February 14, 2022

U.S. EPA, Region 6
Air Permits Section, 6MM-AP
1445 Ross Avenue
Dallas, Texas 75202-2733

Re: **Revised** Notice of Change to Title V Major Source Status
Harvest Four Corners, LLC – Los Mestenios Compressor Station

Dear Madam/Sir,

On behalf of Harvest Four Corners, LLC (Harvest), Cirrus Consulting, LLC submits this **revised** notice that the Los Mestenios Compressor Station is no longer a Title V major source. The original notice neglected to include an emergency generator in the emissions calculations.

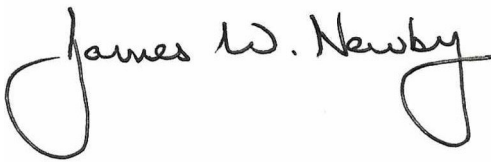
Emissions at the facility have dropped below the Title V major source thresholds. The Caterpillar G-399-TA engine at the facility, a Title V major source by itself, is being replaced with a Waukesha 7042GL engine. Also, flash emissions from the condensate storage tank have been reduced, due both to a change in the condensate composition and improvements to the VMGSym model inputs. A copy of the emissions calculations for the entire facility are attached.

With this notice, a **revised** tribal source registration is also being submitted to EPA Region 6.

Thank you for your assistance. If you have questions or need any additional information, please contact Oakley Hayes of Harvest at (505) 632-4421.

Sincerely,

CIRRUS CONSULTING, LLC



James W. Newby

Attachment
Los Mestenios Compressor Station Emission Calculations

c: Oakley Hayes, Harvest

Cirrus Consulting, LLC
11139 Crisp Air Drive
Colorado Springs, Colorado 80908
Phone: (801) 294-3024
jnewby@cirrusllc.com

EPA United States Environmental Protection Agency

OMB No. 2060-0336, Expires 11/30/2022

Federal Operating Permit Program (40 CFR Part 71)
CERTIFICATION OF TRUTH, ACCURACY, AND COMPLETENESS (CTAC)

This form must be completed, signed by the "Responsible Official" designated for the facility or emission unit, and sent with each submission of documents (i.e., application forms, updates to applications, reports, or any information required by a part 71 permit).

A. Responsible Official

Name: (Last) Jones (First) Travis (MI) ____

Title EH&S Manager

Street or P.O. Box 1111 Travis Street

City Houston State TX ZIP 77002 - ____

Telephone (713)289 - 2630 Ext. ____ Facsimile (____) ____ - ____

B. Certification of Truth, Accuracy and Completeness (to be signed by the responsible official)

I certify under penalty of law, based on information and belief formed after reasonable inquiry, the statements and information contained in these documents are true, accurate and complete.

Name (signed) Travis Jones

Name (typed) Travis Jones Date: 2 / 10 / 2022

Facility Total PTE
Emissions (Criteria Pollutants)

Company: Harvest Four Corners, LLC
Facility: Los Mestenios Compressor Station
Date: February 2022

Unit	Description	NOX,		CO,		VOC,		SOX,		TSP,		PM10,		PM2.5,	
Number		pph	tpy	pph	tpy	pph	tpy	pph	tpy	pph	tpy	pph	tpy	pph	tpy
1	Solar Saturn T1200	4.41	19.30	2.60	11.40	9.13E-02	4.00E-01	3.69E-02	1.61E-01	7.15E-02	3.13E-01	7.15E-02	3.13E-01	7.15E-02	3.13E-01
2	Waukesha 7042GL	4.38	19.20	7.74	33.92	2.92	12.80	5.77E-03	2.53E-02	9.81E-02	4.30E-01	9.81E-02	4.30E-01	9.81E-02	4.30E-01
3	Scania DS11	3.04	7.61E-01	6.56E-01	1.64E-01	2.48E-01	6.21E-02	2.00E-01	5.00E-02	2.14E-01	5.35E-02	2.14E-01	5.35E-02	2.14E-01	5.35E-02
4	Fuel Gas Heater	3.33E-02	1.46E-01	2.80E-02	1.23E-01	1.83E-03	8.03E-03	2.00E-04	8.76E-04	2.53E-03	1.11E-02	2.53E-03	1.11E-02	2.53E-03	1.11E-02
5	Tank Heater	3.33E-02	1.46E-01	2.80E-02	1.23E-01	1.83E-03	8.03E-03	2.00E-04	8.76E-04	2.53E-03	1.11E-02	2.53E-03	1.11E-02	2.53E-03	1.11E-02
SSM	SSM	-	-	-	-	-	16.10	-	-	-	-	-	-	-	-
F1	Leaks	-	-	-	-	1.10	4.81	-	-	-	-	-	-	-	-
L1	Truck Loading (Condensate)	-	-	-	-	-	1.18	-	-	-	-	-	-	-	-
L2	Truck Loading (Produced H2O)	-	-	-	-	-	1.38E-03	-	-	-	-	-	-	-	-
T1	Condensate Tank - 480 bbl	-	-	-	-	-	52.82	-	-	-	-	-	-	-	-
T2	Condensate Tank - 400 bbl	-	-	-	-	-	2.80	-	-	-	-	-	-	-	-
T3	Produced H2O Tank - 70 bbl	-	-	-	-	-	1.10E-01	-	-	-	-	-	-	-	-
T4	Lube Oil Tank - 500 gal	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T5	Used Oil Tank - 500 gal	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6	Ambitrol Tank - 350 gal	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T7	Methanol Tank - 500 gal	-	-	-	-	-	2.24E-02	-	-	-	-	-	-	-	-
	Total	11.90	39.55	11.06	45.73	4.36	91.12	2.43E-01	2.38E-01	3.89E-01	8.19E-01	3.89E-01	8.19E-01	3.89E-01	8.19E-01

Facility Total PTE
Emissions (HAPs)

Company: **Harvest Four Corners, LLC**
Facility: **Los Mestenios Compressor Station**
Date/Rev: **February 2022**

Unit Number	Description	Total HAPs,		1,3-Butadiene,		Acetaldehyde,		Acrolein,		Benzene,		Biphenyl,	
		pph	tpy	pph	tpy	pph	tpy	pph	tpy	pph	tpy	pph	tpy
1	Solar Saturn T1200	1.04E-01	4.55E-01	1.60E-04	7.00E-04	4.34E-02	1.90E-01	6.39E-04	2.80E-03	1.35E-03	5.90E-03	8.22E-04	3.60E-03
2	Waukesha 7042GL	5.17E-01	2.26							1.52E-02	6.65E-02		
3	Scania DS11	2.52E-03	6.31E-04			5.29E-04	1.32E-04			6.44E-04	1.61E-04		
4	Fuel Gas Heater	4.29E-03	1.88E-02	9.13E-05	4.00E-04	2.28E-04	1.00E-03			2.28E-04	1.00E-03		
5	Tank Heater	4.29E-03	1.88E-02	9.13E-05	4.00E-04	2.28E-04	1.00E-03			2.28E-04	1.00E-03		
SSM	SSM		4.62E-01								3.12E-02		
F1	Leaks	3.16E-02	1.38E-01							2.13E-03	9.31E-03		
L1	Truck Loading (Condensate)		7.37E-02								5.84E-03		
L2	Truck Loading (Produced H2O)		2.35E-06								3.69E-07		
T1	Condensate Tank - 480 bbl		3.68								3.79E-01		
T2	Condensate Tank - 400 bbl		2.04E-01								1.62E-02		
T3	Produced H2O Tank - 70 bbl		1.88E-02								2.94E-03		
T4	Lube Oil Tank - 500 gal												
T5	Used Oil Tank - 500 gal												
T6	Ambitrol Tank - 350 gal												
T7	Methanol Tank - 500 gal										2.94E-03		
	Total	6.64E-01	7.33	3.42E-04	1.50E-03	4.44E-02	1.92E-01	6.39E-04	2.80E-03	1.98E-02	5.21E-01	8.22E-04	3.60E-03

Facility Total PTE
Emissions (HAPs)

Company: **Harvest Four Corners, LLC**
Facility: **Los Mestenios Compressor S**
Date/Rev: **February 2022**

Unit Number	Description	Chromium,		Ethylbenzene,		Formaldehyde,		n-Hexane,		Isooctane		Manganese,	
		pph	tpy	pph	tpy	pph	tpy	pph	tpy	pph	tpy	pph	tpy
1	Solar Saturn T1200	6.85E-05	3.00E-04	2.51E-04	1.10E-03	4.24E-02	1.86E-01	3.77E-03	1.65E-02	4.02E-03	1.76E-02	4.57E-05	2.00E-04
2	Waukesha 7042GL					4.92E-01	2.15						
3	Scania DS11					8.14E-04	2.04E-04						
4	Fuel Gas Heater			6.39E-04	2.80E-03	2.51E-04	1.10E-03	4.11E-04	1.80E-03	8.45E-04	3.70E-03		
5	Tank Heater			6.39E-04	2.80E-03	2.51E-04	1.10E-03	4.11E-04	1.80E-03	8.45E-04	3.70E-03		
SSM	SSM				6.89E-04				3.63E-01		9.11E-03		
F1	Leaks			4.70E-05	2.06E-04			2.48E-02	1.08E-01	7.07E-04	3.10E-03		
L1	Truck Loading (Condensate)				3.21E-04				6.37E-02		1.17E-03		
L2	Truck Loading (Produced H2O)				3.69E-08				1.16E-06				
T1	Condensate Tank - 480 bbl				1.89E-02				3.09		5.43E-02		
T2	Condensate Tank - 400 bbl				8.90E-04				1.77E-01		3.23E-03		
T3	Produced H2O Tank - 70 bbl				2.94E-04				9.24E-03				
T4	Lube Oil Tank - 500 gal												
T5	Used Oil Tank - 500 gal												
T6	Ambitrol Tank - 350 gal												
T7	Methanol Tank - 500 gal												
	Total	6.85E-05	3.00E-04	1.58E-03	2.80E-02	5.35E-01	2.34	2.94E-02	3.83	6.42E-03	9.59E-02	4.57E-05	2.00E-04

Facility Total PTE
Emissions (HAPs)

Company: **Harvest Four Corners, LLC**
Facility: **Los Mestenios Compressor S**
Date/Rev: **February 2022**

Unit Number	Description	Methanol,		Naphthalene,		Nickel,		Phenol,		Phosphorous,		Propionaldehyde,	
		pph	tpy	pph	tpy	pph	tpy	pph	tpy	pph	tpy	pph	tpy
1	Solar Saturn T1200			2.28E-05	1.00E-04	2.28E-05	1.00E-04	2.74E-04	1.20E-03	1.60E-04	7.00E-04	2.17E-03	9.50E-03
2	Waukesha 7042GL												
3	Scania DS11			5.85E-05	1.46E-05								
4	Fuel Gas Heater	2.97E-04	1.30E-03										
5	Tank Heater	2.97E-04	1.30E-03										
SSM	SSM												
F1	Leaks												
L1	Truck Loading (Condensate)												
L2	Truck Loading (Produced H2O)												
T1	Condensate Tank - 480 bbl												
T2	Condensate Tank - 400 bbl												
T3	Produced H2O Tank - 70 bbl												
T4	Lube Oil Tank - 500 gal												
T5	Used Oil Tank - 500 gal												
T6	Ambitrol Tank - 350 gal												
T7	Methanol Tank - 500 gal		2.24E-02										
	Total	5.94E-04	2.50E-02	8.13E-05	1.15E-04	2.28E-05	1.00E-04	2.74E-04	1.20E-03	1.60E-04	7.00E-04	2.17E-03	9.50E-03

Facility Total PTE
Emissions (HAPs)

Company: **Harvest Four Corners, LLC**
Facility: **Los Mestenios Compressor S**
Date/Rev: **February 2022**

Unit Number	Description	Propylene Oxide,		Styrene,		Toluene,		Xylenes,	
		pph	tpy	pph	tpy	pph	tpy	pph	tpy
1	Solar Saturn T1200	3.20E-04	1.40E-03			1.03E-03	4.50E-03	3.11E-03	1.36E-02
2	Waukesha 7042GL					6.14E-03	2.69E-02	4.09E-03	1.79E-02
3	Scania DS11					2.82E-04	7.06E-05	1.97E-04	4.92E-05
4	Fuel Gas Heater			6.16E-04	2.70E-03	2.97E-04	1.30E-03	3.88E-04	1.70E-03
5	Tank Heater			6.16E-04	2.70E-03	2.97E-04	1.30E-03	3.88E-04	1.70E-03
SSM	SSM						4.93E-02		8.27E-03
F1	Leaks					3.36E-03	1.47E-02	5.64E-04	2.47E-03
L1	Truck Loading (Condensate)						7.68E-04		1.86E-03
L2	Truck Loading (Produced H2O)						4.74E-07		3.16E-07
T1	Condensate Tank - 480 bbl						4.46E-02		9.45E-02
T2	Condensate Tank - 400 bbl						2.13E-03		5.15E-03
T3	Produced H2O Tank - 70 bbl						3.78E-03		2.52E-03
T4	Lube Oil Tank - 500 gal								
T5	Used Oil Tank - 500 gal								
T6	Ambitrol Tank - 350 gal								
T7	Methanol Tank - 500 gal								
	Total	3.20E-04	1.40E-03	1.23E-03	5.40E-03	1.14E-02	1.49E-01	8.73E-03	1.50E-01

Turbine Exhaust PTE Emissions Calculations

Unit Number: 1
Description: Solar Saturn T1200

Horsepower Calculations

6,715	ft above MSL	Elevation	
1,200	hp	Nameplate hp	Mfg. data
1,136	hp	Site-rated hp	Mfg. data

Fuel Consumption

10.84	MMBtu/hr	Hourly fuel consumption	Btu/hp-hr x NMAQB site-rated hp / 1,000,000
12,044	scf/hr	Hourly fuel consumption	MMBtu/hr x 1,000,000 / Btu/scf
8,760	hr/yr	Annual operating time	Harvest Four Corners, LLC
94,958	MMBtu/yr	Annual fuel consumption	MMBtu/hr x hr/yr
105.51	MMscf/yr	Annual fuel consumption	scf/hr x hr/yr / 1,000,000
900	Btu/scf	Field gas heating value	Nominal heat content

Steady-State Emission Rates

Pollutants	Uncontrolled Emission Rates, pph	tpy
NOX	4.41	19.30
CO	2.60	11.40
VOC	9.13E-02	4.00E-01

Emissions brought forward from Part 71 TV permit R6NM-04-10-M1

Pollutants	Emission Factors, lb/MMBtu	Uncontrolled Emission Rates, pph	tpy
SO2	3.40E-03	3.69E-02	1.61E-01
TSP	6.60E-03	7.15E-02	3.13E-01
PM10	6.60E-03	7.15E-02	3.13E-01
PM2.5	6.60E-03	7.15E-02	3.13E-01

Emission factors taken from AP-42, Table 3.1-2a
Uncontrolled Emission Rates (pph) = lb/MMBtu x MMBtu/hr
Uncontrolled Emission Rates (tpy) = Uncontrolled Emission Rates (pph) x hr/yr / 2,000 lb/ton

GRI-HAPCalc® 3.0
Turbine Report

Facility ID:	**LOS MESTENIOS**	**Notes:**
Operation Type:	**COMPRESSOR STATION**	
Facility Name:	**LOS MESTENIOS COMPRESSOR**	
User Name:	**Harvest Four Corners, LLC**	
Units of Measure:	**U.S. STANDARD**	

Note: Emissions less than 5.00E-09 tons (or tonnes) per year are considered insignificant and are treated as zero. These emissions are indicated on the report with a "0". Emissions between 5.00E-09 and 5.00E-05 tons (or tonnes) per year are represented on the report with "0.0000".

