U.S.ENVIRONMENTAL PROTECTION AGENCY (REGION 6)
APPLICATION FOR FEDERAL OPERATING PERMIT
(40 CFR PART 71)

E & H RECEIVER

Submitted By:

WILLIAMS FOUR CORNERS, LLC
1755 Arroyo Drive
Bloomfield, New Mexico 87413

Prepared By:

CIRRUS CONSULTING, LLC
951 S. Diestel Road
Salt Lake City, UT 84105

February 2010

Amended August 2016

Table of Contents

Introduction

Williams Four Corners LLC (WFC) submitted a permit application in March 2010 to the Region 6 Environmental Protection Agency Air Permits Section to obtain a Part 71 Federal Title V Operating Permit for the E & H Receiver. The facility is located within the Jicarilla Apache Indian Reservation, and as the Tribe has not developed their own rules and regulations concerning air emission sources, the facility is presently under the jurisdiction of the EPA. With this re-submitted application, WFC is updating the March 2010 application to accommodate increased liquids throughputs due to increasing natural gas production from upstream producers.

The E & H Receiver is a natural gas liquids receiver on a natural gas pipeline. This receiver collects liquids (consisting of water and hydrocarbons condensed from the natural gas) removed from the pipeline by pigging operations. Flashing occurs as these liquids are transferred from the receiver to the atmospheric storage tanks, releasing hydrocarbons, including volatile organic compounds (VOCs) to the atmosphere. Due to increasing liquids volumes VOC emissions have reached the 100 tons per year Title V trigger threshold, subjecting the facility to the Federal Operating Permits Program.

A list of equipment included in this permit application is included below.

Equipment List

Unit Number	Unit Description
TK-CAP	Three 300-bbl Condensate Storage Tanks
L-1	Truck Loading
F-1*	Piping Component Fugitive Emissions
F-2*	Pig Receiver Venting Emissions
TK-4*	80-bbl Produced Water Tank
TK-5*	90-bbl Produced Water Tank
TK-6*	40-bbl Receiver Drip Tank

*** Insignificant sources**

The E & H Receiver was initially constructed in 1974, and continues to operate today in its original configuration. Upstream natural gas producers have been increasing gas pipeline throughputs over the last ten years. The initial 2010 Part 71 application requested emissions based on actual throughputs at that time, plus a safety factor to allow for increasing volumes. Those increased volumes have been realized prior to issuance of the Part 71 permit, and as such, WFC wishes to take this opportunity to increase the permit's allowable throughput during this application review process.

Although the updated VOC emissions proposed in this application update exceed the federal Prevention of Significant Deterioration (PSD) threshold of 250 tons per year (tpy), the facility has not had a physical

change, nor has it changed its method of operation since 1974. The facility has been capable of accommodating these liquids since before January 6, 1975. The facility has applied for a Title V permit as per 71.5(a)(1), and has registered as a true minor source as per 49.151(c)(1)(iii)(A), but has yet to receive a Part 71 permit. The proposed increase in production rate is not prohibited under any federally enforceable permit condition pursuant to 40 CFR 52.21 or 51.166, nor pursuant to 40 CFR 71. Therefore, WFC submits this application update to accommodate an increase in production and associated emissions.

United States Environmental Protection Agency

OMB No. 2060-0336,
Approval Expires 05/31/2019

Federal Operating Permit Program (40 CFR Part 71)

GENERAL INFORMATION AND SUMMARY (GIS)

A. Mailing Address and Contact Information

Facility name E&H Receiver

Mailing address: Street or P.O. Box 1755 Arroyo Drive

City Bloomfield State NM ZIP 87413 -_____

Contact person: Mitch Morris Title Environmental Specialist

Telephone (505) 632 - 4708 Ext. _____

Facsimile (505) 632 - 4782

B. Facility Location

Temporary source? __Yes _x_ No Plant site location UTM zone 13, 303798 m E, 4041508 m N

_____ _Lat 36º29'56" N, Long -107º11'26" W

City ~30 miles SSW of Dulce, NM State NM County Rio Arriba EPA Region 6

Is the facility located within:

Indian lands? _x_ YES ___ NO An offshore source in federal waters? ___YES _x_ NO

Non-attainment area? ___ YES _x_ NO If yes, for what air pollutants? _____

Within 50 miles of affected State? _x_ YES __ NO If yes, What State(s)? NM, CO

C. Owner

Name Williams Street/P.O. Box One Williams Center

City Tulsa State OK ZIP 74172 - _____

Telephone (918) 588 - 2984 Ext_____

D. Operator

Name Williams Four Corners LLC Street/P.O. Box 1755 Arroyo Drive

City Bloomfield State NM ZIP 87413 - _____

Telephone (505) 632 - 4708 Ext_____

E. Application Type

Mark only one permit application type and answer the supplementary question appropriate for the type marked.

_X_ Initial Permit ___ Renewal ___ Significant Mod ___ Minor Permit Mod(MPM)

___ Group Processing, MPM ___ Administrative Amendment

For initial permits, when did operations commence? 1974

For permit renewal, what is the expiration date of current permit? _____/____/_____

F. Applicable Requirement Summary

Mark the types of applicable requirements that apply:

___ SIP _X_ FIP/TIP ___ PSD ___Non-attainment NSR

___ Minor source NSR ___ Section 111 ___ Phase I acid rain ___Phase II acid rain

___ Stratospheric ozone ___ OCS regulations ___ NESHAP ___ Sec. 112(d) MACT

___ Sec. 112(g) MACT ___ Early reduction of HAP ___ Sec 112(j) MACT ___ RMP [Sec.112(r)]

___ Section 129 ___ NAAQS, increments or visibility but for temporary sources (This is rare)

Is the source subject to the Deepwater Port Act? ___YES _X_NO

Has a risk management plan been registered? ___YES _X_NO Agency _____

Phase II acid rain application submitted? ___YES _X_NO If YES, Permitting Authority _____

G. Source-Wide PTE Restrictions and Generic Applicable Requirements

Cite and describe any emissions-limiting requirements and/or facility-wide "generic" applicable requirements.

Facility receives pipeline condensate and transfers to storage tanks pending truck haul. Condensate throughput volumes have increased sufficiently such that condensate flash emissions have exceeded the 100 tpy Title V trigger threshold. The recent addition of condensate volumes due to new production has prompted this update to the original 2010 application.

H. Process Description

List processes, products, and SIC codes for the facility.

Process	Products	SIC
Condensate pig receiver and storage	Natural gas condensate	1389

I. Emission Unit Identification

Assign an emissions unit ID and describe each emissions unit at the facility. Control equipment and/or alternative operating scenarios associated with emissions units should by listed on a separate line. Applicants may exclude from this list any insignificant emissions units or activities.

Emissions Unit ID	Description of Unit
TK-CAP	Three 300-bbl condensate storage tanks
L-1	Condensate truck loading emissions

J. Facility Emissions Summary

Enter potential to emit (PTE) for the facility as a whole for each regulated air pollutant listed below. Enter the name of the single HAP emitted in the greatest amount and its PTE. For all pollutants, stipulations to major source status may be indicated by entering "major" in the space for PTE. Indicate the total actual emissions for fee purposes for the facility in the space provided. Applications for permit modifications need not include actual emissions information.

NOx 0.0 tons/yr VOC 306.7 tons/yr SO2 0.0 tons/yr

PM-10 0.0 tons/yr CO 0.0 tons/yr Lead 0.0 tons/yr

Total HAP 6.4 tons/yr

Single HAP with greatest amount n-Hexane PTE 5.5 tons/yr

Total of regulated pollutants (for fee calculation), Sec. F, line 5 of form FEE 196.1 tons/yr

K. Existing Federally-Enforceable Permits – N/A

Permit number(s) _____ Permit type _____ Permitting authority _____

Permit number(s) _____ Permit type _____ Permitting authority _____

L. Emission Unit(s) Covered by General Permits – N/A

Emission unit(s) subject to general permit _____

Check one: ___ Application made ___ Coverage granted

General permit identifier _____ Expiration Date ____/____/____

M. Cross-referenced Information

Does this application cross-reference information? ___ YES _x_ NO (If yes, see instructions)

INSTRUCTIONS FOLLOW

United States Environmental Protection Agency

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Federal Operating Permit Program (40 CFR Part 71)

EMISSIONS UNIT DESCRIPTION FOR VOC EMITTING SOURCES (EUD-2)

A. General Information

Emissions unit ID _TK-CAP_ Description _Three 300-bbl condensate storage tanks_

SIC Code (4-digit) _1389_ SCC Code _40400311_

B. Emissions Unit Description

Equipment type _Condensate storage tanks_ Temporary source: ___Yes _X_No

Manufacturer _unknown_ Model No. _N/A_

Serial No. _N/A_ Installation date _1974_

Articles being coated or degreased _N/A_

Application method _N/A_

Overspray (surface coating) (%) _N/A_ Drying method_N/A_

No. of dryers _N/A_ Tank capacity (degreasers) (gal) _N/A_

C. Associated Air Pollution Control Equipment – N/A

Emissions unit ID _____ Device Type_____

Manufacturer _____ Model No_____

Serial No. _____ Installation date ____/____/_____

Control efficiency (%) _____.___ Capture efficiency (%) _____.___

Air pollutant(s) controlled_____ Efficiency estimation method _____

D. Ambient Impact Assessment – N/A

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp (F) _____._____ Design stack flow rate (ACFM) _____.____

Actual stack flow rate (ACFM) _____ Velocity (ft/sec) _____._____

E. VOC-containing Substance Data

List each VOC-containing substance consumed, processed or produced at the emissions unit that is emitted into the air. In the name column, if providing a brand name, include the name of the manufacture; if the substance contains HAP, list the constituent HAP.

Substance Name (Chemical, Brand Name)	CAS No.	Substance Type	Actual Usage (gal/yr)	Max Usage (gal/day)	Max Usage (gal/year)	VOC Content (lb/gal)
Natural Gas Condensate	N/A	Natural Gas Condensate	N/A	N/A		*See Note

***Note - See emissions calculations in Section 5**

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Federal Operating Permit Program (40 CFR Part 71)

EMISSIONS UNIT DESCRIPTION FOR VOC EMITTING SOURCES (EUD-2)

A. General Information

Emissions unit ID _L-1_ Description _Truck loading loss emissions_

SIC Code (4-digit) _1389_ SCC Code _31000299_

B. Emissions Unit Description

Equipment type _Haul Trucks_ Temporary source: ___Yes _X_ No

Manufacturer _ N/A_ Model No. _N/A_

Serial No. _N/A_ Installation date _ N/A_

Articles being coated or degreased _N/A_

Application method _N/A_

Overspray (surface coating) (%) _N/A_ Drying method _N/A_

No. of dryers _N/A_ Tank capacity (degreasers) (gal) _N/A_

C. Associated Air Pollution Control Equipment – N/A

Emissions unit ID _____ Device Type_____

Manufacturer _____ Model No_____

Serial No. _____ Installation date ____/____/_____

Control efficiency (%) _____.___ Capture efficiency (%) _____.___

Air pollutant(s) controlled_____ Efficiency estimation method _____

D. Ambient Impact Assessment – N/A

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp (F) _____._____ Design stack flow rate (ACFM) _____.____

Actual stack flow rate (ACFM) _____ Velocity (ft/sec) _____._____

E. VOC-containing Substance Data

List each VOC-containing substance consumed, processed or produced at the emissions unit that is emitted into the air. In the name column, if providing a brand name, include the name of the manufacture; if the substance contains HAP, list the constituent HAP.

Substance Name (Chemical, Brand Name)	CAS No.	Substance Type	Actual Usage (gal/yr)	Max Usage (gal/day)	Max Usage (gal/year)	VOC Content (lb/gal)
Natural Gas Condensate	N/A	Natural Gas Condensate	N/A	N/A		*See Note

***Note - See emissions calculations in Section 5**

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INSIGNIFICANT EMISSIONS (IE)

On this page list each insignificant activity or emission unit. In the "number" column, indicate the number of units in this category. Descriptions should be brief but unique. Indicate which emissions criterion of part 71 is the basis for the exemption.

