

December 13, 2019

Texas Commission on Environmental Quality (TCEQ)
Air Permits Initial Review Team (APIRT), MC-161
P.O. Box 13087
Austin, TX 78711-3087

Submitted electronically via STEERS

**RE: Permit by Rule Registration
30 TAC §§106.352(I), 106.511, 106.512
Permian Highway Pipeline, LLC, CN-TBD
Coyanosa Compressor Station
Pecos County, Texas
Permit Registration No. TBD**

Dear APIRT,

On behalf of Permian Highway Pipeline, LLC (PHP LLC), DiSorbo Consulting, LLC (DiSorbo), is submitting the attached Permit by Rule (PBR) application to register and certify the proposed facilities at the Coyanosa Compressor Station located in Pecos County, Texas under the 30 Texas Administrative Code §§106.352(I), 106.511, 106.512.

Note that during the time of this PBR submittal in STEERS, the 106.512 Engines and Turbines section had an internal limit in the system that engines and turbines could not input a horsepower value greater than 20,000. The turbines are represented in this air permit application are rated at 22,232 hp and 30,533 hp and are each listed in STEERS as 20,000 hp.

If you have any questions or require additional information, please contact me at 512-961-4965 or by email at kparsons@disorboconsult.com.

Sincerely,

DiSorbo Consulting LLC (TBPE #15665)



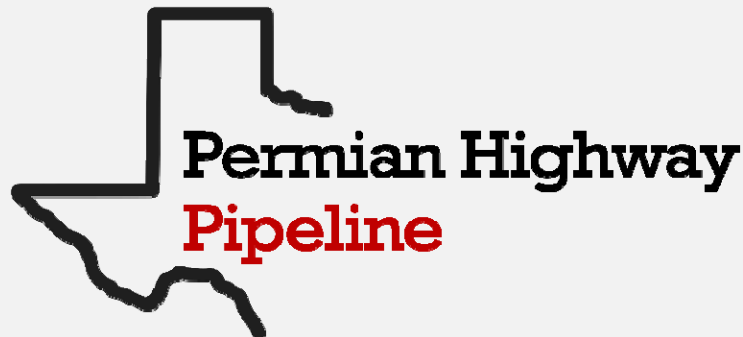
Kristin Parsons
Senior Staff Consultant

cc: Mr. Paul Witkowski, PE, Air Quality Engineer, Permian Highway Pipeline, LLC
Via email: paul_witkowski@kindermorgan.com

Registration for Permits by Rule

30 TAC §§106.352(I), 106.511, 106.512

Permit Registration No. TBD



Permian Highway Pipeline, LLC
Coyanosa Compressor Station
Coyanosa, Pecos County, Texas

CN-TBD; RN-TBD

December 2019



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Section 1

Project Information

1.1 Introduction

Permian Highway Pipeline, LLC (PHP LLC) owns the Coyanosa Compressor Station (Site) in Pecos County, Texas, which is operated by Kinder Morgan Texas Pipeline, LLC. The Site is a natural gas compressor station designed to increase the discharge pressure of the gas in the pipeline to overcome the effect of frictional losses in the pipeline upstream of the Site. The Site consists of a filter separators, turbines, a condensate tank, fuel gas heaters, emergency generators, sumps, miscellaneous storage tanks, and associated piping. PHP LLC wishes to authorize the proposed facilities under PBR.

1.2 Project Description

The purpose of this application is to register and certify the emissions from the Site under the following PBR(s):

- 30 TAC §PBR-106.352(I)
- §106.511
- §106.512

Table 1-1, at the end of this section, presents a summary of the project emissions compared to the applicable emission limits. As shown in Table 1-1, project emissions meet the applicable emissions limits; however, the projected potential-to-emit (PTE) NO_x and CO emissions are expected to exceed major source thresholds. PHP LLC will submit an initial Title V application before the start of operation of the Site.

Table 1-2, at the end of this section presents a summary of the Site's general information, including project information, site location, contact information, and site-wide production information.

This application provides all of the information necessary to demonstrate compliance with all applicable state and federal standards and authorization being claimed.

1.3 Application Organization

This application is organized into the following sections:

- Section 1: Identifies the project scope, presents the organization of the registration, a summary of site-wide emissions, and a summary of the general information of the Site.
- Section 2: No administrative forms are required with this submittal.
- Section 3: Contains an Area Map and a description of the Site location.

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- Section 4: Contains a process description and process flow diagram of the Site.
 - Section 5: Details the calculation methods used to determine routine and maintenance emissions from the sources associated with this project.
 - Section 6: Includes the PBR general requirement applicability analysis that addresses how the project satisfies the general requirements in 30 TAC Chapter 106 and the specific requirements of each PBR being claimed.
 - Section 7: Compliance demonstration with applicable air quality standards (NAAQS, ESL, or State Property Line).
 - Section 8: Includes a review of potentially applicable state and federal requirements.
 - Appendix A: Includes detailed routine emission calculations for the facilities included in this registration.
 - Appendix B: Includes detailed planned MSS emission calculations for the facilities included in this registration.
 - Appendix C: Includes the TCEQ Tables.
 - Appendix D: Includes supporting documentation: Table D-1 (a list of acronyms and abbreviations used throughout the document), lab analyses, equipment specification sheets, and model reports, as applicable.

Table 1-1

Emissions Summary and Compliance with Limits

Permian Highway Pipeline, LLC - Coyanosa Compressor Station
December 2019

EPN	FIN	Source Name	Table No.	Total VOC ^[1]		NO _x		CO		PM ₁₀		PM _{2.5}		SO ₂		Total HAPs ^[2]	
				lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
FUG1	FUG1	Piping Fugitive Emissions	A-1	0.51	2.21	--	--	--	--	--	--	--	--	--	--	0.02	0.09
TURB1, TURB2	TURB1, TURB2	Solar Titan 130 Turbines	A-2	1.12	4.91	19.30	84.52	19.58	85.76	1.51	6.60	0.61	2.67	1.09	4.77	0.31	1.35
TURB3	TURB3	Solar Titan 250 Turbine	A-3	0.67	2.91	11.45	50.13	11.61	50.87	0.90	3.93	0.36	1.59	0.65	2.84	0.18	0.81
GEN1, GEN2	GEN1, GEN2	Emergency Generator Engines	A-4	9.59	4.20	19.18	8.40	38.36	16.80	0.29	0.13	<0.01	<0.01	0.02	0.01	5.79	2.54
HTR1, HTR2	HTR1, HTR2	Fuel Gas Heaters	A-5	0.03	0.13	0.54	2.37	0.46	1.99	0.04	0.18	0.03	0.14	<0.01	0.01	0.01	0.04
TK-COND	TK-COND	Condensate Tank	A-6	86.98	1.22	--	--	--	--	--	--	--	--	--	--	3.51	0.05
TK-CAP	TK-CAP	Miscellaneous Storage Tanks CAP ^[3]	A-6	0.23	<0.01	--	--	--	--	--	--	--	--	--	--	0.01	<0.01
TRKLOAD	TRKLOAD	Truck Loading	A-7	96.41	0.45	--	--	--	--	--	--	--	--	--	--	3.89	0.02
MSS-TURB-SS	MSS-TURB-SS	MSS Turbine Start-up/Shutdown Events	B-1	21.00	0.67	7.00	0.18	207.00	6.35	--	--	--	--	--	--	--	--
MSS-MISC	MSS-MISC	MSS Miscellaneous/General Maintenance	B-2	19.46	1.95	--	--	--	--	--	--	--	--	--	--	--	--
MSS-PIG	MSS-PIG	MSS Pipeline Pigging	B-3	86.72	1.56	--	--	--	--	--	--	--	--	--	--	--	--
MSS-TURB	MSS-TURB	MSS Turbine Blowdowns	B-3	62.11	3.35	--	--	--	--	--	--	--	--	--	--	--	--
Total Emissions and Limits																	
Total Emissions				363.83	23.58	50.47	145.61	70.01	161.78	2.73	10.84	1.00	4.39	1.76	7.64	13.72	4.89
PBR-106.4 Emission Limits					25.0		250.0		250.0		15.0		10.0		25.0		25.0
Meets PBR Limits?				--	Yes	--	Yes	--	Yes	--	Yes	--	Yes	--	Yes	--	Yes
Title V Major Source Threshold					100		100		100		100		100		100		25
Emissions Less than Major Source Threshold?				--	Yes	--	No	--	No	--	Yes	--	Yes	--	Yes	--	Yes

[1] Total VOC include HAPs.

[2] Total HAPs include benzene.

[3] EPN: TK-CAP includes emissions from grouped tank FINs: TK-SLOP, SUMP-SLOP, SUMP-TURB, TK-MISC.

Table 1-2
Site and Project Information

Site General Information	
Company Name	Permian Highway Pipeline, LLC
Site Name	Coyanosa Compressor Station
Nearest City, State	Coyanosa, Texas
Zipcode	79755
Driving Directions	From the intersection of Gamboa Rd and FM 1776, travel 1.9 miles east on Gamboa Rd. Turn north (left) onto Trailer House Rd and travel 1.3 miles to Site on the right-hand side of the road.
Latitude / Longitude	31.2624 / -103.032951
Distance to Nearest Property Line	≥ 50 ft
Distance to Nearest Receptor	≥ 2,000 ft
Permit/Registration Number	TBD
TCEQ Customer Number	CN-TBD
TCEQ Regulated Entity Number	RN-TBD
Authorization Type(s)	PBR-106.352(I), 106.511, 106.512
Project Type	Registration (Initial)
County	Pecos ◀ Attainment County
TCEQ Region	Region 7, Midland
City, State for Met Data	Midland-Odessa, TX

Company Contact Information		
	Technical Contact	Responsible Official
Contact	Mr. Paul Witkowski, PE	Mr. Joe McLaughlin
Organization	Permian Highway Pipeline, LLC	Permian Highway Pipeline, LLC
Title	Air Quality Engineer	Vice President Operations
Mailing Address	1001 Louisiana St, Suite 1000	1001 Louisiana St, Suite 1000
City	Houston	Houston
State	TX	TX
Zipcode	77002	77002
Telephone	713-420-2045	713-369-9847
Email Address	paul_witkowski@kindermorgan.com	joe_mclaughlin@kindermorgan.com

Section 2

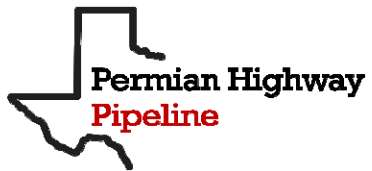
Administrative Forms

This application is being submitted to TCEQ via STEERS; therefore, no TCEQ administrative forms are included with this application as all administrative information is provided through the online entry.

Section 3

Location Information

Coyanosa Compressor Station is located in Pecos County, approximately 2.4 miles northeast of Coyanosa, Texas. A scaled area map which shows the location of the Site is included as Figure 3-1 in this section.



**Permian Highway Pipeline, LLC
Coyanosa Compressor Station**

Pecos County, Texas

31.2624°N, 103.032951°W

Figure 3-1 Area
Map



Section 4

Process Description

4.1 Routine Operations

PHP LLC's Coyanosa Compressor Station is designed to increase the discharge pressure of the gas in the pipeline to overcome the effect of frictional losses in the pipeline upstream of the station. A simplified process flow diagram is included as Figure 4-1 at the end of this section.

Natural gas enters the site through the inlet separators via pipeline where any residual condensate is separated from the gas. The separated gas is routed through a suction header to the compressors which are driven by Solar turbines (EPNs: TURB1, TURB2, TURB3); the compressed gas and then routed off-site via pipeline.

Condensate separated at the inlet separators is routed to and stored in a condensate tank (EPN: TK-COND). Additional storage tanks at the Site include a used slop oil tank, turbine skid oil tanks, which collect organic liquids from the turbines' sumps, and other miscellaneous tanks. These tanks and sumps are grouped under a tank emissions cap (EPN: TK-CAP). Oil/condensate from the condensate and used slop oil tanks are removed from the Site via tank truck (EPN: TRKLOAD).

Other sources of emissions at the Site include fuel gas line heaters (EPNs: HTR1, HTR2) used to heat the fuel gas for the turbines, emergency generators powered by natural gas-fired engines (EPNs: GEN1, GEN2), and piping fugitive components (EPN: FUG1).

4.2 Planned MSS Activities

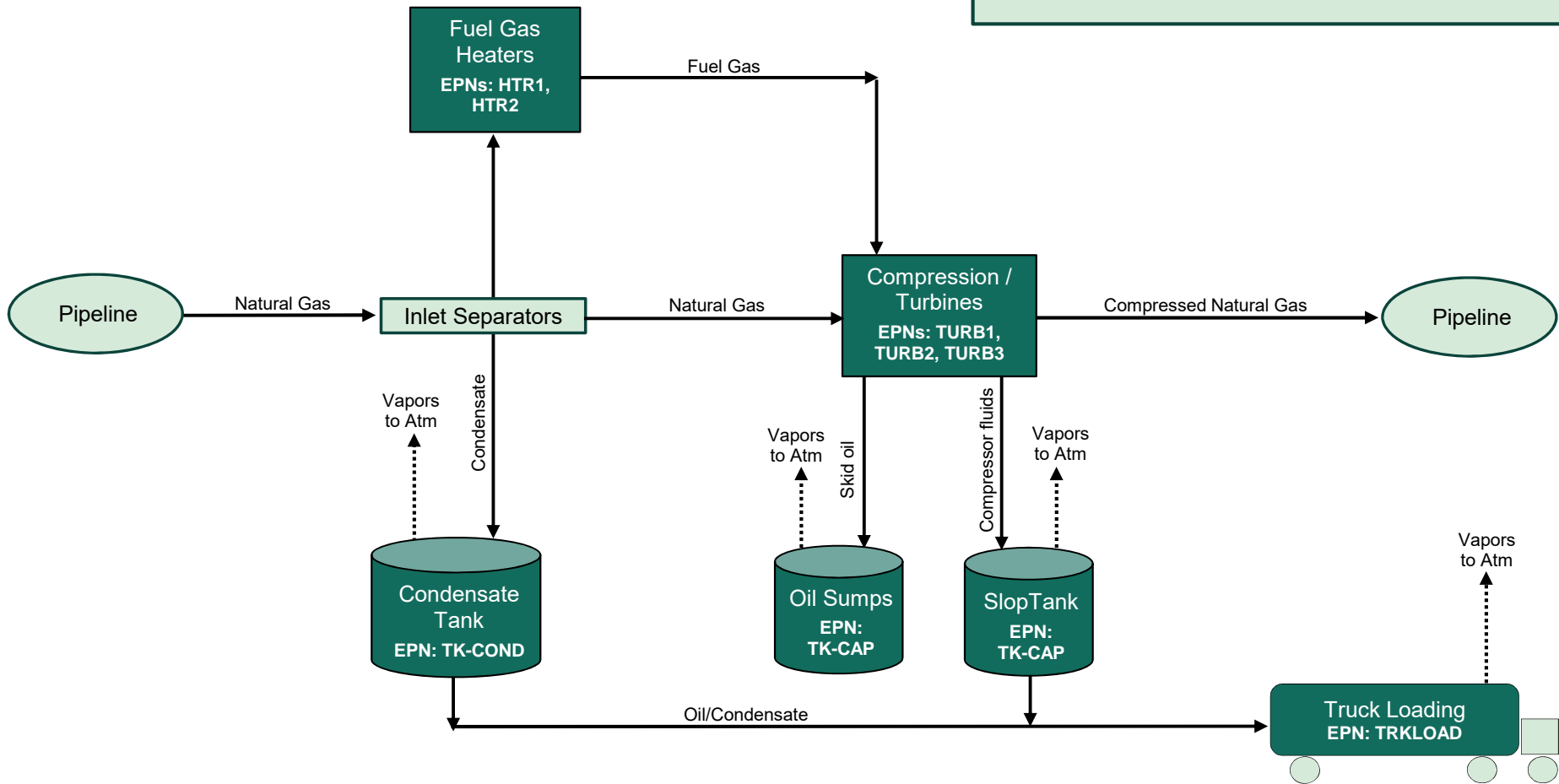
This application includes estimated worst-case emissions from planned MSS activities at the Site. The basis of the emission calculations (i.e. frequency, volume, pressure, etc.) for each activity should not be interpreted as representations of a specific facility or MSS activity condition under 30 TAC §116.116(a). The actual annual frequency of each MSS activity required to maintain good working order of facilities may vary.