Turbine Unit

Unit Name: T1200

Hours of Operation: 8,760 Yearly

Rate Power: 1136 hp

Fuel Type: NATURAL GAS

Emission Factor Set: FIELD > EPA > LITERATURE

Additional EF Set: -NONE-

Calculated Emissions (ton/yr)

Chemical Name	Emissions	Emission Factor	Emission Factor Set
HAPs			
Formaldehyde	0.1856	0.01693680 g/bhp-hr	GRI Field
Acetaldehyde	0.1900	0.01733570 g/bhp-hr	GRI Field
1,3-Butadiene	0.0007	0.00006160 g/bhp-hr	GRI Field
Acrolein	0.0028	0.00026000 g/bhp-hr	GRI Field
Propional	0.0095	0.00086500 g/bhp-hr	GRI Field
Propylene Oxide	0.0014	0.00012480 g/bhp-hr	EPA
n-Nitrosodimethylamine	0.0000	0.00000100 g/bhp-hr	EPA
Benzene	0.0059	0.00053840 g/bhp-hr	GRI Field
Toluene	0.0045	0.00041100 g/bhp-hr	GRI Field
Ethylbenzene	0.0011	0.00010330 g/bhp-hr	EPA
Xylenes(m,p,o)	0.0136	0.00124410 g/bhp-hr	GRI Field
2,2,4-Trimethylpentane	0.0176	0.00160530 g/bhp-hr	GRI Field
n-Hexane	0.0165	0.00150580 g/bhp-hr	GRI Field
Phenol	0.0012	0.00011010 g/bhp-hr	GRI Field
n-Nitrosomorpholine	0.0000	0.00000100 g/bhp-hr	EPA
Naphthalene	0.0001	0.00000760 g/bhp-hr	GRI Field
2-Methylnaphthalene	0.0000	0.00000130 g/bhp-hr	GRI Field
Biphenyl	0.0036	0.00033050 g/bhp-hr	GRI Field
Phenanthrene	0.0000	0.00000050 g/bhp-hr	GRI Field
Chrysene	0.0000	0.00000100 g/bhp-hr	GRI Field
Beryllium	0.0000	0.00000010 g/bhp-hr	GRI Field
Phosphorous	0.0007	0.00006520 g/bhp-hr	GRI Field
Chromium	0.0001	0.00000820 g/bhp-hr	GRI Field
Chromium	0.0001	0.00000560 g/bhp-hr	EPA
Manganese	0.0002	0.00001750 g/bhp-hr	GRI Field
Nickel	0.0001	0.00000610 g/bhp-hr	GRI Field
Cobalt	0.0000	0.00000160 g/bhp-hr	GRI Field

Arsenic	0.0000	0.00000060 g/bhp-hr	GRI Field
Selenium	0.0000	0.00000030 g/bhp-hr	GRI Field
Cadmium	0.0000	0.00000020 g/bhp-hr	GRI Field
Mercury	0.0000	0.00000270 g/bhp-hr	GRI Field
Lead	0.0000	0.00000340 g/bhp-hr	GRI Field
Total	0.4553		

Criteria Pollutants

PM	0.3490	0.03184680 g/bhp-hr	EPA
CO	23.1061	2.10828420 g/bhp-hr	GRI Field
NMHC	2.1248	0.19387800 g/bhp-hr	GRI Field
NMEHC	0.1321	0.01205010 g/bhp-hr	EPA
NOx	13.7233	1.25216290 g/bhp-hr	GRI Field
SO2	0.0113	0.00102720 g/bhp-hr	GRI Field

Other Pollutants

Methane	10.8193	0.98719230 g/bhp-hr	GRI Field
Acetylene	0.0785	0.00716540 g/bhp-hr	GRI Field
Ethylene	0.1529	0.01395450 g/bhp-hr	GRI Field
Ethane	1.6449	0.15008370 g/bhp-hr	GRI Field
Propane	0.1754	0.01600000 g/bhp-hr	GRI Field
Isobutane	0.0526	0.00480000 g/bhp-hr	GRI Field
Butane	0.0570	0.00520000 g/bhp-hr	GRI Field
Trimethylamine	0.0000	0.00000070 g/bhp-hr	EPA
Cyclopentane	0.0181	0.00165110 g/bhp-hr	GRI Field
Butyrald/Isobutyraldehyde	0.0147	0.00134000 g/bhp-hr	GRI Field
n-Pentane	0.8894	0.08115000 g/bhp-hr	GRI Field
Cyclohexane	0.0671	0.00612400 g/bhp-hr	GRI Field
Methylcyclohexane	0.0968	0.00883120 g/bhp-hr	GRI Field
n-Octane	0.0349	0.00318890 g/bhp-hr	GRI Field
1,3,5-Trimethylbenzene	0.0329	0.00300000 g/bhp-hr	GRI Field
n-Nonane	0.0058	0.00053260 g/bhp-hr	GRI Field
CO2	5,188.2765	473.39811550 g/bhp-hr	EPA
Vanadium	0.0000	0.00000070 g/bhp-hr	GRI Field
Copper	0.0002	0.00002050 g/bhp-hr	GRI Field
Molybdenum	0.0002	0.00002030 g/bhp-hr	GRI Field
Barium	0.0003	0.00002290 g/bhp-hr	GRI Field

Table 3.1-2a. EMISSION FACTORS FOR CRITERIA POLLUTANTS AND GREENHOUSE GASES FROM STATIONARY GAS TURBINES

Emission Factors[a] - Uncontrolled				
Pollutant	Natural Gas-Fired Turbines[b]		Distillate Oil-Fired Turbines[d]	
	(lb/MMBtu)[c] (Fuel Input)	Emission Factor Rating	(lb/MMBtu)[e] (Fuel Input)	Emission Factor Rating
CO_2[f]	110	A	157	A
N_2O	0.003[g]	E	ND	NA
Lead	ND	NA	1.4 E-05	C
SO_2	0.94S[h]	B	1.01S[h]	B
Methane	8.6 E-03	C	ND	NA
VOC	2.1 E-03	D	4.1 E-04[j]	E
TOC[k]	1.1 E-02	B	4.0 E-03[l]	C
PM (condensible)	4.7 E-03[l]	C	7.2 E-03[l]	C
PM (filterable)	1.9 E-03[l]	C	4.3 E-03[l]	C
PM (total)	6.6 E-03[l]	C	1.2 E-02[l]	C

[a] Factors are derived from units operating at high loads (≥ 80 percent load) only. For information on units operating at other loads, consult the background report for this chapter (Reference 16), available at "www.epa.gov/ttn/chief". ND = No Data, NA = Not Applicable.

[b] SCCs for natural gas-fired turbines include 2-01-002-01, 2-02-002-01 & 03, and 2-03-002-02 & 03.

[c] Emission factors based on an average natural gas heating value (HHV) of 1020 Btu/scf at 60°F. To convert from (lb/MMBtu) to ($lb/10^6$ scf), multiply by 1020. Similarly, these emission factors can be converted to other natural gas heating values.

[d] SCCs for distillate oil-fired turbines are 2-01-001-01, 2-02-001-01, 2-02-001-03, and 2-03-001-02.

[e] Emission factors based on an average distillate oil heating value of 139 $MMBtu/10^3$ gallons. To convert from (lb/MMBtu) to ($lb/10^3$ gallons), multiply by 139.

[f] Based on 99.5% conversion of fuel carbon to CO_2 for natural gas and 99% conversion of fuel carbon to CO_2 for distillate oil. CO_2 (Natural Gas) [lb/MMBtu] = (0.0036 scf/Btu)(%CON)(C)(D), where %CON = weight percent conversion of fuel carbon to CO_2, C = carbon content of fuel by weight, and D = density of fuel. For natural gas, C is assumed at 75%, and D is assumed at 4.1 E+04 $lb/10^6$scf. For distillate oil, CO_2 (Distillate Oil) [lb/MMBtu] = (26.4 gal/MMBtu) (%CON)(C)(D), where C is assumed at 87%, and the D is assumed at 6.9 lb/gallon.

[g] Emission factor is carried over from the previous revision to AP-42 (Supplement B, October 1996) and is based on limited source tests on a single turbine with water-steam injection (Reference 5).

[h] All sulfur in the fuel is assumed to be converted to SO_2. S = percent sulfur in fuel. Example, if sulfur content in the fuel is 3.4 percent, then S = 3.4. If S is not available, use 3.4 E-03 lb/MMBtu for natural gas turbines, and 3.3 E-02 lb/MMBtu for distillate oil turbines (the equations are more accurate).

[j] VOC emissions are assumed equal to the sum of organic emissions.

[k] Pollutant referenced as THC in the gathered emission tests. It is assumed as TOC, because it is based on EPA Test Method 25A.

[l] Emission factors are based on combustion turbines using water-steam injection.

Engine Exhaust PTE Emissions Calculations

Unit Number: 2
Description: Waukesha L7042GL
Type: Four Stroke Lean Burn (Turbocharged)

Horsepower Calculations

6,715 ft above MSL	Elevation	
1,480 hp	Nameplate hp	Mfg. data
1,326 hp	Mfg. Site-rated hp	Mfg. product bulletin Power Derate, S8154-6, April 2001 (loss of 2% for every 1,000 ft over 1,500 ft)

Engine Specifications

1200 rpm	Engine rpm	Mfg. data
7040 cu in	Engine displacement	Mfg. data
124.28 psi	BMEP	792,000 x Mfg. Site-rated hp / (rpm * cu in)

Fuel Consumption

7408 Btu/hp-hr	Brake specific fuel consumption	Mfg. data
9.82 MMBtu/hr	Hourly fuel consumption	Btu/hp-hr x Mfg. site-rated hp / 1,000,000
900 Btu/scf	Field gas heating value	Nominal heat content
10,912 scf/hr	Hourly fuel consumption	MMBtu/hr x 1,000,000 / Btu/scf
8,760 hr/yr	Annual operating time	Harvest Four Corners, LLC
86,027 MMBtu/yr	Annual fuel consumption	MMBtu/hr x hr/yr
95.59 MMscf/yr	Annual fuel consumption	scf/hr x hr/yr / 1,000,000

Steady-State Emission Rates

Pollutants	Emission Factors, g/hp-hr	Uncontrolled Emission Rates, pph	tpy
NOX	1.50	4.38	19.20
CO	2.65	7.74	33.92
VOC	1.00	2.92	12.80

Emission factors taken from Waukesha Bulletin 7005 0107
Uncontrolled Emission Rates (pph) = g/hp-hr x hp / 453.59 g/lb
Uncontrolled Emission Rates (tpy) = Uncontrolled Emission Rates (pph) x hr/yr / 2,000 lb/ton

Pollutants	Emission Factors, lb/MMBtu	Uncontrolled Emission Rates, pph	tpy
SO2	5.88E-04	5.77E-03	2.53E-02
TSP	9.99E-03	9.81E-02	4.30E-01
PM10	9.99E-03	9.81E-02	4.30E-01
PM2.5	9.99E-03	9.81E-02	4.30E-01

Emission factors taken from AP-42, Table 3.2-2
Particulate factors include both filterable and condensible emissions
Uncontrolled Emission Rates (pph) = lb/MMBtu x MMBtu/hr
Uncontrolled Emission Rates (tpy) = Uncontrolled Emission Rates (pph) x hr/yr / 2,000 lb/ton

GRI-HAPCalc® 3.0
Engines Report

Facility ID:	**LOS MESTENIOS**	**Notes:**
Operation Type:	**COMPRESSOR STATION**	
Facility Name:	**LOS MESTENIOS COMPRESSOR**	
User Name:	**Harvest Four Corners, LLC**	
Units of Measure:	**U.S. STANDARD**	

Note: Emissions less than 5.00E-09 tons (or tonnes) per year are considered insignificant and are treated as zero. These emissions are indicated on the report with a "0". Emissions between 5.00E-09 and 5.00E-05 tons (or tonnes) per year are represented on the report with "0.0000".

Engine Unit

Unit Name: 7042GL

Hours of Operation:	8,760	Yearly
Rate Power:	1,326	hp
Fuel Type:	FIELD GAS	
Engine Type:	4-Stroke, Lean Burn	
Emission Factor Set:	FIELD > EPA > LITERATURE	
Additional EF Set:	-NONE-	

Calculated Emissions (ton/yr)

Chemical Name	Emissions	Emission Factor	Emission Factor Set
HAPs			
Formaldehyde	2.1530	0.16830000 g/bhp-hr	GRI Literature
Benzene	0.0665	0.00520000 g/bhp-hr	GRI Literature
Toluene	0.0269	0.00210000 g/bhp-hr	GRI Literature
Xylenes(m,p,o)	0.0179	0.00140000 g/bhp-hr	GRI Literature
Total	2.2643		

STANDARD EQUIPMENT

AIR CLEANER – Two, 3" dry type filter with hinged rain shield and service indicator.

BARRING DEVICE – Manual.

BATTERY BOX – Ship loose battery box designed to accommodate two series 31 12 VDC batteries. Includes power disconnect switch and 20 foot (6.1 m) cable for connection to ESM Power Distribution Box.

BEARINGS – Heavy duty, replaceable, precision type.

BREATHER – Self regulating, closed system.

CONNECTING RODS – Drop forged steel, rifle drilled.

CONTROL SYSTEM – Waukesha Engine System Manager (ESM) integrates spark timing control, speed governing, detonation detection, start-stop control, diagnostic tools, fault logging and engine safeties. Engine Control Unit (ECU) is central brain of the control system and main customer interface. Interface with ESM is through 25 foot (7.6 m) harness to local panel, through MODBUS RTU slave connection RS-485 multidrop hardware, and through the Electronic Service Program (ESP). Customer connections are only required to the local panel, fuel valve, and 24V DC power supply. Compatible with Woodward load sharing module. ESM meets Canadian Standards Association Class I, Division 2, Group D, hazardous location requirements. ESM controlled prechamber logic.

CRANKCASE – Integral crankcase and cylinder frame. Main bearing caps drilled and tapped for temperature sensors. Does not include sensors.

CRANKSHAFT – Counterweighted, forged steel, seven main bearings, and dynamically balanced.

CYLINDERS – Removable bainitic cast iron wet type cylinder liners, chrome plated on outer diameter.

CYLINDER HEADS – Twelve interchangeable. Two hard faced intake and two hard faced exhaust valves per cylinder. Hard faced intake and exhaust valve seat inserts. Roller valve lifters and hydraulic push rods. Includes prechamber and related fuel control valves.

ENGINE ROTATION – Counterclockwise when facing flywheel.

ENGINE MONITORING DEVICES – Factory mounted and wired sensors for lube oil pressure and temperature; intake manifold temperature and pressure; overspeed; and jacket water temperature; all accessible through ESM®. ESM continually monitors combustion performance through accelerometers to provide detonation protection. Dual magnetic pick-ups are used for accurate engine speed monitoring. ESM provides predictive spark plug diagnostics as well as advanced diagnostics of engine and all ESM sensors and logs any faults into non-volatile flash memory.

EXHAUST THERMOCOUPLES – 14 K-type thermocouples. One for each individual cylinder and one pre-turbine for each bank and 25 foot (7.6 m) harness.

EXHAUST OUTLET – Single vertical at rear. Flexible stainless steel connection with 8" (203 mm) pipe flange.

FLYWHEEL – Approx. WR2 = 155000 lb-in2; with ring gear (208 teeth), machined to accept two drive adapters: 31.88" (810 mm) pilot bore, 30.25"(768 mm) bolt circle, (12) 0.75"–10 tapped holes; or 28.88" (734 mm) pilot bore, 27.25" (692 mm) bolt circle, (12) 0.625"–11 tapped holes and (12) 0.75"–10 tapped holes.

FLYWHEEL HOUSING – No. 00 SAE.

FUEL SYSTEM – Single 3" ANSI flange fuel inlet connection. Dual natural gas, 4" (102 mm) duplex updraft carburetors. Two mounted Mooney Flowgrid 250, 2" (51 mm) gas regulators, 43 – 60 psi (296 – 414 kPa) gas inlet pressure required. Prechamber fuel system and control logic. 10 foot (3 m) harness provided for ESM control of customer supplied fuel shutoff valve.

GOVERNOR – Electric throttle actuator controlled by ESM with throttle position feedback. Governor tuning is performed using ESP. ESM includes option of a load-coming feature to improve engine response to step loads.

IGNITION SYSTEM – Ignition Power Module (IPM) controlled by ESM, with spark timing optimized for any speed-load condition. Dual voltage energy levels automatically controlled by ESM to maximize spark plug life.

INTERCOOLER – Air–to–water.

LEVELING BOLTS

LIFTING EYES – Requires 9.5 ton Working Load Limit (W.L.L.) anchor shackles.

LUBRICATION – Full pressure, gear type pump. Engine mounted full flow lube oil micro-fiberglass filters with mounted differential pressure gauge. MICROSPIN® bypass filter, engine mounted. Lube oil strainer, mounted. Air/gas motor driven prelube pump, requires final piping.

MANIFOLDS – Exhaust, (2) water cooled.

OIL COOLER – Shell and tube type, with thermostatic temperature controller and pressure regulating valve. Factory mounted.

OIL PAN – Deep sump type. 190 gallon (719 L) capacity including filter and cooler.

PAINT – Oilfield orange primer.

PISTONS – Aluminum with floating pin. Oil cooled.

SHIPPING SKID – For domestic truck or rail.

TURBOCHARGERS – Two, dry type. Wastegate controlled.

VIBRATION DAMPER – Two, viscous type. Guard included with remote mounted radiator or no radiator.