Number	Description of Activities or Emissions Units	RAP (except HAP)	HAP
1	80-bbl produced water tank (TK-4)	X	X
1	90-bbl produced water tank (TK-5)	X	X
1	40-bbl receiver drip tank (TK-6)	X	X
1	Fugitives – piping components (F-1)	X	X
1	Fugitives – pig receiver venting (F-2)	X	X

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EMISSION CALCULATIONS (EMISS)

Calculate potential to emit (PTE) for applicability purposes and actual emissions for fee purposes for each emissions unit, control device, or alternative operating scenario identified in section I of form **GIS**. If form **FEE** does not need to be submitted with the application, do not calculate actual emissions.

A. Emissions Unit ID TK-CAP

B. Identification and Quantification of Emissions

For each emissions unit identified above, list each regulated air pollutant or other pollutant for which the source is major, then list any other regulated pollutant (for fee calculation) not already listed. HAP may be simply listed as "HAP." Next, calculate PTE for applicability purposes and actual emissions for fee purposes for each pollutant. Do not calculate PTE for air pollutants listed solely for fee purposes. Include all fugitives for fee purposes. See instructions concerning GHGs. Values should be reported to the nearest tenth (0.1) of a ton for yearly values or tenth (0.1) of a pound for hourly values.

Air Pollutants	Emission Rates			CAS No.
	Actual Annual Emissions (tons/yr)	Potential to Emit		
		Hourly (lb/hr)	Annual (tons/yr)	
VOC	189.7		296.2	
n-Hexane	3.3		5.4	110-54-3
Benzene	0.5		0.8	71-43-2
Toluene	0.0		0.0	108-88-3
Ethylbenzene	0.0		0.0	100-41-4
Xylenes	0.0		0.0	1330-20-7

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EMISSION CALCULATIONS (EMISS)

Calculate potential to emit (PTE) for applicability purposes and actual emissions for fee purposes for each emissions unit, control device, or alternative operating scenario identified in section I of form **GIS**. If form **FEE** does not need to be submitted with the application, do not calculate actual emissions.

A. Emissions Unit ID L-1

B. Identification and Quantification of Emissions

For each emissions unit identified above, list each regulated air pollutant or other pollutant for which the source is major, then list any other regulated pollutant (for fee calculation) not already listed. HAP may be simply listed as "HAP." Next, calculate PTE for applicability purposes and actual emissions for fee purposes for each pollutant. Do not calculate PTE for air pollutants listed solely for fee purposes. Include all fugitives for fee purposes. See instructions concerning GHGs. Values should be reported to the nearest tenth (0.1) of a ton for yearly values or tenth (0.1) of a pound for hourly values.

Air Pollutants	Emission Rates			CAS No.
	Actual Annual Emissions (tons/yr)	Potential to Emit		
		Hourly (lb/hr)	Annual (tons/yr)	
VOC	6.7		10.5	
n-Hexane	0.1		0.1	110-54-3
Benzene	0.0		0.0	71-43-2
Toluene	0.0		0.0	108-88-3
Ethylbenzene	0.0		0.0	100-41-4
Xylenes	0.0		0.0	1330-20-7

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INITIAL COMPLIANCE PLAN AND COMPLIANCE CERTIFICATION (I-COMP)

SECTION A - COMPLIANCE STATUS AND COMPLIANCE PLAN – N/A

Complete this section for each unique combination of applicable requirements and emissions units at the facility. List all compliance methods (monitoring, recordkeeping and reporting) you used to determine compliance with the applicable requirement described above. Indicate your compliance status at this time for this requirement and compliance methods and check "YES" or "NO" to the follow-up question.

Emission Unit ID(s):

Applicable Requirement (Describe and Cite)

Compliance Methods for the Above (Description and Citation):

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

___ Future-Effective Requirement: Do you expect to meet this on a timely basis? ____Yes ____No

Emission Unit ID(s):

Applicable Requirement (Description and Citation):

Compliance Methods for the Above (Description and Citation):

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

___ Future-Effective Requirement: Do you expect to meet this on a timely basis? ____Yes ____No

B. SCHEDULE OF COMPLIANCE – N/A

Complete this section if you answered "NO" to any of the questions in section A. Also, complete this section if required to submit a schedule of compliance by an applicable requirement. Please attach copies of any judicial consent decrees or administrative orders for this requirement.

Unit(s)_____ Requirement_____

Reason for Noncompliance. Briefly explain reason for noncompliance at time of permit issuance or that future-effective requirement will not be met on a timely basis:

Narrative Description of how Source Compliance Will be Achieved. Briefly explain your plan for achieving compliance:

Schedule of Compliance. Provide a schedule of remedial measures, including an enforceable sequence of actions with milestones, leading to compliance, including a date for final compliance.

Remedial Measure or Action	Date to be Achieved

C. SCHEDULE FOR SUBMISSION OF PROGRESS REPORTS – N/A

Only complete this section if you are required to submit one or more schedules of compliance in section B or if an applicable requirement requires submittal of a progress report. If a schedule of compliance is required, your progress report should start within 6 months of application submittal and subsequently, no less than every six months. One progress report may include information on multiple schedules of compliance.

Contents of Progress Report (describe):

First Report____/____/___ Frequency of Submittal_____

Contents of Progress Report (describe):

First Report____/____/___ Frequency of Submittal_____

D. SCHEDULE FOR SUBMISSION OF COMPLIANCE CERTIFICATIONS

This section must be completed once by every source. Indicate when you would prefer to submit compliance certifications during the term of your permit (at least once per year).

Frequency of submittal _annual_ Beginning _within 30 days after permit issuance anniversary_

E. COMPLIANCE WITH ENHANCED MONITORING & COMPLIANCE CERTIFICATION REQUIREMENTS – N/A

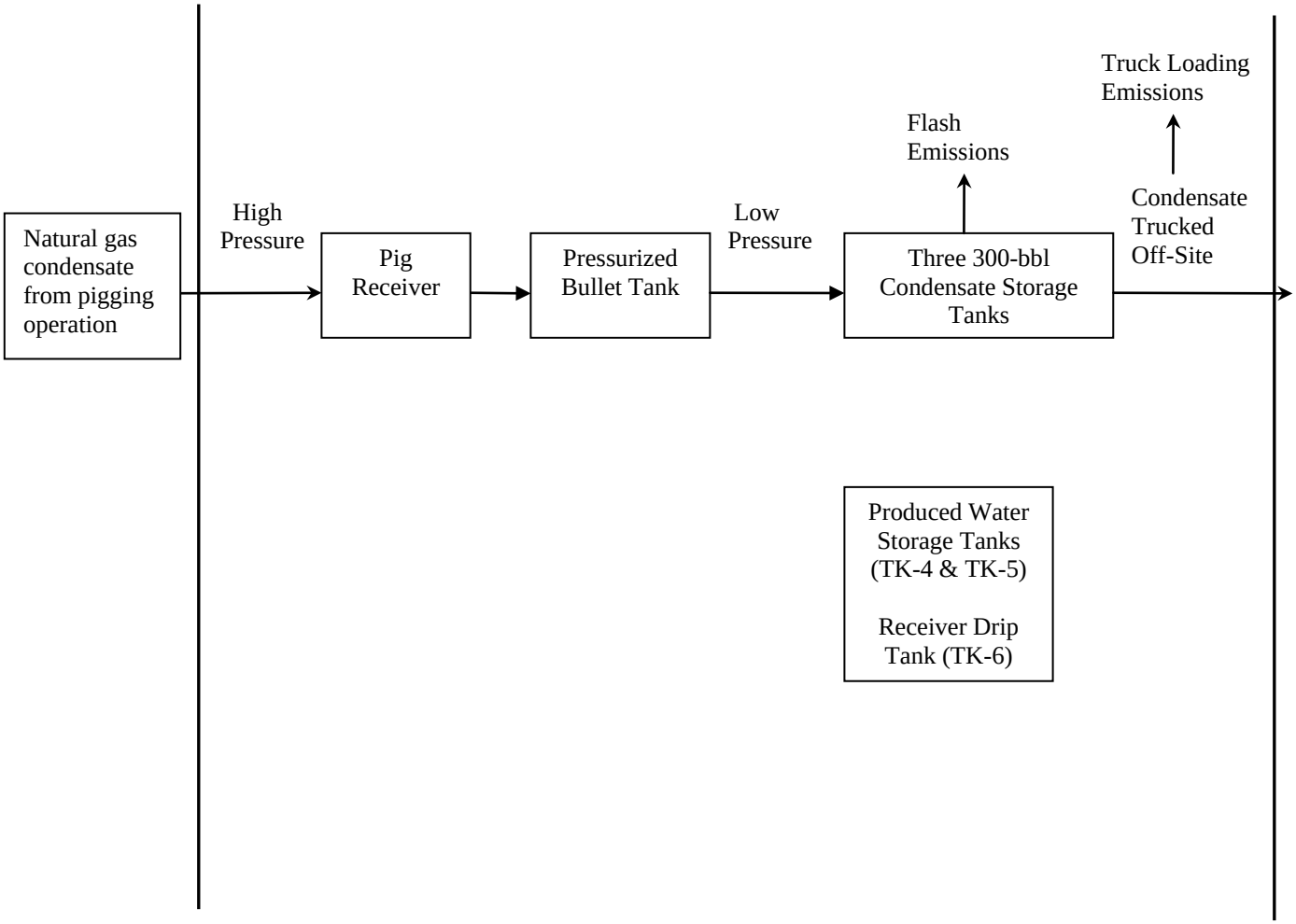
This section must be completed once by every source. To certify compliance with these, you must be able to certify compliance for every applicable requirement related to monitoring and compliance certification at every unit.

Enhanced Monitoring Requirements: ____ In Compliance ____ Not In Compliance

Compliance Certification Requirements: ____ In Compliance ____ Not In Compliance

Section 3

Process Flow Sheet



Section 4

Plot Plan and Topo Map

See next page.