Detailed emission calculations from the following planned MSS activities are included in Appendix B of this application.

- Pipeline Pigging
- Turbine shutdowns and start-ups
- Turbine blowdowns
- Miscellaneous venting during planned general maintenance

Additional emission sources at the site include:

- Piping Fugitive components (EPN: FUG1)
- Emergency Generator Engines (EPNs: GEN1, GEN2)
- Planned MSS Activities (EPNs: MSS-TURB-SS, MSS-MISC, MSS-PIG, MSS-TURB)



Permian Highway Pipeline, LLC
 Coyanosa Compressor Station
 Pecos County, Texas

Figure 4-1
 Process Flow
 Diagram



Section 5 Emissions Data

This section outlines the emission sources and calculation methods used to determine the emission rates associated with each emission source category. A summary of the proposed emissions is included in Section 1, Table 1-1. Detailed emission calculations are presented in Appendices A and B of this document.

5.1 Routine Emissions

The following describes the emission calculations associated with each routine emission source category in this document. Detailed emission calculations are presented in Appendix A of this application.

5.1.1 Fugitives

Emissions from fugitive components are calculated using appropriate stream compositions and emission factors from TCEQ's *Air Permit Guidance for Chemical Sources: Fugitive Guidance*, June 2018. Each fugitive component was classified first by equipment type (valve, pump, relief valve, etc.) and then by material type (gas/vapor, light liquid, heavy liquid). Total emission rates are estimated by multiplying the number of fugitive components by the appropriate emission factor for each equipment type.

5.1.2 Storage Tanks - Fixed Roof

For purposes of determining vapor pressure of the liquid stored, properties of the specified petroleum liquids (from TANKS 4.0.9d and/or US EPA's AP-42 Ch. 7) are used to represent storage tank contents.

Short-term emissions are the sum of the working loss rates calculated per TCEQ's Guidance APDG 6250, February 2018. Worst-case hourly emissions are based on the conservative hourly maximum pump rate. Vapors from tanks are vented to atmosphere.

5.1.3 Natural Gas-Fired Engines

Emissions from the natural gas-fired engines, including NO_x, CO, VOC, SO₂, PM, HCHO, benzene, and other HAPs, are calculated using emission factors from manufacturer's specification sheets, applicable NSPS JJJJ emission standards, the appropriate emission factors from US EPA's AP-42 Ch. 3.2 tables, maximum rated horsepower, and brake specific fuel consumption. Annual emissions from the emergency generators are based on 10% operation (876 hours/year).

5.1.4 Turbine(s)

The natural gas-fired Solar Titan turbines at this Site are all equipped with Solar SoLoNO_xTM dry low NO_x combustion technology. Annual emissions from the turbines are based on continuous operation (8,760 hours/year) and the maximum site-specific horsepower and brake-specific fuel consumption.

The NO_x, CO, and VOC emissions are based on the most conservative site-specific emission factors from Solar Turbines, Titan 250 or Titan 130 Predicted Emission Performance Data Sheet. Per Solar Turbines Product Information Letter (PIL), *PIL 168, Rev 4, May 14, 2012*, the VOC emissions are based on 10% of the unburned hydrocarbon (UHC) emission rate, which is deemed as a conservative estimate.

The emissions SO₂, PM, HCHO, and other HAPs are calculated based on the appropriate emission factors from US EPA's AP-42 Ch. 3.1 tables, maximum site-specific horsepower, and brake specific fuel consumption.

5.1.5 Heaters/Boilers

Emissions are estimated based on the maximum boiler rating, heating value of the fuel gas, and emission factors from US EPA's AP-42 Ch. 1.4 tables. For heaters/boilers utilizing fuel gas with >0 ppm_v H₂S, SO₂ emissions are calculated using a sulfur material balance based on the assumption that 100% of H₂S is converted to SO₂ during combustion.

5.1.6 Truck Loading

Emissions from oil/condensate loading are calculated per US EPA's AP-42 Ch. 5.2, using annual average throughput. Maximum hourly loading rate is based on the volume of the tank truck. Vapors produced during loading operations are vented to atmosphere.

5.2 Planned Maintenance, Startup, and Shutdown Emissions

Planned MSS activities and associated emissions will occur to support the Site's routine operations. The following describes the calculations used to determine the emissions associated with each planned MSS activity included in this application.

Detailed emission calculations are presented in Appendix B of this application.

5.2.1 Pipeline Pigging

Pigging may be required to clean and maintain product pipelines. Emissions associated with pigging maintenance include uncontrolled degassing of the pig receiver and venting of residual vapor. The volume of gas vented is estimated based on the actual volume of the receiver and the volume of gas contained in the piping at line pressure that would be released at atmospheric ambient conditions. Emissions are estimated based on the volume of gas, the vapor composition, molecular weight, and ideal gas constant.

5.2.2 Turbine MSS

Estimated planned MSS emissions, including start-up, shutdown, and blowdowns, for the turbines located at the Site are included with this application.

During turbine startup, the turbines may emit high levels of CO emissions until the turbine stabilizes within the proper operational envelope. Typical start-up and shutdown sequences are less than 10 minutes each. Start-up and shutdown emissions are estimated using factors from Solar Turbines PIL 170, Rev 9, September 10, 2018, Tables 2 and 3.

During turbine blowdowns, gas is vented prior to planned maintenance. The volume of gas vented due to a blowdown is estimated based on the potential volume of gas contained in the turbine that would be released following the shutdown of the turbine and prior to the startup. Emissions are estimated based on the volume of gas, the vapor composition, molecular weight, and ideal gas constant.

5.2.3 General/Miscellaneous Planned Maintenance

The volume of gas released due to general planned maintenance is estimated based on similar operations. Emissions are estimated based on the volume of gas released, the vapor composition, molecular weight, and ideal gas constant.

Section 6

Permit by Rule Requirements

6.1 PBR General Requirements

The Site must comply with all applicable provisions of 30 TAC Chapter 106. The emissions from the facilities included in this application will satisfy the conditions for facilities authorized by PBR, which is covered under 30 TAC Chapter §116.110(d)(1). This section presents a review of the general requirements potentially applicable to the Site.

6.1.1 30 TAC Chapter 106 – General Requirements

The project will comply with the applicable provisions of 30 TAC Chapter 106 as follows:

§106.4 Requirements for Permitting by Rule

The total project emissions, shown in Table 1-1 demonstrate compliance with the limits listed in §106.4(a)(1) and (4). PHP LLC will ensure compliance the applicable requirements of this section.

§106.6 Registration of Emissions

With this registration, PHP LLC is certifying the maximum emission rates from facilities permitted by rule are below the emission limitations in §106.4. PHP LLC will revise the certified registration prior to implementing any change at the site that will result in increased emissions.

§106.8 Recordkeeping

PHP LLC will maintain records, in accordance with §106.8(c), containing sufficient information to demonstrate compliance with all applicable general requirements and PBR conditions.

§106.50 Registration Fees for Permits by Rule

PHP LLC is submitting this registration for review via STEERS and has paid the appropriate fee based on the criteria outlined in §106.50(a). A PI-7 Form is no longer required as all administrative and technical information needed by the APD to evaluate PBR claims is entered in STEERS.

6.2 PBR Specific Requirements - 30 TAC Chapter 106

This section addresses applicable requirements for each applicable PBR being claimed.

6.2.1 §106.352(l) – Oil and Gas Handling and Production Facilities

The Site is a compressor station operating new and/or modified facilities except those specified in §106.352(a)(1). There are no facilities at the handling sour gas.

6.2.2 §106.359 – Planned MSS at Oil and Gas Handling and Production Facilities

This registration includes emissions from planned MSS activities; however, PHP LLC is not requesting authorization of planned MSS activities associated with the facilities at the site under §106.359. Planned MSS activities are authorized under §106.352(I).

6.2.3 §106.511 – Portable and Emergency Engines and Turbines

The engine(s) at this site are used only for emergency services. The maximum operating hours of this unit will not exceed 10% of the normal annual operating schedule, or 876 hours annually.

6.2.3 §106.512 – Stationary Engines and Turbines

The stationary internal combustion reciprocating turbines at this Site are rated 500 hp or greater. The turbines will maintain compliance with the emissions standards, testing, and recordkeeping requirements of this PBR.

Section 7 Impacts Evaluation

In accordance with 30 TAC §101.21 and §112.32, authorized emission sources must be able to demonstrate compliance with the applicable NAAQS and State Property Line Standard.

US EPA's SCREEN3 screening model was used to demonstrate compliance for NO₂ with the relevant NAAQS at the nearest property line. The maximum modeled impacts are shown at distances beyond the property line. Table 7-1 includes the input parameters and the evaluation results are presented in Table(s) 7-2.

Impacts evaluations for SO₂, benzene, and H₂S were not conducted as the concentrations are not expected to exceed any applicable standard. An impacts evaluation can be provided upon request.

Table 7-1

Impacts Evaluation - Modeling Parameters

Permian Highway Pipeline, LLC - Coyanosa Compressor Station

December 2019

EPN	FIN	Stack Parameters (for SCREEN3)					SCREEN3 Results	
		Heat Release	Stack Height	Stack Diameter	Exit Temp	Exit Velocity	Distance to Max (Off-Property)	G _{hourly}
		MMBtu/hr	ft	ft	°F	ft ³ /min	m	(µg/m ³) per (lb/hr)
TURB1, TURB2	TURB1, TURB2		36	6.0	889	254,867	1,138	0.18
TURB3	TURB3		41	7.0	787	289,099	1,227	0.16
GEN1, GEN2	GEN1, GEN2		23	1.3	858	11,703	188	4.77
HTR1, HTR2	HTR1, HTR2	2.765	20	1	400	761	110	63.87

Table 7-2

Impacts Evaluation - NO₂ Impacts Review

Permian Highway Pipeline, LLC - Coyanosa Compressor Station

December 2019

EPN	FIN	NO _x		NO ₂ /NO _x ratio ^[1]	NO ₂		SCREEN3 Evaluation	
		lb/hr	tpy		lb/hr	tpy	G _{hourly}	
							(µg/m ³) per (lb/hr) ^[2]	µg/m ³
TURB1, TURB2	TURB1, TURB2	19.30	84.52	0.9	17.37	76.07	0.18	3.20
TURB3	TURB3	11.45	50.13	0.9	10.30	45.12	0.16	1.67
GEN1, GEN2	GEN1, GEN2	19.18	8.40	0.2	3.84	1.68	4.77	18.29
HTR1, HTR2	HTR1, HTR2	0.54	2.37	0.9	0.49	2.14	63.87	31.16
Site-wide Totals		50.47	145.43		31.99	125.01	Project Impacts (µg/m³)	54.32
Background ^[3] (µg/m³)							70	
Total Impacts (µg/m³)							124.32	
P, Applicable Standard ^[4] (µg/m³)							188	
Pass?							Yes	

Notes

[1]. NO₂/NO_x ratio determined in accordance with the TCEQ APDG 6232v4 Air Quality Modeling Guidelines (09/2018), and with paragraph (k)(4)(A) of 30 TAC §106.352 for engines.

[2]. Each EPN is modeled in SCREEN3 using a unit emission rate of 1 lb/hr. The SCREEN3 generic impact, G_{hourly} (µg/m³) / (lb/hr), is determined for each EPN. Emission rates from each source are multiplied by G_{hourly}. Maximum impacts are summed and evaluated

[3]. Source: TCEQ, Interim 1-Hour NO₂ Screening Background Concentrations, July 22, 2010.

[4]. P: applicable standard - lesser of NAAQS, 30 TAC 112 limit, and ESL (as applicable) (µg/m³)

[5]. The stack gas flow rate for heater/boilers is determined using the following formula: $Q = Fd * [20.9 / (20.9 - \%O_2)] * Hin / 60$, where Fd = Fuel factor, dry basis (from EPA Method 19) = dscf/MMBtu for natural gas; %O₂ = Measured oxygen concentration, dry basis = 3%; and Hin = Heat input rate in MMBtu/hr (Preferred and Alternative Methods for Estimating Air Emissions from Boilers, EPA, January 2001, Volume II, Chapter 2).

Section 8

Rule Applicability Analysis

8.1 State Requirements

Pursuant to 30 TAC §106.4(c), PHP LLC proposes to meet the rules and regulations of the TCEQ and the intent of the TCAA, including protection of the health and property of the public. This section addresses the potentially applicable state requirements.

8.1.1 Chapter 101 – General Air Quality Rules

The Site is located in Pecos County which is currently classified as attainment or unclassified for all criteria pollutants and is not a major source of emissions. PHP LLC will comply with any special inventory requests received from the TCEQ in accordance with 30 TAC §101.10.

