with 40 CFR 60 Subpart IIII	BACT-PSD	
		06/04/2015 ACT	Emergency Generator Engines	17.11	Diesel	2922	hp (each)	NOx	Complying with 40 CFR 60 Subpart IIII	BACT-PSD	
		06/04/2015 ACT	Emergency Generator Engines	17.11	Diesel	2922	hp (each)	Carbon Monoxide	Complying with 40 CFR 60 Subpart IIII	BACT-PSD	
		06/04/2015 ACT	Emergency Generator Engines	17.11	Diesel	2922	hp (each)	VOC	Complying with 40 CFR 60 Subpart IIII	BACT-PSD	
		06/04/2015 ACT	Emergency Generator Engines	17.11	Diesel	2922	hp (each)	Sulfur Dioxide (SO2)		BACT-PSD	
*LA-0312	ST. JAMES METHANOL PLANT	06/30/2017 ACT	DFP1-13 - Diesel Fire Pump Engine	17.11	Diesel	650	HP	Particulate matter, total (	Compliance with NSPS Subpart IIII	BACT-PSD	NSPS , OPERATING PERMIT
		06/30/2017 ACT	DFP1-13 - Diesel Fire Pump Engine	17.11	Diesel	650	HP	Particulate matter, total (	Compliance with NSPS IIII	BACT-PSD	OPERATING PERMIT , NSPS
		06/30/2017 ACT	DFP1-13 - Diesel Fire Pump Engine	17.11	Diesel	650	HP	NOx	Compliance with NSPS Subpart IIII	BACT-PSD	NSPS , OPERATING PERMIT
		06/30/2017 ACT	DFP1-13 - Diesel Fire Pump Engine	17.11	Diesel	650	HP	Carbon Monoxide	Compliance with NSPS Subpart IIII	BACT-PSD	NSPS , OPERATING PERMIT
		06/30/2017 ACT	DFP1-13 - Diesel Fire Pump Engine	17.11	Diesel	650	HP	VOC	Compliance with NNSPS Subpart IIII	BACT-PSD	NSPS , OPERATING PERMIT
		06/30/2017 ACT	DFP1-13 - Diesel Fire Pump Engine	17.11	Diesel	650	HP	Carbon Dioxide Equivalen	Compliance with NSPS Subpart IIII	BACT-PSD	OPERATING PERMIT , NSPS
		06/30/2017 ACT	DEG1-13 - Diesel Fired Emergency	17.11	Diesel	1474	HP	Particulate matter, total (	Compliance with NSPS Subpart IIII	BACT-PSD	NSPS , OPERATING PERMIT
		06/30/2017 ACT	DEG1-13 - Diesel Fired Emergency	17.11	Diesel	1474	HP	Particulate matter, total (	Compliance with NSPS Subpart IIII	BACT-PSD	NSPS , OPERATING PERMIT
		06/30/2017 ACT	DEG1-13 - Diesel Fired Emergency	17.11	Diesel	1474	HP	NOx	Compliance with NSPS Subpart IIII	BACT-PSD	NSPS , OPERATING PERMIT
		06/30/2017 ACT	DEG1-13 - Diesel Fired Emergency	17.11	Diesel	1474	HP	Carbon Monoxide	Compliance with NSPS Subpart IIII	BACT-PSD	NSPS , OPERATING PERMIT
		06/30/2017 ACT	DEG1-13 - Diesel Fired Emergency	17.11	Diesel	1474	HP	VOC	Compliance with NSPS Subpart IIII	BACT-PSD	NSPS , OPERATING PERMIT
		06/30/2017 ACT	DEG1-13 - Diesel Fired Emergency	17.11	Diesel	1474	HP	Carbon Dioxide Equivalen	Compliance with NSPS Subpart IIII	BACT-PSD	NSPS , OPERATING PERMIT
LA-0313	ST. CHARLES POWER STATION	08/31/2016 ACT	SCPS Emergency Diesel Generator	17.11	Diesel	2584	HP	VOC	Good combustion practices	BACT-PSD	NSPS , OPERATING PERMIT
		08/31/2016 ACT	SCPS Emergency Diesel Generator	17.11	Diesel	2584	HP	Carbon Dioxide Equivalen	Good combustion practices	BACT-PSD	OPERATING PERMIT
		08/31/2016 ACT	SCPS Emergency Diesel Generator	17.11	Diesel	2584	HP	Particulate matter, filtera	Compliance with NESHAP 40 CFR 63 Subpart ZZZZ	BACT-PSD	NSPS , OPERATING PERMIT
		08/31/2016 ACT	SCPS Emergency Diesel Generator	17.11	Diesel	2584	HP	Particulate matter, filtera	Compliance with NESHAP 40 CFR 63 Subpart ZZZZ	BACT-PSD	OPERATING PERMIT
		08/31/2016 ACT	SCPS Emergency Diesel Generator	17.11	Diesel	2584	HP	NOx	Compliance with NESHAP 40 CFR 63 Subpart ZZZZ	BACT-PSD	NSPS , OPERATING PERMIT
		08/31/2016 ACT	SCPS Emergency Diesel Generator	17.11	Diesel	2584	HP	Carbon Monoxide	Compliance with NESHAP 40 CFR 63 Subpart ZZZZ	BACT-PSD	OPERATING PERMIT
*LA-0315	G2G PLANT	05/23/2014 ACT	Emergency Diesel Generator 1	17.11	Diesel	5364	HP	NOx	Compliance with 40 CFR 60 Subpart IIII and 40 CFI	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Emergency Diesel Generator 1	17.11	Diesel	5364	HP	Particulate matter, total (	Proper design and operation; use of ultra-low sulf	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Emergency Diesel Generator 1	17.11	Diesel	5364	HP	Particulate matter, total (	Proper burner design and operation	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Emergency Diesel Generator 1	17.11	Diesel	5364	HP	VOC	Compliance with 40 CFR 60 Subpart IIII and 40 CFI	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Emergency Diesel Generator 1	17.11	Diesel	5364	HP	Carbon Monoxide	Compliance with 40 CFR 60 Subpart IIII and 40 CFI	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Emergency Diesel Generator 1	17.11	Diesel	5364	HP	Carbon Dioxide Equivalen	Proper design and operation; energy efficiency m	BACT-PSD	OPERATING PERMIT
		05/23/2014 ACT	Emergency Diesel Generator 2	17.11	Diesel	5364	HP	NOx	Compliance with 40 CFR 60 Subpart IIII and 40 CFI	BACT-PSD	NSPS , OPERATING PERMIT

RBLC ID	FACILITY NAME	PERMIT ISSUANCE	PROCESS_NAME	PROCCESST	PRIMARY FUEL	THROUGH	UNITs	POLLUTANT	CONTROL_METHOD_DESCRIPTION	CASE-BY-CASE	OTHER
		05/23/2014 ACT	Emergency Diesel Generator 2	17.11	Diesel	5364	HP	Particulate matter, total ‹	Proper design and operation; use of ultra-low sulf	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Emergency Diesel Generator 2	17.11	Diesel	5364	HP	Particulate matter, total ‹	Proper design and operation; use of ultra-low sulf	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Emergency Diesel Generator 2	17.11	Diesel	5364	HP	VOC	Compliance with 40 CFR 60 Subpart IIII and 40 CFI	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Emergency Diesel Generator 2	17.11	Diesel	5364	HP	Carbon Monoxide	Compliance with 40 CFR 60 Subpart IIII and 40 CFI	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Emergency Diesel Generator 2	17.11	Diesel	5364	HP	Carbon Dioxide Equivalen	Proper design and operation; energy efficiency m‹	BACT-PSD	OPERATING PERMIT
		05/23/2014 ACT	Fire Pump Diesel Engine 1	17.11	Diesel	751	HP	NOx	Compliance with 40 CFR 60 Subpart IIII and 40 CFI	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Fire Pump Diesel Engine 1	17.11	Diesel	751	HP	Particulate matter, total ‹	Proper design and operation; use of ultra-low sulf	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Fire Pump Diesel Engine 1	17.11	Diesel	751	HP	Particulate matter, total ‹	Proper design and operation; use of ultra-low sulf	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Fire Pump Diesel Engine 1	17.11	Diesel	751	HP	VOC	Compliance with 40 CFR 60 Subpart IIII and 40 CFI	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Fire Pump Diesel Engine 1	17.11	Diesel	751	HP	Carbon Monoxide	Compliance with 40 CFR 60 Subpart IIII and 40 CFI	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Fire Pump Diesel Engine 1	17.11	Diesel	751	HP	Carbon Dioxide Equivalen	Proper design and operation; use of ultra-low sulf	BACT-PSD	OPERATING PERMIT
		05/23/2014 ACT	Fire Pump Diesel Engine 2	17.11	Diesel	751	HP	NOx	Compliance with 40 CFR 60 Subpart IIII and 40 CFI	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Fire Pump Diesel Engine 2	17.11	Diesel	751	HP	Particulate matter, total ‹	Proper design and operation; use of ultra-low sulf	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Fire Pump Diesel Engine 2	17.11	Diesel	751	HP	Particulate matter, total ‹	Proper design and operation; use of ultra-low sulf	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Fire Pump Diesel Engine 2	17.11	Diesel	751	HP	VOC	Compliance with 40 CFR 60 Subpart IIII and 40 CFI	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Fire Pump Diesel Engine 2	17.11	Diesel	751	HP	Carbon Monoxide	Compliance with 40 CFR 60 Subpart IIII and 40 CFI	BACT-PSD	NSPS , OPERATING PERMIT
		05/23/2014 ACT	Fire Pump Diesel Engine 2	17.11	Diesel	751	HP	Carbon Dioxide Equivalen	Proper design and operation; use of ultra-low sulf	BACT-PSD	OPERATING PERMIT
LA-0316	CAMERON LNG FACILITY	02/17/2017 ACT	emergency generator engines (6 u	17.11	diesel	3353	hp	Particulate matter, total ‹	Complying with 40 CFR 60 Subpart IIII	BACT-PSD	NSPS
		02/17/2017 ACT	emergency generator engines (6 u	17.11	diesel	3353	hp	Particulate matter, total ‹	Complying with 40 CFR 60 Subpart IIII	BACT-PSD	NSPS
		02/17/2017 ACT	emergency generator engines (6 u	17.11	diesel	3353	hp	NOx	Complying with 40 CFR 60 Subpart IIII	BACT-PSD	NSPS
		02/17/2017 ACT	emergency generator engines (6 u	17.11	diesel	3353	hp	Carbon Monoxide	Complying with 40 CFR 60 Subpart IIII	BACT-PSD	NSPS
		02/17/2017 ACT	emergency generator engines (6 u	17.11	diesel	3353	hp	VOC	Complying with 40 CFR 60 Subpart IIII	BACT-PSD	NSPS
		02/17/2017 ACT	emergency generator engines (6 u	17.11	diesel	3353	hp	Carbon Dioxide Equivalen	good combustion practices	BACT-PSD	
LA-0317	METHANEX - GEISMAR METHANOL PLANT	12/22/2016 ACT	Emergency Generator Engines (4 ι	17.11	Diesel			NOx	complying with 40 CFR 60 Subpart IIII and 40 CFR ‹	BACT-PSD	NSPS , NESHAP
		12/22/2016 ACT	Emergency Generator Engines (4 ι	17.11	Diesel			Particulate matter, total ‹	complying with 40 CFR 60 Subpart IIII and 40 CFR ‹	BACT-PSD	NSPS , NESHAP
		12/22/2016 ACT	Emergency Generator Engines (4 ι	17.11	Diesel			Particulate matter, total ‹	complying with 40 CFR 60 Subpart IIII and 40 CFR ‹	BACT-PSD	NSPS , NESHAP
		12/22/2016 ACT	Emergency Generator Engines (4 ι	17.11	Diesel			Carbon Dioxide Equivalen	complying with 40 CFR 60 Subpart IIII and 40 CFR ‹	BACT-PSD	NSPS , NESHAP
		12/22/2016 ACT	Emergency Generator Engines (4 ι	17.11	Diesel			Carbon Monoxide	complying with 40 CFR 60 Subpart IIII and 40 CFR ‹	BACT-PSD	NSPS , NESHAP
		12/22/2016 ACT	Firewater pump Engines (4 units)	17.11	diesel	896	hp (each)	Particulate matter, total ‹	complying with 40 CFR 60 Subpart IIII and 40 CFR ‹	BACT-PSD	NSPS , NESHAP
		12/22/2016 ACT	Firewater pump Engines (4 units)	17.11	diesel	896	hp (each)	Particulate matter, total ‹	complying with 40 CFR 60 Subpart IIII and 40 CFR ‹	BACT-PSD	NSPS , NESHAP
		12/22/2016 ACT	Firewater pump Engines (4 units)	17.11	diesel	896	hp (each)	Carbon Dioxide Equivalen	complying with 40 CFR 60 Subpart IIII and 40 CFR ‹	BACT-PSD	NSPS , NESHAP
		12/22/2016 ACT	Firewater pump Engines (4 units)	17.11	diesel	896	hp (each)	Carbon Monoxide	complying with 40 CFR 60 Subpart IIII and 40 CFR ‹	BACT-PSD	NSPS , NESHAP
		12/22/2016 ACT	Firewater pump Engines (4 units)	17.11	diesel	896	hp (each)	NOx	complying with 40 CFR 60 Subpart IIII and 40 CFR ‹	BACT-PSD	NSPS , NESHAP
LA-0318	FLOPAM FACILITY	01/07/2016 ACT	Diesel Engines	17.11				Particulate matter, total ‹	Complying with 40 CFR 60 Subpart IIII	BACT-PSD	
		01/07/2016 ACT	Diesel Engines	17.11				NOx	Complying with 40 CFR 60 Subpart IIII	BACT-PSD	
		01/07/2016 ACT	Diesel Engines	17.11				Carbon Monoxide	Complying with 40 CFR 60 Subpart IIII	BACT-PSD	
		01/07/2016 ACT	Diesel Engines	17.11				VOC	Complying with 40 CFR 60 Subpart IIII	LAER	
LA-0323	MONSANTO LULING PLANT	01/09/2017 ACT	Fire Water Diesel Pump No. 3 Engi	17.11	Diesel Fuel	600	hp	Particulate matter, total ‹	Proper operation and limits on hours operation fo	BACT-PSD	NSPS
		01/09/2017 ACT	Fire Water Diesel Pump No. 3 Engi	17.11	Diesel Fuel	600	hp	Particulate matter, total ‹	Proper operation and limits on hours operation fo	BACT-PSD	NSPS
		01/09/2017 ACT	Fire Water Diesel Pump No. 3 Engi	17.11	Diesel Fuel	600	hp	NOx	Proper operation and limits on hours operation fo	BACT-PSD	NSPS
		01/09/2017 ACT	Fire Water Diesel Pump No. 3 Engi	17.11	Diesel Fuel	600	hp	Carbon Monoxide	Proper operation and limits on hours operation fo	BACT-PSD	NSPS
		01/09/2017 ACT	Fire Water Diesel Pump No. 3 Engi	17.11	Diesel Fuel	600	hp	Carbon Dioxide Equivalen	Proper operation and limits on hours operation fo	BACT-PSD	NSPS
		01/09/2017 ACT	Fire Water Diesel Pump No. 4 Engi	17.11	Diesel Fuel	600	hp	Particulate matter, total ‹	Proper operation and limits on hours of operation	BACT-PSD	NSPS
		01/09/2017 ACT	Fire Water Diesel Pump No. 4 Engi	17.11	Diesel Fuel	600	hp	Particulate matter, total ‹	Proper operation and limits on hours of operation	BACT-PSD	NSPS
		01/09/2017 ACT	Fire Water Diesel Pump No. 4 Engi	17.11	Diesel Fuel	600	hp	NOx	Proper operation and limits on hours of operation	BACT-PSD	NSPS
		01/09/2017 ACT	Fire Water Diesel Pump No. 4 Engi	17.11	Diesel Fuel	600	hp	Carbon Monoxide	Proper operation and limits on hours of operation	BACT-PSD	NSPS
		01/09/2017 ACT	Fire Water Diesel Pump No. 4 Engi	17.11	Diesel Fuel	600	hp	Carbon Dioxide Equivalen	Proper operation and limits on hours of operation	BACT-PSD	NSPS
MA-0039	SALEM HARBOR STATION	01/30/2014 ACT	Emergency Engine/Generator	17.11	ULSD	7.4	MMBTU/H	Carbon Monoxide		OTHER CASE-BY-	NSPS , NESHAP , SIP , OPERA

RBLC ID	FACILITY NAME	PERMIT ISSUANCE	PROCESS_NAME	PROCCESST	PRIMARY FUEL	THROUGH	UNITs	POLLUTANT	CONTROL_METHOD_DESCRIPTION	CASE-BY-CASE	OTHER
	REDEVELOPMENT	01/30/2014 ACT	Emergency Engine/Generator	17.11	ULSD	7.4	MMBTU/H	Sulfur Dioxide (SO2)		OTHER CASE-BY-	NSPS , NESHAP , SIP , OPERA
		01/30/2014 ACT	Emergency Engine/Generator	17.11	ULSD	7.4	MMBTU/H	NOx		LAER	NSPS , NESHAP , SIP , OPERA
		01/30/2014 ACT	Emergency Engine/Generator	17.11	ULSD	7.4	MMBTU/H	Particulate matter, total < 10 Âµ (TPM10)		BACT-PSD	NESHAP , NSPS , SIP , OPERA
		01/30/2014 ACT	Emergency Engine/Generator	17.11	ULSD	7.4	MMBTU/H	Particulate matter, total < 2.5 Âµ (TPM2.5)		BACT-PSD	NSPS , NESHAP , SIP , OPERA
		01/30/2014 ACT	Emergency Engine/Generator	17.11	ULSD	7.4	MMBTU/H	Sulfuric Acid (mist, vapors, etc)		BACT-PSD	OPERATING PERMIT , SIP
		01/30/2014 ACT	Emergency Engine/Generator	17.11	ULSD	7.4	MMBTU/H	Carbon Dioxide Equivalent (CO2e)		BACT-PSD	SIP , OPERATING PERMIT
*MA-0043	MIT CENTRAL UTILITY PLANT	06/21/2017 ACT	Cold Start Engine	17.11	ULSD	19.04	MMBTU/HR	NOx		OTHER CASE-BY-	NESHAP , SIP , OPERATING PI
		06/21/2017 ACT	Cold Start Engine	17.11	ULSD	19.04	MMBTU/HR	Carbon Monoxide		OTHER CASE-BY-	NSPS , NESHAP , SIP , OPERA
		06/21/2017 ACT	Cold Start Engine	17.11	ULSD	19.04	MMBTU/HR	Carbon Dioxide Equivalent (CO2e)		BACT-PSD	SIP , OPERATING PERMIT
		06/21/2017 ACT	Cold Start Engine	17.11	ULSD	19.04	MMBTU/HR	Sulfur Dioxide (SO2)		OTHER CASE-BY-	NSPS , NESHAP , SIP , OPERA
		06/21/2017 ACT	Cold Start Engine	17.11	ULSD	19.04	MMBTU/HR	Sulfuric Acid (mist, vapors, etc)		OTHER CASE-BY-	OPERATING PERMIT , SIP
		06/21/2017 ACT	Cold Start Engine	17.11	ULSD	19.04	MMBTU/HR	Particulate matter, total < 10 Âµ (TPM10)		BACT-PSD	NSPS , NESHAP , SIP , OPERA
		06/21/2017 ACT	Cold Start Engine	17.11	ULSD	19.04	MMBTU/HR	Particulate matter, total < 2.5 Âµ (TPM2.5)		BACT-PSD	NSPS , NESHAP , SIP , OPERA
		06/21/2017 ACT	Cold Start Engine	17.11	ULSD	19.04	MMBTU/HR	VOC		OTHER CASE-BY-	NSPS , NESHAP , SIP , OPERA
MD-0037	MEDIMMUNE FREDERICK CAMPUS	01/28/2008 ACT	TWO (2) DIESEL (NO. 2 FUEL OIL) F	17.11	DIESEL (NO. 2 FUEL	2500	KW	NOx	SELECTIVE CATALYTIC REDUCTION (SCR) SYSTEM I	LAER	NSPS , NESHAP , MACT , SIP ,
		01/28/2008 ACT	THREE (3) DIESEL (NO. 2 FUEL OIL)	17.11	DIESEL (NO. 2 FUEL	2500	KW	NOx		LAER	NSPS , NESHAP , MACT , SIP ,
*MD-0042	WILDCAT POINT GENERATION FACILITY	04/08/2014 ACT	EMERGENCY GENERATOR 1	17.11	ULSD	2250	KW	Particulate matter, filtera	EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTIC	BACT-PSD	NSPS
		04/08/2014 ACT	EMERGENCY GENERATOR 1	17.11	ULSD	2250	KW	Particulate matter, total ६	EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTIC	BACT-PSD	NSPS
		04/08/2014 ACT	EMERGENCY GENERATOR 1	17.11	ULSD	2250	KW	Particulate matter, total ६	EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTIC	BACT-PSD	NSPS
		04/08/2014 ACT	EMERGENCY GENERATOR 1	17.11	ULSD	2250	KW	Sulfur Dioxide (SO2)	USE OF ULTRA-LOW DIESEL SULFUR FUEL, LIMITEI	BACT-PSD	NSPS
		04/08/2014 ACT	EMERGENCY GENERATOR 1	17.11	ULSD	2250	KW	NOx	LIMITED OPERATING HOURS, USE OF ULTRA- LOW	LAER	NSPS
		04/08/2014 ACT	EMERGENCY GENERATOR 1	17.11	ULSD	2250	KW	Carbon Monoxide	USE OF ULSD FUEL, GOOD COMBUSTION PRACTIC	BACT-PSD	NSPS
		04/08/2014 ACT	EMERGENCY GENERATOR 1	17.11	ULSD	2250	KW	Sulfuric Acid (mist, vapor:	USE OF ULTRA-LOW DIESEL SULFUR FUEL, LIMITEI	BACT-PSD	
MD-0043	PERRYMAN GENERATING STATION	07/01/2014 ACT	EMERGENCY GENERATOR	17.11	ULSD	1300	HP	Particulate matter, total ६	GOOD COMBUSTION PRACTICES, LIMITED	BACT-PSD	NSPS
		07/01/2014 ACT	EMERGENCY GENERATOR	17.11	ULSD	1300	HP	NOx	GOOD COMBUSTION PRACTICES, LIMITED HOURS	LAER	NSPS
MD-0044	COVE POINT LNG TERMINAL	06/09/2014 ACT	EMERGENCY GENERATOR	17.11	ULSD	1550	HP	Particulate matter, filtera	EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTIC	BACT-PSD	
		06/09/2014 ACT	EMERGENCY GENERATOR	17.11	ULSD	1550	HP	Particulate matter, total ६	EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTIC	BACT-PSD	
		06/09/2014 ACT	EMERGENCY GENERATOR	17.11	ULSD	1550	HP	Particulate matter, total ६	EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTIC	BACT-PSD	
		06/09/2014 ACT	EMERGENCY GENERATOR	17.11	ULSD	1550	HP	NOx	GOOD COMBUSTION PRACTICES AND DESIGNED 1	LAER	NSPS
		06/09/2014 ACT	EMERGENCY GENERATOR	17.11	ULSD	1550	HP	Carbon Monoxide	GOOD COMBUSTION PRACTICES AND DESIGNED T	BACT-PSD	
		06/09/2014 ACT	EMERGENCY GENERATOR	17.11	ULSD	1550	HP	VOC	USE ONLY ULSD, GOOD COMBUSTION PRACTICES,	LAER	NSPS
MI-0389	KARN WEADOCK GENERATING COMPLEX	12/29/2009 ACT	FIRE PUMP	17.11	ULSD	525	HP	Carbon Monoxide	ENGINE DESIGN AND OPERATION. 15 PPM SULFU	BACT-PSD	NSPS
		12/29/2009 ACT	FIRE PUMP	17.11	ULSD	525	HP	Particulate matter, total (	ENGINE DESIGN AND OPERATION. 15 PPM SULFU	BACT-PSD	NSPS
		12/29/2009 ACT	FIRE PUMP	17.11	ULSD	525	HP	Particulate matter, total ६	ENGINE DESIGN AND OPERATION. 15 PPM SULFU	BACT-PSD	
		12/29/2009 ACT	FIRE PUMP	17.11	ULSD	525	HP	Nonprecursor Organic Co	ENGINE DESIGN AND OPERATION. 15 PPM SULFU	BACT-PSD	NSPS
		12/29/2009 ACT	EMERGENCY GENERATOR	17.11	ULSD	2000	KW	Nonprecursor Organic Co	ENGINE DESIGN AND OPERATION. 15 PPM SULFU	BACT-PSD	NSPS
		12/29/2009 ACT	EMERGENCY GENERATOR	17.11	ULSD	2000	KW	Carbon Monoxide	ENGINE DESIGN AND OPERATION. 15 PPM SULFU	BACT-PSD	NSPS
		12/29/2009 ACT	EMERGENCY GENERATOR	17.11	ULSD	2000	KW	Particulate matter, total (	ENGINE DESIGN AND OPERATION. 15 PPM SULFU	BACT-PSD	NSPS
		12/29/2009 ACT	EMERGENCY GENERATOR	17.11	ULSD	2000	KW	Particulate matter, total ६	ENGINE DESIGN AND OPERATION. 15 PPM SULFU	BACT-PSD	
MI-0394	WARREN TECHNICAL CENTER	02/29/2012 ACT	Four (4) Emergency Generators	17.11	Diesel	2280	KW	NOx	No add-on controls, but ignition timing retardatio	BACT-PSD	NESHAP , NSPS , SIP , OPERA
		02/29/2012 ACT	Nine (9) DRUPS Emergency Gener	17.11	Diesel	3010	KW	NOx	No add-on controls, but ignition timing retardatio	BACT-PSD	NSPS , NESHAP , SIP , OPERA
MI-0406	RENAISSANCE POWER LLC	11/01/2013 ACT	FG-EMGEN7-8; Two (2) 1,000kW c	17.11	Diesel	1000	kW	NOx	Good combustion practices	BACT-PSD	SIP
		11/01/2013 ACT	FG-EMGEN7-8; Two (2) 1,000kW c	17.11	Diesel	1000	kW	Carbon Monoxide	Good combustion practices.	BACT-PSD	NSPS , SIP
		11/01/2013 ACT	FG-EMGEN7-8; Two (2) 1,000kW c	17.11	Diesel	1000	kW	Particulate matter, filtera	Good combustion practices.	BACT-PSD	NSPS
		11/01/2013 ACT	FG-EMGEN7-8; Two (2) 1,000kW c	17.11	Diesel	1000	kW	Particulate matter, total ६	Good combustion practices.	BACT-PSD	SIP
		11/01/2013 ACT	FG-EMGEN7-8; Two (2) 1,000kW c	17.11	Diesel	1000	kW	Particulate matter, total ६	Good combustion practices	BACT-PSD	SIP
		11/01/2013 ACT	FG-EMGEN7-8; Two (2) 1,000kW c	17.11	Diesel	1000	kW	Carbon Dioxide Equivalen	Good combustion practices.	BACT-PSD	
MI-0418	WARREN TECHNICAL CENTER	01/14/2015 ACT	FG-BACKUPGENS (Nine (9) DRUPS	17.11	Diesel	3490	KW	NOx	No add-on controls, but injection timing retardati	BACT-PSD	NSPS , NESHAP , SIP , OPERA
		01/14/2015 ACT	Four (4) emergency engines in FG-	17.11	Diesel	2710	KW	NOx	No add-on controls, but injection timing retardati	BACT-PSD	NSPS , NESHAP , SIP , OPERA

RBLC ID	FACILITY NAME	PERMIT ISSUANCE	PROCESS_NAME	PROCCESST	PRIMARY FUEL	THROUGH	UNITs	POLLUTANT	CONTROL_METHOD_DESCRIPTION	CASE-BY-CASE	OTHER
MI-0421	GRAYLING PARTICLEBOARD	08/26/2016 ACT	Emergency Diesel Generator Engir	17.11	Diesel	500	H/YR	Carbon Monoxide	Good design and combustion practices.	BACT-PSD	NSPS , SIP
		08/26/2016 ACT	Emergency Diesel Generator Engir	17.11	Diesel	500	H/YR	NOx	Certified engines, limited operating hours.	BACT-PSD	SIP
		08/26/2016 ACT	Emergency Diesel Generator Engir	17.11	Diesel	500	H/YR	Particulate matter, filtera	Certified engines, good design, operation and con	BACT-PSD	NSPS
		08/26/2016 ACT	Emergency Diesel Generator Engir	17.11	Diesel	500	H/YR	Particulate matter, total ξ	Certified engines, good design, operation and con	BACT-PSD	SIP
		08/26/2016 ACT	Emergency Diesel Generator Engir	17.11	Diesel	500	H/YR	Particulate matter, total ξ	Certified engines, good design, operation and con	BACT-PSD	SIP
		08/26/2016 ACT	Emergency Diesel Generator Engir	17.11	Diesel	500	H/YR	Carbon Dioxide Equivalen	Good combustion and design practices.	BACT-PSD	
		08/26/2016 ACT	Dieself fire pump engine (EUFIREP	17.11	Diesel	500	H/YR	Carbon Monoxide	Good design and combustion practices.	BACT-PSD	NSPS , SIP
		08/26/2016 ACT	Dieself fire pump engine (EUFIREP	17.11	Diesel	500	H/YR	NOx	Certified engines, limited operating hours.	BACT-PSD	SIP
		08/26/2016 ACT	Dieself fire pump engine (EUFIREP	17.11	Diesel	500	H/YR	Particulate matter, filtera	Certified engines, good design, operation and con	BACT-PSD	NSPS
		08/26/2016 ACT	Dieself fire pump engine (EUFIREP	17.11	Diesel	500	H/YR	Particulate matter, total ξ	Certified engines. Good design, operation and co	BACT-PSD	SIP
		08/26/2016 ACT	Dieself fire pump engine (EUFIREP	17.11	Diesel	500	H/YR	Particulate matter, total ξ	Certified engines. Good design, operation and co	BACT-PSD	SIP
		08/26/2016 ACT	Dieself fire pump engine (EUFIREP	17.11	Diesel	500	H/YR	Carbon Dioxide Equivalen	Good combustion and design practices.	BACT-PSD	
MI-0423	INDECK NILES, LLC	01/04/2017 ACT	EUEMENGINE (Diesel fuel emerge	17.11	Diesel Fuel	22.68	MMBTU/H	Carbon Monoxide	Good combustion practices and meeting NSPS Sul	BACT-PSD	NSPS , SIP
		01/04/2017 ACT	EUEMENGINE (Diesel fuel emerge	17.11	Diesel Fuel	22.68	MMBTU/H	NOx	Good combustion practices and meeting NSPS IIII	BACT-PSD	NSPS , SIP
		01/04/2017 ACT	EUEMENGINE (Diesel fuel emerge	17.11	Diesel Fuel	22.68	MMBTU/H	Particulate matter, filtera	Good combustion practices and meeting NSPS Sul	BACT-PSD	NSPS
		01/04/2017 ACT	EUEMENGINE (Diesel fuel emerge	17.11	Diesel Fuel	22.68	MMBTU/H	Particulate matter, total ξ	Good combustion practices.	BACT-PSD	SIP
		01/04/2017 ACT	EUEMENGINE (Diesel fuel emerge	17.11	Diesel Fuel	22.68	MMBTU/H	Particulate matter, total ξ	Good combustion practices.	BACT-PSD	SIP
		01/04/2017 ACT	EUEMENGINE (Diesel fuel emerge	17.11	Diesel Fuel	22.68	MMBTU/H	VOC	Good combustion practices.	BACT-PSD	
		01/04/2017 ACT	EUEMENGINE (Diesel fuel emerge	17.11	Diesel Fuel	22.68	MMBTU/H	Sulfur Dioxide (SO2)	Good combustion practices and meeting NSPS Sul	BACT-PSD	NSPS , SIP
		01/04/2017 ACT	EUEMENGINE (Diesel fuel emerge	17.11	Diesel Fuel	22.68	MMBTU/H	Carbon Dioxide Equivalen	Good combustion practices	BACT-PSD	
MI-0425	GRAYLING PARTICLEBOARD	05/09/2017 ACT	EUEMRGRICE1 in FGRICE (Emerge	17.11	Diesel	500	H/YR	Carbon Monoxide	Good design and combustion practices.	BACT-PSD	NSPS , SIP
		05/09/2017 ACT	EUEMRGRICE1 in FGRICE (Emerge	17.11	Diesel	500	H/YR	NOx	Certified engines, limited operating hours.	BACT-PSD	SIP
		05/09/2017 ACT	EUEMRGRICE1 in FGRICE (Emerge	17.11	Diesel	500	H/YR	Particulate matter, filtera	Certified engines, good design, operation and con	BACT-PSD	NSPS
		05/09/2017 ACT	EUEMRGRICE1 in FGRICE (Emerge	17.11	Diesel	500	H/YR	Particulate matter, total ξ	Certified engines, good design, operation and con	BACT-PSD	SIP
		05/09/2017 ACT	EUEMRGRICE1 in FGRICE (Emerge	17.11	Diesel	500	H/YR	Particulate matter, total ξ	Certified engines, good design, operation and con	BACT-PSD	SIP
		05/09/2017 ACT	EUEMRGRICE1 in FGRICE (Emerge	17.11	Diesel	500	H/YR	Carbon Dioxide Equivalen	Good combustion and design practices.	BACT-PSD	
		05/09/2017 ACT	EUEMRGRICE2 in FGRICE (Emerge	17.11	Diesel	500	H/YR	Carbon Monoxide	Good design and combustion practices.	BACT-PSD	NSPS , SIP
		05/09/2017 ACT	EUEMRGRICE2 in FGRICE (Emerge	17.11	Diesel	500	H/YR	NOx	Certified engines, limited operating hours	BACT-PSD	SIP
		05/09/2017 ACT	EUEMRGRICE2 in FGRICE (Emerge	17.11	Diesel	500	H/YR	Particulate matter, filtera	Certified engines, good design, operation and con	BACT-PSD	NSPS
		05/09/2017 ACT	EUEMRGRICE2 in FGRICE (Emerge	17.11	Diesel	500	H/YR	Particulate matter, total ξ	Certified engines. Good design, operation and co	BACT-PSD	SIP
		05/09/2017 ACT	EUEMRGRICE2 in FGRICE (Emerge	17.11	Diesel	500	H/YR	Particulate matter, total ξ	Certified engines. Good design, operation and co	BACT-PSD	SIP
		05/09/2017 ACT	EUEMRGRICE2 in FGRICE (Emerge	17.11	Diesel	500	H/YR	Carbon Dioxide Equivalen	Good combustion and design practices.	BACT-PSD	
		05/09/2017 ACT	EUFIREPUMP in FGRICE (Diesel fire	17.11	Diesel	500	H/YR	Carbon Monoxide	Good design and combustion practices.	BACT-PSD	NSPS , SIP
		05/09/2017 ACT	EUFIREPUMP in FGRICE (Diesel fire	17.11	Diesel	500	H/YR	NOx	Certified engines. Limited operating hours.	BACT-PSD	SIP
		05/09/2017 ACT	EUFIREPUMP in FGRICE (Diesel fire	17.11	Diesel	500	H/YR	Particulate matter, filtera	Certified engines. Good design, operation and co	BACT-PSD	NSPS
		05/09/2017 ACT	EUFIREPUMP in FGRICE (Diesel fire	17.11	Diesel	500	H/YR	Particulate matter, total ξ	Certified engines. Good design, operation and co	BACT-PSD	SIP
		05/09/2017 ACT	EUFIREPUMP in FGRICE (Diesel fire	17.11	Diesel	500	H/YR	Particulate matter, total ξ	Certified engines. Good design, operation and co	BACT-PSD	SIP
		05/09/2017 ACT	EUFIREPUMP in FGRICE (Diesel fire	17.11	Diesel	500	H/YR	Carbon Dioxide Equivalen	Good combustion and design practices.	BACT-PSD	
*MI-0433	MEC NORTH, LLC AND MEC SOUTH LLC	06/29/2018 ACT	EUEMENGINE (North Plant): Emer	17.11	Diesel	1341	HP	Carbon Monoxide	Good combustion practices and meeting NSPS Sul	BACT-PSD	NSPS , SIP
		06/29/2018 ACT	EUEMENGINE (North Plant): Emer	17.11	Diesel	1341	HP	NOx	Good combustion practices and meeting NSPS Sul	BACT-PSD	NSPS , SIP
		06/29/2018 ACT	EUEMENGINE (North Plant): Emer	17.11	Diesel	1341	HP	Particulate matter, filtera	Diesel particulate filter, good combustion practice	BACT-PSD	NSPS
		06/29/2018 ACT	EUEMENGINE (North Plant): Emer	17.11	Diesel	1341	HP	Particulate matter, total ξ	Diesel particulate filter, good combustion practice	BACT-PSD	NSPS
		06/29/2018 ACT	EUEMENGINE (North Plant): Emer	17.11	Diesel	1341	HP	Particulate matter, total ξ	Diesel particulate filter, good combustion practice	BACT-PSD	NSPS
		06/29/2018 ACT	EUEMENGINE (North Plant): Emer	17.11	Diesel	1341	HP	VOC	Good combustion practices.	BACT-PSD	
		06/29/2018 ACT	EUEMENGINE (North Plant): Emer	17.11	Diesel	1341	HP	Sulfur Dioxide (SO2)	Good combustion practices and meeting NSPS Sul	BACT-PSD	NSPS , SIP
		06/29/2018 ACT	EUEMENGINE (North Plant): Emer	17.11	Diesel	1341	HP	Carbon Dioxide Equivalen	Good combustion practices.	BACT-PSD	
		06/29/2018 ACT	EUEMENGINE (South Plant): Emer	17.11	Diesel	1341	HP	Carbon Monoxide	Good combustion practices and meeting NSPS IIII	BACT-PSD	NSPS , SIP
		06/29/2018 ACT	EUEMENGINE (South Plant): Emer	17.11	Diesel	1341	HP	NOx	Good combustion practices and meeting NSPS IIII	BACT-PSD	NSPS , SIP

RBLC ID	FACILITY NAME	PERMIT ISSUANCE	PROCESS_NAME	PROCCESST	PRIMARY FUEL	THROUGH	UNITs	POLLUTANT	CONTROL_METHOD_DESCRIPTION	CASE-BY-CASE	OTHER
		06/29/2018 ACT	EUEMENGINE (South Plant): Emer	17.11	Diesel	1341	HP	Particulate matter, filtera	Diesel particulate filter, good combustion practice	BACT-PSD	NSPS
		06/29/2018 ACT	EUEMENGINE (South Plant): Emer	17.11	Diesel	1341	HP	Particulate matter, total	Diesel particulate filter, good combustion practice	BACT-PSD	NSPS
		06/29/2018 ACT	EUEMENGINE (South Plant): Emer	17.11	Diesel	1341	HP	Particulate matter, total	Diesel particulate filter, good combustion practice	BACT-PSD	NSPS
		06/29/2018 ACT	EUEMENGINE (South Plant): Emer	17.11	Diesel	1341	HP	VOC	Good combustion practices	BACT-PSD	
		06/29/2018 ACT	EUEMENGINE (South Plant): Emer	17.11	Diesel	1341	HP	Sulfur Dioxide (SO2)	Good combustion practices and meeting NSPS Sul	BACT-PSD	NSPS , SIP
		06/29/2018 ACT	EUEMENGINE (South Plant): Emer	17.11	Diesel	1341	HP	Carbon Dioxide Equivalen	Good combustion practices.	BACT-PSD	
*MI-0434	FLAT ROCK ASSEMBLY PLANT	03/22/2018 ACT	EUENGINE01 through EUENGINE0	17.11	Diesel	3633	BHP	NOx	Good combustion practices.	BACT-PSD	NSPS , SIP
		03/22/2018 ACT	EUFIREPUMPENGS (2 emergency f	17.21	Diesel	250	BHP	NOx	Good combustion practices.	BACT-PSD	NSPS , SIP
		03/22/2018 ACT	EULIFESAFETYENG - One diesel-fu	17.21	Diesel	500	KW	NOx	Good combustion practices.	BACT-PSD	NSPS , SIP
*MI-0435	BELLE RIVER COMBINED CYCLE POWER PLANT	07/16/2018 ACT	EUEMENGINE: Emergency engine	17.11	Diesel	2	MW	Carbon Monoxide	State of the art combustion design.	BACT-PSD	NSPS , SIP
		07/16/2018 ACT	EUEMENGINE: Emergency engine	17.11	Diesel	2	MW	NOx	State of the art combustion design.	BACT-PSD	NSPS , SIP
		07/16/2018 ACT	EUEMENGINE: Emergency engine	17.11	Diesel	2	MW	Particulate matter, filtera	State of the art combustion design	BACT-PSD	NSPS
		07/16/2018 ACT	EUEMENGINE: Emergency engine	17.11	Diesel	2	MW	Particulate matter, total	State of the art combustion design	BACT-PSD	NSPS
		07/16/2018 ACT	EUEMENGINE: Emergency engine	17.11	Diesel	2	MW	Particulate matter, total	State of the art combustion design.	BACT-PSD	NSPS
		07/16/2018 ACT	EUEMENGINE: Emergency engine	17.11	Diesel	2	MW	VOC	State of the art combustion design.	BACT-PSD	SIP
		07/16/2018 ACT	EUEMENGINE: Emergency engine	17.11	Diesel	2	MW	Sulfuric Acid (mist, vapor	Good combustion practices, low sulfur fuel.	BACT-PSD	NSPS , SIP
		07/16/2018 ACT	EUEMENGINE: Emergency engine	17.11	Diesel	2	MW	Carbon Dioxide Equivalen	Energy efficient design.	BACT-PSD	
		07/16/2018 ACT	EUFPENGINE: Fire pump engine	17.21	Diesel	399	BHP	Carbon Monoxide	State of the art combustion design.	BACT-PSD	NSPS , SIP
		07/16/2018 ACT	EUFPENGINE: Fire pump engine	17.21	Diesel	399	BHP	NOx	State of the art combustion design.	BACT-PSD	NSPS , SIP
		07/16/2018 ACT	EUFPENGINE: Fire pump engine	17.21	Diesel	399	BHP	Particulate matter, filtera	State of the art combustion design	BACT-PSD	NSPS
		07/16/2018 ACT	EUFPENGINE: Fire pump engine	17.21	Diesel	399	BHP	Particulate matter, total	State of the art combustion design.	BACT-PSD	NSPS
		07/16/2018 ACT	EUFPENGINE: Fire pump engine	17.21	Diesel	399	BHP	Particulate matter, total	State of the art combustion design.	BACT-PSD	NSPS
		07/16/2018 ACT	EUFPENGINE: Fire pump engine	17.21	Diesel	399	BHP	VOC	State of the art combustion design.	BACT-PSD	SIP
		07/16/2018 ACT	EUFPENGINE: Fire pump engine	17.21	Diesel	399	BHP	Sulfuric Acid (mist, vapor	Good combustion practices, low sulfur fuel.	BACT-PSD	NSPS , SIP
		07/16/2018 ACT	EUFPENGINE: Fire pump engine	17.21	Diesel	399	BHP	Carbon Dioxide Equivalen	Energy efficient design	BACT-PSD	
NH-0015	CONCORD STEAM CORPORATION	02/27/2009 ACT	EMRGENCY GENERATOR 1	17.11	DIESEL FUEL	5.6	MMBTU/H	NOx	LESS THAN 500 HOURS OF OPERATION PER CONSI	LAER	OPERATING PERMIT
		02/27/2009 ACT	EMERGENCY GENERATOR 2	17.11	DIESEL FUEL	11.6	MMBTU/H	NOx	OPERATES LESS THAN 500 HOURS PER CONSECUT	LAER	NSPS , OPERATING PERMIT
NJ-0079	WOODBRIDGE ENERGY CENTER	07/25/2012 ACT	Emergency Generator	17.11	ULSD	100	H/YR	NOx	Use of ULSD diesel oil	LAER	NSPS , OPERATING PERMIT
		07/25/2012 ACT	Emergency Generator	17.11	ULSD	100	H/YR	Carbon Monoxide	Use of ULSD oil	BACT-PSD	NSPS , OPERATING PERMIT
		07/25/2012 ACT	Emergency Generator	17.11	ULSD	100	H/YR	VOC	Use of ULSD oil	LAER	NSPS , OPERATING PERMIT
		07/25/2012 ACT	Emergency Generator	17.11	ULSD	100	H/YR	Particulate matter, total	Use of ULSD oil	OTHER CASE-BY-	NSPS , OPERATING PERMIT
		07/25/2012 ACT	Emergency Generator	17.11	ULSD	100	H/YR	Particulate matter, total	Use of ULSD oil	OTHER CASE-BY-	NSPS , OPERATING PERMIT
NJ-0080	HESS NEWARK ENERGY CENTER	11/01/2012 ACT	Emergency Generator	17.11	ULSD	200	H/YR	NOx	use of ultra low sulfur diesel (ULSD) a clean fuel	LAER	NSPS , OPERATING PERMIT
		11/01/2012 ACT	Emergency Generator	17.11	ULSD	200	H/YR	Carbon Monoxide		BACT-PSD	OPERATING PERMIT
		11/01/2012 ACT	Emergency Generator	17.11	ULSD	200	H/YR	VOC	use of ULSD, a low sulfur clean fuel	LAER	OPERATING PERMIT
		11/01/2012 ACT	Emergency Generator	17.11	ULSD	200	H/YR	Particulate matter, filtera	use of ULSD, a low sulfur clean fuel	N/A	OPERATING PERMIT
		11/01/2012 ACT	Emergency Generator	17.11	ULSD	200	H/YR	Particulate matter, filterable < 10 Âµ (FPM10)		BACT-PSD	OPERATING PERMIT
		11/01/2012 ACT	Emergency Generator	17.11	ULSD	200	H/YR	Particulate matter, filtera	use of ULSD, a low sulfur clean fuel	BACT-PSD	OPERATING PERMIT
NJ-0084	PSEG FOSSIL LLC SEWAREN GENERATING STATION	03/10/2016 ACT	Diesel Fired Emergency Generator	17.11	ULSD	44	H/YR	VOC	use of ULSD a clean burning fuel, and limited hour	LAER	NSPS , OPERATING PERMIT
		03/10/2016 ACT	Diesel Fired Emergency Generator	17.11	ULSD	44	H/YR	Particulate matter, filtera	use of ULSD a clean burning fuel, and limited hour	BACT-PSD	NSPS , OPERATING PERMIT
		03/10/2016 ACT	Diesel Fired Emergency Generator	17.11	ULSD	44	H/YR	Particulate matter, total	use of ULSD a clean burning fuel, and limited hour	BACT-PSD	NSPS , OPERATING PERMIT
		03/10/2016 ACT	Diesel Fired Emergency Generator	17.11	ULSD	44	H/YR	Particulate matter, total	use of ULSD a clean burning fuel, and limited hour	BACT-PSD	NSPS , OPERATING PERMIT
		03/10/2016 ACT	Diesel Fired Emergency Generator	17.11	ULSD	44	H/YR	NOx	use of ultra low sulfur diesel a clean burning fuel.	LAER	NSPS , OPERATING PERMIT
		03/10/2016 ACT	Diesel Fired Emergency Generator	17.11	ULSD	44	H/YR	Carbon Monoxide	use of ultra low sulfur diesel oil a clean burning fu	BACT-PSD	NSPS , OPERATING PERMIT
NV-0047	NELLIS AIR FORCE BASE	02/26/2008 ACT	LARGE INTERNAL COMBUSTION EI	17.11	DIESEL OIL			Particulate matter, filtera	TURBOCHARGER AND AFTERCOOLER	OTHER CASE-BY-	SIP , OPERATING PERMIT
		02/26/2008 ACT	LARGE INTERNAL COMBUSTION EI	17.11	DIESEL OIL			NOx	TURBOCHARGER AND AFTERCOOLER	BACT-PSD	SIP , OPERATING PERMIT
		02/26/2008 ACT	LARGE INTERNAL COMBUSTION EI	17.11	DIESEL OIL			Carbon Monoxide	TURBOCHARGER AND AFTERCOOLER	Other Case-by-C	SIP , OPERATING PERMIT
		02/26/2008 ACT	LARGE INTERNAL COMBUSTION EI	17.11	DIESEL OIL			Sulfur Dioxide (SO2)	LIMITING SULFUR CONTENT IN THE DIESEL OIL TO	BACT-PSD	SIP , OPERATING PERMIT