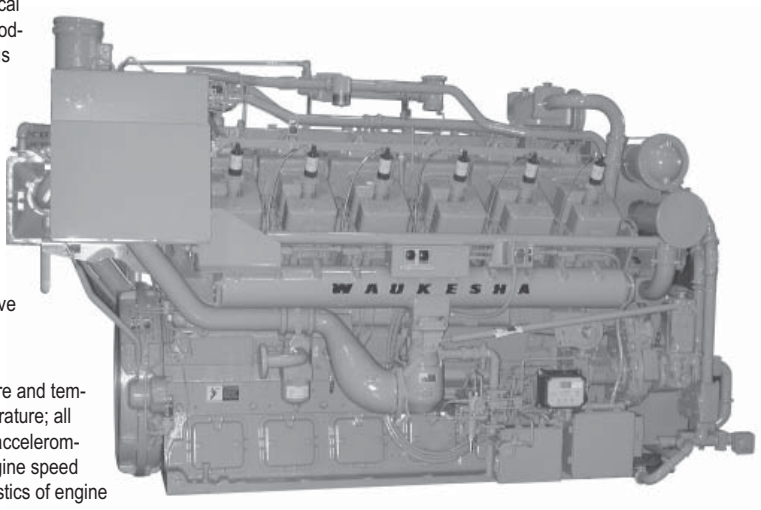
WATER CIRCULATING SYSTEM, AUXILIARY CIRCUIT – Belt driven water circulating high capacity pump for intercooler and lube oil cooler. See S6543-38 performance curve for use with standard 10" diameter crankshaft pulley. Includes thermostatic valve.

WATER CIRCULATING SYSTEM, ENGINE JACKET – Belt driven water circulating pump, cluster type thermostatic temperature regulating valve, full flow bypass type. Flange connections and mating flanges for (2) 4" (102 mm) inlets and (1) 5" (127 mm) outlet.

Waukesha
POWERING PERFORMANCE

L7042GL

VHP® Gas Engine
886 - 1547 BHP



Engine shown without Extender Series Features.

Model L7042GL with ESM®
Turbocharged and Intercooled, Twelve Cylinder, Lean Combustion, Four-Cycle Gas Engine

SPECIFICATIONS

Cylinders
V 12

Piston Displacement
7040 cu. in.
(115 L)

Bore & Stroke
9.375″ x 8.5″
(238 x 216 mm)

Compression Ratio
10.5:1

Jacket Water System Capacity
107 gal.
(405 L)

Lube Oil Capacity
190 gal.
(719 L)

Starting System
125 - 150 psi air/gas
24/32V electric

Dry Weight
21,000 lb.
(9525 kg)

POWER RATINGS: L7042GL VHP® GAS ENGINES

Model	I.C. Water Inlet Temp. °F (°C) (Tcra)	C.R.	Brake Horsepower (kWb Output) 800 rpm	900 rpm	1000 rpm	1100 rpm	1200 rpm
L7042GL	85° (29°)	10.5:1	928 (692)	1160 (865)	1289 (961)	1418 (1057)	1547 (1154)
L7042GL	130° (54°)	10.5:1	886 (661)	1110 (828)	1233 (919)	1357 (1012)	1480 (1104)

Rating Standard: All models: Ratings are based on ISO 3046/1-1995 with mechanical efficiency of 90% and auxiliary water temperature Tcra (clause 10.1) as specified above limited to ± 10° F (± 5° C). Ratings are also valid for SAE J1349, BS5514, DIN6271 and AP17B-11C standard atmospheric conditions.

ISO Standard Power/Continuous Power Rating: The highest load and speed which can be applied 24 hours a day, seven days a week, 365 days per year except for normal maintenance. It is permissible to operate the engine at up to 10% overload, or maximum load indicated by the intermittent rating, whichever is lower, for two hours in each 24 hour period.

All natural gas engine ratings are based on a fuel of 900 Btu/ft^3 (35.3 MJ/nm^3) SLHV value, with a 91 Waukesha Knock Index®.

For conditions or fuels other than standard, contact the Waukesha Engine Sales Engineering Department.

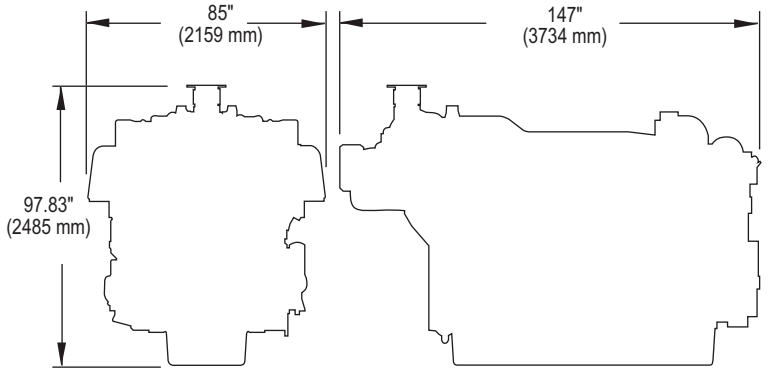
PERFORMANCE: L7042GL VHP® GAS ENGINES

NO_x Settings	English	130° F ICW		85° F ICW	
	RPM	**1200**	**1000**	**1200**	**1000**
1.5 g NO_x	Power (Bhp)	1480	1233	1547	1289
	BSFC (Btu/bhp-hr)	7135	6850	7160	6865
	NOx (grams/bhp-hr)	1.50	1.50	1.50	1.50
	CO (grams/bhp-hr)	2.65	2.65	2.65	2.65
	NMHC (grams/bhp--hr)	0.70	0.80	0.80	0.90

NO_x Settings	Metric	54° C ICW		29° C ICW	
	RPM	**1200**	**1000**	**1200**	**1000**
1.5 g NO_x	Power (kWb)	1104	919	1154	962
	BSFC (kJ/kW-hr)	10089	9686	10124	9707
	NOx (g/nm^3)	0.62	0.62	0.62	0.62
	CO (g/nm^3)	1.09	1.09	1.09	1.09
	NMHC (g/nm^3)	0.29	0.41	0.33	0.37

NOTES:

1) Fuel consumption and exhaust emissions are based on ISO 3046/1-1995 standard reference conditions and commercial quality natural gas of 900 Btu/ft^3 (35.38 MJ/m^3 [25, V(0; 101.325)]) saturated lower heat value, Waukesha Knock Index® of 91 and 93% methane content by volume. ISO 3046/1-1995 standard reference conditions are 77°F (25°C) ambient temperature, 29.54 inches Hg (100 kPa) barometric pressure, 30% relative humidity (1kPa/0.3 inches Hg water vapor pressure).
2) S.I. exhaust emissions are corrected to 5% O_2 (0°C and 101.325 kPa).
3) Data will vary due to variations in site conditions. For conditions and/or fuels other than standard, consult the Waukesha Engine Sales Engineering Department.
4) Fuel consumption based on ISO 3046/1-1995 with a +5% tolerance for commercial quality natural gas having a 900 Btu/ft^3 saturated low heat valve



DRESSER
Waukesha

WAUKESHA ENGINE
DRESSER, INC.
1101 West St. Paul Avenue
Waukesha, WI 53188-4999
Phone: (262) 547-3311 Fax: (262) 549-2795
waukeshaengine.dresser.com

Bulletin 7005 0107

Consult your local Waukesha Distributor for system application assistance. The manufacturer reserves the right to change or modify without notice, the design or equipment specifications as herein set forth without incurring any obligation either with respect to equipment previously sold or in the process of construction except where otherwise specifically guaranteed by the manufacturer.

Table 3.2-2. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE LEAN-BURN ENGINES[a]
(SCC 2-02-002-54)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
Criteria Pollutants and Greenhouse Gases		
NO_x[c] 90 - 105% Load	4.08 E+00	B
NO_x[c] <90% Load	8.47 E-01	B
CO[c] 90 - 105% Load	3.17 E-01	C
CO[c] <90% Load	5.57 E-01	B
CO_2[d]	1.10 E+02	A
SO_2[e]	5.88 E-04	A
TOC[f]	1.47 E+00	A
Methane[g]	1.25 E+00	C
VOC[h]	1.18 E-01	C
PM10 (filterable)[i]	7.71 E-05	D
PM2.5 (filterable)[i]	7.71 E-05	D
PM Condensable[j]	9.91 E-03	D
Trace Organic Compounds		
1,1,2,2-Tetrachloroethane[k]	<4.00 E-05	E
1,1,2-Trichloroethane[k]	<3.18 E-05	E
1,1-Dichloroethane	<2.36 E-05	E
1,2,3-Trimethylbenzene	2.30 E-05	D
1,2,4-Trimethylbenzene	1.43 E-05	C
1,2-Dichloroethane	<2.36 E-05	E
1,2-Dichloropropane	<2.69 E-05	E
1,3,5-Trimethylbenzene	3.38 E-05	D
1,3-Butadiene[k]	2.67E-04	D
1,3-Dichloropropene[k]	<2.64 E-05	E
2-Methylnaphthalene[k]	3.32 E-05	C
2,2,4-Trimethylpentane[k]	2.50 E-04	C
Acenaphthene[k]	1.25 E-06	C

Engine Exhaust Emissions Calculations

Unit Number: 3
Description: Scania DS11 Diesel Generator (Emergency)

Horsepower

250	hp	Nameplate hp	Mfg. data

The data sheet shows the DS11 has a horsepower rating of 250+. Since the assocaited alternator is rated at 130 kW, the assumption of a site rating at 250 hp should be conservative.

Fuel Consumption

0.69	MMBtu/hr	Hourly fuel consumption	Mfg. data
138,000	Btu/gal	Field gas heating value	Nominal heat content
5.00	gal/hr	Hourly fuel consumption	MMBtu/hr x 1,000,000 / Btu/gal
500	hr/yr	Annual operating time	Harvest Four Corners, LLC
2,500	gal/yr	Hourly fuel consumption	gal/hr x hr/yr
345	MMBtu/yr	Annual fuel consumption	MMBtu/hr x hr/yr

Steady-State Emission Rates

Pollutants	Emission Factors, lb/MMBtu	Uncontrolled Emission Rates, pph	tpy
NO2	4.41	3.04	7.61E-01
CO	9.50E-01	6.56E-01	1.64E-01
VOC	3.60E-01	2.48E-01	6.21E-02
SO2	2.90E-01	2.00E-01	5.00E-02
TSP	3.10E-01	2.14E-01	5.35E-02
PM10	3.10E-01	2.14E-01	5.35E-02
PM2.5	3.10E-01	2.14E-01	5.35E-02
Acetaldehyde	7.67E-04	5.29E-04	1.32E-04
Benzene	9.33E-04	6.44E-04	1.61E-04
Formaldehyde	1.18E-03	8.14E-04	2.04E-04
Naphthalene	8.48E-05	5.85E-05	1.46E-05
Toluene	4.09E-04	2.82E-04	7.06E-05
Xylene	2.85E-04	1.97E-04	4.92E-05

Emission factors taken from AP-42, Tables 3.3-1 & 3.3-2
Uncontrolled Emission Rates (pph) = lb/MMBtu x MMBtu/hr
Uncontrolled Emission Rates (tpy) = Uncontrolled Emission Rates (pph) x hr/yr / 2,000 lb/ton

Table 3.3-1. EMISSION FACTORS FOR UNCONTROLLED GASOLINE AND DIESEL INDUSTRIAL ENGINES[a]

Pollutant	Gasoline Fuel (SCC 2-02-003-01, 2-03-003-01)		Diesel Fuel (SCC 2-02-001-02, 2-03-001-01)		EMISSION FACTOR RATING
	Emission Factor (lb/hp-hr) (power output)	Emission Factor (lb/MMBtu) (fuel input)	Emission Factor (lb/hp-hr) (power output)	Emission Factor (lb/MMBtu) (fuel input)	
NO_x	0.011	1.63	0.031	4.41	D
CO	6.96 E-03[d]	0.99[d]	6.68 E-03	0.95	D
SO_x	5.91 E-04	0.084	2.05 E-03	0.29	D
PM-10[b]	7.21 E-04	0.10	2.20 E-03	0.31	D
CO_2[c]	1.08	154	1.15	164	B
Aldehydes	4.85 E-04	0.07	4.63 E-04	0.07	D
TOC					
Exhaust	0.015	2.10	2.47 E-03	0.35	D
Evaporative	6.61 E-04	0.09	0.00	0.00	E
Crankcase	4.85 E-03	0.69	4.41 E-05	0.01	E
Refueling	1.08 E-03	0.15	0.00	0.00	E

[a] References 2,5-6,9-14. When necessary, an average brake-specific fuel consumption (BSFC) of 7,000 Btu/hp-hr was used to convert from lb/MMBtu to lb/hp-hr. To convert from lb/hp-hr to kg/kw-hr, multiply by 0.608. To convert from lb/MMBtu to ng/J, multiply by 430. SCC = Source Classification Code. TOC = total organic compounds.

[b] PM-10 = particulate matter less than or equal to 10 μm aerodynamic diameter. All particulate is assumed to be ≤ 1 μm in size.

[c] Assumes 99% conversion of carbon in fuel to CO_2 with 87 weight % carbon in diesel, 86 weight % carbon in gasoline, average BSFC of 7,000 Btu/hp-hr, diesel heating value of 19,300 Btu/lb, and gasoline heating value of 20,300 Btu/lb.

[d] Instead of 0.439 lb/hp-hr (power output) and 62.7 lb/mmBtu (fuel input), the correct emissions factors values are 6.96 E-03 lb/hp-hr (power output) and 0.99 lb/mmBtu (fuel input), respectively. This is an editorial correction. March 24, 2009

Table 3.3-2. SPECIATED ORGANIC COMPOUND EMISSION FACTORS FOR UNCONTROLLED DIESEL ENGINES[a]

EMISSION FACTOR RATING: E

Pollutant	Emission Factor (Fuel Input) (lb/MMBtu)
Benzene[b]	9.33 E-04
Toluene[b]	4.09 E-04
Xylenes[b]	2.85 E-04
Propylene	2.58 E-03
1,3-Butadiene[b,c]	<3.91 E-05
Formaldehyde[b]	1.18 E-03
Acetaldehyde[b]	7.67 E-04
Acrolein[b]	<9.25 E-05
Polycyclic aromatic hydrocarbons (PAH)	
Naphthalene[b]	8.48 E-05
Acenaphthylene	<5.06 E-06
Acenaphthene	<1.42 E-06
Fluorene	2.92 E-05
Phenanthrene	2.94 E-05
Anthracene	1.87 E-06
Fluoranthene	7.61 E-06
Pyrene	4.78 E-06
Benzo(a)anthracene	1.68 E-06
Chrysene	3.53 E-07
Benzo(b)fluoranthene	<9.91 E-08
Benzo(k)fluoranthene	<1.55 E-07
Benzo(a)pyrene	<1.88 E-07
Indeno(1,2,3-cd)pyrene	<3.75 E-07
Dibenz(a,h)anthracene	<5.83 E-07
Benzo(g,h,l)perylene	<4.89 E-07
TOTAL PAH	1.68 E-04

[a] Based on the uncontrolled levels of 2 diesel engines from References 6-7. Source Classification Codes 2-02-001-02, 2-03-001-01. To convert from lb/MMBtu to ng/J, multiply by 430.
[b] Hazardous air pollutant listed in the *Clean Air Act*.
[c] Based on data from 1 engine.

Heater Exhaust PTE Emissions Calculations

Unit Number: 4 & 5
Description: Fuel Gas Heater and Tank Heater

Note: The data on this worksheet applies to each individual emissions unit identified above.