PHP LLC will report emissions events or scheduled MSS activity exceeding or expected to exceed the reportable quantities defined in this chapter. Records of all emissions events will be maintained in accordance with §101.201 & §101.211.

8.1.2 Chapter 111 – Visible Emissions and Particulate Matter

Facilities included in this registration are subject to and will operate in compliance with this chapter.

The stationary vent(s) at this Site shall not exceed the opacity limit of 20% averaged over a six-minute period. PHP LLC will maintain compliance with this paragraph in accordance with the provisions of this rule.

8.1.3 Chapter 112 – Sulfur Compounds

Facilities that are emission sources of SO₂ or H₂S included in this application are subject to and will operate in compliance with all applicable requirements of 30 TAC Chapter 112.

8.1.4 Chapter 113 – Toxic Materials

This chapter addresses the control of HAP. The Site will comply with applicable standards of performance for HAPs as addressed in the Federal Requirements section.

8.1.5 Chapter 115 – VOC

This chapter addresses the control of air pollution from VOC in the Beaumont/Port Arthur, Dallas/Fort Worth, El Paso, and Houston/Galveston areas. The Site is located in Pecos County, which is not an affected county under Chapter 115.

8.1.6 Chapter 116 – New Construction or Modification

This chapter addresses the authorization requirements for new or modified facilities that emit air contaminants. This application satisfies the requirements of §116.110(a)(2)(A) for facilities permitted by rule under 30 TAC Chapter 106.

8.1.7 Chapter 117 – Nitrogen Compounds

This chapter addresses control of air pollution from nitrogen compounds in the Beaumont/Port Arthur, Dallas/Fort Worth, and Houston/Galveston ozone nonattainment areas; gas-fired reciprocating internal combustion engines in East Texas; and utility electric generation in East and Central Texas.

The Site is located in Pecos County, which is not an affected county under Chapter 117.

8.1.8 Chapter 122 – Federal Operating Permits

This chapter addresses the requirements of any site that is defined as a major source as defined in §122.10. The site is a major source for Title V purposes; therefore, PHP LLC is required to obtain a federal operating permit pursuant to this chapter. PHP LLC is submitting a Title V application concurrently with this submittal.

8.2 Federal Requirements

This section addresses the potential applicability of federal air quality regulations, in accordance with 30 TAC §106.4(a)(6), for the facilities represented in this registration. PHP LLC will comply with the applicable provisions of the regulations presented.

8.2.1 NSPS – 40 CFR Part 60

Subpart Kb – Standards of Performance for Volatile Organic Liquid Storage Vessels for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984.

The storage tanks at this Site commenced construction after July 23, 1984; however, each tank used to store volatile organic liquids has a design capacity less than 75 m³; therefore, this subpart does not apply per §60.110b(a).

Subpart GG – Standards of Performance for Stationary Gas Turbines.

This Site operates a stationary gas turbine which commenced construction after October 3, 1977; however, per 60.4305(b), stationary combustion turbines regulated under NSPS KKKK are exempt from the requirements of subpart GG. There are no further requirements under this subpart.

Subpart KKK – Standards of Performance for Equipment Leaks of VOC From Onshore Natural Gas Processing Plants for Which Construction, Reconstruction, or Modification Commenced After January 20, 1984, and on or Before August 23, 2011.

This Site does not meet the definition of natural gas processing plant as defined in 40 CFR §60.631; therefore, this subpart does not apply.

Subpart LLL – Standards of Performance for SO₂ Emissions From Onshore Natural Gas Processing for Which Construction, Reconstruction, or Modification Commenced after January 20, 1984, and on or before August 23, 2011.

This Site does not operate an affected facility under this subpart; therefore, this subpart does not apply.

Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engine.

The stationary compression ignition (CI) internal combustion engine(s) at this Site commenced construction after July 11, 2005; therefore, the engine is an affected facility. The engine has been certified to meet US EPA Nonroad Tier 3 regulations. There are no further requirements under this subpart.

Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

The stationary spark-ignited internal combustion engines at the Site are emergency engines > 25 hp and were manufactured after January 1, 2009 and are, therefore, subject to this subpart per 60.4230(a)(2)(ii). Compliance with the applicable testing, reporting, monitoring, and recordkeeping requirements of this subpart will be maintained.

Subpart KKKK – Standards of Performance for Stationary Combustion Turbines

This Site operates stationary combustion turbine(s) with a maximum load ≥ 10 MMBtu/hr and commenced construction, modification, or reconstruction after February 18, 2005; therefore, the turbine(s) are subject to this subpart per §60.4305(a). Compliance with the applicable testing, reporting, monitoring, and recordkeeping requirements of this subpart will be maintained.

Subpart OOOO – Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution for which Construction, Modification or Reconstruction Commenced After August 23, 2011, and on or before September 18, 2015.

This subpart covers gas wells, compressors, pneumatic controllers, storage vessels, and process equipment at onshore natural gas processing plants. Any potentially affected facilities were constructed after September 18, 2015; therefore, there are no requirements under this subpart.

Subpart OOOOa – Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015.

This subpart covers oil and gas wells, compressors, pneumatic controllers, pneumatic pumps, storage vessels, process equipment at onshore natural gas processing plants, and fugitive components at a well site or compressor station.

The potentially affected storage vessels at this Site were constructed after September 18, 2015. The storage vessels do not have the potential to emit ≥ 6 tpy VOC and are, therefore, not affected facilities per §60.5365a(e) of this subpart.

The centrifugal compressors at this Site were constructed after September 18, 2015; however, they utilize dry seals and are not affected facilities under this subpart.

This Site is a compressor station as defined in §60.5430a constructed after the applicability date; therefore, the collection of fugitive emissions components at this Site is an affected facility per §60.5365a(j). Compliance with the applicable requirements will be maintained.

No other potentially affected facilities are operated at this Site; therefore, there are no requirements under this subpart.

8.2.2 NESHAP – 40 CFR Part 61

The Site is an area source of HAP and the facilities included in this application are not subject to the requirements of the NESHAP.

8.2.3 NESHAP for Source Categories – 40 CFR Part 63

Subpart HH – National Emission Standards for Hazardous Air Pollutants From Oil and Natural Gas Production Facilities

This Site does not operate an affected facility under this subpart; therefore, this subpart does not apply.

Subpart YYYY – National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines

This Site operates stationary combustion turbine(s) located an area source of HAP, which is not an affected facility under this subpart per §63.6085; therefore, this subpart does not apply.

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

The engines are new stationary RICE located at an area source of HAPs and are affected sources. Per §63.6590(c)(1), the engines meet the requirements of this part by meeting the requirements of NSPS JJJJ or IIII, as applicable.

Appendix A
Routine Emission Calculations

Table A-1

Fugitive Emissions

Permian Highway Pipeline, LLC - Coyanosa Compressor Station

December 2019

FIN/EPN:	FUG1
Name:	Piping Fugitive Emissions

Component Type	Service Stream Type	Emission Factors: ^[1] Oil and Gas Production	LDAR Program:	Component Count ^[2]	TOC Emissions	
			None		lb/hr	tpy
			Control Efficiency ^[3]			
Valves	Gas	0.00992	0%	291	2.89	12.64
Valves	Light Liquid	0.0055	0%	62	0.34	1.49
Valves	Water/Oil	0.000216	NA	34	0.01	0.03
Connectors	Gas	0.00044	0%	801	0.35	1.54
Connectors	Light Liquid	0.000463	0%	164	0.10	0.45
Connectors	Water/Oil	0.000243	NA	106	0.03	0.11
Flanges	Gas	0.00086	0%	5	4.30E-03	0.02
Flanges	Light Liquid	0.000243	0%	41	0.01	0.04
Open-ended Lines	Gas	0.00	0%	32	0.14	0.62
Compressor	Gas	0.02	0%	3	0.06	0.25
Pressure Relief Valves	Gas	0.02	NA	21	0.41	1.78
Total by Service Stream Type: Gas				1,153	3.85	16.86
Total by Service Stream Type: Light Liquid				407	0.49	2.13
Total:					4.34	18.99

Stream Composition (Wt%) ^[4]

Stream Type	TOC	VOC	Total HAPs	Benzene	H ₂ S
Gas	96.51%	0.49%	0.00%	0.00%	0.00%
Light Liquid	100.00%	100.00%	4.03%	0.70%	0.00%

Total Emission Rates

Stream Type	VOC		Total HAPs		Benzene		H ₂ S	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Gas	0.02	0.09	--	--	--	--	--	--
Light Liquid	0.49	2.13	0.02	0.09	3.4E-03	0.01	--	--
Total:	0.51	2.21	0.02	0.09	3.4E-03	0.01	--	--

Notes:

- VOC emission leak factors (lb/hr TOC per component) from Air Permit Technical Guidance for Chemical Sources: Fugitive Guidance for Oil and Gas Production Operations, APDG 6422v2, TCEQ, June 2018, which are based on US EPA's Protocol for Equipment Leak Emission Estimates, November 1995.
- Component counts estimated based on 40 CFR 98 Subpart W, Table W-1B/C counts for Western US Onshore natural gas and oil production.
- No required or voluntary LDAR program has been implemented at this site; therefore, no program reductions have been applied.
- Gas service stream composition based on Representative PHP Gas Composition sample.
- Liquid service stream(s) composition based on Conservative Liquid Analysis (Assumed 100% VOC) sample.

Table A-2

Turbine Emissions

Permian Highway Pipeline, LLC - Coyanosa Compressor Station

December 2019

EPNs	TURB1, TURB2	FINs	TURB1, TURB2
Names	Solar Titan 130 Turbines		

Basis	
Fuel Type:	Natural Gas
Number of Units:	2
Manufacturer:	Solar
Model No.:	Titan 130 E (23502S)
Unit Type:	Turbine
Application:	Gas Compression
Manufacture Date:	2019
Horsepower Rating:	22,232 HP
Fuel Consumption:	7,208 Btu/hp-hr
Emission Control Method:	Low-NOx Combustors
Annual Operation:	8,760 hr/yr

Discharge/Stack Parameters		
Height :	36.00	ft
Diameter:	6.00	ft
Temperature:	889	°F
Flowrate :	254,867	cfm

Constants		
Ideal Gas Law =	385.33	scf/lb-mol
MW S =	32.06	lb/lb-mol
MW SO ₂ =	64.06	lb/lb-mol

Fuel Data		
Sulfur Content:	0.06	grains/100scf
H ₂ S Content*	0.0001%	mol%

*Fuel H₂S content is based on Solar Turbine Fuel Gas sample.

Emissions Rates

Pollutant	Emission Factors [1]			Emissions Rates, (per Unit)		Total Emissions (All Units)	
	Value	units	Source of EF	lb/hr	tpy	lb/hr	tpy
VOC (w/HCHO)	0.0035	lb/MMBtu	Manufacturer Data [2]	0.56	2.46	1.12	4.91
NO _x	0.0602	lb/MMBtu	Manufacturer Data	9.65	42.26	19.30	84.52
CO	0.0611	lb/MMBtu	Manufacturer Data	9.79	42.88	19.58	85.76
PM ₁₀	0.0047	lb/MMBtu	AP-42,Table 3.1-2a	0.75	3.30	1.51	6.60
PM _{2.5}	0.0019	lb/MMBtu	AP-42,Table 3.1-2a	0.30	1.33	0.61	2.67
SO ₂	0.0034	lb/MMBtu	AP-42,Table 3.1-2a	0.54	2.39	1.09	4.77
HAP Emissions							
Acetaldehyde	4.0E-05	lb/MMBtu	AP-42,Table 3.1-3	0.01	0.03	0.01	0.06
Acrolein	6.4E-06	lb/MMBtu	AP-42,Table 3.1-3	1.03E-03	4.49E-03	2.05E-03	0.01
Benzene	1.2E-05	lb/MMBtu	AP-42,Table 3.1-3	1.92E-03	0.01	3.85E-03	0.02
Formaldehyde (HCHO)	0.0007	lb/MMBtu	AP-42,Table 3.1-3	0.11	0.50	0.23	1.00
Toluene	1.3E-04	lb/MMBtu	AP-42,Table 3.1-3	0.02	0.09	0.04	0.18
Xylenes	6.4E-05	lb/MMBtu	AP-42,Table 3.1-3	0.01	0.04	0.02	0.09
Total HAPs				0.15	0.68	0.31	1.35

Equations used:

- (lb/hr) = EF (g/hp-hr) × HP / 453.59 (g/lb)
- (lb/hr) = EF (lb/MMBtu) × Fuel Consumption (Btu/hp-hr) × HP / 1,000,000 (Btu/MMBtu)
- (lb/hr) = (hp) × Fuel Consumption (Btu/hp-hr) / Fuel HHV (Btu/scf) × Fuel H₂S content (mol%) / Ideal Gas Law (scf/lb-mol) × MW SO₂ (lb/lb-mol)
- (tpy) = Hourly Emission Rate (lb/hr) × Annual operation (hrs/yr) / 2,000 (lb/ton)

Notes:

[1] Emissions from the turbine, including NO_x, CO, VOC, SO₂, PM, HCHO, benzene, and other HAPs, are calculated using the appropriate emissions factors as indicated above (i.e. from manufacturer's specification sheets, applicable emission standards for natural gas-fired turbines, and/or emission factors from US EPA's AP 42 Ch. 3.1 tables), maximum rated HP, and brake specific fuel consumption.

[2] VOC emissions are based on 10% of the unburned hydrocarbon (UHC) emission rate per Solar Turbines PIL 168, Rev 4, May 14, 2012.

Table A-3

Turbine Emissions

Permian Highway Pipeline, LLC - Coyanosa Compressor Station

December 2019

EPN	TURB3	FIN	TURB3
Name	Solar Titan 250 Turbine		

Basis	
Fuel Type:	Natural Gas
Number of Units:	1
Manufacturer:	Solar
Model No.:	Titan 250 E (31900S)
Unit Type:	Turbine
Application:	Gas Compression
Manufacture Date:	2019
Horsepower Rating:	30,533 HP
Fuel Consumption:	6,255 Btu/hp-hr
Emission Control Method:	Low-NOx Combustors
Annual Operation:	8,760 hr/yr

Discharge/Stack Parameters		
Height :	41.00	ft
Diameter:	7.00	ft
Temperature:	787	°F
Flowrate :	289,099	cfm

Constants		
Ideal Gas Law =	385.33	scf/lb-mol
MW S =	32.06	lb/lb-mol
MW SO ₂ =	64.06	lb/lb-mol

Fuel Data		
Sulfur Content:	0.06	grains/100scf
H ₂ S Content*	0.0001%	mol%

*Fuel H₂S content is based on Solar Turbine Fuel Gas sample.