RBLC ID	FACILITY NAME	PERMIT ISSUANCE	PROCESS_NAME	PROCCESST	PRIMARY FUEL	THROUGH	UNITs	POLLUTANT	CONTROL_METHOD_DESCRIPTION	CASE-BY-CASE	OTHER
		02/26/2008 ACT	LARGE INTERNAL COMBUSTION EI	17.11	DIESEL OIL			VOC	TURBOCHARGER AND AFTERCOOLER	Other Case-by-C	SIP , OPERATING PERMIT
NV-0049	HARRAH'S OPERATING COMPANY, INC.	08/20/2009 ACT	LARGE INTERNAL COMBUSTION EI	17.11	DIESEL OIL	1232	HP	VOC	THE UNIT IS EQUIPPED WITH A TURBOCHARGER.	Other Case-by-C	SIP , OPERATING PERMIT
		08/20/2009 ACT	LARGE INTERNAL COMBUSTION EI	17.11	DIESEL OIL	1232	HP	Sulfur Oxides (SOx)	THE UNIT SHALL COMBUST ONLY LOW-SULFUR DI	BACT-PSD	SIP , OPERATING PERMIT
		08/20/2009 ACT	LARGE INTERNAL COMBUSTION EI	17.11	DIESEL OIL	1232	HP	Hazardous Air Pollutants	THE UNIT IS EQUIPPED WITH A TURBOCHARGER.	Other Case-by-C	SIP , OPERATING PERMIT
		08/20/2009 ACT	LARGE INTERNAL COMBUSTION EI	17.11	DIESEL OIL	1232	HP	Particulate matter, filtera	THE UNIT IS EQUIPPED WITH A TURBOCHARGER.	Other Case-by-C	SIP , OPERATING PERMIT
		08/20/2009 ACT	LARGE INTERNAL COMBUSTION EI	17.11	DIESEL OIL	1232	HP	NOx	THE UNIT IS EQUIPPED WITH A TURBOCHARGER.	BACT-PSD	SIP , OPERATING PERMIT
		08/20/2009 ACT	LARGE INTERNAL COMBUSTION EI	17.11	DIESEL OIL	1232	HP	Carbon Monoxide	THE UNIT IS EQUIPPED WITH A TURBOCHARGER.	Other Case-by-C	SIP , OPERATING PERMIT
NY-0101	CORNELL COMBINED HEAT & POWER PROJECT	03/12/2008 ACT	EMERGENCY DIESEL GENERATORS	17.11	LSD	1000	KW	Particulate matter, filtera	ULTRA LOW SULFUR DIESEL AT 15 PPM S	BACT-PSD	NSPS , OPERATING PERMIT
		03/12/2008 ACT	EMERGENCY DIESEL GENERATORS	17.11	LSD	1000	KW	Sulfuric Acid (mist, vapor	ULTRA LOW SULFUR DIESEL AT 15 PPM S	BACT-PSD	NSPS , OPERATING PERMIT
		03/12/2008 ACT	EMERGENCY DIESEL GENERATORS	17.11	LSD	1000	KW	Particulate Matter (PM)	ULTRA LOW SULFUR DIESEL AT 15 PPM S.	BACT-PSD	NSPS , OPERATING PERMIT
		03/12/2008 ACT	EMERGENCY DIESEL GENERATORS	17.11	LSD	1000	KW	Particulate matter, filtera	ULTRA LOW SULFUR DIESEL AT 15 PPM S	BACT-PSD	NSPS , OPERATING PERMIT
NY-0103	CRICKET VALLEY ENERGY CENTER	02/03/2016 ACT	Black start generator	17.11	ULSD	3000	KW	NOx	reduction.	LAER	
		02/03/2016 ACT	Black start generator	17.11	ULSD	3000	KW	VOC	Compliance demonstrated with vendor emission	LAER	
		02/03/2016 ACT	Black start generator	17.11	ULSD	3000	KW	Particulate matter, filtera	Compliance demonstrated with vendor emission	BACT-PSD	
		02/03/2016 ACT	Black start generator	17.11	ULSD	3000	KW	Carbon Monoxide	Compliance demonstrated with vendor emission	BACT-PSD	
NY-0104	CPV VALLEY ENERGY CENTER	08/01/2013 ACT	Emergency generator	17.11	ULSD			Sulfur, Total Reduced (TR	Ultra low sulfur diesel with maximum sulfur conte	BACT-PSD	
		08/01/2013 ACT	Emergency generator	17.11	ULSD			VOC	Good combustion practice.	LAER	
		08/01/2013 ACT	Emergency generator	17.11	ULSD			Particulate matter, filtera	Ultra low sulfur diesel with maximum sulfur conte	BACT-PSD	
		08/01/2013 ACT	Emergency generator	17.11	ULSD			Sulfur Dioxide (SO2)	Ultra low sulfur diesel with maximum sulfur conte	BACT-PSD	
		08/01/2013 ACT	Emergency generator	17.11	ULSD			Sulfuric Acid (mist, vapor	Ultra low sulfur diesel with maximum sulfur conte	BACT-PSD	
		08/01/2013 ACT	Emergency generator	17.11	ULSD			Carbon Monoxide	Good combustion practice.	BACT-PSD	
OK-0128	MID AMERICAN STEEL ROLLING MILL	09/08/2008 ACT	Emergency Generator	17.11	No. 2 diesel	1200	HP	NOx	500 hours per year operations	BACT-PSD	SIP
		09/08/2008 ACT	Emergency Generator	17.11	No. 2 diesel	1200	HP	Sulfur Dioxide (SO2)	500 hours per year, 0.05% sulfur diesel fuel	BACT-PSD	
		09/08/2008 ACT	Emergency Generator	17.11	No. 2 diesel	1200	HP	Particulate matter, total < 10 Âµ (TPM10)		BACT-PSD	SIP
		09/08/2008 ACT	Emergency Generator	17.11	No. 2 diesel	1200	HP	Carbon Monoxide		BACT-PSD	
		09/08/2008 ACT	Emergency Generator	17.11	No. 2 diesel	1200	HP	VOC		BACT-PSD	SIP
OK-0129	CHOUTEAU POWER PLANT	01/23/2009 ACT	EMERGENCY DIESEL GENERATOR (	17.11	LOW SULFUR DIESE	2200	HP	NOx		BACT-PSD	NSPS
		01/23/2009 ACT	EMERGENCY DIESEL GENERATOR (	17.11	LOW SULFUR DIESE	2200	HP	Carbon Monoxide		BACT-PSD	NSPS
		01/23/2009 ACT	EMERGENCY DIESEL GENERATOR (	17.11	LOW SULFUR DIESE	2200	HP	VOC	GOOD COMBUSTION	BACT-PSD	NSPS
		01/23/2009 ACT	EMERGENCY DIESEL GENERATOR (	17.11	LOW SULFUR DIESE	2200	HP	Particulate matter, total < 10 Âµ (TPM10)		BACT-PSD	NSPS
		01/23/2009 ACT	EMERGENCY DIESEL GENERATOR (	17.11	LOW SULFUR DIESE	2200	HP	Sulfur Dioxide (SO2)	LOW SULFUR DIESEL 0.05%S	BACT-PSD	NSPS
OK-0145	BROKEN BOW OSB MILL	06/25/2012 ACT	Emerg Diesel Gen, Fire Pump, Rail	17.11	Diesel			NOx		BACT-PSD	N/A
	MOORELAND GENERATING STA	07/02/2013 ACT	DIESEL-FIRED EMERGENCY GENER.	17.11	DIESEL	1341	HP	NOx	COMBUSTION CONTROL	BACT-PSD	NSPS
		07/02/2013 ACT	DIESEL-FIRED EMERGENCY GENER.	17.11	DIESEL	1341	HP	Carbon Monoxide	COMBUSTION CONTROL.	BACT-PSD	
		07/02/2013 ACT	DIESEL-FIRED EMERGENCY GENER.	17.11	DIESEL	1341	HP	VOC	COMBUSTION CONTROL.	BACT-PSD	N/A
		07/02/2013 ACT	DIESEL-FIRED EMERGENCY GENER.	17.11	DIESEL	1341	HP	Particulate matter, total :	COMBUSTION CONTROL.	BACT-PSD	N/A
		07/02/2013 ACT	DIESEL-FIRED EMERGENCY GENER.	17.11	DIESEL	1341	HP	Carbon Dioxide Equivalen	A TIER 3 CERTIFIED ENGINE OPERATED < 100 HR/Y	BACT-PSD	N/A
OK-0156	NORTHSTAR AGRI IND ENID	07/31/2013 ACT	Fire Pump Engine	17.11	Diesel	550	hp	Particulate matter, total < 10 Âµ (TPM10)		BACT-PSD	NSPS
		07/31/2013 ACT	Fire Pump Engine	17.11	Diesel	550	hp	Particulate matter, total < 2.5 Âµ (TPM2.5)		BACT-PSD	NSPS
		07/31/2013 ACT	Fire Pump Engine	17.11	Diesel	550	hp	VOC	Good Combustion	BACT-PSD	NSPS , NESHAP
		07/31/2013 ACT	Fire Pump Engine	17.11	Diesel	550	hp	Carbon Dioxide	Good Combustion	BACT-PSD	NSPS
PA-0278	MOXIE LIBERTY LLC/ASYLUM POWER PL T	10/10/2012 ACT	Emergency Generator	17.11	Diesel			Carbon Monoxide		OTHER CASE-BY-	OTHER
		10/10/2012 ACT	Emergency Generator	17.11	Diesel			VOC		OTHER CASE-BY-	OTHER
		10/10/2012 ACT	Emergency Generator	17.11	Diesel			NOx		OTHER CASE-BY-	OTHER
		10/10/2012 ACT	Emergency Generator	17.11	Diesel			Particulate matter, total < 10 Âµ (TPM10)		OTHER CASE-BY-	OTHER
		10/10/2012 ACT	Emergency Generator	17.11	Diesel			Particulate matter, total < 2.5 Âµ (TPM2.5)		OTHER CASE-BY-	OTHER
		10/10/2012 ACT	Emergency Generator	17.11	Diesel			Sulfur Oxides (SOx)		OTHER CASE-BY-	OTHER
PA-0291	HICKORY RUN ENERGY	04/23/2013 ACT	EMERGENCY GENERATOR	17.11	ULSD	7.8	MMBtu/hr	Particulate matter, total (TPM)		OTHER CASE-BY-	OTHER

RBLC ID	FACILITY NAME	PERMIT ISSUANCE	PROCESS_NAME	PROCCESST	PRIMARY FUEL	THROUGH	UNITs	POLLUTANT	CONTROL_METHOD_DESCRIPTION	CASE-BY-CASE	OTHER
	STATION	04/23/2013 ACT	EMERGENCY GENERATOR	17.11	ULSD	7.8	MMBtu/hr	NOx		OTHER CASE-BY-	OTHER
		04/23/2013 ACT	EMERGENCY GENERATOR	17.11	ULSD	7.8	MMBtu/hr	Carbon Monoxide		OTHER CASE-BY-	OTHER
		04/23/2013 ACT	EMERGENCY GENERATOR	17.11	ULSD	7.8	MMBtu/hr	VOC		OTHER CASE-BY-	OPERATING PERMIT
		04/23/2013 ACT	EMERGENCY GENERATOR	17.11	ULSD	7.8	MMBtu/hr	Sulfur Oxides (SOx)		OTHER CASE-BY-	OPERATING PERMIT
		04/23/2013 ACT	EMERGENCY GENERATOR	17.11	ULSD	7.8	MMBtu/hr	Hydrogen Sulfide		OTHER CASE-BY-	OTHER
		04/23/2013 ACT	EMERGENCY GENERATOR	17.11	ULSD	7.8	MMBtu/hr	Carbon Dioxide Equivalent (CO2e)		OTHER CASE-BY-	OTHER
*PA-0298	FUTURE POWER PA/GOOD SPRINGS NGCC FACILITY	03/04/2014 ACT	EMERGENCY GENERATOR - 670 HP	17.11	Diesel	31.9	Gal/hr				
*PA-0309	LACKAWANNA ENERGY CTR/JESSUP	12/23/2015 ACT	2000 kW Emergency Generator	17.11	ULSD			NOx		LAER	
		12/23/2015 ACT	2000 kW Emergency Generator	17.11	ULSD			Carbon Monoxide		BACT-PSD	
		12/23/2015 ACT	2000 kW Emergency Generator	17.11	ULSD			VOC		LAER	
		12/23/2015 ACT	2000 kW Emergency Generator	17.11	ULSD			Particulate matter, filterable (FPM)		BACT-PSD	
		12/23/2015 ACT	2000 kW Emergency Generator	17.11	ULSD			Particulate matter, total < 10 Âµ (TPM10)		BACT-PSD	
		12/23/2015 ACT	2000 kW Emergency Generator	17.11	ULSD			Particulate matter, total < 2.5 Âµ (TPM2.5)		BACT-PSD	
		12/23/2015 ACT	2000 kW Emergency Generator	17.11	ULSD			Sulfuric Acid (mist, vapors, etc)		BACT-PSD	
		12/23/2015 ACT	2000 kW Emergency Generator	17.11	ULSD			Carbon Dioxide Equivalent (CO2e)		BACT-PSD	
*PA-0310	CPV FAIRVIEW ENERGY CENTER	09/02/2016 ACT	Emergency Generator Engines	17.11	ULSD			NOx		LAER	NSPS
		09/02/2016 ACT	Emergency Generator Engines	17.11	ULSD			Carbon Monoxide		BACT-PSD	NSPS
		09/02/2016 ACT	Emergency Generator Engines	17.11	ULSD			Particulate matter, total (TPM)		BACT-PSD	NSPS
*PA-0311	MOXIE FREEDOM GENERATION PLANT	09/01/2015 ACT	Emergency Generator	17.11				NOx		LAER	NSPS
		09/01/2015 ACT	Emergency Generator	17.11				Carbon Monoxide		BACT-PSD	NSPS
		09/01/2015 ACT	Emergency Generator	17.11				VOC		LAER	NSPS
		09/01/2015 ACT	Emergency Generator	17.11				Particulate matter, total (TPM)		BACT-PSD	NSPS
		09/01/2015 ACT	Emergency Generator	17.11				Particulate matter, total < 10 Âµ (TPM10)		BACT-PSD	NSPS
		09/01/2015 ACT	Emergency Generator	17.11				Particulate matter, total < 2.5 Âµ (TPM2.5)		BACT-PSD	NSPS
		09/01/2015 ACT	Emergency Generator	17.11				Sulfuric Acid (mist, vapors, etc)		BACT-PSD	NSPS
		09/01/2015 ACT	Emergency Generator	17.11				Carbon Dioxide Equivalent (CO2e)		BACT-PSD	NSPS
		09/01/2015 ACT	Fire Pump Engine	17.11	diesel			NOx		LAER	NSPS
		09/01/2015 ACT	Fire Pump Engine	17.11	diesel			Carbon Monoxide		BACT-PSD	NSPS
		09/01/2015 ACT	Fire Pump Engine	17.11	diesel			VOC		LAER	NSPS
		09/01/2015 ACT	Fire Pump Engine	17.11	diesel			Particulate matter, total (TPM)		BACT-PSD	NSPS
		09/01/2015 ACT	Fire Pump Engine	17.11	diesel			Particulate matter, total < 10 Âµ (TPM10)		BACT-PSD	NSPS
		09/01/2015 ACT	Fire Pump Engine	17.11	diesel			Particulate matter, total < 2.5 Âµ (TPM2.5)		BACT-PSD	NSPS
		09/01/2015 ACT	Fire Pump Engine	17.11	diesel			Carbon Dioxide Equivalent (CO2e)		BACT-PSD	NSPS
PR-0009	ENERGY ANSWERS ARECIBO PUERTO RICO RENEWABLE ENERGY PROJECT	04/10/2014 ACT	Emergency Diesel Generator	17.11	ULSD Fuel oil # 2			NOx		BACT-PSD	
		04/10/2014 ACT	Emergency Diesel Generator	17.11	ULSD Fuel oil # 2			Carbon Monoxide		BACT-PSD	
		04/10/2014 ACT	Emergency Diesel Generator	17.11	ULSD Fuel oil # 2			VOC		BACT-PSD	
		04/10/2014 ACT	Emergency Diesel Generator	17.11	ULSD Fuel oil # 2			Particulate matter, filterable (FPM)		BACT-PSD	
		04/10/2014 ACT	Emergency Diesel Generator	17.11	ULSD Fuel oil # 2			Particulate matter, total < 10 Âµ (TPM10)		BACT-PSD	
		04/10/2014 ACT	Emergency Diesel Generator	17.11	ULSD Fuel oil # 2			Particulate matter, total < 2.5 Âµ (TPM2.5)		BACT-PSD	
		04/10/2014 ACT	Emergency Diesel Generator	17.11	ULSD Fuel oil # 2			Sulfur Dioxide (SO2)		BACT-PSD	
		04/10/2014 ACT	Emergency Diesel Generator	17.11	ULSD Fuel oil # 2			Carbon Dioxide Equivalent (CO2e)		BACT-PSD	
SC-0113	PYRAMAX CERAMICS, LLC	02/08/2012 ACT	EMERGENCY GENERATORS 1 THRU	17.11	DIESEL	757	HP	NOx	ENGINES MUST BE CERTIFIED TO COMPLY WITH N	BACT-PSD	NSPS
		02/08/2012 ACT	EMERGENCY GENERATORS 1 THRU	17.11	DIESEL	757	HP	Carbon Monoxide	ENGINES MUST BE CERTIFIED TO COMPLY WITH N	BACT-PSD	NSPS
		02/08/2012 ACT	EMERGENCY GENERATORS 1 THRU	17.11	DIESEL	757	HP	VOC	PURCHASE ENGINES CERTIFIED TO COMPLY WITH	BACT-PSD	NSPS
		02/08/2012 ACT	EMERGENCY GENERATORS 1 THRU	17.11	DIESEL	757	HP	Sulfur Dioxide (SO2)	USE OF LOW SULFUR FUEL DIESEL, SULFUR CONTE	BACT-PSD	
SC-0114	GP ALLENDALE LP	11/25/2008 ACT	FIRE WATER DIESEL PUMP	17.11	DIESEL	525	HP	Particulate matter, total (	TUNE-UPS AND INSPECTIONS WILL BE PERFORMEI	BACT-PSD	
		11/25/2008 ACT	FIRE WATER DIESEL PUMP	17.11	DIESEL	525	HP	Particulate matter, filtera	TUNE-UPS AND INSPECTIONS WILL BE PERFORMEI	BACT-PSD	

RBLC ID	FACILITY NAME	PERMIT ISSUANCE	PROCESS_NAME	PROCCESST	PRIMARY FUEL	THROUGH	UNITs	POLLUTANT	CONTROL_METHOD_DESCRIPTION	CASE-BY-CASE	OTHER
		11/25/2008 ACT	FIRE WATER DIESEL PUMP	17.11	DIESEL	525	HP	NOx	TUNE-UPS AND INSPECTIONS WILL BE PERFORME	BACT-PSD	
		11/25/2008 ACT	FIRE WATER DIESEL PUMP	17.11	DIESEL	525	HP	Sulfur Dioxide (SO2)	TUNE-UPS AND INSPECTIONS WILL BE PERFORME	BACT-PSD	
		11/25/2008 ACT	FIRE WATER DIESEL PUMP	17.11	DIESEL	525	HP	Carbon Monoxide	TUNE-UPS AND INSPECTIONS WILL BE PERFORME	BACT-PSD	
		11/25/2008 ACT	FIRE WATER DIESEL PUMP	17.11	DIESEL	525	HP	VOC	TUNE-UPS AND INSPECTIONS WILL BE PERFORME	BACT-PSD	
		11/25/2008 ACT	DIESEL EMERGENCY GENERATOR	17.11	DIESEL	1400	HP	Particulate matter, total (TPM)		BACT-PSD	
		11/25/2008 ACT	DIESEL EMERGENCY GENERATOR	17.11	DIESEL	1400	HP	Particulate matter, filterable < 10 Âµ (FPM10)		BACT-PSD	
		11/25/2008 ACT	DIESEL EMERGENCY GENERATOR	17.11	DIESEL	1400	HP	NOx		BACT-PSD	
		11/25/2008 ACT	DIESEL EMERGENCY GENERATOR	17.11	DIESEL	1400	HP	Sulfur Dioxide (SO2)		BACT-PSD	
		11/25/2008 ACT	DIESEL EMERGENCY GENERATOR	17.11	DIESEL	1400	HP	Carbon Monoxide		BACT-PSD	
		11/25/2008 ACT	DIESEL EMERGENCY GENERATOR	17.11	DIESEL	1400	HP	VOC		BACT-PSD	
SC-0115	GP CLARENDON LP	02/10/2009 ACT	FIRE WATER DIESEL PUMP	17.11	DIESEL	525	HP	Particulate matter, total (	TUNE-UPS AND INSPECTIONS WILL BE PERFORME	BACT-PSD	
		02/10/2009 ACT	FIRE WATER DIESEL PUMP	17.11	DIESEL	525	HP	Particulate matter, filtera	TUNE-UPS AND INSPECTIONS WILL BE PERFORME	BACT-PSD	
		02/10/2009 ACT	FIRE WATER DIESEL PUMP	17.11	DIESEL	525	HP	NOx	TUNE-UPS AND INSPECTIONS WILL BE PERFORME	BACT-PSD	
		02/10/2009 ACT	FIRE WATER DIESEL PUMP	17.11	DIESEL	525	HP	Sulfur Dioxide (SO2)	TUNE-UPS AND INSPECTIONS WILL BE PERFORME	BACT-PSD	
		02/10/2009 ACT	FIRE WATER DIESEL PUMP	17.11	DIESEL	525	HP	Carbon Monoxide	TUNE-UPS AND INSPECTIONS WILL BE PERFORME	BACT-PSD	
		02/10/2009 ACT	FIRE WATER DIESEL PUMP	17.11	DIESEL	525	HP	VOC	TUNE-UPS AND INSPECTIONS WILL BE PERFORME	BACT-PSD	
		02/10/2009 ACT	DIESEL EMERGENCY GENERATOR	17.11	DIESEL	1400	HP	Particulate matter, total (	TUNE-UPS AND INSPECTIONS WILL BE PERFORME	BACT-PSD	
		02/10/2009 ACT	DIESEL EMERGENCY GENERATOR	17.11	DIESEL	1400	HP	Particulate matter, filtera	TUNE-UPS AND INSPECTIONS WILL BE PERFORME	BACT-PSD	
		02/10/2009 ACT	DIESEL EMERGENCY GENERATOR	17.11	DIESEL	1400	HP	Sulfur Dioxide (SO2)	TUNE-UPS AND INSPECTIONS WILL BE PERFORME	BACT-PSD	
		02/10/2009 ACT	DIESEL EMERGENCY GENERATOR	17.11	DIESEL	1400	HP	Carbon Monoxide	TUNE-UPS AND INSPECTIONS WILL BE PERFORME	BACT-PSD	
		02/10/2009 ACT	DIESEL EMERGENCY GENERATOR	17.11	DIESEL	1400	HP	VOC	TUNE-UPS AND INSPECTIONS WILL BE PERFORME	BACT-PSD	
		02/10/2009 ACT	DIESEL EMERGENCY GENERATOR	17.11	DIESEL	1400	HP	NOx	TUNE-UPS AND INSPECTIONS WILL BE PERFORME	BACT-PSD	
SC-0159	US10 FACILITY	07/09/2012 ACT	EMERGENCY GENERATORS, GEN1, GEN2	17.11	DIESEL	1000	KW	VOC	BACT HAS BEEN DETERMINED TO BE COMPLIANCE WITH NSPS, SUBPART IIII, 40 CFR60.4202 AND 40 CFR60.4205.	BACT-PSD	NSPS
*SD-0005	DEER CREEK STATION	06/29/2010 ACT	Emergency Generator	17.11	Distillate Oil	2000	Kilowatts	Particulate matter, filterable (FPM)		BACT-PSD	NSPS
		06/29/2010 ACT	Emergency Generator	17.11	Distillate Oil	2000	Kilowatts	NOx		BACT-PSD	NSPS
		06/29/2010 ACT	Emergency Generator	17.11	Distillate Oil	2000	Kilowatts	Carbon Monoxide		BACT-PSD	NSPS
		06/29/2010 ACT	Fire Water Pump	17.11	Distillate Oil	577	horsepower	NOx		BACT-PSD	NSPS
		06/29/2010 ACT	Fire Water Pump	17.11	Distillate Oil	577	horsepower	Carbon Monoxide		BACT-PSD	NSPS
		06/29/2010 ACT	Fire Water Pump	17.11	Distillate Oil	577	horsepower	Particulate matter, filterable (FPM)		BACT-PSD	NSPS
*TX-0671	PROJECT JUMBO	12/01/2014 ACT	Engines	17.11	ULSD			NOx	Each emergency generator's emission factor is ba	BACT-PSD	NSPS
		12/01/2014 ACT	Engines	17.11	ULSD			Sulfur Dioxide (SO2)	Ultra low sulfur fuel engines burn will meet the su	BACT-PSD	NSPS
TX-0728	PEONY CHEMICAL MANUFACTURING FACILITY	04/01/2015 ACT	Emergency Diesel Generator	17.11	Diesel	1500	hp	Particulate matter, filtera	Minimized hours of operations Tier II engine	OTHER CASE-BY-	NSPS , MACT
		04/01/2015 ACT	Emergency Diesel Generator	17.11	Diesel	1500	hp	Particulate matter, filtera	Minimized hours of operations Tier II engine	OTHER CASE-BY-	NSPS , MACT
		04/01/2015 ACT	Emergency Diesel Generator	17.11	Diesel	1500	hp	Particulate matter, filtera	Minimized hours of operations Tier II engine	OTHER CASE-BY-	NSPS , MACT
		04/01/2015 ACT	Emergency Diesel Generator	17.11	Diesel	1500	hp	NOx	Minimized hours of operations Tier II engine	LAER	NSPS , MACT
		04/01/2015 ACT	Emergency Diesel Generator	17.11	Diesel	1500	hp	Carbon Monoxide	Minimized hours of operations Tier II engine	OTHER CASE-BY-	NSPS , MACT
		04/01/2015 ACT	Emergency Diesel Generator	17.11	Diesel	1500	hp	Sulfur Dioxide (SO2)	Low sulfur fuel 15 ppmw	OTHER CASE-BY-	N/A
		04/01/2015 ACT	Emergency Diesel Generator	17.11	Diesel	1500	hp	VOC	Minimized hours of operations Tier II engine	OTHER CASE-BY-	N/A
TX-0799	BEAUMONT TERMINAL	06/08/2016 ACT	Fire pump engines	17.11	diesel			VOC	Equipment specifications and good combustion pr	BACT-PSD	
		06/08/2016 ACT	Fire pump engines	17.11	diesel			Carbon Monoxide	Equipment specifications and good combustion pr	BACT-PSD	
		06/08/2016 ACT	Fire pump engines	17.11	diesel			Carbon Dioxide Equivalen	Equipment specifications and good combustion pr	BACT-PSD	
*VA-0321	BRUNSWICK COUNTY POWER STATION	03/12/2013 ACT	Emergency diesel generator-2200 kW	17.11	ULSD	500	hrs/yr	Carbon Monoxide	good combustion practices	BACT-PSD	NSPS , SIP
*VA-0325	GREENSVILLE POWER STATION	06/17/2016 ACT	DIESEL-FIRED EMERGENCY GENER.	17.11	DIESEL FUEL			Carbon Dioxide Equivalen	Good Combustion Practices/Maintenance	N/A	
		06/17/2016 ACT	DIESEL-FIRED EMERGENCY GENER.	17.11	DIESEL FUEL			Carbon Monoxide	Good Combustion Practices/Maintenance	N/A	
		06/17/2016 ACT	DIESEL-FIRED EMERGENCY GENER.	17.11	DIESEL FUEL			NOx	Good Combustion Practices/Maintenance	N/A	
		06/17/2016 ACT	DIESEL-FIRED EMERGENCY GENER.	17.11	DIESEL FUEL			Particulate matter, total (	Ultra Low Sulfur Diesel/Fuel (15 ppm max)	N/A	

RBLC ID	FACILITY NAME	PERMIT ISSUANCE	PROCESS_NAME	PROCCESST	PRIMARY FUEL	THROUGH	UNITs	POLLUTANT	CONTROL_METHOD_DESCRIPTION	CASE-BY-CASE	OTHER
		06/17/2016 ACT	DIESEL-FIRED EMERGENCY GENER	17.11	DIESEL FUEL			Particulate matter, total	Ultra Low Sulfur Diesel/Fuel (15 ppm max)	N/A	
		06/17/2016 ACT	DIESEL-FIRED EMERGENCY GENER	17.11	DIESEL FUEL			Sulfur Dioxide (SO2)	Ultra Low Sulfur Diesel/Fuel (15 ppm max)	N/A	
		06/17/2016 ACT	DIESEL-FIRED EMERGENCY GENER	17.11	DIESEL FUEL			Sulfuric Acid (mist, vapor	Ultra Low Sulfur Diesel/Fuel (15 ppm max)	N/A	
		06/17/2016 ACT	DIESEL-FIRED EMERGENCY GENER	17.11	DIESEL FUEL			VOC	Good Combustion Practices/Maintenance	N/A	
*VA-0328	C4GT, LLC	04/26/2018 ACT	Emergency Diesel GEN	17.11	ULSD	500	H/YR	NOx	good combustion practices and the use of ultra lo	BACT-PSD	NSPS , SIP
		04/26/2018 ACT	Emergency Diesel GEN	17.11	ULSD	500	H/YR	Particulate matter, filtera	good combustion practices and the use of ultra lo	BACT-PSD	NSPS , SIP
		04/26/2018 ACT	Emergency Diesel GEN	17.11	ULSD	500	H/YR	Particulate matter, total	good combustion practices and the use of ultra lo	BACT-PSD	NSPS , SIP
		04/26/2018 ACT	Emergency Diesel GEN	17.11	ULSD	500	H/YR	Particulate matter, total	Good combustion practices and the use of ultra lo	BACT-PSD	NSPS , SIP
		04/26/2018 ACT	Emergency Diesel GEN	17.11	ULSD	500	H/YR	Carbon Monoxide	good combustion practices and the use of ultra lo	BACT-PSD	SIP , NSPS
		04/26/2018 ACT	Emergency Diesel GEN	17.11	ULSD	500	H/YR	Sulfur Dioxide (SO2)	good combustion practices and the use of ultra lo	BACT-PSD	NSPS , SIP
		04/26/2018 ACT	Emergency Diesel GEN	17.11	ULSD	500	H/YR	Sulfuric Acid (mist, vapor	good combustion practices and the use of ultra lo	BACT-PSD	NSPS , SIP
		04/26/2018 ACT	Emergency Diesel GEN	17.11	ULSD	500	H/YR	Carbon Dioxide Equivalen	use of S15 ULSD and high efficiency design and op	BACT-PSD	NSPS , SIP
WV-0025	MOUNDSVILLE COMBINED CYCLE POWER PLANT	11/21/2014 ACT	Emergency Generator	17.11	Diesel	2015.7	HP	Carbon Monoxide		BACT-PSD	NSPS
		11/21/2014 ACT	Emergency Generator	17.11	Diesel	2015.7	HP	NOx		BACT-PSD	NSPS
		11/21/2014 ACT	Emergency Generator	17.11	Diesel	2015.7	HP	Particulate matter, filterable < 2.5 Âµ (FPM2.5)		BACT-PSD	NSPS
		11/21/2014 ACT	Emergency Generator	17.11	Diesel	2015.7	HP	VOC		BACT-PSD	
		11/21/2014 ACT	Emergency Generator	17.11	Diesel	2015.7	HP	Carbon Dioxide Equivalent (CO2e)		BACT-PSD	
WV-0027	INWOOD	09/15/2017 ACT	Emergency Generator - ESDG14	17.11	ULSD	900	bhp	Particulate matter, total	ULSD	BACT-PSD	NSPS
		09/15/2017 ACT	Emergency Generator - ESDG14	17.11	ULSD	900	bhp	NOx	Engine Design	BACT-PSD	NSPS , MACT
WY-0070	CHEYENNE PRAIRIE GENERATING STATION	08/28/2012 ACT	Diesel Emergency Generator (EP1	17.11	ULSD	839	hp	NOx	EPA Tier 2 rated	BACT-PSD	NSPS
		08/28/2012 ACT	Diesel Emergency Generator (EP1	17.11	ULSD	839	hp	Sulfur Dioxide (SO2)	Ultra Low Sulfur Diesel	OTHER CASE-BY-CASE	
		08/28/2012 ACT	Diesel Emergency Generator (EP1	17.11	ULSD	839	hp	Carbon Monoxide	EPA Tier 2 rated	BACT-PSD	NSPS

RBLC ENTRIES FOR FIXED ROOF STORAGE TANKS 1/1/2008 - 12/4/2018

RBLCID	FACILITY_NAME	PERMIT_ISSUANCE_DATE	PROCESS_NAME	PROCCESS _TYPE	PRIMARY _FUEL	THROUGH PUT	THROUGHPUT _UNIT	PROCESS_NOTES	POLLUTANT	CONTROL_METHOD_DESCRIPTION	EMISSION_LI MIT_1	EMISSION _LIMIT_1_ UNIT
*AK-0084	DONLIN GOLD PROJECT	06/30/2017 ACT	Fuel Tanks	42.005	Diesel			Multiple fuel tanks, the larg	VOC	Submerged Fill	1.7	TPY
FL-0346	LAUDERDALE PLANT	04/22/2014 ACT	Three ULSD fuel oil storage tanks	42.005				Three tanks: 80000 bbl, 150	VOC	The Department sets BACT for these storage tanks to minimize VOC em		
FL-0354	LAUDERDALE PLANT	08/25/2015 ACT	Two 3-million gallon ULSD storage tar	42.005					VOC	Low vapor pressure prevents evaporative losses		
IL-0119	PHILLIPS 66 PIPELINE LLC	01/23/2015 ACT	Distillate Storage Tank (Tank 2001)	42.005		200000	bbl	200,000 bbl capacity	VOC	low vapor pressure material	0.1	PSIA
IN-0158	ST. JOSEPH ENEGRY CENTER, LLC	12/03/2012 ACT	EMERGENCY GENERATOR ULSD TANK	42.005		550	GALLONS EACH	THE TWO (2) TANKS ARE IDE	VOC	GOOD DESIGN AND OPERATING PRACTICES		
		12/03/2012 ACT	FIRE PUMP ENGINE ULSD TANKS	42.005		70	GALLONS EACH	THE TWO (2) TANKS ARE IDE	VOC	GOOD CUMBUSTION PRACTICE AND FUEL SPECIFICATION		
		12/03/2012 ACT	VEHICLE GASOLINE DISPENSING TANK	42.005		650	GALLONS	TANK, IDENTIFIED AS TK11,	VOC	SUBMERGED FILL PIPES AND STAGE 1 VAPOR CONTROL		
		12/03/2012 ACT	VEHICLE DIESEL TANK	42.005		650	GALLONS	THIS TANK IS IDENTIFIED AS	VOC	GOOD CUMBUSTION PRACTICE AND FUEL SPECIFICATION		
		12/03/2012 ACT	EMERGENCY GENERATOR ULSD TANK	42.005		300	GALLONS	THIS TANK IS IDENTIFIED AS	VOC	GOOD CUMBUSTION PRACTICE AND FUEL SPECIFICATION		
IN-0273	ST. JOSEPH ENERGY CENTER	06/22/2017 ACT	DIESEL STORAGE TANK TK11	42.005	DIESEL	650	GALLONS		VOC	THE USE OF GOOD DESIGN AND OPERATING		
		06/22/2017 ACT	DIESEL STORAGE TANK TK50	42.005	DIESEL	5000	GALLONS		VOC	PRACTICES. EACH TANK SHALL UTILIZE A FIXED ROOF.		
LA-0213	ST. CHARLES REFINERY	11/17/2009 ACT	TANKS - FOR HEAVY MATERIALS	42.005				39 FIXED ROOF TANKS	VOC	EQUIPPED WITH FIXED ROOF AND COMPLY WITH 40 CFR 63 SUBPART C		
LA-0228	BATON ROUGE JUNCTION FACILITY	11/02/2009 ACT	EQT031-EQT035 FIVE DISTILLATE TANKS (T006-T010)	42.005		240000	BBL (EACH)		VOC	SUBMERGED FILL PIPES AND PRESSURE/VACUUM VENTS	45	T/YR
LA-0237	ST. ROSE TERMINAL	05/20/2010 ACT	HEAVY FUEL OIL STORAGE TANKS (18)	42.005				VOLUME = 4.22 MILLION GA	VOC	FIXED ROOF	67.53	T/YR
LA-0265	ST. CHARLES REFINERY	10/02/2012 ACT	FR Storage Tanks EQT0087 and EQT0C	42.005				EQT0087 (95-52, 150-22) =	VOC	Comply with 40 CFR 63 Subpart CC (Group 2)		
LA-0276	BATON ROUGE JUNCTION	12/15/2016 ACT	Vertical Fixed Roof Tanks 174, 175, 17	42.005				Tanks 174 and 175:	VOC	Submerged fill pipes and pressure/vacuum vents		
OH-0317	OHIO RIVER CLEAN FUELS, LLC	11/20/2008 ACT	FIXED ROOF TANKS (8)	42.005	DIESEL FUEL (	262500	GAL/D	EIGHT FUEL TANKS, 3 MM	VOC	SUBMERGED FILL	0.8	T/YR
OK-0148	BUFFALO CREEK PROCESSING PLANT	09/12/2012 ACT	Condensate Tanks (Petroleum Storage	42.005	N/A	1.46	MMBPY	Closed Vent and Control.	VOC	Flare.		
		09/12/2012 ACT	Condensate Tanks (Petroleum Storage	42.005	N/A	1.46	MMBPY	Closed Vent and Control.	CO2e	Flare.		
OK-0154	MOORELAND GENERATING STA	07/02/2013 ACT	DIESEL TANK (2800 GALLON)	42.005	NA	2800	GALLONS		VOC	FIXED-ROOF TANK		
OR-0050	TROUTDALE ENERGY CENTER, LLC	03/05/2014 ACT	Storage tank	42.005	ULSD			2.2 million gallons, fixed roc	VOC	Submerged fill line; Vapor balancing during tank filling.		
TX-0656	GAS TO GASOLINE PLANT	05/16/2014 ACT	Fixed Roof Tanks (3)	42.005		800000	GAL/YR		VOC	WATER SCRUBBER	1.65	T/YR
TX-0728	PEONY CHEMICAL MANUFACTURING FACILITY	04/01/2015 ACT	Diesel and lube oil tanks	42.005		10708	gallons/yr	The tanks are painted white. Loading is done via submerged piping. The	VOC	low vapor pressure fuel, submerged fill, white tank	0.02	LB/H
TX-0731	CORPUS CHRISTI TERMINAL CONDENSATE SPLITTER	04/10/2015 ACT	Petroleum Liquids Storage in Fixed Roof Tanks	42.005		3.4	MMBbl/yr/tank	(4) Heated atmospheric residuum (â€œresidâ€) tanks	VOC	Temperature reduced to maintain volatile organic compound (VOC) vapor pressure < 0.5 pounds per square inch actual (psia) at all times.	15.78	TONS/YR/TANK
TX-0756	CCI CORPUS CHRISTI CONDENSATE SPLITTER FACILITY	06/19/2015 ACT	Storage Tanks, TK-110, TK-111, TK-11	42.005		57960	gal/hr	each- 169,000,000 gal/yr	VOC	Tanks are required to be painted white and t	3.07	LB/HR
		06/19/2015 ACT	Storage Tanks, TK-113, TK-114, and T	42.005		47000000	gal/yr/tank	16,200 gal/hr maximum fill r	VOC	Tanks are required to be painted white and t	0.85	LB/HR
TX-0772	PORT OF BEAUMONT PETROLEUM TRANSLOAD TERMINAL (PBPTT)	11/06/2015 ACT	Petroleum Liquids Storage in Fixed Roof Tanks	42.005		47.62	BBL/YR	One 1000 gallon tank storing hot oil	VOC	Tank uses submerged fill and is aluminum in color.	0.01	T/YR
TX-0799	BEAUMONT TERMINAL	06/08/2016 ACT	Storage Tanks - fixed roof	42.005				VOLs and refined petroleum	VOC	Fixed-roof tanks (EPNs 168, 222, 225, 227,22	72.5	T/YR
TX-0808	HOUSTON FUEL OIL TERMINAL	09/02/2016 ACT	Storage Tank	42.005				Emission Point Number (EPI	VOC	Insulated, submerged fill, painted white	0.1	T/YR
TX-0813	ODESSA PETROCHEMICAL PLANT	11/22/2016 ACT	Petroleum Liquid Storage in Fixed Roc	42.005					VOC	Submerged fill pipe, reflective or white exter	0.01	T/YR
TX-0825	PASADENA TERMINAL	07/14/2017 ACT	Horizontal fixed roof storage tanks	42.005				Tanks that store product wit	VOC	painted white, has submerged fill	0.37	T/YR
		07/14/2017 ACT	Horizontal fixed roof storage tanks ma	42.005				Degassing and refilling losse	VOC	Degassing and refilling losses will be controll	26.28	T/YR

APPENDIX G
BACT COSTS ANALYSIS SHEETS

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Table 1
BACT Cost Analysis - Vapor Combustor
Sea Port Oil Terminal (SPOT) Project

Line	Description of Cost	Cost Factor	Notes	Cost
1	**Direct Capital Costs**			
2	Purchased Equipment Costs			
3	SPOT DWP Vapor Combustor	New		$51,094,096
4	Freight for Control System	5% of system cost (Line 3)	1	$2,554,705
5	*Subtotal- Purchased Equipment Costs (PEC)*			*$53,648,801*
6				
7	Installation Costs (control equipment)			
8	Foundations, Instrumentation, etc.	10% of PEC (Line 5)	1	$5,364,880
9	*Subtotal- Installation Costs*			*$5,364,880*
10				
11	***Total Direct Capital Costs (TDC)***	***sum of PEC and installation***		***$59,013,681***
12	**Indirect Capital Costs**			
13	Installation Costs			
14	General Facilities	5% of TDC (Line 11)	1	$2,950,684
15	Engineering and Home Office Fees	10% of TDC (Line 11)	1	$5,901,368
16	Process Contingency	5% of TDC (Line 11)	1	$2,950,684
17	***Total Indirect Capital Costs (TIC)***			***$11,802,736***
18				
19	**Project Contingency**	15% of TDC+TIC (Line 11+Line 17)	1	**$10,622,463**
20				
21	**Total Plant Cost**	TDC+TIC+Project Contingency (Line 11+Line 17+Line 19)	1	**$81,438,880**
22	**Start-up, Testing, and Commissioning**	5% of Total Plant Cost (Line 20)	1	**$4,071,944**
23	**Total Capital Investment (TCI)**	**(Line 21 + Line 22)**		**$85,510,824**
24	**Direct Annual Costs**			
25	Expendable Supplies Costs	e.g. liquid nitrogen for condensation, activated carbon for adsorption, ammonia for SCR, etc.		$0
26	Maintenance Labor	1% of TCI (Line 23)	1	$855,108
27	Maintenance Materials	1% of TCI (Line 23)	1	$855,108
28	Electricity Costs	Based on 0.5% performance loss and $0.06/kwh cost		$0
29	Other Material replacement			
	e.g. Fuel Savings	for example, if waste heat recovery replaces a combustion device		$40,186
30	**Total Direct Annual Costs (TDAC)**			***$1,750,402***
31				
32	**Indirect Annual Costs**			
33	Overhead	60% of Maintenance Labor and Materials (Lines 26 and 27)	1	$1,026,130
34	Property tax	1% of TCI (Line 23)	1	$855,108
35	Insurance	1% of TCI (Line 23)	1	$855,108
36	Administration	2% of TCI (Line 23)	1	$1,710,216
37	**Total Indirect Annual Costs (TIAC)**			***$4,446,563***
38				
39	**Capital Recovery Costs**			
40	Capital Recovery Factor (CFI)	$CFI = [i (1 + i)^n] / [(1 + i)^n - 1] * TCI$	2	**$8,709,466**
41	**Total Annualized Cost**	**(Line 30 + Line 37 + Line 40)**		**$14,906,432**
42	**Cost Effectiveness**			
43	VOC Uncontrolled Emission Rate (tons/yr)			28,342.00
44	VOC Controlled Emission Rate (tons/yr)			1,403.00
45	VOC Emission Reduction (tons/yr)			26,939.00
46	**Cost Effectiveness ($/ton)**			**$553**

Notes:

1. Based on EPA Control Cost Manual, Fifth and Sixth Edition.
2. Equation assumes interest rate (i) of 8% and equipment life (n) of 20 years.
3 This calculation sheet provides high-level all-purpose cost estimate and will be updated with vendor provided data during detailed engineering. Additional information as necessary obtained from:
https://www.epa.gov/economic-and-cost-analysis-air-pollution-regulations/cost-reports-and-guidance-air-pollution

Table 1
BACT Cost Analysis - VOC Absorber
Sea Port Oil Terminal (SPOT) Project

Line	Description of Cost	Cost Factor	Notes	Cost
1	**Direct Capital Costs**			
2	Purchased Equipment Costs			
3	SPOT DWP VOC Absorber	New		$70,047,639
4	Freight for Control System	5% of system cost (Line 3)	1	$3,502,382
5	*Subtotal- Purchased Equipment Costs (PEC)*			*$73,550,021*
6				
7	Installation Costs (control equipment)			
8	Foundations, Instrumentation, etc.	10% of PEC (Line 5)	1	$7,355,002
9	*Subtotal- Installation Costs*			*$7,355,002*
10				
11	***Total Direct Capital Costs (TDC)***	***sum of PEC and installation***		***$80,905,023***
12	**Indirect Capital Costs**			
13	Installation Costs			
14	General Facilities	5% of TDC (Line 11)	1	$4,045,251
15	Engineering and Home Office Fees	10% of TDC (Line 11)	1	$8,090,502
16	Process Contingency	5% of TDC (Line 11)	1	$4,045,251
17	***Total Indirect Capital Costs (TIC)***			***$16,181,005***
18				
19	**Project Contingency**	15% of TDC+TIC (Line 11+Line 17)	1	**$14,562,904**
20				
21	**Total Plant Cost**	TDC+TIC+Project Contingency (Line 11+Line 17+Line 19)	1	**$111,648,932**
22	**Start-up, Testing, and Commissioning**	5% of Total Plant Cost (Line 20)	1	**$5,582,447**
23	**Total Capital Investment (TCI)**	**(Line 21 + Line 22)**		**$117,231,378**
24	**Direct Annual Costs**			
25	Expendable Supplies Costs	e.g. liquid nitrogen for condensation, activated carbon for adsorption, ammonia for SCR, etc.		$0
26	Maintenance Labor	1% of TCI (Line 23)	1	$1,172,314
27	Maintenance Materials	1% of TCI (Line 23)	1	$1,172,314
28	Electricity Costs	Based on 0.5% performance loss and $0.06/kwh cost		$0
29	Other Material replacement			
	e.g. Fuel Savings	for example, if waste heat recovery replaces a combustion device		$438,342
30	**Total Direct Annual Costs (TDAC)**			***$2,782,970***
31				
32	**Indirect Annual Costs**			
33	Overhead	60% of Maintenance Labor and Materials (Lines 26 and 27)	1	$1,406,777
34	Property tax	1% of TCI (Line 23)	1	$1,172,314
35	Insurance	1% of TCI (Line 23)	1	$1,172,314
36	Administration	2% of TCI (Line 23)	1	$2,344,628
37	**Total Indirect Annual Costs (TIAC)**			***$6,096,032***
38				
39	**Capital Recovery Costs**			
40	Capital Recovery Factor (CFI)	CFI = $[i(1+i)^n]/[(1+i)^n - 1]$ * TCI	2	**$11,940,275**
41	**Total Annualized Cost**	**(Line 30 + Line 37 + Line 40)**		**$20,819,276**
42	**Cost Effectiveness**			
43	VOC Uncontrolled Emission Rate (tons/yr)			28,342.00
44	VOC Controlled Emission Rate (tons/yr)			5,611.72
45	VOC Emission Reduction (tons/yr)			22,730.28
46	**Cost Effectiveness ($/ton)**			**$916**

Notes:

1. Based on EPA Control Cost Manual, Fifth and Sixth Edition.
2. Equation assumes interest rate (i) of 8% and equipment life (n) of 20 years.
3. This calculation sheet provides high-level all-purpose cost estimate and will be updated with vendor provided data during detailed engineering. Additional information as necessary obtained from: https://www.epa.gov/economic-and-cost-analysis-air-pollution-regulations/cost-reports-and-guidance-air-pollution

APPENDIX H
SUPPORTING DOCUMENTATION

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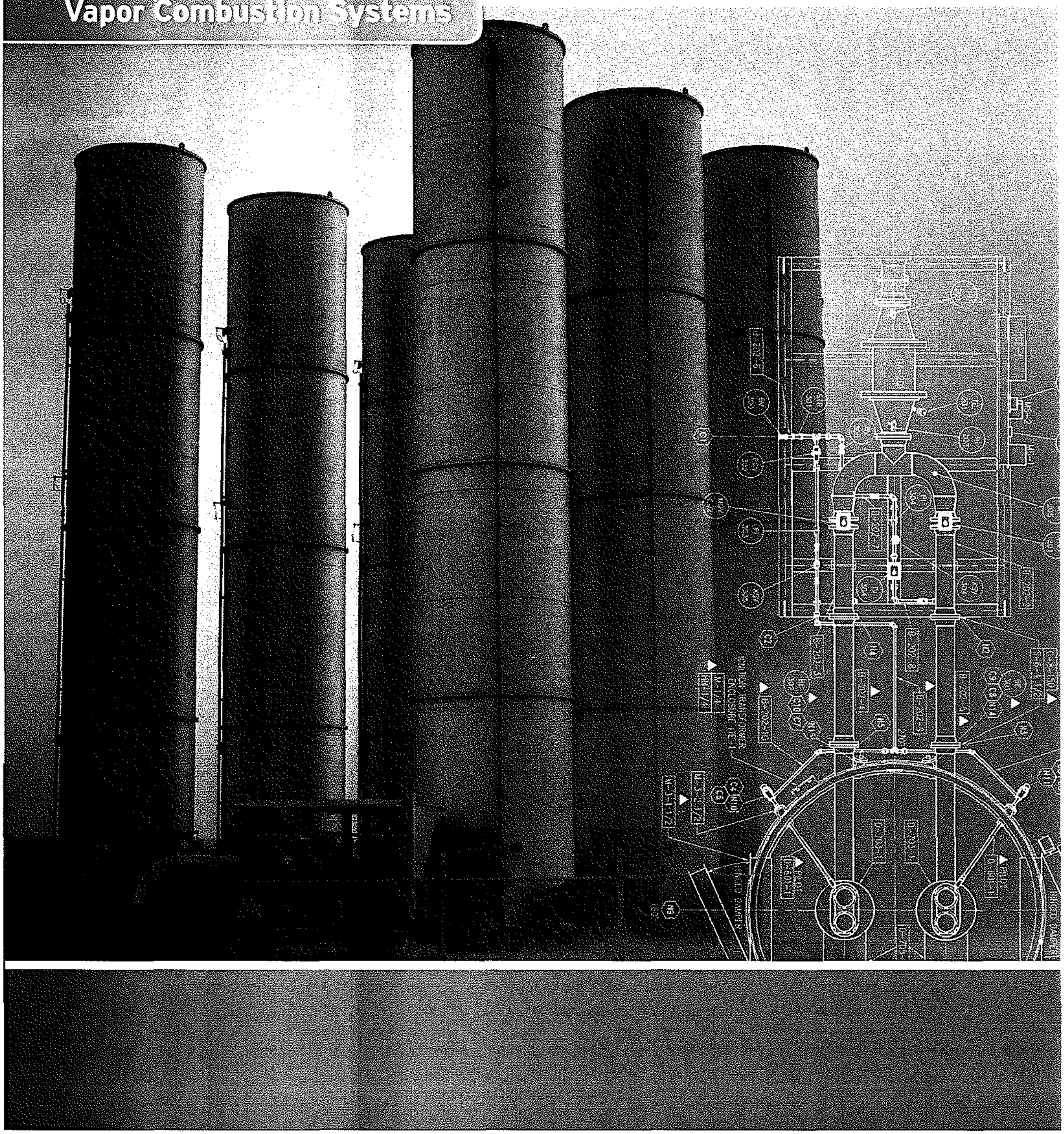
JOHN ZINK HAMWORTHY™
COMBUSTION

Vapor Combustion Systems



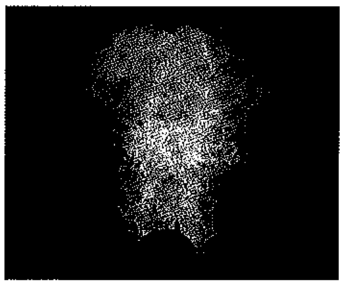
Vapor Control Like No Other.