Fuel Consumption

0.30	MMBtu/hr	Capacity	Mfg. data
333	scf/hr	Hourly fuel consumption	MMBtu/hr x 1,000,000 / Btu/scf
8,760	hr/yr	Annual operating time	Harvest Four Corners, LLC
2,628	MMBtu/yr	Annual fuel consumption	MMBtu/hr x hr/yr
2.92	MMscf/yr	Annual fuel consumption	scf/hr x hr/yr / 1,000,000
900	Btu/scf	Field gas heating value	Nominal heat content

Steady-State Emission Rates

Pollutants	Emission Factors, lb/MMscf	Uncontrolled Emission Rates, pph	tpy
NOX	100	3.33E-02	1.46E-01
CO	84	2.80E-02	1.23E-01
VOC	5.5	1.83E-03	8.03E-03
SO2	0.6	2.00E-04	8.76E-04
TSP	7.60	2.53E-03	1.11E-02
PM10	7.60	2.53E-03	1.11E-02
PM2.5	7.60	2.53E-03	1.11E-02
Lead	5.00E-04	1.67E-07	7.30E-07

Emission factors taken from AP-42, Tables 1.4-1 & 1.4-2
Uncontrolled Emission Rates (pph) = lb/MMBtu x MMBtu/hr
Uncontrolled Emission Rates (tpy) = Uncontrolled Emission Rates (pph) x hr/yr / 2,000 lb/ton

GRI-HAPCalc® 3.0
External Combustion Devices Report

Facility ID:	**LOS MESTENIOS**	**Notes:**
Operation Type:	**COMPRESSOR STATION**	
Facility Name:	**LOS MESTENIOS COMPRESSOR**	
User Name:	**Harvest Four Corners, LLC**	
Units of Measure:	**U.S. STANDARD**	

Note: Emissions less than 5.00E-09 tons (or tonnes) per year are considered insignificant and are treated as zero. These emissions are indicated on the report with a "0". Emissions between 5.00E-09 and 5.00E-05 tons (or tonnes) per year are represented on the report with "0.0000".

External Combustion Devices

Unit Name: HEATERS

Hours of Operation:	8,760	Yearly
Heat Input:	0.30	MMBtu/hr
Fuel Type:	NATURAL GAS	
Device Type:	HEATER	
Emission Factor Set:	FIELD > EPA > LITERATURE	
Additional EF Set:	-NONE-	

Calculated Emissions (ton/yr)

Chemical Name	Emissions	Emission Factor	Emission Factor Set
HAPs			
7,12-Dimethylbenz(a)anthracene	0.0000	0.0000000157 lb/MMBtu	EPA
Formaldehyde	0.0011	0.0008440090 lb/MMBtu	GRI Field
Methanol	0.0013	0.0009636360 lb/MMBtu	GRI Field
Acetaldehyde	0.0010	0.0007375920 lb/MMBtu	GRI Field
1,3-Butadiene	0.0004	0.0003423350 lb/MMBtu	GRI Field
Benzene	0.0010	0.0007480470 lb/MMBtu	GRI Field
Toluene	0.0013	0.0010163310 lb/MMBtu	GRI Field
Ethylbenzene	0.0028	0.0021128220 lb/MMBtu	GRI Field
Xylenes(m,p,o)	0.0017	0.0013205140 lb/MMBtu	GRI Field
2,2,4-Trimethylpentane	0.0037	0.0028417580 lb/MMBtu	GRI Field
n-Hexane	0.0018	0.0014070660 lb/MMBtu	GRI Field
Phenol	0.0000	0.0000001070 lb/MMBtu	GRI Field
Styrene	0.0027	0.0020788960 lb/MMBtu	GRI Field
Naphthalene	0.0000	0.0000005100 lb/MMBtu	GRI Field
2-Methylnaphthalene	0.0000	0.0000001470 lb/MMBtu	GRI Field
Acenaphthylene	0.0000	0.0000000670 lb/MMBtu	GRI Field
Biphenyl	0.0000	0.0000004730 lb/MMBtu	GRI Field
Acenaphthene	0.0000	0.0000000900 lb/MMBtu	GRI Field
Fluorene	0.0000	0.0000000800 lb/MMBtu	GRI Field
Anthracene	0.0000	0.0000000870 lb/MMBtu	GRI Field
Phenanthrene	0.0000	0.0000000600 lb/MMBtu	GRI Field
Fluoranthene	0.0000	0.0000000900 lb/MMBtu	GRI Field
Pyrene	0.0000	0.0000000830 lb/MMBtu	GRI Field
Benz(a)anthracene	0.0000	0.0000000870 lb/MMBtu	GRI Field
Chrysene	0.0000	0.0000001170 lb/MMBtu	GRI Field
Benzo(a)pyrene	0.0000	0.0000000700 lb/MMBtu	GRI Field

Benzo(b)fluoranthene	0.0000	0.0000001500	lb/MMBtu	GRI Field
Benzo(k)fluoranthene	0.0000	0.0000007600	lb/MMBtu	GRI Field
Benzo(g,h,i)perylene	0.0000	0.0000002600	lb/MMBtu	GRI Field
Indeno(1,2,3-c,d)pyrene	0.0000	0.0000001200	lb/MMBtu	GRI Field
Dibenz(a,h)anthracene	0.0000	0.0000001030	lb/MMBtu	GRI Field
Lead	0.0000	0.0000004902	lb/MMBtu	EPA
Total	0.0188			

Criteria Pollutants

VOC	0.0071	0.0053921569	lb/MMBtu	EPA
PM	0.0098	0.0074509804	lb/MMBtu	EPA
PM, Condensible	0.0073	0.0055882353	lb/MMBtu	EPA
PM, Filterable	0.0024	0.0018627451	lb/MMBtu	EPA
CO	0.0425	0.0323636360	lb/MMBtu	GRI Field
NMHC	0.0112	0.0085294118	lb/MMBtu	EPA
NOx	0.1275	0.0970167730	lb/MMBtu	GRI Field
SO2	0.0008	0.0005880000	lb/MMBtu	EPA

Other Pollutants

Dichlorobenzene	0.0000	0.0000011765	lb/MMBtu	EPA
Methane	0.0138	0.0105212610	lb/MMBtu	GRI Field
Acetylene	0.0184	0.0140000000	lb/MMBtu	GRI Field
Ethylene	0.0012	0.0009476310	lb/MMBtu	GRI Field
Ethane	0.0035	0.0026312210	lb/MMBtu	GRI Field
Propylene	0.0031	0.0023454550	lb/MMBtu	GRI Field
Propane	0.0014	0.0010686280	lb/MMBtu	GRI Field
Isobutane	0.0019	0.0014640770	lb/MMBtu	GRI Field
Butane	0.0018	0.0013766990	lb/MMBtu	GRI Field
Cyclopentane	0.0015	0.0011304940	lb/MMBtu	GRI Field
Pentane	0.0046	0.0034671850	lb/MMBtu	GRI Field
n-Pentane	0.0019	0.0014221310	lb/MMBtu	GRI Field
Cyclohexane	0.0012	0.0009183830	lb/MMBtu	GRI Field
Methylcyclohexane	0.0029	0.0022011420	lb/MMBtu	GRI Field
n-Octane	0.0038	0.0028538830	lb/MMBtu	GRI Field
1,2,3-Trimethylbenzene	0.0045	0.0034224540	lb/MMBtu	GRI Field
1,2,4-Trimethylbenzene	0.0045	0.0034224540	lb/MMBtu	GRI Field
1,3,5-Trimethylbenzene	0.0045	0.0034224540	lb/MMBtu	GRI Field
n-Nonane	0.0048	0.0036604170	lb/MMBtu	GRI Field
CO2	154.5882	117.6470588235	lb/MMBtu	EPA

Table 1.4-1. EMISSION FACTORS FOR NITROGEN OXIDES (NO_x) AND CARBON MONOXIDE (CO) FROM NATURAL GAS COMBUSTION[a]

Combustor Type (MMBtu/hr Heat Input) [SCC]	NO_x[b]		CO	
	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
Large Wall-Fired Boilers (>100) [1-01-006-01, 1-02-006-01, 1-03-006-01]				
Uncontrolled (Pre-NSPS)[c]	280	A	84	B
Uncontrolled (Post-NSPS)[c]	190	A	84	B
Controlled - Low NO_x burners	140	A	84	B
Controlled - Flue gas recirculation	100	D	84	B
Small Boilers (<100) [1-01-006-02, 1-02-006-02, 1-03-006-02, 1-03-006-03]				
Uncontrolled	100	B	84	B
Controlled - Low NO_x burners	50	D	84	B
Controlled - Low NO_x burners/Flue gas recirculation	32	C	84	B
Tangential-Fired Boilers (All Sizes) [1-01-006-04]				
Uncontrolled	170	A	24	C
Controlled - Flue gas recirculation	76	D	98	D
Residential Furnaces (<0.3) [No SCC]				
Uncontrolled	94	B	40	B

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. To convert from $lb/10^6$ scf to $kg/10^6$ m^3, multiply by 16. Emission factors are based on an average natural gas higher heating value of 1,020 Btu/scf. To convert from $1b/10^6$ scf to lb/MMBtu, divide by 1,020. The emission factors in this table may be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this average heating value. SCC = Source Classification Code. ND = no data. NA = not applicable.

[b] Expressed as NO_2. For large and small wall fired boilers with SNCR control, apply a 24 percent reduction to the appropriate NO_X emission factor. For tangential-fired boilers with SNCR control, apply a 13 percent reduction to the appropriate NO_X emission factor.

[c] NSPS=New Source Performance Standard as defined in 40 CFR 60 Subparts D and Db. Post-NSPS units are boilers with greater than 250 MMBtu/hr of heat input that commenced construction modification, or reconstruction after August 17, 1971, and units with heat input capacities between 100 and 250 MMBtu/hr that commenced construction modification, or reconstruction after June 19, 1984.

TABLE 1.4-2. EMISSION FACTORS FOR CRITERIA POLLUTANTS AND GREENHOUSE GASES FROM NATURAL GAS COMBUSTION[a]

Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
CO_2[b]	120,000	A
Lead	0.0005	D
N_2O (Uncontrolled)	2.2	E
N_2O (Controlled-low-NO_X burner)	0.64	E
PM (Total)[c]	7.6	D
PM (Condensable)[c]	5.7	D
PM (Filterable)[c]	1.9	B
SO_2[d]	0.6	A
TOC	11	B
Methane	2.3	B
VOC	5.5	C

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. Data are for all natural gas combustion sources. To convert from $lb/10^6$ scf to $kg/10^6$ m^3, multiply by 16. To convert from $lb/10^6$ scf to 1b/MMBtu, divide by 1,020. The emission factors in this table may be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this average heating value. TOC = Total Organic Compounds. VOC = Volatile Organic Compounds.

[b] Based on approximately 100% conversion of fuel carbon to CO_2. $CO_2[lb/10^6 \text{ scf}] = (3.67)(CON)(C)(D)$, where CON = fractional conversion of fuel carbon to CO_2, C = carbon content of fuel by weight (0.76), and D = density of fuel, 4.2×10^4 $lb/10^6$ scf.

[c] All PM (total, condensible, and filterable) is assumed to be less than 1.0 micrometer in diameter. Therefore, the PM emission factors presented here may be used to estimate PM_{10}, $PM_{2.5}$ or PM_1 emissions. Total PM is the sum of the filterable PM and condensible PM. Condensible PM is the particulate matter collected using EPA Method 202 (or equivalent). Filterable PM is the particulate matter collected on, or prior to, the filter of an EPA Method 5 (or equivalent) sampling train.

[d] Based on 100% conversion of fuel sulfur to SO_2. Assumes sulfur content is natural gas of 2,000 grains/10^6 scf. The SO_2 emission factor in this table can be converted to other natural gas sulfur contents by multiplying the SO_2 emission factor by the ratio of the site-specific sulfur content (grains/10^6 scf) to 2,000 grains/10^6 scf.

Turbine & Compressor Blowdown PTE Emissions Calculations

Unit Number: SSM
Description: Turbine, Compressor & Piping Associated With Station

Throughput

1	# of units	Number of units	Harvest Four Corners, LLC
100	events/yr/unit	Blowdowns per year per unit	Harvest Four Corners, LLC
5,780	scf/event	Gas loss per blowdown (compressor)	Harvest Four Corners, LLC
12,400	scf/event	Gas loss per blowdown (turbine)	Harvest Four Corners, LLC
1,818,000	scf/yr	Annual gas loss	# of units x events/yr/unit x [scf/event (compressor) + scf/event (turbine)]

Emission Rates

Pollutants	Emission Factors, lb/scf	Uncontrolled, Emission Rates, tpy
VOC	1.307E-02	11.88
Benzene	2.533E-05	2.30E-02
Ethylbenzene	5.598E-07	5.09E-04
n-Hexane	2.951E-04	2.68E-01
Isooctane	7.398E-06	6.72E-03
Toluene	4.008E-05	3.64E-02
Xylene	6.718E-06	6.11E-03

Emission factors calculated from gas composition (see table below)
Uncontrolled Emission Rates (tpy) = scf/yr x lb/scf / 2,000 lb/ton

Gas Composition

Components	Mole Percents, %	Molecular Weights, lb/lb-mole	Emission Factors, lb/scf
Carbon dioxide	0.8632	44.01	1.002E-03
Hydrogen sulfide	0.0000	34.07	0.000E+00
Nitrogen	0.4462	28.01	3.295E-04
Methane	78.7294	16.04	3.329E-02
Ethane	10.7901	30.07	8.554E-03
Propane	5.0734	44.09	5.897E-03
Isobutane	0.8940	58.12	1.370E-03
n-Butane	1.5609	58.12	2.392E-03
Isopentane	0.5577	72.15	1.061E-03
n-Pentane	0.4298	72.15	8.176E-04
Cyclopentane	0.0189	70.14	3.495E-05
n-Hexane	0.1299	86.17	2.951E-04
Cyclohexane	0.0389	84.16	8.631E-05
Other hexanes	0.2872	86.18	6.525E-04
Heptanes	0.0720	100.20	1.902E-04
Methylcyclohexane	0.0556	98.19	1.439E-04
Isooctane	0.0028	100.21	7.398E-06
Benzene	0.0123	78.11	2.533E-05
Toluene	0.0165	92.14	4.008E-05
Ethylbenzene	0.0002	106.17	5.598E-07
Xylenes	0.0024	106.17	6.718E-06
C8+ Heavies	0.0187	110.00	5.423E-05
Total	100.0001		
Total VOC			1.307E-02

Gas stream composition obtained from Los Mestenios extended gas analysis dated 05/06/2021
Emission Factors (lb/scf) = (% / 100) x lb/lb-mole / 379.3 scf/lb-mole

Compressor Blowdown PTE Emissions Calculations

Unit Number: SSM
Description: RICE Compressor & Piping Associated With Station

Throughput

1	# of units	Number of units	Harvest Four Corners, LLC
100	events/yr/unit	Blowdowns per year per unit	Harvest Four Corners, LLC
6,442	scf/event	Gas loss per blowdown	Harvest Four Corners, LLC
644,200	scf/yr	Annual gas loss	# of units x events/yr/unit x scf/event

Emission Rates

Pollutants	Emission Factors, lb/scf	Uncontrolled, Emission Rates, tpy
VOC	1.307E-02	4.21
Benzene	2.533E-05	8.16E-03
Ethylbenzene	5.598E-07	1.80E-04
n-Hexane	2.951E-04	9.51E-02
Isooctane	7.398E-06	2.38E-03
Toluene	4.008E-05	1.29E-02
Xylene	6.718E-06	2.16E-03

Emission factors calculated from gas composition (see table below)
Uncontrolled Emission Rates (tpy) = scf/yr x lb/scf / 2,000 lb/ton

Gas Composition

Components	Mole Percents, %	Molecular Weights, lb/lb-mole	Emission Factors, lb/scf
Carbon dioxide	0.8632	44.01	1.002E-03
Hydrogen sulfide	0.0000	34.07	0.000E+00
Nitrogen	0.4462	28.01	3.295E-04
Methane	78.7294	16.04	3.329E-02
Ethane	10.7901	30.07	8.554E-03
Propane	5.0734	44.09	5.897E-03
Isobutane	0.8940	58.12	1.370E-03
n-Butane	1.5609	58.12	2.392E-03
Isopentane	0.5577	72.15	1.061E-03
n-Pentane	0.4298	72.15	8.176E-04
Cyclopentane	0.0189	70.14	3.495E-05
n-Hexane	0.1299	86.17	2.951E-04
Cyclohexane	0.0389	84.16	8.631E-05
Other hexanes	0.2872	86.18	6.525E-04
Heptanes	0.0720	100.20	1.902E-04
Methylcyclohexane	0.0556	98.19	1.439E-04
Isooctane	0.0028	100.21	7.398E-06
Benzene	0.0123	78.11	2.533E-05
Toluene	0.0165	92.14	4.008E-05
Ethylbenzene	0.0002	106.17	5.598E-07
Xylenes	0.0024	106.17	6.718E-06
C8+ Heavies	0.0187	110.00	5.423E-05
Total	100.0001		
Total VOC			1.307E-02

Gas stream composition obtained from Los Mestenios extended gas analysis dated 05/06/2021
Emission Factors (lb/scf) = (% / 100) x lb/lb-mole / 379.3 scf/lb-mole

Description:	Los Mestenios	Company:	HARVEST MIDSTREAM
Field:		WorkOrder:	
Meter Number:		GPA Method:	GPA 2286
Analysis Date/Time:	5/7/2021 11:17:24	Sampled By:	
Date Sampled:	5/6/2021	Analyst Initials:	PK
Sample Temperature:	60	Instrument:	SRI 8610
Sample Pressure:	66		