Emissions Rates

Pollutant	Emission Factors [1]			Emissions Rates	
	Value	units	Source of EF	lb/hr	tpy
VOC (w/HCHO)	0.0035	lb/MMBtu	Manufacturer Data [2]	0.67	2.91
NO _x	0.0599	lb/MMBtu	Manufacturer Data	11.45	50.13
CO	0.0608	lb/MMBtu	Manufacturer Data	11.61	50.87
PM ₁₀	0.0047	lb/MMBtu	AP-42,Table 3.1-2a	0.90	3.93
PM _{2.5}	0.0019	lb/MMBtu	AP-42,Table 3.1-2a	0.36	1.59
SO ₂	0.0034	lb/MMBtu	AP-42,Table 3.1-2a	0.65	2.84
HAP Emissions					
Acetaldehyde	0.0000	lb/MMBtu	AP-42,Table 3.1-3	0.01	0.03
Acrolein	0.0000	lb/MMBtu	AP-42,Table 3.1-3	1.22E-03	0.01
Benzene	0.0000	lb/MMBtu	AP-42,Table 3.1-3	2.29E-03	0.01
Formaldehyde (HCHO)	0.0007	lb/MMBtu	AP-42,Table 3.1-3	0.14	0.59
Toluene	0.0001	lb/MMBtu	AP-42,Table 3.1-3	0.02	0.11
Xylenes	0.0001	lb/MMBtu	AP-42,Table 3.1-3	0.01	0.05
Total HAPs				0.18	0.81

Equations used:

- (lb/hr) = EF (g/hp-hr) × HP / 453.59 (g/lb)
- (lb/hr) = EF (lb/MMBtu) × Fuel Consumption (Btu/hp-hr) × HP / 1,000,000 (Btu/MMBtu)
- (lb/hr) = (hp) × Fuel Consumption (Btu/hp-hr) / Fuel HHV (Btu/scf) × Fuel H₂S content (mol%) / Ideal Gas Law (scf/lb-mol) × MW SO₂ (lb/lb-mol)
- (tpy) = Hourly Emission Rate (lb/hr) × Annual operation (hrs/yr) / 2,000 (lb/ton)

Notes:

[1] Emissions from the turbine, including NO_x, CO, VOC, SO₂, PM, HCHO, benzene, and other HAPs, are calculated using the appropriate emissions factors as indicated above (i.e. from manufacturer's specification sheets, applicable emission standards for natural gas-fired turbines, and/or emission factors from US EPA's AP 42 Ch. 3.1 tables), maximum rated HP, and brake specific fuel consumption.

[2] VOC emissions are based on 10% of the unburned hydrocarbon (UHC) emission rate per Solar Turbines PIL 168, Rev 4, May 14, 2012.

Table A-4

Natural Gas Engine Emissions

Permian Highway Pipeline, LLC - Coyanosa Compressor Station

December 2019

EPNs	GEN1, GEN2	FINs	GEN1, GEN2
Names	Emergency Generator Engines		

Basis	
Fuel Type:	Natural Gas
Number of Units:	2
Manufacturer:	Caterpillar
Model No.:	G3516C
Unit Type:	4SLB
Application:	Emergency
Manufacture Date:	TBD
Horsepower Rating:	2,175 HP
Power Output:	1,500 kWm
Fuel Consumption:	6,705 Btu/hp-hr
Emission Control Method:	Oxidation Catalyst
Annual Operation:	876 hr/yr

Discharge/Stack Parameters		
Height :	23.00	ft
Diameter:	1.33	ft
Temperature:	858	°F
Flowrate :	11,703	cfm

Constants		
Ideal Gas Law =	385.33	scf/lb-mol
MW S =	32.06	lb/lb-mol
MW SO ₂ =	64.06	lb/lb-mol

Fuel Data		
Heat Value:	939	Btu/scf
Sulfur Content:	0.06	grains/100scf
H ₂ S Content*	0.0001%	mol%

*Fuel H₂S content is based on Solar Turbine Fuel Gas sample.

Emissions Rates

Pollutant	Emission Factors [1]			Emissions Rates, (per Unit)		Total Emissions (All Units)	
	Value	units	Source of EF	lb/hr	tpy	lb/hr	tpy
VOC (w/HCHO)	1.0000	g/hp-hr	NSPS JJJJ	4.80	2.10	9.59	4.20
NO _x	2.0000	g/hp-hr	NSPS JJJJ	9.59	4.20	19.18	8.40
CO	4.0000	g/hp-hr	NSPS JJJJ	19.18	8.40	38.36	16.80
PM ₁₀	0.0099	lb/MMBtu	AP-42,Table 3.2-2	0.14	0.06	0.29	0.13
PM _{2.5}	0.0001	lb/MMBtu	AP-42,Table 3.2-2	1.12E-03	4.92E-04	2.25E-03	9.85E-04
SO ₂	0.0006	lb/MMBtu	AP-42,Table 3.2-2	0.01	3.76E-03	0.02	0.01
HAP Emissions							
Acetaldehyde	0.0084	lb/MMBtu	AP-42,Table 3.2-2	0.12	0.05	0.24	0.11
Acrolein	0.0051	lb/MMBtu	AP-42,Table 3.2-2	0.07	0.03	0.15	0.07
Benzene	0.0004	lb/MMBtu	AP-42,Table 3.2-2	0.01	2.81E-03	0.01	0.01
Formaldehyde (HCHO)	0.5600	g/hp-hr	Manufacturer Data	2.69	1.18	5.37	2.35
Toluene	0.0004	lb/MMBtu	AP-42,Table 3.2-2	0.01	2.61E-03	0.01	0.01
Xylenes	0.0002	lb/MMBtu	AP-42,Table 3.2-2	2.68E-03	1.18E-03	0.01	2.35E-03
Total HAPs				2.90	1.27	5.79	2.54

Equations used:

- (lb/hr) = EF (g/hp-hr) × HP / 453.59 (g/lb)
- (lb/hr) = EF (lb/MMBtu) × Fuel Consumption (Btu/hp-hr) × HP / 1,000,000 (Btu/MMBtu)
- (lb/hr) = (hp) × Fuel Consumption (Btu/hp-hr) / Fuel HHV (Btu/scf) × Fuel H₂S content (mol%) / Ideal Gas Law (scf/lb-mol) × MW SO₂ (lb/lb-mol)
- (tpy) = Hourly Emission Rate (lb/hr) × Annual operation (hrs/yr) / 2,000 (lb/ton)

Notes:

[1] Emissions from the natural gas-fired engines, including NO_x, CO, VOC, SO₂, PM, HCHO, benzene, and other HAPs, are calculated using emission factors as indicated above (i.e. from manufacturer's specification sheets and the most stringent applicable emission standard, the appropriate emission factors from US EPA's AP-42 Ch. 3.2 tables), maximum rated HP, and brake specific fuel consumption.

Table A-5

Heater/Boiler Emissions

Permian Highway Pipeline, LLC - Cayanosa Compressor Station

December 2019

EPNs	HTR1, HTR2	FINs	HTR1, HTR2
Names	Fuel Gas Heaters		

Basis		
Fuel Type:	Natural Gas	
Number of Units:	2	(Model HH2750)
Heater/Boiler Rating	2.76	MMBtu/hr
Fuel Heat Value (HHV):	939	Btu/scf
Fuel H ₂ S content ^[1] :	0.0001%	mol%
Stack Height:	20	ft
Annual Operation:	8,760	hours/year

[1] Fuel H₂S Content is based on Solar Turbine Fuel Gas sample.

Pollutant	Emission Factor			Emission Rates (per Unit)	
	lb/MMscf	lb/MMBtu	Source of Emission Factor	lb/hr	tpy
Total VOC	5.5	5.39E-03	AP-42, Table 1.4-2	0.01	0.07
NO _x	100	9.80E-02	AP-42, Table 1.4-1	0.27	1.19
CO	84	8.24E-02	AP-42, Table 1.4-1	0.23	1.00
PM ₁₀	7.6	7.45E-03	AP-42, Table 1.4-2	0.02	0.09
PM _{2.5}	5.7	5.59E-03	AP-42, Table 1.4-2	0.02	0.07
SO ₂	0.6	5.88E-04	AP-42, Table 1.4-2	1.63E-03	0.01
HAP Emissions					
Benzene	0.0021	2.06E-06	AP-42, Table 1.4-3	5.69E-06	2.49E-05
Formaldehyde	0.075	7.35E-05	AP-42, Table 1.4-3	2.03E-04	8.90E-04
n-Hexane	1.800	1.76E-03	AP-42, Table 1.4-3	4.88E-03	0.02
Toluene	0.003	3.33E-06	AP-42, Table 1.4-3	9.22E-06	4.04E-05
Total HAPs				0.01	0.02

Equations Used:

- Hourly emissions (lb/hr) = EF (lb/MMscf) / 1,020 (Btu/scf) × Heater/Boiler Rating (MMBtu/hr)
- Annual emission rate (tpy) = Hourly Emission Rate (lb/hr) × Hours of operation per year (hrs/yr) / 2,000 (lb/ton)
- Hourly Emissions (lb/hr) = Heater/Boiler Rating (MMBtu/hr) × 10⁶ (Btu/MMBtu) / Fuel Heat Value (Btu/scf) × Fuel H₂S content (mol%) / Ideal Gas Law (scf/lb-mol) × MW SO₂ (lb/lb-mol)

**Table A-6
Fixed Roof Tank Losses**

Permian Highway Pipeline, LLC - Coyanosa Compressor Station
December 2019

FIN				TK-COND		TK-SLOP		SUMP-SLOP			
FIN Name				Condensate Tank		Used Slop Tank		Slop Sump			
EPN				TK-COND		TK-CAP		TK-CAP			
Parameter Name & Variable			Units	Reference							
Tank and Product Data	Product Stored Category			Oil/Condensate		Slop (Oil/Cond.)		Slop (Oil/Cond.)			
	Product Stored Type			Crude		Crude		Crude			
	Tank Type			VFR		VFR		VFR			
	Fixed Roof Type			N/A for horizontal tanks		Cone		Cone			
	Constant-Level Tank?		Yes/No			No		No			
	Tank Capacity	T _{CG}	bbl			100		100			
	Number of Tanks					1		1			
	Height (VFR) / Length (HFR)	H _S	ft			8.0		8.0			
	Turnovers	N	-	Eq. 7.1-30		10.0		17.9			
	Annual Throughput	Q	bbl/yr			1,000		1,786			
	Average Liquid Height	H _L	ft			4.0		4.0			
	Diameter/Effective Diameter (HFR only)	D / D _e	ft			9.6		9.6			
	Tank Max Liquid Volume	H _{LX}	gal			4,200		4,200			
	Maximum Pump Rate	F _{RM}	gal/hr			4,200		4,200			
	Roof Outage / Vapor Space Outage	H _{RO} / H _{VO}	ft			0.10	4.10	0.10	4.10	0.08	6.08
	Breather Vent Vacuum / Pressure Setting		psig			-0.03	0.03	-0.03	0.03	-0.03	0.03
	Paint Color			Assumes paint condition = Good		White		White		Green, Dark	
	Paint Solar Absorptance	α				0.17		0.17		0.89	
AP-42/Tanks4.09.d or OTHER Defined Liquid					Gasoline (RVP 15)		Distillate fuel oil No. 2		Residual oil No. 6		
Vapor Pressure Calculation Method					VP Interpolation		VP Interpolation		VP Interpolation		
Vapor Molecular Weight	M _v	lb/lb-mole			60.00		130.00		190.00		
Parameter Name & Variable			Units	Reference		Short-term	Annual	Short-term	Annual	Short-term	Annual
Climatological & Calculated Product Data	Daily Total Solar Insolation Factor	I	Btu/ft ²			2317.97	1689.48	2317.97	1689.48	2317.97	1689.48
	Atmospheric Pressure		psia			13.28	13.28	13.28	13.28	13.28	13.28
	Daily Maximum Ambient Temperature	T _{AX}	°F			95.40	77.22	95.40	77.22	95.40	77.22
	Daily Minimum Ambient Temperature	T _{AN}	°F			68.50	49.32	68.50	49.32	68.50	49.32
	Daily Ambient Temp. Change	ΔT _A	°R	Eq. 7.1-12		26.90	27.90	26.90	27.90	26.90	27.90
	Daily Avg. Ambient Temperature	T _{AA}	°R	Eq. 7.1-27		541.62	522.94	541.62	522.94	541.62	522.94
	Liquid Bulk Temperature	T _B	°R	Eq. 7.1-28		541.64	522.96	541.64	522.96	545.96	527.28
	Daily Avg. Liquid Surface Temperature	T _{LA}	°R	Eq. 7.1-26		544.74	525.22	544.74	525.22	560.35	537.25
	Daily Max. Avg. Liq. Surf. Temp.	T _{LX}	°R	Fig. 7.1-17		554.67	532.25	554.67	532.25	579.63	552.80
	Daily Min. Avg. Liq. Surf. Temp.	T _{LN}	°R	Fig. 7.1-17		537.14	518.19	537.14	518.19	541.07	521.70
	Daily Vapor Temperature Range	ΔT _V	°R	Eq. 7.1-8		30.40	28.13	30.40	28.13	77.13	62.19
	True Vapor Pressure @ T _{LA}	P _{VA}	psia			12.67	9.05	0.01	0.01	0.00	0.00
	True Vapor Pressure @ T _{LX}	P _{VX}	psia			14.90	10.24	0.02	0.01	0.00	0.00
	True Vapor Pressure @ T _{LN}	P _{VN}	psia			11.14	7.96	0.01	0.01	0.00	0.00
	Daily Vapor Pressure Range	ΔP _V	psia	Eq. 7.1-9		3.76	2.28	0.01	0.00	0.00	0.00
	Working Loss Product Factor	K _E		Eq. 7.1-7		6.15	0.58	0.05	0.05	0.13	0.11
	Vented Vapor Saturation Factor	K _S		Eq. 7.1-20		0.27	0.34	1.00	1.00	1.00	1.00
	Turnover Factor	K _N		Fig. 7.1-18		-	1.00	-	1.00	-	1.00
Working Loss Product Factor	K _P				0.75		0.75		0.75		
Vapor Space Volume	V _V	ft ³	Eq. 7.1-3		296.77		296.77		268.52		
Vapor Density	W _V	lb/ft ³	Eq. 7.1-21		0.13	0.10	0.00	0.00	0.00	0.00	
Breathing/Working Emissions Calculations						lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Total Stream Uncontrolled, Breathing Emissions	L _S		Eq. 7.1-2		2.64	1.02	2.00E-04	4.85E-04	9.09E-06	1.49E-05	
Total Stream Uncontrolled, Working Emissions	L _W		Eq. 7.1-29		84.34	0.20	0.23	6.87E-04	--	1.68E-06	
Total Stream Uncontrolled Emissions	L_T		Eq. 7.1-1		86.98	1.22	0.23	1.17E-03	9.09E-06	1.65E-05	
Breathing/Working Vapor Composition	TOC		(wt%)		100.00%		100.00%		100.00%		
Breathing/Working Vapor Composition	Total VOC		(wt%)		100.00%		100.00%		100.00%		
Breathing/Working Vapor Composition	H ₂ S		(wt%)		0.00%		0.00%		0.00%		
Breathing/Working Vapor Composition	Total HAPs		(wt%)		4.03%		4.03%		4.03%		
Uncontrolled Breathing/Working Emissions			Total VOC		86.98	1.22	0.23	1.17E-03	9.09E-06	1.65E-05	
Uncontrolled Breathing/Working Emissions			Benzene		0.61	0.01	1.63E-03	8.20E-06	6.37E-08	1.16E-07	
Uncontrolled Breathing/Working Emissions			Total HAPs		3.51	0.05	0.01	4.72E-05	3.66E-07	6.67E-07	
Total Uncontrolled Emissions			Total VOC		86.98	1.22	0.23	1.17E-03	9.09E-06	1.65E-05	
Total Uncontrolled Emissions			Benzene		0.61	0.01	1.63E-03	8.20E-06	6.37E-08	1.16E-07	
Total Uncontrolled Emissions			Total HAPs		3.51	0.05	0.01	4.72E-05	3.66E-07	6.67E-07	

Total HAPs include benzene. Total VOC include HAPs.