Whether you need to reduce emissions through the recovery of valuable product or the destruction of waste gas, John Zink Hamworthy Combustion's vapor control solutions simplify the process to make your operations cleaner and more efficient. We have more than 2,000 vapor combustion and vapor recovery installations worldwide. Our vapor control technologies are recognized as the "Best Demonstrated Technology" and the "Maximum Achievable Control Technology" by the U.S. Environmental Protection Agency. And our engineering and process expertise is recognized as leading the industry.

Superior Performance, Proven In The Field

John Zink Hamworthy Combustion Vapor Combustion Units (VCUs) have been proven in numerous gasoline, crude oil, ethanol, diesel, and other hydrocarbon and petrochemical applications including:

- Truck and rail car loading
- Barge and ship loading
- Storage tank transfer and breathing
- Barge and tank degassing
- Reactors, dryers and other process vents
- Pipeline breakout stations
- Soil remediation and groundwater cleanup
- API separators and other wastewater vents



Our VCUs can achieve volatile organic compound (VOC) destruction efficiencies greater than 99 percent, resulting in hydrocarbon emissions less than 10 milligrams per liter of product transferred. In addition, our VCUs satisfy all the applicable requirements of 40 CFR 60.18. Combustion is effective even on light hydrocarbons including methane and ethane. And unlike other technologies which may require substances such as refrigerants, coolants, lube oils, catalysts, adsorbents or absorbents that involve special handling and disposal procedures, our VCUs do not require any special fluids or materials for operation.

Vapor Combustion System

1 | A local or remote start signal is received, starting the assist air blower to purge the combustor of any existing combustibles.

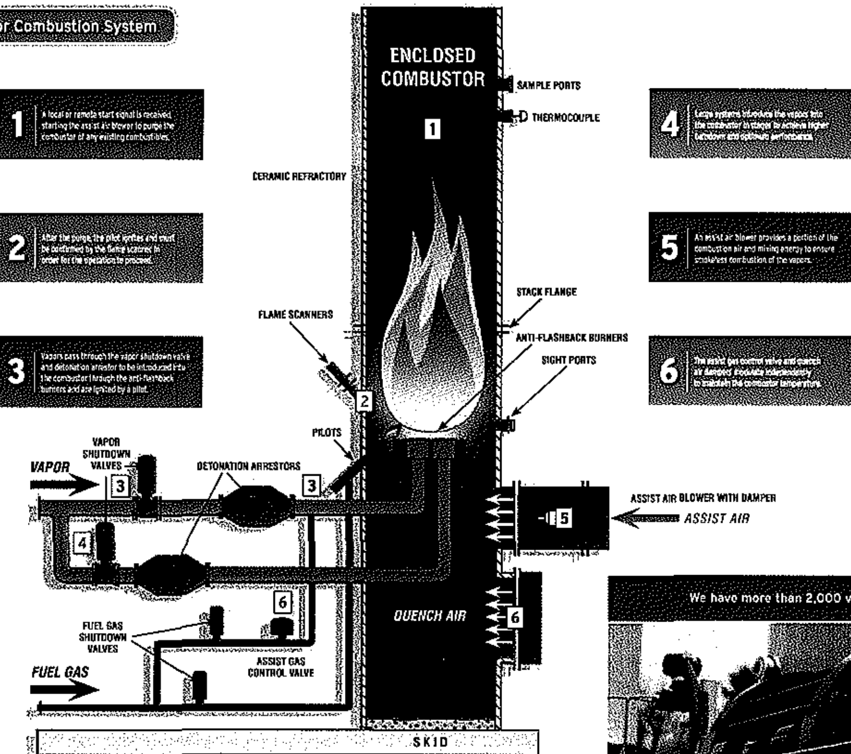
2 | After the purge, the pilot ignites and must be confirmed by the flame scanner in order for the operation to proceed.

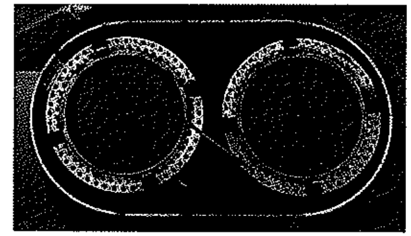
3 | Vapors pass through the vapor shutdown valve and detonation arrestor to be introduced into the combustor through the anti-flashback burners and are ignited by a pilot.

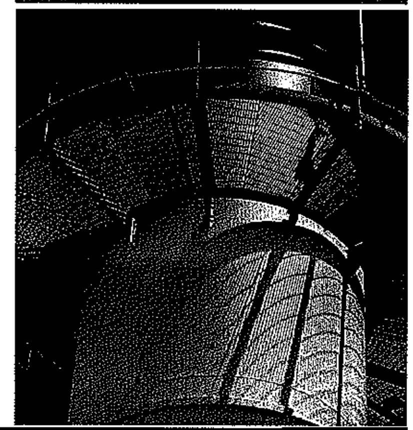
4 | Large systems introduce the vapors into the combustor in stages to achieve higher turndown and optimum performance.

5 | An assist air blower provides a portion of the combustion air and mixing energy to ensure smokeless combustion of the vapors.

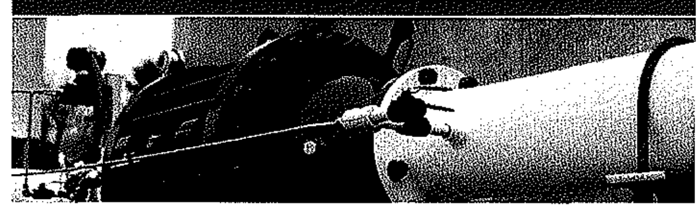
6 | The assist gas control valve and quench air dampers modulate independently to maintain the combustor temperature.







We have more than 2,000 vapor combustion and vapor recovery installations worldwide.



Designed To Deliver

With vapor control experience dating back to the 1970s, we've earned our reputation as a leader in research and development, manufacturing, service and support, and more. As a result, you can rely on John Zink Hamworthy Combustion VCUs to deliver where it counts:

Proven

+ Enclosed combustors completely hide the flame while combusting hydrocarbon vapors in a controlled manner.
+ Temperature control reduces fuel consumption and achieves higher destruction efficiencies.
+ Open-flame combustors are a low-cost alternative when a visible flame and its resultant noise and radiation are not concerns. Open-flame combustors are capable of destruction efficiencies of 98 percent.

Safe

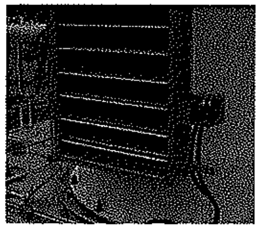
+ Detonation arrestors provide primary flashback protection. In marine loading applications, we work with the Coast Guard to provide a liquid seal exemption based on our proprietary burner and operating procedure.
+ Anti-flashback burners allow safe combustion of explosive mixtures that are unsuitable for standard burners. These burners, manufactured at the John Zink Hamworthy Combustion facility, help prevent flashbacks and provide stable combustion over a wide range of flows and concentrations.
+ Reliable, energy-efficient pilots, also manufactured at John Zink Hamworthy Combustion, provide a stable, continuous ignition source for the vapors.
+ Burner staging logic ensures safe combustion.

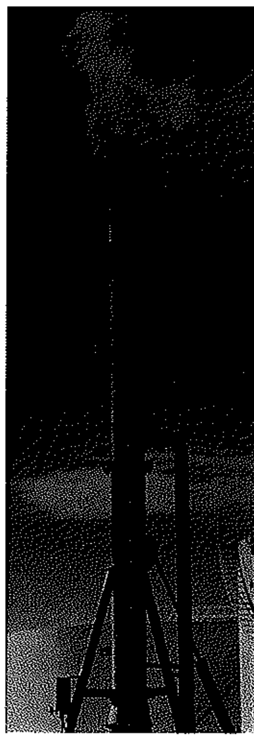
Efficient

+ Our Vapor Equalizer™ for gasoline or distillate vapors can reduce or eliminate auxiliary fuel usage by collecting gasoline vapors when rich, enriching vapors when lean, and averaging out vapor concentrations.
+ A separate assist gas burner reduces fuel use for inert vapors, especially when vapors are lean.
+ Premixing fuel with highly-oxygenated lean vapors can reduce fuel gas usage.
+ Staged combustion and multiple assist air blowers reduce the amount of fuel gas required for higher turndown requirements.
+ A stable burner design allows emission requirements to be met at lower operating temperatures, reducing fuel consumption.

Flexible

+ Skid mounted components reduce field installation time and cost. An enclosed stack can be flanged with the lower section skid mounted to save you even more.
+ A vapor blower package can be provided in cases where the vapors have insufficient pressure. A single integrated system transfers and combusts the vapors.

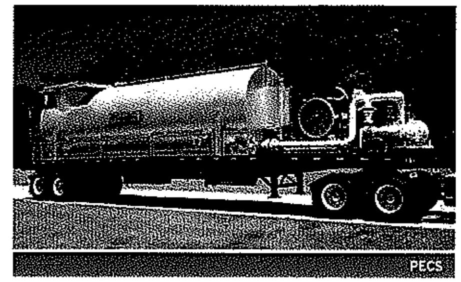




We Back You Up Like No Other

The John Zink Hamworthy Combustion worldwide service organization is the largest, most technically savvy team of its kind. Our service technicians are trained in the latest technologies to evaluate existing systems for upgrades and retrofits, to troubleshoot operations, and to help plan your next turnaround. Our experts are available on emergency call-out 24 hours a day, 7 days a week. And to keep you up and running during installation, retrofitting or maintenance, we offer equipment rental including the PECS® (Portable Emission Control System), a self-contained, trailer-mounted vapor combustor that ensures stable, smokeless combustion and maintains temperature control over a wide range of process conditions.

We also provide comprehensive vapor control courses held at the John Zink Institute℠. These courses help vapor control operators and engineers optimize their equipment and address issues at their facilities.



Bundle a PECS rental with other John Zink services such as installation, start-up, on-site operator assistance and training, or dismantling to save both time and money.

JOHN ZINK HAMWORTHY COMBUSTION

johnzinkhamworthy.com

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To locate an office in your region, visit johnzinkhamworthy.com/contacts/office-locator

JZVS-13054

Crane Pedestal Diesel Storage Tank (DST3)

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification	
User Identification:	DT3
City:	Galveston
State:	Texas
Company:	SPOT Terminal Services, LLC
Type of Tank:	Vertical Fixed Roof Tank
Description:	SPOT Crane Pedestal Diesel Storage Tank
Tank Dimensions	
Shell Height (ft):	15.00
Diameter (ft):	10.00
Liquid Height (ft) :	14.00
Avg. Liquid Height (ft):	10.00
Volume (gallons):	8,225.29
Turnovers:	20.00
Net Throughput(gal/yr):	164,505.76
Is Tank Heated (y/n):	N
Paint Characteristics	
Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good
Roof Characteristics	
Type:	Dome
Height (ft)	0.00
Radius (ft) (Dome Roof)	0.00
Breather Vent Settings	
Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Houston, Texas (Avg Atmospheric Pressure = 14.7 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

DT3 - Vertical Fixed Roof Tank
Galveston, Texas

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	69.81	64.30	75.32	67.93	0.0090	0.0076	0.0106	130.0000			188.00	Option 1: VP60 = .0065 VP70 = .009

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

DT3 - Vertical Fixed Roof Tank
Galveston, Texas

Annual Emission Calcaulations	
Standing Losses (lb):	1.2565
Vapor Space Volume (cu ft):	446.5699
Vapor Density (lb/cu ft):	0.0002
Vapor Space Expansion Factor:	0.0377
Vented Vapor Saturation Factor:	0.9973
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	446.5699
Tank Diameter (ft):	10.0000
Vapor Space Outage (ft):	5.6859
Tank Shell Height (ft):	15.0000
Average Liquid Height (ft):	10.0000
Roof Outage (ft):	0.6859
Roof Outage (Dome Roof)	
Roof Outage (ft):	0.6859
Dome Radius (ft):	10.0000
Shell Radius (ft):	5.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0002
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0090
Daily Avg. Liquid Surface Temp. (deg. R):	529.4813
Daily Average Ambient Temp. (deg. F):	67.9125
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	527.6025
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,405.5061
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0377
Daily Vapor Temperature Range (deg. R):	22.0322
Daily Vapor Pressure Range (psia):	0.0030
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0090
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0076
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0106
Daily Avg. Liquid Surface Temp. (deg R):	529.4813
Daily Min. Liquid Surface Temp. (deg R):	523.9732
Daily Max. Liquid Surface Temp. (deg R):	534.9893
Daily Ambient Temp. Range (deg. R):	21.3083
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9973
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0090
Vapor Space Outage (ft):	5.6859
Working Losses (lb):	4.5586

Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0090
Annual Net Throughput (gal/yr.):	164,505.7600
Annual Turnovers:	20.0000
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	8,225.2880
Maximum Liquid Height (ft):	14.0000
Tank Diameter (ft):	10.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	5.8151

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

DT3 - Vertical Fixed Roof Tank
Galveston, Texas

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	4.56	1.26	5.82

Diesel Generators (DGEN1 and DGEN2)

PERFORMANCE DATA [PC0958]

SEPTEMBER 27, 2018

For Help Desk Phone Numbers Click here

Perf No: EM1535 **Change Level: 00**

General | Heat Rejection | Sound | Emissions | Regulatory | Altitude Derate | Cross Reference | Supplementary Data | Perf Param Ref

View PDF

SALES MODEL:	3516C	**COMBUSTION:**	DI
BRAND:	CAT	**ENGINE SPEED (RPM):**	1,200
ENGINE POWER (BHP):	2,150	**HERTZ:**	60
GEN POWER W/O FAN (EKW):	1,530.0	**ASPIRATION:**	TA
COMPRESSION RATIO:	14.7	**AFTERCOOLER TYPE:**	SCAC
RATING LEVEL:	MCR	**AFTERCOOLER CIRCUIT TYPE:**	JW+OC, AC
PUMP QUANTITY:	2	**AFTERCOOLER TEMP (F):**	122
FUEL TYPE:	DIESEL	**JACKET WATER TEMP (F):**	210.2
MANIFOLD TYPE:	DRY	**TURBO CONFIGURATION:**	PARALLEL
GOVERNOR TYPE:	ADEM3	**TURBO QUANTITY:**	2
ELECTRONICS TYPE:	ADEM3	**TURBOCHARGER MODEL:**	GT6041O4BL-56T-1.47
CAMSHAFT TYPE:	STANDARD	**CERTIFICATION YEAR:**	2015
IGNITION TYPE:	CI	**CRANKCASE BLOWBY RATE (FT3/HR):**	2,146.9
INJECTOR TYPE:	EUI	**FUEL RATE (RATED RPM) NO LOAD (GAL/HR):**	6.3
FUEL INJECTOR:	3920222	**PISTON SPD @ RATED ENG SPD (FT/MIN):**	1,692.9
UNIT INJECTOR TIMING (IN):	64.34		
REF EXH STACK DIAMETER (IN):	12		
MAX OPERATING ALTITUDE (FT):	4,593		

INDUSTRY	SUB INDUSTRY	APPLICATION
OIL AND GAS	OFFSHORE DRILLING	OIL FIELD

General Performance Data Top

Note(s)

THE PERFORMANCE DATA IN THIS PERFORMANCE FILE SHOULD BE USED ON APPLICATIONS WHERE THE EXHAUST BACK PRESSURE IS LESS THAN THE STANDARD BACK PRESSURE OF 6.7 KPA. FOR APPLICATIONS WHERE THE EXI

GENSET POWER WITHOUT FAN	PERCENT LOAD	ENGINE POWER	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	EXH MFLD PRES	ENGINE OUTLET TEMP
EKW	%	BHP	PSI	LB/BHP-HR	GAL/HR	IN-HG	DEG F	DEG F	IN-HG	DEG F
1,683.0	110	2,367	328	0.351	118.6	82.8	136.2	1,157.5	80.1	838.7
1,530.0	100	2,150	298	0.355	108.9	78.1	135.8	1,104.3	75.4	808.3
1,377.0	90	1,934	268	0.359	99.1	73.9	135.4	1,053.9	70.1	778.0
1,224.0	80	1,721	238	0.363	89.1	70.0	134.8	1,007.8	63.5	747.3
1,147.5	75	1,616	224	0.363	83.8	66.2	134.4	985.3	58.3	727.9
1,071.0	70	1,511	209	0.363	78.4	61.5	134.0	963.6	52.6	710.9
918.0	60	1,303	181	0.358	66.7	50.2	133.3	928.5	40.0	695.4
765.0	50	1,097	152	0.358	56.1	39.7	133.2	887.0	30.7	682.8
612.0	40	891	123	0.365	46.5	30.6	133.5	840.0	23.7	662.6
459.0	30	683	95	0.379	36.9	21.9	132.8	776.5	17.8	628.1
382.5	25	576	80	0.391	32.1	18.0	132.7	732.9	15.1	601.2
306.0	20	467	65	0.409	27.3	14.5	132.8	678.2	12.8	565.0
153.0	10	240	33	0.509	17.4	8.2	132.5	529.7	9.2	460.8

GENSET POWER WITHOUT FAN	PERCENT LOAD	ENGINE POWER	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP	WET INLET AIR VOL FLOW RATE	ENGINE OUTLET WET EXH GAS VOL FLOW RATE	WET INLET AIR MASS FLOW RATE	WET EXH GAS MASS FLOW RATE	WET EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)	DRY EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)
EKW	%	BHP	IN-HG	DEG F	CFM	CFM	LB/HR	LB/HR	FT3/MIN	FT3/MIN
1,683.0	110	2,367	82	453.3	4,986.5	12,469.8	21,623.5	22,453.7	4,722.3	4,318.8
1,530.0	100	2,150	78	431.9	4,773.2	11,728.9	20,846.1	21,608.1	4,548.2	4,170.3
1,377.0	90	1,934	74	408.9	4,608.8	11,042.5	20,131.3	20,824.8	4,386.7	4,037.2
1,224.0	80	1,721	68	382.6	4,495.3	10,383.9	19,479.8	20,103.8	4,229.8	3,912.9
1,147.5	75	1,616	63	364.9	4,335.2	9,824.3	18,761.2	19,348.2	4,067.5	3,768.4
1,071.0	70	1,511	57	344.6	4,132.9	9,223.6	17,860.3	18,408.7	3,874.3	3,593.3
918.0	60	1,303	44	297.2	3,645.0	7,972.2	15,655.9	16,123.1	3,393.3	3,152.2
765.0	50	1,097	33	256.2	3,193.0	6,849.7	13,614.0	14,006.6	2,947.9	2,743.0
612.0	40	891	24	219.9	2,785.4	5,817.1	11,782.1	12,107.4	2,548.5	2,377.1
459.0	30	683	17	183.6	2,392.1	4,825.5	10,102.8	10,361.5	2,181.0	2,042.1
382.5	25	576	13	165.9	2,210.2	4,342.4	9,336.1	9,561.2	2,012.6	1,889.6
306.0	20	467	10	149.4	2,044.6	3,869.6	8,629.3	8,820.6	1,856.8	1,749.9
153.0	10	240	5	121.9	1,761.6	2,974.7	7,419.5	7,541.6	1,588.9	1,513.8

Heat Rejection Data Top

GENSET POWER WITHOUT FAN	PERCENT LOAD	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXHUAST RECOVERY TO 350F	FROM OIL COOLER	FROM AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HIGH HEAT VALUE ENERGY
EKW	%	BHP	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN
1,683.0	110	2,367	42,554	7,995	91,412	46,418	13,556	28,836	100,378	254,520	271,128
1,530.0	100	2,150	39,901	7,480	84,137	41,723	12,443	26,092	91,157	233,615	248,858
1,377.0	90	1,934	37,230	7,055	76,795	37,395	11,324	23,283	82,018	212,608	226,481
1,224.0	80	1,721	34,489	6,753	69,311	33,364	10,189	20,282	72,993	191,292	203,774
1,147.5	75	1,616	32,879	6,607	65,449	30,472	9,585	18,183	68,511	179,949	191,691
1,071.0	70	1,511	31,199	6,467	61,456	27,639	8,957	15,875	64,067	168,167	179,140
918.0	60	1,303	27,733	6,234	52,626	23,128	7,628	10,901	55,265	143,213	152,558
765.0	50	1,097	24,290	5,966	44,471	19,318	6,411	7,078	46,504	120,374	128,228

GENSET POWER WITHOUT FAN	PERCENT LOAD	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXHUAST RECOVERY TO 350F	FROM OIL COOLER	FROM AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HIGH HEAT VALUE ENERGY
612.0	40	891	21,096	5,627	37,420	15,646	5,311	4,244	37,795	99,723	106,230
459.0	30	683	17,713	5,307	30,289	11,859	4,222	2,146	28,947	79,262	84,434
382.5	25	576	15,955	5,134	26,660	9,850	3,674	1,313	24,427	68,984	73,485
306.0	20	467	14,137	4,949	22,974	7,742	3,122	608	19,803	58,608	62,432
153.0	10	240	10,051	4,550	15,540	3,361	1,994	-383	10,174	37,431	39,874

Sound Data Top

Note(s)

SOUND PRESSURE DATA FOR THIS RATING CAN BE FOUND IN PERFORMANCE NUMBER - DM8779.

Emissions Data Top

Units Filter All Units ▼

RATED SPEED POTENTIAL SITE VARIATION: 1200 RPM

GENSET POWER WITHOUT FAN		EKW	1,683.0	1,530.0	1,147.5	765.0	382.5	153.0
ENGINE POWER		BHP	2,367	2,150	1,616	1,097	576	240
PERCENT LOAD		%	110	100	75	50	25	10
TOTAL NOX (AS NO2)		G/HR	14,204	11,669	6,806	6,243	4,174	2,192
TOTAL CO		G/HR	2,779	2,937	2,397	1,368	834	809
TOTAL HC		G/HR	133	118	175	169	146	183
PART MATTER		G/HR	95.3	131.9	172.3	183.6	148.6	56.5
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,964.1	2,610.8	1,973.9	2,690.0	3,097.9	2,940.1
TOTAL CO	(CORR 5% O2)	MG/NM3	552.8	658.0	701.4	587.5	617.1	1,324.3
TOTAL HC	(CORR 5% O2)	MG/NM3	24.6	22.8	43.7	62.9	94.0	274.4
PART MATTER	(CORR 5% O2)	MG/NM3	15.2	24.8	43.2	68.7	95.3	69.1
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,444	1,272	961	1,310	1,509	1,432
TOTAL CO	(CORR 5% O2)	PPM	442	526	561	470	494	1,059
TOTAL HC	(CORR 5% O2)	PPM	46	43	82	117	175	512
TOTAL NOX (AS NO2)		G/HP-HR	6.05	5.47	4.24	5.72	7.27	9.16
TOTAL CO		G/HP-HR	1.18	1.38	1.49	1.25	1.45	3.38
TOTAL HC		G/HP-HR	0.06	0.06	0.11	0.15	0.25	0.77
PART MATTER		G/HP-HR	0.04	0.06	0.11	0.17	0.26	0.24
TOTAL NOX (AS NO2)		LB/HR	31.32	25.73	15.01	13.76	9.20	4.83
TOTAL CO		LB/HR	6.13	6.48	5.28	3.02	1.84	1.78
TOTAL HC		LB/HR	0.29	0.26	0.39	0.37	0.32	0.40
PART MATTER		LB/HR	0.21	0.29	0.38	0.40	0.33	0.12

RATED SPEED NOMINAL DATA: 1200 RPM

GENSET POWER WITHOUT FAN		EKW	1,683.0	1,530.0	1,147.5	765.0	382.5	153.0
ENGINE POWER		BHP	2,367	2,150	1,616	1,097	576	240
PERCENT LOAD		%	110	100	75	50	25	10
TOTAL NOX (AS NO2)		G/HR	11,837	9,724	5,672	5,202	3,478	1,827
TOTAL CO		G/HR	1,544	1,632	1,332	760	463	449
TOTAL HC		G/HR	100	89	132	127	110	138
TOTAL CO2		KG/HR	1,107	1,015	784	526	302	164
PART MATTER		G/HR	68.0	94.2	123.0	131.2	106.2	40.4
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,470.1	2,175.7	1,644.9	2,241.7	2,581.6	2,450.1
TOTAL CO	(CORR 5% O2)	MG/NM3	307.1	365.6	389.7	326.4	342.8	735.7
TOTAL HC	(CORR 5% O2)	MG/NM3	18.5	17.1	32.8	47.3	70.7	206.3
PART MATTER	(CORR 5% O2)	MG/NM3	10.9	17.7	30.8	49.0	68.1	49.4
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,203	1,060	801	1,092	1,257	1,193
TOTAL CO	(CORR 5% O2)	PPM	246	292	312	261	274	589
TOTAL HC	(CORR 5% O2)	PPM	34	32	61	88	132	385
TOTAL NOX (AS NO2)		G/HP-HR	5.04	4.56	3.53	4.77	6.06	7.63
TOTAL CO		G/HP-HR	0.66	0.77	0.83	0.70	0.81	1.88
TOTAL HC		G/HP-HR	0.04	0.04	0.08	0.12	0.19	0.58
PART MATTER		G/HP-HR	0.03	0.04	0.08	0.12	0.18	0.17
TOTAL NOX (AS NO2)		LB/HR	26.10	21.44	12.50	11.47	7.67	4.03
TOTAL CO		LB/HR	3.40	3.60	2.94	1.68	1.02	0.99
TOTAL HC		LB/HR	0.22	0.20	0.29	0.28	0.24	0.30
TOTAL CO2		LB/HR	2,440	2,238	1,729	1,159	666	362
PART MATTER		LB/HR	0.15	0.21	0.27	0.29	0.23	0.09
OXYGEN IN EXH		%	10.2	10.7	12.2	12.9	14.2	16.3
DRY SMOKE OPACITY		%	1.2	1.8	2.4	3.1	4.0	2.3
BOSCH SMOKE NUMBER			0.43	0.60	0.83	1.13	1.29	0.78

Regulatory Information Top

IMO II **2011 - ----**

GASEOUS EMISSIONS DATA MEASUREMENTS ARE CONSISTENT WITH THOSE DESCRIBED IN REGULATION 13 OF REVISED ANNEX VI OF MARPOL 73/78 AND ISO 8178 FOR MEASURING HC, CO, PM, AND NOX. THIS ENGINE CONFORMS TO INTERNATIONAL MARINE ORGANIZATION'S (IMO) MARINE COMPRESSION-IGNITION EMISSION REGULATIONS.

Altitude Derate Data Top

ALTITUDE CORRECTED POWER CAPABILITY (BHP)

AMBIENT OPERATING TEMP (F)	30	40	50	60	70	80	90	100	110	120	130	140	NORMAL
ALTITUDE (FT)													
0	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,086	2,150
1,000	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,064	2,150
2,000	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,107	2,021	2,150
3,000	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,123	2,086	2,051	1,957	2,150

Cross Reference Top

Test Spec	Setting	Engine Arrangement	Engineering Model	Engineering Model Version	Start Effective Serial Number	End Effective Serial Number
4577112	GG1337	4880720	PG034	-	DP600001	
4577116	GG1341	4880720	PG034	XJ	CG600001	

4577112	GG1337	5073147	PG200	-	PYA00100

Supplementary Data Top

Type	Classification	Performance Number
SOUND	SOUND PRESSURE	DM8779
EXHAUST BACK PRESSURE	15 KPA	EM1537

Performance Parameter Reference Top

Parameters Reference: DM9600 - 10

PERFORMANCE DEFINITIONS

PERFORMANCE DEFINITIONS DM9600

APPLICATION: Engine performance tolerance values below are representative of a typical production engine tested in a calibrated dynamometer test cell at SAE J1995 standard reference conditions. Caterpillar maintains ISO9001:2000 certified quality management systems for engine test Facilities to assure accurate calibration of test equipment. Engine test data is corrected in accordance with SAE J1995. Additional reference material SAE J1228, J1349, ISO 8665, 3046-1:2002E, 3046-3:1989, 1585, 2534, 2288, and 9249 may apply in part or are similar to SAE J1995. Special engine rating request (SERR) test data shall be noted.

PERFORMANCE PARAMETER TOLERANCE FACTORS: Power +/- 3% Torque +/- 3% Exhaust stack temperature +/- 8% Inlet airflow +/- 5% Intake manifold pressure-gage +/- 10% Exhaust flow +/- 6% Specific fuel consumption +/- 3% Fuel rate +/- 5% Specific DEF consumption +/- 3% DEF rate +/- 5% Heat rejection +/- 5% Heat rejection exhaust only +/- 10% Heat rejection CEM only +/- 10%
Heat Rejection values based on using treated water.
Torque is included for truck and industrial applications, do not use for Gen Set or steady state applications.
On C7 - C18 engines, at speeds of 1100 RPM and under these values are provided for reference only, and may not meet the tolerance listed.
These values do not apply to C280/3600. For these models, see the tolerances listed below.

C280/3600 HEAT REJECTION TOLERANCE FACTORS: Heat rejection +/- 10% Heat rejection to Atmosphere +/- 50% Heat rejection to Lube Oil +/- 20% Heat rejection to Aftercooler +/- 5%

TEST CELL TRANSDUCER TOLERANCE FACTORS: Torque +/- 0.5% Speed +/- 0.2% Fuel flow +/- 1.0% Temperature +/- 2.0 C degrees Intake manifold pressure +/- 0.1 kPa
OBSERVED ENGINE PERFORMANCE IS CORRECTED TO SAE J1995 REFERENCE AIR AND FUEL CONDITIONS.

REFERENCE ATMOSPHERIC INLET AIR FOR 3500 ENGINES AND SMALLER SAE J1228 AUG2002 for marine engines, and J1995 JAN2014 for other engines, reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity at the stated aftercooler water temp, or inlet manifold temp.
FOR 3600 ENGINES Engine rating obtained and presented in accordance with ISO 3046/1 and SAE J1995 JANJAN2014 reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity and 150M altitude at the stated aftercooler water temperature.

MEASUREMENT LOCATION FOR INLET AIR TEMPERATURE Location for air temperature measurement air cleaner inlet at stabilized operating conditions.

REFERENCE EXHAUST STACK DIAMETER The Reference Exhaust Stack Diameter published with this dataset is only used for the calculation of Smoke Opacity values displayed in this dataset. This value does not necessarily represent the actual stack diameter of the engine due to the variety of exhaust stack adapter options available. Consult the price list, engine order or general dimension drawings for the actual stack diameter size ordered or options available.

REFERENCE FUEL DIESEL Reference fuel is #2 distillate diesel with a 35API gravity; A lower heating value is 42,780 KJ/KG (18,390 BTU/LB) when used at 29 deg C (84.2 deg F), where the density is 838.9 G/Liter (7.001 Lbs/Gal).
GAS Reference natural gas fuel has a lower heating value of 33.74 KJ/L (905 BTU/CU Ft). Low BTU ratings are based on 18.64 KJ/L (500 BTU/CU FT) lower heating value gas. Propane ratings are based on 87.56 KJ/L (2350 BTU/CU Ft) lower heating value gas.

ENGINE POWER (NET) IS THE CORRECTED FLYWHEEL POWER (GROSS) LESS EXTERNAL AUXILIARY LOAD Engine corrected gross output includes the power required to drive standard equipment; lube oil, scavenge lube oil, fuel transfer, common rail fuel, separate circuit aftercooler and jacket water pumps. Engine net power available for the external (flywheel) load is calculated by subtracting the sum of auxiliary load from the corrected gross flywheel out put power. Typical auxiliary loads are radiator cooling fans, hydraulic pumps, air compressors and battery charging alternators. For Tier 4 ratings additional Parasitic losses would also include Intake, and Exhaust Restrictions.

ALTITUDE CAPABILITY Altitude capability is the maximum altitude above sea level at standard temperature and standard pressure at which the engine could develop full rated output power on the current performance data set.
Standard temperature values versus altitude could be seen on TM2001.
When viewing the altitude capability chart the ambient temperature is the inlet air temp at the compressor inlet.
Engines with ADEM MEUI and HEUI fuel systems operating at conditions above the defined altitude capability derate for atmospheric pressure and temperature conditions outside the values defined, see TM2001.
Mechanical governor controlled unit injector engines require a setting change for operation at conditions above the altitude defined on the engine performance sheet. See your Caterpillar technical representative for non standard ratings.

REGULATIONS AND PRODUCT COMPLIANCE TMI Emissions information is presented at 'nominal' and 'Potential Site Variation' values for standard ratings. No tolerances are applied to the emissions data. These values are subject to change at any time. The controlling federal and local emission requirements need to be verified by your Caterpillar technical representative.
Customer's may have special emission site requirements that need to be verified by the Caterpillar Product Group engineer.

EMISSIONS DEFINITIONS: Emissions : DM1176

HEAT REJECTION DEFINITIONS: Diesel Circuit Type and HHV Balance : DM9500

HIGH DISPLACEMENT (HD) DEFINITIONS: 3500: EM1500

RATING DEFINITIONS: Agriculture : TM6008
Fire Pump : TM6009
Generator Set : TM6035
Generator (Gas) : TM6041
Industrial Diesel : TM6010
Industrial (Gas) : TM6040
Irrigation : TM5749
Locomotive : TM6037
Marine Auxiliary : TM6036
Marine Prop (Except 3600) : TM5747
Marine Prop (3600 only) : TM5748
MSHA : TM6042
Oil Field (Petroleum) : TM6011
Off-Highway Truck : TM6039
On-Highway Truck : TM6038

SOUND DEFINITIONS: Sound Power : DM8702
Sound Pressure : TM7080

Date Released : 7/7/15

PERFORMANCE DATA[EM0288]

September 27, 2018

Performance Number: EM0288 **Change Level: 02**

SALES MODEL:	C15	**COMBUSTION:**	DI
BRAND:	CAT	**ENGINE SPEED (RPM):**	2,100
ENGINE POWER (BHP):	581	**PEAK TORQUE SPEED (RPM):**	1,400
PEAK TORQUE (FT-LB):	1,958.2	**TORQUE RISE (%):**	35
COMPRESSION RATIO:	17.1	**ASPIRATION:**	TA
RATING LEVEL:	INDUSTRIAL D	**AFTERCOOLER TYPE:**	ATAAC
PUMP QUANTITY:	1	**AFTERCOOLER CIRCUIT TYPE:**	JW+OC, ATAAC
FUEL TYPE:	DIESEL	**INLET MANIFOLD AIR TEMP (F):**	122
MANIFOLD TYPE:	DRY	**JACKET WATER TEMP (F):**	192.2
GOVERNOR TYPE:	ELEC	**TURBO CONFIGURATION:**	SINGLE
ELECTRONICS TYPE:	ADEM4	**TURBO QUANTITY:**	1
CAMSHAFT TYPE:	STANDARD	**TURBOCHARGER MODEL:**	GT4502 1.06 A/R
IGNITION TYPE:	CI	**CERTIFICATION YEAR:**	2013
INJECTOR TYPE:	EUI	**PISTON SPD @ RATED ENG SPD (FT/MIN):**	2,362.5
REF EXH STACK DIAMETER (IN):	6		
MAX OPERATING ALTITUDE (FT):	6,499		

INDUSTRY	SUBINDUSTRY	APPLICATION
INDUSTRIAL	GENERAL INDUSTRIAL	INDUSTRIAL
INDUSTRIAL	CONSTRUCTION	INDUSTRIAL
OIL AND GAS	LAND PRODUCTION	INDUSTRIAL
INDUSTRIAL	INDUSTRIAL POWER UNIT	INDUSTRIAL
INDUSTRIAL	MATERIAL HANDLING	INDUSTRIAL
OIL AND GAS	LAND DRILLING	INDUSTRIAL
INDUSTRIAL	FORESTRY	INDUSTRIAL
OIL AND GAS	WELL SERVICING	INDUSTRIAL
INDUSTRIAL	AGRICULTURE	INDUSTRIAL

General Performance Data

INLET MANIFOLD AIR TEMPERATURE ("INLET MFLD TEMP") FOR THIS CONFIGURATION IS MEASURED AT THE OUTLET OF THE AFTERCOOLER.

ENGINE SPEED	ENGINE POWER	ENGINE TORQUE	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	EXH MFLD PRES	ENGINE OUTLET TEMP
RPM	BHP	LB-FT	PSI	LB/BHP-HR	GAL/HR	IN-HG	DEG F	DEG F	IN-HG	DEG F
2,100	581	1,452	236	0.370	30.8	66.1	122.0	1,172.7	93.0	870.1
2,000	581	1,525	248	0.359	29.9	66.8	122.0	1,160.0	88.9	865.4
1,900	581	1,605	261	0.347	28.9	66.2	122.0	1,138.8	80.2	856.8
1,800	581	1,694	275	0.337	28.1	64.4	122.0	1,129.9	73.2	857.7
1,700	574	1,773	288	0.333	27.4	63.7	122.0	1,139.8	70.1	870.6
1,600	561	1,843	300	0.332	26.8	64.4	122.0	1,157.9	70.2	887.3
1,500	544	1,906	310	0.334	26.1	64.8	122.0	1,180.7	69.1	905.8
1,400	522	1,959	318	0.332	24.9	62.7	122.0	1,198.6	63.9	927.1
1,300	472	1,908	310	0.330	22.4	54.7	122.0	1,215.4	51.6	962.3
1,200	421	1,842	300	0.338	20.4	48.6	122.0	1,248.0	43.3	1,012.8
1,100	365	1,741	283	0.343	18.0	42.5	122.0	1,275.6	36.3	1,053.8
1,000	304	1,596	259	0.344	15.0	36.1	122.0	1,224.9	31.4	1,019.5
900	249	1,451	236	0.342	12.3	24.7	122.0	1,202.9	20.6	1,029.0
800	199	1,306	212	0.333	9.6	15.1	122.0	1,145.7	12.7	1,011.5
700	145	1,088	177	0.346	7.3	8.8	122.0	1,077.1	7.8	965.6
600	99.4	870	141	0.345	5.0	4.6	122.0	918.3	4.6	831.8

ENGINE SPEED	ENGINE POWER	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP	WET INLET AIR VOL FLOW RATE	ENGINE OUTLET WET EXH GAS VOL FLOW RATE	WET INLET AIR MASS FLOW RATE	WET EXH GAS MASS FLOW RATE	WET EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)	DRY EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)
RPM	BHP	IN-HG	DEG F	CFM	CFM	LB/HR	LB/HR	FT3/MIN	FT3/MIN
2,100	581	69	384.8	1,162.2	2,132.1	5,034.9	5,250.7	788.3	713.8
2,000	581	69	380.1	1,131.1	2,087.2	4,891.4	5,100.8	774.5	701.2
1,900	581	68	370.6	1,067.3	2,003.8	4,596.1	4,798.2	748.4	676.0
1,800	581	66	361.5	1,011.7	1,940.9	4,338.7	4,535.2	724.4	652.6
1,700	574	66	359.4	980.1	1,917.4	4,194.8	4,386.4	708.7	638.1
1,600	561	66	362.2	973.5	1,929.9	4,165.1	4,352.6	704.5	635.3
1,500	544	67	364.8	938.0	1,904.6	4,005.8	4,188.9	685.8	617.6
1,400	522	64	360.6	885.0	1,846.4	3,771.1	3,945.1	654.6	588.8
1,300	472	56	340.9	761.4	1,691.6	3,224.8	3,381.7	584.9	523.5
1,200	421	50	325.2	664.6	1,568.4	2,805.7	2,948.9	523.7	466.9

1,100	365	43	307.7	582.2	1,438.3	2,453.1	2,578.8	467.3	416.2
1,000	304	37	281.9	525.8	1,289.7	2,213.0	2,318.2	428.7	384.4
900	249	25	232.2	396.0	1,018.7	1,662.3	1,748.1	336.5	299.5
800	199	16	184.2	288.7	755.6	1,208.7	1,275.6	252.5	223.3
700	145	9	147.0	214.6	554.6	898.9	949.7	191.3	168.7
600	99.4	5	118.4	163.7	385.6	685.1	719.9	146.8	130.9

Heat Rejection Data

ENGINE SPEED	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXHUAST RECOVERY TO 350F	FROM OIL COOLER	FROM AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HIGH HEAT VALUE ENERGY
RPM	BHP	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN
2,100	581	14,719	3,592	22,325	11,630	3,028	5,564	24,624	66,113	70,427
2,000	581	14,293	3,419	21,200	11,190	2,872	5,197	24,624	64,197	68,386
1,900	581	13,932	3,368	19,545	10,357	2,773	4,688	24,624	61,985	66,030
1,800	581	13,411	3,208	18,737	9,820	2,759	4,299	24,624	60,237	64,168
1,700	574	12,527	3,007	18,728	9,752	2,693	4,197	24,334	58,800	62,637
1,600	561	11,699	2,817	18,926	9,991	2,634	4,165	23,805	57,497	61,249
1,500	544	11,236	2,690	18,827	9,967	2,570	4,124	23,083	56,107	59,769
1,400	522	10,634	2,559	18,140	9,766	2,445	3,810	22,139	53,382	56,866
1,300	472	9,730	2,356	16,490	8,925	2,253	2,919	20,024	48,073	51,210
1,200	421	8,973	2,150	15,423	8,473	2,150	2,337	17,851	43,874	46,737
1,100	365	7,968	1,930	14,047	7,893	2,013	1,848	15,463	38,558	41,074
1,000	304	6,737	1,616	12,306	6,709	1,753	1,341	12,887	32,269	34,375
900	249	5,633	1,373	10,061	5,154	1,569	785	10,544	26,309	28,026
800	199	4,739	1,136	7,404	3,673	1,398	328	8,434	20,502	21,840
700	145	4,071	980	5,416	2,540	1,229	100	6,148	15,597	16,614
600	99.4	3,011	727	3,647	1,485	898	-11	4,214	10,667	11,363

Sound Data

SOUND DATA REPRESENTATIVE OF NOISE PRODUCED BY THE ENGINE AND AFTERTREATMENT.

