TABLE 3-1
ACTUAL AIR EMISSION RATES

BAILEY UNIT C1 June 27 2013 through June 27 2014

BURLINGTON RESOURCES OIL & GAS COMPANY LP

			Proposed Allowable Hourly and Annual Emission Rates													
			VOC		NO_X		CO		$PM/PM_{10}/PM_{2.5}$		SO_2		Benzene		H_2S	
EPN	**FIN**	**Description**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**
Normal Operations and AOS																
FUG	FUG	Site Fugitives	0.52	2.23	--	--	--	--	--	--	--	--	0.003	0.01	0.0005	0.002
FL-1	TK-01 TK-02 TK-03	Controlled Condensate Tank Emissions	1.28	5.36	--	--	--	--	--	--	--	--	0.002	0.01	0.001	0.004
FL-1	TK-04	Controlled PW Tank Emissions	0.04	0.17	--	--	--	--	--	--	--	--	0.0001	0.0002	0.00002	0.0001
FL-1	TRUCK1	Controlled Condensate Truck Loading	0.98	0.43	--	--	--	--	--	--	--	--	0.003	0.001	--	--
FL-1	TRUCK2	Controlled Produced Water Truck Loading	0.01	0.002	--	--	--	--	--	--	--	--	0.00002	0.000004	--	--
TRUCK1	TRUCK1	Uncaptured and Uncontrolled Condensate Truck Loading	0.64	0.28	--	--	--	--	--	--	--	--	0.002	0.001	--	--
TRUCK2	TRUCK2	Uncaptured and Uncontrolled Produced Water Truck Loading	0.01	0.001	--	--	--	--	--	--	--	--	0.00002	0.000002	--	--
FL-1	FL-1	Flare Combustion (normal operations waste gas, assist, and pilot)	0.01	0.04	0.74	2.31	1.48	4.65	--	--	0.18	0.82	0.000003	0.00001	0.001	0.004
FL-1	SEP-GAS	Low Pressure Separator Gas to Flare	0.00	0.00	--	--	--	--	--	--	--	--	0.00	0.00	0.00	0.00
FL-1	FL-1	Flare Combustion (lp separator waste gas)	--	--	0.00	0.00	0.00	0.00	--	--	0.00	0.00	--	--	0.00	0.00
TK-01 TK-02 TK-03	TK-01 TK-02 TK-03	Uncontrolled Condensate Tank Standing Loss Emissions (during flare downtime)	3.91	0.34	--	--	--	--	--	--	--	--	0.01	0.001	--	--
TK-04	TK-04	Uncontrolled PW Tank Standing Loss Emissions (during flare downtime)	0.001	0.0001	--	--	--	--	--	--	--	--	0.000002	0.0000002	--	--
Scheduled Maintenance, Startup and Shutdown Events																
MSS-FUG FL-1-MSS	MSS-FUG	MSS Activities	5.72	0.13	--	--	--	--	2.74	1.46	--	--	0.01	0.0004	0.002	0.00001
FL-1-MSS	FL-1-MSS	Flare Combustion (waste gas)	--	--	1.38	0.003	2.75	0.01	--	--	0.18	0.001	--	--	0.002	0.00001
		Site-Wide Emissions:	**13.12**	**8.98**	**2.12**	**2.31**	**4.23**	**4.66**	**2.74**	**1.46**	**0.36**	**0.82**	**0.03**	**0.02**	**0.01**	**0.01**

Note: Aggregated HAP emissions at the Site will be below 10 tpy.

CALCULATION OF SITE FUGITIVES (FIN FUG) POTENTIAL TO EMIT

BAILEY UNIT C1 June 27 2013 through June 27 2014

BURLINGTON RESOURCES OIL & GAS COMPANY LP

Component	Number of Components	Emission Factors [a] (lb/hr-component)	Annual Operating Hours (hr/yr)	Maximum VOC[a] (wt%)	Maximum Benzene[a] (wt%)	Maximum H_2S (wt%)	Reduction Credit [a] (%)	PTE VOC Hourly [b] (lb/hr)	PTE VOC Annual [c] (T/yr)	PTE Benzene Hourly [b] (lb/hr)	PTE Benzene Annual [c] (T/yr)	PTE H_2S Hourly [b] (lb/hr)	PTE H_2S Annual [c] (T/yr)
Valves													
Gas Streams	48	0.00992	8,760	50%	0.36%	0.09%	0%	0.24	1.04	0.002	0.01	0.0004	0.002
Light Oil	29	0.0055	8,760	100%	0.26%	--	0%	0.16	0.70	0.0004	0.002	--	--
Water/Light Oil	45	0.000216	8,760	--	0.20%	--	0%	0.01	0.04	0.00002	0.0001	--	--
Pumps													
Water/Light Oil	1	0.000052	8,760	--	0.20%	--	0%	0.0001	0.0002	0.0000001	0.0000005	--	--
Flanges													
Gas Streams	70	0.00086	8,760	50%	0.36%	0.09%	0%	0.03	0.13	0.0002	0.001	0.0001	0.0002
Light Oil	26	0.000243	8,760	100%	0.26%	--	0%	0.01	0.03	0.00002	0.0001	--	--
Water/Light Oil	8	0.000006	8,760	--	0.20%	--	0%	0.00005	0.0002	0.0000001	0.0000004	--	--
Connectors													
Gas Streams	75	0.00044	8,760	50%	0.36%	0.09%	0%	0.02	0.07	0.0001	0.001	0.00003	0.0001
Light Oil	60	0.000463	8,760	100%	0.26%	--	0%	0.03	0.12	0.0001	0.0003	--	--
Water/Light Oil	90	0.000243	8,760	--	0.20%	--	0%	0.02	0.10	0.00004	0.0002	--	--
							TOTAL:	**0.52**	**2.23**	**0.003**	**0.01**	**0.0005**	**0.002**

[a] Fugitive Emission Factors and Reduction Credits are per TCEQ Technical Guidance Document for Equipment Leak Fugitives, dated October 2000. The emission factors are for total hydrocarbon, except for the emission factors associated with Water/Light Oil. As indicated on page 6 of 55 in the mentioned Guidance document, these factors are based off of a known stream constituency of 50%-99% water, and remainder VOC. Therefore, applying a VOC wt % would be double counting for the reduction due to water.

[b] Hourly VOC emission rates are calculated as follows:
(48 components) * (0.00992 lb/hr-component) * (50% VOC) * (100% - 0% reduction credit) = 0.24 lb/hr

[c] Annual VOC emission rates are calculated as follows:
(48 components) * (0.00992 lb/hr-component) * (8,760 hr/yr) * (50% VOC) * (100% - 0% reduction credit) / (2,000 lb/T) = 1.04 T/yr

SUMMARY OF TANKS SENT TO FLARE POTENTIAL TO EMIT

BAILEY UNIT C1 June 27 2013 through June 27 2014

BURLINGTON RESOURCES OIL & GAS COMPANY LP

			VOC Emissions								Benzene Emissions								H_2S Emissions[c]			
			Flash Emissions[a]		WB Emissions[b]		Uncontrolled Total		Controlled Total[d]		Flash Emissions[a]		WB Emissions[b]		Uncontrolled Total		Controlled Total[d]		Uncontrolled Total		Controlled Total[d]	
EPN	**FIN**	**Description**	**Hourly (lb/hr)**	**Annual (T/yr)**	**Hourly (lb/hr)**	**Annual (T/yr)**	**Hourly (lb/hr)**	**Annual (T/yr)**	**Hourly (lb/hr)**	**Annual (T/yr)**	**Hourly (lb/hr)**	**Annual (T/yr)**	**Hourly (lb/hr)**	**Annual (T/yr)**	**Hourly (lb/hr)**	**Annual (T/yr)**	**Hourly (lb/hr)**	**Annual (T/yr)**	**Hourly (lb/hr)**	**Annual (T/yr)**	**Hourly (lb/hr)**	**Annual (T/yr)**
FL-1	TK-01 TK-02 TK-03	500 bbl Condensate Storage Tanks	54.83	240.16	9.07	27.95	63.90	268.11	1.28	5.36	0.08	0.35	0.02	0.07	0.10	0.42	0.002	0.01	0.04	0.18	0.001	0.004
FL-1	TK-04	500 bbl Produced Water Storage Tank	1.91	8.37	0.09	0.02	2.00	8.39	0.04	0.17	0.003	0.01	0.0002	0.00004	0.003	0.01	0.0001	0.0002	0.001	0.004	0.00002	0.0001

Notes:

[a] VOC and Benzene Flash Emissions are calculated using the WinSim stream simulation program. Data inputs included the pressurized stream data and throughputs represented in this submittal. See the pages at the end of this attachment for a printout of the data inputs and emissions reports.

[b] The Working/Breathing emissions are calculated using AP 42 Chapter 7 calculations with data inputs from the stream data and throughputs. See the following pages for the represented calculations.

[c] The Ideal Gas Law was used to estimate the H2S emission rates using the maximum sulfur concentration in the gas coming off the tanks (500 ppm). An example calculation for hourly H2S emissions from FIN TK-04 follows:

H_2S (lb/hr) = (% Vol H_2S in stream) * (Total Volumetric Flow of Gas, scf/hr) * (1 atm STP) * (34.0798 lb/lb-mol H2S) / (1.314, atm-scf/lb-mol-K) / (298 K)

H_2S (lb/hr) = (500 ppm /10^6) * (29.98 scf/hr) * (1 atm) * (34.0789 lb/lbmol H2S) / (1.314, atm-scf/lb-mol-K) / (298 K)

H_2S (lb/hr) = 0.001 lb/hr

[d] All VOC tank emissions are routed to the flare control device with a destruction efficiency of 98%. H_2S emissions are conservatively represented to be captured at 98% and then 98% converted to SO_2 during combustion, while SO_2 emissions are represented at 100 % H_2S conversion to SO_2.