Liquid stream(s) composition based on Conservative Liquid Analysis (Assumed 100% VOC) sample.

**Table A-6
Fixed Roof Tank Losses**

Permian Highway Pipeline, LLC - Coyanosa Compressor Station
December 2019

FIN				SUMP-TURB		TK-MISC	
FIN Name				Turbine Skid Oil Sump		Miscellaneous Tanks	
EPN				TK-CAP		TK-CAP	
Parameter Name & Variable			Units	Reference			
Tank and Product Data	Product Stored Category			Slop (Oil/Cond.)		Misc. Chemical	
	Product Stored Type			Crude		Refined	
	Tank Type			VFR		VFR	
	Fixed Roof Type			N/A for horizontal tanks		Cone	
	Constant-Level Tank?		Yes/No	No		No	
	Tank Capacity	T _{CG}	bbl	61		12	
	Number of Tanks			3		4	
	Height (VFR) / Length (HFR)	H _S	ft	8.0		6.0	
	Turnovers	N	-	Eq. 7.1-30		18.7	
	Annual Throughput	Q	bbl/yr	1,143		100	
	Average Liquid Height	H _L	ft	4.0		3.0	
	Diameter/Effective Diameter (HFR only)	D / D _e	ft	7.0		3.8	
	Tank Max Liquid Volume	H _{LX}	gal	2,573		500	
	Maximum Pump Rate	F _{RM}	gal/hr	0		0	
	Roof Outage / Vapor Space Outage	H _{RO} / H _{VO}	ft	0.07		4.07	
	Breather Vent Vacuum / Pressure Setting		psig	-0.03		0.03	
	Paint Color			Assumes paint condition = Good		Green, Dark	
	Paint Solar Absorptance	α		0.89		0.89	
AP-42/Tanks4.09.d or OTHER Defined Liquid			Residual oil No. 6		Jet kerosene		
Vapor Pressure Calculation Method			VP Interpolation		VP Interpolation		
Vapor Molecular Weight	M _V	lb/lb-mole	190.00		130.00		
Parameter Name & Variable			Units	Reference		Short-term	Annual
Climatological & Calculated Product Data	Daily Total Solar Insolation Factor	I	Btu/ft ²			2317.97	1689.48
	Atmospheric Pressure		psia			13.28	13.28
	Daily Maximum Ambient Temperature	T _{AX}	°F			95.40	77.22
	Daily Minimum Ambient Temperature	T _{AN}	°F			68.50	49.32
	Daily Ambient Temp. Change	ΔT _A	°R	Eq. 7.1-12		26.90	27.90
	Daily Avg. Ambient Temperature	T _{AA}	°R	Eq. 7.1-27		541.62	522.94
	Liquid Bulk Temperature	T _B	°R	Eq. 7.1-28		545.96	527.28
	Daily Avg. Liquid Surface Temperature	T _{LA}	°R	Eq. 7.1-26		560.35	537.25
	Daily Max. Avg. Liq. Surf. Temp.	T _{LX}	°R	Fig. 7.1-17		579.63	552.80
	Daily Min. Avg. Liq. Surf. Temp.	T _{LN}	°R	Fig. 7.1-17		541.07	521.70
	Daily Vapor Temperature Range	ΔT _V	°R	Eq. 7.1-8		77.13	62.19
	True Vapor Pressure @ T _{LA}	P _{VA}	psia			0.00	0.00
	True Vapor Pressure @ T _{LX}	P _{VX}	psia			0.00	0.00
	True Vapor Pressure @ T _{LN}	P _{VN}	psia			0.00	0.00
	Daily Vapor Pressure Range	ΔP _V	psia	Eq. 7.1-9		0.00	0.00
	Working Loss Product Factor	K _E		Eq. 7.1-7		0.13	0.11
	Vented Vapor Saturation Factor	K _S		Eq. 7.1-20		1.00	1.00
	Turnover Factor	K _N		Fig. 7.1-18		-	1.00
Working Loss Product Factor	K _P				0.75		
Vapor Space Volume	V _V	ft ³	Eq. 7.1-3		156.74		
Vapor Density	W _V	lb/ft ³	Eq. 7.1-21		0.00	0.00	
Breathing/Working Emissions Calculations				lb/hr	tpy	lb/hr	tpy
Total Stream Uncontrolled, Breathing Emissions	L _S		Eq. 7.1-2		1.59E-05	2.60E-05	4.85E-04
Total Stream Uncontrolled, Working Emissions	L _W		Eq. 7.1-29		-	2.02E-05	-
Total Stream Uncontrolled Emissions	L_T		Eq. 7.1-1		1.59E-05	4.62E-05	4.85E-04
Breathing/Working Vapor Composition	TOC		(wt%)		100.00%		
Breathing/Working Vapor Composition	Total VOC		(wt%)		100.00%		
Breathing/Working Vapor Composition	H ₂ S		(wt%)		0.00%		
Breathing/Working Vapor Composition	Total HAPs		(wt%)		4.03%		
Uncontrolled Breathing/Working Emissions			Total VOC		1.59E-05	4.62E-05	4.85E-04
Uncontrolled Breathing/Working Emissions			Benzene		1.11E-07	3.24E-07	3.40E-06
Uncontrolled Breathing/Working Emissions			Total HAPs		6.42E-07	1.86E-06	1.95E-05
Total Uncontrolled Emissions			Total VOC		1.59E-05	4.62E-05	4.85E-04
Total Uncontrolled Emissions			Benzene		1.11E-07	3.24E-07	3.40E-06
Total Uncontrolled Emissions			Total HAPs		6.42E-07	1.86E-06	1.95E-05

Total HAPs include benzene. Total VOC include HAPs.

Liquid stream(s) composition based on Conservative Liquid Analysis (Assumed 100% VOC) sample.

Table A-7 Loading Emissions

Permian Highway Pipeline, LLC - Coyanosa Compressor Station
December 2019

Basis		
	FIN	TRKLOAD
	Name	Truck Loading
	Loading Type	Truck Loading - dedicated normal service
	Product Loaded	Oil/Condensate
	Truck Loading: Tank Truck Volume (gallons)	8,000
	Annual Throughput Product Loaded (bbl/yr)	2,786
Control Device		
	Primary Control Device	None (uncontrolled/vented)
Loading Loss Calculation		Hourly
	S, Saturation Factor	0.6
	M, Molecular Weight of Vapors (lb/lb-mole)	60.0
	P, True vapor pressure of liquid loaded (psia)	14.90
	T, Temperature of bulk liquid loaded (°R)	554.67
	Loading Loss, L _L (lb _{TOC} /1,000 gal loaded)	12.051
	Loading Rate (gal)	8,000
Emission Calculations		lb/hr
	Total Stream Uncontrolled Emissions **	96.41
Stream Composition (Wt %)	Total VOC	100.00%
	Total HAPs	4.03%
	Total Stream Uncaptured Emissions	96.41
	Total VOC	96.41
	Total HAPs	3.89

Emissions from tank truck loading are calculated in accordance with US EPA's AP-42 Ch. 5.2 and TCEQ's Guidance APDG 6217 V2, November 2013 for submerged loading: dedicated normal service (S=0.6), using annual average throughput. Maximum hourly loading rate is based on the volume of the tank truck.

Calculation Method

- $L_L = 12.46 \times S \times P \times M / T$

L_L = loading loss, lbs TOC/1,000 gals of liquid loaded (AP-42, Chapter 5, Section 5.2-4)

S = saturation factor from AP-42, Table 5.2-1

P = true vapor pressure of liquid loaded (psia)

M = molecular weight of vapors (lb/lb-mole)

T = temperature of bulk liquid loaded (°R)

$M_V, T_{LX}, T_B, P_{VX}, P_{VA}$, from AP-42 Tanks Calculations
 Per TCEQ Guidance APDG6217v2, hourly emissions use T_{LX} in place of bulk liquid temperature (minimum of 95 °F). Annual emissions use annual average T_B.

- ** Total Stream Uncontrolled = Total Hydrocarbon Losses / TOC Wt%

Appendix B
MSS Emission Calculations

Table B-1

Planned MSS Emissions - Turbine Start-up & Shutdown

Permian Highway Pipeline, LLC - Coyanosa Compressor Station

December 2019

Calculation Basis: The turbines are shutdown periodically for planned maintenance. The emissions released during the shutdown and start-up of the turbines based on manufacturer's data are presented here.

$$\text{Annual Emissions (tpy)} = \text{Emission rate (lb/event)} \times \text{Number of Events} \times \text{Number of Turbines} / 2,000 \text{ lb/ton}$$

FIN	MSS-TURB-SS	EPN	MSS-TURB-SS
Name	MSS Turbine Start-up/Shutdown Events		

Basis			
Turbine Model	Titan 130	Titan 250	Totals
Total Number of Turbines	2	1	
Annual Events (per Turbine)	36	36	
Event Duration (hr)	1	1	
Total Number of Events	72	36	108
Start-up Emissions ^[1]			
NOx (lb/event)	1.0	2.0	3.0
CO (lb/event)	55.0	38.0	93.0
VOC (lb/event)	7.0	3.0	10.0
Shutdown Emissions ^[1]			
NOx (lb/event)	2.0	2.0	4.0
CO (lb/event)	91.0	23.0	114.0
VOC (lb/event)	9.0	2.0	11.0

[1] Start-up and Shutdown emissions are from Tables 2 and 3 of Solar Turbines Product Information Letter (PIL170 Revision 9, Sep 10, 2018)

Emissions Calculations

Pollutant	Start-up/Shutdown Titan 130	Start-up/Shutdown Titan 250	Total Emissions	
	lb/yr	lb/yr	lb/hr ^[2]	tpy
NOx	216.00	144.00	7.00	0.18
CO	10,512.00	2,196.00	207.00	6.35
VOC	1,152.00	180.00	21.00	0.67

[2] Conservatively assumes that the start-up and shutdown of both turbine models would occur in the same hour.

Note: The basis of these emission calculations (i.e. volume, stream composition, frequency) are conditions used to establish a potential to emit and should not be interpreted as representations of a specific activity or condition under 30 TAC §116.116(a). Individual activities performed in this MSS category may have slight variations in procedure or equipment configuration.

Table B-2

Planned MSS Emissions - Miscellaneous Venting

Permian Highway Pipeline, LLC - Cayanosa Compressor Station

December 2019

Calculation Basis: The volume of gas released and vented to atmosphere due to planned maintenance. Estimated emissions are based on gas flowrate, composition, molecular weight, ideal gas constant.

$$\text{Annual Emissions (tpy)} = \text{Annual Venting Volume (scf/yr)} \times \text{MW (lb/lb-mol)} / \text{Ideal Gas Law Constant (scf/lb-mol)} / 2,000 \text{ lb/ton}$$

$$\text{Ideal Gas Law (scf/lb-mol)} = R \times (459.67 \text{ }^\circ\text{R} + \text{Atm. Temperature (}^\circ\text{F)}) / \text{Atm Pressure (psia)}$$

FIN	MSS-MISC	EPN	MSS-MISC
Name	MSS Miscellaneous/General Maintenance		

Constants Used in Emission Calculations		
R, Ideal Gas Constant =	10.73159	(ft ³)(psi)/(lb-mol)(°R)
Ideal Gas Law =	422.20	scf/lb-mol @ ambient conditions
Annual Average Temperature =	62.78	°F (Based on MET data from Midland-Odessa, TX)
Atmospheric Pressure =	13.28	psia (Based on MET data from Midland-Odessa, TX)

Basis		
Hourly Venting Volume	100,000	scf/hr
Total Annual Vented Volume	20,000,000	scf/yr
MW of Gas ^[1]	16.83	lb/lb-mol

Emissions Calculations

Pollutant	Pollutant Wt.% ^[1]	Emission Rates	
		lb/hr	tpy
Total Emissions	100.00%	3,987.12	398.71
Total VOC	0.49%	19.46	1.95

[1] Composition taken from Representative PHP Gas Composition sample.

Note: The basis of these emission calculations (i.e. volume, stream composition, frequency) are conditions used to establish a potential to emit and should not be interpreted as representations of a specific activity or condition under 30 TAC §116.116(a). Individual activities performed in this MSS category may have slight variations in procedure or equipment configuration.