GRI GlyCalc Information

Component	Mol%	Normalized Weight %
Carbon Dioxide	0.8632	1.7763
Hydrogen Sulfide	N/R	0
Nitrogen	0.4462	0.5845
Methane	78.7294	59.0586
Ethane	10.7901	15.1712
Propane	5.0734	10.4609
Iso-Butane	0.894	2.4297
n-Butane	1.5609	4.2421
Iso-Pentane	0.5577	1.8815
n-Pentane	0.4298	1.45
Cyclopentane	0.0189	0.062
n-Hexane	0.1299	0.5483
Cyclohexane	0.0389	0.1531
Other Hexanes	0.2872	1.3456
Heptanes	0.072	0.3373
Methylcyclohexane	0.0556	0.2553
2 2 4 Trimethylpentane	0.0028	0.015
Benzene	0.0123	0.0449
Toluene	0.0165	0.0711
Ethylbenzene	0.0002	0.001
Xylenes	0.0024	0.0119
C8+ Heavies	0.0187	0.0999
Subtotal	100.0001	
Oxygen	N/R	
Subtotal	100.0001	100

Calculated Molecular Weight	21.3865

2030 Afton Place
Farmington, NM 87401
(505) 325-6622

Analysis No: HM2021049
Cust No: 33700-10375

Well/Lease Information

Customer Name:	HARVEST MIDSTREAM	Source:	METER RUN
Well Name:	Los Mestenios CDP	Well Flowing:	Y
County/State:		Pressure:	80 PSIG
Location:		Flow Temp:	60 DEG. F
Lease/PA/CA:		Ambient Temp:	72 DEG. F
Formation:		Flow Rate:	MCF/D
Cust. Stn. No.:		Sample Method:	Purge & Fill
		Sample Date:	05/06/2021
		Sample Time:	2.10 PM
		Sampled By:	
Heat Trace:	N	Sampled by (CO):	Harvest Mid.
Remarks:	Calculated Molecular Weight = 21.3865		

Analysis

Component:	Mole%:	Unormalized %:	**GPM:	*BTU:	*SP Gravity:
Nitrogen	0.4462	0.4456	0.0490	0.00	0.0043
CO2	0.8632	0.8621	0.1480	0.00	0.0131
Methane	78.7294	78.6321	13.3930	795.17	0.4361
Ethane	10.7901	10.7768	2.8960	190.95	0.1120
Propane	5.0734	5.0671	1.4030	127.65	0.0772
Iso-Butane	0.8940	0.8929	0.2940	29.07	0.0179
N-Butane	1.5609	1.5590	0.4940	50.92	0.0313
Neopentane 2,2 dmc3	0.0000	0.0000	0.0000	0.00	0.0000
I-Pentane	0.5577	0.5570	0.2050	22.31	0.0139
N-Pentane	0.4298	0.4293	0.1560	17.23	0.0107
Neohexane	0.0117	N/R	0.0050	0.55	0.0003
2-3-Dimethylbutane	0.0181	N/R	0.0070	0.86	0.0005
Cyclopentane	0.0189	N/R	0.0060	0.71	0.0005
2-Methylpentane	0.1220	N/R	0.0510	5.79	0.0036
3-Methylpentane	0.0464	N/R	0.0190	2.20	0.0014
C6	0.1299	0.6545	0.0540	6.18	0.0039
Methylcyclopentane	0.0890	N/R	0.0320	4.01	0.0026
Benzene	0.0123	N/R	0.0030	0.46	0.0003
Cyclohexane	0.0389	N/R	0.0130	1.74	0.0011
2-Methylhexane	0.0143	N/R	0.0070	0.78	0.0005
3-Methylhexane	0.0156	N/R	0.0070	0.85	0.0005
2-2-4-Trimethylpentane	0.0028	N/R	0.0010	0.17	0.0001
i-heptanes	0.0091	N/R	0.0040	0.48	0.0003
Heptane	0.0330	N/R	0.0150	1.82	0.0011

Methylcyclohexane	0.0556	N/R	0.0220	2.90	0.0019
Toluene	0.0165	N/R	0.0060	0.74	0.0005
2-Methylheptane	0.0064	N/R	0.0030	0.40	0.0003
4-Methylheptane	0.0033	N/R	0.0020	0.20	0.0001
i-Octanes	0.0026	N/R	0.0010	0.16	0.0001
Octane	0.0056	N/R	0.0030	0.35	0.0002
Ethylbenzene	0.0002	N/R	0.0000	0.01	0.0000
m, p Xylene	0.0022	N/R	0.0010	0.11	0.0001
o Xylene (& 2,2,4 tmc7)	0.0002	N/R	0.0000	0.01	0.0000
i-C9	0.0002	N/R	0.0000	0.01	0.0000
C9	0.0003	N/R	0.0000	0.02	0.0000
i-C10	0.0001	N/R	0.0000	0.01	0.0000
C10	0.0001	N/R	0.0000	0.01	0.0000
i-C11	0.0000	N/R	0.0000	0.00	0.0000
C11	0.0001	N/R	0.0000	0.01	0.0000
C12P	0.0000	N/R	0.0000	0.00	0.0000
Total	100.00	99.876	19.300	1264.86	0.7368

* @ 14.730 PSIA DRY & UNCORRECTED FOR COMPRESSIBILITY
**@ 14.730 PSIA & 60 DEG. F.

COMPRESSIBLITY FACTOR (1/Z):	1.0037	CYLINDER #:	16
BTU/CU.FT IDEAL:	1267.8	CYLINDER PRESSURE:	66 PSIG
BTU/CU.FT (DRY) CORRECTED FOR (1/Z):	1272.5	ANALYSIS DATE:	05/07/2021
BTU/CU.FT (WET) CORRECTED FOR (1/Z):	1250.4	ANALYIS TIME:	11:17:24 AM
DRY BTU @ 15.025:	1298.0	ANALYSIS RUN BY:	PATRICIA KING
REAL SPECIFIC GRAVITY:	0.7392		

GPM, BTU, and SPG calculations as shown above are based on current GPA constants.
GPA Standard: GPA 2286-14
GC: SRI Instruments 8610 **Last Cal/Verify: 05/11/2021**
GC Method: C12+BTEX Gas

Equipment Leaks PTE Emissions Calculations

Unit Number: F1
Description: Valves, Connectors, Seals & Open-Ended Lines

Steady-State Emission Rates

Equipment	Number of Components, # of sources	Emission Factors, kg/hr/source	Emission Factors, lb/hr/source	Uncontrolled TOC Emission Rates, pph	tpy
Valves	315	0.0045	0.0099	3.12	13.66
Connectors	263	0.0002	0.0004	0.12	0.51
Pump Seals	0	0.0024	0.0053	0.00	0.00
Compressor Seals	32	0.0088	0.0194	0.62	2.71
Pressure Relief Valves	19	0.0088	0.0194	0.37	1.61
Open-Ended Lines	88	0.0020	0.0044	0.39	1.70
Total				**4.61**	**20.19**

Number of components based on the numbers of compressors and dehydrators at the station (see next page)
Emission factors taken from the EPA "1995 Protocol for Equipment Leak Emission Estimates"
Emission factors (lb/hr/source) = Emission factors (kg/hr/source) x 2.2 lb/kg
Uncontrolled TOC Emission Rates (pph) = lb/hr/source x # of sources
Uncontrolled TOC Emission Rates (tpy) = Uncontrolled TOC Emission Rates (pph) x 8,760 hr/yr / 2,000 lb/ton

Components	Mole Percents, %	Molecular Weights, lb/lb-mole	Component Weights, lb/lb-mole	Weight Percent of TOC, %	Uncontrolled Emission Rates, pph	tpy
Carbon dioxide	0.8632	44.010				
Hydrogen sulfide	0.0000	34.070				
Nitrogen	0.4462	28.013				
Methane	78.7294	16.043	1263.056	60.619		
Ethane	10.7901	30.070	324.458	15.572		
Propane	5.0734	44.097	223.722	10.737	4.95E-01	2.17E+00
Isobutane	0.8940	58.123	51.962	2.494	1.15E-01	5.03E-01
n-Butane	1.5609	58.123	90.724	4.354	2.01E-01	8.79E-01
Isopentane	0.5577	72.150	40.238	1.931	8.90E-02	3.90E-01
n-Pentane	0.4298	72.150	31.010	1.488	6.86E-02	3.00E-01
Cyclopentane	0.0189	70.134	1.326	0.064	2.93E-03	1.28E-02
n-Hexane	0.1299	86.177	11.194	0.537	2.48E-02	1.08E-01
Cyclohexane	0.0389	84.161	3.274	0.157	7.24E-03	3.17E-02
Other hexanes	0.2872	86.177	24.750	1.188	5.47E-02	2.40E-01
Heptanes	0.0720	100.204	7.215	0.346	1.60E-02	6.99E-02
Methylcyclohexane	0.0556	98.188	5.459	0.262	1.21E-02	5.29E-02
Isooctane	0.0028	114.231	0.320	0.015	7.07E-04	3.10E-03
Benzene	0.0123	78.114	0.961	0.046	2.13E-03	9.31E-03
Toluene	0.0165	92.141	1.520	0.073	3.36E-03	1.47E-02
Ethylbenzene	0.0002	106.167	0.021	0.001	4.70E-05	2.06E-04
Xylenes	0.0024	106.167	0.255	0.012	5.64E-04	2.47E-03
C8+ Heavies	0.0187	114.231	2.136	0.103	4.72E-03	2.07E-02
Total	100.0001		2083.601			
Total VOC				23.809	1.10	4.81

Gas stream composition obtained from Los Mestenios extended gas analysis dated 05/06/2021
Component Weights (lb/lb-mole) = (% / 100) * Molecular Weights (lb/lb-mole)
Weight Percent of TOC (%) = 100 x Component Weights (lb/lb-mole) / Total Component Weight (lb/lb-mole)
Uncontrolled Emission Rates (pph) = Total Uncontrolled TOC Emission Rate (pph) x (% / 100)
Uncontrolled Emission Rates (tpy) = Total Uncontrolled TOC Emission Rate (tpy) x (% / 100)

Equipment Leaks PTE Emissions Calculations

Unit Number: F1
Description: Valves, Connectors, Seals & Lines

Number of Compression Units at the Facility: 2
Number of Dehydrators at the Facility: 0

Process Equipment Description	Equipment Count						Instrument Count		
	Valves	Connectors	Pump Seals	Compressor Seals	Pressure Relief Valves	Open-end	Flow	Level	Pressure
Station inlet, meter run to pulsation dampener	17	14	0	0	1	13	3	0	3
Pulsation dampener	12	8	0	0	0	2	0	4	1
Compressor suction header	7	4	0	0	0	3	0	0	1
Suction header feed to instrument gas header	3	1	0	0	0	1	0	0	0
Compressor discharge header and bypass to station discharge	6	5	0	0	0	3	0	1	1
Compressor discharge header and suction header bypass lines	4	2	0	0	0	2	0	0	1
Fuel gas header	2	2	0	0	1	2	0	0	1
Instrument gas header	2	2	0	0	1	2	0	0	0
Station discharge header	9	5	0	0	1	6	0	0	2
Fuel gas recovery header	2	2	0	0	1	2	0	0	0
Fuel gas feed and filter loop	15	9	0	0	0	1	0	4	1
Instrument gas feed and filter loop	9	11	0	0	0	3	0	0	0
Produced water storage tank	1	0	0	0	0	1	0	1	0
ESD panel	12	0	0	0	0	0	0	0	0
Starting gas header	6	2	0	0	1	3	0	0	0
Hot gas header	2	2	0	0	0	2	0	0	0
Volume bottle lop	12	4	0	24	1	2	0	0	1
Components from Compressors	88	118	0	8	12	22	0	8	18
Components from dehydrators	0	0	0	0	0	0	0	0	0
Total	209	191	0	32	19	70	3	18	30
Adjusted Total	315	263	0	32	19	88			

The following additions are included in the Adjusted Total:

1 valve is added for each open end line
2 connectors are added for each flow meter
2 valves, 2 connectors and 1 open end line are added for each level gauge
1 connector is added for each pressure gauge

The component count is based on an evaluation of the Sim Mesa Compressor Station (two stage compression)

TABLE 2-4. OIL AND GAS PRODUCTION OPERATIONS AVERAGE EMISSION FACTORS (kg/hr/source)

Equipment Type	Service[a]	Emission Factor (kg/hr/source)[b]
Valves	Gas	4.5E-03
	Heavy Oil	8.4E-06
	Light Oil	2.5E-03
	Water/Oil	9.8E-05
Pump seals	Gas	2.4E-03
	Heavy Oil	NA
	Light Oil	1.3E-02
	Water/Oil	2.4E-05
Others[c]	Gas	8.8E-03
	Heavy Oil	3.2E-05
	Light Oil	7.5E-03
	Water/Oil	1.4E-02
Connectors	Gas	2.0E-04
	Heavy Oil	7.5E-06
	Light Oil	2.1E-04
	Water/Oil	1.1E-04
Flanges	Gas	3.9E-04
	Heavy Oil	3.9E-07
	Light Oil	1.1E-04
	Water/Oil	2.9E-06
Open-ended lines	Gas	2.0E-03
	Heavy Oil	1.4E-04
	Light Oil	1.4E-03
	Water/Oil	2.5E-04

[a]Water/Oil emission factors apply to water streams in oil service with a water content greater than 50%, from the point of origin to the point where the water content reaches 99%. For water streams with a water content greater than 99%, the emission rate is considered negligible.

[b]These factors are for total organic compound emission rates (including non-VOC's such as methane and ethane) and apply to light crude, heavy crude, gas plant, gas production, and off shore facilities. "NA" indicates that not enough data were available to develop the indicated emission factor.

[c]The "other" equipment type was derived from compressors, diaphrams, drains, dump arms, hatches, instruments, meters, pressure relief valves, polished rods, relief valves, and vents. This "other" equipment type should be applied for any equipment type other than connectors, flanges, open-ended lines, pumps, or valves.

Truck Loading (Condensate) PTE Emissions Calculations

Unit Number: L1
Description: Truck Loading

Emission Factor

0.6		Saturation factor, S	AP-42, Table 5.2-1 (submerged loading & dedicated service)
2.28	psia	True vapor pressure of liquid, P	TANKS 4.0 output file
78.1	lb/lb-mole	Molecular weight of vapors, M	TANKS 4.0 output file
65	°F	Temperature of liquid	TANKS 4.0 output file
524.6	°R	Temperature of liquid, T	°F + 459.67
2.54	lb/10^3 gal	Emission factor, L	AP-42, Section 5.2, Equation 1 L =12.46 (SPM/T)

Production Rate

929.92	10^3 gal/yr	Maximum annual production rate (= 21,000 bbl/yr, which is approx. max historical throughput plus 10%)	Harvest Four Corners, LLC

Steady-State Emission Rates

Pollutant	Emission Rates, tpy
VOC	1.18

Emission Rate (tpy) = lb/10^3 gal x 10^3 gal/yr / 2,000 lb/ton

Pollutants	Percent of VOC, %	Emission Rates, tpy
Benzene	0.50	5.84E-03
Ethylbenzene	0.03	3.21E-04
n-Hexane	5.40	6.37E-02
Isooctane	0.10	1.17E-03
Toluene	0.07	7.68E-04
m-Xylene	0.16	1.86E-03

Liquid percent of VOC calculated from the TANKS 4.0 results
Percent of VOC (%) = 100 x Pollutant Emission Rate (lb/yr) / Total VOC Emission Rate (lb/yr)
Emission Rates (tpy) = VOC Emission Rate (tpy) x (% / 100)

Truck Loading (Produced Water) PTE Emissions Calculations

Unit Number: L2
Description: Truck Loading

Emission Factor

0.6		Saturation factor, S	AP-42, Table 5.2-1 (submerged loading & dedicated service)
0.3045	psia (average)	True vapor pressure of liquid, P	Estimated using Antoine's Equation (see calculations below)
18.02	lb/lb-mole	Molecular weight of vapors, M	TANKS 4.0 Database
65	°F (average)	Temperature of liquid	Estimated (see calculations below)
524.67	°R (average)	Temperature of liquid, T	°F + 459.67
0.08	lb/10^3 gal (average)	Emission factor, L	AP-42, Section 5.2, $L = 12.46 \frac{SPM}{T}$

Production Rate

35.28	10^3 gal/yr	Maximum annual production rate	Harvest Four Corners, LLC

Steady-State Emission Rates

Pollutant	Emission Rates, tpy
VOC	1.38E-03

Uncontrolled Emission Rate (tpy) = lb/10^3 gal x 10^3 gal/yr / 2,000 lb/ton

Pollutants	Mass Fraction	Emission Rates, tpy
Benzene	0.0267	3.69E-07
Ethylbenzene	0.0027	3.69E-08
n-Hexane	0.0840	1.16E-06
Toluene	0.0344	4.74E-07
m-Xylene	0.0229	3.16E-07

HAP mass fractions are estimated from the produced water tank emission factors
HAP Mass Fraction = HAP Emission Factor (lb/bbl) / VOC Emission Factor (lb/bbl)
Emission Rates (tpy) = VOC Emission Rate (tpy) x HAP Mass Fraction

Vapor Pressure of Produced Water:

It is estimated that the true vapor pressure of produced water is approximately equal to the true vapor pressure of pure water.
An estimate of the true vapor pressure for water is calculated using Antoine's equation (see AP-42, Section 7.1, Equation 1-25).