CALCULATION OF STORAGE TANK WORKING AND BREATHING POTENTIAL TO EMIT

BAILEY UNIT C1 June 27 2013 through June 27 2014

BURLINGTON RESOURCES OIL & GAS COMPANY LP

Variable	Description	Units	Value
L_T	total loss = Ls + Lw	Ton/yr	See Table
L_S	standing loss = 365 Vv Wv Ke Ks	lb/yr	See Table
L_W	working loss = 0.001 Mv Pv Q Kn Kp	lb/yr	See Table
L_H	working loss = 0.001 Mv Pmax Qh	lb/hr	See Table
	Roof Construction		Cone
RVP	Condensate Reid Vapor Pressure	psia	12.26
ΔPb	Breather vent pressure range	psi	0.06
I	Solar insolation factor	Btu/ft2-day	1521
P_A	Atmospheric Pressure	psia	14.7
Mv	Vapor Molecular Weight	lb/lb-mol	37
T	Annual Average Temperature	°F	72.1
T_{AX}	Daily Maximum Ambient Temperature	°R	541.6
T_{AN}	Daily Minimum Ambient Temperature	°R	522.5
ΔT_A	Daily average ambient temperature range	°R	19.1
Kp	Product factor		1

		Tank Specifications							Material Specifications																	VOC		Benzene	
		V/H	D	H/L	Capacity	Color		α	Mv	P_{MAX}	Q[1]		ΔTv	Hvo	Vv	T_{LA}	P_{VA}	Wv	ΔPv	Ke	Ks	Kn	L_S	L_W	L_T	L_H	L_T	L_H
Material	No. of Tanks	Tank Type	Tank Diameter (ft)	Tank Height/ Length (ft)	Tank Capacity (bbl)	Paint Color	Paint Conditions	Paint Solar Absorbance Factor	Vapor Molecular Weight	Reid Vapor Pressure (psia)	Max. Hourly Thruput (bbl/hr)	Annual thruput (bbl)	Daily Vapor Temp. Range °F	Vapor Space Outage (ft)	Vapor Space Volume (ft3)	Daily Average Liquid Surface Temp °R	Average Vapor Pressure (psia)	Vapor Density (lb/ft3)	Daily Vapor Pressure Range	Vapor Space Expan. Factor	Vented Vapor Sat. Factor	Turnover Factor	Standing Loss (lb/yr)	Working Loss (lb/yr)	Total Loss (lb/hr)	Total Loss (T/yr)	Total Loss (lb/hr)	Total Loss (T/yr)
Condensate	3	V	12	25	500	Gray	Good	0.54	37	12.26	20	169,050	36.75	12.63	1428.4	539.8	13.313	0.08504	3.53719	2.5751	0.10	0.26	34,252.10	21,650.41	**9.07**	**27.95**	**0.02**	**0.07**
PW	1	V	12	25	500	Gray	Good	0.54	37	0.123	20	73,000	36.75	12.63	1428.4	539.8	0.036	0.00023	0.02227	0.0662	0.98	0.37	7.78	35.98	**0.09**	**0.02**	**0.0002**	**0.00004**

NOTE: Tank working and breathing emissions are based on the equations found in EPA AP 42 Chapter 7. All factors used are represented in the table on this page. The Condensate Reid Vapor Pressure and Vapor Molecular Weight are determined based on the WinSim condensate stream and Off Gas stream. All other variables are found in AP 42 Chapter 7 or are default unit values.

CALCULATION OF TRUCK LOADING POTENTIAL TO EMIT

BAILEY UNIT C1 June 27 2013 through June 27 2014

BURLINGTON RESOURCES OIL & GAS COMPANY LP

Sample Calculations for condensate:

Loading Loss (lb/Mgal) = 12.46 * S * P * M / T (AP-42 Section 5.2)
Maximum Loading Loss = 12.46 * 0.60 * 12.260 * 37 / 560 = 6.056 lb/Mgal

Hourly Uncollected Emissions PTE = (Hourly Throughput, Mgal/hr) * (Maximum Loading Loss, lb/Mgal) * (1 - Capture Efficiency)
Hourly Uncollected Emissions PTE = (8.19 Mgal/yr) * (6.056 lb/Mgal) * (1 - 0.987) = 0.64 lb/hr

Hourly PTE = ((Hourly Throughput, Mgal/hr) * (Maximum Loading Loss, lb/Mgal) * (Capture Efficiency) * (1 - Destruction Efficiency))
Hourly PTE = (8.19 Mgal/hr) * (6.056 lb/Mgal) * (0.987) * (1 - 0.98) = 0.98 lb/hr

Annual Emissions = ((Annual Throughput, Mgal/yr) * (Average Loading Loss, lb/Mgal) * (Capture Efficiency) * (1 - Destruction Efficiency))) / (2000 lb/T)
Annual Emissions = (7100.09 Mgal/yr) * (6.149 lb/Mgal) * (0.987) * (1 - 0.98) / (2000 lb/T) = 0.43 T/yr

												Uncollected Total Emissions					Captured and Collected Total Emissions			
												VOC		Benzene			VOC		Benzene	
FIN	EPN	Facility Name	S	P @ 560 °R (psia)	P @531.7 °R (psia)	M	Maximum Loading Loss (lb/Mgal)	Average Loading Loss (lb/Mgal)	Hourly Throughput (Mgal/hr)	Annual Throughput (Mgals/yr)	Capture Efficiency	Hourly Uncollected Loading Emissions (lb/hr)	Annual Uncollected Loading Emissions (T/yr))	Hourly Uncollected Loading Emissions (lb/hr)	Annual Uncollected Loading Emissions (T/yr))	Destruction Efficiency	Hourly PTE (lb/hr)	Annual PTE (T/yr)	Hourly PTE (lb/hr)	Annual PTE (T/yr)
TRUCK1	FL-1/ TRUCK1	Condensate Truck Loading	0.60	12.26	11.820	37	6.056	6.149	8.19	7,100.09	0.987	0.64	0.28	0.002	0.001	0.98	0.98	0.43	0.003	0.001
TRUCK2	FL-1/ TRUCK2	Produced Water Truck Loading	0.60	0.12	0.026	37	0.059	0.062	8.19	3,066.00	0.987	0.01	0.001	0.00002	0.000002	0.98	0.01	0.002	0.00002	0.000004

Daily maximum and daily minimum ambient temperature from Tanks 4.09d for this area's annual averages (81.6 and 62.5, for average of 72.1).

Annual Average Condensate Vapor Pressure at T_{LA}:

P = exp{ [(2799/(T+459.6) - 2.227]log10(RVP) - 7261/(T+459.6) + 12.82}
exp{ [(2799/(72.1+459.6) - 2.227]log10(12.26) - 7261/(72.1+459.6) + 12.82}
11.820 psia

Annual Average Produced Water Vapor Pressure at T_{LA}:

P = exp{ [(2799/(T+459.6) - 2.227]log10(RVP) - 7261/(T+459.6) + 12.82}
exp{ [(2799/(72.1+459.6) - 2.227]log10(12.26*.01) - 7261/(72.1+459.6) + 12.82}
0.026 psia

NOTE: Capture Efficiency of 98.7% represented based upon TCEQ Guidance regarding trucks that are utlizing NSPS XX Testing.

SUMMARY OF PROCESS FLARE FUEL GAS COMBUSTION AND
WASTE GAS COMBUSTION POTENTIAL TO EMIT- NORMAL OPERATIONS

BAILEY UNIT C1 June 27 2013 through June 27 2014

BURLINGTON RESOURCES OIL & GAS COMPANY LP

			VOC		NO_X		CO		SO_2		Benzene		H_2S	
EPN	**FIN**	**Description**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**
FL-1	FL-1	Pilot Gas Combustion	0.0001	0.0004	0.003	0.01	0.01	0.04	0.001	0.004	0.00000003	0.0000001	0.0000004	0.000002
FL-1	FL-1	Flare Assist Gas Combustion	0.01	0.04	0.22	0.96	0.44	1.93	0.11	0.48	0.000003	0.00001	0.00003	0.0001
FL-1	FL-1	Waste Gas Combustion	--	--	0.52	1.34	1.03	2.68	0.07	0.34	--	--	0.001	0.004
		Totals:	**0.01**	**0.04**	**0.74**	**2.31**	**1.48**	**4.65**	**0.18**	**0.82**	**0.000003**	**0.00001**	**0.001**	**0.004**

NOTE: Pilot Gas Combustion and Flare Assist Gas Combustion calculations are shown on the following page. Waste Gas Combustion shown here is the combined sum of the waste gas from the Condensate and Produced Water tanks and loading operations shown on subsequent pages.