Table B-3

Planned MSS - Pigging, Purging, and Blowdowns

Permian Highway Pipeline, LLC - Coyanosa Compressor Station

December 2019

Calculation Basis & Method:

Emissions from blowdowns of compressors, piping, storage tanks, or process vessels, are due to vapors released when depressurizing the equipment from operating to atmospheric conditions. Emissions are calculated based on the Ideal Gas Law, with an estimated volume vented or sent to flare at the venting temperature and pressure.

$$\text{Total Vapor Volumetric Flowrate (Fraction of Empty Vessel Volume) x Volume [acf] x Ambient Temp [°R] / Max Operating Temp [°R] x (scf/activity) = Venting Pressure (venting pressure [psig] + Atm Pressure [psia]) / Atm Pressure [psia]}$$

$$\text{Vapor Mass Flowrate (lb/activity) = Total Vapor Volumetric Flowrate [scf/activity] / Ideal Gas Law Constant [scf/lb-mol] x Vent Gas MW [lb/lb-mol] x (1 - \% Reduc. for PW as Oil/Condensate)}$$

$$\text{Ideal Gas Law (scf/lb-mol) = R x (459.67 °R + Atm. Temperature (°F))/Atm Pressure (psia)}$$

Constants Used in Emission Calculations		
R, Ideal Gas Constant =	10.73159	(ft ³)(psi)/((lb-mol)(°R))
Ideal Gas Law =	448.55	scf/lb-mol @ ambient conditions
Daily Maximum Temperature	95.40	°F (Based on MET data from Midland-Odessa, TX)
Atmospheric Pressure	13.28	psia (Based on MET data from Midland-Odessa, TX)

Basis										
FIN	Source Name	Number of Units	Annual Events	Hourly Events	Actual Volume of Vented Unit	Gas Temp Before Venting	Gas Pressure Before Venting	Liquid Heel/Clingage	Routed to Control Device?	EPN
			event/yr/unit	event/hr	acf	°F	psig	%		
MSS-PIG	MSS Pipeline Pigging	1	36	1	4,189	100	1,500	0%	No	MSS-PIG
MSS-TURB	MSS Turbine Blowdowns	3	36	1	3,000	100	1,500	0%	No	MSS-TURB

Emission Calculations

FIN	Source Name	Volumetric Flowrate		Mass Flowrate		Total Stream Properties ^[1]				
		scf/hr	Mscf/yr	lb/hr	tpy	MW lb/lbmol	Total VOC Wt%	HAPs Wt%	Benzene Wt%	H ₂ S Wt%
MSS-PIG	MSS Pipeline Pigging	473,397	17,042.29	#####	319.78	16.83	0.49%	0.00%	0.00%	0.00%
MSS-TURB	MSS Turbine Blowdowns	339,046	36,616.93	#####	687.09	16.83	0.49%	0.00%	0.00%	0.00%

[1] Vapor MW and speciation taken from the Representative PHP Gas Composition, Conservative Liquid Analysis (Assumed 100% VOC) sample(s).

Emission Rates

FIN	Source Name	EPN	Total VOC		Total HAPs	
			lb/hr	tpy	lb/hr	tpy
MSS-PIG	MSS Pipeline Pigging	MSS-PIG	86.72	1.56	--	--
MSS-TURB	MSS Turbine Blowdowns	MSS-TURB	62.11	3.35	--	--

Note: The basis of the example emission calculation (such as volume, concentration, pressure) are example conditions and should not be interpreted as representations of a specific facility or activity condition under 116.116(a). Individual activities in this MSS category which are performed may have slight variations in procedure or equipment configuration.

Appendix C
TCEQ Tables

Texas Commission on Environmental Quality
Table 31
Combustion Turbines

Equipment Information	
Manufacturer:	Solar
Model No.:	Titan 130 E (23502S)
Serial No.:	TBD
Emission Point Number (EPN) From Table 1(a):	TURB1, TURB2
Turbine Application	
<input type="checkbox"/> Electric Generation	<input type="checkbox"/> Base Load
<input type="checkbox"/> Peaking	<input type="checkbox"/> Load Following
<input checked="" type="checkbox"/> Gas Compression	
<input type="checkbox"/> Other (specify):	
Cycle	
<input checked="" type="checkbox"/> Simple Cycle: 8760 hr/yr	<input type="checkbox"/> Regenerative Cycle
<input type="checkbox"/> Cogeneration	<input type="checkbox"/> Combined Cycle
Model represented is based on (<i>see 30 TAC § 116.116(a)</i>):	
<input checked="" type="checkbox"/> Preliminary Design	<input type="checkbox"/> Contract Award
<input type="checkbox"/> Other (specify):	
Nominal Power Output at Baseload, ISO:	22,232
	<input type="checkbox"/> MW <input checked="" type="checkbox"/> HP
Manufacturer's rated gross heat rate at baseload at expected conditions (efficiency in BTU/hp-hr):	
7,208	
Fuel Data	
Primary Fuels:	
<input checked="" type="checkbox"/> Natural Gas (Sulfur content <u>0.06</u> gr S/100 dscf; LHV <u>939</u> Btu/scf)	
<input type="checkbox"/> Process Offgas	<input type="checkbox"/> Landfill/Digester Gas
<input type="checkbox"/> Fuel Oil	<input type="checkbox"/> Refinery Gas
<input type="checkbox"/> Other (specify):	
Backup Fuels:	
<input checked="" type="checkbox"/> Not Provided	<input type="checkbox"/> Process Offgas
<input type="checkbox"/> Ethane	<input type="checkbox"/> Fuel Oil
<input type="checkbox"/> Refinery Gas	
<input type="checkbox"/> Other (specify):	
If using fuels other than natural gas, attach fuel analyses, including maximum sulfur content, heating value (specify LHV or HHV) and mole percent of gaseous constituents.	
Emissions Data	
Attach manufacturer's information showing emissions of NO _x , CO, VOC, SO _x , and PM for each proposed fuel at turbine loads and site ambient temperatures representative of the range of proposed operation. The information must be sufficient to determine maximum hourly and annual emission rates. Annual emissions may be based on a conservatively low approximation of site annual average temperature. Provide emissions in pounds per hour and except for PM, parts per million by volume at actual conditions and corrected to dry, 15% oxygen conditions. In Table 1(a), provide speciation of PM/PM ₁₀ /PM _{2.5} .	
Method of Emission Control:	
<input type="checkbox"/> Lean Premix Combustors	<input type="checkbox"/> Oxidation Catalyst
<input checked="" type="checkbox"/> Low-NO _x Combustors	<input type="checkbox"/> SCR Catalyst
<input type="checkbox"/> Water Injection	<input type="checkbox"/> Steam Injection
<input type="checkbox"/> Other (specify):	

Texas Commission on Environmental Quality
Table 31
Combustion Turbines

Equipment Information	
Manufacturer:	Solar
Model No.:	Titan 250 E (31900S)
Serial No.:	TBD
Emission Point Number (EPN) From Table 1(a):	TURB3
Turbine Application	
<input type="checkbox"/> Electric Generation	<input type="checkbox"/> Base Load
<input type="checkbox"/> Other (specify):	<input type="checkbox"/> Peaking
	<input type="checkbox"/> Load Following
	<input checked="" type="checkbox"/> Gas Compression
Cycle	
<input checked="" type="checkbox"/> Simple Cycle: 8760 hr/yr	<input type="checkbox"/> Regenerative Cycle
	<input type="checkbox"/> Cogeneration
	<input type="checkbox"/> Combined Cycle
Model represented is based on (<i>see 30 TAC § 116.116(a)</i>):	
<input checked="" type="checkbox"/> Preliminary Design	<input type="checkbox"/> Contract Award
	<input type="checkbox"/> Other (specify):
Nominal Power Output at Baseload, ISO:	30,533
	<input type="checkbox"/> MW
	<input checked="" type="checkbox"/> HP
Manufacturer's rated gross heat rate at baseload at expected conditions (efficiency in BTU/hp-hr):	
	6,255
Fuel Data	
Primary Fuels:	
<input checked="" type="checkbox"/> Natural Gas (Sulfur content	<u>0.06</u> gr S/100 dscf; LHV <u>939</u> Btu/scf)
<input type="checkbox"/> Process Offgas	<input type="checkbox"/> Landfill/Digester Gas
<input type="checkbox"/> Other (specify):	<input type="checkbox"/> Fuel Oil
	<input type="checkbox"/> Refinery Gas
Backup Fuels:	
<input checked="" type="checkbox"/> Not Provided	<input type="checkbox"/> Process Offgas
	<input type="checkbox"/> Ethane
	<input type="checkbox"/> Fuel Oil
	<input type="checkbox"/> Refinery Gas
	<input type="checkbox"/> Other (specify):
If using fuels other than natural gas, attach fuel analyses, including maximum sulfur content, heating value (specify LHV or HHV) and mole percent of gaseous constituents.	
Emissions Data	
Attach manufacturer's information showing emissions of NO _x , CO, VOC, SO _x , and PM for each proposed fuel at turbine loads and site ambient temperatures representative of the range of proposed operation. The information must be sufficient to determine maximum hourly and annual emission rates. Annual emissions may be based on a conservatively low approximation of site annual average temperature. Provide emissions in pounds per hour and except for PM, parts per million by volume at actual conditions and corrected to dry, 15% oxygen conditions. In Table 1(a), provide speciation of PM/PM ₁₀ /PM _{2.5} .	
Method of Emission Control:	
<input type="checkbox"/> Lean Premix Combustors	<input type="checkbox"/> Oxidation Catalyst
<input checked="" type="checkbox"/> Low-NO _x Combustors	<input type="checkbox"/> SCR Catalyst
<input type="checkbox"/> Other (specify):	<input type="checkbox"/> Water Injection
	<input type="checkbox"/> Steam Injection

**Texas Commission on Environmental Quality
Table 29 Reciprocating Engines**

I. Engine Data					
Manufacturer: Caterpillar	Model No. G3516C	Serial No. tbd	Manufacture Date: TBD		
Rebuild Date:	No. of Cylinders	Compression Ratio:	EPN: GEN1, GEN2		
Application:					
<input type="checkbox"/> Gas Compression	<input type="checkbox"/> Spark Ignited	<input type="checkbox"/> Naturally Aspirated	<input type="checkbox"/> Carbureted		
<input checked="" type="checkbox"/> 4 Stroke Cycle	<input type="checkbox"/> Electric Generation	<input type="checkbox"/> Rich Burn	<input type="checkbox"/> I.C. Water Temperature <input type="checkbox"/> Dual Fuel		
<input type="checkbox"/> 2 Stroke Cycle	<input type="checkbox"/> Refrigeration	<input checked="" type="checkbox"/> Lean Burn	<input type="checkbox"/> Turbo Chrg and I.C. <input type="checkbox"/> Fuel Inject.		
<input type="checkbox"/> Intercooled	<input type="checkbox"/> Emergency/ Stand by	<input type="checkbox"/> Diesel	<input type="checkbox"/> Blower/Pump Scavenge <input type="checkbox"/> Turbo Chrg		
Ignition/Injection Timing: Fixed: _____ Variable: _____					
Manufacture Horsepower Rating: 2,175		Proposed Horsepower Rating: 2,175			
Discharge Parameters					
Stack Height (Feet)	Stack Diameter (Feet)	Stack Temperature (°F)	Exit Flowrate (cfm)		
23.00	1.33	858	11,703		
II. Fuel Data					
Type of Fuel:					
<input type="checkbox"/> Field Gas	<input checked="" type="checkbox"/> Natural Gas	<input type="checkbox"/> Digester Gas			
<input type="checkbox"/> Landfill Gas	<input type="checkbox"/> LP Gas	<input type="checkbox"/> Diesel			
Fuel Consumption (BTU/bhp-hr): 6,705 Heat Value: 939 Btu/scf (HHV) (LHV)					
Sulfur Content (grains/100 scf - weight %): 0.06					
III. Emission Factors (Before Control)					
NOx	CO	SO ₂	VOC	Formaldehyde	PM ₁₀
g/hp-hr	g/hp-hr	lb/MMBtu	g/hp-hr	g/hp-hr	lb/MMBtu
2.000	4.000	0.001	1.000	0.560	0.000
Source of Emission Factors: <input type="checkbox"/> Manufacturer Data <input checked="" type="checkbox"/> AP-42 <input checked="" type="checkbox"/> Other (specify): NSPS JJJJ Limits.					
IV. Emission Factors (Post Control)					
NOx	CO	SO ₂	VOC	Formaldehyde	PM ₁₀
g/hp-hr	g/hp-hr	lb/MMBtu	g/hp-hr	g/hp-hr	lb/MMBtu
1.000	2.160	0.001	0.980	0.980	0.000
Method of Emission Control: <input type="checkbox"/> NSCR Catalyst <input checked="" type="checkbox"/> Lean Operation <input type="checkbox"/> Parameter Adjustment					
<input type="checkbox"/> Stratified Charge <input type="checkbox"/> JLCC Catalyst <input checked="" type="checkbox"/> Other (specify): Oxidation Catalyst					
<i>Note: Must submit a copy of any manufacturer control information that demonstrates control efficiency.</i>					
Is Formaldehyde included in the VOCs? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No					
V. Federal and State Standards (Check all that apply)					
<input checked="" type="checkbox"/> NSPS JJJJ <input checked="" type="checkbox"/> MACT ZZZZ <input type="checkbox"/> NSPS IIII <input type="checkbox"/> 30 TAC 117- 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).					