Maximum:

Temperature = 77 °F

log P = A - (B / (C + T))

A = 8.07131
B = 1730.63
C = 233.426
T = 25.00 °C
P = mmHg

P = 10^(A - (B / (C + T))

P = 23.69 mmHg
P = 0.4581 psi

Average:

Temperature = 65 °F

log P = A - (B / (C + T))

A = 8.07131
B = 1730.63
C = 233.426
T = 18.33 °C
P = mmHg

P = 10^(A - (B / (C + T))

P = 15.75 mmHg
P = 0.3045 psi

Note: 760 mmHg = 14.7 psia

loading operation, resulting in high levels of vapor generation and loss. If the turbulence is great enough, liquid droplets will be entrained in the vented vapors.

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

The recent loading history of a cargo carrier is just as important a factor in loading losses as the method of loading. If the carrier has carried a nonvolatile liquid such as fuel oil, or has just been cleaned, it will contain vapor-free air. If it has just carried gasoline and has not been vented, the air in the carrier tank will contain volatile organic vapors, which will be expelled during the loading operation along with newly generated vapors.

Cargo carriers are sometimes designated to transport only one product, and in such cases are practicing "dedicated service". Dedicated gasoline cargo tanks return to a loading terminal containing air fully or partially saturated with vapor from the previous load. Cargo tanks may also be "switch loaded" with various products, so that a nonvolatile product being loaded may expel the vapors remaining from a previous load of a volatile product such as gasoline. These circumstances vary with the type of cargo tank and with the ownership of the carrier, the petroleum liquids being transported, geographic location, and season of the year.

One control measure for vapors displaced during liquid loading is called "vapor balance service", in which the cargo tank retrieves the vapors displaced during product unloading at bulk plants or service stations and transports the vapors back to the loading terminal. Figure 5.2-5 shows a tank truck in vapor balance service filling a service station underground tank and taking on displaced gasoline vapors for return to the terminal. A cargo tank returning to a bulk terminal in vapor balance service normally is saturated with organic vapors, and the presence of these vapors at the start of submerged loading of the tanker truck results in greater loading losses than encountered during nonvapor balance, or "normal", service. Vapor balance service is usually not practiced with marine vessels, although some vessels practice emission control by means of vapor transfer within their own cargo tanks during ballasting operations, discussed below.

Emissions from loading petroleum liquid can be estimated (with a probable error of ±30 percent)[4] using the following expression:

$$L_L = 12.46 \frac{SPM}{T} \quad (1)$$

where:

L_L = loading loss, pounds per 1000 gallons ($lb/10^3$ gal) of liquid loaded

S = a saturation factor (see Table 5.2-1)
P = true vapor pressure of liquid loaded, pounds per square inch absolute (psia) (see Figure 7.1-5, Figure 7.1-6, and Table 7.1-2)
M = molecular weight of vapors, pounds per pound-mole (lb/lb-mole) (see Table 7.1-2)
T = temperature of bulk liquid loaded, °R (°F + 460)

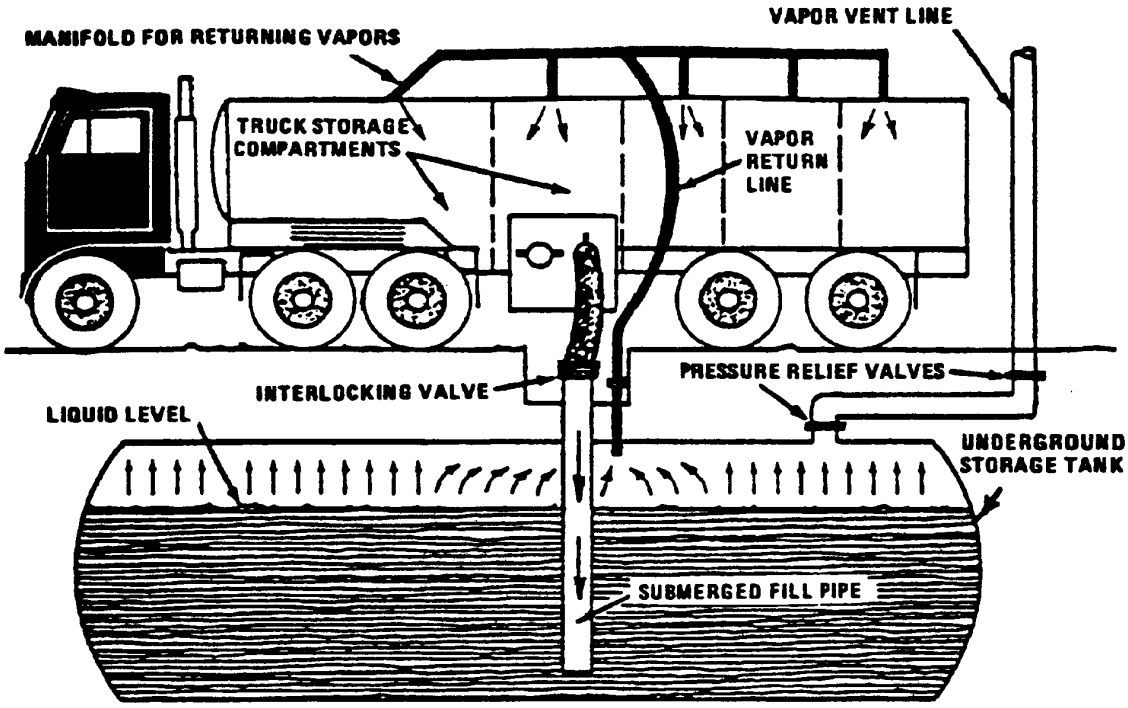


Figure 5.2-5. Tank truck unloading into a service station underground storage tank and practicing "vapor balance" form of emission control.

Table 5.2-1. SATURATION (S) FACTORS FOR CALCULATING PETROLEUM LIQUID LOADING LOSSES

Cargo Carrier	Mode Of Operation	S Factor
Tank trucks and rail tank cars	Submerged loading of a clean cargo tank	0.50
	Submerged loading: dedicated normal service	0.60
	Submerged loading: dedicated vapor balance service	1.00
	Splash loading of a clean cargo tank	1.45
	Splash loading: dedicated normal service	1.45
	Splash loading: dedicated vapor balance service	1.00
Marine vessels[a]	Submerged loading: ships	0.2
	Submerged loading: barges	0.5

[a] For products other than gasoline and crude oil. For marine loading of gasoline, use factors from Table 5.2-2. For marine loading of crude oil, use Equations 2 and 3 and Table 5.2-3.

The saturation factor, S, represents the expelled vapor's fractional approach to saturation, and it accounts for the variations observed in emission rates from the different unloading and loading methods. Table 5.2-1 lists suggested saturation factors.

Emissions from controlled loading operations can be calculated by multiplying the uncontrolled emission rate calculated in Equation 1 by an overall reduction efficiency term:

$$\left(1 - \frac{\text{eff}}{100}\right)$$

The overall reduction efficiency should account for the capture efficiency of the collection system as well as both the control efficiency and any downtime of the control device. Measures to reduce loading emissions include selection of alternate loading methods and application of vapor recovery equipment. The latter captures organic vapors displaced during loading operations and recovers the vapors by the use of refrigeration, absorption, adsorption, and/or compression. The recovered product is piped back to storage. Vapors can also be controlled through combustion in a thermal oxidation unit, with no product recovery. Figure 5.2-6 demonstrates the recovery of gasoline vapors from tank trucks during loading operations at bulk terminals. Control efficiencies for the recovery units range from 90 to over 99 percent, depending on both the nature of the vapors and the type of control equipment used.[5-6] However, not all of the displaced vapors reach the control device, because of leakage from both the tank truck and collection system. The collection efficiency should be assumed to be 99.2 percent for tanker trucks passing the MACT-level annual leak test (not more than 1 inch water column pressure change in 5 minutes after pressurizing to 18 inches water followed by pulling a vacuum of 6 inches water).[7] A collection efficiency of 98.7 percent (a 1.3 percent leakage rate) should be assumed for trucks passing the NSPS-level annual test (3 inches pressure change) A collection efficiency of 70 percent should be assumed for trucks not passing one of these annual leak tests[6].

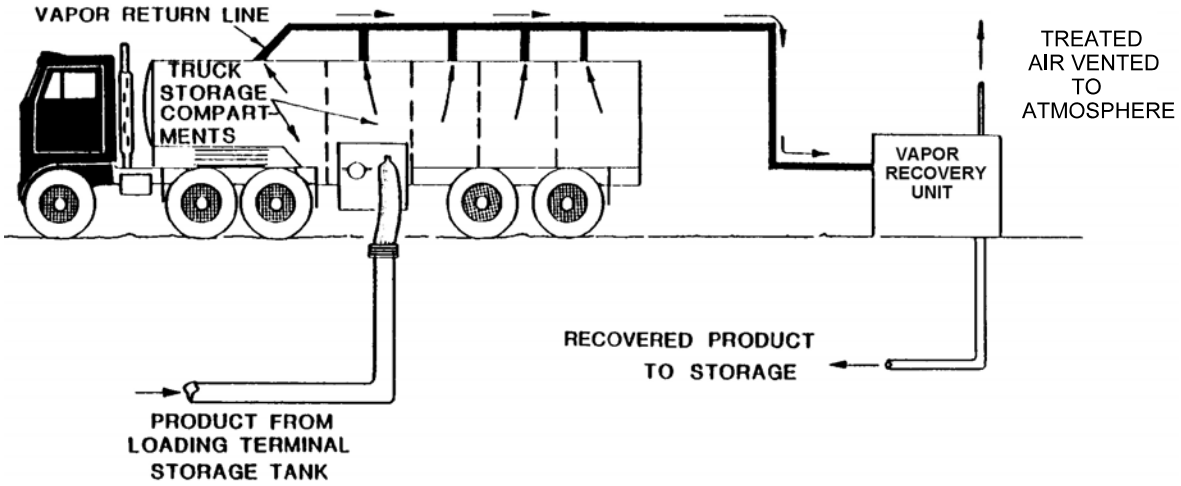


Figure 5.2-6. Tank truck loading with vapor recovery.

Storage Tank PTE Emissions Data and Calculations

Unit Number: T1 & T2
Description: Condensate Storage Tanks

Emission Rates

Source/Pollutants	Working/Breathing Losses, ppy	Working/Breathing Losses, tpy	Flash Losses, tpy	Uncontrolled Emission Rates, tpy	10% Safety Factor tpy
T1					
VOC	6,540.36	3.27	44.75	48.02	52.82
Benzene	37.76	1.89E-02	3.25E-01	3.44E-01	3.79E-01
Ethylbenzene	2.07	1.04E-03	1.62E-02	1.72E-02	1.89E-02
n-Hexane	412.11	2.06E-01	2.60	2.81	3.09
Isooctane	7.53	3.77E-03	4.56E-02	4.94E-02	5.43E-02
Toluene	4.96	2.48E-03	3.81E-02	4.06E-02	4.46E-02
Xylene	12.01	6.01E-03	7.99E-02	8.59E-02	9.45E-02
T2					
VOC	5,608.34	2.80	--	2.80	
Benzene	32.38	1.62E-02	--	1.62E-02	
Ethylbenzene	1.78	8.90E-04	--	8.90E-04	
n-Hexane	353.38	1.77E-01	--	1.77E-01	
Isooctane	6.46	3.23E-03	--	3.23E-03	
Toluene	4.26	2.13E-03	--	2.13E-03	
Xylene	10.30	5.15E-03	--	5.15E-03	

Working/breathing losses taken from TANKS 4.0 results
Flash VOC emissions taken from VMGSim results
Flash HAP emissions calculated from the flash VOC emissions and the weight % HAP (calculated in the table below)
Unit T2 does not have flash emissions because it is an overflow tank for Unit T1. All flashing occurs in Unit T1.

Storage Tank PTE Emissions Data and Calculations

Unit Number: T1 & T2
Description: Condensate Storage Tanks

Flash Emissions Composition (To Determine HAP Emissions)

Components	Mole Percents, %	Molecular Weights, lb/lb-mole	Component Weights, lb/lb-mole	Weight Percent, %
Carbon dioxide	0.1231	44.010		
Hydrogen sulfide	0.0000	34.070		
Nitrogen	1.4810	28.013		
Water	1.9137	18.015		
Methane	58.8518	16.043		
Ethane	9.5652	30.070		
Propane	3.1622	44.097	139.445	7.752
Isobutane	4.8689	58.123	282.998	15.732
n-Butane	9.3180	58.123	541.590	30.108
Isopentane	4.5581	72.150	328.870	18.282
n-Pentane	3.0399	72.150	219.325	12.193
Cyclopentane	0.0158	70.134	1.107	0.062
n-Hexane	1.2128	86.177	104.513	5.810
Cyclohexane	0.4511	84.161	37.966	2.111
Other hexanes	0.0000	86.177	0.000	0.000
Heptanes	0.6055	100.204	60.677	3.373
Methylcyclohexane	0.4106	98.188	40.317	2.241
Isooctane	0.0160	114.231	1.833	0.102
Benzene	0.1674	78.114	13.074	0.727
Toluene	0.0166	92.141	1.532	0.085
Ethylbenzene	0.0061	106.167	0.651	0.036
Xylenes	0.0303	106.167	3.212	0.179
n-Octane	0.1544	114.232	17.643	0.981
n-Nonane	0.0262	128.259	3.355	0.187
n-Decane	0.0051	142.286	0.719	0.040
Total	100.0000		1798.826	100.000

Gas stream composition obtained from VGMSym output
Component Weights (lb/lb-mole) = (% / 100) * Molecular Weights (lb/lb-mole)
Weight Percent of TOC (%) = 100 x Component Weights (lb/lb-mole) / Total Component Weight (lb/lb-mole)

Storage Tank PTE Emissions Data and Calculations

Unit Number: T1 & T2
Description: Condensate Storage Tanks

Condensate Composition (To Determine Working/Breathing Losses)

Components	Mole Percents, %	Molecular Weights, lb/lb-mole	Component Weights, lb/lb-mole	Weight Percent, %
Carbon dioxide	0.0016	44.010		
Hydrogen sulfide	0.0000	34.070		
Nitrogen	0.0016	28.013		
Water	10.3467	18.015	186.3954	1.9609
Methane	0.2398	16.043	3.8476	0.0405
Ethane	0.2647	30.070	7.9592	0.0837
Propane	0.3284	44.097	14.4797	0.1523
Isobutane	1.3530	58.123	78.6407	0.8273
n-Butane	4.0043	58.123	232.7417	2.4485
Isopentane	5.2914	72.150	381.7734	4.0163
n-Pentane	4.7618	72.150	343.5631	3.6143
Cyclopentane	0.0479	70.134	3.3588	0.0353
n-Hexane	7.2009	86.177	620.5560	6.5283
Cyclohexane	4.2312	84.161	356.1035	3.7463
Other hexanes	0.0000	86.177	0.0000	0.0000
Heptanes	12.0651	100.204	1208.9690	12.7185
Methylcyclohexane	9.4637	98.188	929.2256	9.7756
Isooctane	0.3125	114.231	35.7007	0.3756
Benzene	1.1780	78.114	92.0162	0.9680
Toluene	0.4530	92.141	41.7421	0.4391
Ethylbenzene	0.4864	106.167	51.6357	0.5432
Xylenes	3.3752	106.167	358.3340	3.7697
n-Octane	10.1150	114.232	1155.4546	12.1555
n-Nonane	5.6876	128.259	729.4821	7.6743
n-Decane	18.7903	142.286	2673.5942	28.1266
Total	100.0000		9505.5736	100.0000