CALCULATION OF FLARE PILOT GAS and FLARE ASSIST GAS POTENTIAL TO EMIT

BAILEY UNIT C1 June 27 2013 through June 27 2014

BURLINGTON RESOURCES OIL & GAS COMPANY LP

EPN	FIN	Description	LHV (Btu/scf)	Heat Release scf/hr	Operating Hours (hr/yr)	Pollutant	Emission Factors	Units	Emission Rates Hourly [a] (lb/hr)	Emission Rates Annual [b] (T/yr)
FL-1	FL-1	Flare 1- Process Pilot Gas Combustion	1,292	15	8,760	VOC	5.5	lb/MMscf	0.0001	0.0004
						NO_X	0.138	lb/MMBtu	0.003	0.01
						CO	0.2755	lb/MMBtu	0.01	0.04
						$PM/PM_{10}/PM_{2.5}$	-- [c]	--	--	--
						SO_2	500	ppm H_2S	0.001	0.004
						Benzene	0.0021	lb/MMscf	0.00000003	0.0000001
						H_2S	500	ppm H_2S	0.0000004	0.000002
FL-1	FL-1	Flare 1- Process Flare Assist Gas Combustion	1,292	1,250	8,760	VOC	5.5	lb/MMscf	0.01	0.04
						NO_X	0.138	lb/MMBtu	0.22	0.96
						CO	0.2755	lb/MMBtu	0.44	1.93
						$PM/PM_{10}/PM_{2.5}$	-- [c]	--	--	--
						SO_2	500	ppm H_2S	0.11	0.48
						Benzene	0.0021	lb/MMscf	0.000003	0.00001
						H_2S	500	ppm H_2S	0.00003	0.00013

[a] Emission Factors for CO and NO_X are based upon the Draft TNRCC Guidance Document for Flares and Vapor Oxidizers (dated 10/00) for other high-Btu flares. An example calculation for hourly CO emissions for EPN FL-1 follows:

CO (lb/hr) = (Heat Release, scf/hr) * (Lower Heating Value, Btu/scf) * ($MM/10^6$)*(Emission Factor, lb/MMBtu)

CO (lb/hr) = (15 scf/hr) * (1,292 Btu/scf) * (MM/10^6)*(0.2755 lb/MMBtu)

= 0.01 lb/hr CO

The Emission Factors for VOC and Benzene were based upon AP-42 Table 1.4-2 and 1.4-3 (dated 7/98). An example calculation for hourly VOC emissions for EPN FL-1 follows:

VOC (lb/hr) = (Heat Release, scf/hr) * ($MM/10^6$) * (Emission Factor, lb/MMscf)

VOC (lb/hr) = (15 scf/hr) * (MM/10^6) * (5.5 lb/MMscf)

= 0.0001 lb/hr VOC

A material balance approach was used to estimate the SO_2 and H_2S emission rates using the maximum sulfur concentration in the natural gas. As shown in Figure 6-1, H_2S concentration at the site is conservatively represented at 500 ppm. To be most conservative, SO_2 emission rates were determined based on the combustion efficiency of 100% H_2S converted to SO_2. H_2S emitted at the flare is conservatively represented as 2% of the captured stream. An example calculation for hourly SO_2 emissions for the pilot gas of EPN FL-1 follows:

SO_2 (lb/hr) = Heat Release (scf/hr)*(Sulfur Content, ppmv)*(100% conversion to SO_2)*(1 lb-mol/379 scf)*(34.065 lb H2S/lb-mol)*(64.06 lb SO_2/34.065 lb H2S)

SO_2 (lb/hr) = (15 scf/hr)*((500 ppm H2S)/(10^6 scf gas))*(100% converted to SO2)*(1 lb-mol/379 scf)*(34.065 lb H2S/lb-mol)*(64.06 lb SO2/34.065 lb H2S)

= 0.001 lb/hr SO_2

[b] An example calculation for annual CO emissions for EPN FL-1 follows:

CO (T/yr) = (Hourly Emissions, lb/hr)*(Annual Operating Hours, hr/yr)*(1 T/2,000 lb)

CO (T/yr) = (0.01 lb/hr)*(8,760 hr/yr)*(1 T/2,000 lb)

CO (T/yr) = 0.04 T/yr CO

[c] The process flares are smokeless per 40 CFR §60.18 requirements; therefore, PM emissions are negligible.

PROCESS FLARE WASTE GAS COMBUSTION EMISSIONS

BAILEY UNIT C1 June 27 2013 through June 27 2014

BURLINGTON RESOURCES OIL & GAS COMPANY LP

EPN	FIN	Description	LHV[a] (Btu/scf)	Waste Gas Flow Rate Hourly (MMBtu/hr)	Waste Gas Flow Rate Annual (MMBtu/yr)	Pollutant	Emission Factors	Units	Potential to Emit Hourly[b] (lb/hr)	Potential to Emit Annual[c] (T/yr)
FL-1	FL-1	Process Flare	1,925	3.68	18,854.13	NO_X	0.1380	lb/MMBtu	0.51	1.30
		Condensate Tanks and Loading				CO	0.2755	lb/MMBtu	1.01	2.60
						$PM/PM_{10}/PM_{2.5}$	-- [e]	--	--	--
						SO_2	-- [c]	--	0.07	0.33
						H_2S	-- [c]	--	0.001	0.004
FL-1	FL-1	Process Flare	1,895	0.08	547.08	NO_X	0.1380	lb/MMBtu	0.01	0.04
		Produced Water Tank and Loading				CO	0.2755	lb/MMBtu	0.02	0.08
						$PM/PM_{10}/PM_{2.5}$	-- [e]	--	--	--
						SO_2	-- [c]	--	0.002	0.01
						H_2S	-- [c]	--	0.00002	0.0001

[a] Waste gas stream lower heating value was taken from WinSim calculated stream value.

[b] Emission Factors for CO and NO_X are based upon the Draft TNRCC Guidance Document for Flares and Vapor Oxidizers (dated 10/00) for other high-Btu flares. An example calculation for hourly CO emissions for EPN FL-1 follows:

CO (lb/hr) = (Hourly Waste Gas Flow Rate, MMBtu/hr)*(Emission Factor, lb/MMBtu)

CO (lb/hr) = (3.68 MMBtu/hr)*(0.2755 lb/MMBtu)

= 1.01 lb/hr CO

[c] H_2S emissions are routed from the tanks to the flare and then converted to SO_2. To be most conservative, SO_2 emission rates were determined based on the combustion efficiency of 100% H_2S converted to SO_2. H_2S emitted at the flare is conservatively represented as 2% of the stream not converted by combustion. An example calculation for hourly SO_2 emissions for EPN FL-1 follows:

SO_2 (lb/hr) = (Source H_2S Emission Rate, lb/hr) * (98% captured H2S stream) * (100% conversion to SO_2 at combustion) * (1 mol H_2S/34.07 lb H_2S) * (64.06 lb SO2/1 mol SO_2)

SO_2 (lb/hr) = (0.040 lb/hr H2S at Condensate Tanks)* (98%) * (100%) * (1 mol H2S/34.07 lb H2S) * (64.06 lb SO2/1 mol SO2)

= 0.07 lb/hr SO_2

[d] An example calculation for annual CO emissions for EPN FL-1 follows:

CO (T/yr) = (Annual Waste Gas Flow Rate, MMBtu/yr) * (Emission Factor, lb/MMBtu) * (1 T / 2,000 lb)

CO (T/yr) = (18,854.13 MMBtu/yr) * (0.2755 lb/MMBtu) * (1 T / 2,000 lb)

= 2.60 T/yr CO

[e] The process flares are smokeless per 40 CFR §60.18 requirements; therefore, PM emissions are negligible.

CALCULATION OF FLARE FEED RATES FROM FINs TK-01 THROUGH TK-03, and TRUCK1

BAILEY UNIT C1 June 27 2013 through June 27 2014

BURLINGTON RESOURCES OIL & GAS COMPANY LP

TK-01 through TK-03 and TRUCK1 Total Emissions:[a]

VOC Emissions (lb/hr):	112.90
VOC Emissions (TPY):	289.61
Hydrocarbon Emissions (lb/hr):	174.15
Hydrocarbon Emissions (TPY):	446.72

Constituent	Heating Value[b] (Btu/lb)	Condensate Tanks Flash Gas Weight (%)	TK-01 through TK-03 and TRUCK1 Emissions [c] Hourly (lb/hr)	TK-01 through TK-03 and TRUCK1 Emissions [c] Annual (T/yr)	Flare Feed Rate [d] Hourly (MMBtu/hr)	Flare Feed Rate [d] Annual (MMBtu/yr)
Methane	23,861	10.93%	19.03	48.83	0.45	2,306.96
Ethane	22,304	22.13%	38.54	98.86	0.85	4,365.85
Propane	21,646	29.01%	50.52	129.59	1.08	5,554.11
I-Butane	21,242	6.53%	11.37	29.17	0.24	1,214.47
N-Butane	21,293	14.95%	26.04	66.78	0.54	2,787.02
I-Pentane	21,025	4.62%	8.05	20.64	0.17	850.55
N-Pentane	21,072	4.68%	8.15	20.91	0.17	863.61
Cyclopentane	20,350	0.00%	0.00	0.00	0.00	0.00
n-Hexane	20,928	2.60%	4.53	11.61	0.09	476.23
Cyclohexane	20,195	0.25%	0.44	1.12	0.01	44.33
Other Hexanes	20,928	0.00%	0.00	0.00	0.00	0.00
Heptanes	20,825	1.07%	1.86	4.78	0.04	195.11
Octanes	20,747	0.34%	0.59	1.52	0.01	61.81
Nonanes	20,687	0.10%	0.17	0.45	0.003	18.25
Decanes Plus	20,638	0.32%	0.56	1.43	0.01	57.84
Benzene	18,172	0.09%	0.16	0.40	0.003	14.25
Toluene	18,422	0.15%	0.26	0.67	0.005	24.19
Ethylbenzene	18,658	0.02%	0.03	0.09	0.001	3.29
Xylene	18,438	0.10%	0.17	0.45	0.003	16.26
	VOC	64.83%				
				Total:	**3.68**	**18,854.13**

[a] Total VOC Emissions were determined by adding the Uncontrolled Streams for FIN TK-01 through TK-03 on the Tank Summary table with the uncontrolled emissions from the Condensate Truck Loading. Total Hydrocarbon Emissions were calculated as follows:

Total HC (lb/hr) = VOC Emissions (lb/hr) * (1/ VOC% of stream)

Total HC (lb/hr) = (112.90 lb/hr) * (1 / 64.83%)

Total HC (lb/hr) = 174.15 lb/hr

[b] Heating values taken from Perry's Chemical Engineers' Handbook , Table 3-207 (pg. 3-155)

[c] Emission Rates were proportioned from the Total Hydrocarbon Emissions using the Condensate Flash Gas stream constituents weight percents, generated by the WinSim program.

[d] An example calculation for the hourly flare feed rate for Methane is demonstrated. Note that consituents with greater than 3 carbons use 98% destruction efficiency.