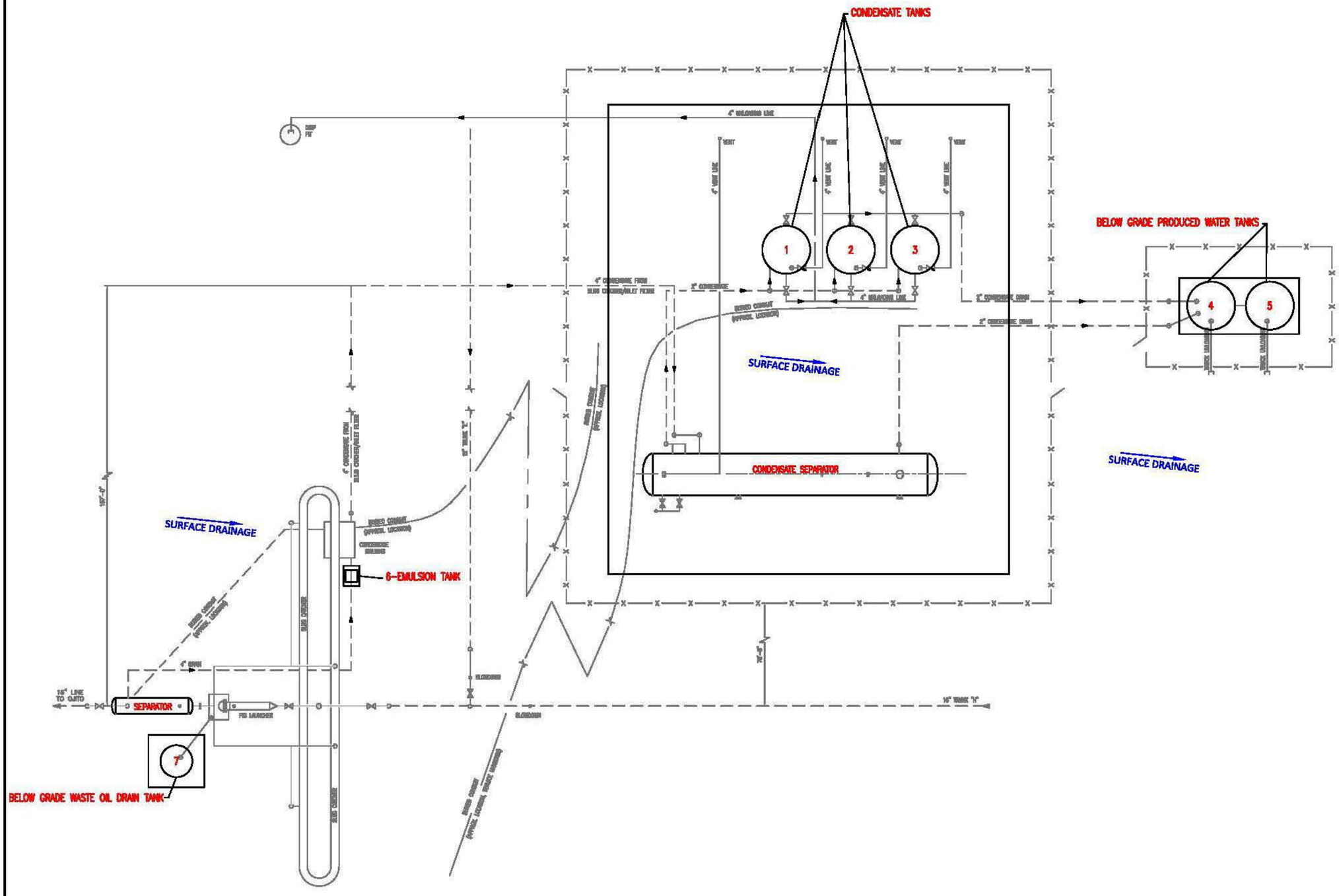
FIGURE 2

FACILITY LAYOUT
WILLIAMS FOUR CORNERS LLC
TRUNK E AND H BATTERY FACILITY
NW¼ SW¼, SECTION 7, T26N, R3W
RIO ARRIBA COUNTY, NEW MEXICO
N36.49881, W107.19064

animas environmental services
Farmington, NM • Durango, CO
animasenvironmental.com

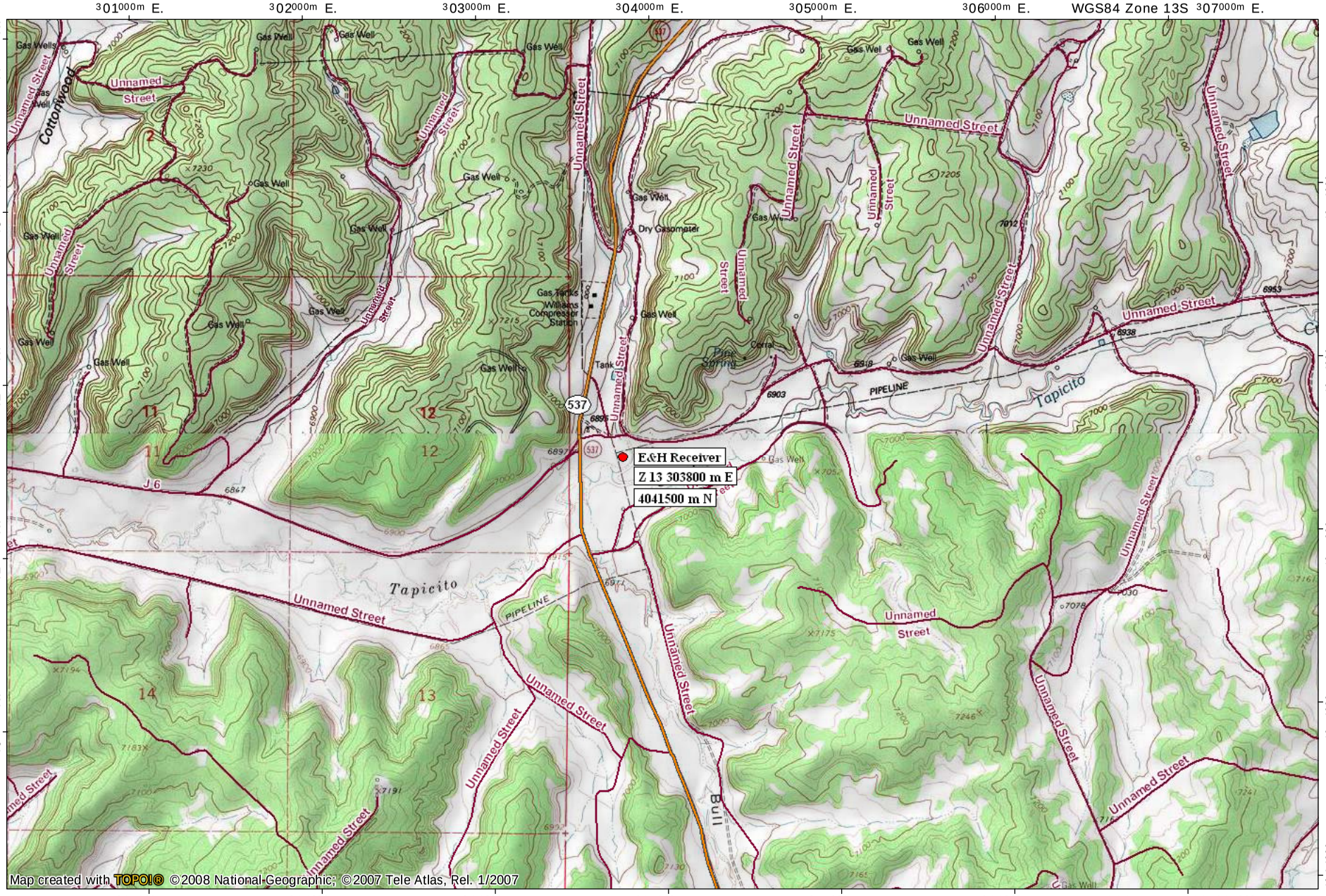
DRAWN BY:	DATE DRAWN:
C. Lameman	December 11, 2013
REVISIONS BY:	**DATE REVISED:**
D. Dougl	December 31, 2015
CHECKED BY:	**DATE CHECKED:**
S. Hinds	December 31, 2015
APPROVED BY:	**DATE APPROVED:**
E. McNally	December 31, 2015

NOTE: SITE DIAGRAM OBTAINED FROM WILLIAMS.



SCALE
25 15 0 25
5
(1 INCH = 25 FEET)

TOPO! map printed on 01/25/10 from "E&H Receiver.tpo"



NATIONAL GEOGRAPHIC

0 .5 1 MILES

1000 0 1000 2000 3000 4000 5000 FEET

1 .5 0 KILOMETERS 1

1000 0 METERS 1000

TN MN 10°

01/25/10

Section 5

Emission Calculations

Condensate Storage Tanks (Unit TK-CAP), Produced Water Storage Tanks (TK-4 & TK-5) and Receiver Drip Tank (TK-6)

Flash emissions from the condensate tanks (Unit TK-CAP) are calculated using VMGSim, version 9.5. The flash emissions calculations provided in this section are calculated using actual condensate throughput plus a safety factor. This margin of safety is used to account for future variations in condensate composition and throughput. Working and breathing losses from the condensate tanks are calculated using the post-flash condensate analysis in TANKS 4.09.d plus the safety factor.

Flash emissions associated with the Receiver Drip Tank (TK-6) are accounted for in the pig receiver venting (F-2) emissions below. Working and breathing losses from this tank are calculated using the post-flash condensate analysis in TANKS 4.09.d plus a safety factor on the throughput as noted above.

There are no flash emissions associated with the produced water tanks (TK-4 and TK-5). The produced water tanks are included in this application as insignificant sources. Working and breathing losses from the produced water tanks are calculated using Colorado Department of Public Health and Environment (CDPHE) and Texas Commission on Environmental Quality (TCEQ) studies, and using actual throughput plus a safety factor.

Copies of the VMGSim, TANKS 4.09.d output files, and pre-flash condensate analysis are provided for the condensate storage tank calculations. A copy of the post-flash condensate analysis used for the condensate TANKS 4.09.d calculations and the produced water tank calculations are included in this section separately.

Truck Loading Losses (L-1)

Fugitive emissions due to liquid loading of condensate to trucks have been calculated for the condensate storage tanks (TK-CAP) using emission factors from AP-42, Section 5.2, *Transportation and Marketing of Petroleum Liquids* and the annual condensate throughput volume plus safety factor. The calculations, post-flash condensate analysis, and AP-42 reference are provided in this section.

Fugitives (F-1 and F-2)

Fugitive emissions (F-1) from leaking piping components (valves, flanges, seals, etc.) were calculated using emission factors from the *1993 Protocol for Equipment Leak Emission Estimates* published by the Environmental Protection Agency (EPA) and a current post-flash condensate analysis. Component counts

were based on review of engineering drawings as well as physical surveys conducted at the facility in January 2010 and April 2016. A safety factor was applied to component counts for the emission calculations.

Fugitive emissions from pig receiver venting (F-2) occur as gas vapors are released when the pig receiver is opened to remove the pigging device. Emissions were calculated based on the volume released and a current pre-flash condensate analysis. The volume released was calculated based on receiver dimensions and assuming venting occurs once per week. Emissions from venting the receiver are included in this as an insignificant source.

A copy of the emission calculations, the July 25, 2016 condensate analysis, and EPA reference used are included in this section.

Facility Total Projected Emissions (Criteria Pollutants)

Company: Williams Four Corners LLC
Facility: E&H Receiver

Proposed PTE Emissions

Unit Number	Description	VOC tpy	n-Hexane tpy	Benzene tpy	Toluene tpy	Ethylbenzene tpy	Xylenes tpy
TK-CAP	(3) Condensate Tanks	296.20	5.38	0.80	1.00E-05	1.03E-02	1.03E-02
L-1	Truck Loading	10.52	0.13	0.02	1.04E-05	3.45E-04	3.06E-04
	Total	306.72	5.51	0.82	0.00	0.01	0.01

Insignificant Sources		VOC tpy	n-Hexane tpy	Benzene tpy	Toluene tpy	Ethylbenzene tpy	Xylenes tpy
TK-4 & TK-5	Produced Water Tanks	1.31	1.10E-01	3.50E-02	4.50E-02	3.50E-03	3.00E-02
TK-6	Receiver Drip Tank	0.40	2.75E-02	1.00E-03	0.00	2.50E-05	2.50E-05
F-1	Fugitive VOC	0.85	0.01	2.62E-06	8.91E-05	9.13E-05	6.79E-04
F-2	Pig Receiver Venting	0.38	5.43E-07	2.31E-03	1.80E-05	1.73E-05	1.44E-04

2015 Actual Emissions

Unit Number	Description	VOC tpy	n-Hexane tpy	Benzene tpy	Toluene tpy	Ethylbenzene tpy	Xylenes tpy
TK-CAP	(3) Condensate Tanks	189.37	3.25	0.51	5.00E-06	1.02E-02	1.02E-02
L-1	Truck Loading	6.69	0.08	0.00	0.00E+00	0.00E+00	0.00E+00
	Total	196.06	3.33	0.51	0.00	0.01	0.01

Insignificant Sources		VOC tpy	n-Hexane tpy	Benzene tpy	Toluene tpy	Ethylbenzene tpy	Xylenes tpy
TK-4 & TK-5	Produced Water Tanks	0.81	6.79E-02	2.16E-02	2.78E-02	2.16E-03	1.85E-02
TK-6	Receiver Drip Tank	0.40	2.75E-02	1.00E-03	0.00	2.50E-05	2.50E-05
F-1	Fugitive VOC	0.85	0.01	2.62E-06	8.91E-05	9.13E-05	6.79E-04
F-2	Pig Receiver Venting	0.38	5.43E-07	2.31E-03	1.80E-05	1.73E-05	1.44E-04

Emission Calculations

Condensate Storage Tanks

(TK-CAP)

E&H Receiver VOC Emissions from Condensate Tank Flash plus Working & Breathing

Unit Number: TK-CAP (combined emissions from Tanks TK-1, TK-2 and TK-3)
Description: Three 300-bbl Condensate Storage Tanks