EXHAUST: Sound Power (1/3 Octave Frequencies)

ENGINE SPEED	ENGINE POWER	OVERALL SOUND	100 HZ	125 HZ	160 HZ	200 HZ	250 HZ	315 HZ	400 HZ	500 HZ	630 HZ	800 HZ
RPM	BHP	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
2,100	581	99.8	70.1	70.4	75.0	78.8	82.5	86.5	89.2	90.8	90.1	90.3
2,000	581	99.5	72.4	70.7	75.9	78.8	82.3	86.2	89.3	90.4	90.0	90.0
1,900	581	97.7	74.8	69.5	73.8	78.2	81.0	85.2	87.6	88.5	88.0	87.9
1,800	581	96.3	71.7	73.3	73.1	77.0	80.4	84.6	86.4	86.9	86.5	86.4
1,700	574	96.1	68.7	73.3	73.5	76.3	80.3	84.4	86.3	86.8	86.4	86.3
1,600	561	95.8	65.9	72.1	73.5	76.0	79.8	84.3	86.1	86.5	86.0	86.0
1,500	544	94.9	66.9	70.9	73.3	75.6	79.3	83.8	85.2	85.3	84.9	84.9
1,400	522	93.7	67.8	70.9	73.8	74.9	78.6	82.9	84.1	84.0	83.8	83.7
1,300	472	90.3	67.5	70.4	71.0	72.1	76.3	80.3	80.2	80.8	80.3	80.5
1,200	421	87.5	67.6	71.3	67.6	70.3	74.9	77.6	76.9	77.8	77.4	77.6
1,100	365	85.1	67.7	70.4	64.2	69.1	74.5	74.5	74.2	75.0	74.6	75.4
1,000	304	81.8	65.9	63.6	63.1	66.7	71.4	70.8	70.2	71.2	70.9	72.2
900	249	77.5	62.4	51.4	63.6	63.0	65.5	67.1	65.4	66.7	66.7	67.6

EXHAUST: Sound Power (1/3 Octave Frequencies)

ENGINE SPEED	ENGINE POWER	1000 HZ	1250 HZ	1600 HZ	2000 HZ	2500 HZ	3150 HZ	4000 HZ	5000 HZ	6300 HZ	8000 HZ	10000 HZ
RPM	BHP	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
2,100	581	89.2	88.6	87.1	86.1	88.6	88.9	83.9	81.5	80.1	77.9	75.0
2,000	581	89.1	88.5	86.9	86.0	88.2	87.9	83.4	81.1	79.7	77.5	74.7
1,900	581	87.1	86.5	84.9	84.0	87.1	85.7	81.0	78.8	77.6	75.3	72.5
1,800	581	85.6	84.9	83.2	82.4	86.4	84.3	79.4	77.2	76.0	73.7	70.8
1,700	574	85.5	84.8	83.2	82.2	85.5	83.9	79.2	77.0	75.8	73.6	70.8
1,600	561	85.2	84.4	82.9	82.0	85.5	83.6	79.0	76.6	75.6	73.2	70.2
1,500	544	84.2	83.5	81.8	81.5	84.8	82.3	78.0	75.6	74.6	72.1	69.0
1,400	522	83.1	82.3	80.6	80.5	83.4	80.7	76.5	74.3	73.2	70.6	67.5
1,300	472	79.7	78.7	77.4	77.4	79.2	76.6	73.1	70.7	69.2	66.5	63.1

1,200	421	76.8	75.7	74.5	74.5	75.1	72.9	70.2	67.6	66.1	63.2	59.4
1,100	365	74.2	73.3	72.5	72.3	71.6	70.1	68.1	64.8	63.5	60.3	56.1
1,000	304	71.1	70.6	69.4	70.0	68.4	66.5	65.3	60.6	59.2	55.5	51.2
900	249	67.6	67.2	65.1	67.2	65.3	61.8	61.7	55.2	53.6	49.3	45.4

Sound Data (Continued)

MECHANICAL: Sound Power (1/3 Octave Frequencies)

ENGINE SPEED	ENGINE POWER	OVERALL SOUND	100 HZ	125 HZ	160 HZ	200 HZ	250 HZ	315 HZ	400 HZ	500 HZ	630 HZ	800 HZ
RPM	BHP	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
2,100	581	115.4	75.9	79.0	88.0	90.9	96.8	93.9	101.1	102.2	104.3	105.2
2,000	581	114.7	73.6	79.3	87.0	91.4	94.5	91.1	102.2	101.7	101.1	103.8
1,900	581	115.1	77.8	78.3	86.9	88.9	91.8	90.9	101.3	103.2	102.6	105.9
1,800	581	113.7	72.6	78.2	83.5	88.3	91.5	90.5	101.0	101.6	101.5	104.5
1,700	574	113.1	71.5	78.1	84.4	87.3	90.6	89.5	99.1	100.7	101.3	103.8
1,600	561	112.3	72.2	77.9	85.2	85.7	89.0	87.6	96.5	98.9	100.6	102.5
1,500	544	111.3	71.0	78.3	81.9	83.2	86.8	86.8	96.6	97.5	99.6	101.3
1,400	522	110.6	69.6	78.1	79.0	80.5	84.1	86.8	97.2	96.3	98.5	100.6
1,300	472	110.0	67.5	75.5	75.8	78.3	83.4	85.9	96.5	96.4	97.3	100.0
1,200	421	109.5	65.6	73.1	73.2	77.1	83.2	86.1	95.0	95.7	96.6	99.5
1,100	365	108.9	67.5	70.9	71.7	77.3	83.4	86.9	93.5	94.9	96.0	99.1
1,000	304	108.0	71.1	66.0	70.9	78.5	84.1	86.2	92.6	94.6	94.9	98.5
900	249	106.8	75.4	59.3	70.3	79.6	84.4	84.7	92.4	94.3	93.8	96.7

MECHANICAL: Sound Power (1/3 Octave Frequencies)

ENGINE SPEED	ENGINE POWER	1000 HZ	1250 HZ	1600 HZ	2000 HZ	2500 HZ	3150 HZ	4000 HZ	5000 HZ	6300 HZ	8000 HZ	10000 HZ
RPM	BHP	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
2,100	581	105.6	105.5	106.0	106.3	105.6	103.3	102.1	99.5	95.8	94.2	92.6
2,000	581	105.2	104.6	105.4	106.9	104.7	102.9	101.1	98.1	95.2	93.1	91.6
1,900	581	104.4	104.9	105.0	107.4	105.4	103.1	101.6	98.5	95.8	92.9	91.3
1,800	581	103.5	103.2	103.6	105.4	103.7	101.8	100.5	97.5	95.1	92.8	90.8
1,700	574	102.8	103.1	103.4	104.9	103.2	101.4	99.6	97.0	94.3	92.1	90.2
1,600	561	102.4	102.5	103.4	104.4	102.2	100.5	98.8	96.2	93.0	91.1	90.0
1,500	544	101.0	101.2	102.1	103.4	101.4	99.9	98.0	95.3	92.3	90.7	89.8
1,400	522	99.5	100.8	100.6	102.7	101.1	99.6	97.3	94.6	91.9	90.6	89.6
1,300	472	99.0	99.9	100.3	101.8	100.9	99.6	96.7	94.7	91.7	90.1	89.0
1,200	421	99.4	99.5	100.0	100.8	100.3	99.0	96.0	94.0	91.0	89.3	88.3
1,100	365	99.7	99.1	99.2	99.9	99.5	98.1	95.5	92.5	90.1	88.5	87.8
1,000	304	98.7	97.9	97.9	99.0	99.0	97.3	95.4	91.3	89.0	87.8	87.2
900	249	97.1	96.1	96.1	97.8	98.2	96.2	94.8	89.5	86.7	86.3	86.8

Emissions Data

RATED SPEED NOMINAL DATA: 2100 RPM

ENGINE POWER		BHP	581	435	290	145	58.1
PERCENT LOAD		%	100	75	50	25	10
TOTAL NOX (AS NO2)		G/HR	55	20	9	14	108
TOTAL CO		G/HR	3	1	1	1	1
TOTAL HC		G/HR	10	5	4	3	3
TOTAL CO2		KG/HR	310	228	176	103	65
PART MATTER		G/HR	0.3	0.1	0.1	0.3	0.1
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	40.7	19.9	12.2	28.2	389.9
TOTAL CO	(CORR 5% O2)	MG/NM3	2.0	1.3	1.3	2.4	3.5
TOTAL HC	(CORR 5% O2)	MG/NM3	6.2	4.3	5.0	5.0	8.9
PART MATTER	(CORR 5% O2)	MG/NM3	0.2	0.1	0.1	0.5	0.3
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	20	10	6	14	190
TOTAL CO	(CORR 5% O2)	PPM	2	1	1	2	3
TOTAL HC	(CORR 5% O2)	PPM	12	8	9	9	17
TOTAL NOX (AS NO2)		G/HP-HR	0.10	0.05	0.03	0.10	1.86
TOTAL CO		G/HP-HR	0.00	0.00	0.00	0.01	0.02
TOTAL HC		G/HP-HR	0.02	0.01	0.02	0.02	0.05
PART MATTER		G/HP-HR	0.00	0.00	0.00	0.00	0.00
TOTAL NOX (AS NO2)		LB/HR	0.12	0.04	0.02	0.03	0.24
TOTAL CO		LB/HR	0.01	0.00	0.00	0.00	0.00

TOTAL HC		LB/HR	0.02	0.01	0.01	0.01	0.01
TOTAL CO2		LB/HR	684	502	387	226	143
PART MATTER		LB/HR	0.00	0.00	0.00	0.00	0.00
OXYGEN IN EXH		%	7.9	9.6	11.8	14.2	16.3

SECONDARY SPEED NOMINAL DATA: 1800 RPM

ENGINE POWER		BHP	581	436	290	145	58.1
PERCENT LOAD		%	100	75	50	25	10
TOTAL NOX (AS NO2)		G/HR	40	13	4	0	92
TOTAL CO		G/HR	2	1	1	1	1
TOTAL HC		G/HR	9	5	4	2	3
TOTAL CO2		KG/HR	284	213	161	88	52
PART MATTER		G/HR	0.0	0.1	0.1	0.1	0.1
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	32.7	15.3	4.3	1.5	429.1
TOTAL CO	(CORR 5% O2)	MG/NM3	1.7	1.6	1.5	2.9	4.1
TOTAL HC	(CORR 5% O2)	MG/NM3	6.5	4.5	4.9	4.2	9.7
PART MATTER	(CORR 5% O2)	MG/NM3	0.0	0.1	0.2	0.1	0.2
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	16	7	2	1	209
TOTAL CO	(CORR 5% O2)	PPM	1	1	1	2	3
TOTAL HC	(CORR 5% O2)	PPM	12	8	9	8	18
TOTAL NOX (AS NO2)		G/HP-HR	0.07	0.03	0.02	0.00	1.59
TOTAL CO		G/HP-HR	0.00	0.00	0.00	0.01	0.02
TOTAL HC		G/HP-HR	0.02	0.01	0.01	0.01	0.04
PART MATTER		G/HP-HR	0.00	0.00	0.00	0.00	0.00
TOTAL NOX (AS NO2)		LB/HR	0.09	0.03	0.01	0.00	0.20
TOTAL CO		LB/HR	0.00	0.00	0.00	0.00	0.00
TOTAL HC		LB/HR	0.02	0.01	0.01	0.00	0.01
TOTAL CO2		LB/HR	626	470	355	193	115
PART MATTER		LB/HR	0.00	0.00	0.00	0.00	0.00
OXYGEN IN EXH		%	7.3	8.7	10.8	12.6	16.1

Regulatory Information

EPA TIER 4 FINAL		2014 - ----		
Locality	**Agency**	**Regulation**	**Tier/Stage**	**Max Limits - G/BKW - HR**
U.S. (INCL CALIF)	EPA	NON-ROAD	TIER 4 FINAL	CO: 3.5 NOx: 0.4 HC: 0.19 PM: 0.02

EU STAGE IV		2014 - ----		
Locality	**Agency**	**Regulation**	**Tier/Stage**	**Max Limits - G/BKW - HR**
EUROPE	EU	NON-ROAD	STAGE IV	CO: 3.5 NOx: 0.4 HC: 0.19 PM: 0.025

Altitude Derate Data

ALTITUDE CORRECTED POWER CAPABILITY (BHP)

AMBIENT OPERATING TEMP (F)	50	60	70	80	90	100	110	120	130	140	NORMAL
ALTITUDE (FT)											
0	581	581	581	581	579	575	571	567	564	560	581
1,000	581	581	580	577	573	569	566	562	558	554	578
2,000	579	577	574	571	567	564	560	557	553	549	574
3,000	574	571	568	565	562	559	555	552	548	542	569
4,000	568	566	563	560	557	554	550	546	537	523	565
5,000	563	560	558	555	551	548	543	531	517	502	560
6,000	557	555	553	550	546	539	528	512	494	478	556
7,000	551	549	547	543	535	524	510	489	469	452	551
8,000	546	538	534	527	517	505	485	465	447	430	543
9,000	531	525	519	511	501	488	472	451	429	404	533
10,000	518	512	506	497	486	472	455	432	399	369	521
11,000	504	497	491	482	470	455	437	408	361	342	509
12,000	487	479	472	462	449	425	419	395	348	330	496
13,000	462	454	445	435	424	407	390	346	329	315	483
14,000	424	416	409	401	394	369	336	320	308	295	447
15,000	388	381	375	367	343	326	313	300	295	294	413

Cross Reference

Test Spec	Setting	Engine Arrangement	Engineering Model	Engineering Model Version	Start Effective Serial Number	End Effective Serial Number
3717460	PP6976	3857723	EE126	-	N5F00001	
3717460	PP6976	3857724	EE126	-	N5F00001	

Supplementary Data

Type	Classification	Performance Number
AMBIENT TEMP	50C (122F)	EM0695

This performance data is supplementary data for:
EM0695

Performance Parameter Reference

Parameters Reference:DM9600-10
PERFORMANCE DEFINITIONS

PERFORMANCE DEFINITIONS DM9600
APPLICATION:
Engine performance tolerance values below are representative of a typical production engine tested in a calibrated dynamometer test cell at SAE J1995 standard reference conditions. Caterpillar maintains ISO9001:2000 certified quality management systems for engine test Facilities to assure accurate calibration of test equipment. Engine test data is corrected in accordance with SAE J1995. Additional reference material SAE J1228, J1349, ISO 8665, 3046-1:2002E, 3046-3:1989, 1585, 2534, 2288, and 9249 may apply in part or are similar to SAE J1995. Special engine rating request (SERR) test data shall be noted.
PERFORMANCE PARAMETER TOLERANCE FACTORS:
Power +/- 3%
Torque +/- 3%
Exhaust stack temperature +/- 8%
Inlet airflow +/- 5%
Intake manifold pressure-gage +/- 10%
Exhaust flow +/- 6%
Specific fuel consumption +/- 3%
Fuel rate +/- 5%
Specific DEF consumption +/- 3%
DEF rate +/- 5%
Heat rejection +/- 5%
Heat rejection exhaust only +/- 10%
Heat rejection CEM only +/- 10%
Heat Rejection values based on using treated water.
Torque is included for truck and industrial applications, do not use for Gen Set or steady state applications.
On C7 - C18 engines, at speeds of 1100 RPM and under these values are provided for reference only, and may not meet the tolerance listed.
These values do not apply to C280/3600. For these models, see the tolerances listed below.
C280/3600 HEAT REJECTION TOLERANCE FACTORS:
Heat rejection +/- 10%
Heat rejection to Atmosphere +/- 50%
Heat rejection to Lube Oil +/- 20%
Heat rejection to Aftercooler +/- 5%
TEST CELL TRANSDUCER TOLERANCE FACTORS:
Torque +/- 0.5%
Speed +/- 0.2%
Fuel flow +/- 1.0%
Temperature +/- 2.0 C degrees
Intake manifold pressure +/- 0.1 kPa
OBSERVED ENGINE PERFORMANCE IS CORRECTED TO SAE J1995 REFERENCE AIR AND FUEL CONDITIONS.
REFERENCE ATMOSPHERIC INLET AIR
FOR 3500 ENGINES AND SMALLER
SAE J1228 AUG2002 for marine engines, and J1995 JAN2014 for other engines, reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity at the stated aftercooler water temp, or inlet manifold temp.

FOR 3600 ENGINES
Engine rating obtained and presented in accordance with ISO 3046/1 and SAE J1995 JANJAN2014 reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity and 150M altitude at the stated aftercooler water temperature.
MEASUREMENT LOCATION FOR INLET AIR TEMPERATURE
Location for air temperature measurement air cleaner inlet at stabilized operating conditions.
REFERENCE EXHAUST STACK DIAMETER
The Reference Exhaust Stack Diameter published with this dataset is only used for the calculation of Smoke Opacity values displayed in this dataset. This value does not necessarily represent the actual stack diameter of the engine due to the variety of exhaust stack adapter options available. Consult the price list, engine order or general dimension drawings for the actual stack diameter size ordered or options available.
REFERENCE FUEL
DIESEL
Reference fuel is #2 distillate diesel with a 35API gravity;
A lower heating value is 42,780 KJ/KG (18,390 BTU/LB) when used at 29 deg C (84.2 deg F), where the density is 838.9 G/Liter (7.001 Lbs/Gal).
GAS
Reference natural gas fuel has a lower heating value of 33.74 KJ/L (905 BTU/CU Ft). Low BTU ratings are based on 18.64 KJ/L (500 BTU/CU FT) lower heating value gas. Propane ratings are based on 87.56 KJ/L (2350 BTU/CU Ft) lower heating value gas.
ENGINE POWER (NET) IS THE CORRECTED FLYWHEEL POWER (GROSS) LESS EXTERNAL AUXILIARY LOAD
Engine corrected gross output includes the power required to drive standard equipment; lube oil, scavenge lube oil, fuel transfer, common rail fuel, separate circuit aftercooler and jacket water pumps. Engine net power available for the external (flywheel) load is calculated by subtracting the sum of auxiliary load from the corrected gross flywheel out put power. Typical auxiliary loads are radiator cooling fans, hydraulic pumps, air compressors and battery charging alternators. For Tier 4 ratings additional Parasitic losses would also include Intake, and Exhaust Restrictions.
ALTITUDE CAPABILITY
Altitude capability is the maximum altitude above sea level at standard temperature and standard pressure at which the engine could develop full rated output power on the current performance data set.
Standard temperature values versus altitude could be seen on TM2001.
When viewing the altitude capability chart the ambient temperature is the inlet air temp at the compressor inlet.
Engines with ADEM MEUI and HEUI fuel systems operating at conditions above the defined altitude capability derate for atmospheric pressure and temperature conditions outside the values defined, see TM2001.
Mechanical governor controlled unit injector engines require a setting change for operation at conditions above the altitude defined on the engine performance sheet. See your Caterpillar technical representative for non standard ratings.
REGULATIONS AND PRODUCT COMPLIANCE
TMI Emissions information is presented at 'nominal' and 'Potential Site Variation' values for standard ratings. No tolerances are applied to the emissions data. These values are subject to change at any time. The controlling federal and local emission requirements need to be verified by your Caterpillar technical representative.
Customer's may have special emission site requirements that need to be verified by the Caterpillar Product Group engineer.
EMISSIONS DEFINITIONS:
Emissions : DM1176
HEAT REJECTION DEFINITIONS:
Diesel Circuit Type and HHV Balance : DM9500
HIGH DISPLACEMENT (HD) DEFINITIONS:
3500: EM1500
RATING DEFINITIONS:
Agriculture : TM6008
Fire Pump : TM6009
Generator Set : TM6035
Generator (Gas) : TM6041
Industrial Diesel : TM6010
Industrial (Gas) : TM6040
Irrigation : TM5749
Locomotive : TM6037
Marine Auxiliary : TM6036
Marine Prop (Except 3600) : TM5747
Marine Prop (3600 only) : TM5748
MSHA : TM6042
Oil Field (Petroleum) : TM6011
Off-Highway Truck : TM6039
On-Highway Truck : TM6038

PERFORMANCE DATA[EM0288]

SOUND DEFINITIONS:
Sound Power : DM8702
Sound Pressure : TM7080
Date Released : 7/7/15

PERFORMANCE DATA[EM4133]

October 12, 2018

Performance Number: EM4133 **Change Level: 00**

SALES MODEL:	C18	COMBUSTION:	DI
BRAND:	CAT	ENGINE SPEED (RPM):	1,800
ENGINE POWER (BHP):	803	HERTZ:	60
GEN POWER W/O FAN (EKW):	565.0	ASPIRATION:	TA
COMPRESSION RATIO:	16.5	AFTERCOOLER TYPE:	SCAC
RATING LEVEL:	PRIME	AFTERCOOLER CIRCUIT TYPE:	JW+OC, AC
PUMP QUANTITY:	1	AFTERCOOLER TEMP (F):	126
FUEL TYPE:	DIESEL	JACKET WATER TEMP (F):	185
MANIFOLD TYPE:	WATER COOLED	TURBO CONFIGURATION:	SINGLE
GOVERNOR TYPE:	ELEC	TURBO QUANTITY:	1
ELECTRONICS TYPE:	ADEM4	TURBOCHARGER MODEL:	S510W - A/R 1.15 VOW
CAMSHAFT TYPE:	STANDARD	CERTIFICATION YEAR:	2018
IGNITION TYPE:	CI		
INJECTOR TYPE:	EUI		
REF EXH STACK DIAMETER (IN):	8		
MAX OPERATING ALTITUDE (FT):	984		

INDUSTRY	SUBINDUSTRY	APPLICATION
MARINE	FISHING	MARINE AUXILIARY
MARINE	PLEASURE CRAFT	MARINE AUXILIARY
MARINE	OFFSHORE	MARINE AUXILIARY
MARINE	DREDGE	MARINE AUXILIARY
MARINE	FERRY	MARINE AUXILIARY
MARINE	TUG & SALVAGE	MARINE AUXILIARY
MARINE	GOVERNMENT	MARINE AUXILIARY
MARINE	INLAND WATERWAY	MARINE AUXILIARY

General Performance Data

GENSET POWER WITHOUT FAN	PERCENT LOAD	ENGINE POWER	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	EXH MFLD PRES	ENGINE OUTLET TEMP
EKW	%	BHP	PSI	LB/BHP-HR	GAL/HR	IN-HG	DEG F	DEG F	IN-HG	DEG F
621.5	110	884	351	0.347	43.8	81.4	149.0	1,208.6	80.2	734.6
565.0	100	803	320	0.350	40.1	77.1	146.5	1,159.8	74.9	709.7
508.5	90	723	287	0.351	36.2	71.6	143.7	1,107.4	68.5	680.7
452.0	80	642	255	0.356	32.7	66.3	140.9	1,063.4	62.4	657.1
423.8	75	602	239	0.349	30.0	59.7	138.1	1,026.3	55.3	638.6
395.5	70	562	224	0.341	27.4	53.4	135.5	993.2	48.7	622.6
339.0	60	482	192	0.348	24.0	46.0	133.0	959.9	41.7	608.9
282.5	50	402	160	0.364	20.9	39.8	131.3	932.0	36.2	599.0
226.0	40	322	128	0.376	17.3	30.9	129.3	891.0	28.6	583.2
169.5	30	241	96	0.395	13.6	21.8	127.2	831.6	21.2	555.8
141.2	25	201	80	0.412	11.8	17.8	125.4	789.9	18.1	535.6
113.0	20	161	64	0.436	10.0	14.0	123.0	736.5	15.2	508.9
56.5	10	80.4	32	0.542	6.2	6.9	116.7	574.4	9.9	421.2

GENSET POWER WITHOUT FAN	PERCENT LOAD	ENGINE POWER	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP	WET INLET AIR VOL FLOW RATE	ENGINE OUTLET WET EXH GAS VOL FLOW RATE	WET INLET AIR MASS FLOW RATE	WET EXH GAS MASS FLOW RATE	WET EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)	DRY EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)
EKW	%	BHP	IN-HG	DEG F	CFM	CFM	LB/HR	LB/HR	FT3/MIN	FT3/MIN
621.5	110	884	87	448.5	1,702.6	3,804.1	7,515.5	7,821.9	1,566.1	1,424.4
565.0	100	803	82	430.3	1,654.0	3,622.7	7,277.7	7,558.6	1,523.2	1,391.0
508.5	90	723	77	408.2	1,590.5	3,419.7	6,974.2	7,227.7	1,474.4	1,352.0
452.0	80	642	71	386.7	1,523.5	3,225.0	6,658.8	6,887.7	1,419.9	1,307.0
423.8	75	602	64	362.1	1,428.3	2,997.1	6,220.5	6,430.2	1,341.8	1,237.4
395.5	70	562	57	338.6	1,335.8	2,781.9	5,794.9	5,986.7	1,263.8	1,167.5
339.0	60	482	50	311.6	1,230.7	2,551.3	5,312.9	5,480.7	1,174.0	1,086.2
282.5	50	402	43	288.3	1,137.6	2,351.3	4,895.0	5,041.2	1,092.0	1,013.7
226.0	40	322	34	252.2	999.5	2,053.9	4,284.1	4,405.2	968.3	901.8
169.5	30	241	24	212.0	854.2	1,725.1	3,646.6	3,742.1	835.3	781.0
141.2	25	201	20	192.8	790.3	1,565.4	3,368.2	3,451.2	773.3	725.5
113.0	20	161	16	173.8	729.8	1,402.4	3,106.0	3,176.2	711.9	670.7
56.5	10	80.4	9	136.2	615.6	1,049.4	2,614.4	2,658.1	585.8	558.0

Heat Rejection Data

GENSET POWER WITHOUT FAN	PERCENT LOAD	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXHUAST RECOVERY TO 350F	FROM OIL COOLER	FROM AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HIGH HEAT VALUE ENERGY
EKW	%	BHP	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN
621.5	110	884	21,013	1,824	31,148	12,664	5,020	9,282	37,481	94,250	100,400
565.0	100	803	19,150	1,709	28,678	11,403	4,588	8,439	34,073	86,133	91,753
508.5	90	723	17,505	1,599	26,308	9,981	4,173	7,647	30,652	78,344	83,456
452.0	80	642	15,838	1,484	23,766	8,799	3,740	6,696	27,233	70,219	74,801
423.8	75	602	14,900	1,421	22,313	7,705	3,502	6,076	25,528	65,753	70,044
395.5	70	562	13,964	1,358	20,859	6,765	3,264	5,433	23,834	61,277	65,276
339.0	60	482	12,150	1,234	18,065	5,867	2,796	4,154	20,447	52,495	55,920
282.5	50	402	10,576	1,122	15,751	5,178	2,375	3,058	17,054	44,587	47,496
226.0	40	322	9,111	1,016	13,674	4,226	1,974	2,102	13,647	37,066	39,485
169.5	30	241	7,660	911	11,500	3,154	1,575	1,235	10,235	29,570	31,499
141.2	25	201	6,871	855	10,276	2,617	1,369	879	8,528	25,702	27,379
113.0	20	161	5,973	798	8,860	2,054	1,152	607	6,820	21,625	23,037
56.5	10	80.4	3,989	677	5,663	760	699	250	3,409	13,122	13,978

Sound Data

EXHAUST: Sound Power (1/3 Octave Frequencies)

GENSET POWER WITHOUT FAN	PERCENT LOAD	ENGINE POWER	OVERALL SOUND	100 HZ	125 HZ	160 HZ	200 HZ	250 HZ	315 HZ	400 HZ	500 HZ	630 HZ
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
621.5	110	884	128.1	108.8	107.8	104.8	111.7	114.2	112.2	112.1	112.5	113.3
565.0	100	803	127.4	108.6	108.5	103.9	110.8	113.7	111.5	111.6	111.7	112.6
508.5	90	723	126.7	108.1	109.6	102.8	110.2	113.9	111.6	111.3	111.7	112.7
452.0	80	642	125.8	106.9	110.2	102.1	109.9	113.6	110.4	110.9	110.7	112.1
423.8	75	602	125.6	107.3	109.9	102.1	110.1	114.0	110.5	110.9	110.9	112.2
395.5	70	562	125.3	107.4	109.8	101.9	109.9	113.8	110.2	110.7	110.7	112.2
339.0	60	482	124.5	106.7	108.8	101.0	107.8	112.2	108.1	109.3	110.0	111.8
282.5	50	402	123.9	106.3	108.7	100.9	107.6	111.8	108.0	109.6	110.0	111.6
226.0	40	322	123.2	105.9	109.5	101.6	107.5	112.0	108.4	109.6	110.1	111.4
169.5	30	241	121.0	103.7	109.6	101.6	106.2	109.9	105.7	107.4	108.5	109.1
141.2	25	201	119.1	101.2	106.0	98.6	103.8	105.2	106.3	105.1	106.6	107.6
113.0	20	161	117.7	99.8	101.9	100.2	101.2	103.7	103.5	104.1	105.0	107.0
56.5	10	80.4	115.0	95.3	99.1	99.4	96.5	99.7	101.1	104.0	104.4	104.9

EXHAUST: Sound Power (1/3 Octave Frequencies)

GENSET POWER WITHOUT FAN	PERCENT LOAD	ENGINE POWER	1000 HZ	1250 HZ	1600 HZ	2000 HZ	2500 HZ	3150 HZ	4000 HZ	5000 HZ	6300 HZ	8000 HZ
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
621.5	110	884	116.5	119.0	119.7	119.9	119.0	117.9	113.9	108.3	101.7	93.9
565.0	100	803	116.0	118.3	119.2	119.2	117.9	116.8	113.0	107.5	100.9	92.2
508.5	90	723	115.7	117.5	118.4	118.3	116.9	115.5	111.4	105.9	99.5	90.2
452.0	80	642	115.0	116.5	117.7	116.9	115.8	114.0	109.6	104.1	97.2	87.3
423.8	75	602	114.7	116.1	117.2	116.5	115.3	113.7	109.3	103.8	96.7	86.8
395.5	70	562	114.5	115.7	116.8	116.1	114.8	113.3	108.7	103.2	96.0	85.9
339.0	60	482	114.1	115.2	116.4	115.6	114.0	112.5	107.6	102.1	94.6	84.5
282.5	50	402	113.4	114.4	115.6	114.6	113.0	111.2	106.0	100.6	92.7	82.6
226.0	40	322	112.6	113.1	114.4	113.5	111.7	109.5	104.3	98.4	90.3	79.7
169.5	30	241	110.5	111.2	111.9	110.6	108.4	106.1	100.4	93.8	85.2	73.3
141.2	25	201	109.4	110.3	110.3	108.1	106.2	104.2	97.6	90.9	81.7	69.7
113.0	20	161	108.6	109.2	108.6	106.3	104.7	101.9	95.1	88.6	79.6	67.4
56.5	10	80.4	106.2	105.3	104.0	103.0	101.5	97.1	90.8	85.3	78.6	65.8

Sound Data (Continued)

PERFORMANCE DATA[EM4133]

MECHANICAL: Sound Power (1/3 Octave Frequencies)

GENSET POWER WITHOUT FAN	PERCENT LOAD	ENGINE POWER	OVERALL SOUND	100 HZ	125 HZ	160 HZ	200 HZ	250 HZ	315 HZ	400 HZ	500 HZ	630 HZ
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
621.5	110	884	124.3	76.8	83.2	88.4	94.9	94.3	97.8	104.8	109.5	106.5
565.0	100	803	123.6	76.1	82.0	87.3	92.8	93.6	96.7	104.0	108.7	107.0
508.5	90	723	122.2	74.9	81.0	88.9	92.9	93.8	96.2	102.8	107.7	106.0
452.0	80	642	120.3	70.2	83.2	88.8	92.6	93.4	95.9	101.9	107.1	106.1
423.8	75	602	119.5	69.7	83.5	88.8	93.0	93.4	95.8	101.3	106.8	104.4
395.5	70	562	119.2	71.7	83.4	88.1	93.2	92.7	94.3	100.8	106.0	103.4
339.0	60	482	119.1	71.1	82.6	87.2	92.4	92.8	93.9	100.5	104.0	103.0
282.5	50	402	119.7	71.2	82.0	86.7	92.0	92.3	93.8	99.7	103.0	103.0
226.0	40	322	116.9	71.2	82.0	85.5	90.9	90.9	93.5	98.9	101.5	102.4
169.5	30	241	115.1	70.5	83.6	83.5	89.4	88.9	92.9	98.4	101.7	100.8
141.2	25	201	114.4	70.0	82.7	82.6	87.9	87.1	93.3	98.0	100.3	101.2
113.0	20	161	113.4	70.5	81.9	81.8	87.3	87.1	94.2	96.5	99.6	100.6
56.5	10	80.4	112.5	70.5	81.7	80.6	86.7	87.4	92.1	95.8	97.9	101.4

MECHANICAL: Sound Power (1/3 Octave Frequencies)

GENSET POWER WITHOUT FAN	PERCENT LOAD	ENGINE POWER	1000 HZ	1250 HZ	1600 HZ	2000 HZ	2500 HZ	3150 HZ	4000 HZ	5000 HZ	6300 HZ	8000 HZ
EKW	%	BHP	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
621.5	110	884	109.3	109.8	110.3	109.7	110.8	108.5	108.3	109.2	103.0	102.4
565.0	100	803	109.2	108.6	109.4	109.1	111.5	107.8	107.1	106.6	101.9	102.6
508.5	90	723	108.8	108.5	108.9	108.5	110.6	106.9	106.0	105.6	101.5	103.7
452.0	80	642	108.8	107.9	108.6	108.4	110.5	107.1	104.7	103.1	102.2	107.7
423.8	75	602	107.8	107.1	107.9	107.9	108.7	106.5	104.2	102.9	102.5	109.7
395.5	70	562	106.7	106.7	107.4	107.5	107.9	106.1	104.0	102.7	102.2	112.4
339.0	60	482	105.1	106.6	106.5	107.4	106.5	105.0	103.8	102.2	102.1	115.3
282.5	50	402	104.5	105.1	106.1	107.0	105.5	104.5	103.1	101.6	102.4	117.4
226.0	40	322	104.8	104.4	105.3	105.7	104.6	103.3	102.2	100.5	104.6	112.4
169.5	30	241	104.3	105.8	105.3	103.9	103.3	103.2	99.6	100.0	108.1	97.5
141.2	25	201	104.9	104.2	105.4	104.4	102.8	101.7	98.9	105.1	102.8	94.8
113.0	20	161	103.9	103.4	103.7	104.0	101.8	101.1	98.3	104.8	95.8	93.6
56.5	10	80.4	103.7	103.2	102.9	102.9	100.5	99.4	101.4	94.3	92.1	92.2

Emissions Data

RATED SPEED POTENTIAL SITE VARIATION: 1800 RPM

GENSET POWER WITHOUT FAN		EKW	621.5	565.0	423.8	282.5	141.2
PERCENT LOAD		%	110	100	75	50	25
ENGINE POWER		BHP	884	803	602	402	201
TOTAL NOX (AS NO2)		G/HR	4,704	3,855	2,664	1,438	621
TOTAL CO		G/HR	448	338	235	187	248
TOTAL HC		G/HR	63	74	66	59	50
PART MATTER		G/HR	8.9	52.3	0.0	0.0	0.0
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,462.7	2,200.8	2,062.4	1,553.9	1,142.3
TOTAL CO	(CORR 5% O2)	MG/NM3	233.2	191.6	180.9	202.7	470.2
TOTAL HC	(CORR 5% O2)	MG/NM3	28.5	36.9	43.5	55.4	81.5
PART MATTER	(CORR 5% O2)	MG/NM3	4.2	24.6	0.0	0.0	0.0
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,200	1,072	1,005	757	556
TOTAL CO	(CORR 5% O2)	PPM	187	153	145	162	376
TOTAL HC	(CORR 5% O2)	PPM	53	69	81	103	152
TOTAL NOX (AS NO2)		G/HP-HR	5.37	4.84	4.46	3.59	3.10
TOTAL CO		G/HP-HR	0.51	0.42	0.39	0.47	1.24
TOTAL HC		G/HP-HR	0.07	0.09	0.11	0.15	0.25
PART MATTER		G/HP-HR	0.01	0.07	0.00	0.00	0.00
TOTAL NOX (AS NO2)		LB/HR	10.37	8.50	5.87	3.17	1.37
TOTAL CO		LB/HR	0.99	0.74	0.52	0.41	0.55
TOTAL HC		LB/HR	0.14	0.16	0.15	0.13	0.11
PART MATTER		LB/HR	0.02	0.12	0.00	0.00	0.00

RATED SPEED NOMINAL DATA: 1800 RPM

GENSET POWER WITHOUT FAN		EKW	621.5	565.0	423.8	282.5	141.2
PERCENT LOAD		%	110	100	75	50	25
ENGINE POWER		BHP	884	803	602	402	201
TOTAL NOX (AS NO2)		G/HR	4,356	3,570	2,467	1,331	575
TOTAL CO		G/HR	239	180	126	100	132
TOTAL HC		G/HR	33	39	35	31	26
TOTAL CO2		KG/HR	435	398	298	208	119
PART MATTER		G/HR	4.6	26.8	0.0	0.0	0.0
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,280.3	2,037.7	1,909.7	1,438.8	1,057.7
TOTAL CO	(CORR 5% O2)	MG/NM3	124.7	102.5	96.8	108.4	251.4
TOTAL HC	(CORR 5% O2)	MG/NM3	15.1	19.5	23.0	29.3	43.1
PART MATTER	(CORR 5% O2)	MG/NM3	2.1	12.6	0.0	0.0	0.0
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,111	993	930	701	515
TOTAL CO	(CORR 5% O2)	PPM	100	82	77	87	201
TOTAL HC	(CORR 5% O2)	PPM	28	36	43	55	80
TOTAL NOX (AS NO2)		G/HP-HR	4.97	4.48	4.13	3.33	2.87
TOTAL CO		G/HP-HR	0.27	0.23	0.21	0.25	0.66
TOTAL HC		G/HP-HR	0.04	0.05	0.06	0.08	0.13
PART MATTER		G/HP-HR	0.01	0.03	0.00	0.00	0.00
TOTAL NOX (AS NO2)		LB/HR	9.60	7.87	5.44	2.93	1.27
TOTAL CO		LB/HR	0.53	0.40	0.28	0.22	0.29
TOTAL HC		LB/HR	0.07	0.09	0.08	0.07	0.06
TOTAL CO2		LB/HR	958	876	657	459	261
PART MATTER		LB/HR	0.01	0.06	0.00	0.00	0.00
OXYGEN IN EXH		%	8.7	9.4	10.9	12.0	13.5
DRY SMOKE OPACITY		%	1.1	1.0	1.1	1.4	2.5
BOSCH SMOKE NUMBER			0.43	0.39	0.40	0.59	1.11

Regulatory Information

CCNR STAGE II	2006 - ----

EPA TIER 3		2018 - ----		
Locality	**Agency**	**Regulation**	**Tier/Stage**	**Max Limits - G/BKW - HR**
U.S. (INCL CALIF)	EPA	MARINE COMMERCIAL	TIER 3	CO: 5.0 NOx + HC: 5.6 PM: 0.10

IMO II	2011 - ----

Cross Reference

Test Spec	Setting	Engine Arrangement	Engineering Model	Engineering Model Version	Start Effective Serial Number	End Effective Serial Number
5526443	PP7277	5403882	GS628	-	DSE00001	
5526443	PP7999	5403882	GS628	-	DSE00001	

Supplementary Data

Type	Classification	Performance Number
CHART	AMBIENT CAPABILTY CHART	EM0463

Performance Parameter Reference

Parameters Reference:DM9600-10
PERFORMANCE DEFINITIONS

PERFORMANCE DEFINITIONS DM9600
APPLICATION:
Engine performance tolerance values below are representative of a typical production engine tested in a calibrated dynamometer test

cell at SAE J1995 standard reference conditions. Caterpillar maintains ISO9001:2000 certified quality management systems for engine test Facilities to assure accurate calibration of test equipment. Engine test data is corrected in accordance with SAE J1995. Additional reference material SAE J1228, J1349, ISO 8665, 3046-1:2002E, 3046-3:1989, 1585, 2534, 2288, and 9249 may apply in part or are similar to SAE J1995. Special engine rating request (SERR) test data shall be noted.

PERFORMANCE PARAMETER TOLERANCE FACTORS:
Power +/- 3%
Torque +/- 3%
Exhaust stack temperature +/- 8%
Inlet airflow +/- 5%
Intake manifold pressure-gage +/- 10%
Exhaust flow +/- 6%
Specific fuel consumption +/- 3%
Fuel rate +/- 5%
Specific DEF consumption +/- 3%
DEF rate +/- 5%
Heat rejection +/- 5%
Heat rejection exhaust only +/- 10%
Heat rejection CEM only +/- 10%
Heat Rejection values based on using treated water.
Torque is included for truck and industrial applications, do not use for Gen Set or steady state applications.
On C7 - C18 engines, at speeds of 1100 RPM and under these values are provided for reference only, and may not meet the tolerance listed.
These values do not apply to C280/3600. For these models, see the tolerances listed below.

C280/3600 HEAT REJECTION TOLERANCE FACTORS:
Heat rejection +/- 10%
Heat rejection to Atmosphere +/- 50%
Heat rejection to Lube Oil +/- 20%
Heat rejection to Aftercooler +/- 5%

TEST CELL TRANSDUCER TOLERANCE FACTORS:
Torque +/- 0.5%
Speed +/- 0.2%
Fuel flow +/- 1.0%
Temperature +/- 2.0 C degrees
Intake manifold pressure +/- 0.1 kPa

OBSERVED ENGINE PERFORMANCE IS CORRECTED TO SAE J1995 REFERENCE AIR AND FUEL CONDITIONS.

REFERENCE ATMOSPHERIC INLET AIR

FOR 3500 ENGINES AND SMALLER

SAE J1228 AUG2002 for marine engines, and J1995 JAN2014 for other engines, reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity at the stated aftercooler water temp, or inlet manifold temp.

FOR 3600 ENGINES

Engine rating obtained and presented in accordance with ISO 3046/1 and SAE J1995 JANJAN2014 reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity and 150M altitude at the stated aftercooler water temperature.

MEASUREMENT LOCATION FOR INLET AIR TEMPERATURE

Location for air temperature measurement air cleaner inlet at stabilized operating conditions.

REFERENCE EXHAUST STACK DIAMETER

The Reference Exhaust Stack Diameter published with this dataset is only used for the calculation of Smoke Opacity values displayed in this dataset. This value does not necessarily represent the actual stack diameter of the engine due to the variety of exhaust stack adapter options available. Consult the price list, engine order or general dimension drawings for the actual stack diameter size ordered or options available.

REFERENCE FUEL

DIESEL

Reference fuel is #2 distillate diesel with a 35API gravity; A lower heating value is 42,780 KJ/KG (18,390 BTU/LB) when used at 29 deg C (84.2 deg F), where the density is 838.9 G/Liter (7.001 Lbs/Gal).

GAS

Reference natural gas fuel has a lower heating value of 33.74 KJ/L (905 BTU/CU Ft). Low BTU ratings are based on 18.64 KJ/L (500 BTU/CU FT) lower heating value gas. Propane ratings are based on 87.56 KJ/L (2350 BTU/CU Ft) lower heating value gas.

ENGINE POWER (NET) IS THE CORRECTED FLYWHEEL POWER (GROSS) LESS EXTERNAL AUXILIARY LOAD

Engine corrected gross output includes the power required to drive standard equipment; lube oil, scavenge lube oil, fuel transfer, common rail fuel, separate circuit aftercooler and jacket water pumps. Engine net power available for the external (flywheel) load is calculated by subtracting the sum of auxiliary load from the corrected gross flywheel out put power. Typical auxiliary loads are radiator cooling fans, hydraulic pumps, air compressors and battery charging alternators. For Tier 4 ratings additional

Parasitic losses would also include Intake, and Exhaust Restrictions.

ALTITUDE CAPABILITY

Altitude capability is the maximum altitude above sea level at standard temperature and standard pressure at which the engine could develop full rated output power on the current performance data set.

Standard temperature values versus altitude could be seen on TM2001.

When viewing the altitude capability chart the ambient temperature is the inlet air temp at the compressor inlet.

Engines with ADEM MEUI and HEUI fuel systems operating at conditions above the defined altitude capability derate for atmospheric pressure and temperature conditions outside the values defined, see TM2001.

Mechanical governor controlled unit injector engines require a setting change for operation at conditions above the altitude defined on the engine performance sheet. See your Caterpillar technical representative for non standard ratings.

REGULATIONS AND PRODUCT COMPLIANCE

TMI Emissions information is presented at 'nominal' and 'Potential Site Variation' values for standard ratings. No tolerances are applied to the emissions data. These values are subject to change at any time. The controlling federal and local emission requirements need to be verified by your Caterpillar technical representative.

Customer's may have special emission site requirements that need to be verified by the Caterpillar Product Group engineer.