MMBtu/hr Methane = Methane Heating Value (Btu/lb) * Hourly Methane Emissions (lb/hr) * 99% of stream is combusted / 10^6

MMBtu/hr Methane = (23,861 Btu/lb) * (19.03 lb/hr) * 99% / (10^6)

MMBtu/hr Methane = 0.45 MMBtu/hr

An example calculation for the annual flare feed rate for Methane is demonstrated.

MMBtu/yr Methane = Methane Heating Value (Btu/lb) * Annual Methane Emissions (T/yr) * (2,000 lb/T) * 99% of stream is combusted / 10^6

MMBtu/yr Methane = (23,861 Btu/lb) * (48.83 T/yr) * (2,000 lb/T) * 99% / (10^6)

MMBtu/yr Methane = 2,306.96 MMBtu/yr

CALCULATION OF FLARE FEED RATES FROM FIN TK-04 and TRUCK2

BAILEY UNIT C1 June 27 2013 through June 27 2014

BURLINGTON RESOURCES OIL & GAS COMPANY LP

TK-04 and TRUCK2 Total Emissions:[a]

VOC Emissions (lb/hr):	2.50
VOC Emissions (TPY):	8.49
Hydrocarbon Emissions (lb/hr):	3.86
Hydrocarbon Emissions (TPY):	13.09

Constituent	Heating Value[b] (Btu/lb)	Produced Water Tanks Flash Gas Weight (%)	TK-04 and TRUCK2 Emissions [c] Hourly (lb/hr)	TK-04 and TRUCK2 Emissions [c] Annual (T/yr)	Flare Feed Rate [d] Hourly (MMBtu/hr)	Flare Feed Rate [d] Annual (MMBtu/yr)
Methane	23,861	10.62%	0.41	1.39	0.01	65.67
Ethane	22,304	21.70%	0.84	2.84	0.02	125.42
Propane	21,646	28.75%	1.11	3.76	0.02	161.15
I-Butane	21,242	6.57%	0.25	0.86	0.01	35.81
N-Butane	21,293	15.06%	0.58	1.97	0.01	82.22
I-Pentane	21,025	4.66%	0.18	0.61	0.004	25.14
N-Pentane	21,072	4.72%	0.18	0.62	0.004	25.61
Cyclopentane	20,350	0.00%	0.00	0.00	0.00	0.00
n-Hexane	20,928	2.62%	0.10	0.34	0.002	13.95
Cyclohexane	20,195	0.25%	0.01	0.03	0.0002	1.19
Other Hexanes	20,928	0.00%	0.00	0.00	0.00	0.00
Heptanes	20,825	1.08%	0.04	0.14	0.001	5.71
Octanes	20,747	0.34%	0.01	0.04	0.0002	1.63
Nonanes	20,687	0.10%	0.004	0.01	0.0001	0.41
Decanes Plus	20,638	0.32%	0.01	0.04	0.0002	1.62
Benzene	18,172	0.09%	0.003	0.01	0.0001	0.36
Toluene	18,422	0.15%	0.01	0.02	0.0002	0.72
Ethylbenzene	18,658	0.02%	0.001	0.003	0.00002	0.11
Xylene	18,438	0.11%	0.004	0.01	0.0001	0.36
	VOC	64.84%				
				Total:	**0.08**	**547.08**

[a] Total VOC Emissions were determined by adding the Uncontrolled Streams for FIN TK-04 on the Tank Summary table and the uncontrolled emissions associated with the produced water loading, FIN TRUCK2. Total Hydrocarbon Emissions were calculated as follows:

Total HC (lb/hr) = VOC Emissions (lb/hr) * (1/ VOC% of stream)

Total HC (lb/hr) = (2.50 lb/hr) * (1/ 64.84%)

Total HC (lb/hr) = 3.86 lb/hr

[b] Heating values taken from Perry's Chemical Engineers' Handbook , Table 3-207 (pg. 3-155)

[c] Emission Rates were proportioned from the Total Hydrocarbon Emissions using the Produced Water Flash Gas stream constituents weight percents, generated by the WinSim program.

[d] An example calculation for the hourly flare feed rate for Methane is demonstrated. Note that consituents with greater than 3 carbons use 98% destruction efficiency.

MMBtu/hr Methane = Methane Heating Value (Btu/lb) * Hourly Methane Emissions (lb/hr) * 99% of stream is combusted / 10^6

MMBtu/hr Methane = (23,861 Btu/lb) * (0.41 lb/hr) * 99% / (10^6)

MMBtu/hr Methane = 0.01 MMBtu/hr

An example calculation for the annual flare feed rate for Methane is demonstrated.

MMBtu/yr Methane = Methane Heating Value (Btu/lb) * Annual Methane Emissions (T/yr) * (2,000 lb/T) * 99% of stream is combusted / 10^6

MMBtu/yr Methane = (23,861 Btu/lb) * (1.39 T/yr) * (2,000 lb/T) * 99% / (10^6)

MMBtu/yr Methane = 65.67 MMBtu/yr

CALCULATION OF SEPARATOR GAS ROUTED TO FLARE POTENTIAL TO EMIT - AOS

BAILEY UNIT C1 June 27 2013 through June 27 2014

BURLINGTON RESOURCES OIL & GAS COMPANY LP

								Potential to Emit (PTE)					
								VOC		Benzene		H_2S	
Facility Identification Number (FIN)	**Gas Throughput (MSCF/hr)**	**Gas Volume Sent to Flare (MSCF/yr)**	**Gas Stream Molecular Weight (lb/lb-mol)**	**Max VOC Percentage in Gas (wt%)**	**Max Benzene Percentage in Gas (wt%)**	**Max H_2S Percentage in Gas (wt%)**	**Destruction Efficiency on Flare (%)**	**Hourly Emission Rate[b] (lb/hr)**	**Annual Emission Rate[c] (T/yr)**	**Hourly Emission Rate[b] (lb/hr)**	**Annual Emission Rate[c] (T/yr)**	**Hourly Emission Rate (lb/hr)**	**Annual Emission Rate (T/yr)**
SEP-GAS	0.00	0	29.44	50%	0.18%	0.09%	98%	0.00	0.00	0.00	0.00	0.00	0.00

[a] During engine maintenance at other downstream sites, the low pressure separator gas at this site may be routed to flare 5% of the year.

[b] Hourly VOC emission rates are calculated as follows:

(Gas Throughput, MSCF/hr) / (379 scf/lb-mol) * (Gas Stream MW, lb/lb-mol) * (Maximum VOC Percentage in Gas) * (Destruction Efficiency on Flare) = (VOC Emissions, lb/hr)

(0.00 MSCF/hr) / (379 scf/lb-mol) * (29.44 lb/lb-mol) * (50%) * (100% - 98%) * (1000 scf/Mscf) = 0.00 lb/hr

[c] Annual VOC emission rates are calculated as follows:

(Gas Throughput at Site, MSCF/yr) / (379 scf/lb-mol) * (Gas Stream MW, lb/lb-mol) * (Max VOC Percentage in Gas) * (Destruction Efficiency on Flare) * (1000 scf/Mscf) / (2000 lb/T) = (VOC Emissions, T/yr)

(00,000 MSCF/yr) / (379 scf/lb-mol) * (29.44 lb/lb-mol) * (50%) * (100% - 98%) * (1000 scf/Mscf) / (2000 lb/T) = 0.00 T/yr

PROCESS FLARE WASTE GAS COMBUSTION EMISSIONS - AOS

BAILEY UNIT C1 June 27 2013 through June 27 2014

BURLINGTON RESOURCES OIL & GAS COMPANY LP

EPN	FIN	Description	LHV[a] (Btu/scf)	Waste Gas Flow Rate Hourly (MMBtu/hr)	Waste Gas Flow Rate Annual (MMBtu/yr)	Pollutant	Emission Factors	Units	Potential to Emit Hourly[b] (lb/hr)	Potential to Emit Annual[c] (T/yr)
FL-1	FL-1	Process Flare	1,674	0.00	0.00	NO_X	0.1380	lb/MMBtu	0.00	0.00
		LP Separator Gas to Flare Event				CO	0.2755	lb/MMBtu	0.00	0.00
						$PM/PM_{10}/PM_{2.5}$	-- [e]	--	--	--
						SO_2	-- [c]	--	0.00	0.00
						H_2S	-- [c]	--	0.00	0.00

[a] Waste gas stream lower heating value was taken from the inlet gas analysis.

[b] Emission Factors for CO and NO_X are based upon the Draft TNRCC Guidance Document for Flares and Vapor Oxidizers (dated 10/00) for other high-Btu flares. An example calculation for hourly CO emissions for EPN FL-1 follows:

CO (lb/hr) = (Hourly Waste Gas Flow Rate, MMBtu/hr)*(Emission Factor, lb/MMBtu)

CO (lb/hr) = (0.00 MMBtu/hr)*(0.2755 lb/MMBtu)

= 0.00 lb/hr CO

[c] H_2S emissions are routed from the separator to the flare and then converted to SO_2. To be most conservative, SO_2 emission rates were determined based on the combustion efficiency of 100% H2S converted to SO_2. H_2S emitted at the flare is conservatively represented as 2% of the captured stream. An example calculation for hourly SO_2 emissions for EPN FL-1 follows:

SO_2 (lb/hr) = (Source H_2S Emission Rate, lb/hr) * (98% captured H2S stream) * (100% conversion to SO_2 at combustion) * (1 mol H_2S/34.07 lb H_2S) * (64.06 lb SO2/1 mol SO_2)

SO_2 (lb/hr) = (0.00 lb/hr H2S off Separator)* (98%) * (100%) * (1 mol H2S/34.07 lb H2S) * (64.06 lb SO2/1 mol SO2)

= 0.00 lb/hr SO_2

[d] An example calculation for annual CO emissions for EPN FL-1 follows:

CO (T/yr) = (Annual Waste Gas Flow Rate, MMBtu/yr) * (Emission Factor, lb/MMBtu) * (1 T / 2,000 lb)

CO (T/yr) = (0,000.00 MMBtu/yr) * (0.2755 lb/MMBtu) * (1 T / 2,000 lb)

= 0.00 T/yr CO

[e] The process flares are smokeless per 40 CFR §60.18 requirements; therefore, PM emissions are negligible.