Emission Rates

Throughput

50,000 bbl/yr

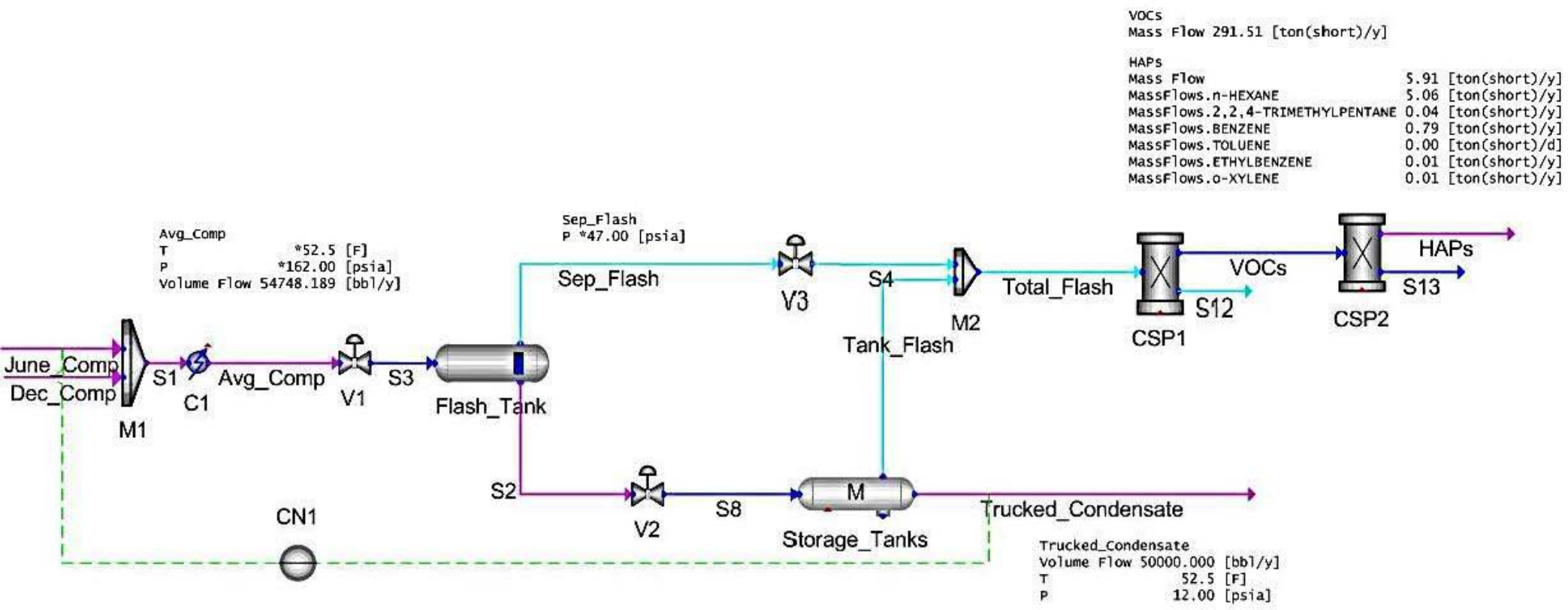
PTE

12-month total as of April 2016 plus 43%

Williams Four Corners LLC

Source/Pollutants	Working/Breathing Losses, ppy	Working/Breathing Losses, tpy	Flash Losses, tpy	Uncontrolled Emission Rates, tpy
TK-CAP				
VOC	9,376.84	4.69	291.51	296.20
n-Hexane	647.55	0.32	5.06	5.38
Benzene	25.26	1.26E-02	0.79	0.80
Toluene	0.02	1.00E-05	0.00	0.00
Ethylbenzene	0.53	2.65E-04	0.01	0.01
Xylene	0.54	2.70E-04	0.01	0.01

Note: Results from Tanks 4.09d (working & breathing losses) are calculated on a per-tank basis (assuming full annual throughput for each tank), multiplied by three for the three tanks, whereas flashing losses are total emissions.


VOCs
Mass Flow 291.51 [ton(short)/y]
HAPs
Mass Flow 5.91 [ton(short)/y]
MassFlows.n-HEXANE 5.06 [ton(short)/y]
MassFlows.2,2,4-TRIMETHYLPENTANE 0.04 [ton(short)/y]
MassFlows.BENZENE 0.79 [ton(short)/y]
MassFlows.TOLUENE 0.00 [ton(short)/d]
MassFlows.ETHYLBENZENE 0.01 [ton(short)/y]
MassFlows.o-XYLENE 0.01 [ton(short)/y]
Avg_Comp
T *52.5 [F]
P *162.00 [psia]
Volume Flow 54748.189 [bbl/y]
Sep_Flash
P *47.00 [psia]
June_Comp
Dec_Comp
M1
S1
C1
Avg_Comp
V1
S3
Flash_Tank
Sep_Flash
V3
S4
M2
Total_Flash
CSP1
VOCs
S12
CSP2
HAPs
S13
Tank_Flash
S2
V2
S8
M
Storage_Tanks
Trucked_Condensate
CN1
Trucked_Condensate
Volume Flow 50000.000 [bbl/y]
T 52.5 [F]
P 12.00 [psia]

Simulation Report

File Name:	E-H Receiver Emissions 50kbblyr 07252016
Company:	Virtual Materials Group
Customer:	
Project:	
Job No:	
Prepared By:	
Report Date:	7/25/2016 10:19:18 AM
Unit Set:	Environmental

VMGSim v9.5

File: C:\Users\cdean\Documents\EH Receiver\E-H Receiver Emissions 50kbblyr 07252016.vmp

*Bold face throughout the report denotes specified values.
*Italic face throughout the report denotes recycle values.

Material Streams

	/Avg_Comp	/Dec_Comp	/HAPs
In.VapFrac	0.00	0.00	0.00
In.T [F]	52.5	27.0	60.0
In.P [psia]	162.00	160.00	12.00
In.Mole Flow [lbmol/h]	16.91	8.46	0.02
In.Mass Flow [ton(short)/d]	17.52	8.30	0.02
In.Volume Flow [bbl/y]	54748.189	25907.632	49.039
In.Mole Fraction [Fraction]			
NITROGEN [Fraction]	1.65E-04	3.30E-04	0.00
METHANE [Fraction]	0.0432	0.0432	0.00
CARBON DIOXIDE [Fraction]	0.0012	0.0012	0.00
ETHANE [Fraction]	0.0381	0.0395	0.00
PROPANE [Fraction]	0.0729	0.0825	0.00
ISOBUTANE [Fraction]	0.0304	0.0340	0.00
n-BUTANE [Fraction]	0.0809	0.0950	0.00
ISOPENTANE [Fraction]	0.0622	0.0715	0.00
n-PENTANE [Fraction]	0.0675	0.0794	0.00
2-METHYLPENTANE [Fraction]	0.0703	0.0858	0.00
n-HEXANE [Fraction]	0.0514	0.0592	0.8463
2,2,4-TRIMETHYLPENTANE [Fraction]	8.70E-04	8.70E-04	0.0049
BENZENE [Fraction]	0.0085	0.0095	0.1452
n-HEPTANE [Fraction]	0.1932	0.1955	0.00
TOLUENE [Fraction]	1.50E-05	3.00E-05	6.43E-05
n-OCTANE [Fraction]	0.1571	0.1284	0.00
ETHYLBENZENE [Fraction]	0.0014	8.70E-04	0.0019
o-XYLENE [Fraction]	0.0017	9.50E-04	0.0017
n-NONANE [Fraction]	0.0271	0.0155	0.00
n-DECANE [Fraction]	0.0916	0.0569	0.00
In.Mass Fraction [Fraction]			
NITROGEN [Fraction]	5.35E-05	1.13E-04	0.00
METHANE [Fraction]	0.0080	0.0085	0.00
CARBON DIOXIDE [Fraction]	6.32E-04	6.29E-04	0.00
ETHANE [Fraction]	0.0133	0.0145	0.00
PROPANE [Fraction]	0.0372	0.0444	0.00
ISOBUTANE [Fraction]	0.0204	0.0242	0.00
n-BUTANE [Fraction]	0.0545	0.0675	0.00
ISOPENTANE [Fraction]	0.0520	0.0630	0.00
n-PENTANE [Fraction]	0.0564	0.0700	0.00
2-METHYLPENTANE [Fraction]	0.0702	0.0903	0.00
n-HEXANE [Fraction]	0.0513	0.0623	0.8559
2,2,4-TRIMETHYLPENTANE [Fraction]	0.0012	0.0012	0.0066

BENZENE [Fraction]	0.0077	0.0091	0.1331
n-HEPTANE [Fraction]	0.2242	0.2394	0.00
TOLUENE [Fraction]	1.60E-05	3.38E-05	6.95E-05
n-OCTANE [Fraction]	0.2078	0.1793	0.00
ETHYLBENZENE [Fraction]	0.0017	0.0011	0.0023
o-XYLENE [Fraction]	0.0021	0.0012	0.0021
n-NONANE [Fraction]	0.0403	0.0242	0.00
n-DECANE [Fraction]	0.1510	0.0990	0.00

	/June_Comp	/S1	/S12
In.VapFrac	0.00	0.00	1.00
In.T [F]	77.0	53.5	60.0
In.P [psia]	162.00	160.00	12.00
In.Mole Flow [lbmol/h]	8.46	16.91	1.29
In.Mass Flow [ton(short)/d]	9.22	17.52	0.35
In.Volume Flow [bbl/y]	28847.661	54783.350	928817.206
In.Mole Fraction [Fraction]			
NITROGEN [Fraction]	0.00	1.65E-04	0.0022
METHANE [Fraction]	0.0432	0.0432	0.5626
CARBON DIOXIDE [Fraction]	0.0013	0.0012	0.0154
ETHANE [Fraction]	0.0367	0.0381	0.4198
PROPANE [Fraction]	0.0634	0.0729	0.00
ISOBUTANE [Fraction]	0.0267	0.0304	0.00
n-BUTANE [Fraction]	0.0669	0.0809	0.00
ISOPENTANE [Fraction]	0.0530	0.0622	0.00
n-PENTANE [Fraction]	0.0556	0.0675	0.00
2-METHYLPENTANE [Fraction]	0.0549	0.0703	0.00
n-HEXANE [Fraction]	0.0437	0.0514	0.00
2,2,4-TRIMETHYLPENTANE [Fraction]	8.70E-04	8.70E-04	0.00
BENZENE [Fraction]	0.0076	0.0085	0.00
n-HEPTANE [Fraction]	0.1910	0.1932	0.00
TOLUENE [Fraction]	0.00	1.50E-05	0.00
n-OCTANE [Fraction]	0.1857	0.1571	0.00
ETHYLBENZENE [Fraction]	0.0019	0.0014	0.00
o-XYLENE [Fraction]	0.0025	0.0017	0.00
n-NONANE [Fraction]	0.0388	0.0271	0.00
n-DECANE [Fraction]	0.1264	0.0916	0.00
In.Mass Fraction [Fraction]			
NITROGEN [Fraction]	0.00	5.35E-05	0.0027
METHANE [Fraction]	0.0076	0.0080	0.4032
CARBON DIOXIDE [Fraction]	6.34E-04	6.32E-04	0.0302
ETHANE [Fraction]	0.0121	0.0133	0.5639
PROPANE [Fraction]	0.0307	0.0372	0.00

ISOBUTANE [Fraction]	0.0171	0.0204	0.00
n-BUTANE [Fraction]	0.0428	0.0545	0.00
ISOPENTANE [Fraction]	0.0421	0.0520	0.00
n-PENTANE [Fraction]	0.0441	0.0564	0.00
2-METHYLPENTANE [Fraction]	0.0521	0.0702	0.00
n-HEXANE [Fraction]	0.0414	0.0513	0.00
2,2,4-TRIMETHYLPENTANE [Fraction]	0.0011	0.0012	0.00
BENZENE [Fraction]	0.0065	0.0077	0.00
n-HEPTANE [Fraction]	0.2106	0.2242	0.00
TOLUENE [Fraction]	0.00	1.60E-05	0.00
n-OCTANE [Fraction]	0.2334	0.2078	0.00
ETHYLBENZENE [Fraction]	0.0022	0.0017	0.00
o-XYLENE [Fraction]	0.0029	0.0021	0.00
n-NONANE [Fraction]	0.0548	0.0403	0.00
n-DECANE [Fraction]	0.1978	0.1510	0.00