Appendix D
Supporting Documentation

Table D-1

List of Acronyms and Abbreviations

°C	Degrees Celsius
°F	Degrees Fahrenheit
30 TAC	Title 30 of the Texas Administration Code
40 CFR	Title 40 of the United States Code of Federal Regulations
µg/m ³	Microgram per cubic meter
acfm	Actual cubic feet per minute
AP-42	Air Pollutant Emissions Factors, 5 th ed
APD	Air Permits Division
APIRT	Air Permits Initial Review Team
BACT	Best Available Control Technology
bbl	Barrel
bbl/day	Barrels per day
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
Btu/scf	British thermal unit per standard cubic foot
C ₃	VOC with three Carbons (i.e. Propane)
C ₄₊	VOCs with four or more Carbons
cfm	Cubic feet per minute
CO ₂	Carbon dioxide
DRE	Destruction rate efficiency
dscf	Dry standard cubic foot
EPN	Emission point number
ESL	Effects Screening Level
FIN	Facility Identification Number
ft	Feet
ft/sec	Feet per second
gal/yr	Gallon(s) per year
H ₂ S	Hydrogen sulfide
HAP	Hazardous Air Pollutant
HFR	Horizontal Floating Roof
hp	Horsepower
hr	Hour
ICE	Internal combustion engine
lb	Pound
lb/hr	Pound(s) per hour

Table D-1**List of Acronyms and Abbreviations**

lb/MMBtu	Pounds per million British thermal units
lb/day	Pound(s) per day
MMBtu/hr	Million British thermal units per hour
MMscfd	Million standard cubic feet per day
MSS	Maintenance, Start-up, and Shutdown
NAAQS	National Ambient Air Quality Standard
NESHAP	National Emission Standards for Hazardous Air Pollutants
NNSR	Nonattainment New Source Review
NO ₂	Nitrogen dioxide
NO _x	Nitrogen oxides
NSR	New Source Review
NSPS	New Source Performance Standard
OGS	Oil and gas site
PBR	Permit(s) by Rule
PM	Particulate Matter
PM ₁₀	Particulate matter ≤ 10 microns
PM _{2.5}	Particulate matter ≤ 2.5 microns
ppm _v	Parts per million by volume
ppm _w	Parts per million by weight
PSD	Prevention of Significant Deterioration
psi	Pound per square inch
psia	Pound per square inch, absolute
psig	Pound per square inch, gage
PTE	Potential to emit
RICE	Reciprocating Internal Combustion Engine
RQ	Reportable Quantity
RVP	Reid Vapor Pressure
scfh	Standard cubic feet per hour
scfm	Standard cubic feet per minute
SCREEN3	Air dispersion model screening tool, based on US EPA's ISC3 air dispersion model
SI	Spark ignited
SIC	Standard Industrial Classification System
SO ₂	Sulfur dioxide
TAC	Texas Administrative Code

Table D-1

List of Acronyms and Abbreviations

TCAA	Texas Clean Air Act
TCEQ	Texas Commission on Environmental Quality
THSC	Texas Health and Safety Code
tpy	Tons per year
US EPA	United States Environmental Protection Agency
VFR	Vertical fixed roof
VOC	Volatile organic compounds

Gas Analysis

Permian Highway Pipeline, LLC - Cayanosa Compressor Station

Fuel Gas Composition				
Analysis Identifier/Name	Solar Turbine Fuel Gas			
Site-specific or Representative?	Site-specific Sample			
Who analyzed the sample?	--			
Date of sample	--			
Temperature (F)	--	Pressure (psig)		--
Component	mole %	Molecular Weight (grams/mole)	Net Heating Value (Btu/scf)	Weight % of Total Sample
hydrogen	0.00%	2.02	273.93	0.00%
helium	0.00%	4.00	0	0.00%
nitrogen	1.51%	28.01	0	2.45%
CO2	0.44%	44.01	0	1.12%
H2S	0.00010%	34.08	586.8	0.00%
methane (C1)	92.79%	16.04	909.4	86.09%
ethane (C2)	4.16%	30.07	1618.7	7.23%
propane (C3)	0.84%	44.10	2314.9	2.14%
iso-butane (C4)	0.00%	58.12	3000.4	0.00%
n-butane (C4)	0.18%	58.12	3010.8	0.61%
iso-pentane (C5)	0.00%	72.15	3699	0.00%
n-pentane (C5)	0.04%	72.15	3703.9	0.17%
hexanes (C6)	0.04%	86.17	4403.9	0.20%
heptanes (C7)	0.00%	100.20	5100.3	0.00%
octanes (C8)	0.00%	114.23	5796.2	0.00%
nonanes (C9)	0.00%	128.26	6493.6	0.00%
decanes (C10+)	0.00%	142.29	7189.9	0.00%
n-hexanes	0.00%	86.17	4403.9	0.00%
2,2,4-trimethylpentane	0.00%	114.23	5559.2	0.00%
benzene	0.00%	78.11	3590.9	0.00%
toluene	0.00%	92.14	4273.6	0.00%
ethylbenzene	0.00%	106.17	4970.5	0.00%
xylenes (M,P,O)	0.00%	106.17	4958.2	0.00%
TOTALS:	100.00%			100.00%

Molecular Weight (lb/lb-mol)	17.29
Net Heating Value (Btu/scf)	939.3
Gross Heating Value <i>dry basis</i> (Btu/scf)	n/a
Specific Gravity*	0.60

TOC wt%	96.43%
Total VOC wt%	3.11%
VOC (C ₄₊) wt%	0.97%
Total HAPs wt%	0.00%

H2S Concentration	0 ppmv (Sweet)	0.0 grains/100 scf	0.0 wt%

Notes:

- See Solar Turbines emission performance sheet.

Constants:

28.97 MWair (lb/lb-mol)
422.20 scf/lb-mol*

453.59237 mol/lb-mol
0.06479891 grams/grain

*Ideal Gas Law in Midland-Odessa, TX = 10.73159 scf/psi / (°R/lb-mol) x (459.67°R + TAX°F) / atm P (psia)

Gas Analysis

Permian Highway Pipeline, LLC - Coyanosa Compressor Station

Gas Composition				
Analysis Identifier/Name	Representative PHP Gas Composition			
Site-specific or Representative?	Representative Sample (See notes below)			
Who analyzed the sample?	--			
Date of sample	--			
Temperature (F)	--		Pressure (psig)	--
Component	mole %	Molecular Weight (lb/lb-mol)	Net Heating Value (Btu/scf)	Weight % of Total Sample
hydrogen	0.00%	2.02	273.93	0.00%
helium	0.00%	4.00	0	0.00%
nitrogen	1.95%	28.01	0	3.25%
CO2	0.09%	44.01	0	0.24%
H2S	0.00%	34.08	586.8	0.00%
methane (C1)	94.36%	16.04	909.4	89.92%
ethane (C2)	3.42%	30.07	1618.7	6.10%
propane (C3)	0.18%	44.10	2314.9	0.47%
iso-butane (C4)	0.00%	58.12	3000.4	0.01%
n-butane (C4)	0.00%	58.12	3010.8	0.01%
iso-pentane (C5)	0.00%	72.15	3699	0.00%
n-pentane (C5)	0.00%	72.15	3703.9	0.00%
hexanes (C6)	0.00%	86.17	4403.9	0.00%
heptanes (C7)	0.00%	100.20	5100.3	0.00%
octanes (C8)	0.00%	114.23	5796.2	0.00%
nonanes (C9)	0.00%	128.26	6493.6	0.00%
decanes (C10+)	0.00%	142.29	7189.9	0.00%
n-hexanes	0.00%	86.17	4403.9	0.00%
2,2,4-trimethylpentane	0.00%	114.23	5559.2	0.00%
benzene	0.00%	78.11	3590.9	0.00%
toluene	0.00%	92.14	4273.6	0.00%
ethylbenzene	0.00%	106.17	4970.5	0.00%
xylenes (M,P,O)	0.00%	106.17	4958.2	0.00%
TOTALS:	100.00%			100.00%

Molecular Weight (lb/lb-mol)	16.83
Net Heating Value (Btu/scf)	917.7
Gross Heating Value <i>dry basis</i> (Btu/scf)	n/a
Specific Gravity*	0.58

TOC wt%	96.51%
Total VOC wt%	0.49%
VOC (C ₄₊) wt%	0.02%
Total HAPs wt%	0.00%

H2S Concentration	0 ppmv (Sweet)	0.0 grains/100 scf	0.0 wt%

Notes:

- Expected representative composition of gas which originates from the same basin as the gas that will be processed at the Coyanosa Compressor Station.

Constants:

28.97 MWair (lb/lb-mol)
422.20 scf/lb-mol*

453.59237 mol/lb-mol
0.06479891 grams/grain

*Ideal Gas Law in Midland-Odessa, TX = 10.73159 scf/psi / (°R/lb-mol) x (459.67°R + TAX°F) / atm P (psia)

Customer KM-W1	
Job ID PD 4B002	
Inquiry Number	
Run By Aileen D Fahme	Date Run 6-Sep-19

Engine Model TITAN 130-23502S CS/MD 59F MATCH	
Fuel Type SD NATURAL GAS	Water Injection NO
Engine Emissions Data REV. 0.0	

NOx EMISSIONS

CO EMISSIONS

UHC EMISSIONS

1	22232 HP	100.0% Load	Elev. 2570 ft	Rel. Humidity 60.0%	Temperature 0 Deg. F
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PPMvd at 15% O2	15.00	25.00	25.00
ton/yr	42.26	42.88	24.56
lbm/MMBtu (Fuel LHV)	0.060	0.061	0.035
lbm/(MW-hr)	0.58	0.59	0.34
(gas turbine shaft pwr) lbm/hr	9.65	9.79	5.61

2	21992 HP	100.0% Load	Elev. 2570 ft	Rel. Humidity 60.0%	Temperature 25.0 Deg. F
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PPMvd at 15% O2	15.00	25.00	25.00
ton/yr	40.60	41.19	23.59
lbm/MMBtu (Fuel LHV)	0.060	0.061	0.035
lbm/(MW-hr)	0.57	0.57	0.33
(gas turbine shaft pwr) lbm/hr	9.27	9.40	5.39

3	21382 HP	100.0% Load	Elev. 2570 ft	Rel. Humidity 60.0%	Temperature 50.0 Deg. F
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PPMvd at 15% O2	15.00	25.00	25.00
ton/yr	38.65	39.22	22.46
lbm/MMBtu (Fuel LHV)	0.060	0.061	0.035
lbm/(MW-hr)	0.55	0.56	0.32
(gas turbine shaft pwr) lbm/hr	8.82	8.95	5.13

Notes

- For short-term emission limits such as lbs/hr., Solar recommends using "worst case" anticipated operating conditions specific to the application and the site conditions. Worst case for one pollutant is not necessarily the same for another.
- Solar's typical SoLoNOx warranty, for ppm values, is available for greater than 0 deg F or -20 deg F, and between 50% and 100% load for gas fuel, and between 65% and 100% load for liquid fuel (except for the Centaur 40). An emission warranty for non-SoLoNOx equipment is available for greater than 0 deg F or -20 deg F and between
- Fuel must meet Solar standard fuel specification ES 9-98. Emissions are based on the attached fuel composition, or, San Diego natural gas or equivalent.
- If needed, Solar can provide Product Information Letters to address turbine operation outside typical warranty ranges, as well as non-warranted emissions of SO2, PM10/2.5, VOC, and formaldehyde.
- Solar can provide factory testing in San Diego to ensure the actual unit(s) meet the above values within the tolerances quoted. Pricing and schedule impact will be provided upon request.
- Any emissions warranty is applicable only for steady-state conditions and does not apply during start-up, shut-down, malfunction, or transient event.

Customer KM-W1	
Job ID PD 4B002	
Run By Aileen D Fahme	Date Run 6-Sep-19
Engine Performance Code REV. 4.20.1.23.12	Engine Performance Data REV. 1.0

Model TITAN 130-23502S
Package Type CS/MD
Match 59F MATCH
Fuel System GAS
Fuel Type SD NATURAL GAS

DATA FOR NOMINAL PERFORMANCE

Elevation	feet	2570
Inlet Loss	in H2O	4.0
Exhaust Loss	in H2O	4.0
Accessory on GP Shaft	HP	29.2

		1	2	3	4	5	6
Engine Inlet Temperature	deg F	0	25.0	50.0	75.0	100.0	105.0
Relative Humidity	%	60.0	60.0	60.0	60.0	60.0	60.0
Driven Equipment Speed	RPM	8856	8856	8838	8589	8252	8172
Specified Load	HP	FULL	FULL	FULL	FULL	FULL	FULL
Net Output Power	HP	22232	21992	21382	19680	17527	17042
Fuel Flow	mmBtu/hr	160.23	154.13	147.22	137.01	125.68	123.29
Heat Rate	Btu/HP-hr	7208	7009	6885	6962	7171	7235
Therm Eff	%	35.303	36.304	36.955	36.548	35.484	35.171
Engine Exhaust Flow	lbm/hr	449597	433625	415822	389416	355508	347888
PT Exit Temperature	deg F	889	890	897	912	937	943
Exhaust Temperature	deg F	883	889	897	912	937	943

Fuel Gas Composition (Volume Percent)	Methane (CH4)	92.79
	Ethane (C2H6)	4.16
	Propane (C3H8)	0.84
	N-Butane (C4H10)	0.18
	N-Pentane (C5H12)	0.04
	Hexane (C6H14)	0.04
	Carbon Dioxide (CO2)	0.44
	Hydrogen Sulfide (H2S)	0.0001
	Nitrogen (N2)	1.51

Fuel Gas Properties	LHV (Btu/Scf)	939.2	Specific Gravity	0.5970	Wobbe Index at 60F	1215.6
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This performance was calculated with a basic inlet and exhaust system. Special equipment such as low noise silencers, special filters, heat recovery systems or cooling devices will affect engine performance. Performance shown is "Expected" performance at the pressure drops stated, not guaranteed.

Customer KM-W1	
Job ID PD 4B001	
Inquiry Number	
Run By Aileen D Fahme	Date Run 6-Sep-19

Engine Model TITAN 250-31900S CS/MD 59F MATCH	
Fuel Type SD NATURAL GAS	Water Injection NO
Engine Emissions Data REV. 1.1	

NOx EMISSIONS

CO EMISSIONS

UHC EMISSIONS

1	30533 HP	100.0% Load	Elev. 2570 ft	Rel. Humidity 60.0%	Temperature 0 Deg. F
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PPMvd at 15% O2	15.00	25.00	25.00
ton/yr	50.13	50.87	29.13
lbm/MMBtu (Fuel LHV)	0.060	0.061	0.035
lbm/(MW-hr)	0.50	0.51	0.29
(gas turbine shaft pwr) lbm/hr	11.45	11.61	6.65

2	30578 HP	100.0% Load	Elev. 2570 ft	Rel. Humidity 60.0%	Temperature 25.0 Deg. F
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PPMvd at 15% O2	15.00	25.00	25.00
ton/yr	50.33	51.07	29.25
lbm/MMBtu (Fuel LHV)	0.060	0.061	0.035
lbm/(MW-hr)	0.50	0.51	0.29
(gas turbine shaft pwr) lbm/hr	11.49	11.66	6.68

3	29346 HP	100.0% Load	Elev. 2570 ft	Rel. Humidity 60.0%	Temperature 50.0 Deg. F
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PPMvd at 15% O2	15.00	25.00	25.00
ton/yr	48.44	49.15	28.15
lbm/MMBtu (Fuel LHV)	0.060	0.061	0.035
lbm/(MW-hr)	0.51	0.51	0.29
(gas turbine shaft pwr) lbm/hr	11.06	11.22	6.43

Notes

- For short-term emission limits such as lbs/hr., Solar recommends using "worst case" anticipated operating conditions specific to the application and the site conditions. Worst case for one pollutant is not necessarily the same for another.
- Solar's SoLoNOx warranty, for ppm values, is available for greater than -20 deg F, and between 40% and 100% load for gas fuel.
- Fuel must meet Solar standard fuel specification ES 9-98. Emissions are based on the attached fuel composition, or, San Diego natural gas or equivalent.
- If needed, Solar can provide Product Information Letters to address turbine operation outside typical warranty ranges, as well as non-warranted emissions of SO2, PM10/2.5, VOC, and formaldehyde.
- Solar can provide factory testing in San Diego to ensure the actual unit(s) meet the above values within the tolerances quoted. Pricing and schedule impact will be provided upon request.
- Any emissions warranty is applicable only for steady-state conditions and does not apply during start-up, shut-down, malfunction, or transient event.