CALCULATION OF FLARE FEED RATES FROM LP SEPARATOR - AOS

BAILEY UNIT C1 June 27 2013 through June 27 2014

BURLINGTON RESOURCES OIL & GAS COMPANY LP

Max BD Volume (Mscf/hr)	-
Max BD Volume (Mscf/yr)	-
Gas Density (lb/scf)	0.0781

Constituent	Heating Value[a] (Btu/lb)	Inlet Gas Weight (%)	Separator BD Emissions[b] Hourly (lb/hr)	Separator BD Emissions[b] Annual (T/yr)	Flare Feed Rate[c] Hourly (MMBtu/hr)	Flare Feed Rate[c] Annual (MMBtu/yr)
Methane	23,861	28.15%	0.00	0.00	0.00	0.00
Ethane	22,304	21.29%	0.00	0.00	0.00	0.00
Propane	21,646	20.53%	0.00	0.00	0.00	0.00
I-Butane	21,242	4.87%	0.00	0.00	0.00	0.00
N-Butane	21,293	9.91%	0.00	0.00	0.00	0.00
I-Pentane	21,025	3.71%	0.00	0.00	0.00	0.00
N-Pentane	21,072	3.60%	0.00	0.00	0.00	0.00
Cyclopentane	20,350	0.00%	0.00	0.00	0.00	0.00
n-Hexane	20,928	1.40%	0.00	0.00	0.00	0.00
Cyclohexane	20,195	0.46%	0.00	0.00	0.00	0.00
Other Hexanes	20,928	2.42%	0.00	0.00	0.00	0.00
Heptanes	20,825	0.99%	0.00	0.00	0.00	0.00
Octanes	20,747	0.11%	0.00	0.00	0.00	0.00
Nonanes	20,687	0.05%	0.00	0.00	0.00	0.00
Decanes Plus	20,638	0.00%	0.00	0.00	0.00	0.00
Benzene	18,172	0.12%	0.00	0.00	0.00	0.00
Toluene	18,422	0.19%	0.00	0.00	0.00	0.00
Ethylbenzene	18,658	0.01%	0.00	0.00	0.00	0.00
Xylene	18,438	0.03%	0.00	0.00	0.00	0.00
				Totals:	**0.00**	**0.00**

[a] Heating values taken from Perry's Chemical Engineers' Handbook , Table 3-207 (pg. 3-155)

[b] Constituent Emission Rates were calculated from the known maximum blowdown volumes and density then proportioned using the Inlet Gas stream constituents weight percents. An example calculation for Methane emissions is as follows:

Methane (lb/hr) = Maximum BD Volume (Mscf/hr) * Gas Density (lb/scf) * Inlet Gas Weight % * 1000
Methane (lb/hr) = (0.00 Mscf/hr) * (0.0781 lb/scf) * 28.15% * 1,000
Methane (lb/hr) = 0.00 lb/hr

[c] An example calculation for the hourly flare feed rate for Methane is demonstrated. Note that consituents with greater than 3 carbons use 98% destruction efficiency.

MMBtu/hr Methane = Methane Heating Value (Btu/lb) * Hourly Methane Emissions (lb/hr) * 99% of stream is combusted / 10^6
MMBtu/hr Methane = (23,861 Btu/lb) * (000.00 lb/hr) * 99% / (10^6)
MMBtu/hr Methane = 0.00 MMBtu/hr

An example calculation for the annual flare feed rate for Methane is demonstrated.

MMBtu/yr Methane = Methane Heating Value (Btu/lb) * Annual Methane Emissions (T/yr) * (2,000 lb/T) * 99% of stream is combusted / 10^6
MMBtu/yr Methane = (23,861 Btu/lb) * (0.00 T/yr) * (2,000 lb/T) * 99% / (10^6)
MMBtu/yr Methane = 0.00 MMBtu/yr

CALCULATION OF STORAGE TANK WORKING AND BREATHING POTENTIAL TO EMIT DURING FLARE DOWNTIME -AOS

BAILEY UNIT C1 June 27 2013 through June 27 2014

BURLINGTON RESOURCES OIL & GAS COMPANY LP

Variable	Description	Units	Value
L_T	total loss = Ls + Lw	Ton/yr	See Table
L_S	standing loss = 365 Vv Wv Ke Ks	lb/yr	See Table
L_W	working loss = 0.001 Mv Pv Q Kn Kp	lb/yr	See Table
L_H	working loss = 0.001 Mv Pmax Qh	lb/hr	See Table
	Roof Construction		Cone
RVP	Condensate Reid Vapor Pressure	psia	12.26
ΔPb	Breather vent pressure range	psi	0.06
I	Solar insolation factor	Btu/ft2-day	1521
P_A	Atmospheric Pressure	psia	14.7
Mv	Vapor Molecular Weight	lb/lb-mol	37
T	Annual Average Temperature	°F	72.1
T_{AX}	Daily Maximum Ambient Temperature	°R	541.6
T_{AN}	Daily Minimum Ambient Temperature	°R	522.5
ΔT_A	Daily average ambient temperature range	°R	19.1
Kp	Product factor		1

		Tank Specifications							Material Specifications													VOC		Benzene	
		V/H	D	H/L	Capacity	Color		α	Mv	P_{MAX}	$Q^{\angle}$	ΔTv	Hvo	T_{LA}	P_{VA}	Wv	ΔPv	Ke	Ks	L_S	L_T	L_H	L_T	L_H
Material	No. of Tanks	Tank Type	Tank Diameter (ft)	Tank Height/ Length (ft)	Tank Capacity (bbl)	Paint Color	Paint Conditions	Paint Solar Absorbance Factor	Vapor Molecular Weight	Reid Vapor Pressure (psia)	Max. Hourly Storage (bbl/hr)	Daily Vapor Temp. Range °F	Vapor Space Outage (ft)	Daily Average Liquid Surface Temp °R	Average Vapor Pressure (psia)	Vapor Density (lb/ft3)	Daily Vapor Pressure Range	Vapor Space Expan. Factor	Vented Vapor Sat. Factor	Standing Loss (lb/yr)	Total Loss (lb/hr)	Total Loss (T/yr)	Total Loss (lb/hr)	Total Loss (T/yr)
Condensate	3	V	12	25	500	Gray	Good	0.54	37	12.26	500	36.75	12.63	539.8	13.313	0.08504	3.53719	2.5751	0.10	685.04	**3.91**	**0.34**	**0.01**	**0.001**
PW	1	V	12	25	500	Gray	Good	0.54	37	0.123	500	36.75	12.63	539.8	0.036	0.00023	0.02227	0.0662	0.98	0.2	**0.001**	**0.0001**	**0.000002**	**0.0000002**

NOTE: Tank working and breathing emissions are based on the equations found in EPA AP 42 Chapter 7. All factors used are represented in the table on this page. The Condensate Reid Vapor Pressure and Vapor Molecular Weight are determined based on the WinSim condensate stream and Off Gas stream. All other variables are found in AP 42 Chapter 7 or are default unit values.

The emissions shown are due to flare maintenance occuring 2% of the year. During the flare downtime the wellhead would be shut in. Therefore, there would be no condensate or produced water liquids flowing to the tanks; however, any liquid already in the tanks would remain and have breathing (standing losses) emissions. These emissions would not be controlled, as the flare is down for maintenance. The calculations shown demonstrate this alternative operating scenario regarding flare maintenance and downtime. Based on 2% downtime, this scenario is being shown to occur for 175.2 hours in a year.

As shown on the summary page representing the Tank Emission sent to Flare, H_2S emissions are represented as occuring when the liquid streams flash during the change from a pressurized flow to the atmospheric tank. Due to the chemical properties of H_2S, the most conservative approach is to represent that all H_2S in the liquid will immediately flash, and there will be no H_2S emitted during working and breathing while the liquids are stored. Since there will be no liquid flow during the flare downtime, there are no flash emissions and therefore no H_2S emissions from the standing loss of the tanks.

EMISSIONS FOR MISCELLANEOUS MSS ACTIVITIES (FIN MSS-FUG)

BAILEY UNIT C1 June 27 2013 through June 27 2014

BURLINGTON RESOURCES OIL & GAS COMPANY LP

Emissions Summary

Pollutant	Hourly Max (lb/hr)	Annual Total (T/yr)
VOC	5.72	0.13
H_2S	0.002	0.00001
PM	2.21	1.18
PM10	0.53	0.28
PM2.5	0.00	0.00
Benzene	0.01	0.0001