Gas stream composition obtained from VGMSym output
Component Weights (lb/lb-mole) = (% / 100) * Molecular Weights (lb/lb-mole)
Weight Percent of TOC (%) = 100 x Component Weights (lb/lb-mole) / Total Component Weight (lb/lb-mole)
In TANKS 4, the methane, ethane, and propane percentages are included with isobutane and n-butane (an even distribution)

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Los Mestenios - T1 - Condensate PTE
City:	Gavilan
State:	New Mexico
Company:	Harvest Four Corners, LLC
Type of Tank:	Vertical Fixed Roof Tank
Description:	490 Barrel Condensate Storage Tank

Tank Dimensions

Shell Height (ft):	16.00
Diameter (ft):	14.75
Liquid Height (ft) :	15.00
Avg. Liquid Height (ft):	7.50
Volume (gallons):	19,173.00
Turnovers:	48.50
Net Throughput(gal/yr):	929,922.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Medium
Shell Condition	Good
Roof Color/Shade:	Gray/Medium
Roof Condition:	Good

Roof Characteristics

Type:	Dome
Height (ft)	0.00
Radius (ft) (Dome Roof)	14.75

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Albuquerque, New Mexico (Avg Atmospheric Pressure = 12.15 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

Los Mestenios - T1 - Condensate PTE - Vertical Fixed Roof Tank
Gavilan, New Mexico

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Condensate	All	67.36	53.93	80.79	59.23	3.4523	2.6161	4.3471	66.3334			95.42	
2,2,4-Trimethylpentane (isooctane)						0.7338	0.4989	1.0546	114.2300	0.0038	0.0011	114.23	Option 2: A=6.8118, B=1257.84, C=220.74
Benzene						1.4274	0.9846	2.0237	78.1100	0.0097	0.0058	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Butane (-n)						29.9357	23.3576	34.6684	58.1230	0.0259	0.3227	58.12	Option 1: VP60 = 26.1 VP70 = 31.31
Cyclohexane						1.4738	1.0254	2.0729	84.1600	0.0375	0.0230	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Cyclopentane						4.9596	3.6370	6.6394	70.1300	0.0004	0.0007	70.13	Option 1: VP60 = 4.177 VP70 = 5.24
Decane (-n)						0.0395	0.0291	0.0536	142.2900	0.2813	0.0046	142.29	Option 1: VP60 = .033211 VP70 = .041762
Ethylbenzene						0.1396	0.0876	0.2162	106.1700	0.0054	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Heptane (-n)						0.7600	0.5088	1.1128	100.2000	0.1272	0.0403	100.20	Option 3: A=37358, B=8.2585
Hexane (-n)						2.3100	1.6303	3.2059	86.1700	0.0653	0.0628	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Iso-Butane						43.3083	34.4026	53.8185	58.1230	0.0097	0.1743	58.12	Option 1: VP60 = 38.14 VP70 = 45.16
Isopentane						11.8640	8.7212	15.5743	72.1500	0.0402	0.1985	72.15	Option 1: VP60 = 10.005 VP70 = 12.53
Methylcyclohexane						0.6886	0.4673	0.9913	98.1800	0.0978	0.0280	98.18	Option 2: A=6.823, B=1270.763, C=221.42
Nonane (-n)						0.0784	0.0568	0.1080	128.2600	0.0767	0.0025	128.26	Option 1: VP60 = .065278 VP70 = .08309
Octane (-n)						0.1769	0.1254	0.2493	114.2300	0.1216	0.0090	114.23	Option 1: VP60 = .145444 VP70 = .188224
Pentane (-n)						8.0308	5.9649	10.6537	72.1500	0.0361	0.1209	72.15	Option 3: A=27691, B=7.558
Toluene						0.4136	0.2726	0.6120	92.1300	0.0044	0.0008	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Water						0.3402	0.2160	0.5229	18.0150	0.0196	0.0028	18.02	Option 1: VP60 = .263 VP70 = .3679
Xylenes (mixed isomers)						0.1165	0.0728	0.1813	106.1700	0.0377	0.0018	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

Los Mestenios - T1 - Condensate PTE - Vertical Fixed Roof Tank
Gavilan, New Mexico

Annual Emission Calcaulations	
Standing Losses (lb):	2,577.2156
Vapor Space Volume (cu ft):	1,625.2961
Vapor Density (lb/cu ft):	0.0405
Vapor Space Expansion Factor:	0.2940
Vented Vapor Saturation Factor:	0.3649
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	1,625.2961
Tank Diameter (ft):	14.7500
Vapor Space Outage (ft):	9.5117
Tank Shell Height (ft):	16.0000
Average Liquid Height (ft):	7.5000
Roof Outage (ft):	1.0117
Roof Outage (Dome Roof)	
Roof Outage (ft):	1.0117
Dome Radius (ft):	14.7500
Shell Radius (ft):	7.3750
Vapor Density	
Vapor Density (lb/cu ft):	0.0405
Vapor Molecular Weight (lb/lb-mole):	66.3334
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.4523
Daily Avg. Liquid Surface Temp. (deg. R):	527.0322
Daily Average Ambient Temp. (deg. F):	56.1542
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	518.9042
Tank Paint Solar Absorptance (Shell):	0.6800
Tank Paint Solar Absorptance (Roof):	0.6800
Daily Total Solar Insulation Factor (Btu/sqft day):	1,765.3167
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.2940
Daily Vapor Temperature Range (deg. R):	53.7176
Daily Vapor Pressure Range (psia):	1.7309
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.4523
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	2.6161
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	4.3471
Daily Avg. Liquid Surface Temp. (deg R):	527.0322
Daily Min. Liquid Surface Temp. (deg R):	513.6028
Daily Max. Liquid Surface Temp. (deg R):	540.4617
Daily Ambient Temp. Range (deg. R):	27.9250
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.3649
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	3.4523
Vapor Space Outage (ft):	9.5117
Working Losses (lb):	3,981.3785

Vapor Molecular Weight (lb/lb-mole):	66.3334
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.4523
Annual Net Throughput (gal/yr.):	929,922.0000
Annual Turnovers:	48.5000
Turnover Factor:	0.7852
Maximum Liquid Volume (gal):	19,173.0000
Maximum Liquid Height (ft):	15.0000
Tank Diameter (ft):	14.7500
Working Loss Product Factor:	1.0000

Total Losses (lb):	6,558.5942

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

Los Mestenios - T1 - Condensate PTE - Vertical Fixed Roof Tank
Gavilan, New Mexico

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Condensate	3,981.38	2,577.22	6,558.59
Iso-Butane	693.82	449.12	1,142.94
Butane (-n)	1,284.65	831.58	2,116.23
Isopentane	790.47	511.69	1,302.16
Pentane (-n)	481.52	311.70	793.22
Cyclopentane	2.90	1.88	4.78
Hexane (-n)	250.17	161.94	412.11
Cyclohexane	91.60	59.29	150.89
Heptane (-n)	160.36	103.80	264.16
Methylcyclohexane	111.67	72.28	183.95
2,2,4-Trimethylpentane (isooctane)	4.57	2.96	7.53
Benzene	22.92	14.84	37.76
Toluene	3.01	1.95	4.96
Ethylbenzene	1.26	0.81	2.07
Xylenes (mixed isomers)	7.29	4.72	12.01
Octane (-n)	35.68	23.10	58.78
Nonane (-n)	9.98	6.46	16.44
Decane (-n)	18.43	11.93	30.37
Water	11.07	7.16	18.23

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Los Mestenios - T2 - Condensate PTE
City:	Gavilan
State:	New Mexico
Company:	Harvest Four Corners, LLC
Type of Tank:	Vertical Fixed Roof Tank
Description:	400 Barrel Condensate Storage Tank

Tank Dimensions

Shell Height (ft):	16.00
Diameter (ft):	13.50
Liquid Height (ft) :	15.00
Avg. Liquid Height (ft):	7.50
Volume (gallons):	16,061.00
Turnovers:	57.90
Net Throughput(gal/yr):	929,922.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Medium
Shell Condition	Good
Roof Color/Shade:	Gray/Medium
Roof Condition:	Good

Roof Characteristics

Type:	Dome
Height (ft)	0.00
Radius (ft) (Dome Roof)	13.50

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Albuquerque, New Mexico (Avg Atmospheric Pressure = 12.15 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

Los Mestenios - T2 - Condensate PTE - Vertical Fixed Roof Tank
Gavilan, New Mexico

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Condensate	All	67.36	53.93	80.79	59.23	3.4523	2.6161	4.3471	66.3334			95.42	
2,2,4-Trimethylpentane (isooctane)						0.7338	0.4989	1.0546	114.2300	0.0038	0.0011	114.23	Option 2: A=6.8118, B=1257.84, C=220.74
Benzene						1.4274	0.9846	2.0237	78.1100	0.0097	0.0058	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Butane (-n)						29.9357	23.3576	34.6684	58.1230	0.0259	0.3227	58.12	Option 1: VP60 = 26.1 VP70 = 31.31
Cyclohexane						1.4738	1.0254	2.0729	84.1600	0.0375	0.0230	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Cyclopentane						4.9596	3.6370	6.6394	70.1300	0.0004	0.0007	70.13	Option 1: VP60 = 4.177 VP70 = 5.24
Decane (-n)						0.0395	0.0291	0.0536	142.2900	0.2813	0.0046	142.29	Option 1: VP60 = .033211 VP70 = .041762
Ethylbenzene						0.1396	0.0876	0.2162	106.1700	0.0054	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Heptane (-n)						0.7600	0.5088	1.1128	100.2000	0.1272	0.0403	100.20	Option 3: A=37358, B=8.2585
Hexane (-n)						2.3100	1.6303	3.2059	86.1700	0.0653	0.0628	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Iso-Butane						43.3083	34.4026	53.8185	58.1230	0.0097	0.1743	58.12	Option 1: VP60 = 38.14 VP70 = 45.16
Isopentane						11.8640	8.7212	15.5743	72.1500	0.0402	0.1985	72.15	Option 1: VP60 = 10.005 VP70 = 12.53
Methylcyclohexane						0.6886	0.4673	0.9913	98.1800	0.0978	0.0280	98.18	Option 2: A=6.823, B=1270.763, C=221.42
Nonane (-n)						0.0784	0.0568	0.1080	128.2600	0.0767	0.0025	128.26	Option 1: VP60 = .065278 VP70 = .08309
Octane (-n)						0.1769	0.1254	0.2493	114.2300	0.1216	0.0090	114.23	Option 1: VP60 = .145444 VP70 = .188224
Pentane (-n)						8.0308	5.9649	10.6537	72.1500	0.0361	0.1209	72.15	Option 3: A=27691, B=7.558
Toluene						0.4136	0.2726	0.6120	92.1300	0.0044	0.0008	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Water						0.3402	0.2160	0.5229	18.0150	0.0196	0.0028	18.02	Option 1: VP60 = .263 VP70 = .3679
Xylenes (mixed isomers)						0.1165	0.0728	0.1813	106.1700	0.0377	0.0018	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

Los Mestenios - T2 - Condensate PTE - Vertical Fixed Roof Tank
Gavilan, New Mexico

Annual Emission Calcaulations	
Standing Losses (lb):	2,151.7664
Vapor Space Volume (cu ft):	1,349.2223
Vapor Density (lb/cu ft):	0.0405
Vapor Space Expansion Factor:	0.2940
Vented Vapor Saturation Factor:	0.3670
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	1,349.2223
Tank Diameter (ft):	13.5000
Vapor Space Outage (ft):	9.4260
Tank Shell Height (ft):	16.0000
Average Liquid Height (ft):	7.5000
Roof Outage (ft):	0.9260
Roof Outage (Dome Roof)	
Roof Outage (ft):	0.9260
Dome Radius (ft):	13.5000
Shell Radius (ft):	6.7500
Vapor Density	
Vapor Density (lb/cu ft):	0.0405
Vapor Molecular Weight (lb/lb-mole):	66.3334
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.4523
Daily Avg. Liquid Surface Temp. (deg. R):	527.0322
Daily Average Ambient Temp. (deg. F):	56.1542
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	518.9042
Tank Paint Solar Absorptance (Shell):	0.6800
Tank Paint Solar Absorptance (Roof):	0.6800
Daily Total Solar Insulation Factor (Btu/sqft day):	1,765.3167
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.2940
Daily Vapor Temperature Range (deg. R):	53.7176
Daily Vapor Pressure Range (psia):	1.7309
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.4523
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	2.6161
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	4.3471
Daily Avg. Liquid Surface Temp. (deg R):	527.0322
Daily Min. Liquid Surface Temp. (deg R):	513.6028
Daily Max. Liquid Surface Temp. (deg R):	540.4617
Daily Ambient Temp. Range (deg. R):	27.9250
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.3670
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	3.4523
Vapor Space Outage (ft):	9.4260
Working Losses (lb):	3,472.2012

Vapor Molecular Weight (lb/lb-mole):	66.3334
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.4523
Annual Net Throughput (gal/yr.):	929,922.0000
Annual Turnovers:	57.9000
Turnover Factor:	0.6848
Maximum Liquid Volume (gal):	16,061.0000
Maximum Liquid Height (ft):	15.0000
Tank Diameter (ft):	13.5000
Working Loss Product Factor:	1.0000

Total Losses (lb):	5,623.9676

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

Los Mestenios - T2 - Condensate PTE - Vertical Fixed Roof Tank
Gavilan, New Mexico

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Condensate	3,472.20	2,151.77	5,623.97
Iso-Butane	605.09	374.98	980.06
Butane (-n)	1,120.36	694.30	1,814.66
Isopentane	689.38	427.22	1,116.60
Pentane (-n)	419.94	260.24	680.18
Cyclopentane	2.53	1.57	4.10
Hexane (-n)	218.18	135.21	353.38
Cyclohexane	79.88	49.50	129.39
Heptane (-n)	139.85	86.67	226.52
Methylcyclohexane	97.39	60.35	157.74
2,2,4-Trimethylpentane (isooctane)	3.99	2.47	6.46
Benzene	19.99	12.39	32.38
Toluene	2.63	1.63	4.26
Ethylbenzene	1.10	0.68	1.78
Xylenes (mixed isomers)	6.36	3.94	10.30
Octane (-n)	31.12	19.28	50.40
Nonane (-n)	8.70	5.39	14.10
Decane (-n)	16.08	9.96	26.04
Water	9.65	5.98	15.63

Simulation Report

Symmetry

File Name:	Los Mestenios Emissions Flash Model 12.21.2021
Company:	VMG, a Schlumberger Technology
Customer:	
Project:	
Job No:	
Prepared By:	
Report Date:	Tuesday, December 21, 2021
Unit Set:	Field

File: U:\Environmental\Los Mestenios Emissions Flash Model 12.21.2021.vsym

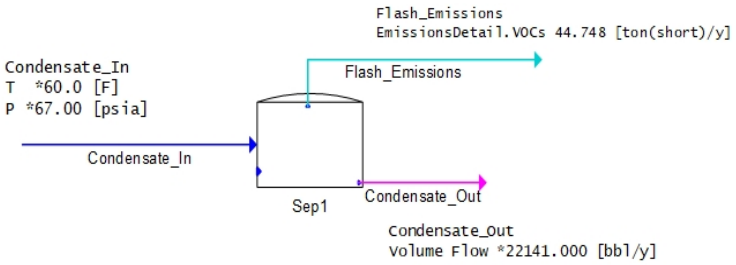
Symmetry

Main Flowsheet

Material Stream (3)
2ph Separator (1)

*Bold face throughout the report denotes specified values.

*Italic face throughout the report denotes recycle values.