EMISSIONS DEFINITIONS:

Emissions : DM1176

HEAT REJECTION DEFINITIONS:

Diesel Circuit Type and HHV Balance : DM9500

HIGH DISPLACEMENT (HD) DEFINITIONS:

3500: EM1500

RATING DEFINITIONS:

Agriculture : TM6008

Fire Pump : TM6009

Generator Set : TM6035

Generator (Gas) : TM6041

Industrial Diesel : TM6010

Industrial (Gas) : TM6040

Irrigation : TM5749

Locomotive : TM6037

Marine Auxiliary : TM6036

Marine Prop (Except 3600) : TM5747

Marine Prop (3600 only) : TM5748

MSHA : TM6042

Oil Field (Petroleum) : TM6011

Off-Highway Truck : TM6039

On-Highway Truck : TM6038

SOUND DEFINITIONS:

Sound Power : DM8702

Sound Pressure : TM7080

Date Released : 7/7/15

PERFORMANCE DATA[TM8579]

July 24, 2017

Performance Number: TM8579 | **Change Level: 08**

SALES MODEL:	3508	**COMBUSTION:**	DI
BRAND:	CAT	**ENGINE SPEED (RPM):**	1,750
ENGINE POWER (BHP):	1,065	**ASPIRATION:**	TA
COMPRESSION RATIO:	13	**AFTERCOOLER TYPE:**	JWAC
RATING LEVEL:	STANDBY	**AFTERCOOLER CIRCUIT TYPE:**	JW+OC+AC
PUMP QUANTITY:	1	**AFTERCOOLER TEMP (F):**	180
FUEL TYPE:	DIESEL	**JACKET WATER TEMP (F):**	210.2
MANIFOLD TYPE:	ASWC	**TURBO CONFIGURATION:**	PARALLEL
GOVERNOR TYPE:	WOODWARD	**TURBO QUANTITY:**	2
CAMSHAFT TYPE:	STANDARD	**TURBOCHARGER MODEL:**	UTW8302-47T-1.03
IGNITION TYPE:	CI	**COMBUSTION STRATEGY:**	LOW BSFC
INJECTOR TYPE:	MUI	**CRANKCASE BLOWBY RATE (FT3/HR):**	533.2
FUEL INJECTOR:	4P9077	**FUEL RATE (RATED RPM) NO LOAD (GAL/HR):**	5.2
UNIT INJECTOR TIMING (IN):	87.60		
REF EXH STACK DIAMETER (IN):	8		
MAX OPERATING ALTITUDE (FT):	5,413		

INDUSTRY	SUBINDUSTRY	APPLICATION
INDUSTRIAL	GENERAL INDUSTRIAL	INDUSTRIAL
INDUSTRIAL	FIRE PUMP	INDUSTRIAL

General Performance Data

PERCENT LOAD	ENGINE POWER	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	ENGINE OUTLET TEMP
%	BHP	PSI	LB/BHP-HR	GAL/HR	IN-HG	DEG F	DEG F	DEG F
100	1,065	229	0.352	53.6	60.4	206.2	1,009.4	732.6
90	958	206	0.352	48.1	53.2	202.6	970.7	705.9
80	852	183	0.354	43.0	47.0	199.2	923.0	681.8
75	799	172	0.355	40.5	43.8	197.6	899.6	670.9
70	745	160	0.358	38.1	40.7	196.2	876.7	660.6
60	639	137	0.364	33.2	34.2	194.0	834.6	640.9
50	532	114	0.373	28.4	27.8	192.2	790.3	620.1
40	426	92	0.386	23.5	21.7	190.6	734.4	586.7
30	319	69	0.407	18.6	16.2	189.1	666.0	542.7
25	266	57	0.425	16.2	13.7	188.6	626.9	517.2
20	213	46	0.453	13.8	11.4	188.1	584.4	489.2
10	106	23	0.605	9.2	7.7	187.3	487.4	425.7

PERCENT LOAD	ENGINE POWER	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP	WET INLET AIR VOL FLOW RATE	ENGINE OUTLET WET EXH GAS VOL FLOW RATE	WET INLET AIR MASS FLOW RATE	WET EXH GAS MASS FLOW RATE	WET EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)	DRY EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)
%	BHP	IN-HG	DEG F	CFM	CFM	LB/HR	LB/HR	FT3/MIN	FT3/MIN
100	1,065	63	375.1	2,355.2	5,434.3	10,346.0	10,721.0	2,241.1	2,058.9
90	958	55	349.5	2,171.6	4,904.7	9,122.9	9,459.8	2,068.9	1,900.7
80	852	49	320.4	2,016.2	4,449.2	8,102.5	8,403.7	1,916.4	1,760.7
75	799	46	306.0	1,936.1	4,225.6	7,621.5	7,905.3	1,837.6	1,688.3
70	745	43	291.9	1,853.8	4,004.2	7,156.0	7,422.6	1,757.5	1,614.6
60	639	36	264.9	1,680.8	3,566.4	6,262.4	6,495.2	1,593.2	1,463.7
50	532	29	238.1	1,511.3	3,139.1	5,409.8	5,608.6	1,429.4	1,313.3
40	426	23	211.3	1,351.9	2,721.9	4,563.5	4,728.1	1,278.9	1,175.0
30	319	17	184.5	1,207.6	2,323.4	3,723.5	3,853.6	1,139.7	1,047.1
25	266	15	172.1	1,144.6	2,139.5	3,345.7	3,458.9	1,076.8	989.3
20	213	12	160.5	1,087.6	1,966.8	2,991.6	3,088.1	1,019.1	936.3
10	106	9	141.6	995.8	1,677.3	2,392.7	2,457.2	931.5	855.8

Heat Rejection Data

PERCENT LOAD	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXHUAST RECOVERY TO 350F	FROM OIL COOLER	FROM AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HIGH HEAT VALUE ENERGY

PERFORMANCE DATA[TM8579]

July 24, 2017

%	BHP	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN
100	1,065	36,851	3,833	37,079	16,776	6,142	7,052	45,154	114,939	122,439
90	958	33,553	3,537	32,870	14,331	5,516	5,687	40,639	103,301	110,042
80	852	30,311	3,247	29,003	12,341	4,948	4,379	36,123	92,357	98,383
75	799	28,719	3,102	27,185	11,435	4,663	3,765	33,865	87,013	92,691
70	745	27,127	2,957	25,420	10,578	4,379	3,185	31,608	81,733	87,066
60	639	23,942	2,679	22,008	8,985	3,810	2,161	27,092	71,323	75,977
50	532	20,700	2,411	18,824	7,450	3,242	1,308	22,577	60,913	64,888
40	426	17,459	2,172	15,801	5,787	2,673	561	18,062	50,378	53,665
30	319	14,217	1,962	12,909	4,151	2,104	-57	13,546	39,879	42,481
25	266	12,568	1,869	11,497	3,396	1,848	-301	11,288	34,700	36,964
20	213	10,919	1,786	10,123	2,673	1,592	-512	9,031	29,576	31,505
10	106	7,620	1,649	7,564	1,308	1,081	-853	4,515	19,753	21,042

Emissions Data

RATED SPEED POTENTIAL SITE VARIATION: 1750 RPM

ENGINE POWER		BHP	1,065	799	532	266	106
PERCENT LOAD		%	100	75	50	25	10
TOTAL NOX (AS NO2)		G/HR	15,740	12,793	9,425	5,882	3,407
TOTAL CO		G/HR	1,098	814	455	407	661
TOTAL HC		G/HR	273	255	202	162	137
PART MATTER		G/HR	114.4	97.4	82.2	57.1	47.9
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	6,714.2	7,181.4	7,579.9	8,288.6	8,624.8
TOTAL CO	(CORR 5% O2)	MG/NM3	468.4	456.8	365.8	572.2	1,674.0
TOTAL HC	(CORR 5% O2)	MG/NM3	116.2	143.4	162.4	227.7	345.5
PART MATTER	(CORR 5% O2)	MG/NM3	48.9	54.7	66.1	80.4	121.1
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	3,264	3,505	3,692	4,002	4,379
TOTAL CO	(CORR 5% O2)	PPM	374	364	293	464	1,307
TOTAL HC	(CORR 5% O2)	PPM	188	233	262	364	568
TOTAL NOX (AS NO2)		G/HP-HR	14.78	16.02	17.70	22.10	32.00
TOTAL CO		G/HP-HR	1.03	1.02	0.86	1.53	6.20
TOTAL HC		G/HP-HR	0.26	0.32	0.38	0.61	1.29
PART MATTER		G/HP-HR	0.11	0.12	0.15	0.21	0.45
TOTAL NOX (AS NO2)		LB/HR	34.70	28.20	20.78	12.97	7.51
TOTAL CO		LB/HR	2.42	1.79	1.00	0.90	1.46
TOTAL HC		LB/HR	0.60	0.56	0.45	0.36	0.30
PART MATTER		LB/HR	0.25	0.21	0.18	0.13	0.11

RATED SPEED NOMINAL DATA: 1750 RPM

ENGINE POWER		BHP	1,065	799	532	266	106
PERCENT LOAD		%	100	75	50	25	10
TOTAL NOX (AS NO2)		G/HR	13,117	10,661	7,854	4,902	2,839
TOTAL CO		G/HR	610	452	253	226	367
TOTAL HC		G/HR	205	192	152	122	103
TOTAL CO2		KG/HR	523	389	272	158	95
PART MATTER		G/HR	81.7	69.6	58.7	40.8	34.2
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	5,595.2	5,984.5	6,316.6	6,907.2	7,187.3
TOTAL CO	(CORR 5% O2)	MG/NM3	260.2	253.8	203.2	317.9	930.0
TOTAL HC	(CORR 5% O2)	MG/NM3	87.4	107.8	122.1	171.2	259.8
PART MATTER	(CORR 5% O2)	MG/NM3	34.9	39.1	47.2	57.4	86.5
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	2,720	2,921	3,077	3,335	3,649
TOTAL CO	(CORR 5% O2)	PPM	208	202	163	258	726
TOTAL HC	(CORR 5% O2)	PPM	141	175	197	274	427
TOTAL NOX (AS NO2)		G/HP-HR	12.32	13.35	14.75	18.42	26.66
TOTAL CO		G/HP-HR	0.57	0.57	0.48	0.85	3.45
TOTAL HC		G/HP-HR	0.19	0.24	0.29	0.46	0.97
PART MATTER		G/HP-HR	0.08	0.09	0.11	0.15	0.32
TOTAL NOX (AS NO2)		LB/HR	28.92	23.50	17.31	10.81	6.26
TOTAL CO		LB/HR	1.34	1.00	0.56	0.50	0.81
TOTAL HC		LB/HR	0.45	0.42	0.34	0.27	0.23
TOTAL CO2		LB/HR	1,152	858	600	349	209
PART MATTER		LB/HR	0.18	0.15	0.13	0.09	0.08
OXYGEN IN EXH		%	10.3	11.1	12.2	14.4	16.8
DRY SMOKE OPACITY		%	1.0	1.1	1.2	1.1	1.0
BOSCH SMOKE NUMBER			0.37	0.43	0.49	0.43	0.37

Regulatory Information

NON-CERTIFIED	1970 - 2100

Altitude Derate Data

ALTITUDE CORRECTED POWER CAPABILITY (BHP)

AMBIENT OPERATING TEMP (F)	30	40	50	60	70	80	90	100	110	120	130	140	NORMAL
ALTITUDE (FT)													
0	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,044	1,001	1,065
1,000	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,033	990	1,065
2,000	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,012	959	1,065
3,000	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,033	980	937	1,065
4,000	1,065	1,065	1,065	1,065	1,065	1,065	1,065	1,058	1,039	990	948	905	1,065
5,000	1,065	1,065	1,065	1,065	1,065	1,057	1,037	1,019	1,001	959	916	873	1,065
6,000	1,065	1,065	1,065	1,057	1,037	1,018	999	981	964	927	884	841	1,046
7,000	1,065	1,058	1,037	1,018	998	980	962	945	928	895	852	809	1,014
8,000	1,039	1,019	999	979	961	943	926	909	893	852	809	777	983
9,000	1,000	980	961	943	925	908	891	875	852	809	777	735	952
10,000	962	943	925	907	890	873	857	842	809	767	735	692	922
11,000	926	907	889	872	856	840	825	809	767	724	682	639	893
12,000	890	872	855	839	823	807	793	756	724	682	639	596	865
13,000	855	838	822	806	791	776	756	714	671	628	586	543	838
14,000	822	805	790	774	760	746	703	660	618	575	533	490	811
15,000	790	774	759	744	724	682	639	607	564	522	479	426	784

Cross Reference

Test Spec	Setting	Engine Arrangement	Engineering Model	Engineering Model Version	Start Effective Serial Number	End Effective Serial Number
2T9508	PP4054	4W0280	E258	-	95Y00001	

Supplementary Data

Type	Classification	Performance Number
SOUND	SOUND PRESSURE	DM8779

General Notes

General Notes TM8579 - 08

Performance Parameter Reference

Parameters Reference:DM9600-08 PERFORMANCE DEFINITIONS

PERFORMANCE DEFINITIONS DM9600
APPLICATION:
Engine performance tolerance values below are representative of a typical production engine tested in a calibrated dynamometer test cell at SAE J1995 standard reference conditions. Caterpillar maintains ISO9001:2000 certified quality management systems for

engine test Facilities to assure accurate calibration of test equipment. Engine test data is corrected in accordance with SAE J1995. Additional reference material SAE J1228, J1349, ISO 8665, 3046-1:2002E, 3046-3:1989, 1585, 2534, 2288, and 9249 may apply in part or are similar to SAE J1995. Special engine rating request (SERR) test data shall be noted.

PERFORMANCE PARAMETER TOLERANCE FACTORS:

Power +/- 3%
Torque +/- 3%
Exhaust stack temperature +/- 8%
Inlet airflow +/- 5%
Intake manifold pressure-gage +/- 10%
Exhaust flow +/- 6%
Specific fuel consumption +/- 3%
Fuel rate +/- 5%
Specific DEF consumption +/- 3%
DEF rate +/- 5%
Heat rejection +/- 5%
Heat rejection exhaust only +/- 10%
Heat rejection CEM only +/- 10%

Heat Rejection values based on using treated water.

Torque is included for truck and industrial applications, do not use for Gen Set or steady state applications.

On C7 - C18 engines, at speeds of 1100 RPM and under these values are provided for reference only, and may not meet the tolerance listed.

These values do not apply to C280/3600. For these models, see the tolerances listed below.

C280/3600 HEAT REJECTION TOLERANCE FACTORS:

Heat rejection +/- 10%
Heat rejection to Atmosphere +/- 50%
Heat rejection to Lube Oil +/- 20%
Heat rejection to Aftercooler +/- 5%

TEST CELL TRANSDUCER TOLERANCE FACTORS:

Torque +/- 0.5%
Speed +/- 0.2%
Fuel flow +/- 1.0%
Temperature +/- 2.0 C degrees
Intake manifold pressure +/- 0.1 kPa

OBSERVED ENGINE PERFORMANCE IS CORRECTED TO SAE J1995 REFERENCE AIR AND FUEL CONDITIONS.

REFERENCE ATMOSPHERIC INLET AIR

FOR 3500 ENGINES AND SMALLER

SAE J1228 AUG2002 for marine engines, and J1995 JAN2014 for other engines, reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity at the stated aftercooler water temp, or inlet manifold temp.

FOR 3600 ENGINES

Engine rating obtained and presented in accordance with ISO 3046/1 and SAE J1995 JANJAN2014 reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity and 150M altitude at the stated aftercooler water temperature.

MEASUREMENT LOCATION FOR INLET AIR TEMPERATURE

Location for air temperature measurement air cleaner inlet at stabilized operating conditions.

REFERENCE EXHAUST STACK DIAMETER

The Reference Exhaust Stack Diameter published with this dataset is only used for the calculation of Smoke Opacity values displayed in this dataset. This value does not necessarily represent the actual stack diameter of the engine due to the variety of exhaust stack adapter options available. Consult the price list, engine order or general dimension drawings for the actual stack diameter size ordered or options available.

REFERENCE FUEL

DIESEL

Reference fuel is #2 distillate diesel with a 35API gravity; A lower heating value is 42,780 KJ/KG (18,390 BTU/LB) when used at 29 (84.2), where the density is 838.9 G/Liter (7.001 Lbs/Gal).

GAS

Reference natural gas fuel has a lower heating value of 33.74 KJ/L (905 BTU/CU Ft). Low BTU ratings are based on 18.64 KJ/L (500 BTU/CU FT) lower heating value gas. Propane ratings are based on 87.56 KJ/L (2350 BTU/CU Ft) lower heating value gas.

ENGINE POWER (NET) IS THE CORRECTED FLYWHEEL POWER (GROSS) LESS EXTERNAL AUXILIARY LOAD

Engine corrected gross output includes the power required to drive standard equipment; lube oil, scavenge lube oil, fuel transfer, common rail fuel, separate circuit aftercooler and jacket water pumps. Engine net power available for the external (flywheel) load is calculated by subtracting the sum of auxiliary load from the corrected gross flywheel out put power. Typical auxiliary loads are radiator cooling fans, hydraulic pumps, air compressors and battery charging alternators. For Tier 4 ratings additional Parasitic losses would also include Intake, and Exhaust Restrictions.

ALTITUDE CAPABILITY

Altitude capability is the maximum altitude above sea level at standard temperature and standard pressure at which the engine could develop full rated output power on the current performance data set.
Standard temperature values versus altitude could be seen on TM2001.
When viewing the altitude capability chart the ambient temperature is the inlet air temp at the compressor inlet.
Engines with ADEM MEUI and HEUI fuel systems operating at conditions above the defined altitude capability derate for atmospheric pressure and temperature conditions outside the values defined, see TM2001.
Mechanical governor controlled unit injector engines require a setting change for operation at conditions above the altitude defined on the engine performance sheet. See your Caterpillar technical representative for non standard ratings.
REGULATIONS AND PRODUCT COMPLIANCE
TMI Emissions information is presented at 'nominal' and 'Potential Site Variation' values for standard ratings. No tolerances are applied to the emissions data. These values are subject to change at any time. The controlling federal and local emission requirements need to be verified by your Caterpillar technical representative.
Customer's may have special emission site requirements that need to be verified by the Caterpillar Product Group engineer.
EMISSIONS DEFINITIONS:
Emissions : DM1176
HEAT REJECTION DEFINITIONS:
Diesel Circuit Type and HHV Balance : DM9500
HIGH DISPLACEMENT (HD) DEFINITIONS:
3500: EM1500
RATING DEFINITIONS:
Agriculture : TM6008
Fire Pump : TM6009
Generator Set : TM6035
Generator (Gas) : TM6041
Industrial Diesel : TM6010
Industrial (Gas) : TM6040
Irrigation : TM5749
Locomotive : TM6037
Marine Auxiliary : TM6036
Marine Prop (Except 3600) : TM5747
Marine Prop (3600 only) : TM5748
MSHA : TM6042
Oil Field (Petroleum) : TM6011
Off-Highway Truck : TM6039
On-Highway Truck : TM6038
SOUND DEFINITIONS:
Sound Power : DM8702
Sound Pressure : TM7080
Date Released : 7/7/15

APPENDIX I
AIR QUALITY DISPERSION MODELING PROTOCOL

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SPOT
Sea Port Oil Terminal

Sea Port Oil Terminal Project, Offshore Brazoria County, Texas

AIR DISPERSION MODELING PROTOCOL

PRIVATE AND CONFIDENTIAL

Released by SPOT for public release via email on February 25, 2019

Prepared for:
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Lancaster NY 14086

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Revision 1
October 5, 2018

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ACRONYMS AND ABBREVIATIONS

Applicant	SPOT Terminal Services, LLC
ARM	Ambient Ratio Method
BACT	Best Available Control Technology
bbl/h	barrels per hour
BOEM	U.S. Bureau of Ocean Energy Management
CAA	Clean Air Act
CFR	Code of Federal Regulations
CMAQ	Community Multiscale Air Quality
COARE	Coupled Ocean Atmosphere Response Experiment
DWP	deepwater port
DWPA	Deepwater Port Act of 1974, as amended
ESL	Effects Screening Level
GEP	Good Engineering Practice
GUI	Graphical User Interface
m/sec	meters per second
MARAD	U.S. Maritime Administration
MERA	Modeling and Effects Review
MERP	Modeled Emission Rate for Precursor
MMIF	Mesoscale Model Interface Tool
MMS	Minerals Management Service
NAAQS	National Ambient Air Quality Standards
NAD83	North American Datum of 1983
NEPA	National Environmental Policy Act
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NO_X	nitrogen oxides
NSR	New Source Review
OCD	Offshore and Coastal Dispersion
OCS	Outer Continental Shelf
OLM	Ozone Limiting Method

Project	Sea Port Oil Terminal; *also* SPOT *and* SPOT Onshore Station (for the onshore components)
PSD	Prevention of Significant Deterioration
PVMRM	Plume Volume Molar Ratio Method
RTP	RTP Environmental Associates, Inc.
SER	significant emission rates
SIA	significant impacts analysis
SIL	Significant Impact Level
SMC	significant monitoring concentration
SPOT	Sea Port Oil Terminal; *also* the Project *and* SPOT Onshore Station (for the onshore components)
TCEQ	Texas Commission on Environmental Quality
USCG	U.S. Coast Guard
USEPA	U.S. Environmental Protection Agency
UTM	Universal Transverse Mercator
VLCC	very large crude carrier
VOC	volatile organic compound
WRF	Weather Research and Forecasting

1 INTRODUCTION

SPOT Terminal Services, LLC (the Applicant), a subsidiary of Enterprise Products Partners, LP, a Texas limited liability company, is proposing to develop the Sea Port Oil Terminal (SPOT) Deepwater Port (DWP) in the Gulf of Mexico to provide U.S. crude oil loading services on very large crude carriers (VLCCs) and other vessels for export to the global market. This document presents the protocol for the air quality dispersion modeling analysis to be conducted for the proposed Sea Port Oil Terminal (SPOT, also the Project), in the Gulf of Mexico.

The analysis will evaluate emissions of criteria pollutants regulated under the Prevention of Significant Deterioration (PSD) regulations (40 Code of Federal Regulations [CFR] 52.21). The criteria pollutant analysis will be conducted to ensure that the proposed Project will not cause or contribute to air pollution in violation of a National Ambient Air Quality Standard (NAAQS) or PSD increment for any criteria pollutants proposed to be emitted in excess of the PSD significant emission rates (SERs). The analysis will also evaluate the ambient impact of emissions of the chemical species subject to the Texas Commission on Environmental Quality (TCEQ) Modeling and Effects Review (MERA) process[1].

The protocol conforms with the modeling procedures outlined in U.S. Environmental Protection Agency's (USEPA) Guideline on Air Quality Models[2] (Appendix W of 40 CFR 51), associated USEPA modeling policy and guidance, as well as U.S. Bureau of Ocean Energy Management's (BOEM) modeling guidance[3]. The applicable air modeling requirements were discussed, and major elements of this protocol were presented on August 29, 2018, and on October 11, 2018, respectively, at meetings in Dallas, Texas, with USEPA Region 6 staff. Additionally, a separate justification letter for use of an alternate modeling approach was submitted to USEPA Region 6 on September 14, 2018 (see Section 4 for details).

2 PROJECT DESCRIPTION

The proposed Project has both onshore and offshore components. The TCEQ will issue the air permit for the onshore components. Onshore facilities are not part of this modeling protocol.

The Project would originate at the Oyster Creek onshore facility, owned and operated by Enterprise Products Partners, LP, in south Brazoria County, Texas, and would use two (2) new 36-inch (91.4-centimeter) outside diameter crude oil export pipelines from shore crossing to the offshore fixed platform. SPOT is currently considering two locations for the fixed platform proposed as part of the Project. Each would be located in federal waters within the Outer Continental Shelf (OCS) of the Gulf of Mexico, approximately 25 to 30 nautical miles (28.8 to 34.5 statute miles, or 46.3 to 55.6 kilometers) off the coast of Brazoria County, Texas (Figure 1). The crude oil would be primarily loaded to VLCCs and other crude oil carriers via a single point mooring (SPM) buoy. There would be two sets of crude oil tanker loading facilities, each with one crude oil carrier loading pipeline, one vapor recovery pipeline, and one SPM buoy. Each VLCC can carry up to 2 million barrels of oil when fully loaded. The offshore terminal would be capable of loading and exporting crude oil at approximately 85,000 barrels per hour (bbl/h). Note that the Project is in the early stages of engineering, and the design information provided is preliminary and is subject to change.

Under the provisions of the Deepwater Port Act of 1974, as amended (DWPA), the USEPA is responsible for air permitting outside (seaward) of state jurisdictional boundaries. Air quality regulations of the nearest adjacent coastal state (in this case, Texas) are applicable. As such, USEPA Region 6 is responsible for permitting the Project's air emissions under the federal Clean Air Act (CAA). The primary pollutants to be emitted will be volatile organic compounds (VOCs) from crude oil loading. The Project may also trigger PSD review for other criteria pollutants, depending on selection of a Best Available Control Technology (BACT) for VOCs.

The primary sources of emissions are expected to be the VOC control devices located on the fixed offshore platform. Platform-based sources would include a diesel engine for power generation, intermittent sources, such as a firewater pump diesel engine, an emergency electrical generator diesel engine, and a diesel engine stationary crane on the platform. Mobile sources for National Environmental Policy Act (NEPA) evaluation would include combustion emissions from the VLCC engines, support vessels (tug boats, pilot boats), and helicopter flights. The sources of emissions on the VLCCs and support vessels would be primarily from diesel-fired internal combustion engines and boilers.

The facility would likely be classified under the regulations governing PSD (40 CFR 52.21) and Title V (40 CFR 70.2) as a major stationary source of air pollution. USEPA Region 6 has requested an air quality demonstration for pollutants that trigger PSD review as well as for the pollutants that do not trigger PSD review (i.e., minor emissions). Only the regulated New Source Review (NSR) pollutants with emissions increases exceeding the SERs will be subject to PSD review and evaluated for both NAAQS and increment compliance. The proposed Project, as well as any nearby sources determined to significanlty contribute to total concentrations, will be modeled for these pollutants. Only an NAAQS analysis without consideration of offsite sources will be conducted for the pollutants that do not trigger PSD review. The NAAQS demonstration could be made via screening techniques and may or may not include modeling. Such techniques may include rationing existing airshed emissions and SPOT emissions against existing ambient data. Furthermore, a State Health Effects evaluation for emissions of speciated VOCs from loading crude oil to demonstrate compliance with the TCEQ's Effects Screening Levels (ESLs) will be conducted.

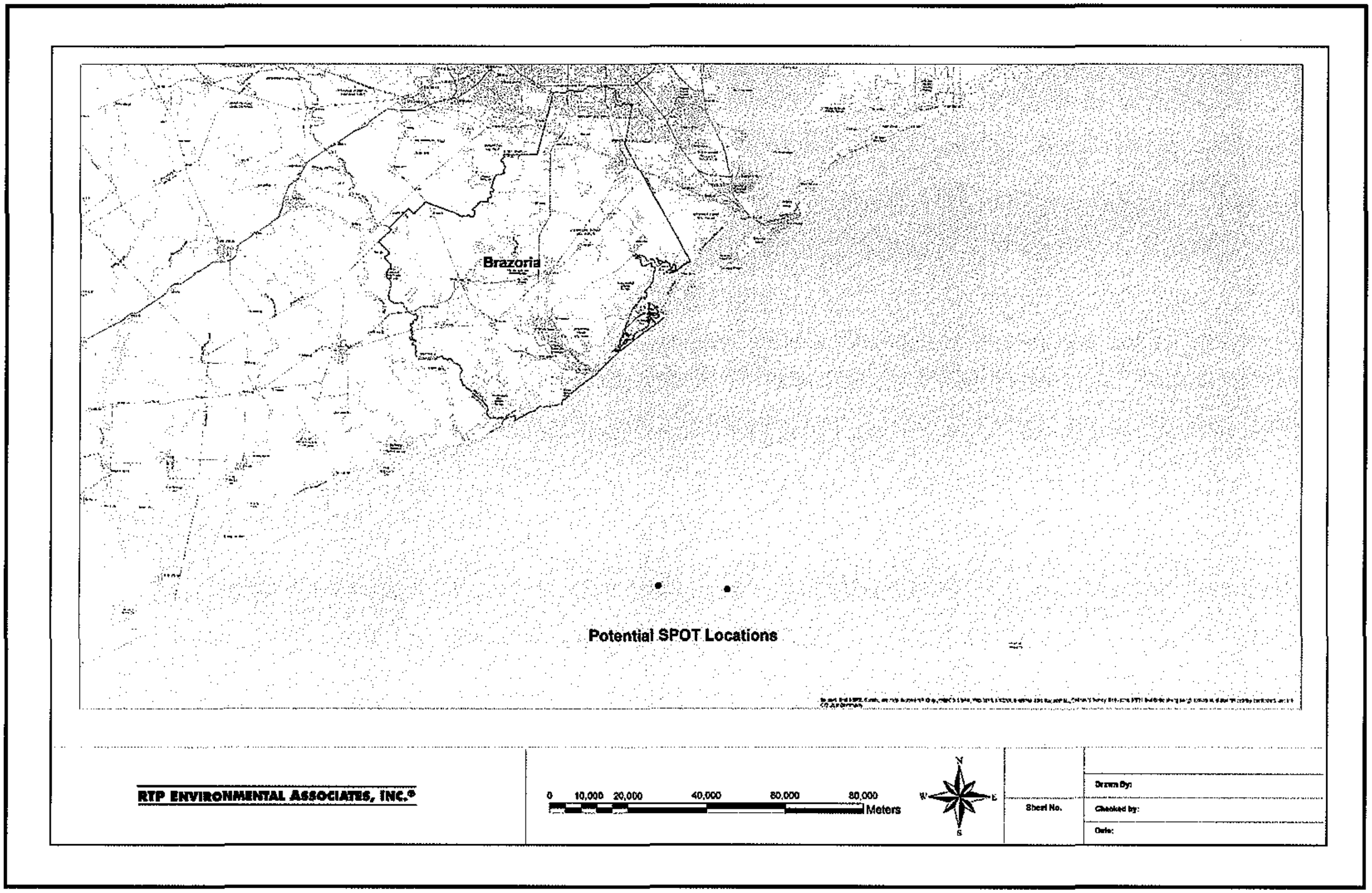


Figure 1 Potential Locations of the Proposed Project

3 SITE DESCRIPTION

The proposed DWP would be located in federal waters within the OCS offshore Brazoria County, Texas, approximately 25 to 30 nautical miles (28.8 to 34.5 statute miles, or 46.3 to 55.6 kilometers) off the coast of Brazoria County, Texas. The centroid of the proposed locations is at Universal Transverse Mercator (UTM) coordinates 300,943 meters east and 3,148,411 meters north (UTM Zone 15, North American Datum of 1983 [NAD83]). Figure 1 shows the general location of the facility. Figure 2 provides an example layout of the contemplated platform and mooring layout (subject to change).

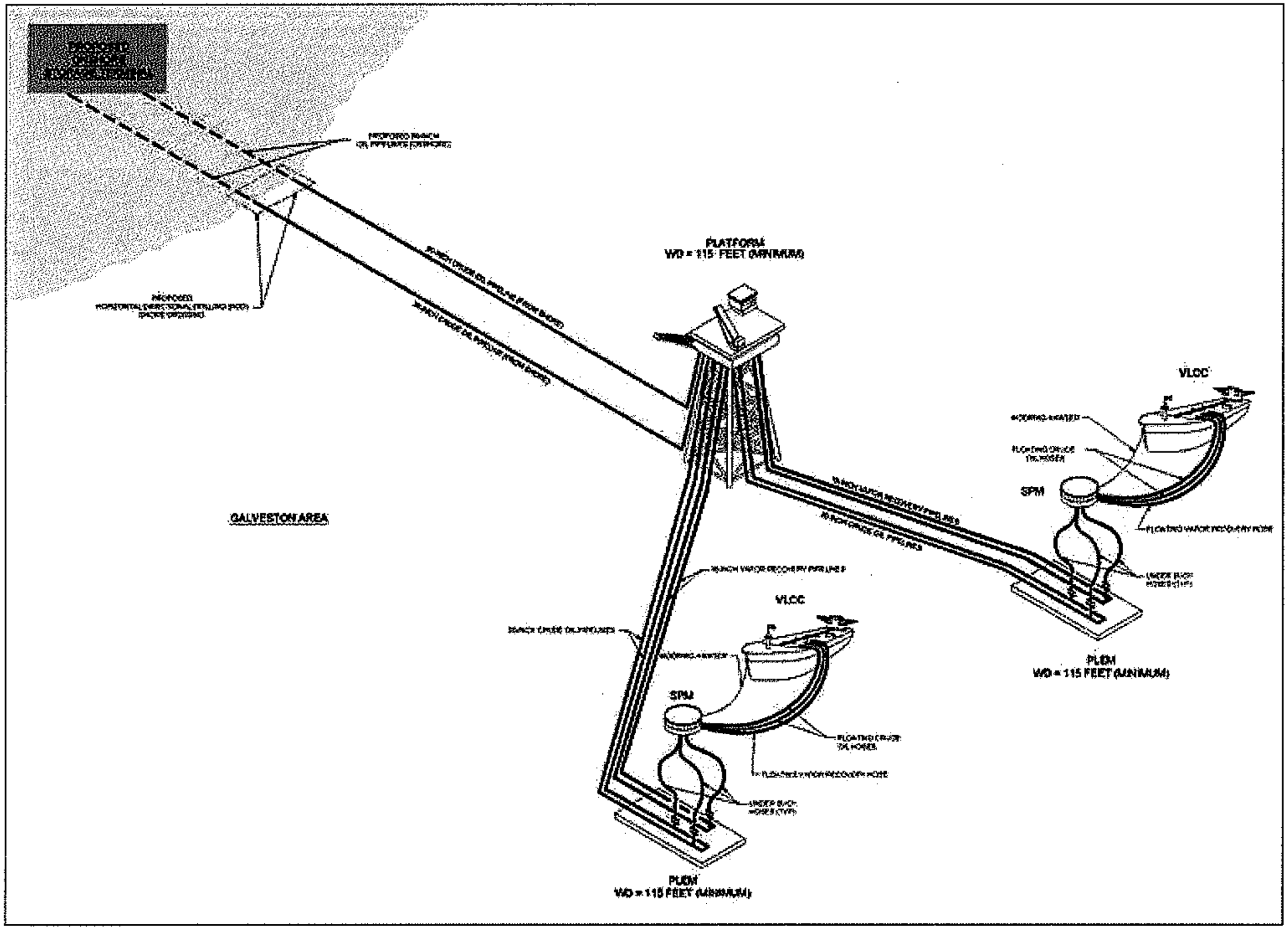


Figure 2 Example SPOT Layout

4 MODEL SELECTION AND MODEL INPUT

4.1 MODEL SELECTION AND JUSTIFICATION

The latest version of the AMS/EPA Regulatory Model (AERMOD-COARE, AERMOD Version 18081, AERCOARE Version D13108) is proposed for conducting the dispersion modeling analysis. AERMOD is a Gaussian plume dispersion model that is based on planetary boundary layer principals for characterizing atmospheric stability. The model evaluates the non-Gaussian vertical behavior of plumes during convective conditions with the probability density function and the superposition of several Gaussian plumes. AERMOD is a modeling system with three components: AERMAP is the terrain preprocessor program; AERMET is the typical, overland meteorological data preprocessor; and AERMOD includes the dispersion modeling algorithms. However, development of the AERMET pre-processor was dependent upon the diurnal cycle of solar heating over land. AERMET will not adequately calculate the boundary layer parameters over a marine environment because the ocean does not respond the same to diurnal heating and cooling effects. Therefore, the Project proposes the AERCOARE meteorological processor and overwater meteorological data for use in AERMOD.

AERCOARE is essentially the overwater counterpart to AERMET. As stated in the AERCOARE User's Guide, the combination of AERCOARE and AERMOD may eventually replace the current regulatory approach for offshore projects, the Offshore and Coastal Dispersion (OCD) model, because OCD has not been updated for many years and does not reflect the latest scientific advancements found in AERMOD.[4] In addition, OCD does not provide model output in a form suitable for comparison to the statistical basis of some of the newer NAAQS.

Pursuant to Section 3.2.2 of 40 CFR 51, Appendix W, a request for approval for the use of AERCOARE as an alternate model to the preferred OCD model was submitted to USEPA Region 6 on September 14, 2018. The letter provides detailed justification for why AERMOD-COARE is a more suitable model than OCD for the Project. AERCOARE applies the Coupled Ocean Atmosphere Response Experiment (COARE) air-sea flux algorithm to overwater meteorological measurements to estimate surface energy fluxes and assembles these estimates and other measurements for subsequent dispersion model simulations with AERMOD.

AERMOD is the most appropriate dispersion model for calculating ambient concentrations from the facility, based on the model's ability to incorporate multiple sources and source types. The model can also account for convective updrafts and downdrafts and meteorological data throughout the plume depth. The model also provides parameters required for use with up-to-date planetary boundary layer parameterization. In addition, the model has the ability to incorporate building wake effects and calculate concentrations within the cavity recirculation zone. All model options will be selected as recommended in the USEPA Guideline on Air Quality Models.

Oris Solution's BEEST Graphical User Interface (GUI) will be used to run AERMOD. The GUI uses an altered version of the AERMOD code to allow for flexibility in the file naming convention. The dispersion algorithms of AERMOD are not altered. Therefore, there is no need for a model equivalency evaluation pursuant to Section 3.2 of 40 CFR 51, Appendix W.

In the event that the Applicant's request for the use of AERCOARE is not accepted by the USEPA, the Applicant will employ the Guideline OCD model. The OCD model is a straight-line, Gaussian model for flat terrain developed to determine the impact of offshore emissions from point, area, or line sources on the air quality of coastal regions. OCD incorporates over-water plume transport and dispersion as well as changes that occur as the plume crosses the shoreline. OCD incorporates over-water and overland turbulence intensities. The model features drilling platform building downwash, partial plume penetration into elevated inversions, direct use of turbulence intensities for plume dispersions, interaction with overland internal boundary layer, and continuous shoreline fumigation.

4.2 MODEL CONTROL OPTIONS AND LAND USE

AERMOD will be run in the regulatory default mode for all pollutants, with the possible exception of nitrogen dioxide (NO_2). The NO_2 modeling may include the non-regulatory default Plume Volume Molar Ratio Method (PVMRM) or Ozone Limiting Method (OLM). This non-default option is discussed in more detail in Section 5.7 of this protocol.

The default rural dispersion coefficients in AERMOD will be used because the area within 1.7 nautical miles (1.9 statute miles, or 3 kilometers) of the facility consists of water.

If OCD is employed, the following default dispersion options will be used:

- No terrain adjustments will be made (the closest shoreline is approximately 25 to 30 nautical miles (28.8 to 34.5 statute miles, or 46.3 to 55.6 kilometers);
- Stack tip downwash will not be employed;
- Buoyancy induced dispersion will not be employed; and
- Gradual plume rise will not be employed.

4.3 SOURCE DATA

4.3.1 SOURCE CHARACTERIZATION

Point Sources

The emission sources at the the faciliy that vent to stacks with a well-defined opening will be modeled as point sources.

Raincaps and Horizontal Releases

Any point source subject to building downwash that has a rain cap or that releases horizontally will be modeled in AERMOD using the recently promulgated Appendix W options POINTHOR or POINTCAP. If OCD is used, the exit velocity will be set to 0.01 meters per second (m/sec) and the actual stack diameter input. The exhaust gas temperature will be set to 0 Kelvin for any release point with an exhaust gas temperature that varies with the ambient temperature. The use of a 0 Kelvin release temperature allows the exhaust gas release temperature to vary with the ambient temperature. All source locations will be based upon a NAD83, UTM Zone 15 projection.

4.3.2 GOOD ENGINEERING PRACTICE STACK HEIGHT ANALYSIS

A Good Engineering Practice (GEP) stack height evaluation will be conducted to determine appropriate building (vessel) dimensions to include in the model and to calculate the GEP formula stack height used to justify stack height credit for stacks to be constructed in excess of 213 feet (65 meters). However, the Applicant does not anticipate stacks on the fixed platform in excess of 213 feet (65 meters). Procedures to be used will be in accordance with those described in the USEPA Guidelines for

Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations – Revised)[5]. GEP formula stack height, as defined in 40 CFR 51, is expressed as GEP $= H_b + 1.5L$, where H_b is the building height and L is the lesser of the building height or maximum projected width. For the proposed Project, the vessel height and projected width would be used. Building/structure locations will be determined from a facility plot plan. The structure locations and heights will be input to the USEPA's Building Profile Input Program (BPIP-PRIME) computer program to calculate the direction-specific building dimensions needed for AERMOD. If OCD is employed, direction-specific dimensions are not entered. A single building height and width are entered. The Applicant proposes to conservatively use the maximum building height and width, regardless of direction.

4.4 MONITORED BACKGROUND DATA

Ambient pollutant concentrations are needed to establish a representative background concentration to complete the NAAQS portion of the Source Impact Analysis of 40 CFR 52.21(k). The background concentrations are added to the modeled concentrations to account for sources not explicitly modeled before assessing NAAQS compliance. Ambient pollutant concentrations are also needed to fulfill the Air Quality Analysis requirement of 40 CFR 52.21(m).

The Project will use the "representative" background data approach from the USEPA May 2014 $PM_{2.5}$ guidance for all criteria pollutants (USEPA 2014) rather than rely on any significant monitoring concentration (SMC) exclusion. There are many existing onshore ambient monitors that can be used to establish background pollutant concentrations (Figure 3). Given the more urban and industrial setting of many of the onshore monitoring sites compared to the relatively isolated nature of the offshore location, data from the onshore monitors will be a highly conservative representation of the offshore ambient background. Existing monitoring data will be evaluated in relation to the criteria provided in USEPA's Ambient Monitoring Guidelines[6] as being representative of the SPOT Project site and proposed for use in both the Source Impact Analysis and the Air Quality Analysis requirements. Pursuant to the guidelines, the ambient data will be evaluated based on quality, location, and how current the data are.

4.5 RECEPTOR DATA

Modeled receptors will be placed in all areas considered as "ambient air," pursuant to 40 CFR 50.1(e). Ambient air is defined as that portion of the atmosphere, external to buildings, to which the general public has access. Public access over water, as is the situation with the SPOT Project, will be established based upon a safety zone as defined by the USGS. The USCG has not yet formally established a safety zone boundary for the Project; therefore, for the purpose of this protocol, the Applicant assumes a typical 1,640 feet (500 meter) safety zone boundary.

Since the Project would consist of a platform and two mooring locations separated from the platform by 5,200 feet (1,585 meters), three radii were used to establish a preliminary modeled boundary. A 1,640-foot (500-meter) radius boundary was used around the platform. For each mooring location, a 3,534-foot (1,078-meter) radius boundary was used. This boundary is equal to the distance of the mooring point to the crude oil carrier 899 feet (274 meters) plus the length of the crude oil carrier 997 feet (304 meters) plus the 1,640-foot (500-meter) safety zone.

Figure 3 Monitors in the Vicinity of the Proposed Project

Approximately 12,000 receptors will be used in the AERMOD (or OCD, if required) significant impacts analysis (SIA) (Figure 4). The receptor grid will consist of two cartesian grids. The first cartesian grid will extend to approximately 1.6 statute miles (2.57 kilometers) from the SPOT model boundary in all directions. Receptors in this region will be spaced at 328-foot (100-meter) intervals. The second grid will extend to 4.7 statute miles (7.56 kilometers). Receptor spacing in this region will be 656 feet (200 meters). The receptor grid is designed such that maximum facility impacts fall within the 328-foot (100-meter) spacing of receptors. If maximum impacts are identified outside the 328-foot (100-meter) grid, the impacts will be refined to 328 feet (100 meters). In addition, if significant impacts are identified at the perimeter of the grid, the grid will be extended to ensure that concentrations are below significance at the edge of the grid. Since all receptors are located over water, terrain elevations will be assigned an elevation of 0 meters (i.e., sea level) and AERMAP will not be run.

4.6 METEOROLOGICAL DATA

RTP Environmental Associates, Inc. (RTP) has obtained the 2013-2015 simulated annual meteorology using the Weather Research and Forecasting (WRF) model at a 7.5-statute-mile (12-kilometer) horizontal resolution for the continental United States. The WRF data were distributed by the USEPA to various federal and state agencies. RTP obtained the datasets from the Planning and Support Program of the Georgia Department of Natural Resources. The WRF meteorological fields have been processed using the Mesoscale Model Interface Tool (MMIF) to generate the input files for AERCOARE.

MMIF was used to extract the WRF data at a point central to the two contemplated DWP locations. MMIF does not interpolate between the WRF grid points to the exact point requested in the control file. It simply uses the single grid cell containing the requested point. The meteorological conditions at that point are used as AERCOARE input. MMIF default processing options will be employed, as shown on Figure 5 below.

The WRF data will provide a much more reliable dataset than data processed from overwater hourly meteorological data obtained from the National Oceanic and Atmospheric Administration's (NOAA's) National Data Buoy Center. The buoy data are often incomplete; a complete dataset must be constructed by substituting the data surrounding buoys and interpolating values for missing hours from existing data. AERCOARE will be run with the inputs shown on Figure 6. MIXOPT 1 will be employed. In this method, the mechanical mixing height is calculated from the friction velocity using the Venketram Method and the convective mixing height is taken from observations in the overwater meteorological file. AERCOARE writes AERMOD-ready "SFC" and "PFL" input files using output from the COARE algorithm and data from the overwater meteorological input file. All AERCOARE default settings will be used.

If OCD is used, the OCD Group 2, 5-year (2000-2004) OCD5 meteorological data file will be used. These data were developed by Minerals Management Service (MMS) using PCRAMMET from surface and upper air data from Corpus Christi and overwater data from buoy 42019. This buoy is located approximately 39 statute miles (62.8 kilometers) to the southwest of the Project location. Additional information on how these data were processed can be found in the MMS report.[7]

Wind roses have been prepared for both the extracted WRF data and the data from buoy 42019 (as obtained from the MMS OCD5 meteorological dataset) and are shown on Figure 7. The wind roses show that the frequency of occurrence of wind speed and direction are similar for the two data sets. The WRF data therefore provide an accurate representation of the wind speed and wind direction at the proposed SPOT site.