#	Activity	Description / Comments	Default Parameters		Equation Used		Input Parameters		Pollutant	Hourly Emissions (lb/hr)	Annual Emissions (T/yr)	Source for "Input Parameters"
1	***§106.352(i) Engine/Turbine Oil Changes / Filter Changes*** The emissions associated with an engine oil/filter change occur during the draining of the used engine oil into oil pan or container.	-Engine has been isolated and blow down occurs prior to oil change. The emissions associated with the blow down need to be accounted for in the oil and gas emission calculation spreadsheet. -Oil is drained into a 4 ft x 4 ft open pan and transferred to a closed container per Best Management Practice (BMP). -Input parameters based on manufacturer specifications of engine oil SAE 10W (a). -Used a 1380 hp Caterpillar G3516B LE engine (b) as basis for calculation. In order to account for emissions from larger horse power engines, the emissions are doubled. An average engine uses 112 gallons of motor oil and manufacturer recommends changing oil every 1000 hrs. We used 10 changes of oil per year as a conservative estimate. -Emission estimates for 1380 hp engine are being doubled to be conservative and to accommodate engines with higher hp. -Assume all emissions from opening, loading, and evaporation occur in three separate hours.	Temperature (F) Vapor Pressure (psia) Saturation Factor Molecular Weight (lb/lbmol) Motor Oil (gal/activity) U wind speed (mph) Vapor Pressure P_V (Pa) Molecular Weight (lb/lbmol) Surface Area Ap (m2) (4ft * 4ft) Evaporation time t (hrs) Number of activities per year (Number of oil changes per engine per year) Factor used to account for larger horsepower engines	212 0.001 1 500 112 3.52 10 500 1.48 10 10 2	Loading loss L_L (lb/1000 gal) Loading loss per activity (lb/activity) Evaporation Loss (lb/activity) Total (lb/yr/engine)	0.009 0.001 1.027 20.560	Number of Engines/Turbines	0	VOC	0.00	0.00	Site-Specific Data
2	***§106.352(i) Changing Engine Rod Packings*** Emissions from changing of the rod would be from clingage of lubricant in the casing.	-Engine has been isolated and blow down occurs prior to changing rod packing. The emissions associated with the blow down need to be accounted for in the oil and gas emission calculation spreadsheet. -Emissions from clingage are the evaporation of the lubricant adhered to the rod packing casing. -Casing volume for calculations is based on field observation of casing for a 1380hp G3516B LE engine(b). -Input parameters based on material specifications for AP 101(c) grease. -Assume all emissions from maintenance activity occur in one hour.	Temperature (°F) Vapor pressure (psia) Molecular weight (lb/lb-mole) V_V Casing volume (ft3) (1ft * 3ft) Ideal gas constant (psia-ft3/lb-mol-°R) Number of activities per year (Number of rod packing changes per year per engine)	104 0.001 500 2.355 10.73 10	Clingage Loss (lb/activity) Total (lb/yr/engine)	0.0001 0.0010	Number of Engines	0	VOC	0.00	0.00	Site-Specific Data
3	***§106.352(i) Changing Wet and Dry Seals*** Emissions from changing seals would be from clingage of lubricant in the casing.	-Engine has been isolated and blow down occurs prior to changing seals. The emissions associated with the blow down need to be accounted for in the oil and gas emission calculation spreadsheet. -Emissions from clingage are the evaporation of the lubricant adhered to the rod packing casing. -Casing volume for calculations is based on field observation of casing for a 1380 hp Caterpillar G3516B LE engine (b). -Input parameters based on material specifications for AP 101(c) grease. -Assume all emissions from maintenance activity occur in one hour.	Temperature (°F) Vapor pressure of material stored (psia) Molecular weight (lb/lb-mole) V_V Casing volume (ft3) (1ft * 3ft) Ideal gas constant (psia-ft3/lb-mol-°R) Number of activities per year (Number of seal changes per year per engine)	104 0.001 500 2.355 10.73 2	Clingage Loss (lb/activity) Total (lb/yr/engine)	0.0001 0.0002	Number of Engines	0	VOC	0.00	0.00	Site-Specific Data
4	***§106.352(i) Glycol Dehydration Unit*** Emissions associated with replacement of glycol solution used in dehydration unit. There are two vessels in a dehydration unit: contactor and regenerator.	-Calculations based on physical properties of mono ethylene glycol (MEG)(d) because of its low molecular weight and high vapor pressure which gives the most conservative emissions estimate. -Typically the glycol solution used in dehydration unit is not entirely replaced but it is conservatively assumed that the glycol solution is drained once per year for vessel maintenance. -Per field experience, 4000 gal of glycol solution is used in a large dehydration unit. -Assume all emissions from opening, loading, and clingage occur in three separate hours.	Temperature (F) Vapor Pressure (psia) Saturation Factor Molecular Weight (lb/lbmol) Glycol Solution (gal/activity) Temperature (F) Vapor Pressure (psia) Molecular Weight (lb/lbmol) V_V Vessel volume (ft3) (5 ft radii * 30 ft height) Ideal gas constant (psia-ft3/lb-mol-°R) Number of activities per year	68 0.001 1 62.07 4000 68 0.001 62.07 2355 10.73 1	Loading loss L_L (lb/1000 gal) Loading loss per activity (lb/activity) Clingage Loss (lb/activity) Total (lb/yr/unit)	0.0015 0.0060 0.0155 0.0215	Number of Dehy Units	0	VOC	0.00	0.00	Site-Specific Data

EMISSIONS FOR MISCELLANEOUS MSS ACTIVITIES (FIN MSS-FUG)

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BURLINGTON RESOURCES OIL & GAS COMPANY LP

5	***§106.352(i) Heater Treater***	-Calculations based on condensate (RVP 10) because it has higher vapor pressure than crude oil (RVP 5) and results in a more conservative emission estimate. -Emission estimates are based on a large site that typically has 4 heater treaters. -Assume all emissions from maintenance activity occur in one hour.	Temperature (°F)	100	Clingage Loss (lb/activity)	8.6913	Number of Heater Treaters	0	VOC	0.00	0.00	Site-Specific Data
			Vapor pressure of material stored (psia)	10.5								
			Molecular weight (lb/lb-mole)	66								
			V_V Vessel volume (ft3) (2ft radii * 10 ft height)	125.6								
			Ideal gas constant (psia-ft3/lb-mol-°R)	10.73								
			Number of activities per year	1	Total (lb/yr/treater)	8.6913						
6	***§106.352(i) Aerosol Lubricants***	-45-50% VOC by weight volatilizes. -Material specification per Lubricant MSDS (f). -VOC evaporation is based off standard engineering judgment consistent with product specification. - Standard Industrial Size Cans (oz.) 16 -Assume 4 cans used in an hour as a maximum			Pounds of Emissions per Can (lb/can)	0.5	Number of 16 oz Cans Used	100	VOC	2.00	0.03	TCEQ Default Value
7	***§106.352(i) Piping Components***	-Calculations based on condensate (RVP 10) because it has higher vapor pressure than crude oil (RVP 5) and results in a more conservative emission estimate. -100 foot long pipe sections conservatively assumed for emission calculations. -Assume all emissions from maintenance activity occur in one hour.	Temperature (°F)	72.1	Clingage Loss (lb/activity)	5.7169	Number of 100 ft Piping Sections	10	VOC	5.72	0.03	TCEQ Default Value
			Vapor pressure of material stored (psia)	10.5					Benzene	0.01	0.0001	
			Molecular weight (lb/lb-mole)	66								
			V_V Vessel volume (ft3) (0.5 ft radii * 100 ft height)	78.5								
			Ideal gas constant (psia-ft3/lb-mol-°R)	10.73								
			Number of activities per year	1	Total (lb/yr/section)	5.7169						
8	***§106.352(i) Pneumatic Controllers***	Based on field experience and recent site visits to two plants in Central Texas area, changing pneumatic controllers of equipment under pressure requires isolation of pipe section or process equipment and a blow down. There are no emissions associated with changing the controller.										
9	***§106.352(i) Calibration***	-Per Monitoring Division's Laboratory and Quality Assurance Section - One cylinder of pentane or other calibration gas used per year and a typical cylinder contains 100 lbs. -Assume one cylinder emptied in an hour.	Pounds of pentane in one cylinder (lb)	100	Pounds of pentane in one cylinder (lb/cylinder)	100	Number of Cylinders	1	VOC	0.05	0.05	TCEQ Default Value
10	***Safety Factor***	Safety factor to account for MSS activities with the same character and quantity of emissions as those listed in paragraphs (b) (1) - (5) of §106.359.						1	VOC	0.72	0.01	TCEQ Default Value
11	***§106.352(i) Catalyst Handling and Maintenance***	-Based on U.S. EPA AP-42, 13.2.4 "Aggregate Handling and Storage Piles" (Equation 1). -The mean wind speed is consistent with the assumptions in the TCEQ's default calculations. -Moisture content estimate based on process knowledge -Particle size multipliers taken from AP-42, Chapter 13.2.4. -Assumed Control Efficiency of 0%. -Dust thickness assumed to be fly ash thickness in SCR. -Dust density assumed as fly ash density. -Based upon maximum surface area changed in an hour. -Based upon maximum surface area changed in a year.	U wind speed (mph)	3.52	Emission Factor (lb PM/ton)	0.010	Number of Engines/Turbines with Catalyst	0	PM	0.00	0.00	Site-Specific Data
			M material moisture content (%)	0.5	Emission Factor (lb PM10/ton)	0.005			PM10	0.00	0.00	
			k particle size multiplier (PM)	0.74	Emission Factor (lb PM2.5/ton)	0.001			PM2.5	0.00	0.00	
			k particle size multiplier (PM10)	0.35								
			k particle size multiplier (PM2.5)	0.053								
			Honeycomb (filter) surface area (ft2)	100	Dust generated per filter replacement (lb)	246.06						
			Dust thickness (mm)	10								
			Dust Density (lb/ft3)	75								
			Number of activities per hour	1								
			Number of activities per year	5	Dust generated per year (T/yr)	0.62						
12	***§106.263 Abrasive Blasting***	-Blasting media usage rates provided by the site and includes a 25% factor of safety. Based on maximum of blasting with one nozzle at a time. -Based on worst-case PM/PM10 emissions factors from TCEQ's "Abrasive Blast Cleaning," Draft RG-169, March 2001.	PM10 Emission Factor (lb PM/lb usage)	0.0014			Number of Blasting Guns	1	PM10	0.53	0.28	Site-Specific Data
			PM Emission Factor (lb PM/lb usage)	0.0059					PM	2.21	1.18	
			Hourly Blasting Media Usage (lb/hr)	375								
			Annual Blasting Media Usage (T/yr)	200								
13	***§106.352(i) Gas Pipeline Blowdown***	-Based on an estimate of 100 scf of gas being degassed per event at 900 psi -Assume all emissions from maintenance activity occur in one hour. -Includes blocking and venting lines for minor repair and replacement.	Volume degassed (scf)	0	Volume degassed (at pressure) (scf)	0.00			VOC	0.00	0.00	Site-Specific Data
			Pressure at which stream is degassed (psi)	900					H2S	0.00	0.00	
			Air Molecular Weight (lb/lb-mol)	28.96	Stream Specific Gravity	1.022			Benzene	0.00	0.00	
			Molar volume conversion (scf/(lb/mol))	379.4	Stream Density (lb/scf)	0.078						
			Inlet stream VOC content (%)	50.00%								
			Inlet stream H_2S content (%)	0.06%								
			Inlet stream Benzene content (%)	0.18%								
			Type of Control Equipment									
			Control Efficiency (%)	0.00%								
			Events per Hour	1								
			Events per Year	40								
14	***§106.263 Coating (hand-applied)***	Regardless of the amount of paint applied, if the coating is applied with brushes and/or rollers, the coating activity is De Minimis.										