Flash_Emissions
EmissionsDetail.VOCs 44.748 [ton(short)/y]
Condensate_In
T *60.0 [F]
P *67.00 [psia]
Flash_Emissions
Condensate_In
Sep1
Condensate_Out
Condensate_Out
Volume Flow *22141.000 [bbl/y]

/Condensate_In (Material Stream)

Thermo Model: APRNGL2

Connections

Material Inlets

	Connection	Up Stream Unit Op
In	<Disconnected>	---

Material Outlets

	Connection	Down Stream Unit Op
Out	Sep1.In0	---

Allocation / Product Allocation

Auto Calculate	**False**	Is Up To Date	False
Status	Y?No Results		

Equilibrium Results

	Bulk	**Vap**	**Liq0**	**Liq1**
Phase Frac [Fraction]	1.00	0.0390	0.8649	0.0962
T [F]	60.0	60.0	60.0	60.0
P [psia]	67.00	67.00	67.00	67.00
Mole Flow [lbmol/h]	7.04	0.27	6.09	0.68
Mass Flow [lb/h]	657.72	5.59	639.94	12.19
Volume Flow [ft3/s]	0.010	0.006	0.004	0.000
Fraction [Fraction]				
NITROGEN	0.0012	0.0273	1.69E-04	1.39E-06
METHANE	0.0497	0.8415	0.0195	9.28E-05
CARBON DIOXIDE	1.14E-04	0.0011	8.10E-05	3.03E-06
ETHANE	0.0102	0.0590	0.0091	9.68E-06
PROPANE	0.0056	0.0105	0.0060	1.15E-06
ISOBUTANE	0.0164	0.0123	0.0184	7.47E-07
n-BUTANE	0.0443	0.0218	0.0503	1.96E-06
ISOPENTANE	0.0523	0.0098	0.0601	5.01E-07
n-PENTANE	0.0462	0.0065	0.0532	4.95E-07
CYCLOPENTANE	4.53E-04	3.28E-05	5.22E-04	1.90E-08
n-HEXANE	0.0672	0.0025	0.0776	1.89E-07
METHYLCYCLOHEXANE	0.0873	8.63E-04	0.1009	3.17E-07
2,2,4-TRIMETHYLPENTANE	0.0029	3.38E-05	0.0033	8.35E-10
BENZENE	0.0110	3.47E-04	0.0127	5.87E-06
CYCLOHEXANE	0.0393	9.37E-04	0.0454	5.73E-07
n-HEPTANE	0.1114	0.0013	0.1288	6.67E-08
TOLUENE	0.0042	3.47E-05	0.0048	5.99E-07
n-OCTANE	0.0931	3.30E-04	0.1076	1.08E-08
ETHYLBENZENE	0.0045	1.30E-05	0.0052	1.82E-07
m-XYLENE	0.0214	4.76E-05	0.0247	7.31E-07
o-XYLENE	0.0096	1.66E-05	0.0112	4.19E-07
n-NONANE	0.0523	5.68E-05	0.0605	5.32E-09
n-DECANE	0.0024	8.18E-07	0.0028	1.01E-10
n-UNDECANE	0.0852	8.06E-06	0.0985	1.31E-09
n-DODECANE	0.0852	2.53E-06	0.0985	6.27E-10
WATER	0.0967	0.0038	4.11E-04	0.9999

/Condensate_Out (Material Stream)

Thermo Model: APRNGL2

Connections

Material Inlets

	Connection	Up Stream Unit Op
In	Sep1.Liq0	---

Material Outlets

	Connection	Down Stream Unit Op
Out	<Disconnected>	---

Allocation / Product Allocation

Auto Calculate	**False**	Is Up To Date	False
Status	Y?No Results		

Equilibrium Results

	Bulk	**Vap**	**Liq0**	**Liq1**
Phase Frac [Fraction]	1.00	0.00	1.00	
T [F]	60.0	60.0	60.0	
P [psia]	13.00	13.00	13.00	
Mole Flow [lbmol/h]	6.47	0.00	6.47	
Mass Flow [lb/h]	640.04	0.00	640.04	
Volume Flow [ft3/s]	0.004	0.000	0.004	
Fraction [Fraction]				
NITROGEN	1.58E-05	0.0148	1.58E-05	
METHANE	0.0024	0.5885	0.0024	
CARBON DIOXIDE	1.59E-05	0.0012	1.59E-05	
ETHANE	0.0026	0.0957	0.0026	
PROPANE	0.0033	0.0316	0.0033	
ISOBUTANE	0.0135	0.0487	0.0135	
n-BUTANE	0.0400	0.0932	0.0400	
ISOPENTANE	0.0529	0.0456	0.0529	
n-PENTANE	0.0476	0.0304	0.0476	
CYCLOPENTANE	4.79E-04	1.58E-04	4.79E-04	
n-HEXANE	0.0720	0.0121	0.0720	
METHYLCYCLOHEXANE	0.0946	0.0041	0.0946	
2,2,4-TRIMETHYLPENTANE	0.0031	1.60E-04	0.0031	
BENZENE	0.0118	0.0017	0.0118	
CYCLOHEXANE	0.0423	0.0045	0.0423	
n-HEPTANE	0.1207	0.0061	0.1207	
TOLUENE	0.0045	1.66E-04	0.0045	
n-OCTANE	0.1011	0.0015	0.1011	
ETHYLBENZENE	0.0049	6.13E-05	0.0049	
m-XYLENE	0.0233	2.24E-04	0.0233	
o-XYLENE	0.0105	7.81E-05	0.0105	
n-NONANE	0.0569	2.62E-04	0.0569	
n-DECANE	0.0026	3.70E-06	0.0026	
n-UNDECANE	0.0926	3.58E-05	0.0926	
n-DODECANE	0.0926	1.10E-05	0.0926	
WATER	0.1035	0.0191	0.1035	

/Flash_Emissions (Material Stream)

Thermo Model: APRNGL2

Connections

Material Inlets

	Connection	Up Stream Unit Op
In	Sep1.Vap	---

Material Outlets

	Connection	Down Stream Unit Op
Out	<Disconnected>	---

Allocation / Product Allocation

Auto Calculate	**False**	Is Up To Date	False
Status	Y?No Results		

Equilibrium Results

	Bulk	**Vap**	**Liq0**	**Liq1**
Phase Frac [Fraction]	1.00	1.00	0.00	
T [F]	60.0	60.0	60.0	
P [psia]	13.00	13.00	13.00	
Mole Flow [lbmol/h]	0.57	0.57	0.00	
Mass Flow [lb/h]	17.67	17.67	0.00	
Volume Flow [ft3/s]	0.067	0.067	0.000	
Fraction [Fraction]				
NITROGEN	0.0148	0.0148	1.58E-05	
METHANE	0.5885	0.5885	0.0024	
CARBON DIOXIDE	0.0012	0.0012	1.59E-05	
ETHANE	0.0957	0.0957	0.0026	
PROPANE	0.0316	0.0316	0.0033	
ISOBUTANE	0.0487	0.0487	0.0135	
n-BUTANE	0.0932	0.0932	0.0400	
ISOPENTANE	0.0456	0.0456	0.0529	
n-PENTANE	0.0304	0.0304	0.0476	
CYCLOPENTANE	1.58E-04	1.58E-04	4.79E-04	
n-HEXANE	0.0121	0.0121	0.0720	
METHYLCYCLOHEXANE	0.0041	0.0041	0.0946	
2,2,4-TRIMETHYLPENTANE	1.60E-04	1.60E-04	0.0031	
BENZENE	0.0017	0.0017	0.0118	
CYCLOHEXANE	0.0045	0.0045	0.0423	
n-HEPTANE	0.0061	0.0061	0.1207	
TOLUENE	1.66E-04	1.66E-04	0.0045	
n-OCTANE	0.0015	0.0015	0.1011	
ETHYLBENZENE	6.13E-05	6.13E-05	0.0049	
m-XYLENE	2.24E-04	2.24E-04	0.0233	
o-XYLENE	7.81E-05	7.81E-05	0.0105	
n-NONANE	2.62E-04	2.62E-04	0.0569	
n-DECANE	3.70E-06	3.70E-06	0.0026	
n-UNDECANE	3.58E-05	3.58E-05	0.0926	
n-DODECANE	1.10E-05	1.10E-05	0.0926	
WATER	0.0191	0.0191	0.1035	

Storage Tank PTE Emissions Calculations

Unit Number: T3
Description: Produced Water Tank

Note: The data on this worksheet applies to each individual emissions unit identified above.

Throughput

70	bbl/turnover	Tank capacity	Harvest Four Corners, LLC
12	turnover/yr	Turnovers per year	Harvest Four Corners, LLC
840	bbl/yr	Annual liquid throughput	bbl/turnover x turnover/yr

Emission Rates

Pollutant	Emission Factor, lb/bbl	Uncontrolled, Emission Rate, tpy
VOC	0.262	1.10E-01
Benzene	0.007	2.94E-03
Ethylbenzene	0.0007	2.94E-04
n-Hexane	0.022	9.24E-03
Toluene	0.009	3.78E-03
Xylene	0.006	2.52E-03

VOC, Benzene, and n-Hexane emission factors are taken from the CDPHE PS Memo 09-02 (Oil & Gas Produced Water Tank Batteries - Regulatory Definitions & Permitting Guidance)
Ethylbenzene, toluene, and xylene emissions factors (Non-Texas) are taken from the TCEQ Project 2010-29 (Emission Factor Determination for Produced Water Storage Tanks) report
Uncontrolled Emission Rates (tpy) = lb/bbl x bbl/yr / 2,000 lb/ton

PS Memo 09-02

To: **Stationary Sources Program, Local Agencies, and Regulated Community**

From: **Chris Laplante and Roland C. Hea, Colorado Air Pollution Control Division**

Date: **February 8, 2010**

Subject: **Oil & Gas Produced Water Tank Batteries**
Regulatory Definitions and Permitting Guidance

This guidance document is intended to answer frequently asked questions concerning oil and gas industry produced water tank batteries. This document does not address any other equipment types that may be part of a common facility with a tank battery. Nothing in this guidance should be construed regarding Air Pollution Control Division (Division) permitting of evaporation ponds or water treatment facilities. Please consult with the Division for information regarding the permitting of evaporation ponds or water treatment facilities.

Revision History

October 1, 2009	Initial issuance.
February 8, 2010	First revision. This guidance document replaces the October 1, 2009 version. Revised language to clarify APEN fee structure, definition of modification, APEN submittals, and produced water exemption.

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3. EMISSION FACTORS AND SITE SPECIFIC SAMPLING Q&A

3.1. ***What are the State approved default emission factors for produced water tanks?***

County	Produced Water Tank Default Emission Factors[1] (lb/bbl)[2]		
	VOC	Benzene	n-Hexane
Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, Jefferson, Larimer, & Weld	0.262	0.007	0.022
Garfield, Mesa, Rio Blanco, & Moffat	0.178	0.004	0.010
Remainder of Colorado[3]	0.262	0.007	0.022

[1] Testing may be performed at any site to determine site-specific emissions factors. These default emission factors may be revised by the Division in the future, pending approved data and testing results.

[2] Units of lb/bbl means pounds of emissions per barrel of produced water throughput

[3] For counties not listed in this table, use the emissions factors listed as a conservative measure or perform testing to determine a site-specific emission factor

3.2. ***What type of emissions are included in the produced water tank state default emission factors?***

State default emission factors for produced water tanks include flash, working, and breathing losses.

3.3. ***Are there limits as to when produced water tank state default emission factors may be used?***

State default emission factors may be used at all oil and gas industry tank batteries. The Division intends to work with industry to refine emission factors and may develop separate emission factors for E&P and non-E&P sites.

3.4. ***When are site-specific emission factors required for tank batteries?***

Site-specific emission factors may be developed and used on a voluntary basis for any tank battery. The Division reserves the authority to require site-specific emission factors at any time. Site-specific emission factors may only be applied at the tank battery for which they were developed, unless otherwise approved by the Division.

3.5. ***How is a site-specific emission factor developed?***

A site-specific emission factor for tank batteries is developed by performing a Division approved stack test. A test protocol must be submitted and approved by the Division prior to performing the test. Once a test protocol has been approved by the Division, subsequent testing may be performed following the approved protocol without submittal to the Division.

The Division must be notified of the site specific testing at least 30-days prior to the actual test date.

Emission Factor Determination for Produced Water Storage Tanks

TCEQ Project 2010-29

Prepared for:
Texas Commission on Environmental Quality
Austin, Texas

Prepared by:
ENVIRON International Corporation
Novato, California

Date:
August 2010

ENVIRON Project Number:
06-17477T

Executive Summary

The overall purpose of this Study is to evaluate volatile organic compounds (VOC), speciated VOC and hazardous air pollutant (HAP) emissions from produced water and/or saltwater storage tanks servicing oil and gas wells and to develop appropriate VOC and HAP emission factors. The emission factors are to be used for emission inventory development purposes.

The primary source of information for this study was testing conducted by the Texas Commission on Environmental Quality (TCEQ) under Work Order 522-7-84005-FY10-25, *Upstream Oil & Gas Tank Measurements*, TCEQ Project 2010-39. As part of this referenced testing project, pressurized produced water samples were taken at seven different tank batteries located in Johnson, Wise and Tarrant Counties, Texas (all part of the Eastern Barnett Shale region) and analyzed for flash gas volume and composition. The sample collection and analysis conducted as part of TCEQ Project 2010-39 was done according to strict sampling and quality assurance procedures. In addition to TCEQ Project 2010-39 data, a thorough review of publically-available information sources identified a limited amount of data on produced water emissions. This was supplemented by data provided by two natural gas producers and one petroleum engineering services company. Other than TCEQ Project 2010-39 data, however, it could not be confirmed that any of the data had undergone a rigorous quality assurance process and therefore is considered secondary data, used to support conclusions drawn using the primary data but not used directly in deriving the produced water emission factors.

Emissions from produced water storage tanks consist of flash emissions, working losses and breathing losses. Flash emissions are determined using flash gas analysis. Working and breathing losses are estimated using EPA TANKS 4.09d software. Using this approach and the assumptions detailed within this report, it is determined that working and breathing losses associated with primary data source sites are very small compared to flash emissions and can be ignored without affecting the overall emission factor determination.

Table ES-1 presents the recommended emission factors for VOC and four HAPs – benzene, toluene, ethylbenzene and xylenes – derived from the primary data source sites. For comparative purposes, average emissions from Texas and non-Texas secondary sites are also presented in Table ES-1.

Table ES-1. Recommended Emission Factors and Comparative Data

Pollutant	Average Produced Water Emission Factor by Data Set (lb/bbl)		
	Recommended Emission Factor	Secondary Data – Texas	Secondary Data – Non-Texas
VOC	0.01	0.012	0.18
Benzene	0.0001	0.0012	0.004
Toluene	0.0003	0.0012	0.009
Ethylbenzene	0.000006	0.0001	0.0007
Xylenes	0.00006	0.0003	0.006

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Los Mestenios - T7 - Methanol
City:	Gavilan
State:	New Mexico
Company:	Harvest Four Corners, LLC
Type of Tank:	Horizontal Tank
Description:	500 Gallon Methanol Storage Tank

Tank Dimensions

Shell Length (ft):	6.00
Diameter (ft):	4.00
Volume (gallons):	500.00
Turnovers:	12.00
Net Throughput(gal/yr):	6,000.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Medium
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Albuquerque, New Mexico (Avg Atmospheric Pressure = 12.15 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

Los Mestenios - T7 - Methanol - Horizontal Tank
Gavilan, New Mexico

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Methyl alcohol	All	67.36	53.93	80.79	59.23	1.8115	1.1881	2.6951	32.0400			32.04	Option 2: A=7.897, B=1474.08, C=229.13

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

Los Mestenios - T7 - Methanol - Horizontal Tank
Gavilan, New Mexico

Annual Emission Calcaulations	
Standing Losses (lb):	36.5024
Vapor Space Volume (cu ft):	48.0243
Vapor Density (lb/cu ft):	0.0103
Vapor Space Expansion Factor:	0.2419
Vented Vapor Saturation Factor:	0.8389
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	48.0243
Tank Diameter (ft):	4.0000
Effective Diameter (ft):	5.5293
Vapor Space Outage (ft):	2.0000
Tank Shell Length (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0103
Vapor Molecular Weight (lb/lb-mole):	32.0400
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.8115
Daily Avg. Liquid Surface Temp. (deg. R):	527.0322
Daily Average Ambient Temp. (deg. F):	56.1542
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	518.9042
Tank Paint Solar Absorptance (Shell):	0.6800
Daily Total Solar Insulation Factor (Btu/sqft day):	1,765.3167
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.2419
Daily Vapor Temperature Range (deg. R):	53.7176
Daily Vapor Pressure Range (psia):	1.5070
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.8115
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	1.1881
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	2.6951
Daily Avg. Liquid Surface Temp. (deg R):	527.0322
Daily Min. Liquid Surface Temp. (deg R):	513.6028
Daily Max. Liquid Surface Temp. (deg R):	540.4617
Daily Ambient Temp. Range (deg. R):	27.9250
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.8389
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	1.8115
Vapor Space Outage (ft):	2.0000
Working Losses (lb):	8.2917
Vapor Molecular Weight (lb/lb-mole):	32.0400
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.8115
Annual Net Throughput (gal/yr.):	6,000.0000
Annual Turnovers:	12.0000
Turnover Factor:	1.0000

Tank Diameter (ft):	4.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	44.7941

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

Los Mestenios - T7 - Methanol - Horizontal Tank
Gavilan, New Mexico

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Methyl alcohol	8.29	36.50	44.79