	/S13	/S2	/S3
In.VapFrac	0.99893	0.00	0.05958
In.T [F]	60.0	47.8	47.8
In.P [psia]	12.00	47.00	47.00
In.Mole Flow [lbmol/h]	1.21	15.90	16.91
In.Mass Flow [ton(short)/d]	0.78	17.20	17.52
In.Volume Flow [bbl/y]	855063.430	53002.711	230783.487
In.Mole Fraction [Fraction]			
NITROGEN [Fraction]	0.00	1.31E-05	1.65E-04
METHANE [Fraction]	0.00	0.0105	0.0432
CARBON DIOXIDE [Fraction]	0.00	6.25E-04	0.0012
ETHANE [Fraction]	0.00	0.0273	0.0381
PROPANE [Fraction]	0.5115	0.0693	0.0729
ISOBUTANE [Fraction]	0.1103	0.0309	0.0304
n-BUTANE [Fraction]	0.2162	0.0836	0.0809
ISOPENTANE [Fraction]	0.0666	0.0655	0.0622
n-PENTANE [Fraction]	0.0563	0.0712	0.0675
2-METHYLPENTANE [Fraction]	0.0230	0.0746	0.0703
n-HEXANE [Fraction]	0.00	0.0546	0.0514
2,2,4-TRIMETHYLPENTANE [Fraction]	0.00	9.24E-04	8.70E-04
BENZENE [Fraction]	0.00	0.0091	0.0085
n-HEPTANE [Fraction]	0.0127	0.2054	0.1932
TOLUENE [Fraction]	0.00	1.59E-05	1.50E-05
n-OCTANE [Fraction]	0.0031	0.1670	0.1571
ETHYLBENZENE [Fraction]	0.00	0.0015	0.0014
o-XYLENE [Fraction]	0.00	0.0018	0.0017
n-NONANE [Fraction]	1.61E-04	0.0289	0.0271

n-DECANE [Fraction]	1.67E-04	0.0974	0.0916
In.Mass Fraction [Fraction]			
NITROGEN [Fraction]	0.00	4.07E-06	5.35E-05
METHANE [Fraction]	0.00	0.0019	0.0080
CARBON DIOXIDE [Fraction]	0.00	3.05E-04	6.32E-04
ETHANE [Fraction]	0.00	0.0091	0.0133
PROPANE [Fraction]	0.4173	0.0339	0.0372
ISOBUTANE [Fraction]	0.1186	0.0200	0.0204
n-BUTANE [Fraction]	0.2325	0.0539	0.0545
ISOPENTANE [Fraction]	0.0890	0.0524	0.0520
n-PENTANE [Fraction]	0.0751	0.0570	0.0564
2-METHYLPENTANE [Fraction]	0.0367	0.0713	0.0702
n-HEXANE [Fraction]	0.00	0.0522	0.0513
2,2,4-TRIMETHYLPENTANE [Fraction]	0.00	0.0012	0.0012
BENZENE [Fraction]	0.00	0.0079	0.0077
n-HEPTANE [Fraction]	0.0235	0.2284	0.2242
TOLUENE [Fraction]	0.00	1.63E-05	1.60E-05
n-OCTANE [Fraction]	0.0065	0.2117	0.2078
ETHYLBENZENE [Fraction]	0.00	0.0017	0.0017
o-XYLENE [Fraction]	0.00	0.0021	0.0021
n-NONANE [Fraction]	3.82E-04	0.0411	0.0403
n-DECANE [Fraction]	4.39E-04	0.1539	0.1510

	/S4	/S8	/Sep_Flash
In.VapFrac	1.00	0.06747	1.00
In.T [F]	43.5	37.9	47.8
In.P [psia]	12.00	12.00	47.00
In.Mole Flow [lbmol/h]	1.01	15.90	1.01
In.Mass Flow [ton(short)/d]	0.33	17.20	0.33
In.Volume Flow [bbl/y]	702961.897	784734.392	177780.776
In.Mole Fraction [Fraction]			
NITROGEN [Fraction]	0.0026	1.31E-05	0.0026
METHANE [Fraction]	0.5589	0.0105	0.5589
CARBON DIOXIDE [Fraction]	0.0110	6.25E-04	0.0110
ETHANE [Fraction]	0.2077	0.0273	0.2077
PROPANE [Fraction]	0.1303	0.0693	0.1303
ISOBUTANE [Fraction]	0.0215	0.0309	0.0215
n-BUTANE [Fraction]	0.0396	0.0836	0.0396
ISOPENTANE [Fraction]	0.0111	0.0655	0.0111
n-PENTANE [Fraction]	0.0093	0.0712	0.0093
2-METHYLPENTANE [Fraction]	0.0037	0.0746	0.0037
n-HEXANE [Fraction]	0.0017	0.0546	0.0017
2,2,4-TRIMETHYLPENTANE [Fraction]	1.01E-05	9.24E-04	1.01E-05

BENZENE [Fraction]	3.02E-04	0.0091	3.02E-04
n-HEPTANE [Fraction]	0.0020	0.2054	0.0020
TOLUENE [Fraction]	1.31E-07	1.59E-05	1.31E-07
n-OCTANE [Fraction]	4.79E-04	0.1670	4.79E-04
ETHYLBENZENE [Fraction]	3.79E-06	0.0015	3.79E-06
o-XYLENE [Fraction]	3.36E-06	0.0018	3.36E-06
n-NONANE [Fraction]	2.50E-05	0.0289	2.50E-05
n-DECANE [Fraction]	2.58E-05	0.0974	2.58E-05
In.Mass Fraction [Fraction]			
NITROGEN [Fraction]	0.0026	4.07E-06	0.0026
METHANE [Fraction]	0.3287	0.0019	0.3287
CARBON DIOXIDE [Fraction]	0.0177	3.05E-04	0.0177
ETHANE [Fraction]	0.2289	0.0091	0.2289
PROPANE [Fraction]	0.2106	0.0339	0.2106
ISOBUTANE [Fraction]	0.0458	0.0200	0.0458
n-BUTANE [Fraction]	0.0844	0.0539	0.0844
ISOPENTANE [Fraction]	0.0293	0.0524	0.0293
n-PENTANE [Fraction]	0.0245	0.0570	0.0245
2-METHYLPENTANE [Fraction]	0.0116	0.0713	0.0116
n-HEXANE [Fraction]	0.0055	0.0522	0.0055
2,2,4-TRIMETHYLPENTANE [Fraction]	4.24E-05	0.0012	4.24E-05
BENZENE [Fraction]	8.64E-04	0.0079	8.64E-04
n-HEPTANE [Fraction]	0.0073	0.2284	0.0073
TOLUENE [Fraction]	4.44E-07	1.63E-05	4.44E-07
n-OCTANE [Fraction]	0.0020	0.2117	0.0020
ETHYLBENZENE [Fraction]	1.47E-05	0.0017	1.47E-05
o-XYLENE [Fraction]	1.31E-05	0.0021	1.31E-05
n-NONANE [Fraction]	1.17E-04	0.0411	1.17E-04
n-DECANE [Fraction]	1.35E-04	0.1539	1.35E-04

	/Tank_Flash	/Total_Flash	/Trucked_Condensate
In.VapFrac	1.00	1.00	0.00
In.T [F]	52.5	49.6	52.5
In.P [psia]	12.00	12.00	12.00
In.Mole Flow [lbmol/h]	1.50	2.51	14.40
In.Mass Flow [ton(short)/d]	0.81	1.14	16.38
In.Volume Flow [bbl/y]	1055498.553	1762088.680	50000.000
In.Mole Fraction [Fraction]			
NITROGEN [Fraction]	1.37E-04	0.0011	1.76E-07
METHANE [Fraction]	0.1069	0.2885	5.06E-04
CARBON DIOXIDE [Fraction]	0.0058	0.0079	8.29E-05
ETHANE [Fraction]	0.2204	0.2153	0.0072
PROPANE [Fraction]	0.3237	0.2460	0.0428

ISOBUTANE [Fraction]	0.0742	0.0530	0.0264
n-BUTANE [Fraction]	0.1472	0.1040	0.0769
ISOPENTANE [Fraction]	0.0461	0.0321	0.0675
n-PENTANE [Fraction]	0.0390	0.0271	0.0745
2-METHYLPENTANE [Fraction]	0.0160	0.0111	0.0807
n-HEXANE [Fraction]	0.0078	0.0053	0.0595
2,2,4-TRIMETHYLPENTANE [Fraction]	4.50E-05	3.10E-05	0.0010
BENZENE [Fraction]	0.0013	9.17E-04	0.0099
n-HEPTANE [Fraction]	0.0089	0.0061	0.2258
TOLUENE [Fraction]	5.91E-07	4.06E-07	1.75E-05
n-OCTANE [Fraction]	0.0022	0.0015	0.1842
ETHYLBENZENE [Fraction]	1.71E-05	1.17E-05	0.0016
o-XYLENE [Fraction]	1.52E-05	1.04E-05	0.0020
n-NONANE [Fraction]	1.13E-04	7.74E-05	0.0319
n-DECANE [Fraction]	1.17E-04	8.02E-05	0.1076
In.Mass Fraction [Fraction]			
NITROGEN [Fraction]	8.49E-05	8.19E-04	5.19E-08
METHANE [Fraction]	0.0379	0.1217	8.56E-05
CARBON DIOXIDE [Fraction]	0.0057	0.0091	3.85E-05
ETHANE [Fraction]	0.1465	0.1703	0.0023
PROPANE [Fraction]	0.3157	0.2854	0.0199
ISOBUTANE [Fraction]	0.0954	0.0811	0.0162
n-BUTANE [Fraction]	0.1892	0.1590	0.0472
ISOPENTANE [Fraction]	0.0736	0.0608	0.0514
n-PENTANE [Fraction]	0.0623	0.0514	0.0567
2-METHYLPENTANE [Fraction]	0.0306	0.0251	0.0733
n-HEXANE [Fraction]	0.0148	0.0121	0.0541
2,2,4-TRIMETHYLPENTANE [Fraction]	1.14E-04	9.31E-05	0.0012
BENZENE [Fraction]	0.0023	0.0019	0.0081
n-HEPTANE [Fraction]	0.0196	0.0161	0.2388
TOLUENE [Fraction]	1.20E-06	9.85E-07	1.71E-05
n-OCTANE [Fraction]	0.0054	0.0045	0.2220
ETHYLBENZENE [Fraction]	4.01E-05	3.28E-05	0.0018
o-XYLENE [Fraction]	3.56E-05	2.91E-05	0.0022
n-NONANE [Fraction]	3.19E-04	2.61E-04	0.0431
n-DECANE [Fraction]	3.67E-04	3.00E-04	0.1615

	/VOCs
In.VapFrac	0.99668
In.T [F]	60.0
In.P [psia]	12.00
In.Mole Flow [lbmol/h]	1.22
In.Mass Flow [ton(short)/d]	0.80