EMISSIONS FOR MISCELLANEOUS MSS ACTIVITIES (FIN MSS-FUG)

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14a	***§106.263 Coating (spray)***	-If use less than 100 gal/yr coating and less than 50 gal/yr of solvent, activity is De Minimis regardless of the application method. -Assume max VOC content as allowed by 30 TAC 115, i.e., 3.5 lb/gal. -Emission calculation formula and emission factors are defined in TCEQ Technical Guidance Document for Surface Coating Operations dated April 2001. -The calculations do not account for any enclosure or control device.	Maximum hourly coating usage rate (gal/hr-gun)	5	Maximum Hourly Emissions (lb/hr)	17.500			VOC	0.00	0.00	Site-Specific Data
			Maximum annual coating usage rate (gal/yr-gun)	99								
			Number of guns with concurrent coating	1	Maximum Annual Emissions (T/yr)	0.173						
			Max VOC content (lb/gal)	3.5								
14b	***§106.263 Coating (spray)***	-If use less than 100 gal/yr coating and less than 50 gal/yr of solvent, activity is De Minimis regardless of the application method. -Emission calculation formula and emission factors are defined in TCEQ Technical Guidance Document for Surface Coating Operations dated April 2001. -It is assumed that 90% of the overspray falls to the ground per TCEQ Memo dated January 10, 1994. -All PM is assumed to be PM and PM10 (i.e., no particle size distribution is applied).	Maximum hourly coating usage rate (gal/hr-gun)	5	Maximum Hourly Emissions (lb/hr)	4.543			PM10	0.00	0.00	Site-Specific Data
			Maximum annual coating usage rate (gal/yr-gun)	99					PM	0.00	0.00	
			Max Density (lb/gal)	23	Maximum Annual Emissions (T/yr)	0.040						
			Percent Overspray for PM (%)	50.00%								
			Max Solids content (%)	79.00%								
			Max Solids content (%)	70.00%								
			Fallout factor content (%)	90.00%								
15	***§106.352(i) Pigging Activities***	-Based on an estimate of 50 scf of gas being degassed per event at 900 psi -Assume all emissions from maintenance activity occur in one hour.	Volume degassed (scf)	0	Volume degassed (at pressure) (scf)	0.00			VOC	0.00	0.00	Site-Specific Data
			Pressure at which stream is degassed (psi)	900					H2S	0.00	0.00	
			Air Molecular Weight (lb/lb-mol)	28.96	Stream Specific Gravity	1.022			Benzene	0.00	0.00	
			Molar volume conversion (scf/(lb/mol))	379.4	Stream Density (lb/scf)	0.078						
			Inlet stream VOC content (%)	50.00%								
			Inlet stream H_2S content (%)	0.06%								
			Inlet stream Benzene content (%)	0.18%								
			Type of Control Equipment									
			Control Efficiency (%)	0.00%								
			Events per Hour	1								
			Events per Year	52								
16	***§106.352(i) Non-Condensate Tank Cleaning Activities***	-For non-condensate tanks and storage vessels -Assumed volume drained was equal to 1% of the vessel volume -Assumed drained material is immediately placed in a closed vessel. To be conservative, this time is represented as 15 minutes -Assumed an average daily temperature of 95F, per TCEQ guidance. -Assume all emissions from opening, loading, and evaporation occur in three separate hours.	P, vapor pressure of material (psia)	0.123	Vv, volume of vessel (ft3)	2807.49	Number of Non-Condensate Tanks	1	VOC	0.04	0.00003	Site-Specific Data
			Vessel Height (ft)	25					H_2S	0.00002	0.00000002	
			Vessel Diameter (ft)	12					Benzene	0.0001	0.0000001	
			Vessel Volume (bbl)	500								
			Average Daily Temperature (F)	72.1	Lo, opening loss (lb/activity)	2.238						
			Ideal gas constant (psia-ft3/lb-mol-°R)	10.73								
			MWv, vapor molecular weight (lb/lb-mol)	37	Loading loss factor (lb/1000 gal loaded)	0.06394						
			Saturation Factor	0.60	Vl, volume of liquid drained (gallon/activity)	210.00						
			U wind speed (mph)	3.52	Loading loss per activity (due to draining) (lb/activity)	0.01343						
			Surface Area Ap (m2)	1	Vapor Pressure P_V (Pa)	848.06						
			t, time material sits uncovered (hr)	0.25	Evaporation Loss (lb/activity)	0.263						
			Produced Water stream H_2S content (%)	0.05%								
			Produced Water stream Benzene content (%)	0.26%								
			Type of Control Equipment	Flare								
			Control Efficiency (%) (for opening losses only)	98.00%								
			Events per Hour per tank	1	Total (lb/yr/tank)	2.514						
			Events per Year per tank	1								
17	***§106.352(i) Condensate Tank Cleaning Activities***	-For condensate tanks and storage vessels -Assumed volume drained was equal to 1% of the vessel volume -Assumed drained material is immediately placed in a closed vessel. To be conservative, this time is represented as 15 minutes -Assumed an average daily temperature of 95F, per TCEQ guidance. -Assume all emissions from opening, loading, and evaporation occur in three separate hours.	P, vapor pressure of material (psia)	12.26	Vv, volume of vessel (ft3)	2807.49	Number of Condensate Tanks	3	VOC	4.46	0.01	Site-Specific Data
			Vessel Height (ft)	25					H_2S	0.002	0.00001	
			Vessel Diameter (ft)	12					Benzene	0.01	0.00003	
			Vessel Volume (bbl)	500								
			Average Daily Temperature (F)	72.1	Lo, opening loss (lb/activity)	223.06						
			Ideal gas constant (psia-ft3/lb-mol-°R)	10.73								
			MWv, vapor molecular weight (lb/lb-mol)	37	Loading loss factor (lb/1000 gal loaded)	6.37						
			Saturation Factor	0.60	Vl, volume of liquid drained (gallon/activity)	210.00						
			U wind speed (mph)	3.52	Loading loss per activity (due to draining) (lb/activity)	1.34						
			Surface Area Ap (m2)	1	Vapor Pressure P_V (Pa)	84529.76						
			t, time material sits uncovered (hr)	0.25	Evaporation Loss (lb/activity)	26.24						
			Condensate stream H_2S content (%)	0.05%								
			Condensate stream Benzene content (%)	0.26%								
			Type of Control Equipment	Flare								
			Control Efficiency (%) (for opening losses only)	98.00%								
			Events per Hour per tank	1	Total (lb/yr/tank)	250.64						
			Events per Year per tank	1								

Note: The emissions from the MSS Activies presented above are determined using equations and applicable default values presented by the TCEQ in 106.359(b), as well as equations from AP-42. Blowdown emissions are accounted for on a separate page when applicable.

PROCESS FLARE WASTE GAS COMBUSTION EMISSIONS - MSS

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EPN	FIN	Description	LHV[a] (Btu/scf)	Waste Gas Flow Rate Hourly (MMBtu/hr)	Waste Gas Flow Rate Annual (MMBtu/yr)	Pollutant	Emission Factors	Units	Potential to Emit Hourly[b] (lb/hr)	Potential to Emit Annual[c] (T/yr)
FL-1-MSS	FL-1-MSS	Process Flare	1,925	9.91	44.01	NO_X	0.1380	lb/MMBtu	1.37	0.003
		Condensate Tank Cleaning Activities				CO	0.2755	lb/MMBtu	2.73	0.01
						$PM/PM_{10}/PM_{2.5}$	-- [e]	--	--	--
						SO_2	-- [c]	--	0.18	0.001
						H_2S	-- [c]	--	0.002	0.00001
FL-1-MSS	FL-1-MSS	Process Flare	1,895	0.09	0.18	NO_X	0.1380	lb/MMBtu	0.01	0.00001
		Produced Water Tank Cleaning Activities				CO	0.2755	lb/MMBtu	0.02	0.00002
						$PM/PM_{10}/PM_{2.5}$	-- [e]	--	--	--
						SO_2	-- [c]	--	0.002	0.000002
						H_2S	-- [c]	--	0.00002	0.00000002

[a] Waste gas stream lower heating value was taken from the inlet gas analysis.