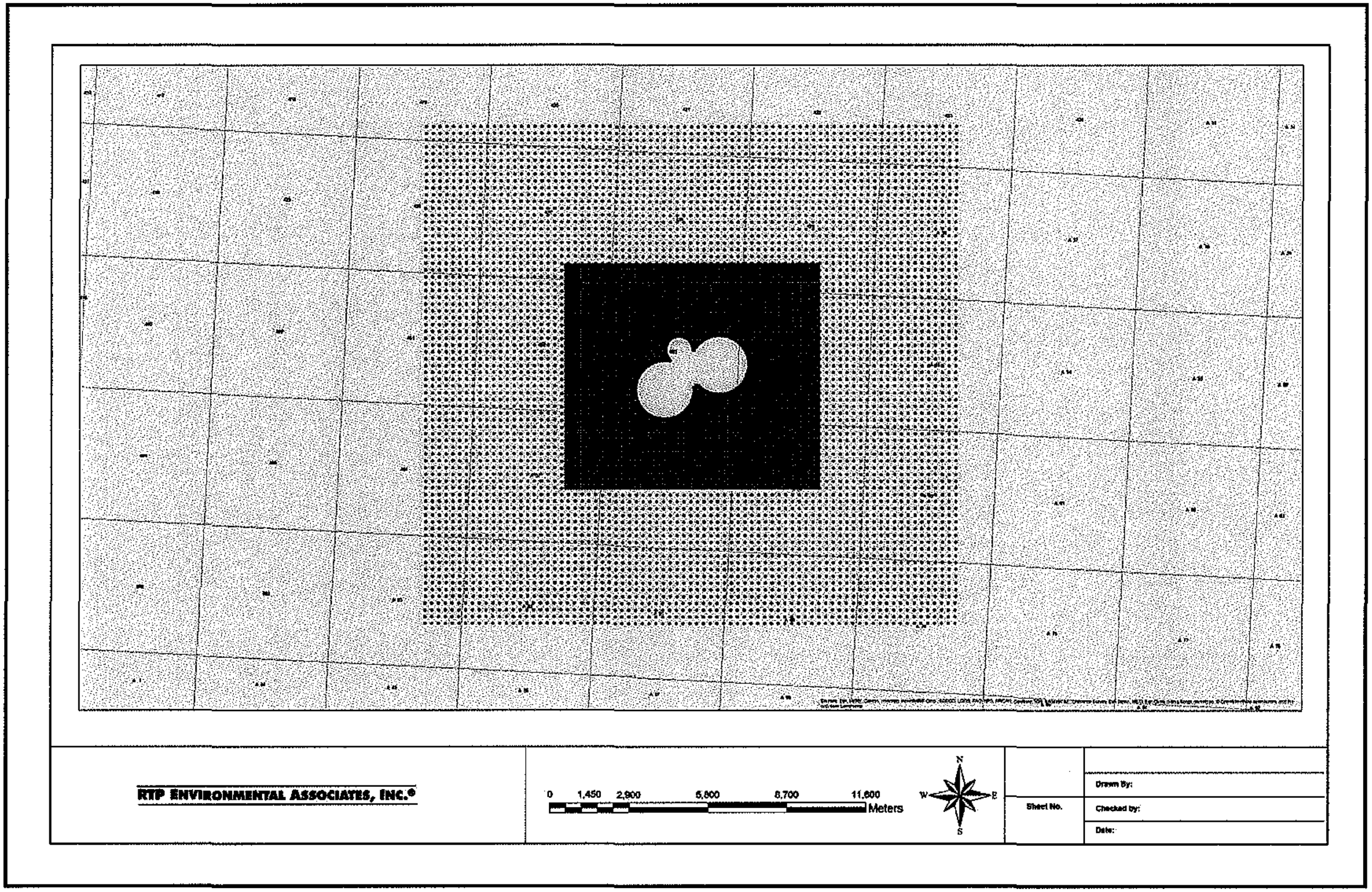


Figure 4 Receptors Used in the Significant Impact Analysis for SPOT

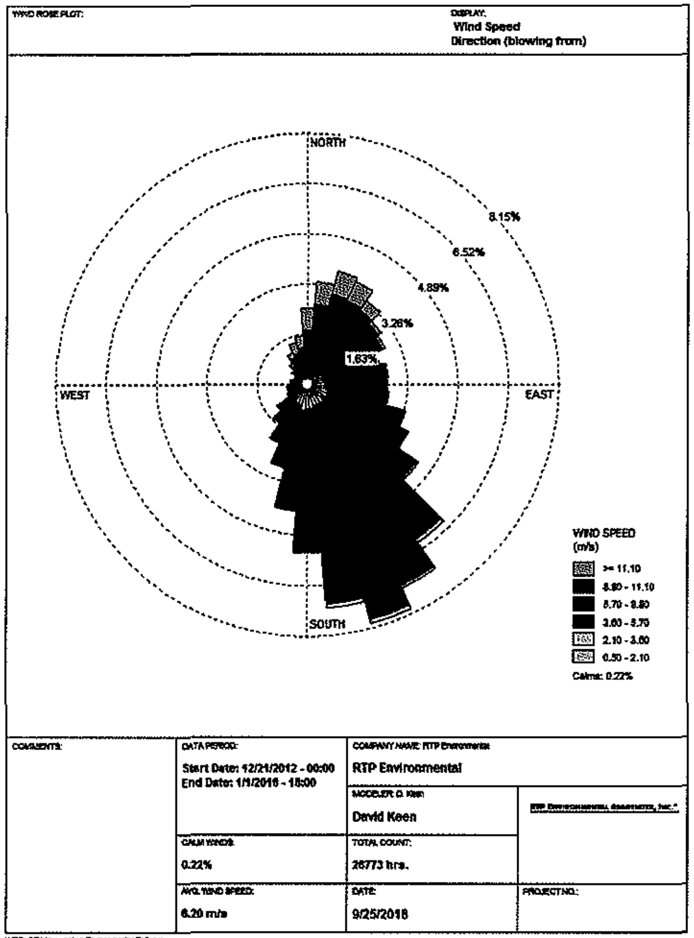
```
START   2012 12 31 00
STOP    2014 01 01 00
#GRID    LATLON 27.540 -95.907 29.366 -93.888
POINT   LATLON 28.458 -95.033 -6
AER_MIN_SPEED 0.5
OUTPUT AERCOARE USEFUL aercoare_2013.inp
OUTPUT AERCOARE DATA aercoare_2013.csv

INPUT D:\WRF\2013\wrfout_d01_2012-12-21_00_00_00
INPUT D:\WRF\2013\wrfout_d01_2012-12-22_00_00_00
INPUT D:\WRF\2013\wrfout_d01_2012-12-23_00_00_00
INPUT D:\WRF\2013\wrfout_d01_2012-12-24_00_00_00
INPUT D:\WRF\2013\wrfout_d01_2012-12-25_00_00_00
INPUT D:\WRF\2013\wrfout_d01_2012-12-26_00_00_00
INPUT D:\WRF\2013\wrfout_d01_2012-12-27_00_00_00
INPUT D:\WRF\2013\wrfout_d01_2012-12-28_00_00_00
```

Figure 5 Example MMIF Control File for 2013

```
aercoare_2013.csv        ! input met file
aercoare_2013.sfc        ! output sfc file
aercoare_2013.pfl        ! output pfl file
aercoare_2013.out        ! output listing/debug file
  28.481        ! lat (degN)
  94.996        ! lon (degW)
 6              ! time zone (pos for western himisphere)
600.            ! mix height (m) for COARE gustiness calc
25.             ! min mix height (m)
5.              ! min abs(monin-obukhov length) (m)
0.5             ! calms threshold (m/s) winds < this are calm
0.01            ! default vert pot temp gradient (degC/m)
10.0            ! default buoy wind measurement height (m)
2.0             ! default buoy temp measurement height (m)
2.0             ! default buoy RH measurement height (m)
0.002           ! default buoy water temp depth (m)
1               ! mix ht opt (0-obs for zic & zim),1-obs for zic, venk zim;
0               ! warm layer (1-yes, 0-no)
0               ! cool skin (1-yes, 0-no)
0               ! 0=Charnock,1=Oost et al,2=Taylor and Yelland
'end',1,0,0     ! 'variable', scale, min, max
```

Figure 6 Example AERCOARE Control File for 2013



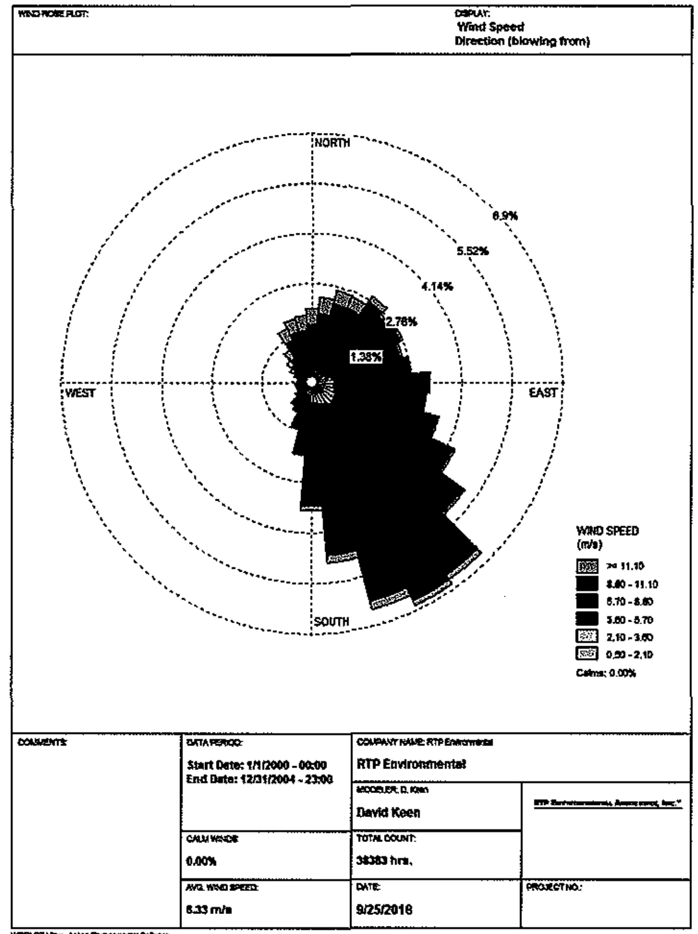


Figure 7 Wind Rose for the 2013-2015 WRF Extraction (Left) and 2000-2004 Buoy 42019 (Right)

5 MODELING METHODOLOGY

5.1 POLLUTANTS SUBJECT TO REVIEW

The regulated NSR pollutants with emissions increases exceeding the PSD SERs are subject to PSD review and will be evaluated. Impacts will initially be compared to the Significant Impact Levels (SILs). Pollutants with impacts in excess of the SIL will be evaluated for both NAAQS and increment compliance. In addition, emissions of the chemical species subject to the MERA health effects analysis will be modeled. Potential ozone impacts will be evaluated using the Modeled Emission Rate for Precursor (MERP) approach rather than modeling. Additionally, based on discussion with USEPA Region 6, a NAAQS analysis will be performed for the criteria pollutants with emissions below the SERs. The NAAQS demonstration will be made via screening techniques that may or may not include modeling, as discussed in Section 2.

5.2 LOAD/OPERATING CONDITIONS

For any units that may operate at a reduced load, a range of load conditions will be evaluated to identify the load condition that results in the worst-case impact for each averaging period of concern. The emission rates and flow conditions associated with each load will be modeled. The condition resulting in the worst-case impacts will be carried forward for the remainder of the analysis.

5.3 SIGNIFICANT IMPACT ANALYSIS

The analysis of the criteria pollutants with emissions in excess of the SER will be conducted in two phases: (1) an initial or significant impact analysis; (2) and a refined phase including an increment analysis and a NAAQS analysis. In the significant impacts analysis, the calculated maximum impacts will be determined for each pollutant. Three years of meteorology will be modeled. Maximum modeled concentrations will be compared to the pollutant-specific significance levels for all pollutants and averaging times except for the 1-hr NO_2, 24-hr $PM_{2.5}$ and annual $PM_{2.5}$ impacts. The 3-year average of the maximum impact at each receptor will be used to assess significance for these pollutants and averaging times.

Pollutants with impacts that exceed the ambient air significance levels, as defined in 40 CFR 51.165, will be included in both the NAAQS and increment analyses. The PSD Class II Significant Impact Levels are listed in Table 1.

Table 1 PSD Class II Significant Impact Levels

Pollutant	Averaging Time	PSD Class II SILs (µg/m³)[a]
PM_{10}	24-hour	5.0
	Annual	1.0
$PM_{2.5}$	24-hour	1.2
	Annual	0.3
NO_2	1-hour	7.5[b]
	Annual	1.0
SO_2	1-hour	7.8[b]
	3-hour	25

Table 1 PSD Class II Significant Impact Levels

Pollutant	Averaging Time	PSD Class II SILs ($\mu g/m^3$)[a]
CO	1-hour	2,000
	8-hour	500

Notes:

[a] Please note that on January 22, 2013, the U.S. Court of Appeals for the District of Columbia Circuit Court granted a request from the U.S. Environmental Protection Agency (USEPA) to vacate and remand the $PM_{2.5}$ SILs as previously codified at 40 Code of Federal Regulations (CFR) 52.21(k)(2). The court decision did not affect the use of the SILs, as codified at 40 CFR 51.165(b)(2), in PSD modeling analyses. Justification for the use of SILs is provided in Section 5.3.1 of this protocol.

[b] There is no 1-hr NO_2 or SO_2 SIL promulgated at 40 CFR 51.165. Consistent with the June 28, 2010, and August 23, 2010, USEPA Policy Memorandi, an interim 1-hr NO_2 SIL of 4 parts per billion (ppb) (7.5 $\mu g/m^3$) will be used. Similarly, an interim 1-hr NO_2 SIL of 3 ppb (7.5 $\mu g/m^3$) will be used.

Key:

$\mu g/m^3$ = micrograms per cubic meters
CO = carbon monoxide
NO_2 = nitrogen dioxide
$PM_{2.5}$ = particulate matter less than 2.5 micrometers in diameter
PM_{10} = particulate matter less than 10 micrometers in diameter
PSD = Prevention of Significant Deterioration
SIL = Significant Impact Level
SO_2 = sulfur dioxide

5.4 NAAQS ANALYSIS

Following the determination of significant impacts, a refined air quality analysis to determine compliance with the NAAQS will be conducted. A refined analysis will be conducted to determine compliance with the NAAQS only for pollutants/averaging time combinations modeled as having significant impacts in the initial analysis. Three years of meteorological data will again be used in this analysis.

Impacts calculated by AERMOD will be added to concentrations from a representative, on-shore monitor and the resultant concentration compared to the NAAQS. Only the receptors showing a significant impact will be modeled. Each source's potential emission rate will be used. For the short-term NAAQS compliance demonstration, the following analysis would be performed:

- The highest-sixth-high modeled 24-hour PM_{10} concentration at each receptor over the 3-year meteorological dataset will be added to the maximum monitored 24-hour value to assess compliance.
- The 3-year average of the 98th percentile maximum daily 1-hour NO_2 and 24-hr $PM_{2.5}$ modeled values will be added to the background monitor values.
- For sulfur dioxide (SO_2), the 3-year average of the 99th percentile maximum daily 1-hour modeled value will be added to the background monitor value to assess compliance.
- The second-highest modeled concentration over the receptors for each year will be added to the maximum monitored carbon monoxide (CO) value to assess CO NAAQS compliance.

For the annual NAAQS compliance demonstration, the maximum modeled annual impacts of NO_2 and $PM_{2.5}$ will be added to the maximum monitored values used to assess compliance with the annual standards. The NAAQS are shown in Table 2.

Table 2 National Ambient Air Quality Standards

Pollutant	Averaging Time	Ambient Air Quality Standards (µg/m³) Primary	Secondary
PM_{10}	24-hour	150	150
$PM_{2.5}$	24-hour	35	35
	Annual	12	15
NO_2	1-hour	188	--
	Annual	100	100
SO_2	1-hour	196	--
	3-hour	--	1,300
CO	1-hour	40,000	--
	8-hour	10,000	--

Note:
Source: 40 CFR Part 50
Key:
µg/m³ = micrograms per cubic meters
CO = carbon monoxide
NO_2 = nitrogen dioxide
$PM_{2.5}$ = particulate matter less than 2.5 micrometers in diameter
PM_{10} = particulate matter less than 10 micrometers in diameter
SO_2 = sulfur dioxide

If the OCD model is used, the model does not calculate concentrations in the statistically based form of the 1-hour NO_2 and SO_2 standards or the 24-hour $PM_{2.5}$ standard. For these pollutants and averaging times, the overall eighth- and fourth-highest values may conservatively be used or the Applicant may develop a program to post-process the results into the correct form for comparison to the standards.

5.5 PSD INCREMENT ANALYSIS

The increment consumption analysis will include emissions from only the project sources. Compliance with the PSD increments will be based on cumulative impacts of the Project's sources. Only the receptors showing a significant impact will be modeled. The resultant impacts will be compared to the PSD Class II increment levels. The highest modeled annual averages will be used for evaluating compliance with the annual increments and the high-second-high values will be used for the evaluation of compliance with the short-term increments. The PSD Class II increments are shown in Table 3.

Table 3 PSD Class II Increments

Pollutant	Averaging Time	PSD Class II Increments ($\mu g/m^3$)
PM_{10}	24-hour	30
	Annual	17
$PM_{2.5}$	24-hour	9
	Annual	4
NO_2	Annual	25
SO_2	3-hour	512

Key:
$\mu g/m^3$ = micrograms per cubic meters
NO_2 = nitrogen dioxide
$PM_{2.5}$ = particulate matter less than 2.5 micrometers in diameter
PM_{10} = particulate matter less than 10 micrometers in diameter
PSD = Prevention of Significant Deterioration
SO_2 = sulfur dioxide

5.6 NO_2 ANALYSES

Following USEPA guidance, the AERMOD NO_2 modeling analyses will use the recommended three-tier screening approach. Initially, Tier 1 will be employed with the conservative assumption that 100 percent of the available nitrogen oxide (NO_X) converts to NO_2. If NO_2 impacts exceed the SILs, the Tier 2 (Ambient Ratio Method, or ARM2) will be employed with the USEPA's recommended minimum and maximum NO_2/NO_X ratios of 0.5 and 0.9, respectively.

Tier 3 may be employed in the AERMOD NAAQS evaluation. Tier 3 accounts for the chemical reactions that convert NO_X to NO_2 in the presence of ozone. If OCD is employed, an Ambient Ratio of 0.9 will conservatively be employed outside of the model calculations.

5.6.1 TIER 3 OPTION

There are two Tier 3 methods currently available in AERMOD for simulating this conversion: OLM and PVMRM. Use of either technique will be in consultation with USEPA Region 6. The required NO_2/NO_X in stack ratios will be obtained from the equipment vendors or developed from published data. An in-stack ratio of 0.50 will be assumed where this information is not available. In addition, a NO_2/NO_X equilibrium ratio of 0.90 will be employed.

5.6.2 INTERMITTENT EMISSIONS

Emissions from sources that emit intermittently (i.e., emergency generators, firewater pumps, and startups and shutdowns) will be modeled in the 1-hour NO_2 analysis pursuant to the March 1, 2011, USEPA guidance. Pursuant to this guidance, any source with emissions that does not have the potential to significantly contribute to the annual distribution of the daily maximum concentrations would either be excluded from the analysis or the emissions would be based on an average hourly rate, rather than the maximum hourly rate. Sources that are not likely to contribute include those with an emission duration of less than 100 hours per year.

5.7 SECONDARY $PM_{2.5}$ ANALYSES

In May 2014, the USEPA issued its final guidance for assessing primary and secondary formation of fine particulate matter ($PM_{2.5}$) in a NAAQS and increment compliance demonstration under PSD.[8] On June 5, 2018, at the USEPA Regional, State, and Local Modeler's Workshop, the USEPA announced changes to the 2014 Guidance. The USEPA now outlines two cases for assessing the primary and secondary $PM_{2.5}$ impacts. The appropriate case to use depends on the magnitude of direct $PM_{2.5}$ and precursor NO_2 and SO_2 emissions. Case 1 is applicable if the emissions increase of both direct $PM_{2.5}$ and secondary NOx and SO_2 emissions are below the SER. Case 2 is applicable if the direct $PM_{2.5}$ emissions increase or the NO_X and/or SO_2 emissions increase is greater than the respective SER. Case 2 could be applicable to the Project if the direct $PM_{2.5}$ emissions exceed 10 tons per year and NO_X emissions exceed 40 tons per year. In this case, a $PM_{2.5}$ compliance demonstration is required for the direct $PM_{2.5}$ emissions based on approved dispersion modeling techniques. The potential impact of the precursor emissions must also be evaluated. The potential precursor emissions impact on secondary $PM_{2.5}$ formation can be based on the MERP approach[9], or may be a full quantitative photochemical grid modeling exercise.

The proposed Project would model the direct $PM_{2.5}$ emissions using approved dispersion techniques and will use the MERP approach to estimate the secondary $PM_{2.5}$ contribution from both NO_X and SO_2 emissions.

5.8 OZONE ANALYSIS

Currently, there are no regulatory photochemical models available to evaluate smaller spatial scales or single-source impacts on ozone concentrations. Since ozone is formed from precursor pollutants, assessment of ambient ozone impacts is typically conducted on a regional basis using resource-intensive models, such as the USEPA Community Multiscale Air Quality (CMAQ) model. However, sources subject to PSD review are required to conduct a source impact analysis and demonstrate that a proposed source will not cause or contribute to a violation of any NAAQS or applicable increment. Qualitative ozone analyses typically have been performed in recent PSD applications to evaluate whether ozone precursor emissions (NO_X and VOC) will significantly impact regional ozone formation.

The proposed Project has the potential to exceed the SER for VOCs. The Project's ozone precursor emissions will be evaluated under the USEPA's MERP guidance to demonstrate that the Project will not result in quantifiable ozone formation.

5.9 STATE HEALTH EFFECTS ANALYSIS

The modeled concentrations of crude with a benzene concentration of less than 1 percent will be compared to the ESLs shown in Table 4. If the maximum impacts are below the ESLs, no further analyses will be conducted.

Table 4 Health Effects Review — Effects Screening Levels

Pollutant	CAS No.	Averaging Period	ESL (µg/m³)
Crude, benzene <1%PM_{10}	64741-45-5	1-hour	3500
	Annual	Annual	350

Key:
µg/m³ = micrograms per cubic meters
PM_{10} = particulate matter less than 10 micrometers in diameter

6 ADDITIONAL IMPACTS ANALYSIS

A complete PSD permit application must also contain an evaluation of the impacts of proposed new and/or modified sources on soils and vegetation, visibility, and a growth analysis.

6.1 SOILS AND VEGETATION ANALYSIS

The potential impacts of the proposed Project on the soils and vegetation in the Project's impact area must be considered. Since the location of the proposed Project will be 25 to 30 nautical miles (28.8 to 34.5 statute miles, or 46.3 to 55.6 kilometers) from any coastline, no significant impacts from the proposed Project on soils or vegetation are expected.

6.2 VISIBILITY ANALYSIS

In addition, a Class II visibility analysis will be conducted using the VISCREEN model. The distance to the closest nearby Class II park, the San Bernard National Wildlife Refuge, will be used as an indicator for potential Class II visibility impacts. First-level screening values of 1.00 for the color parameter (delta E) and 0.02 for the contrast parameter (C) will be used. A background visible range of 12.4 statute miles (20 kilometers) will also be used. This background visual range is recommended as the default value according to USEPA's Workbook for Plume Visual Impact Screening and Analysis.[10]

6.3 GROWTH ANALYSIS

The growth analysis includes an evaluation of the potential for the Project to induce industrial, commercial, and residential growth and associated emissions. Any industrial, commercial, and residential growth is expected to occur at onshore locations beyond 28.8 to 34.5 statute miles, or 46.3 to 55.6 kilometers) from the Project. Onshore industrial growth would include the interconnection to existing pipeline and the additional storage facility and pumping facility. No commerical growth or concentrated residential growth are expected due to the proposed Project. A qualitative discussion will be provided to address the growth analysis.

7 CLASS I AREA IMPACTS AND CLASS II

7.1 CLASS I AQRV ANALYSIS

There are no Class I areas located within 373 miles (600 kilometers) of the proposed Project. The closest Class I area is Breton Wildlife Refuge, which is located approximately 382 miles (615 kilometers) to the east. Therefore, no Class I analysis will be conducted.

7.2 CLASS I INCREMENT ANALYSIS

Given the distance between the closest Class I area and the Project, no Class I increment analysis will be conducted.

8 MODEL REPORT DATA ELEMENTS

A modeling report documenting the procedures and the results of the analysis will be included in the PSD permit application. The report will include summary tables of results and a facility plot plan showing emission release locations and structures. The plot plan will be drawn to scale. Computer-generated modeling results files, as well as all model and BPIP input files and meteorological data files, will be submitted electronically.

9 REFERENCES

[1]. Texas Commission on Environmental Quality (TCEQ), Air Permits Division. 2018. Modeling and Effects Review Applicability (MERA). APDG 5874. March 2018.

[2]. U.S. Environmental Protection Agency (USEPA), Office of Air Quality Planning and Standards 2017. Guidelines on Air Quality Models, (Revised). Appendix W of 40 CFR 51. November 9, 2005. Update with Appendix W, January 27, 2017.

[3]. U.S. Bureau of Ocean Energy Management. 2018. GOMR Air Dispersion Modeling Guidelines. January 2018.

[4]. U.S. Environmental Protection Agency (USEPA), Region 10. 2012. User's Manual AERCOARE Version 1.0. EPA 910-R-12-008. October 2012.

[5]. U.S. Environmental Protection Agency (USEPA). 1985. Guideline for Determination of Good Engineering Practice Stack Height Technical Support Document for Stack Height Regulations (Revised). EPA-450/4-80-023R. June 1985.

[6]. U.S. Environmental Protection Agency (USEPA). 1987. Ambient Monitor Guidelines for Prevention of Significant Deterioration. EPA-450/4-87-007. May 1987.

[7]. U.S. Department of the Interior, Minerals Management Service (MMS). Five-Year Meteorological Datasets for CALMET/CALPUFF and OCD5 Modeling of the Gulf of Mexico Region, OCS Study. MMS 2008-029. July 2008.

[8]. U.S. Environmental Protection Agency (USEPA). 2014. Guidance for PM2.5 Permit Modeling. EPA-454/B-14-001. May 2014.

[9]. U.S. Environmental Protection Agency (USEPA). 2017. Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ under the PSD Permitting Program. December 02, 2016 with corrections February 23, 2017.

[10]. U.S. Environmental Protection Agency (USEPA). 1980. Workbook for Estimating Visibility Impairment. EPA Pub. No. 450/4-80-031. RTP, NC. November 1980.

APPENDIX J

AIR QUALITY MODELING ANALYSIS

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Sea Port Oil Terminal Project
Offshore Brazoria County, Texas

PREVENTION OF SIGNIFICANT DETERIORATION AIR DISPERSION MODELING REPORT

Prepared for:
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December 21, 2018

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ACRONYMS AND ABBREVIATIONS

Applicant	SPOT Terminal Services LLC
ARM	Ambient Ratio Method
bbl/h	barrels per hour
BOEM	Bureau of Ocean Energy Management
BPIP	Building Profile Input Program
CAA	Clean Air Act
CFR	Code of Federal Regulations
CMAQ	Community Multiscale Air Quality
CO	carbon monoxide
COARE	Coupled Ocean Atmosphere Response Experiment
DWP	deepwater port
DWPA	Deepwater Port Act of 1974, as amended
ESL	Effects Screening Level
GEP	Good Engineering Practice
GUI	Graphical User Interface
H_2S	hydrogen sulfide
MERA	Modeling and Effects Review
MERP	Modeled Emission Rate for Precursor
MMIF	Mesoscale Model Interface (Tool)
NAAQS	National Ambient Air Quality Standards
NAD83	North American Datum of 1983
NEPA	National Environmental Policy Act
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NO_X	nitrogen oxides
NO_X	nitrogen oxide
NSR	New Source Review
OCD	Offshore and Coastal Dispersion
OCS	Outer Continental Shelf
PM_{10}	particulate matter equal to or less than 2.5 micrometers
$PM_{2.5}$	particulate matter equal to or less than 10 micrometers
ppb	parts per billion

PSD	Prevention of Significant Deterioration
SER	significant emission rates
SIL	Significant Impact Level
SMC	significant monitoring concentration
SO_2	sulfur dioxide
SPM	single point mooring
SPOT	Sea Port Oil Terminal
TCEQ	Texas Commission on Environmental Quality
USCG	U.S. Coast Guard
USEPA	U.S. Environmental Protection Agency
UTM	Universal Transverse Mercator
VLCC	very large crude carrier
VOC	volatile organic compound
WRF	Weather Research and Forecasting

1 INTRODUCTION

SPOT Terminal Services LLC (the Applicant), a subsidiary of Enterprise Products Operating LLC, a Texas limited liability company, is proposing to develop the Sea Port Oil Terminal (SPOT) Project in the Gulf of Mexico to provide the United States with crude oil loading services on very large crude carriers (VLCCs) and other crude oil carriers for export to the global market. This document presents the procedures and results of the air quality dispersion modeling analysis conducted for the proposed SPOT DWP.

The analysis evaluated emissions of criteria pollutants regulated under Prevention of Significant Deterioration (PSD) regulations (40 Code of Federal Regulations [CFR] 52.21). The criteria pollutant analysis was conducted to ensure that the proposed Project will not cause or contribute to air pollution in violation of a National Ambient Air Quality Standard (NAAQS) or PSD increments. The analysis also evaluated the ambient impact of emissions of the chemical species subject to the Texas Commission on Environmental Quality (TCEQ) Modeling and Effects Review (MERA) process and the emissions of SO_2 subject to review under the TCEQs State Property Line Standards[1].

The analysis conforms with the modeling procedures outlined in U.S. Environmental Protection Agency's (USEPA) Guidelines on Air Quality Models[2] (Appendix W of 40 CFR 51), associated USEPA modeling policy and guidance, as well as the Bureau of Ocean Energy Management's (BOEM) modeling guidance[3]. The applicable air modeling requirements were discussed with USEPA Region 6 staff in meetings in Dallas, Texas on August 29, 2018 and on October 11, 2018, as well as in a conference call held on October 22, 2018. A detailed modeling protocol document was also submitted to USEPA Region 6 on October 5, 2018.

The Applicant is proposing use of an alternative model pursuant to Appendix W, as the preferred model (the Offshore and Coastal Dispersion [OCD] model) is less appropriate. OCD it is based on outdated science and cannot generate results in the form of the current statistically based standards. A separate justification letter was submitted to USEPA Region 6 on September 14, 2018, for use of the Coupled Ocean-Atmosphere Response Experiment (COARE) bulk flux algorithm, as implemented in the meteorological data processor program AERCOARE, to prepare the meteorological data for use in the analysis. This request was submitted pursuant to Section 3.0 and 3.2.2.a of Appendix W (see Section 4 for details).

2 PROJECT DESCRIPTION

The SPOT Project would have both onshore and offshore components. The TCEQ will issue the air permit for the onshore components. Onshore facilities were not included in this modeling analysis as the onshore components are over 50km away and constitute a minor source.

The Project would originate at the proposed Oyster Creek Terminal, owned and operated by Enterprise Products Operating LLC, in south Brazoria County, Texas, and would use two (2) new 36-inch (91.4-centimeter) outside diameter crude oil export pipelines from shore crossings to the offshore fixed platform. The SPOT deepwater port (DWP) would be located in federal waters within the Outer Continental Shelf (OCS) in Galveston Area Lease Blocks 463 and A-59, approximately between 27.2 and 30.8 nautical miles (31.3 and 35.4 statute miles, or 50.4 and 57.0 kilometers), respectively, off the coast of Brazoria County, Texas, in water depths of approximately 115 feet (35.1 meters) (Figure 1). The SPOT DWP Project would provide crude oil loading services for VLCCs and other crude oil carriers that may provide the transport of U.S. crude oil for export. Based on its current design, the SPOT Project would have the capability of loading VLCCs and other crude oil carriers at a rate of up to 85,000 barrels per hour (bbl/h). The SPOT DWP would allow for up to two (2) VLCCs or other crude oil carriers to moor at the single point mooring (SPM) buoys and connect with the buoys via hawser line. Floating connecting crude oil hoses and a floating vapor recovery hose are routed through the buoy to support crude oil loading. The maximum frequency of loading VLCCs would be up to 365 per year, although other smaller crude oil transport vessels may be loaded. The crude oils to be exported by the SPOT Project range from ultralight crude to light crude to heavy grade crude oil.

Under the provisions of the Deepwater Port Act (DWPA) of 1974, as amended, the USEPA is responsible for air permitting outside (seaward) of state jurisdictional boundaries. As such, USEPA Region 6 is responsible for permitting the SPOT Project's air emissions under the federal Clean Air Act (CAA). The primary pollutant to be emitted would be volatile organic compounds (VOCs) from crude oil loading. The SPOT DWP Project would also trigger PSD review for nitrogen oxides (NOx) and carbon monoxide (CO). Particulate matter (PM), sulfur dioxide (SO_2), and hydrogen sulfide (H_2S) would not exceed the PSD Significant Emission Rates (SER). However, emissions of these pollutants were included in the modeling analysis at the request of USEPA. The primary sources of emissions are expected to be the VOC control devices (i.e. three (3) vapor combustors) located on the fixed offshore platform. Platform-based other sources would include two (2) diesel engines for power generation, component fugitive emissions, and intermittent sources, such as two (2) firewater pump diesel engines, an emergency backup generator diesel engine, two (2) diesel engine stationary cranes, and one (1) vent boom for crude oil pigging activities on the platform. Mobile sources for National Environmental Policy Act (NEPA) evaluation would include combustion emissions from the VLCC engines, support vessels (tug boats, supply boats), and helicopter flights. The sources of emissions on the VLCCs and support vessels would be primarily from diesel-fired internal combustion engines and boilers.

The facility would be classified under the regulations governing PSD (40 CFR 52.21) and Title V (40 CFR 70.2) as a major stationary source of air pollution. USEPA Region 6 has requested an air quality demonstration for pollutants that trigger PSD review as well as for the pollutants that do not trigger PSD review (i.e., minor emissions). The proposed Project, as well as all sources located within 31 statute miles (50 kilometers) of the proposed Project site were modeled in assessing compliance with the NAAQS and increments for each pollutant with impacts in excess of the PSD Signifiant Impact Levels (SILs). Furthermore, the Applicant has modeled emissions of speciated VOCs (benzene) to demonstrate compliance with the TCEQ's Effects Screening Levels (ESLs), as well as H_2S and SO_2, to demonstrate compliance with the State Property Line Standards.

Document Path: M:\Miami\Enterprise_Oil_DWP\Maps\Mxds\Report\Air_Modeling\Figure 1 Proposed DWP Port Project.mxd

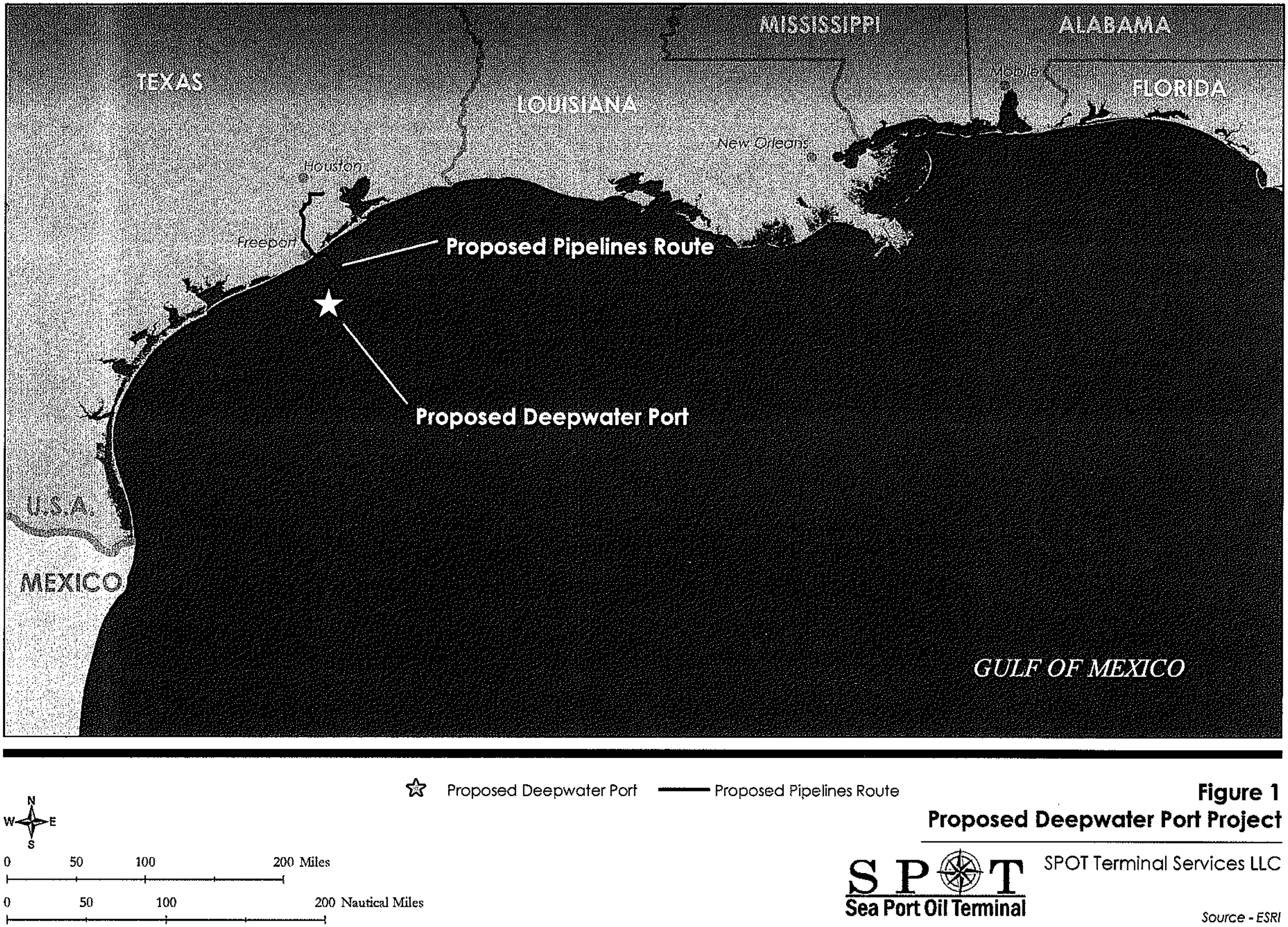

Figure 1
Proposed Deepwater Port Project

SPOT
Sea Port Oil Terminal

SPOT Terminal Services LLC

Source - ESRI

3 SITE DESCRIPTION

The SPOT DWP would be located in federal waters within the OCS in Galveston Area Lease Blocks 463 and A-59, approximately between 27.2 and 30.8 nautical miles (31.3 and 35.4 statute miles, or 50.4 and 57.0 kilometers), respectively, off the coast of Brazoria County, Texas. The fixed platform would be located at Universal Transverse Mercator (UTM) coordinates 292,200 meters east and 3,151,500 meters north (UTM Zone 15, North American Datum of 1983 [NAD83]). Figure 1 shows the general location of the facility. Figure 2 provides a schematic illustrating the offshore/marine components for the SPOT DWP.

Document Path: M:\Miami\Enterprise_Oil_DWP\Maps\Mxds\Report\Air_Modeling\Figure 2 Schematic.mxd

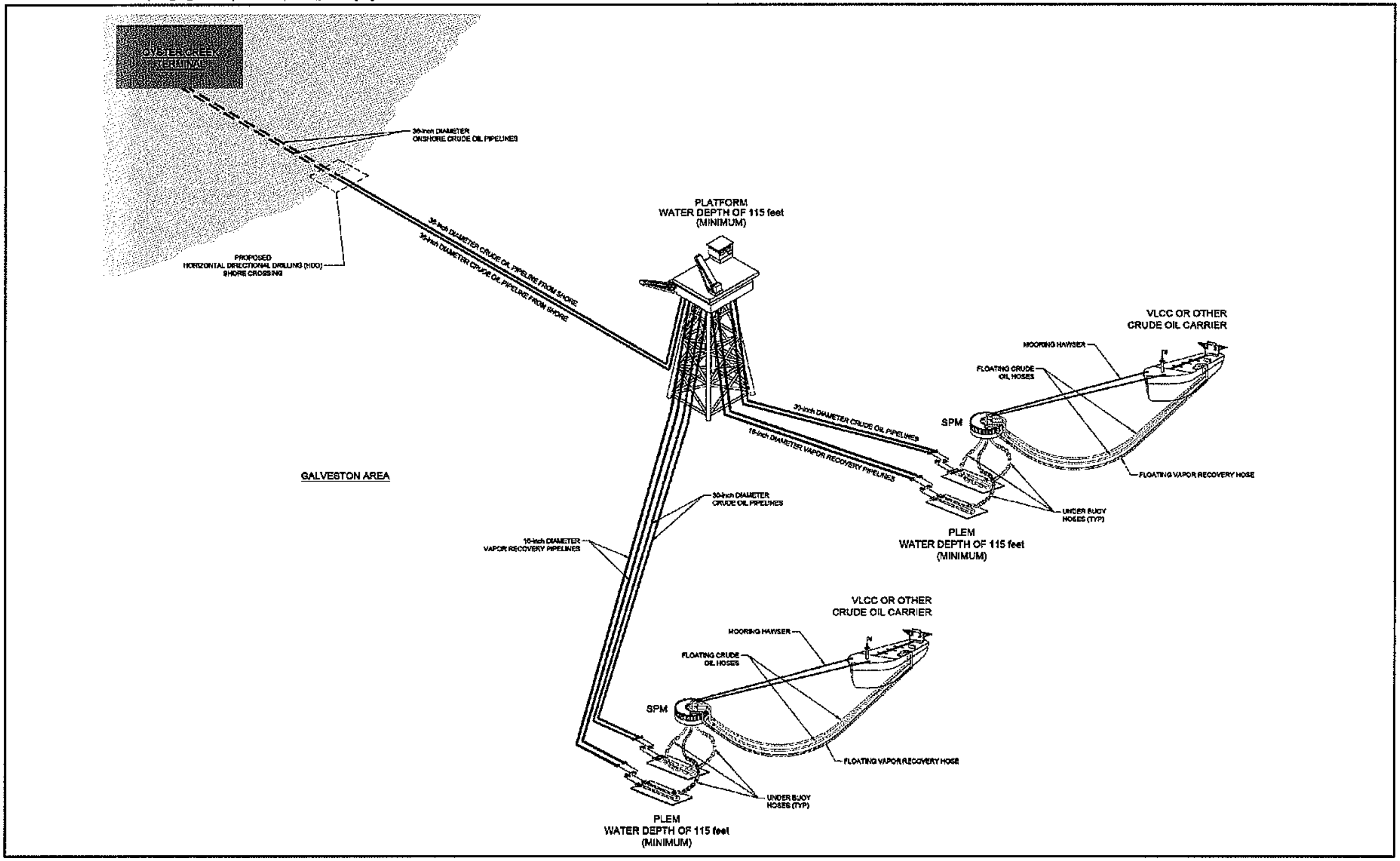

Figure 2

Proposed Deepwater Port Schematic

SPOT
Sea Port Oil Terminal

SPOT Terminal Services LLC

4 MODEL SELECTION AND MODEL INPUT

4.1 MODEL SELECTION AND JUSTIFICATION

The latest version of the AMS/EPA Regulatory Model (AERMOD-COARE, AERMOD Version 18081, AERCOARE Version D13108) was used to conduct the dispersion modeling analysis. AERMOD is a Gaussian plume dispersion model that is based on planetary boundary layer principals for characterizing atmospheric stability. The model evaluates the non-Gaussian vertical behavior of plumes during convective conditions with the probability density function and the superposition of several Gaussian plumes. AERMOD is a modeling system with three components:

- AERMAP is the terrain preprocessor program;
- AERMET is the typical, overland meteorological data preprocessor; and
- AERMOD includes the dispersion modeling algorithms.

However, development of the AERMET pre-processor was dependent upon the diurnal cycle of solar heating over land. AERMET will not adequately calculate the boundary layer parameters over a marine environment because the ocean does not respond the same to diurnal heating and cooling effects. Therefore, the AERCOARE meteorological processor was used to process overwater meteorological data for use in AERMOD.

AERCOARE is essentially the overwater counterpart to AERMET. As stated in the AERCOARE User's Guide, the combination of AERCOARE and AERMOD may eventually replace the current regulatory approach for offshore projects, the OCD model, because OCD has not been updated for many years and does not reflect the latest scientific advancements found in AERMOD.[4] In addition, OCD does not provide model output in a form suitable for comparison to the statistical basis of some of the newer NAAQS.

Pursuant to Section 3.2.2 of 40 CFR 51, Appendix W, a request for approval for the use of AERCOARE as an alternate model to the preferred OCD model was submitted to USEPA Region 6 on September 14, 2018. The letter provided detailed justification for AERMOD-COARE as a more suitable model than OCD for the SPOT DWP Project. AERCOARE applies the COARE air-sea flux algorithm to overwater meteorological measurements to estimate surface energy fluxes and assembles these estimates and other measurements for subsequent dispersion model simulations with AERMOD.

AERMOD is the most appropriate dispersion model for calculating ambient concentrations from the proposed SPOT DWP Project, based on the model's ability to incorporate multiple sources and source types. The model can also account for convective updrafts and downdrafts and meteorological data throughout the plume depth. The model also provides parameters required for use with up-to-date planetary boundary layer parameterization. In addition, the model has the ability to incorporate building wake effects and calculate concentrations within the cavity recirculation zone. All model options were selected as recommended in the USEPA Guidelines on Air Quality Models.

Oris Solution's BEEST Graphical User Interface (GUI) was used to run AERMOD. The GUI uses an altered version of the AERMOD code to allow for flexibility in the file naming convention. The dispersion algorithms of AERMOD are not altered. Therefore, there is no need for a model equivalency evaluation pursuant to Section 3.2 of 40 CFR 51, Appendix W.

4.2 MODEL CONTROL OPTIONS AND LAND USE

AERMOD was run in the regulatory default mode for all pollutants. The default rural dispersion coefficients in AERMOD were used because the area within three kilometers of the facility consists of water.

4.3 SOURCE DATA

4.3.1 SOURCE CHARACTERIZATION AND EMISSIONS

Point Sources

All emission sources at the facility that vent to stacks with a well-defined opening were modeled as point sources.

Fugitive Emissions

Fugitive emissions are those that are not emitted from a well-defined opening. Only benzene (subject to State Health Effects Review) would be emitted as a fugitive. The fugitive benzene emissions were modeled as a volume source. The initial dispersion coefficients (sigma y and sigma z) were calculated based on the dimensions of the area of release and the equations contained in Table 3-1 of the AERMOD User's Guide.

Potential hourly emission rates were modeled for all stationary sources, except the emergency engines, in assessing compliance with both short-term and annual standards. As discussed in Section 5.8, emissions from the emergency backup diesel generator and the two fire water pumps were modeled in the 1-hour NO_2 analysis based on an annual average hourly rate, rather than the maximum hourly rate.

The modeled input data and sigma y and z calculations as well as modeled emissions are provided in Attachment A. All source locations were based upon a NAD83, UTM Zone 15 projection.

4.3.2 GOOD ENGINEERING PRACTICE STACK HEIGHT ANALYSIS

A Good Engineering Practice (GEP) stack height evaluation was conducted to determine appropriate building (vessel) dimensions to include in the model and to calculate the GEP formula stack. Procedures used were in accordance with those described in the USEPA Guidelines for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations – Revised)[5]. GEP formula stack height, as defined in 40 CFR 51, is expressed as $GEP = H_b + 1.5L$, where H_b is the building height and L is the lesser of the building height or maximum projected width.

For the SPOT DWP Project, the height above sea level of each structure and a base elevation of zero (sea level) was conservatively input to the USEPA's Building Profile Input Program (BPIP-PRIME) computer program even though platform structures would reside on one of three platform levels and, therefore, essentially "hang" in the air and allow air flow underneath the structure. The building vertical dimensions are therefore conservatively overstated in BPIP. This method was employed since BPIP was not designed to calculate structure dimensions whose base is not at ground (sea) level.

4.3.3 MODELED POLLUTANT NAMES

Two pollutants were modeled for NO_2 and SO_2 as well as for $PM_{2.5}$ and PM_{10}. The pollutants named "NOx" and "SOx" were modeled for the annual standards and PSD increments. "NO_2" and "SO_2" were modeled for the NAAQS. Likewise, the pollutants named "$PM_{2.5}$" and "PM_{10}" were used to assess NAAQS compliance and the pollutants named "PMF" and "PMTEN" were used to assess complinace with the PSD increments. Different pollutant names for these pollutants were used due to the statistical form of the NAAQS and the requirement in AERMOD for use of specific pollutant names to allow for the appropriate calculations.

4.4 MONITORED BACKGROUND DATA

Ambient pollutant concentrations are needed to establish a representative background concentration to complete the NAAQS portion of the Source Impact Analysis of 40 CFR 52.21(k). The background concentrations are added to the modeled concentrations to account for sources not explicitly modeled before assessing NAAQS compliance. Ambient pollutant concentrations are also needed to fulfill the Air Quality Analysis requirement of 40 CFR 52.21(m).

Pursuant to 40 CFR 52.21(i)(5), pollutants with projected increases in ambient concentrations due to the SPOT DWP Project that are below the Significant Monitoring Concentrations (SMC) are exempt from the pre-application monitoring requirement under 40 CFR 52.21(m). As shown in Table 8, Section 7.1, the SPOT DWP would qualify for such exemption with respect to all listed pollutants because the maximum modeled impacts are less than the SMC. However, in light of the decision of the D.C. Circuit Court of Appeals in Sierra Club v. USEPA, out of an abundance of caution, the Applicant has elected not to rely on the exemption. Instead, the Applicant has elected to use existing ambient monitoring data in lieu of preconstruction monitoring data consistent with USEPA guidance on this issue.

The USEPA's Ambient Monitoring Guidelines[6], other USEPA interpretive guidance, and USEPA administrative decisions clarify that representative, existing air quality monitoring data may be used to fulfill the PSD pre-construction monitoring requirements and establish the background concentrations needed for assessing NAAQS compliance, in lieu of monitoring data from the precise area in the vicinity of the proposed source or modification. USEPA's Monitoring Guidelines suggest specific criteria to determine representativeness of off-site data: the quality of the data, how current the data are, and the monitoring location.

As shown in Figure 3, there are numerous air quality monitors within 62 miles (100 kilometers) of the proposed SPOT DWP, all onshore, that can be used to satisfy the requirements for ambient monitoring data. Existing monitoring data were evaluated in relation to the criteria provided in USEPA's Ambient Monitoring Guidelines as being representative of the SPOT DWP Project site and proposed for use in both the Source Impact Analysis of 40 CFR 52.21(k) and the Air Quality Analysis requirements of 40 CFR 52.21(m).

The 2015-2017, quality assured ozone data from the Galveston 99th Street monitor (AQS # 48-167-1034) was used to establish representative background$PM_{2.5}$, and NO_2 concentrations to fulfill the 40 CFR 52.21(k) and (m) requirements. The Texas City Ball Park monitor (AQS # 48-167-0005) was used for SO_2, the Houston Deer Park No. 2 monitor (AQS # 48-201-1039) was used for CO and PM_{10}, .and the Lake Jackson monitor (AQS #48-039-1016) was used for ozone.