Customer KM-W1	
Job ID PD 4B001	
Inquiry Number	
Run By Aileen D Fahme	Date Run 6-Sep-19

Engine Model TITAN 250-31900S CS/MD 59F MATCH	
Fuel Type SD NATURAL GAS	Water Injection NO
Engine Emissions Data REV. 1.1	

NOx EMISSIONS

CO EMISSIONS

UHC EMISSIONS

4	26252 HP	100.0% Load	Elev. 2570 ft	Rel. Humidity 60.0%	Temperature 75.0 Deg. F
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PPMvd at 15% O2	15.00	25.00	25.00
ton/yr	44.19	44.84	25.68
lbm/MMBtu (Fuel LHV)	0.059	0.060	0.034
lbm/(MW-hr)	0.52	0.52	0.30
(gas turbine shaft pwr) lbm/hr	10.09	10.24	5.86

5	22521 HP	100.0% Load	Elev. 2570 ft	Rel. Humidity 60.0%	Temperature 100.0 Deg. F
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PPMvd at 15% O2	15.00	25.00	25.00
ton/yr	39.20	39.78	22.78
lbm/MMBtu (Fuel LHV)	0.058	0.059	0.034
lbm/(MW-hr)	0.53	0.54	0.31
(gas turbine shaft pwr) lbm/hr	8.95	9.08	5.20

6	21848 HP	100.0% Load	Elev. 2570 ft	Rel. Humidity 60.0%	Temperature 105.0 Deg. F
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PPMvd at 15% O2	15.00	25.00	25.00
ton/yr	38.28	38.84	22.25
lbm/MMBtu (Fuel LHV)	0.058	0.059	0.034
lbm/(MW-hr)	0.54	0.54	0.31
(gas turbine shaft pwr) lbm/hr	8.74	8.87	5.08

Notes

- For short-term emission limits such as lbs/hr., Solar recommends using "worst case" anticipated operating conditions specific to the application and the site conditions. Worst case for one pollutant is not necessarily the same for another.
- Solar's SoLoNOx warranty, for ppm values, is available for greater than -20 deg F, and between 40% and 100% load for gas fuel.
- Fuel must meet Solar standard fuel specification ES 9-98. Emissions are based on the attached fuel composition, or, San Diego natural gas or equivalent.
- If needed, Solar can provide Product Information Letters to address turbine operation outside typical warranty ranges, as well as non-warranted emissions of SO2, PM10/2.5, VOC, and formaldehyde.
- Solar can provide factory testing in San Diego to ensure the actual unit(s) meet the above values within the tolerances quoted. Pricing and schedule impact will be provided upon request.
- Any emissions warranty is applicable only for steady-state conditions and does not apply during start-up, shut-down, malfunction, or transient event.

Solar Turbines

A Caterpillar Company

PREDICTED ENGINE PERFORMANCE

Customer KM-W1	
Job ID PD 4B001	
Run By Aileen D Fahme	Date Run 6-Sep-19
Engine Performance Code REV. 4.20.1.23.12	Engine Performance Data REV. 1.1

Model TITAN 250-31900S
Package Type CS/MD
Match 59F MATCH
Fuel System GAS
Fuel Type SD NATURAL GAS

DATA FOR NOMINAL PERFORMANCE

Elevation	feet	2570
Inlet Loss	in H2O	4.0
Exhaust Loss	in H2O	4.0
Accessory on GP Shaft	HP	42.0

		1	2	3	4	5	6
Engine Inlet Temperature	deg F	0	25.0	50.0	75.0	100.0	105.0
Relative Humidity	%	60.0	60.0	60.0	60.0	60.0	60.0
Driven Equipment Speed	RPM	6526	6617	6581	6398	6152	6106
Specified Load	HP	FULL	FULL	FULL	FULL	FULL	FULL
Net Output Power	HP	30533	30578	29346	26252	22521	21848
Fuel Flow	mmBtu/hr	190.97	191.90	185.26	170.22	153.30	150.36
Heat Rate	Btu/HP-hr	6255	6276	6313	6484	6807	6882
Therm Eff	%	40.681	40.542	40.305	39.242	37.379	36.971
Engine Exhaust Flow	lbm/hr	551699	536024	515281	476711	428336	419069
PT Exit Temperature	deg F	787	835	862	889	928	937
Exhaust Temperature	deg F	787	835	862	889	928	937

Fuel Gas Composition (Volume Percent)	Methane (CH4)	92.79
	Ethane (C2H6)	4.16
	Propane (C3H8)	0.84
	N-Butane (C4H10)	0.18
	N-Pentane (C5H12)	0.04
	Hexane (C6H14)	0.04
	Carbon Dioxide (CO2)	0.44
	Hydrogen Sulfide (H2S)	0.0001
	Nitrogen (N2)	1.51

Fuel Gas Properties	LHV (Btu/Scf)	939.2	Specific Gravity	0.5970	Wobbe Index at 60F	1215.6
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This performance was calculated with a basic inlet and exhaust system. Special equipment such as low noise silencers, special filters, heat recovery systems or cooling devices will affect engine performance. Performance shown is "Expected" performance at the pressure drops stated, not guaranteed.

10/03/19
13:30:35

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 13043 ***

Titan 130

SIMPLE TERRAIN INPUTS:

SOURCE TYPE = POINT
EMISSION RATE (G/S) = 0.126000
STACK HEIGHT (M) = 10.9728
STK INSIDE DIAM (M) = 1.8288
STK EXIT VELOCITY (M/S) = 45.7915
STK GAS EXIT TEMP (K) = 749.2611
AMBIENT AIR TEMP (K) = 293.1500
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
BUILDING HEIGHT (M) = 0.0000
MIN HORIZ BLDG DIM (M) = 0.0000
MAX HORIZ BLDG DIM (M) = 0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BOUY. FLUX = 228.557 M**4/S**3; MOM. FLUX = 685.960 M**4/S**2.

*** FULL METEOROLOGY ***

*** SCREEN AUTOMATED DISTANCES ***

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	0.000	1	1.0	1.0	1012.9	1011.89	7.22	7.22	NO
100.	0.1842E-01	6	1.0	1.1	10000.0	159.25	42.56	42.43	NO
200.	0.1896E-01	6	1.0	1.1	10000.0	159.25	43.07	42.56	NO
300.	0.1965E-01	6	1.0	1.1	10000.0	159.25	43.83	42.74	NO
400.	0.2046E-01	6	1.0	1.1	10000.0	159.25	44.82	42.95	NO
500.	0.2965E-01	4	20.0	20.3	6400.0	60.65	37.17	20.25	NO
600.	0.6653E-01	4	20.0	20.3	6400.0	60.65	43.83	23.37	NO
700.	0.1085	1	3.0	3.0	960.0	344.61	168.89	225.46	NO
800.	0.1394	4	20.0	20.3	6400.0	60.65	56.83	29.30	NO
900.	0.1642	4	20.0	20.3	6400.0	60.65	63.20	32.14	NO
1000.	0.1804	4	20.0	20.3	6400.0	60.65	69.51	34.93	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:
 1138. 0.1842 4 20.0 20.3 6400.0 60.65 77.89 37.64 NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

*** INVERSION BREAK-UP FUMIGATION CALC. ***
 CONC (UG/M**3) = 0.2838
 DIST TO MAX (M) = 10504.31

 *** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.1842	1138.	0.
INV BREAKUP FUMI	0.2838	10504.	--

10/03/19
13:29:55

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 13043 ***

Titan 250

SIMPLE TERRAIN INPUTS:

SOURCE TYPE = POINT
EMISSION RATE (G/S) = 0.126000
STACK HEIGHT (M) = 12.4968
STK INSIDE DIAM (M) = 2.1336
STK EXIT VELOCITY (M/S) = 38.1614
STK GAS EXIT TEMP (K) = 692.5944
AMBIENT AIR TEMP (K) = 293.1500
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
BUILDING HEIGHT (M) = 0.0000
MIN HORIZ BLDG DIM (M) = 0.0000
MAX HORIZ BLDG DIM (M) = 0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX = 245.622 M**4/S**3; MOM. FLUX = 701.497 M**4/S**2.

*** FULL METEOROLOGY ***

*** SCREEN AUTOMATED DISTANCES ***

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	0.000	1	1.0	1.0	1049.1	1048.13	7.17	7.16	NO
100.	0.1497E-01	6	1.0	1.1	10000.0	160.80	42.57	42.44	NO
200.	0.1543E-01	6	1.0	1.1	10000.0	160.80	43.07	42.57	NO
300.	0.1600E-01	6	1.0	1.1	10000.0	160.80	43.84	42.74	NO
400.	0.1669E-01	6	1.0	1.1	10000.0	160.80	44.83	42.95	NO
500.	0.1943E-01	4	20.0	20.7	6400.0	63.36	37.18	20.27	NO
600.	0.5439E-01	1	3.0	3.0	960.0	357.71	148.74	167.82	NO
700.	0.9815E-01	1	3.0	3.0	960.0	357.71	169.36	225.82	NO
800.	0.1127	1	3.0	3.0	960.0	357.71	189.56	294.36	NO
900.	0.1371	4	20.0	20.7	6400.0	63.36	63.21	32.17	NO
1000.	0.1543	4	20.0	20.7	6400.0	63.36	69.52	34.95	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:
 1227. 0.1620 4 20.0 20.7 6400.0 63.36 83.30 39.37 NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

*** INVERSION BREAK-UP FUMIGATION CALC. ***
 CONC (UG/M**3) = 0.2621
 DIST TO MAX (M) = 11130.57

 *** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.1620	1227.	0.
INV BREAKUP FUMI	0.2621	11131.	--

10/03/19
12:03:03

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 13043 ***

CAT G3516C

SIMPLE TERRAIN INPUTS:

SOURCE TYPE = POINT
EMISSION RATE (G/S) = 0.126000
STACK HEIGHT (M) = 7.0104
STK INSIDE DIAM (M) = 0.3962
STK EXIT VELOCITY (M/S) = 44.7905
STK GAS EXIT TEMP (K) = 732.0389
AMBIENT AIR TEMP (K) = 293.1500
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
BUILDING HEIGHT (M) = 0.0000
MIN HORIZ BLDG DIM (M) = 0.0000
MAX HORIZ BLDG DIM (M) = 0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BOUY. FLUX = 10.334 M**4/S**3; MOM. FLUX = 31.528 M**4/S**2.

*** FULL METEOROLOGY ***

*** SCREEN AUTOMATED DISTANCES ***

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	0.000	1	1.0	1.0	320.0	130.50	2.63	2.60	NO
100.	1.801	3	10.0	10.0	3200.0	19.36	12.65	7.74	NO
200.	4.737	3	10.0	10.0	3200.0	19.36	23.86	14.44	NO
300.	4.441	4	15.0	15.0	4800.0	15.24	22.73	12.32	NO
400.	4.023	4	10.0	10.0	3200.0	19.36	29.66	15.67	NO
500.	3.592	4	8.0	8.0	2560.0	22.45	36.41	18.82	NO
600.	3.150	4	8.0	8.0	2560.0	22.45	42.94	21.66	NO
700.	2.892	4	5.0	5.0	1600.0	31.71	49.69	25.05	NO
800.	2.685	4	5.0	5.0	1600.0	31.71	56.02	27.70	NO
900.	2.475	4	4.5	4.5	1440.0	34.45	62.38	30.49	NO
1000.	2.295	4	4.0	4.0	1280.0	37.88	68.70	33.28	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:
 188. 4.767 3 10.0 10.0 3200.0 19.36 22.66 13.72 NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

 *** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	4.767	188.	0.

10/03/19
12:06:01

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 13043 ***

HTR-2.765MMBtu/hr

SIMPLE TERRAIN INPUTS:

SOURCE TYPE = POINT
EMISSION RATE (G/S) = 0.126000
STACK HEIGHT (M) = 6.0960
STK INSIDE DIAM (M) = 0.3048
STK EXIT VELOCITY (M/S)= 4.9222
STK GAS EXIT TEMP (K) = 477.5944
AMBIENT AIR TEMP (K) = 293.1500
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
BUILDING HEIGHT (M) = 0.0000
MIN HORIZ BLDG DIM (M) = 0.0000
MAX HORIZ BLDG DIM (M) = 0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX = 0.433 M**4/S**3; MOM. FLUX = 0.345 M**4/S**2.

*** FULL METEOROLOGY ***

*** SCREEN AUTOMATED DISTANCES ***

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	0.000	1	1.0	1.0	320.0	17.53	0.60	0.47	NO
100.	62.94	3	2.0	2.0	640.0	11.81	12.57	7.62	NO
200.	58.33	4	2.0	2.0	640.0	11.81	15.65	8.65	NO
300.	52.63	4	1.0	1.0	320.0	17.53	22.85	12.53	NO
400.	46.15	4	1.0	1.0	320.0	17.53	29.63	15.61	NO
500.	38.11	4	1.0	1.0	320.0	17.53	36.29	18.59	NO
600.	31.25	4	1.0	1.0	320.0	17.53	42.84	21.46	NO
700.	25.83	4	1.0	1.0	320.0	17.53	49.30	24.26	NO
800.	21.62	4	1.0	1.0	320.0	17.53	55.67	26.98	NO
900.	19.30	6	1.0	1.0	10000.0	24.76	31.23	14.03	NO
1000.	19.82	6	1.0	1.0	10000.0	24.76	34.30	14.94	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:
 110. 63.87 3 2.0 2.0 640.0 11.81 13.82 8.35 NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

 *** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	63.87	110.	0.