In.Volume Flow [bbl/y]	864121.905
In.Mole Fraction [Fraction]	
NITROGEN [Fraction]	0.00
METHANE [Fraction]	0.00
CARBON DIOXIDE [Fraction]	0.00
ETHANE [Fraction]	0.00
PROPANE [Fraction]	0.5049
ISOBUTANE [Fraction]	0.1088
n-BUTANE [Fraction]	0.2134
ISOPENTANE [Fraction]	0.0658
n-PENTANE [Fraction]	0.0555
2-METHYLPENTANE [Fraction]	0.0227
n-HEXANE [Fraction]	0.0110
2,2,4-TRIMETHYLPENTANE [Fraction]	6.36E-05
BENZENE [Fraction]	0.0019
n-HEPTANE [Fraction]	0.0125
TOLUENE [Fraction]	8.34E-07
n-OCTANE [Fraction]	0.0030
ETHYLBENZENE [Fraction]	2.41E-05
o-XYLENE [Fraction]	2.14E-05
n-NONANE [Fraction]	1.59E-04
n-DECANE [Fraction]	1.65E-04
In.Mass Fraction [Fraction]	
NITROGEN [Fraction]	0.00
METHANE [Fraction]	0.00
CARBON DIOXIDE [Fraction]	0.00
ETHANE [Fraction]	0.00
PROPANE [Fraction]	0.4089
ISOBUTANE [Fraction]	0.1162
n-BUTANE [Fraction]	0.2278
ISOPENTANE [Fraction]	0.0872
n-PENTANE [Fraction]	0.0736
2-METHYLPENTANE [Fraction]	0.0359
n-HEXANE [Fraction]	0.0174
2,2,4-TRIMETHYLPENTANE [Fraction]	1.33E-04
BENZENE [Fraction]	0.0027
n-HEPTANE [Fraction]	0.0230
TOLUENE [Fraction]	1.41E-06
n-OCTANE [Fraction]	0.0064
ETHYLBENZENE [Fraction]	4.69E-05
o-XYLENE [Fraction]	4.17E-05
n-NONANE [Fraction]	3.74E-04
n-DECANE [Fraction]	4.30E-04

E&H Condensate composition from VMGSim 07-25-16

	/Trucked_Condensate			
In.VapFrac	0			
In.T [F]	52.5			
In.P [psia]	12			
In.Mole Flow [lbmol/h]	14.4			
In.Mass Flow [ton(short)/d]	16.38			
In.Volume Flow [bbl/y]	50000			
In.Mass Fraction [Fraction]	mol frac	mol%		
NITROGEN [Fraction]	5.19E-08	5.19E-06		
METHANE [Fraction]	8.56E-05	8.56E-03		
CARBON DIOXIDE [Fraction]	3.85E-05	3.85E-03		
ETHANE [Fraction]	0.0023	0.230	light ends split between	
PROPANE [Fraction]	0.0199	1.990	2.232	butanes
ISOBUTANE [Fraction]	0.0162	1.620		2.736
n-BUTANE [Fraction]	0.0472	4.720		5.836
ISOPENTANE [Fraction]	0.0514	5.140		5.14
n-PENTANE [Fraction]	0.0567	5.670		5.67
2-METHYLPENTANE [Fraction]	0.0733	7.330		
n-HEXANE [Fraction]	0.0541	5.410	hexanes	12.74
2,2,4-TRIMETHYLPENTANE [Fraction]	0.0012	0.120		0.12
BENZENE [Fraction]	0.0081	0.810		0.81
n-HEPTANE [Fraction]	0.2388	23.880		23.88
TOLUENE [Fraction]	1.71E-05	1.71E-03		0.00171
n-OCTANE [Fraction]	0.222	22.200		22.20
ETHYLBENZENE [Fraction]	0.0018	0.180		0.18
o-XYLENE [Fraction]	0.0022	0.220		0.22
n-NONANE [Fraction]	0.0431	4.310		4.31
n-DECANE [Fraction]	0.1615	16.150		16.15
		99.994		99.994

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

Identification

User Identification:	E&H Condensate 2016 PTE
City:	
State:	New Mexico
Company:	
Type of Tank:	Vertical Fixed Roof Tank
Description:	E&H Receiver (3) 300-bbl condensate tanks 50,000 bpy PTE throughput assume each tank gets all of annual thruput nitrogen thru propane added to butanes

Tank Dimensions

Shell Height (ft):	15.00
Diameter (ft):	12.00
Liquid Height (ft) :	14.00
Avg. Liquid Height (ft):	7.00
Volume (gallons):	11,844.41
Turnovers:	177.30
Net Throughput(gal/yr):	2,100,000.00
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:	Cone
Height (ft)	0.00
Slope (ft/ft) (Cone Roof)	0.06

Breather Vent Settings

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

Meterological Data used in Emissions Calculations: Grand Junction, Colorado (Avg Atmospheric Pressure = 12.37 psia)

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

E&H Condensate 2016 PTE - Vertical Fixed Roof Tank

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
E&H condensate July 2016	All	63.14	51.01	75.26	56.01	5.7231	4.4579	7.2462	64.3041			96.14	
2,2,4-Trimethylpentane (isooctane)						0.6516	0.4572	0.9108	114.2300	0.0012	0.0002	114.23	Option 2: A=6.8118, B=1257.84, C=220.74
Benzene						1.2732	0.9053	1.7574	78.1100	0.0081	0.0027	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Decane (-n)						0.0359	0.0271	0.0474	142.2900	0.1615	0.0015	142.29	Option 1: VP60 = .033211 VP70 = .041762
Ethylbenzene						0.1210	0.0788	0.1812	106.1700	0.0018	0.0001	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Heptane (-n)						0.6714	0.4650	0.9534	100.2000	0.2388	0.0419	100.20	Option 3: A=37358, B=8.2585
Hexane (-n)						2.0749	1.5069	2.8080	86.1700	0.1274	0.0691	86.17	Option 2: A=6.876, B=1171.17, C=224.41
i-butane						27.7317	22.0390	34.4463	58.1300	0.0274	0.1982	58.13	Option 1: VP60 = 26.098 VP70 = 31.306
Isopentane						10.7970	8.1027	14.0059	72.1500	0.0514	0.1450	72.15	Option 1: VP60 = 10.005 VP70 = 12.53
n-butane						27.7317	22.0390	34.4463	58.1300	0.0584	0.4228	58.13	Option 1: VP60 = 26.098 VP70 = 31.306
Nonane (-n)						0.0709	0.0527	0.0950	128.2600	0.0431	0.0008	128.26	Option 1: VP60 = .065278 VP70 = .08309
Octane (-n)						0.1589	0.1157	0.2174	114.2300	0.2220	0.0092	114.23	Option 1: VP60 = .145444 VP70 = .188224
Pentane (-n)						7.3255	5.5795	9.5000	72.1500	0.0567	0.1085	72.15	Option 3: A=27691, B=7.558
Toluene						0.3638	0.2480	0.5223	92.1300	0.0000	0.0000	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylenes (mixed isomers)						0.1008	0.0654	0.1516	106.1700	0.0022	0.0001	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)

E&H Condensate 2016 PTE - Vertical Fixed Roof Tank

Annual Emission Calcaulations

Standing Losses (lb):	3,196.4838
Vapor Space Volume (cu ft):	918.9159
Vapor Density (lb/cu ft):	0.0656
Vapor Space Expansion Factor:	0.5033
Vented Vapor Saturation Factor:	0.2886
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	918.9159
Tank Diameter (ft):	12.0000
Vapor Space Outage (ft):	8.1250
Tank Shell Height (ft):	15.0000
Average Liquid Height (ft):	7.0000
Roof Outage (ft):	0.1250
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.1250
Roof Height (ft):	0.0000
Roof Slope (ft/ft):	0.0625
Shell Radius (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0656
Vapor Molecular Weight (lb/lb-mole):	64.3041
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	5.7231
Daily Avg. Liquid Surface Temp. (deg. R):	522.8068
Daily Average Ambient Temp. (deg. F):	52.9333
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	515.6833
Tank Paint Solar Absorptance (Shell):	0.6800
Tank Paint Solar Absorptance (Roof):	0.6800
Daily Total Solar Insulation Factor (Btu/sqft day):	1,578.3125
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.5033
Daily Vapor Temperature Range (deg. R):	48.5071
Daily Vapor Pressure Range (psia):	2.7883
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	5.7231
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	4.4579
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	7.2462
Daily Avg. Liquid Surface Temp. (deg R):	522.8068
Daily Min. Liquid Surface Temp. (deg R):	510.6801
Daily Max. Liquid Surface Temp. (deg R):	534.9336
Daily Ambient Temp. Range (deg. R):	25.6333
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.2886
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	5.7231
Vapor Space Outage (ft):	8.1250

Working Losses (lb):	6,180.3522
Vapor Molecular Weight (lb/lb-mole):	64.3041
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	5.7231
Annual Net Throughput (gal/yr.):	2,100,000.0000
Annual Turnovers:	177.2988
Turnover Factor:	0.3359
Maximum Liquid Volume (gal):	11,844.4147
Maximum Liquid Height (ft):	14.0000
Tank Diameter (ft):	12.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	9,376.8360

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

Emissions Report for: Annual

E&H Condensate 2016 PTE - Vertical Fixed Roof Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
n-butane	2,613.09	1,351.49	3,964.58
Isopentane	896.05	463.44	1,359.48
E&H condensate July 2016	6,180.35	3,196.48	9,376.84
i-butane	1,225.05	633.60	1,858.65
Pentane (-n)	670.63	346.85	1,017.48
Hexane (-n)	426.81	220.74	647.55
2,2,4-Trimethylpentane (isooctane)	1.26	0.65	1.92
Benzene	16.65	8.61	25.26
Heptane (-n)	258.86	133.88	392.74
Toluene	0.01	0.01	0.02
Octane (-n)	56.94	29.45	86.39
Ethylbenzene	0.35	0.18	0.53
Xylenes (mixed isomers)	0.36	0.19	0.54
Nonane (-n)	4.93	2.55	7.48
Decane (-n)	9.36	4.84	14.20

E&H Receiver VOC Emissions from Condensate Tank Flash plus Working & Breathing

Unit Number: TK-CAP (combined emissions from Tanks TK-1, TK-2 and TK-3)
Description: Three 300-bbl Condensate Storage Tanks

Emission Rates

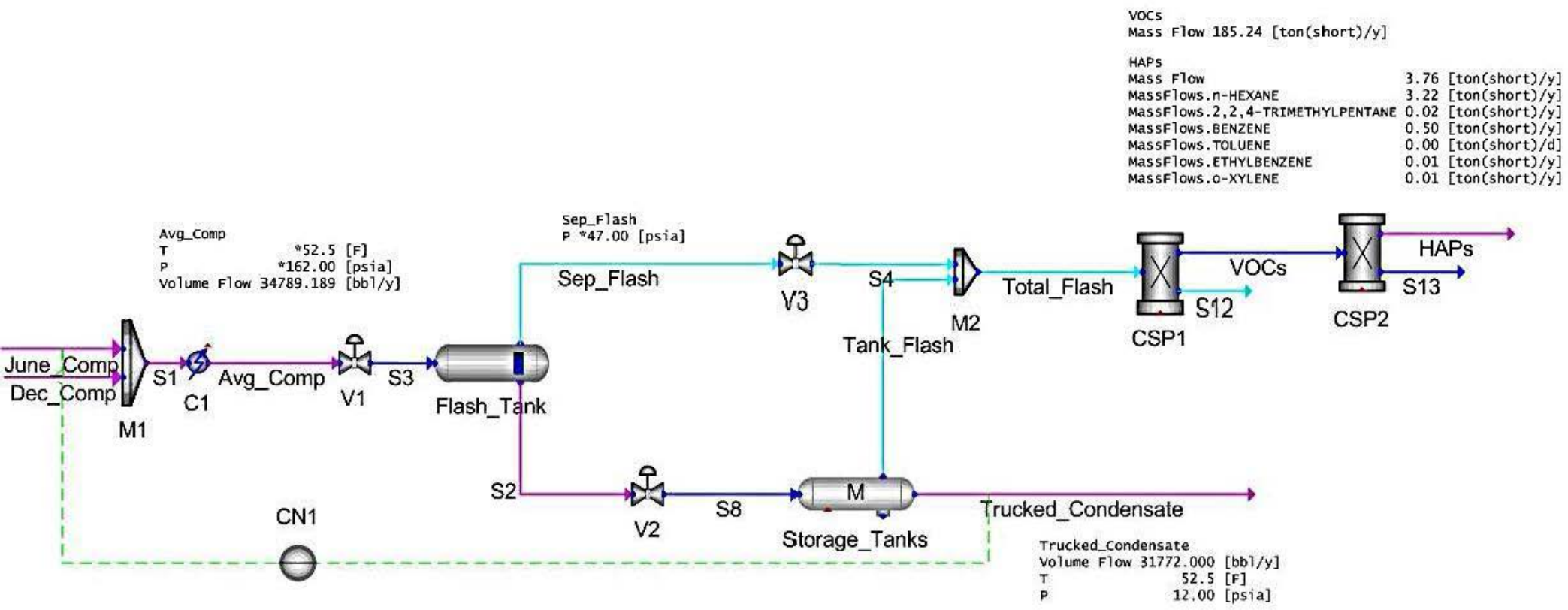
Throughput

31,772 bbl/yr **actual 2015 12-month throughput**

Williams Four Corners LLC

Source/Pollutants	Working/Breathing Losses, ppy	Working/Breathing Losses, tpy	Flash Losses, tpy	Uncontrolled Emission Rates, tpy
TK-CAP				
VOC	8,258.87	4.13	185.24	189.37
n-Hexane	57.35	0.03	3.22	3.25
Benzene	22.25	1.11E-02	0.50	0.51
Toluene	0.01	5.00E-06	0.00	5.00E-06
Ethylbenzene	0.47	2.35E-04	0.01	0.01
Xylene	0.48	2.40E-04	0.01	0.01

Note: Results from Tanks 4.09d (working & breathing losses) are calculated on a per-tank basis, multiplied by three for the three tanks, whereas flashing losses are total emissions.