The background values are provided in Table 1. These values are conservative over-estimates of the pollutant concentrations likely to be experienced within the SPOT DWP Project's modeling domain. The proposed SPOT DWP is located 31 miles (50 kilometers) offshore in a much more isolated environment. However, the existing monitoring data satisfy the criteria provided in the Ambient Monitoring Guidelines as being representative of the SPOT DWP site because the data satisfy the criteria for data quality, currentness, and location provided in the Ambient Monitoring Guidelines.

Figure 3 Monitors in the Vicinity of the Proposed Project

Table 1
Background Concentrations 2015-2017

Pollutant	Averaging Time	Design Value (ppb)[μg/m³]	Basis	Monitor Site Location
NO_2	1-hour	(29.8) [56.3]	Avg 98%	Galveston 99th Street (AQS #48-167-1034)
	Annual	(3.26) [6.16]	Avg	
$PM_{2.5}$	24-hour	[21.7]	Avg 98%	
	Annual	[7.2]	Avg	
CO	1-hour	(2.1) [2400]	Max	Houston Deer Park #2 (AQS #48-201-1039)
	8-hour	(1.2) [1372]	Max	
PM_{10}	24-hour	[70.3]	Avg H1H	
Ozone	8-hour	(65)	Avg 99%	Lake Jackson (AQS #48-039-1016)
SO_2	1-hour	(20.8) [55.5]	Avg 99%	Texas City Ball Park (AQS #48-167-0005)
	3-hour	[37.9) [101.2]	Max H1H	

Notes:
"Avg 98%" is the 3-yr average of the 98% (eighth highest) daily maximum values.
"Avg 99%" is the 3-yr average of the 99% (fourth highest) daily maximum values.
"Max H1H" is the maximum of the highest values over the three years.
"Avg H1H" is the average of the highest values over the three years.
Key:
μg/m³ = micrograms per cubic meter
CO = carbon monoxide
NO_2 = nitrogen dioxide
$PM_{2.5}$ = particulate matter equal to or less than 2.5 micrometers in diameter
PM_{10} = particulate matter equal to or less than 10 micrometers in diameter
ppb = parts per billion
SO_2 = sulfur dioxide

4.4.1 DATA QUALITY

The monitor data were collected and quality assured by the TCEQ.

4.4.2 CURRENTNESS OF DATA

The data were collected during 2015-2017 and represent the most recent quality assured data available for use in assessing compliance.

4.4.3 MONITOR LOCATION

Of the monitors available, these monitors represent background concentrations, as they are the closest monitors with data for the pollutants of concern that are not also significantly influenced by the localized source impacts. The monitors also offer conservative representations of the pollutant concentrations offshore as the offshore location of the SPOT DWP would be absent pollutant generating activities.

4.5 RECEPTOR DATA

Modeled receptors were placed in all areas considered as "ambient air," pursuant to 40 CFR 50.1(e). Ambient air is defined as that portion of the atmosphere, external to buildings, to which the general public has access. Public access over water, as is the situation with the SPOT DWP Project, was established based upon a safety zone as defined by the United States Coast Guard (USCG). The USCG has defined the safety zone for the SPOT DWP Project as 3,140-foot (957-meter) radius centered on each of the east and west buoys and a 1,640-foot (500-meter) radius centered on the platform.

Approximately 17,300 receptors were used in the AERMOD analysis. Figure 4 shows the near field receptor grid modeled. The receptor grid consists of three cartesian grids and receptors spaced at100 meters along the safety zone boundary. The first cartesian grid extends to 2,500 meters from the safety zone in all directions. Receptors in this region were spaced at 100-meter intervals. The second grid extends from 2,500 to 7,500 meters. Receptor spacing in this region were spaced at 250m. The third grid extends from 7,500 to 20,000 meters with receptors spaced at 500 meters. The receptor grid is designed such that maximum facility impacts fall within the 100-meter spacing of receptors and such that impacts for all pollutants were less than the SIL at the receptor grid boundary. Since all receptors are located over water, terrain elevations were assigned an elevation of 0 meters (i.e., sea level) and AERMAP was not run.

4.6 METEOROLOGICAL DATA

Overwater hourly meteorological data, as obtained from the National Oceanic and Atmospheric Administration (NOAA) National Data Buoy Center for 2012 through 2017 were used in the analysis. AERCOARE requires measurements of wind speed, wind direction, air and sea temperature, atmospheric pressure, wave height, and wave period. These data were obtained from the NOAA website. The required relative humidity values were calculated from buoy measurements of dew point temperature and dry bulb temperature. The closest buoy with sufficient, current meteorological measurements is Buoy 42035. Other nearby buoys either did not monitor all the required meteorological parameters, did not have historical measurements, or the data records did not meet the 90% by quarter completeness criterion of the USEPA's Meteorological Monitoring Guidance.[7]

Buoy 42035 is located 22 nautical miles (25.3 statute miles, or 40.7 kilometers) east of Galveston, Texas, and 32 nautical miles (59.3 statute miles, or 36.8 kilometers) northeast of the SPOT DWP. Prior to substitution, the data from this buoy met the 90% by quarter completeness criterion for all required meteorological parameters except for dew point temperature. No other buoy had a sufficient number of valid hours recorded to meet the completeness criterion for more than three of the most recent five years. Dew point temperature is not used by the model. However, it is used to calculate relative humidity, which is used by the model. There is a 7-month period in 2015 with missing dew point temperature. Additionally, the dew point temperature is missing for most of 2016. Therefore, dew point temperature was substituted with data from a nearby buoy (42019) for most of these missing observations. However, all nearby buoys are missing dew point temperature for about a one month period from June 16 to July 27 in 2015. For this month, the relative humidity data, as extracted by the Mesoscale Model Interface (MMIF) Tool as centered on the project location from the Weather Research and Forecasting (WRF) data, were used. Missing periods of 3 hours or less were filled in with the average of the last hour of valid data and the next hour of valid data. The nearby buoys are shown in Figure 5. The buoy 42035 data completeness evaluation results are shown in Table 2.

AERCOARE writes AERMOD-ready "SFC" and "PFL" input files using output from the COARE algorithm and data from the overwater meteorological input file. Mixing heights are not predicted by AERCOARE; however, AERCOARE provides an option for the calculation of mechanical mixing heights using the same method employed by AERMET. MIXOPT 1 was employed. In this method, the mechanical mixing height is calculated from the friction velocity using the Venketram Method and the convective mixing height is assumed equal to the mechanical mixing height. The AERCOARE input file for 2012 is shown in Figure 6. A wind rose of the 5-year overwater meteorological dataset is provided in Figure 7.

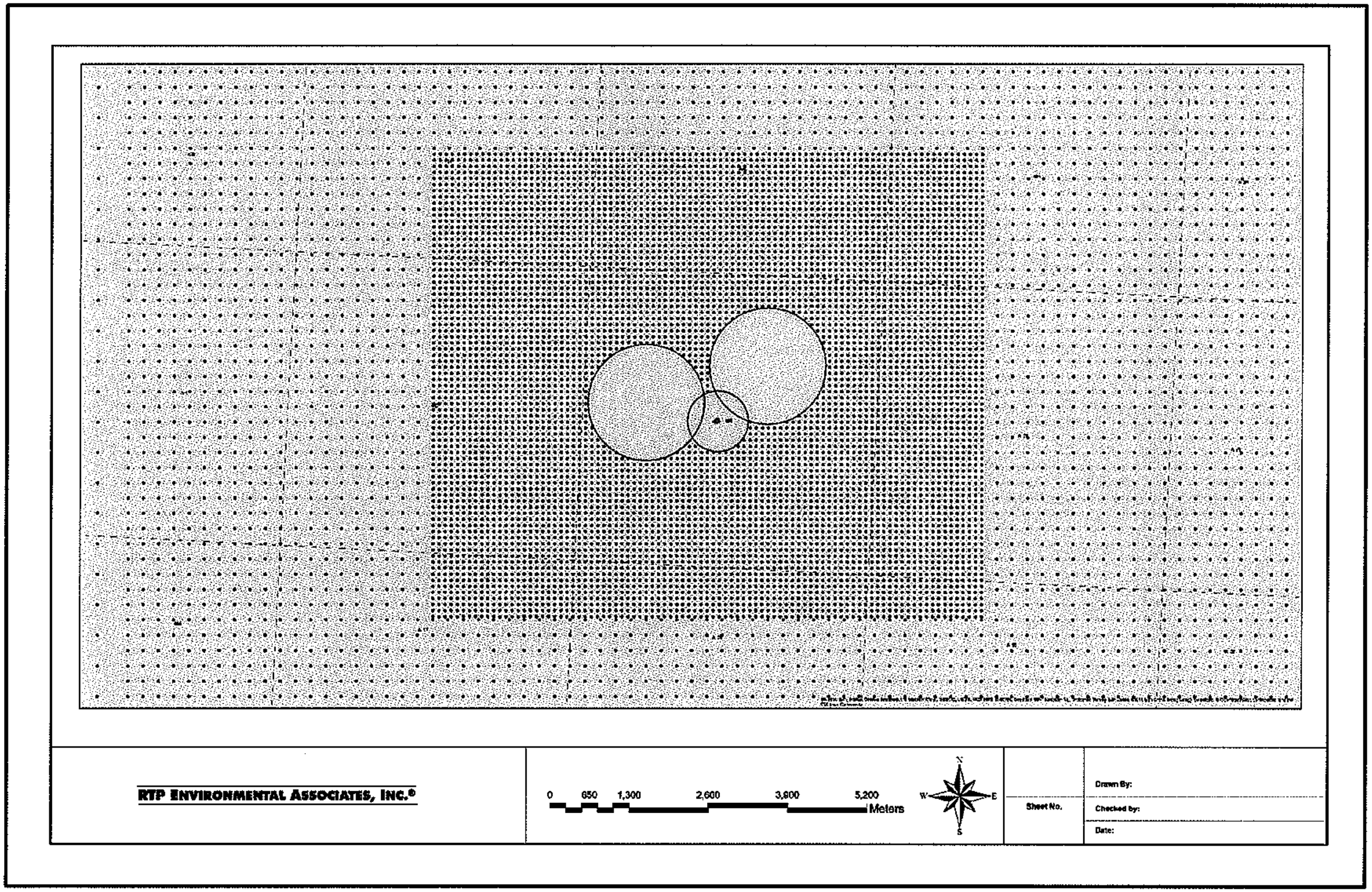

Figure 4 Nearfield Receptors Used in the SPOT DWP Modeling Analysis

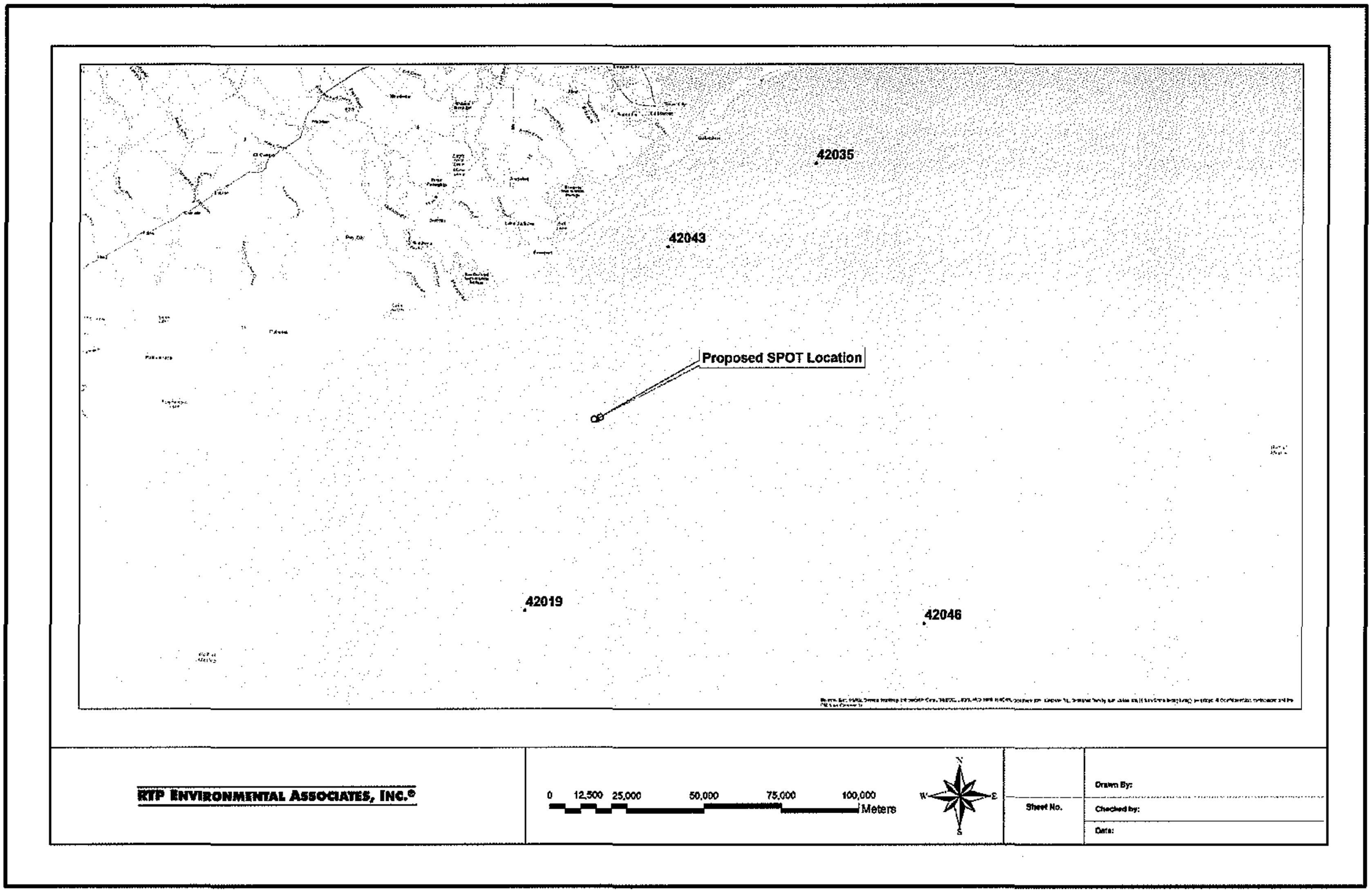

Figure 5 NOAA Buoys in the Vicinity of the Proposed SPOT DWP Location

Table 2
Buoy 42035 Data Completeness Evaluation Results

Buoy 42035 Data Completeness

Year	Q1	Q2	Q3	Q4		Q1	Q2	Q3	Q4
		Wind Direction					***Pressure***		
2012	99.9%	99.9%	100.0%	99.5%		99.8%	99.9%	100.0%	99.5%
2013	99.6%	99.9%	99.8%	99.9%		99.5%	99.8%	99.8%	99.9%
2014	99.9%	43.5%	44.2%	100.0%		99.9%	42.4%	42.5%	100.0%
2015	99.7%	99.3%	100.0%	99.5%		99.7%	99.3%	100.0%	99.5%
2016	99.9%	98.9%	99.3%	99.1%		99.9%	98.9%	99.3%	99.1%
2017	99.7%	97.9%	98.7%	99.2%		99.7%	97.9%	98.7%	99.2%
		Wind Speed					***Air Temperature***		
2012	99.9%	99.9%	100.0%	99.5%		99.9%	99.9%	100.0%	99.5%
2013	99.6%	99.9%	99.8%	99.9%		99.6%	99.9%	99.8%	99.9%
2014	99.9%	43.5%	44.0%	100.0%		99.9%	43.3%	43.4%	100.0%
2015	99.7%	99.3%	100.0%	99.5%		99.7%	99.3%	100.0%	99.5%
2016	99.9%	98.9%	99.3%	99.1%		99.9%	98.9%	99.3%	99.1%
2017	99.7%	97.9%	98.7%	99.2%		99.7%	97.9%	98.7%	99.2%
		Dew Point Temperature							
2012	98.8%	99.9%	100.0%	99.5%					
2013	99.6%	99.9%	99.8%	99.9%					
2014	99.5%	42.9%	43.3%	100.0%					
2015	99.7%	13.7%	0.0%	55.5%					
2016	66.5%	0.0%	0.0%	24.7%					
2017	99.7%	97.9%	98.7%	99.1%					

Quarters not meeting 90% completeness criterion are shaded.

Relative Humidity Completeness after Substitution

Year	Q1	Q2	Q3	Q4
2012	98.8%	99.9%	100.0%	99.5%
2013	99.6%	99.9%	99.8%	99.9%
2014	99.5%	42.90%	43.3%	100.0%
2015	99.7%	84.3%/99.0%	69.2%/97.9%	95.5%
2016	99.6%	97.1%	96.7%	98.4%
2017	99.7%	97.9%	98.7%	99.1%

Data initially substituted using only Buoy 42019 for missing buoy 42035 dew point temperature.

Q2 and Q3 in 2015 were still incomplete, so substituted with relative humidity data from WRF. Values before and after WRF substitution shown for Q2 and Q3 in 2015.

```
42035_12.prn          | input met file
42035_12.sfc          | output sfc file
42035_12.pfl          | output pfl file
42035_12.out          | output listing/debug file
  29.232        | lat (degN) of Buoy 42035
  94.413        | lon (degW) of Buoy 42035
 6              | time zone (pos for western himisphere)
600.            | mix height (m) for COARE gustiness calc
25.             | min mix height (m)
5.              | min abs(monin-obukhov length) (m)
0.5             | calms threshold (m/s) winds < this are calm
0.01            | default vert pot temp gradient (degC/m)
4.0             | default buoy wind measurement height (m)
4.0             | default buoy temp measurement height (m)
4.0             | default buoy RH measurement height (m)
0.6             | default buoy water temp depth (m)
1               | mix ht opt (0-obs for zic & zim),1-obs for zic, venk zim;
0               | warm layer (1-yes, 0-no)
0               | cool skin (1-yes, 0-no)
0               | 0=Charnock,1=Oost et al,2=Taylor and Yelland
'end',1,0,0     | 'variable', scale, min, max
```

Figure 6 Example AERCOARE Control File for 2012

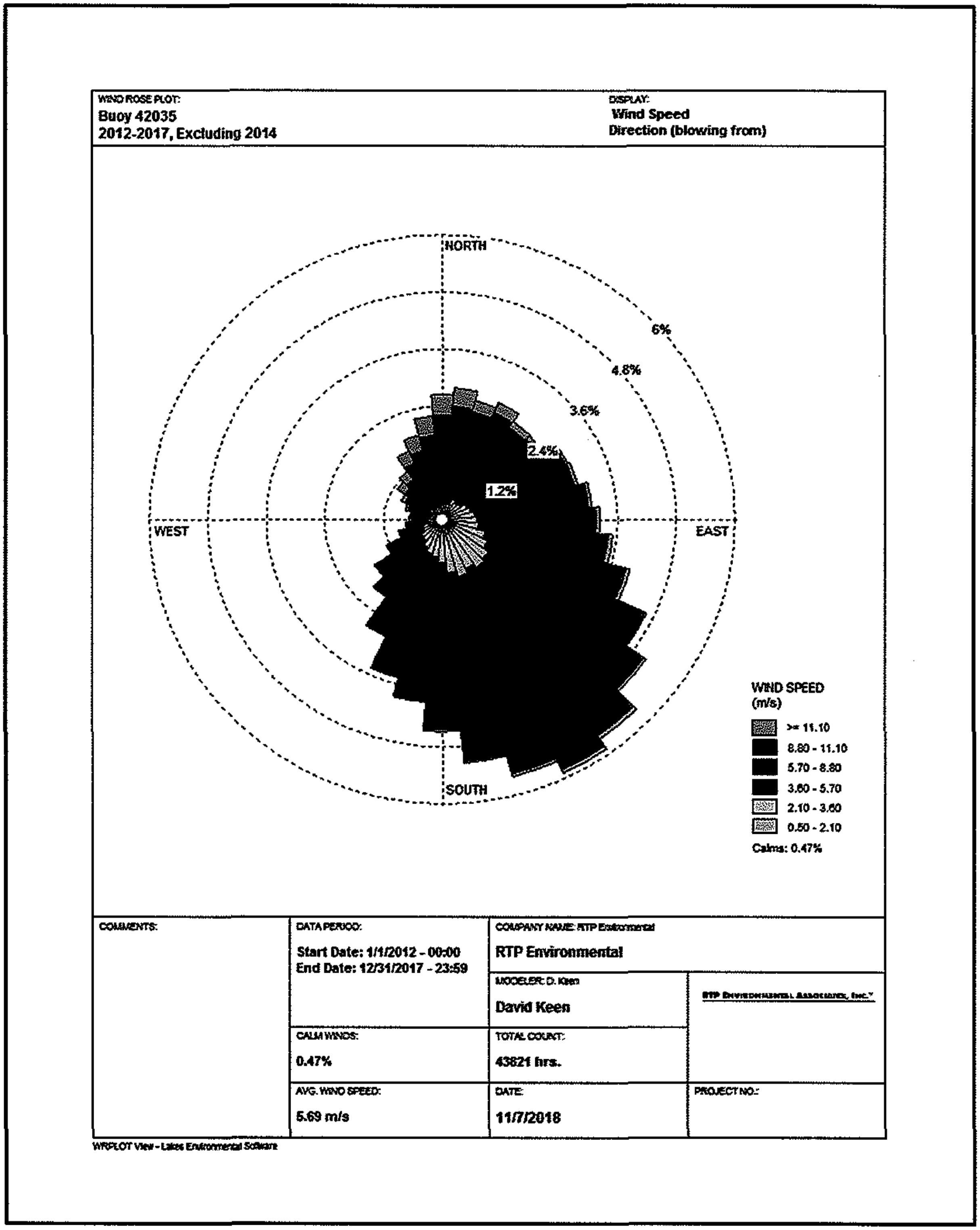

Figure 7 Five-Year (2012, 2013, 2015-2017) Wind Rose Buoy 42035

5 MODELING METHODOLOGY

5.1 POLLUTANTS SUBJECT TO REVIEW

The regulated New Source Review (NSR) pollutants with emissions increases exceeding the PSD SERs are subject to PSD review and were evaluated. Impacts were initially compared to the SILs. The pollutants subject to review are shown in Table 3. Pollutants with impacts in excess of the SILs were evaluated for both NAAQS and increment compliance. Additionally, based on discussion with USEPA Region 6, an analysis was performed for the criteria pollutants with emissions below the SERs. Futhermore, emissions of the chemical species subject to the MERA health effects and State Property Line Standards were also modeled. Potential ozone and secondary $PM_{2.5}$ impacts were evaluated using the Modeled Emission Rate for Precursor (MERP) approach rather than modeling.

Table 3
Project Emissions and PSD Significant Emission Rates

Pollutant	Potential to Emit (tpy)	Major Source Level (tpy)	Significant Emission Rate (tpy)	Subject to PSD Modeling?
CO	212	250	100	Yes
NO_2	223	250	40	Yes
SO_2	36.9	250	40	No
H_2S	1.19	N/A	10	No
PM_{10}	8.11	250	15	No
$PM_{2.5}$	8.11	250	10	No

5.3 SIGNIFICANT IMPACT ANALYSIS

The analysis of the criteria pollutants was conducted in two phases: (1) an initial or significant impact analysis; and (2) a refined phase, including an increment analysis and a NAAQS analysis. As previously mentioned, all pollutants were evaluated regardless of whether project emissions were projected to exceed the SER. In the significant impacts analysis, the calculated maximum impacts were determined for each pollutant. Five years of meteorology were modeled. Maximum modeled concentrations were compared to the pollutant-specific significance levels for all pollutants and averaging times, except for the 1-hour NO_2, 24-hour $PM_{2.5}$ and annual $PM_{2.5}$ impacts. The 5-year average of the maximum impact at each receptor was used to assess significance for these pollutants and averaging times.

Pollutants with impacts that exceed the ambient air significance levels, as defined in 40 CFR 51.165, were included in both the NAAQS and increment analyses. The PSD Class II SILs are listed in Table 4.

5.4 PRECONSTRUCTION MONITORING

The concentrations calculated in the significant impact analysis were also compared to the PSD SMCs shown in Table 5. If these exemption levels are not exceeded, USEPA has the discretion to exempt the Project from the requirement to collect pre-construction ambient monitoring data. As shown, the ambient monitoring exemption levels are not calculated to be exceeded. Existing representative monitoring data has been incorporated in the analysis and used in lieu of site-specific pre-construction monitoring data.

5.5 NEARBY SOURCE INVENTORY

Off-site sources were included in the NAAQS and increment analyses. A 31-mile (50-kilometer) radius was used to define the screening area. The screening area is located entirely offshore. A list of sources that are located within the screening area was obtained from the BOEM's 2014 Platform Source Gulfwide Access File. All sources located within the screening area were conservatively included in the NAAQS and increment modeling.

Table 4
PSD Class II Significant Impact Levels

Pollutant	Averaging Time	PSD Class II SILs (μg/m³)[1]
PM_{10}	24-hour	5.0
	Annual	1.0
$PM_{2.5}$	24-hour	1.2
	Annual	0.2
NO_2	1-hour	7.5[2]
	Annual	1.0
SO_2	1-hour	7.8[2]
	3-hour	25
CO	1-hour	2,000
	8-hour	500

Notes:
[1] Please note that on January 22, 2013, the U.S. Court of Appeals for the District of Columbia Circuit Court granted a request from the U.S. Environmental Protection Agency (USEPA) to vacate and remand the $PM_{2.5}$ SILs as previously codified at 40 Code of Federal Regulations (CFR) 52.21(k)(2). The court decision did not affect the use of the SILs, as codified at 40 CFR 51.165(b)(2), in PSD modeling analyses. Justification for the use of SILs is provided in Section 5.3.1 of this protocol.
[2] There is no 1-hour NO_2 or SO_2 SIL promulgated at 40 CFR 51.165. Consistent with the June 28, 2010, and August 23, 2010, USEPA Policy Memoranda, an interim 1-hour NO_2 SIL of 4 parts per billion (ppb) (7.5 μg/m³) will be used. Similarly, an interim 1-hour NO_2 SIL of 3 ppb (7.5 μg/m³) will be used.

Key:
μg/m³ = micrograms per cubic meters
CO = carbon monoxide
NO_2 = nitrogen dioxide
$PM_{2.5}$ = particulate matter less than 2.5 micrometers in diameter
PM_{10} = particulate matter less than 10 micrometers in diameter
PSD = Prevention of Significant Deterioration
SIL = Significant Impact Level
SO_2 = sulfur dioxide

Table 5
PSD Preconstruction Monitoring Exemption Levels

Pollutant	Averaging Time	Monitoring Exemption Levels (μg/m3)[1]
CO	8-hour average	575
NO_2	Annual average	14
SO_2	24-hour average	13
PM_{10}	24-hour average	10

5.6 NAAQS ANALYSIS

Following the determination of significant impacts, a refined air quality analysis to determine compliance with the NAAQS was conducted. A refined analysis was conducted to determine compliance with the NAAQS only for pollutants/averaging time combinations modeled as having significant impacts in the initial analysis. Five years of meteorological data were, again, used in this analysis.

All SPOT DWP Project sources and nearby sources were included in the NAAQS analysis. Impacts calculated by AERMOD were added to concentrations from a representative, onshore monitor and the resultant concentration compared to the NAAQS. Each source's potential emission rate was used. For the short-term NAAQS compliance demonstration, the following analysis was performed:

- The highest-sixth-high modeled 24-hour PM_{10} concentration at each receptor over the 5-year meteorological dataset was added to the monitored value to assess compliance;
- The 5-year average of the 98th percentile maximum daily 1-hour NO_2 and 24-hour $PM_{2.5}$ modeled values was added to the background monitor value;
- For SO_2, the 5-year average of the 99th percentile maximum daily 1-hour modeled value was added to the background monitor value to assess compliance; and
- The second-highest modeled concentration over the receptors for each year was added to the maximum monitored CO value to assess CO NAAQS compliance.

For the annual NAAQS compliance demonstration, the maximum modeled annual impacts of NO_2 and $PM_{2.5}$ were added to the maximum monitored values used to assess compliance with the annual standards. The NAAQS are shown in Table 6.

Table 6
National Ambient Air Quality Standards

Pollutant	Averaging Time	Ambient Air Quality Standards (μg/m³) Primary	Secondary
PM_{10}	24-hour	150	150
$PM_{2.5}$	24-hour	35	35
	Annual	12	15
NO_2	1-hour	188	--
	Annual	100	100
SO_2	1-hour	196	--
	3-hour	--	1,300
CO	1-hour	40,000	--
	8-hour	10,000	--

Note:
Source: 40 CFR Part 50
Key:
$\mu g/m^3$ = micrograms per cubic meter
CO = carbon monoxide
NO_2 = nitrogen dioxide
$PM_{2.5}$ = particulate matter less than or equal to 2.5 micrometers in diameter
PM_{10} = particulate matter less than or equal to 10 micrometers in diameter
SO_2 = sulfur dioxide

5.7 PSD INCREMENT ANALYSIS

The increment consumption analysis included emissions from the SPOT DWP Project sources as well as nearby sources. All nearby sources were conservatively assumed to consume increment for all pollutants. Compliance with the PSD increments was based on cumulative impacts of the SPOT DWP Project and offsite sources. The resultant impacts were compared to the PSD Class II increment levels. The highest modeled annual averages were used for evaluating compliance with the annual increments and the high-second-high values were used for the evaluation of compliance with the short-term increments. The PSD Class II increments are shown in Table 6.

Table 6
PSD Class II Increments

Pollutant	Averaging Time	PSD Class II Increments ($\mu g/m^3$)
PM_{10}	24-hour	30
	Annual	17
$PM_{2.5}$	24-hour	9
	Annual	4
NO_2	Annual	25
SO_2	3-hour	512

Key:
$\mu g/m^3$ = micrograms per cubic meter
NO_2 = nitrogen dioxide
$PM_{2.5}$ = particulate matter less than or equal to 2.5 micrometers in diameter
PM_{10} = particulate matter less than or equal to 10 micrometers in diameter
PSD = Prevention of Significant Deterioration
SO_2 = sulfur dioxide

5.8 NO_2 ANALYSES

Following USEPA guidance, the AERMOD NO_2 modeling analyses used the recommended three-tier screening approach. Initially, Tier 1 was employed with the conservative assumption that 100 percent of the available nitrogen oxide (NO_X) converts to NO_2. The Tier 2 (Ambient Ratio Method, or ARM2) was ultimately employed with the USEPA's recommended minimum and maximum NO_2/NO_X ratios of 0.5 and 0.9, respectively. Tier 3 was not employed.

Emissions from sources that emit intermittently (i.e., the emergency backup diesel generator and the two fire water pumps) were modeled in the 1-hour NO_2 analysis pursuant to the March 1, 2011, USEPA guidance. Pursuant to this guidance, any source with emissions that does not have the potential to significantly contribute to the annual distribution of the daily maximum concentrations would either be excluded from the analysis or the emissions would be based on an average hourly rate, rather than the maximum hourly rate. The Applicant used the annual average rate, which was based on the potential hourly emissions and 100 hours/year operation. Although the cranes operate intermittently, they would operate for about 4,300 hours per year, thus were not considered intermittent sources for short term modeling purposes.

5.9 SECONDARY $PM_{2.5}$ ANALYSES

In May 2014, the USEPA issued its final guidance for assessing primary and secondary formation of fine particulate matter ($PM_{2.5}$) in a NAAQS and increment compliance demonstration under PSD.[8] On June 5, 2018, at the USEPA Regional, State, and Local Modeler's Workshop, the USEPA announced changes to the 2014 Guidance. The USEPA now outlines two cases for assessing the primary and secondary $PM_{2.5}$ impacts. The appropriate case to use depends on the magnitude of direct $PM_{2.5}$ and precursor NO_2 and SO_2 emissions. Case 1 is applicable if the emissions increase of both direct $PM_{2.5}$ and secondary NO_2 and SO_2 emissions are below the SER. Case 2 is applicable if the direct $PM_{2.5}$ emissions increase or the NO_X and/or SO_2 emissions increase is greater than the respective SER. Case 2 is applicable to the Project as the direct $PM_{2.5}$ emissions are less than 10 tons per year and NO_X emissions exceed 40 tons per year. In this case, a $PM_{2.5}$ compliance demonstration is required for the direct $PM_{2.5}$ emissions based on approved dispersion modeling techniques. The potential impact of the precursor emissions must also be evaluated. The potential precursor emissions impact on secondary $PM_{2.5}$ formation was based on the MERPs approach to estimate the secondary $PM_{2.5}$ contribution from both NO_X and SO_2 emissions.[9]

The MERP equation was used with the modeled emission rates and air quality impact information from Source 20 in Harris County, Texas [see Table A-1 of the MERPs Guidance]. The data from the source modeled with an elevated release were used, when available. However, the Applicant conservatively used the data from the low level release from this source if no data for a particular emission rate was available at the elevated release height. Since primary $PM_{2.5}$ impacts exceed the SIL, as described below, the $PM_{2.5}$ increments were used as the critical air quality thresholds. Since multiple sources were modeled at the location of source 20, the lowest calculated MERP for each precursor (NOx and SO_2) was selected in calculating secondary $PM_{2.5}$ formation. The 24-hour and annual NOx and SO_2 MERPs were calculated as:

MERP = CAC x MER/MIHS

Where:

MERP = SO_2 or NOx MERP

CAC = the critical air quality threshold (in this case the $PM_{2.5}$ increments)

MER = the modeled emission rate from the hypothetical source

MIHS = modeled impact from the hypothetical source.

The air quality impact from the SPOT DWP Project was then calculated as follows:

AQI = MDC/CAC + NOxP/NOx MERP + SO_2P/SO_2 MERP

Where:

AQI = air quality impact (expressed as percent of PM2.5 increment)

MDC = The modeled direct $PM_{2.5}$ concentration

CAC = the critical air quality threshold (in this case the $PM_{2.5}$ increments, μg/m^3)

NOxP = SPOT DWP Project NOx emissions [tpy]

NOx MERP =NOx MERP

SO_2P = SPOT DWP Project SO_2 emissions [tpy]

SO_2 MERP = SO_2 MERP

5.10 OZONE ANALYSIS

Currently, there are no regulatory photochemical models available to evaluate smaller spatial scales or single-source impacts on ozone concentrations. Since ozone is formed from precursor pollutants, assessment of ambient ozone impacts is typically conducted on a regional basis using resource-intensive models, such as the USEPA Community Multiscale Air Quality (CMAQ) model. However, sources subject to PSD review are required to conduct a source impact analysis and demonstrate that a proposed source will not cause or contribute to a violation of any NAAQS, including ozone, or applicable increment. Qualitative ozone analyses typically have been performed in recent PSD applications to evaluate whether ozone precursor emissions (NO_X and VOC) will significantly impact regional ozone formation.

The proposed Project has the potential to exceed the SER for VOCs and NOx. The SPOT DWP Project's ozone precursor emissions were evaluated under the USEPA's MERP guidance to demonstrate that the SPOT DWP Project would not result in quantifiable ozone formation.

As with $PM_{2.5}$, the MERP equation was used with the modeled emission rates and air quality impact information from Source 20 in Harris County, Texas. The data from the source modeled with an elevated release were used, when available. However, the Applicant conservatively used the data from the low level release from this source if no data for a particular emission rate were available at the elevated release height. The draft ozone 8-hour SIL of 1.0 parts per billion (ppb) was used as the critical air quality threshold in calculating the MERP. Since multiple sources were modeled at the location of source 20, the lowest calculated MERP for each precursor (NOx and VOC) was selected in calculating the potential ozone formation. The 8-hour NOx and VOC MERPs were calculated as follows:

MERP = CAC x MER/MIHS

Where:

MERP = NOx or Ozone MERP

CAC = the critical air quality threshold (in this case the ozone SIL, ppb)

MER = the modeled emission rate from the hypothetical source

MIHS = modeled impact from the hypothetical source.

The air quality impact from the SPOT DWP Project was then calculated as follows:

AQI = NOxP/NOx MERP + VOCP/VOC MERP

Where:

AQI = air quality impact (expressed as percent of ozone SIL)

NOxP = the SPOT DWP Project NOx emissions [tpy]

NOx MERP = NOx MERP

VOCP = SPOT DWP Project VOC emissions [tpy]

VOC MERP = VOC MERP

5.11 STATE HEALTH EFFECTS ANALYSIS

The applicable pollutant evaluated in this analysis is defined by TCEQ as "crude oil with a benzene concentration of less than 1 percent". Modeled concentrations of this pollutant were compared to the ESLs shown in Table 8. Since the maximum impacts were shown to be below the ESLs, as presented in Section 7.5, no further analyses was conducted.

Table 8
Health Effects Review – Effects Screening Levels

Pollutant	CAS No.	Averaging Period	ESL ($\mu g/m^3$)
Crude Oil, benzene <1%	64741-45-5	1-hour	3500
		Annual	350

Key:
$\mu g/m^3$ = micrograms per cubic meter
ESL = effects screening level
PM_{10} = particulate matter less than or equal to 10 micrometers in diameter

5.12 STATE PROPERTY LINE STANDARDS ANALYSIS

The modeled concentrations of SO_2 and hydrogen sulfide (H_2S) were compared to the State Property Line Standards as shown in Table 9.

Table 9
State Property Line Standards

Pollutant	Averaging Period	Standard ($\mu g/m^3$)
SO_2	1-hour	1021
H_2S		108

Key:
$\mu g/m^3$ = micrograms per cubic meter
H_2S = hydrogen sulfide
SO_2 = sulfur dioxide

6 CLASS I AREA IMPACTS

6.1 CLASS I AQRV ANALYSIS

There are no Class I areas located within 600 kilometers of the SPOT DWP Project. The closest Class I area is Breton National Wildlife Refuge, which is located approximately 615 kilometers to the east. Therefore, no Class I analysis was conducted.

6.2 CLASS I INCREMENT ANALYSIS

Given the distance between the closest Class I area and the SPOT DWP Project, no Class I increment analysis was conducted.

7 MODEL RESULTS

7.1 SIGNIFICANT IMPACT ANALYSIS RESULTS

The SPOT DWP Project would result in significant impacts for NO_2, SO_2 (1-hour only), and $PM_{2.5}$. Insignificant impacts are calculated for 3-hour, 24-hour, and annual SO_2, PM_{10}, and CO. The Class II significant impact analysis results are presented in Table 10. A cumulative analysis was therefore conducted for NO_2, 1-hour SO_2, and $PM_{2.5}$. Table 10 also shows that the SMCs will not be exceeded.

Table 10
Class II Significant Impact Analysis Results

Pollutant	Averaging Period	Maximum Modeled Impact (µg/m³)	PSD Significant Class II Impact Level (µg/m³)	Significant Monitoring Concentration (µg/m³)	Maximum Distance to a Significant Impact (km)
NO_2	1-hr	135.52	7.5	--	19.8
	Annual	9.63	1.0	14	5.5
CO	1-hr	188.88	2,000.0	--	NA
	8-hr	91.68	500.0	575	NA
SO_2	1-hr	10.66	7.8		0.82
	3-hr	9.84	25.0		NA
	24-hr	1.84	5.0	13	NA
	Annual	0.06	1.0		NA
PM_{10}	24-hr	2.16	5.0	10	NA
	Annual	0.37	1.0	--	NA
$PM_{2.5}$	24-hr	1.70	1.2	0	0.76
	Annual	0.34	0.2	--	0.85

Key:
µg/m³ = micrograms per cubic meter
CO = carbon monoxide
hr = hour
km = kilometer
NO_2 = nitrogen dioxide
NA = not applicable, impacts calculated to be insignificant
$PM_{2.5}$ = particulate matter less than or equal to 2.5 micrometers in diameter
PM_{10} = particulate matter less than or equal to 10 micrometers in diameter
PSD = Prevention of Significant Deterioration
SO_2 = sulfur dioxide

7.2 NAAQS ANALYSIS RESULTS

Following the determination of significant impacts, an analysis was conducted to assess compliance with the NO_2, SO_2, and $PM_{2.5}$ NAAQS. Only the 1-hour SO_2 standard was evaluated, as the 3-hour SO_2 impacts were determined to be insignificant. All nearby sources located within 31 statute miles (50 kilometers) of the proposed SPOT DWP were included in the model to assess compliance.

The results of the NAAQS analysis are presented in Table 11. As shown, the model demonstrates compliance because total concentration is below the standard.

Table 11
NAAQS Analysis Results

Pollutant	Averaging Period	Modeled Concentration (µg/m³)	Background Concentration (µg/m³)	Total Concentration (µg/m³)	Standard (µg/m³)
NO_2	1-hour	110.3[1]	56.25	166.5	188
	Annual	9.66	6.16	15.8	100
SO_2	1-hour	2.84[2]	55.5	58.3	196
$PM_{2.5}$	24-hour	1.00[3]	21.7	22.7	35
	Annual	0.35	7.2	7.5	12

Notes:
[1]Based on the 98th percentile of the annual distribution of maximum daily 1-hour concentrations, averaged across the 5 years of meteorological data modeled. ARM2 was employed for the 1-hour and annual NOx to NO2 conversions.
[2] Based on the 99th percentile of the annual distribution of daily concentrations, averaged across the 5 years of meteorological data modeled
[3]Based on the 98th percentile of the annual distribution of daily concentrations, averaged across the 5 years of meteorological data modeled.
Key:
µg/m³ = micrograms per cubic meter
NAAQS = National Ambient Air Quality Standards
$PM_{2.5}$ = particulate matter less than or equal to 2.5 micrometers in diameter
SO_2 = sulfur dioxide

7.3 INCREMENT ANALYSIS RESULTS

Evaluation of compliance with the short-term increment was based upon the highest-second-high value from the 5 years of meteorology. The maximum annual concentrations were used to assess compliance with the annual increments. The results of the increment analysis are presented in Table 12. As shown, the cumulative model demonstrates compliance with the PSD increments.

Table 12
PSD Increment Analysis Results

Pollutant	Averaging Period	Modeled Concentration (µg/m³)[1]	Standard (µg/m³)
NO_2	Annual	9.66	25
$PM_{2.5}$	24-hour[a]	1.86	9.0
	Annual	0.37	4.0

Note:
[1] Based on the maximum highest second high value from the five years of meteorology.
Key:
µg/m³ = micrograms per cubic meter
NAAQS = National Ambient Air Quality Standards
NO_2 = nitrogen dioxide
$PM_{2.5}$ = particulate matter less than or equal to 2.5 micrometers in diameter
PSD = Prevention of Significant Deterioration

7.4 SECONDARY $PM_{2.5}$ AND OZONE ANALYSIS RESULTS

The results of the $PM_{2.5}$ and ozone MERPS analysis are presented in Tables 13 and 14, respectively. As shown, the total air quality impacts will be less than the $PM_{2.5}$ increment and the ozone SIL.

Table 13
Secondary $PM_{2.5}$ Impacts Analysis Results

Precursor	Modeld Emissions of Hypothetical Source (MER) (TPY)	Release Height of Hypothetical Source	Max 24-hr Impact of Hypothetical Soruce (MIHS) (ug/m3)	Calculated 24-hr MERP (TPY)	Max Annual Impact of Hypothetical Soruce (MIHS) (ug/m3)	Calculated Annual MERP (TPY)
NOx	500	L	0.13	34615.4	0.009	222222.2
	1000	H	0.09	100000.0	0.004	1000000.0
	3000	H	0.33	81818.2	0.015	800000.0
SO2	500	L	1.65	2727.3	0.04	50000.0
	1000	H	0.89	10112.4	0.022	181818.2
	3000	H	2.86	9440.6	0.1	120000.0

Secondary PM2.5 Impact Calculation

	Primary PM2.5 Impacts			Secondary NOx Contribution			Secondary SO2 Contribution			
Average	Model (MDC) (ug/m3)	Increment (CAC) (ug/m3)	% Contribution (MDC/CAC)	Emissions (NOxP) (TPY)	Lowest MERP	% Contribution	Emissions (SO2P) (TPY)	Lowest MERP	% Contribution	Total (AQI)
24-hr	1.86	9	20.66%	223	34615.4	0.64%	36.9	2727.3	1.35%	22.7%
Annual	0.37	4	9.36%	223	222222.2	0.10%	36.9	50000.0	0.07%	9.5%

Where:

MERP = Critical Air Quality Threshold (CAC) (Conservatively use PM2.5 Increments) X [Modeled Emission Rate from Source 20 (MER)/Modeled Impact from Source 20 (MIHS)]

Total Air Quality Impact (AQI) = [Modeled Direct PM2.5 Concentration (MDC)/Critical Ambient Concentration (CAC)] + [Project NOx Emissions (NOxP)/Lowest NOx MERP] + [Project SO2 Emissions (SO2P)/Lowest SO2 MERP]

Table 14
Ozone Impacts Analysis Results

Precursor	Modeld Emissions of Hypothetical Source (MER) (TPY)	Release Height of Hypothetical Source	Max 8-hr Impact of Hypothetical Source (MIHS) (ppb)	Calculated 8-hr MERP (TPY)
NOx	500	H	0.78	641.0
	1000	H	1.35	740.7
	3000	H	2.81	1067.6
VOC	500	L	0.14	3571.4
	1000	H	0.29	3448.3
	3000	H	1.09	2752.3

Ozone Impact Calculation

	NOx Contribution			VOC Contribution			
Average	Project Emissions (NOxP) (TPY)	Lowest MERP	% Contribution	Project Emissions (VOCP) (TPY)	Lowest MERP	% Contribution	Total (AQI)
8-hr	223	641.0	34.79%	1730	2752.3	62.86%	97.64%

Where:

MERP = Critical Air Quality Threshold (Use O3 SIL of 1.0 ppb) X [Modeled Emission Rate from Source 20 (MER)/Modeled Impact from Source 20 (MIHS)]

Total Air Quality Impact (AQI) = [Project NOx Emissions (NOxP)/Lowest NOx MERP] + [Project VOC Emissions (VOCP)/Lowest VOC MERP]

7.5 MERA AND STATE PROPERTY LINE ANALYSIS RESULTS

The results of the MERA and State Property Line modeling are shown in Table 15. As shown, modeled impacts are acceptable.

Table 25
MERA and State Property Line Analysis Results

Pollutant	Averaging Period	Maximum Modeled Impact (µg/m³)	Standard (µg/m³)	Analysis
SO_2	30-min[1]	27.1	1021	State Property Line
H_2S	30-min[1]	1.27	108	
Benzene	1-hr	2.63	3500	MERA
	Annual	0.11	350	

Note:
[1] 1-hr impacts were compared to the 30-min standard.
Key:
µg/m³ = micrograms per cubic meter
H_2S = hydrogen sulfide
hr = hour
MERA = Modeling and Effects Review
SO_2 = sulfur dioxide

7.5 MODEL INPUT AND OUTPUT FILES

The modeling input and output files are provided on the attached CD. Model summary results are presented in Attachment B to this report. The summary results list the model file names associated with each phase of the analysis.[a]

[a] As a general rule, the AERMOD input files have a "dta" extension. The AERMOD output files have a "lst" extension.

8 CLASS II VISIBILITY ANALYSIS

The CAA Amendments of 1977 require evaluation of new and modified emission sources to determine potential impacts on visibility. The maximum increase in hourly particulate matter and NO_X emissions from the proposed SPOT DWP were used as input parameters in the visibility analysis. Emissions were evaluated as described in the USEPA Workbook for Plume Visual Impact Screening and Analysis[x] to determine potential contribution to atmospheric discoloration and visual range reduction.

Generally, atmospheric discoloration occurs when NO emissions from combustion sources react in the presence of atmospheric oxygen to form NO_2, a reddish-brown gas. Another form of atmospheric discoloration may be caused by particulate emissions and secondary aerosols formed by gaseous precursor emissions. The visual range reduction (increased haze) is primarily caused by particulate emissions and secondary aerosols such as sulfates and nitrates. Both secondary sulfate and primary particulate emissions are accounted for in the analysis. Emissions of other pollutants do not materially affect visibility.