[b] Emission Factors for CO and NO_X are based upon the Draft TNRCC Guidance Document for Flares and Vapor Oxidizers (dated 10/00) for other high-Btu flares. An example calculation for hourly CO emissions from the condensate tank cleaning activities for EPN FL-1-MSS follows:

CO (lb/hr) = (Hourly Waste Gas Flow Rate, MMBtu/hr)*(Emission Factor, lb/MMBtu)

CO (lb/hr) = (9.91 MMBtu/hr)*(0.2755 lb/MMBtu)

= 2.73 lb/hr CO

[c] H_2S emissions are routed to the flare and then converted to SO_2. To be most conservative, SO_2 emission rates were determined based on the combustion efficiency of 100% H_2S converted to SO_2. H_2S emitted at the flare is conservatively represented as 2% of the captured stream. An example calculation for hourly SO_2 emissions from the condensate tank cleaning activities for EPN FL-1-MSS follows:

SO_2 (lb/hr) = (Source H_2S Emission Rate, lb/hr) * (98% captured H2S stream) * (100% conversion to SO_2 at combustion) * (1 mol H_2S/34.07 lb H_2S) * (64.06 lb SO2/1 mol SO_2)

SO_2 (lb/hr) = (0.002 lb/hr H2S off Separator)* (98%) * (100%) * (1 mol H2S/34.07 lb H2S) * (64.06 lb SO2/1 mol SO2)

= 0.18 lb/hr SO_2

[d] An example calculation for annual CO emissions from the condensate tank cleaning activities for EPN FL-1-MSS follows:

CO (T/yr) = (Annual Waste Gas Flow Rate, MMBtu/yr) * (Emission Factor, lb/MMBtu) * (1 T / 2,000 lb)

CO (T/yr) = (44.01 MMBtu/yr) * (0.2755 lb/MMBtu) * (1 T / 2,000 lb)

= 0.01 T/yr CO

[e] The process flares are smokeless per 40 CFR §60.18 requirements; therefore, PM emissions are negligible.

[f] Produced Water Tank Clean Out is conservatively estimated by including both combustion of 98% of the waste gas by the flare and 100% uncontrolled emissions at the Produced Water Tank.

CALCULATION OF FLARE FEED RATES FROM CONDENSATE TANK CLEANING ACTIVITIES - MSS

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MSS Condensate Tank Clean Out Total Emissions: [a]

VOC Emissions (lb/hr):	223.00
VOC Emissions (TPY):	0.50
Hydrocarbon Emissions (lb/hr):	460.74
Hydrocarbon Emissions (TPY):	1.03

Constituent	Heating Value [b] (Btu/lb)	Condensate Tanks Flash Gas Weight (%)	MSS Condensate Tank Cleaning Activities Emissions [c]		Flare Feed Rate [d]	
			Hourly (lb/hr)	Annual (T/yr)	Hourly (MMBtu/hr)	Annual (MMBtu/yr)
Methane	23,861	28.15%	129.70	0.29	3.06	13.70
Ethane	22,304	21.29%	98.09	0.22	2.17	9.72
Propane	21,646	20.53%	94.59	0.21	2.03	9.00
I-Butane	21,242	4.87%	22.44	0.05	0.47	2.08
N-Butane	21,293	9.91%	45.66	0.10	0.95	4.17
I-Pentane	21,025	3.71%	17.09	0.04	0.35	1.65
N-Pentane	21,072	3.60%	16.59	0.04	0.34	1.65
Cyclopentane	20,350	0.00%	0.00	0.00	0.00	0.00
n-Hexane	20,928	1.40%	6.45	0.01	0.13	0.41
Cyclohexane	20,195	0.46%	2.12	0.005	0.04	0.20
Other Hexanes	20,928	2.42%	11.15	0.02	0.23	0.82
Heptanes	20,825	0.99%	4.56	0.01	0.09	0.41
Octanes	20,747	0.11%	0.51	0.001	0.01	0.04
Nonanes	20,687	0.05%	0.23	0.001	0.005	0.04
Decanes Plus	20,638	0.00%	0.00	0.00	0.00	0.00
Benzene	18,172	0.12%	0.55	0.001	0.01	0.04
Toluene	18,422	0.19%	0.88	0.002	0.02	0.07
Ethylbenzene	18,658	0.01%	0.05	0.0001	0.001	0.004
Xylene	18,438	0.03%	0.14	0.0003	0.003	0.01
	VOC	**48.40%**				
				Totals:	**9.91**	**44.01**

[a] Total VOC Emissions were determined by adding the MSS Condensate Clean Out Stream. Total Hydrocarbon Emissions were calculated as follows:

Total HC (lb/hr) = VOC Emissions (lb/hr) * (1/ VOC% of stream)
Total HC (lb/hr) = (223.00 lb/hr) * (1 / 48.40%)
Total HC (lb/hr) = 460.74 lb/hr

[b] Heating values taken from Perry's Chemical Engineers' Handbook , Table 3-207 (pg. 3-155)

[c] Emission Rates were proportioned from the Total Hydrocarbon Emissions using the Condensate Flash Gas stream constituents weight percents, generated by the WinSim program.

[d] An example calculation for the hourly flare feed rate for Methane is demonstrated. Note that constituents with greater than 3 carbons use 98% destruction efficiency.

MMBtu/hr Methane = Methane Heating Value (Btu/lb) * Hourly Methane Emissions (lb/hr) * 99% of stream is combusted / 10^6
MMBtu/hr Methane = (23,861 Btu/lb) * (129.70 lb/hr) * 99% / (10^6)
MMBtu/hr Methane = 3.06 MMBtu/hr

An example calculation for the annual flare feed rate for Methane is demonstrated. Note that consituents with greater than 3 carbons use 98% destruction efficiency.

MMBtu/yr Methane = Methane Heating Value (Btu/lb) * Annual Methane Emissions (T/yr) * (2,000 lb/T) * 99% of stream is combusted / 10^6
MMBtu/yr Methane = (23,861 Btu/lb) * (0.29 T/yr) * (2,000 lb/T) * 99% / (10^6)
MMBtu/yr Methane = 13.70 MMBtu/yr

Note: Hourly MSS emissions determined from maximum event occuring in one hour. While the max MSS event for one hour may not always be routed to flare, the flare waste gas combustion emissions are included to be most conservative. The emissions shown here are associated with the opening loss of the condensate storage tanks.

CALCULATION OF FLARE FEED RATES FROM PRODUCED WATER TANK CLEANING ACTIVITIES - MSS

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BURLINGTON RESOURCES OIL & GAS COMPANY LP

MSS Produced Water Tank Clean Out Total Emissions: [a]

VOC Emissions (lb/hr):	2.00
VOC Emissions (TPY):	0.002
Hydrocarbon Emissions (lb/hr):	4.13
Hydrocarbon Emissions (TPY):	0.004

Constituent	Heating Value [b] (Btu/lb)	Produced Water Tanks Flash Gas Weight (%)	MSS Produced Water Tank Cleaning Activities Emissions [c]		Flare Feed Rate [d]	
			Hourly (lb/hr)	Annual (T/yr)	Hourly (MMBtu/hr)	Annual (MMBtu/yr)
Methane	23,861	28.15%	1.16	0.001	0.03	0.05
Ethane	22,304	21.29%	0.88	0.001	0.02	0.04
Propane	21,646	20.53%	0.85	0.001	0.02	0.04
I-Butane	21,242	4.87%	0.20	0.0002	0.004	0.01
N-Butane	21,293	9.91%	0.41	0.0004	0.01	0.02
I-Pentane	21,025	3.71%	0.15	0.0001	0.003	0.004
N-Pentane	21,072	3.60%	0.15	0.0001	0.003	0.004
Cyclopentane	20,350	0.00%	0.00	0.00	0.00	0.00
n-Hexane	20,928	1.40%	0.06	0.0001	0.001	0.004
Cyclohexane	20,195	0.46%	0.02	0.00002	0.0004	0.001
Other Hexanes	20,928	2.42%	0.10	0.0001	0.002	0.004
Heptanes	20,825	0.99%	0.04	0.00004	0.001	0.002
Octanes	20,747	0.11%	0.005	0.000004	0.0001	0.0002
Nonanes	20,687	0.05%	0.002	0.000002	0.00004	0.0001
Decanes Plus	20,638	0.00%	0.00	0.00	0.00	0.00
Benzene	18,172	0.12%	0.005	0.000005	0.0001	0.0002
Toluene	18,422	0.19%	0.01	0.00001	0.0002	0.0004
Ethylbenzene	18,658	0.01%	0.0004	0.0000004	0.00001	0.00001
Xylene	18,438	0.03%	0.001	0.000001	0.00002	0.00004
	VOC	**48.40%**				
				Totals:	**0.09**	**0.18**

[a] Total VOC Emissions were determined by adding the MSS Produced Water Clean Out Stream. Total Hydrocarbon Emissions were calculated as follows:

Total HC (lb/hr) = VOC Emissions (lb/hr) * (1/ VOC% of stream)
Total HC (lb/hr) = (2.00 lb/hr) * (1 / 48.40%)
Total HC (lb/hr) = 4.13 lb/hr

[b] Heating values taken from Perry's Chemical Engineers' Handbook , Table 3-207 (pg. 3-155)

[c] Emission Rates were proportioned from the Total Hydrocarbon Emissions using the Produced Water Flash Gas stream constituents weight percents, generated by the WinSim program.

[d] An example calculation for the hourly flare feed rate for Methane is demonstrated. Note that constituents with greater than 3 carbons use 98% destruction efficiency.

MMBtu/hr Methane = Methane Heating Value (Btu/lb) * Hourly Methane Emissions (lb/hr) * 99% of stream is combusted / 10^6
MMBtu/hr Methane = (23,861 Btu/lb) * (1.16 lb/hr) * 99% / (10^6)
MMBtu/hr Methane = 0.03 MMBtu/hr

An example calculation for the annual flare feed rate for Methane is demonstrated. Note that consituents with greater than 3 carbons use 98% destruction efficiency.

MMBtu/yr Methane = Methane Heating Value (Btu/lb) * Annual Methane Emissions (T/yr) * (2,000 lb/T) * 99% of stream is combusted / 10^6
MMBtu/yr Methane = (23,861 Btu/lb) * (0.001 T/yr) * (2,000 lb/T) * 99% / (10^6)
MMBtu/yr Methane = 0.05 MMBtu/yr

Note: Hourly MSS emissions determined from maximum event occuring in one hour. While the max MSS event for one hour may not always be routed to flare, the flare waste gas combustion emissions are included to be most conservative. The emissions shown here are associated with the opening loss of the produced water storage tanks.