VOCs
Mass Flow 185.24 [ton(short)/y]
HAPs
Mass Flow 3.76 [ton(short)/y]
MassFlows.n-HEXANE 3.22 [ton(short)/y]
MassFlows.2,2,4-TRIMETHYLPENTANE 0.02 [ton(short)/y]
MassFlows.BENZENE 0.50 [ton(short)/y]
MassFlows.TOLUENE 0.00 [ton(short)/d]
MassFlows.ETHYLBENZENE 0.01 [ton(short)/y]
MassFlows.o-XYLENE 0.01 [ton(short)/y]
Avg_Comp
T *52.5 [F]
P *162.00 [psia]
Volume Flow 34789.189 [bbl/y]
Sep_Flash
P *47.00 [psia]
June_Comp
Dec_Comp
M1
S1
C1
Avg_Comp
V1
S3
Flash_Tank
Sep_Flash
V3
S4
M2
Total_Flash
CSP1
VOCs
S12
CSP2
HAPs
S13
Tank_Flash
S2
V2
S8
M
Storage_Tanks
Trucked_Condensate
CN1
Trucked_Condensate
Volume Flow 31772.000 [bbl/y]
T 52.5 [F]
P 12.00 [psia]

Simulation Report

File Name:	E-H Receiver Emissions 32kbblyr 07252016
Company:	Virtual Materials Group
Customer:	
Project:	
Job No:	
Prepared By:	
Report Date:	7/25/2016 10:22:05 AM
Unit Set:	Environmental

VMGSim v9.5

File: C:\Users\cdean\Documents\EH Receiver\E-H Receiver Emissions 32kbblyr 07252016.vmp

*Bold face throughout the report denotes specified values.
*Italic face throughout the report denotes recycle values.

Material Streams

	/Avg_Comp	/Dec_Comp	/HAPs
In.VapFrac	0.00	0.00	0.00
In.T [F]	52.5	27.0	60.0
In.P [psia]	162.00	160.00	12.00
In.Mole Flow [lbmol/h]	10.75	5.37	0.01
In.Mass Flow [ton(short)/d]	11.14	5.28	0.01
In.Volume Flow [bbl/y]	34789.189	16462.745	31.161
In.Mole Fraction [Fraction]			
NITROGEN [Fraction]	1.65E-04	3.30E-04	0.00
METHANE [Fraction]	0.0432	0.0432	0.00
CARBON DIOXIDE [Fraction]	0.0012	0.0012	0.00
ETHANE [Fraction]	0.0381	0.0395	0.00
PROPANE [Fraction]	0.0729	0.0825	0.00
ISOBUTANE [Fraction]	0.0304	0.0340	0.00
n-BUTANE [Fraction]	0.0809	0.0950	0.00
ISOPENTANE [Fraction]	0.0622	0.0715	0.00
n-PENTANE [Fraction]	0.0675	0.0794	0.00
2-METHYLPENTANE [Fraction]	0.0703	0.0858	0.00
n-HEXANE [Fraction]	0.0514	0.0592	0.8463
2,2,4-TRIMETHYLPENTANE [Fraction]	8.70E-04	8.70E-04	0.0049
BENZENE [Fraction]	0.0085	0.0095	0.1452
n-HEPTANE [Fraction]	0.1932	0.1955	0.00
TOLUENE [Fraction]	1.50E-05	3.00E-05	6.43E-05
n-OCTANE [Fraction]	0.1571	0.1284	0.00
ETHYLBENZENE [Fraction]	0.0014	8.70E-04	0.0019
o-XYLENE [Fraction]	0.0017	9.50E-04	0.0017
n-NONANE [Fraction]	0.0271	0.0155	0.00
n-DECANE [Fraction]	0.0916	0.0569	0.00
In.Mass Fraction [Fraction]			
NITROGEN [Fraction]	5.35E-05	1.13E-04	0.00
METHANE [Fraction]	0.0080	0.0085	0.00
CARBON DIOXIDE [Fraction]	6.32E-04	6.29E-04	0.00
ETHANE [Fraction]	0.0133	0.0145	0.00
PROPANE [Fraction]	0.0372	0.0444	0.00
ISOBUTANE [Fraction]	0.0204	0.0242	0.00
n-BUTANE [Fraction]	0.0545	0.0675	0.00
ISOPENTANE [Fraction]	0.0520	0.0630	0.00
n-PENTANE [Fraction]	0.0564	0.0700	0.00
2-METHYLPENTANE [Fraction]	0.0702	0.0903	0.00
n-HEXANE [Fraction]	0.0513	0.0623	0.8559
2,2,4-TRIMETHYLPENTANE [Fraction]	0.0012	0.0012	0.0066

BENZENE [Fraction]	0.0077	0.0091	0.1331
n-HEPTANE [Fraction]	0.2242	0.2394	0.00
TOLUENE [Fraction]	1.60E-05	3.38E-05	6.95E-05
n-OCTANE [Fraction]	0.2078	0.1793	0.00
ETHYLBENZENE [Fraction]	0.0017	0.0011	0.0023
o-XYLENE [Fraction]	0.0021	0.0012	0.0021
n-NONANE [Fraction]	0.0403	0.0242	0.00
n-DECANE [Fraction]	0.1510	0.0990	0.00

	/June_Comp	/S1	/S12
In.VapFrac	0.00	0.00	1.00
In.T [F]	77.0	53.5	60.0
In.P [psia]	162.00	160.00	12.00
In.Mole Flow [lbmol/h]	5.37	10.75	0.82
In.Mass Flow [ton(short)/d]	5.86	11.14	0.22
In.Volume Flow [bbl/y]	18330.958	34811.532	590207.606
In.Mole Fraction [Fraction]			
NITROGEN [Fraction]	0.00	1.65E-04	0.0022
METHANE [Fraction]	0.0432	0.0432	0.5626
CARBON DIOXIDE [Fraction]	0.0013	0.0012	0.0154
ETHANE [Fraction]	0.0367	0.0381	0.4198
PROPANE [Fraction]	0.0634	0.0729	0.00
ISOBUTANE [Fraction]	0.0267	0.0304	0.00
n-BUTANE [Fraction]	0.0669	0.0809	0.00
ISOPENTANE [Fraction]	0.0530	0.0622	0.00
n-PENTANE [Fraction]	0.0556	0.0675	0.00
2-METHYLPENTANE [Fraction]	0.0549	0.0703	0.00
n-HEXANE [Fraction]	0.0437	0.0514	0.00
2,2,4-TRIMETHYLPENTANE [Fraction]	8.70E-04	8.70E-04	0.00
BENZENE [Fraction]	0.0076	0.0085	0.00
n-HEPTANE [Fraction]	0.1910	0.1932	0.00
TOLUENE [Fraction]	0.00	1.50E-05	0.00
n-OCTANE [Fraction]	0.1857	0.1571	0.00
ETHYLBENZENE [Fraction]	0.0019	0.0014	0.00
o-XYLENE [Fraction]	0.0025	0.0017	0.00
n-NONANE [Fraction]	0.0388	0.0271	0.00
n-DECANE [Fraction]	0.1264	0.0916	0.00
In.Mass Fraction [Fraction]			
NITROGEN [Fraction]	0.00	5.35E-05	0.0027
METHANE [Fraction]	0.0076	0.0080	0.4032
CARBON DIOXIDE [Fraction]	6.34E-04	6.32E-04	0.0302
ETHANE [Fraction]	0.0121	0.0133	0.5639
PROPANE [Fraction]	0.0307	0.0372	0.00

ISOBUTANE [Fraction]	0.0171	0.0204	0.00
n-BUTANE [Fraction]	0.0428	0.0545	0.00
ISOPENTANE [Fraction]	0.0421	0.0520	0.00
n-PENTANE [Fraction]	0.0441	0.0564	0.00
2-METHYLPENTANE [Fraction]	0.0521	0.0702	0.00
n-HEXANE [Fraction]	0.0414	0.0513	0.00
2,2,4-TRIMETHYLPENTANE [Fraction]	0.0011	0.0012	0.00
BENZENE [Fraction]	0.0065	0.0077	0.00
n-HEPTANE [Fraction]	0.2106	0.2242	0.00
TOLUENE [Fraction]	0.00	1.60E-05	0.00
n-OCTANE [Fraction]	0.2334	0.2078	0.00
ETHYLBENZENE [Fraction]	0.0022	0.0017	0.00
o-XYLENE [Fraction]	0.0029	0.0021	0.00
n-NONANE [Fraction]	0.0548	0.0403	0.00
n-DECANE [Fraction]	0.1978	0.1510	0.00

	/S13	/S2	/S3
In.VapFrac	0.99893	0.00	0.05958
In.T [F]	60.0	47.8	47.8
In.P [psia]	12.00	47.00	47.00
In.Mole Flow [lbmol/h]	0.77	10.11	10.75
In.Mass Flow [ton(short)/d]	0.50	10.93	11.14
In.Volume Flow [bbl/y]	543341.506	33680.043	146649.059
In.Mole Fraction [Fraction]			
NITROGEN [Fraction]	0.00	1.31E-05	1.65E-04
METHANE [Fraction]	0.00	0.0105	0.0432
CARBON DIOXIDE [Fraction]	0.00	6.25E-04	0.0012
ETHANE [Fraction]	0.00	0.0273	0.0381
PROPANE [Fraction]	0.5115	0.0693	0.0729
ISOBUTANE [Fraction]	0.1103	0.0309	0.0304
n-BUTANE [Fraction]	0.2162	0.0836	0.0809
ISOPENTANE [Fraction]	0.0666	0.0655	0.0622
n-PENTANE [Fraction]	0.0563	0.0712	0.0675
2-METHYLPENTANE [Fraction]	0.0230	0.0746	0.0703
n-HEXANE [Fraction]	0.00	0.0546	0.0514
2,2,4-TRIMETHYLPENTANE [Fraction]	0.00	9.24E-04	8.70E-04
BENZENE [Fraction]	0.00	0.0091	0.0085
n-HEPTANE [Fraction]	0.0127	0.2054	0.1932
TOLUENE [Fraction]	0.00	1.59E-05	1.50E-05
n-OCTANE [Fraction]	0.0031	0.1670	0.1571
ETHYLBENZENE [Fraction]	0.00	0.0015	0.0014
o-XYLENE [Fraction]	0.00	0.0018	0.0017
n-NONANE [Fraction]	1.61E-04	0.0289	0.0271

n-DECANE [Fraction]	1.67E-04	0.0974	0.0916
In.Mass Fraction [Fraction]			
NITROGEN [Fraction]	0.00	4.07E-06	5.35E-05
METHANE [Fraction]	0.00	0.0019	0.0080
CARBON DIOXIDE [Fraction]	0.00	3.05E-04	6.32E-04
ETHANE [Fraction]	0.00	0.0091	0.0133
PROPANE [Fraction]	0.4173	0.0339	0.0372
ISOBUTANE [Fraction]	0.1186	0.0200	0.0204
n-BUTANE [Fraction]	0.2325	0.0539	0.0545
ISOPENTANE [Fraction]	0.0890	0.0524	0.0520
n-PENTANE [Fraction]	0.0751	0.0570	0.0564
2-METHYLPENTANE [Fraction]	0.0367	0.0713	0.0702
n-HEXANE [Fraction]	0.00	0.0522	0.0513
2,2,4-TRIMETHYLPENTANE [Fraction]	0.00	0.0012	0.0012
BENZENE [Fraction]	0.00	0.0079	0.0077
n-HEPTANE [Fraction]	0.0235	0.2284	0.2242
TOLUENE [Fraction]	0.00	1.63E-05	1.60E-05
n-OCTANE [Fraction]	0.0065	0.2117	0.2078
ETHYLBENZENE [Fraction]	0.00	0.0017	0.0017
o-XYLENE [Fraction]	0.00	0.0021	0.0021
n-NONANE [Fraction]	3.82E-04	0.0411	0.0403
n-DECANE [Fraction]	4.39E-04	0.1539	0.1510