USEPA visibility impairment analysis guidelines were followed in conducting the analysis. The analysis was performed for the San Bernard National Wildlife Refuge, located approximately 32.3 miles (52 kilometers) north west of the SPOT DWP Project site. This refuge is not a Class I area.

This analysis requires inputs of emission rates (PM and NO_X), regional visual range, distance between the source and the object of study, and worst-case dispersion parameters (i.e., wind speed and stability). Outputs from the model include plume contrast against the sky and terrain and perceptibility of the plume (Delta E criteria).

Emission rates for PM and NOx for the analyses were set to 8.1 and 223 tons/year, respectively. These emissions represent the total facility proposed emissions. The background visual range was set to 20 kilometers, which was determined from Figure 9 of the VISCREEN manual. The VISCREEN default screening values for Delta E (2.0) and contrast (0.05) were assumed.

As shown in Table 16, there are no exceedances of the visibility screening criteria. The Delta E and the green contrast plume values from the model are less than their respective criterion. The SPOT DWP Project should, therefore, not affect visibility at the San Bernard National Wildlife Refuge. The VISCREEN model files are provided on the enclosed CD.

Table 36
Level-1 Class II Visibility Analysis Results for San Bernard National Wildlife Refuge

Viewing Background	Theta (degrees)	Azimuth (degrees)	Distance (km)	Alpha (degrees)	Delta E		Green Contrast	
					Criterion	Plume	Criterion	Plume
SKY	10	84	52	84	2	0.089	0.05	0.000
SKY	140	84	52	84	2	0.027	0.05	-0.001
TERRAIN	10	84	52	84	2	0.005	0.05	0.000
TERRAIN	140	84	52	84	2	0.001	0.05	0.000

9 REFERENCES

[1]. Texas Commission on Environmental Quality (TCEQ), Air Permits Division. 2018. Modeling and Effects Review Applicability (MERA). APDG 5874. March 2018.

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[3]. U.S. Bureau of Ocean Energy Management. 2018. GOMR Air Dispersion Modeling Guidelines. January 2018.

[4]. U.S. Environmental Protection Agency (USEPA), Region 10. 2012. User's Manual AERCOARE Version 1.0. EPA 910-R-12-008. October 2012.

[5]. U.S. Environmental Protection Agency (USEPA). 1985. Guideline for Determination of Good Engineering Practice Stack Height Technical Support Document for Stack Height Regulations (Revised). EPA-450/4-80-023R. June 1985.

[6]. U.S. Environmental Protection Agency (USEPA). 1987, Ambient Monitoring Guidelines for Prevention of Significant Deterioration, EPA-450/4-87-007. May 1987.

[7]. U.S. Environmental Protection Agency (USEPA). 2000, Meteorological Monitoring Guidance for Regulatory Modeling Applications, EPA-454/R-99-0005. February 2000.

[8]. U.S. Environmental Protection Agency (USEPA). 2014. Guidance for PM2.5 Permit Modeling. EPA-454/B-14-001. May 2014.

[9]. U.S. Environmental Protection Agency (USEPA). 2017. Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ under the PSD Permitting Program. December 02, 2016 with corrections February 23, 2017.

[x]. U.S. Environmental Protection Agency (USEPA). 1988. Workbook for Plume Visual Impact Screening and Analysis. EPA-450/4-88-015. RTP, NC. September 1988.

ATTACHMENT A

- **MODELED SOURCE INPUT DATA**
- **VOLUME SOURCE SIGMA CALCULATIONS**
- **MERPS CALCULATIONS**

SPOT - Off Shore AERMOD Input (NAD83, Zone 15)

Point Sources (Last Update 12/17/18)

Source ID	Stack Release Type	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (ft)	Stack Height (ft)	Temp. (°F)	Exit Velocity (ft/sec)	Stack Diameter (ft)	NO2 (lb/hr)	NOx (lb/hr)	SO2 (lb/hr)	SOx (lb/hr)	PM2.5 (lb/hr)	PMF (lb/hr)	PM10 (lb/hr)	PMTEN (lb/hr)	CO (lb/hr)	H2S (lb/hr)	Benzene (lb/hr)
PC_1	DEFAULT	Pedestal Crane 1	292189.787	3151521.596	0.0	185.0	870.0	45.0	0.50	0.39	0.39	0.007	0.007	0.019	0.019	0.019	0.019	3.392	0.000	0.003
PC_2	DEFAULT	Pedestal Crane 2	292148.704	3151503.811	0.0	185.0	870.0	45.0	0.50	0.39	0.39	0.007	0.007	0.019	0.019	0.019	0.019	3.392	0.000	0.003
DGEN_1	DEFAULT	Diesel Generator 1	292136.179	3151536.687	0.0	118.0	683.0	143.0	1.00	20.63	20.63	0.025	0.025	0.181	0.181	0.181	0.181	3.483	0.000	0.011
DGEN_2	DEFAULT	Diesel Generator 2	292129.878	3151530.386	0.0	118.0	683.0	143.0	1.00	20.63	20.63	0.025	0.025	0.181	0.181	0.181	0.181	3.483	0.000	0.011
EDGEN	DEFAULT	Emergency Backup Diesel Generator	292196.570	3151505.971	0.0	155.0	599.0	79.0	0.67	0.08	0.08	0.009	0.009	0.123	0.123	0.123	0.123	6.148	0.000	0.004
DFP_1	DEFAULT	Diesel Firewater Pump 1	292157.292	3151539.482	0.0	112.0	620.0	146.0	0.67	0.13	0.13	0.013	0.013	0.357	0.357	0.357	0.357	6.190	0.000	0.006
DFP_2	DEFAULT	Diesel Firewater Pump 2	292196.596	3151500.178	0.0	112.0	620.0	146.0	0.67	0.13	0.13	0.013	0.013	0.357	0.357	0.357	0.357	6.190	0.000	0.006
VC_1	DEFAULT	Vapor Combustor 1	292147.485	3151546.545	0.0	185.0	1200.0	62.0	10.00	37.57	37.57	39.457	39.457	2.080	2.080	2.079	2.079	75.143	1.810	0.759
VC_2	DEFAULT	Vapor Combustor 2	292144.461	3151543.521	0.0	185.0	1200.0	62.0	10.00	37.57	37.57	39.457	39.457	2.080	2.080	2.079	2.079	75.143	1.810	0.759
VC_3	DEFAULT	Vapor Combustor 3	292141.438	3151540.498	0.0	185.0	1200.0	62.0	10.00	37.57	37.57	39.457	39.457	2.080	2.080	2.079	2.079	75.143	1.810	0.759

Notes: 1) The annual average NO2 rate based upon potential hourly emissions and 100 hr/yr operation was modeled for the emergency equipment (diesel generator and firewater pumps).

2) Only one generator would operate at a time; each generator would be rotated into service to allow for maintenance. The total operating hours for both diesel generators combined is 8,760 hours per year.

Volume Sources

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (ft)	Release Height (ft)	Sigma Y (ft)	Sigma Z (ft)	NO2 (lb/hr)	NOx (lb/hr)	SO2 (lb/hr)	SOx (lb/hr)	PM2.5 (lb/hr)	PMF (lb/hr)	PM10 (lb/hr)	PMTEN (lb/hr)	CO (lb/hr)	H2S (lb/hr)	Benzene (lb/hr)
PF_FUG	Platform Fugitives	292169.247	3151512.699	0.0	100.0	43.6	46.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.037	0.499

SPOT Off-Site Source Emission Inventory

NAD83, Zone 15

Point Sources

Source ID	Stack Release Type	FLAT (Non-Default)	Source Description	Easting (m)	Northing (m)	Base Elevation (ft)	Stack Height (ft)	Temp. (F)	Exit Velocity (ft/sec)	Stack Diameter (ft)	NO2 (lb/hr)	NOx (lb/hr)	SO2 (lb/hr)	SOx (lb/hr)	PM2.5 (lb/hr)	PMF (lb/hr)	PM10 (lb/hr)	PMTEN (lb/hr)	CO (lb/hr)
10002_1	DEFAULT		Transcontinental (10002)- DIE001	243,041.60	3,134,845.93	0.0	100.00	900.0	25.8	1.00	6.17E+00	6.17E+00	2.94E-01	2.94E-01	4.34E-01	4.34E-01	4.34E-01	4.34E-01	1.33E+00
10002_2	DEFAULT		Transcontinental (10002)- NGE002	243,041.60	3,134,845.93	0.0	100.00	1100.0	7.0	1.00	1.45E+00	1.45E+00	5.18E-04	5.18E-04	1.10E-02	1.10E-02	1.10E-02	1.10E-02	2.24E+00
10002_3	DEFAULT		Transcontinental (10002)- NGE001	243,041.60	3,134,845.93	0.0	100.00	1100.0	7.0	1.00	1.45E+00	1.45E+00	3.75E-04	3.75E-04	1.10E-02	1.10E-02	1.10E-02	1.10E-02	2.24E+00
10184_1	DEFAULT		Transcontinental (10184) - DIE001	288,186.83	3,167,016.61	0.0	85.00	900.0	11.7	1.00	2.79E+00	2.79E+00	1.84E-01	1.84E-01	1.96E-01	1.96E-01	1.96E-01	1.96E-01	6.02E-01
10440_1	DEFAULT		Black Elk Energy (10440) - DIE100	279,103.93	3,180,391.84	0.0	66.00	900.0	11.1	1.00	2.54E+00	2.54E+00	1.67E-01	1.67E-01	1.78E-01	1.78E-01	1.78E-01	1.78E-01	5.47E-01
1276_1	DEFAULT		Black Elk Energy (1276) - DIE002	306,352.67	3,163,055.75	0.0	89.00	800.0	75.6	0.29	1.70E+00	1.70E+00	1.12E-01	1.12E-01	1.19E-01	1.19E-01	1.19E-01	1.19E-01	3.66E-01
1276_2	DEFAULT		Black Elk Energy (1276) - DIE001	306,352.67	3,163,055.75	0.0	106.00	800.0	229.6	0.29	5.12E+00	5.12E+00	8.69E-02	8.69E-02	3.60E-01	3.60E-01	3.60E-01	3.60E-01	1.10E+00
1276_3	DEFAULT		Black Elk Energy (1276) - DIE003	306,352.67	3,163,055.75	0.0	89.00	800.0	286.3	0.25	4.72E+00	4.72E+00	2.95E-02	2.95E-02	1.31E-01	1.31E-01	1.31E-01	1.31E-01	1.02E+00
1276_4	HORIZONTAL		Black Elk Energy (1276) - NGE004	306,352.67	3,163,055.75	0.0	97.00	1100.0	118.6	0.33	2.81E+00	2.81E+00	2.96E-02	2.96E-02	4.06E-02	4.06E-02	4.06E-02	4.06E-02	4.34E+00
1871_1	DEFAULT		Knight Resources (1871) - DIE500	315,798.18	3,175,546.40	0.0	60.00	900.0	69.5	0.50	4.17E+00	4.17E+00	2.74E-01	2.74E-01	2.93E-01	2.93E-01	2.93E-01	2.93E-01	8.98E-01
1871_2	DEFAULT		Knight Resources (1871) - NGE500	315,798.18	3,175,546.40	0.0	60.00	1100.0	32.1	1.00	6.84E+00	6.84E+00	1.77E-03	1.77E-03	5.21E-02	5.21E-02	5.21E-02	5.21E-02	1.06E+01
1981_1	DEFAULT		Knight Resources (1981) - DIE100	313,968.82	3,178,625.00	0.0	60.00	900.0	30.3	0.25	4.81E-01	4.81E-01	3.16E-02	3.16E-02	3.38E-02	3.38E-02	3.38E-02	3.38E-02	1.04E-01
2222_1	DEFAULT		Peregrine Oil & Gas (2222) - DIE100	329,157.50	3,116,151.10	0.0	80.00	900.0	36.1	0.50	2.18E+00	2.18E+00	8.52E-02	8.52E-02	1.53E-01	1.53E-01	1.53E-01	1.53E-01	4.69E-01
2222_2	DEFAULT		Peregrine Oil & Gas (2222) - BOI100	329,157.50	3,116,151.10	0.0	80.00	400.0	9.2	1.00	4.29E-02	4.29E-02	4.32E-04	4.32E-04	2.12E-03	2.12E-03	2.12E-03	2.12E-03	3.60E-02
2222_3	DEFAULT		Peregrine Oil & Gas (2222) - NGE500	329,157.50	3,116,151.10	0.0	80.00	1100.0	60.2	0.50	3.22E+00	3.22E+00	8.33E-04	8.33E-04	2.45E-02	2.45E-02	2.45E-02	2.45E-02	4.97E+00
2428_1	DEFAULT		Peregrine Oil & Gas (2428) - DIE100	327,241.68	3,119,503.64	0.0	80.00	900.0	36.1	0.50	2.18E+00	2.18E+00	1.43E-01	1.43E-01	1.53E-01	1.53E-01	1.53E-01	1.53E-01	4.69E-01
											4.79E+01	4.79E+01	1.44E+00	1.44E+00	2.19E+00	2.19E+00	2.19E+00	2.19E+00	3.13E+01

SPOT Volume Source Parameter Calculation

Model ID	Source Description	Source Dimensions: Length (ft)	Width (ft)	Root of Area (ft)	Height/Vertical Dimension (ft)	Release Height (ft)	Initial Dispersion Coefficients: Horizontal Dimension s_Y	Initial Vertical Dimension s_Z (ft)	Reference
PF_FUG	Platform Fugitives	135	65	93.7	100.0	100.0	43.57	46.5	Note 1, 2, and 3

Note 1: Release height equal to platform cellar height or height of carrier or tug.

Note 2: Sigma Y value calculated as the square root of the area (length of vessel side) divided by 2.15 (Table 3-1 of AERMOD Manual for line source represented by adjacent volumn sources).

Note 3: Sigma Z values for elevated sources on or adjacent to a building calculated as the building height divided by 2.15 (Table 3-1 of AERMOD Manual for Elevated Source on or Adjacent to Building).

PM2.5 MERP Calculation (Use Source 20, Harris Co Texas)

Precursor	Modeld Emissions of Hypothetical Source (MER) (TPY)	Release Height of Hypothetical Source	Max 24-hr Impact of Hypothetical Soruce (MIHS) (ug/m3)	Calculated 24-hr MERP (TPY)	Max Annual Impact of Hypothetical Soruce (MIHS) (ug/m3)	Calculated Annual MERP (TPY)
NOx	500	L	0.13	34615.4	0.009	222222.2
	1000	H	0.09	100000.0	0.004	1000000.0
	3000	H	0.33	81818.2	0.015	800000.0
SO2	500	L	1.65	2727.3	0.04	50000.0
	1000	H	0.89	10112.4	0.022	181818.2
	3000	H	2.86	9440.6	0.1	120000.0

Secondary PM2.5 Impact Calculation

	Primary PM2.5 Impacts			Secondary NOx Contribution			Secondary SO2 Contribution			
Average	Model (MDC) (ug/m3)	Increment (CAC) (ug/m3)	% Contribution (MDC/CAC)	Emissions (NOxP) (TPY)	Lowest MERP	% Contribution	Emissions (SO2P) (TPY)	Lowest MERP	% Contribution	Total (AQI)
24-hr	1.86	9	20.66%	223	34615.4	0.64%	36.9	2727.3	1.35%	22.7%
Annual	0.37	4	9.36%	223	222222.2	0.10%	36.9	50000.0	0.07%	9.5%

Where:

MERP = Critical Air Quality Threshold (CAC) (Conservatively use PM2.5 Increments) X [Modeled Emission Rate from Source 20 (MER)/Modeled Impact from Source 20 (MIHS)]

Total Air Quality Impact (AQI) = [Modeled Direct PM2.5 Concentration (MDC)/Critical Ambient Concentration (CAC)] + [Project NOx Emissions (NOxP)/Lowest NOx MERP] +
[Project SO2 Emissions (SO2P)/Lowest SO2 MERP]

Ozone MERP Calculation (Use Source 20, Harris Co Texas)

Precursor	Modeld Emissions of Hypothetical Source (MER) (TPY)	Release Height of Hypothetical Source	Max 8-hr Impact of Hypothetical Source (MIHS) (ppb)	Calculated 8-hr MERP (TPY)
NOx	500	H	0.78	641.0
	1000	H	1.35	740.7
	3000	H	2.81	1067.6
VOC	500	L	0.14	3571.4
	1000	H	0.29	3448.3
	3000	H	1.09	2752.3

Ozone Impact Calculation

	NOx Contribution			VOC Contribution			
Average	Project Emissions (NOxP) (TPY)	Lowest MERP	% Contribution	Project Emissions (VOCP) (TPY)	Lowest MERP	% Contribution	Total (AQI)
8-hr	223	641.0	34.79%	1730	2752.3	62.86%	97.64%

Where:

MERP = Critical Air Quality Threshold (Use O3 SIL of 1.0 ppb) X [Modeled Emission Rate from Source 20 (MER)/Modeled Impact from Source 20 (MIHS)]

Total Air Quality Impact (AQI) = [Project NOx Emissions (NOxP)/Lowest NOx MERP] + [Project VOC Emissions (VOCP)/Lowest VOC MERP]

ATTACHMENT B

MODEL SUMMARY RESULTS

SPOT Offshore Significant Impact Analysis Model Results - Safety Zone as Model Boundary, Buoy 42035 MET (12-20-18)

Model	File	Pollutant	Average	Group	Rank	Conc/Dep	East (X)	North (Y)	Elev	Hill	Flag	Time	Met File	Sources	Groups	Receptors
AERMOD 18081	SPOT SIA_2016_CO.SUM	CO	1-HR	ALL	1ST	188.88147	291911.8	3152067.9	0	0	0		16121303 42035_16.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2017_CO.SUM	CO	1-HR	ALL	1ST	188.84309	291911.8	3152067.9	0	0	0		17010107 42035_17.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2013_CO.SUM	CO	1-HR	ALL	1ST	187.21569	292600	3150900	0	0	0		13042805 42035_13.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2015_CO.SUM	CO	1-HR	ALL	1ST	177.05244	292500	3150900	0	0	0		15031711 42035_15.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2012_CO.SUM	CO	1-HR	ALL	1ST	176.59071	292600	3150900	0	0	0		12010110 42035_12.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2015_CO.SUM	CO	8-HR	ALL	1ST	91.68385	291998.2	3151982.5	0	0	0		15031908 42035_15.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2013_CO.SUM	CO	8-HR	ALL	1ST	78.84383	291933.4	3151987.4	0	0	0		13101216 42035_13.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2012_CO.SUM	CO	8-HR	ALL	1ST	78.0875	291998.2	3151982.5	0	0	0		12010608 42035_12.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2017_CO.SUM	CO	8-HR	ALL	1ST	71.74882	292082.4	3152005.1	0	0	0		17020224 42035_17.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2016_CO.SUM	CO	8-HR	ALL	1ST	67.50823	291933.4	3151987.4	0	0	0		16022924 42035_16.sfc	10	1	17294
AERMOD 18081	SPOT SIA_5yrs_NO2.SUM	NO2	1ST-HIGHEST MAX DAILY 1-HR	ALL	1ST	135.51838	291724	3151206	0	0	0	0 5 YEARS	42035_2012_2017.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2012_NOX.SUM	NOX	ANNUAL	ALL	1ST	9.62862	291933.4	3151987.4	0	0	0	0 1 YEARS	42035_12.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2016_NOX.SUM	NOX	ANNUAL	ALL	1ST	9.23082	292082.4	3152005.1	0	0	0	0 1 YEARS	42035_16.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2017_NOX.SUM	NOX	ANNUAL	ALL	1ST	8.86371	291933.4	3151987.4	0	0	0	0 1 YEARS	42035_17.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2015_NOX.SUM	NOX	ANNUAL	ALL	1ST	7.92538	292082.4	3152005.1	0	0	0	0 1 YEARS	42035_15.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2013_NOX.SUM	NOX	ANNUAL	ALL	1ST	7.40896	291237.7	3152742.1	0	0	0	0 1 YEARS	42035_13.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2015_PM10.SUM	PM10	24-HR	ALL	1ST	2.15892	291998.2	3151982.5	0	0	0		15031924 42035_15.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2013_PM10.SUM	PM10	24-HR	ALL	1ST	1.85597	292000	3152100	0	0	0		13012524 42035_13.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2016_PM10.SUM	PM10	24-HR	ALL	1ST	1.67175	291998.2	3151982.5	0	0	0		16122824 42035_16.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2017_PM10.SUM	PM10	24-HR	ALL	1ST	1.63922	292082.4	3152005.1	0	0	0		17020124 42035_17.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2012_PM10.SUM	PM10	24-HR	ALL	1ST	1.4678	291998.2	3151982.5	0	0	0		12010524 42035_12.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2012_PM10.SUM	PM10	ANNUAL	ALL	1ST	0.37118	291933.4	3151987.4	0	0	0	0 1 YEARS	42035_12.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2017_PM10.SUM	PM10	ANNUAL	ALL	1ST	0.35282	291933.4	3151987.4	0	0	0	0 1 YEARS	42035_17.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2015_PM10.SUM	PM10	ANNUAL	ALL	1ST	0.34696	291998.2	3151982.5	0	0	0	0 1 YEARS	42035_15.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2016_PM10.SUM	PM10	ANNUAL	ALL	1ST	0.34053	291998.2	3151982.5	0	0	0	0 1 YEARS	42035_16.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2013_PM10.SUM	PM10	ANNUAL	ALL	1ST	0.33236	291933.4	3151987.4	0	0	0	0 1 YEARS	42035_13.sfc	10	1	17294
AERMOD 18081	SPOT SIA_5yrs_PM25.SUM	PM25	1ST-HIGHEST 24-HR	ALL	1ST	1.69646	291998.2	3151982.5	0	0	0	0 5 YEARS	42035_2012_2017.sfc	10	1	17294
AERMOD 18081	SPOT SIA_5yrs_PM25.SUM	PM25	ANNUAL	ALL	1ST	0.34418	291933.4	3151987.4	0	0	0	0 5 YEARS	42035_2012_2017.sfc	10	1	17294
AERMOD 18081	SPOT SIA_5yrs_SO2.SUM	SO2	1ST-HIGHEST MAX DAILY 1-HR	ALL	1ST	10.65755	291933.4	3151987.4	0	0	0	0 5 YEARS	42035_2012_2017.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2017_SOX.SUM	SOX	1-HR	ALL	1ST	27.09186	292500	3150900	0	0	0		17111901 42035_17.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2012_SOX.SUM	SOX	1-HR	ALL	1ST	24.50283	292169.2	3151012.7	0	0	0		12022413 42035_12.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2016_SOX.SUM	SOX	1-HR	ALL	1ST	24.17509	291933.4	3151987.4	0	0	0		16030917 42035_16.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2013_SOX.SUM	SOX	1-HR	ALL	1ST	21.08576	292119.4	3152015.7	0	0	0		13103111 42035_13.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2015_SOX.SUM	SOX	1-HR	ALL	1ST	10.74624	292700	3151000	0	0	0		15021003 42035_15.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2015_SOX.SUM	SOX	24-HR	ALL	1ST	1.83942	286250	3154250	0	0	0		15050524 42035_15.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2016_SOX.SUM	SOX	24-HR	ALL	1ST	1.64022	292800	3151100	0	0	0		16012124 42035_16.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2017_SOX.SUM	SOX	24-HR	ALL	1ST	1.61728	288250	3156000	0	0	0		17051924 42035_17.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2013_SOX.SUM	SOX	24-HR	ALL	1ST	1.57215	292119.4	3152015.7	0	0	0		13103124 42035_13.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2012_SOX.SUM	SOX	24-HR	ALL	1ST	1.54252	286750	3157000	0	0	0		12032024 42035_12.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2016_SOX.SUM	SOX	3-HR	ALL	1ST	9.84134	292800	3151100	0	0	0		16012124 42035_16.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2013_SOX.SUM	SOX	3-HR	ALL	1ST	9.40042	292119.4	3152015.7	0	0	0		13103112 42035_13.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2017_SOX.SUM	SOX	3-HR	ALL	1ST	9.03062	292500	3150900	0	0	0		17111903 42035_17.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2012_SOX.SUM	SOX	3-HR	ALL	1ST	8.16761	292169.2	3151012.7	0	0	0		12022415 42035_12.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2015_SOX.SUM	SOX	3-HR	ALL	1ST	3.58333	292700	3151000	0	0	0		15021003 42035_15.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2017_SOX.SUM	SOX	ANNUAL	ALL	1ST	0.06108	291911.8	3152067.9	0	0	0	0 1 YEARS	42035_17.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2016_SOX.SUM	SOX	ANNUAL	ALL	1ST	0.0553	291911.8	3152067.9	0	0	0	0 1 YEARS	42035_16.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2015_SOX.SUM	SOX	ANNUAL	ALL	1ST	0.05103	284750	3154750	0	0	0	0 1 YEARS	42035_15.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2013_SOX.SUM	SOX	ANNUAL	ALL	1ST	0.0437	290907.8	3152770.9	0	0	0	0 1 YEARS	42035_13.sfc	10	1	17294
AERMOD 18081	SPOT SIA_2012_SOX.SUM	SOX	ANNUAL	ALL	1ST	0.04262	291911.8	3152067.9	0	0	0	0 1 YEARS	42035_12.sfc	10	1	17294

SPOT Offshore Significant Impact Analysis Model Results - Safety Zone as Model Boundary, Buoy 42035 MET (12-20-18)

Pollutant	Average	Group	Rank	Model Conc.	Background	Total	SIL	% SIL
NO2	1ST-HIGHEST MAX DAILY 1-HR	ALL	1ST	135.52	NA	135.5	7.5	1807%
NOx	ANNUAL	ALL	1ST	9.63	NA	9.6	1.0	963%
CO	1-HR	ALL	1ST	188.88	NA	188.9	2000	9%
CO	8-HR	ALL	1ST	91.68	NA	91.7	500	18%
SO2	1ST-HIGHEST MAX DAILY 1-HR	ALL	1ST	10.66	NA	10.7	7.8	137%
SOx	3-HR	ALL	1ST	9.84	NA	9.8	25.0	39%
SOx	24-HR	ALL	1ST	1.84	NA	1.8	5.0	37%
SOx	ANNUAL	ALL	1ST	0.06	NA	0.1	1.0	6%
PM10	24-HR	ALL	1ST	2.16	NA	2.2	5	43%
PM10	ANNUAL	ALL	1ST	0.37	NA	0.4	1	37%
PM25	1ST-HIGHEST 24-HR	ALL	1ST	1.70	NA	1.7	1.2	141%
PM25	ANNUAL	ALL	1ST	0.34	NA	0.3	0.2	172%

1-hr NO2 impacts include emergency generator and fire water pumps at annual average NO2 emission rate.

ARM2 with minimum and maximum NO2/NOx ratios of 0.5 and 0.9, respectively, used for NOx to NO2 conversion.

SPOT Offshore NAAQS Analysis Results - Safety Zone as Model Boundary, Buoy 42035 MET (12-20-18)

Model	File	Pollutant	Average	Group	Rank	Conc/Dep	East (X)	North (Y)	Elev	Hill	Flag	Time	Met File	Sources	Groups	Receptors
AERMOD 18081	SPOT NAAQS_5yrs_NO2.SUM	NO2	8TH-HIGHEST MAX DAILY 1-HR	ALL	1ST	110.24736	291933.4	3151987.4		0	0	0 5 YEARS	42035_2012_2017.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_5yrs_NO2.SUM	NO2	8TH-HIGHEST MAX DAILY 1-HR	OFFSITE	1ST	12.26958	306000	3164000		0	0	0 5 YEARS	42035_2012_2017.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_5yrs_NO2.SUM	NO2	8TH-HIGHEST MAX DAILY 1-HR	SPOT	1ST	110.2422	291933.4	3151987.4		0	0	0 5 YEARS	42035_2012_2017.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_2012_NOX.SUM	NOX	ANNUAL	ALL	1ST	9.65739	291933.4	3151987.4		0	0	0 1 YEARS	42035_12.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_2016_NOX.SUM	NOX	ANNUAL	ALL	1ST	9.27174	292082.4	3152005.1		0	0	0 1 YEARS	42035_16.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_2017_NOX.SUM	NOX	ANNUAL	ALL	1ST	8.88787	291933.4	3151987.4		0	0	0 1 YEARS	42035_17.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_2015_NOX.SUM	NOX	ANNUAL	ALL	1ST	7.95266	292082.4	3152005.1		0	0	0 1 YEARS	42035_15.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_2013_NOX.SUM	NOX	ANNUAL	ALL	1ST	7.45106	291237.7	3152742.1		0	0	0 1 YEARS	42035_13.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_2013_NOX.SUM	NOX	ANNUAL	OFFSITE	1ST	0.54819	304500	3163500		0	0	0 1 YEARS	42035_13.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_2015_NOX.SUM	NOX	ANNUAL	OFFSITE	1ST	0.54033	305500	3165500		0	0	0 1 YEARS	42035_15.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_2017_NOX.SUM	NOX	ANNUAL	OFFSITE	1ST	0.53991	305000	3165000		0	0	0 1 YEARS	42035_17.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_2016_NOX.SUM	NOX	ANNUAL	OFFSITE	1ST	0.48849	305500	3165000		0	0	0 1 YEARS	42035_16.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_2012_NOX.SUM	NOX	ANNUAL	OFFSITE	1ST	0.45061	305000	3165000		0	0	0 1 YEARS	42035_12.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_2012_NOX.SUM	NOX	ANNUAL	SPOT	1ST	9.62862	291933.4	3151987.4		0	0	0 1 YEARS	42035_12.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_2016_NOX.SUM	NOX	ANNUAL	SPOT	1ST	9.23082	292082.4	3152005.1		0	0	0 1 YEARS	42035_16.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_2017_NOX.SUM	NOX	ANNUAL	SPOT	1ST	8.86371	291933.4	3151987.4		0	0	0 1 YEARS	42035_17.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_2015_NOX.SUM	NOX	ANNUAL	SPOT	1ST	7.92538	292082.4	3152005.1		0	0	0 1 YEARS	42035_15.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_2013_NOX.SUM	NOX	ANNUAL	SPOT	1ST	7.40896	291237.7	3152742.1		0	0	0 1 YEARS	42035_13.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_5yrs_PM25.SUM	PM25	8TH-HIGHEST 24-HR	ALL	1ST	0.99702	291998.2	3151982.5		0	0	0 5 YEARS	42035_2012_2017.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_5yrs_PM25.SUM	PM25	8TH-HIGHEST 24-HR	OFFSITE	1ST	0.07386	305500	3164500		0	0	0 5 YEARS	42035_2012_2017.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_5yrs_PM25.SUM	PM25	8TH-HIGHEST 24-HR	SPOT	1ST	0.99685	291998.2	3151982.5		0	0	0 5 YEARS	42035_2012_2017.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_5yrs_PM25.SUM	PM25	ANNUAL	ALL	1ST	0.34582	291933.4	3151987.4		0	0	0 5 YEARS	42035_2012_2017.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_5yrs_PM25.SUM	PM25	ANNUAL	OFFSITE	1ST	0.02045	305000	3165000		0	0	0 5 YEARS	42035_2012_2017.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_5yrs_PM25.SUM	PM25	ANNUAL	SPOT	1ST	0.34418	291933.4	3151987.4		0	0	0 5 YEARS	42035_2012_2017.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_5yrs_SO2.SUM	SO2	4TH-HIGHEST MAX DAILY 1-HR	ALL	1ST	2.84046	291911.8	3152067.9		0	0	0 5 YEARS	42035_2012_2017.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_5yrs_SO2.SUM	SO2	4TH-HIGHEST MAX DAILY 1-HR	OFFSITE	1ST	0.36477	305000	3163500		0	0	0 5 YEARS	42035_2012_2017.sfc	26	3	17294
AERMOD 18081	SPOT NAAQS_5yrs_SO2.SUM	SO2	4TH-HIGHEST MAX DAILY 1-HR	SPOT	1ST	2.84007	291911.8	3152067.9		0	0	0 5 YEARS	42035_2012_2017.sfc	26	3	17294

SPOT Offshore NAAQS Analysis Results - Safety Zone as Model Boundary, Buoy 42035 MET (12-20-18)

Pollutant	Average	Group	Rank	Model Conc.	Background	Total	NAAQS	% NAAQS
NO2	8TH-HIGHEST MAX DAILY 1-HR	ALL	1ST	110.25	56.25	166.5	188	89%
NOx	ANNUAL	ALL	1ST	9.66	6.16	15.8	100	16%
SO2	4TH-HIGHEST MAX DAILY 1-HR	ALL	1ST	2.84	55.5	58.3	196	30%
PM25	8TH-HIGHEST 24-HR	ALL	1ST	1.00	21.7	22.7	35	65%
PM25	ANNUAL	ALL	1ST	0.35	7.2	7.5	12	63%

All offsite platforms located within 50km of the SPOT project location included.

1-hr NO2 impacts include emergency generator and fire water pumps at annual average NO2 emission rate.

ARM2 with minimum and maximum NO2/NOx ratios of 0.5 and 0.9, respectively, used for NOx to NO2 conversion.

PM2.5 and NO2 background values are from Galveston monitor (AQS 48-167-1034, 2015-2017 values used).

SO2 background values are from Texas City Ball Park monitor (AQS 48-167-0005, 2015-2017 values used).

SPOT Offshore Increment Analysis Results - Safety Zone as Model Boundary, Buoy 42035 MET (12-20-18)

Model	File	Pollutant	Average	Group	Rank	Conc/Dep	East (X)	North (Y)	Elev	Hill	Flag	Time	Met File	Sources	Groups	Receptors
AERMOD 18081	SPOT Increment_2012_NOX.SUM	NOX	ANNUAL	ALL	1ST	9.65739	291933.4	3151987.4		0	0	0 1 YEARS	42035_12.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2016_NOX.SUM	NOX	ANNUAL	ALL	1ST	9.27174	292082.4	3152005.1		0	0	0 1 YEARS	42035_16.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2017_NOX.SUM	NOX	ANNUAL	ALL	1ST	8.88787	291933.4	3151987.4		0	0	0 1 YEARS	42035_17.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2015_NOX.SUM	NOX	ANNUAL	ALL	1ST	7.95266	292082.4	3152005.1		0	0	0 1 YEARS	42035_15.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2013_NOX.SUM	NOX	ANNUAL	ALL	1ST	7.45106	291237.7	3152742.1		0	0	0 1 YEARS	42035_13.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2013_NOX.SUM	NOX	ANNUAL	OFFSITE	1ST	0.54819	304500	3163500		0	0	0 1 YEARS	42035_13.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2015_NOX.SUM	NOX	ANNUAL	OFFSITE	1ST	0.54033	305500	3165500		0	0	0 1 YEARS	42035_15.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2017_NOX.SUM	NOX	ANNUAL	OFFSITE	1ST	0.53991	305000	3165000		0	0	0 1 YEARS	42035_17.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2016_NOX.SUM	NOX	ANNUAL	OFFSITE	1ST	0.48849	305500	3165000		0	0	0 1 YEARS	42035_16.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2012_NOX.SUM	NOX	ANNUAL	OFFSITE	1ST	0.45061	305000	3165000		0	0	0 1 YEARS	42035_12.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2012_NOX.SUM	NOX	ANNUAL	SPOT	1ST	9.62862	291933.4	3151987.4		0	0	0 1 YEARS	42035_12.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2016_NOX.SUM	NOX	ANNUAL	SPOT	1ST	9.23082	292082.4	3152005.1		0	0	0 1 YEARS	42035_16.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2017_NOX.SUM	NOX	ANNUAL	SPOT	1ST	8.86371	291933.4	3151987.4		0	0	0 1 YEARS	42035_17.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2015_NOX.SUM	NOX	ANNUAL	SPOT	1ST	7.92538	292082.4	3152005.1		0	0	0 1 YEARS	42035_15.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2013_NOX.SUM	NOX	ANNUAL	SPOT	1ST	7.40896	291237.7	3152742.1		0	0	0 1 YEARS	42035_13.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2013_PMF.SUM	PMF	24-HR	ALL	2ND	1.859	292000	3152100		0	0	0	13120524 42035_13.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2015_PMF.SUM	PMF	24-HR	ALL	2ND	1.80889	292000	3152000		0	0	0	15070124 42035_15.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2017_PMF.SUM	PMF	24-HR	ALL	2ND	1.4961	292082.4	3152005.1		0	0	0	17020224 42035_17.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2012_PMF.SUM	PMF	24-HR	ALL	2ND	1.46347	291998.2	3151982.5		0	0	0	12010624 42035_12.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2016_PMF.SUM	PMF	24-HR	ALL	2ND	1.30597	292119.4	3152015.7		0	0	0	16013124 42035_16.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2015_PMF.SUM	PMF	24-HR	OFFSITE	2ND	0.24432	306500	3164500		0	0	0	15101324 42035_15.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2013_PMF.SUM	PMF	24-HR	OFFSITE	2ND	0.21946	305500	3164000		0	0	0	13051924 42035_13.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2017_PMF.SUM	PMF	24-HR	OFFSITE	2ND	0.19635	305500	3164000		0	0	0	17051824 42035_17.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2012_PMF.SUM	PMF	24-HR	OFFSITE	2ND	0.16287	304500	3163000		0	0	0	12120424 42035_12.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2016_PMF.SUM	PMF	24-HR	OFFSITE	2ND	0.14605	307000	3165000		0	0	0	16031324 42035_16.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2013_PMF.SUM	PMF	24-HR	SPOT	2ND	1.85597	292000	3152100		0	0	0	13120524 42035_13.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2015_PMF.SUM	PMF	24-HR	SPOT	2ND	1.80878	292000	3152000		0	0	0	15070124 42035_15.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2017_PMF.SUM	PMF	24-HR	SPOT	2ND	1.49307	292082.4	3152005.1		0	0	0	17020224 42035_17.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2012_PMF.SUM	PMF	24-HR	SPOT	2ND	1.46307	291998.2	3151982.5		0	0	0	12010624 42035_12.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2016_PMF.SUM	PMF	24-HR	SPOT	2ND	1.30571	292119.4	3152015.7		0	0	0	16013124 42035_16.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2012_PMF.SUM	PMF	ANNUAL	ALL	1ST	0.37248	291933.4	3151987.4		0	0	0 1 YEARS	42035_12.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2017_PMF.SUM	PMF	ANNUAL	ALL	1ST	0.35392	291933.4	3151987.4		0	0	0 1 YEARS	42035_17.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2015_PMF.SUM	PMF	ANNUAL	ALL	1ST	0.3482	291998.2	3151982.5		0	0	0 1 YEARS	42035_15.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2016_PMF.SUM	PMF	ANNUAL	ALL	1ST	0.34248	291998.2	3151982.5		0	0	0 1 YEARS	42035_16.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2013_PMF.SUM	PMF	ANNUAL	ALL	1ST	0.335	291933.4	3151987.4		0	0	0 1 YEARS	42035_13.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2017_PMF.SUM	PMF	ANNUAL	OFFSITE	1ST	0.02363	305000	3165000		0	0	0 1 YEARS	42035_17.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2013_PMF.SUM	PMF	ANNUAL	OFFSITE	1ST	0.02346	305000	3164500		0	0	0 1 YEARS	42035_13.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2015_PMF.SUM	PMF	ANNUAL	OFFSITE	1ST	0.02337	305500	3165500		0	0	0 1 YEARS	42035_15.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2016_PMF.SUM	PMF	ANNUAL	OFFSITE	1ST	0.02124	305500	3165000		0	0	0 1 YEARS	42035_16.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2012_PMF.SUM	PMF	ANNUAL	OFFSITE	1ST	0.01922	305000	3165000		0	0	0 1 YEARS	42035_12.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2012_PMF.SUM	PMF	ANNUAL	SPOT	1ST	0.37118	291933.4	3151987.4		0	0	0 1 YEARS	42035_12.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2017_PMF.SUM	PMF	ANNUAL	SPOT	1ST	0.35282	291933.4	3151987.4		0	0	0 1 YEARS	42035_17.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2015_PMF.SUM	PMF	ANNUAL	SPOT	1ST	0.34696	291998.2	3151982.5		0	0	0 1 YEARS	42035_15.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2016_PMF.SUM	PMF	ANNUAL	SPOT	1ST	0.34053	291998.2	3151982.5		0	0	0 1 YEARS	42035_16.sfc	26	3	17294
AERMOD 18081	SPOT Increment_2013_PMF.SUM	PMF	ANNUAL	SPOT	1ST	0.33236	291933.4	3151987.4		0	0	0 1 YEARS	42035_13.sfc	26	3	17294

SPOT Offshore Increment Analysis Results - Safety Zone as Model Boundary, Buoy 42035 MET (12-20-18)

Pollutant	Average	Group	Rank	Model Conc.	Background	Total	Increment	% Increment
NOx	ANNUAL	ALL	1ST	9.66	NA	9.7	25	39%
PMF	24-HR	ALL	2ND	1.86	NA	1.9	9	21%
PMF	ANNUAL	ALL	1ST	0.37	NA	0.4	4	9%

All offsite platforms located within 50km of the SPOT project location included. All conservatively assumed to consume increment.

SPOT Offshore MERA and State Property Line Analysis Results - Safety Zone as Model Boundary, Buoy 42035 MET (12-20-18)

Model	File	Pollutant	Average	Group	Rank	Conc/Dep	East (X)	North (Y)	Elev	Hill	Flag	Time	Met File	Sources	Groups	Receptors
AERMOD 18081	SPOT SPL & MERA_2013_BENZ.SUM	BENZ	1-HR	ALL	1ST	2.63064	291724	3151206	0	0	0		13012001 42035_13.sfc	11	1	17294
AERMOD 18081	SPOT SPL & MERA_2016_BENZ.SUM	BENZ	1-HR	ALL	1ST	2.58636	291847.9	3151129.7	0	0	0		16031811 42035_16.sfc	11	1	17294
AERMOD 18081	SPOT SPL & MERA_2015_BENZ.SUM	BENZ	1-HR	ALL	1ST	2.4961	292119.4	3152015.7	0	0	0		15011912 42035_15.sfc	11	1	17294
AERMOD 18081	SPOT SPL & MERA_2017_BENZ.SUM	BENZ	1-HR	ALL	1ST	2.46729	292119.4	3152015.7	0	0	0		17051205 42035_17.sfc	11	1	17294
AERMOD 18081	SPOT SPL & MERA_2012_BENZ.SUM	BENZ	1-HR	ALL	1ST	2.36824	291919.2	3151079.7	0	0	0		12022114 42035_12.sfc	11	1	17294
AERMOD 18081	SPOT SPL & MERA_2012_BENZ.SUM	BENZ	ANNUAL	ALL	1ST	0.11352	291933.4	3151987.4	0	0	0	1 YEARS	42035_12.sfc	11	1	17294
AERMOD 18081	SPOT SPL & MERA_2017_BENZ.SUM	BENZ	ANNUAL	ALL	1ST	0.10895	291933.4	3151987.4	0	0	0	1 YEARS	42035_17.sfc	11	1	17294
AERMOD 18081	SPOT SPL & MERA_2015_BENZ.SUM	BENZ	ANNUAL	ALL	1ST	0.10886	291998.2	3151982.5	0	0	0	1 YEARS	42035_15.sfc	11	1	17294
AERMOD 18081	SPOT SPL & MERA_2016_BENZ.SUM	BENZ	ANNUAL	ALL	1ST	0.10528	292082.4	3152005.1	0	0	0	1 YEARS	42035_16.sfc	11	1	17294
AERMOD 18081	SPOT SPL & MERA_2013_BENZ.SUM	BENZ	ANNUAL	ALL	1ST	0.09971	291933.4	3151987.4	0	0	0	1 YEARS	42035_13.sfc	11	1	17294
AERMOD 18081	SPOT SPL & MERA_2017_H2S.SUM	H2S	1-HR	ALL	1ST	1.27228	292500	3150900	0	0	0		17111901 42035_17.sfc	4	1	17294
AERMOD 18081	SPOT SPL & MERA_2012_H2S.SUM	H2S	1-HR	ALL	1ST	1.15701	292169.2	3151012.7	0	0	0		12022413 42035_12.sfc	4	1	17294
AERMOD 18081	SPOT SPL & MERA_2016_H2S.SUM	H2S	1-HR	ALL	1ST	1.13596	291933.4	3151987.4	0	0	0		16030917 42035_16.sfc	4	1	17294
AERMOD 18081	SPOT SPL & MERA_2013_H2S.SUM	H2S	1-HR	ALL	1ST	0.99744	292119.4	3152015.7	0	0	0		13103111 42035_13.sfc	4	1	17294
AERMOD 18081	SPOT SPL & MERA_2015_H2S.SUM	H2S	1-HR	ALL	1ST	0.5246	292700	3151000	0	0	0		15021003 42035_15.sfc	4	1	17294
AERMOD 18081	SPOT SPL & MERA_2017_SO2.SUM	SO2	1-HR	ALL	1ST	27.09186	292500	3150900	0	0	0		17111901 42035_17.sfc	10	1	17294
AERMOD 18081	SPOT SPL & MERA_2012_SO2.SUM	SO2	1-HR	ALL	1ST	24.50283	292169.2	3151012.7	0	0	0		12022413 42035_12.sfc	10	1	17294
AERMOD 18081	SPOT SPL & MERA_2016_SO2.SUM	SO2	1-HR	ALL	1ST	24.17509	291933.4	3151987.4	0	0	0		16030917 42035_16.sfc	10	1	17294
AERMOD 18081	SPOT SPL & MERA_2013_SO2.SUM	SO2	1-HR	ALL	1ST	21.08576	292119.4	3152015.7	0	0	0		13103111 42035_13.sfc	10	1	17294
AERMOD 18081	SPOT SPL & MERA_2015_SO2.SUM	SO2	1-HR	ALL	1ST	10.74624	292700	3151000	0	0	0		15021003 42035_15.sfc	10	1	17294

SPOT Offshore MERA and State Property Line Analysis Results - Safety Zone as Model Boundary, Buoy 42035 MET (12-20-18)

Pollutant	Average	Group	Rank	Model Conc.	Background	Total	Standard	% Standard	Standard
SO2	1-HR	ALL	1ST	27.09	NA	27.1	1021	3%	State Property
H2S	1-HR	ALL	1ST	1.27	NA	1.3	108	1%	State Property
BENZ	1-HR	ALL	1ST	2.63	NA	2.6	3500	0.1%	State Health Effects
BENZ	ANNUAL	ALL	1ST	0.11	NA	0.1	350	0.03%	State Health Effects

Visual Effects Screening Analysis for
Source: SPOT
Class I Area: San Bernard NWR

*** Level-1 Screening ***

Input Emissions for

Particulates	8.10	TON/YR
NOx (as NO2)	223.00	TON/YR
Primary NO2	0.00	TON/YR
Soot	0.00	TON/YR
Primary SO4	0.00	TON/YR

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	0.04 ppm
Background Visual Range:	20.00 km
Source-Observer Distance:	52.00 km
Min. Source-Class I Distance:	52.00 km
Max. Source-Class I Distance:	70.00 km
Plume-Source-Observer Angle:	11.25 degrees
Stability: 6	
Wind Speed: 1.00 m/s	

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	84.	52.0	84.	2.00	0.089	0.05	0.000
SKY	140.	84.	52.0	84.	2.00	0.027	0.05	-0.001
TERRAIN	10.	84.	52.0	84.	2.00	0.005	0.05	0.000
TERRAIN	140.	84.	52.0	84.	2.00	0.001	0.05	0.000

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	70.	49.4	99.	2.00	0.094	0.05	0.000
SKY	140.	70.	49.4	99.	2.00	0.029	0.05	-0.001
TERRAIN	10.	60.	47.6	109.	2.00	0.007	0.05	0.000
TERRAIN	140.	60.	47.6	109.	2.00	0.002	0.05	0.000