	/S4	/S8	/Sep_Flash
In.VapFrac	1.00	0.06747	1.00
In.T [F]	43.5	37.9	47.8
In.P [psia]	12.00	12.00	47.00
In.Mole Flow [lbmol/h]	0.64	10.11	0.64
In.Mass Flow [ton(short)/d]	0.21	10.93	0.21
In.Volume Flow [bbl/y]	446690.108	498651.622	112969.016
In.Mole Fraction [Fraction]			
NITROGEN [Fraction]	0.0026	1.31E-05	0.0026
METHANE [Fraction]	0.5589	0.0105	0.5589
CARBON DIOXIDE [Fraction]	0.0110	6.25E-04	0.0110
ETHANE [Fraction]	0.2077	0.0273	0.2077
PROPANE [Fraction]	0.1303	0.0693	0.1303
ISOBUTANE [Fraction]	0.0215	0.0309	0.0215
n-BUTANE [Fraction]	0.0396	0.0836	0.0396
ISOPENTANE [Fraction]	0.0111	0.0655	0.0111
n-PENTANE [Fraction]	0.0093	0.0712	0.0093
2-METHYLPENTANE [Fraction]	0.0037	0.0746	0.0037
n-HEXANE [Fraction]	0.0017	0.0546	0.0017
2,2,4-TRIMETHYLPENTANE [Fraction]	1.01E-05	9.24E-04	1.01E-05

BENZENE [Fraction]	3.02E-04	0.0091	3.02E-04
n-HEPTANE [Fraction]	0.0020	0.2054	0.0020
TOLUENE [Fraction]	1.31E-07	1.59E-05	1.31E-07
n-OCTANE [Fraction]	4.79E-04	0.1670	4.79E-04
ETHYLBENZENE [Fraction]	3.79E-06	0.0015	3.79E-06
o-XYLENE [Fraction]	3.36E-06	0.0018	3.36E-06
n-NONANE [Fraction]	2.50E-05	0.0289	2.50E-05
n-DECANE [Fraction]	2.58E-05	0.0974	2.58E-05
In.Mass Fraction [Fraction]			
NITROGEN [Fraction]	0.0026	4.07E-06	0.0026
METHANE [Fraction]	0.3287	0.0019	0.3287
CARBON DIOXIDE [Fraction]	0.0177	3.05E-04	0.0177
ETHANE [Fraction]	0.2289	0.0091	0.2289
PROPANE [Fraction]	0.2106	0.0339	0.2106
ISOBUTANE [Fraction]	0.0458	0.0200	0.0458
n-BUTANE [Fraction]	0.0844	0.0539	0.0844
ISOPENTANE [Fraction]	0.0293	0.0524	0.0293
n-PENTANE [Fraction]	0.0245	0.0570	0.0245
2-METHYLPENTANE [Fraction]	0.0116	0.0713	0.0116
n-HEXANE [Fraction]	0.0055	0.0522	0.0055
2,2,4-TRIMETHYLPENTANE [Fraction]	4.24E-05	0.0012	4.24E-05
BENZENE [Fraction]	8.64E-04	0.0079	8.64E-04
n-HEPTANE [Fraction]	0.0073	0.2284	0.0073
TOLUENE [Fraction]	4.44E-07	1.63E-05	4.44E-07
n-OCTANE [Fraction]	0.0020	0.2117	0.0020
ETHYLBENZENE [Fraction]	1.47E-05	0.0017	1.47E-05
o-XYLENE [Fraction]	1.31E-05	0.0021	1.31E-05
n-NONANE [Fraction]	1.17E-04	0.0411	1.17E-04
n-DECANE [Fraction]	1.35E-04	0.1539	1.35E-04

	/Tank_Flash	/Total_Flash	/Trucked_Condensate
In.VapFrac	1.00	1.00	0.00
In.T [F]	52.5	49.6	52.5
In.P [psia]	12.00	12.00	12.00
In.Mole Flow [lbmol/h]	0.95	1.59	9.15
In.Mass Flow [ton(short)/d]	0.52	0.73	10.41
In.Volume Flow [bbl/y]	670706.001	1119701.631	31772.000
In.Mole Fraction [Fraction]			
NITROGEN [Fraction]	1.37E-04	0.0011	1.76E-07
METHANE [Fraction]	0.1069	0.2885	5.06E-04
CARBON DIOXIDE [Fraction]	0.0058	0.0079	8.29E-05
ETHANE [Fraction]	0.2204	0.2153	0.0072
PROPANE [Fraction]	0.3237	0.2460	0.0428

ISOBUTANE [Fraction]	0.0742	0.0530	0.0264
n-BUTANE [Fraction]	0.1472	0.1040	0.0769
ISOPENTANE [Fraction]	0.0461	0.0321	0.0675
n-PENTANE [Fraction]	0.0390	0.0271	0.0745
2-METHYLPENTANE [Fraction]	0.0160	0.0111	0.0807
n-HEXANE [Fraction]	0.0078	0.0053	0.0595
2,2,4-TRIMETHYLPENTANE [Fraction]	4.50E-05	3.10E-05	0.0010
BENZENE [Fraction]	0.0013	9.17E-04	0.0099
n-HEPTANE [Fraction]	0.0089	0.0061	0.2258
TOLUENE [Fraction]	5.91E-07	4.06E-07	1.75E-05
n-OCTANE [Fraction]	0.0022	0.0015	0.1842
ETHYLBENZENE [Fraction]	1.71E-05	1.17E-05	0.0016
o-XYLENE [Fraction]	1.52E-05	1.04E-05	0.0020
n-NONANE [Fraction]	1.13E-04	7.74E-05	0.0319
n-DECANE [Fraction]	1.17E-04	8.02E-05	0.1076
In.Mass Fraction [Fraction]			
NITROGEN [Fraction]	8.49E-05	8.19E-04	5.19E-08
METHANE [Fraction]	0.0379	0.1217	8.56E-05
CARBON DIOXIDE [Fraction]	0.0057	0.0091	3.85E-05
ETHANE [Fraction]	0.1465	0.1703	0.0023
PROPANE [Fraction]	0.3157	0.2854	0.0199
ISOBUTANE [Fraction]	0.0954	0.0811	0.0162
n-BUTANE [Fraction]	0.1892	0.1590	0.0472
ISOPENTANE [Fraction]	0.0736	0.0608	0.0514
n-PENTANE [Fraction]	0.0623	0.0514	0.0567
2-METHYLPENTANE [Fraction]	0.0306	0.0251	0.0733
n-HEXANE [Fraction]	0.0148	0.0121	0.0541
2,2,4-TRIMETHYLPENTANE [Fraction]	1.14E-04	9.31E-05	0.0012
BENZENE [Fraction]	0.0023	0.0019	0.0081
n-HEPTANE [Fraction]	0.0196	0.0161	0.2388
TOLUENE [Fraction]	1.20E-06	9.85E-07	1.71E-05
n-OCTANE [Fraction]	0.0054	0.0045	0.2220
ETHYLBENZENE [Fraction]	4.01E-05	3.28E-05	0.0018
o-XYLENE [Fraction]	3.56E-05	2.91E-05	0.0022
n-NONANE [Fraction]	3.19E-04	2.61E-04	0.0431
n-DECANE [Fraction]	3.67E-04	3.00E-04	0.1615

	/VOCs
In.VapFrac	0.99668
In.T [F]	60.0
In.P [psia]	12.00
In.Mole Flow [lbmol/h]	0.78
In.Mass Flow [ton(short)/d]	0.51

In.Volume Flow [bbl/y]	549097.623
In.Mole Fraction [Fraction]	
NITROGEN [Fraction]	0.00
METHANE [Fraction]	0.00
CARBON DIOXIDE [Fraction]	0.00
ETHANE [Fraction]	0.00
PROPANE [Fraction]	0.5049
ISOBUTANE [Fraction]	0.1088
n-BUTANE [Fraction]	0.2134
ISOPENTANE [Fraction]	0.0658
n-PENTANE [Fraction]	0.0555
2-METHYLPENTANE [Fraction]	0.0227
n-HEXANE [Fraction]	0.0110
2,2,4-TRIMETHYLPENTANE [Fraction]	6.36E-05
BENZENE [Fraction]	0.0019
n-HEPTANE [Fraction]	0.0125
TOLUENE [Fraction]	8.34E-07
n-OCTANE [Fraction]	0.0030
ETHYLBENZENE [Fraction]	2.41E-05
o-XYLENE [Fraction]	2.14E-05
n-NONANE [Fraction]	1.59E-04
n-DECANE [Fraction]	1.65E-04
In.Mass Fraction [Fraction]	
NITROGEN [Fraction]	0.00
METHANE [Fraction]	0.00
CARBON DIOXIDE [Fraction]	0.00
ETHANE [Fraction]	0.00
PROPANE [Fraction]	0.4089
ISOBUTANE [Fraction]	0.1162
n-BUTANE [Fraction]	0.2278
ISOPENTANE [Fraction]	0.0872
n-PENTANE [Fraction]	0.0736
2-METHYLPENTANE [Fraction]	0.0359
n-HEXANE [Fraction]	0.0174
2,2,4-TRIMETHYLPENTANE [Fraction]	1.33E-04
BENZENE [Fraction]	0.0027
n-HEPTANE [Fraction]	0.0230
TOLUENE [Fraction]	1.41E-06
n-OCTANE [Fraction]	0.0064
ETHYLBENZENE [Fraction]	4.69E-05
o-XYLENE [Fraction]	4.17E-05
n-NONANE [Fraction]	3.74E-04
n-DECANE [Fraction]	4.30E-04

E&H Condensate composition from VMGSim 07-25-16

	/Trucked_Condensate			
In.VapFrac	0			
In.T [F]	52.5			
In.P [psia]	12			
In.Mole Flow [lbmol/h]	14.4			
In.Mass Flow [ton(short)/d]	16.38			
In.Volume Flow [bbl/y]	50000			
In.Mass Fraction [Fraction]	mol frac	mol%		
NITROGEN [Fraction]	5.19E-08	5.19E-06		
METHANE [Fraction]	8.56E-05	8.56E-03		
CARBON DIOXIDE [Fraction]	3.85E-05	3.85E-03		
ETHANE [Fraction]	0.0023	0.230	light ends split between	
PROPANE [Fraction]	0.0199	1.990	2.232	butanes
ISOBUTANE [Fraction]	0.0162	1.620		2.736
n-BUTANE [Fraction]	0.0472	4.720		5.836
ISOPENTANE [Fraction]	0.0514	5.140		5.14
n-PENTANE [Fraction]	0.0567	5.670		5.67
2-METHYLPENTANE [Fraction]	0.0733	7.330		
n-HEXANE [Fraction]	0.0541	5.410	hexanes	12.74
2,2,4-TRIMETHYLPENTANE [Fraction]	0.0012	0.120		0.12
BENZENE [Fraction]	0.0081	0.810		0.81
n-HEPTANE [Fraction]	0.2388	23.880		23.88
TOLUENE [Fraction]	1.71E-05	1.71E-03		0.00171
n-OCTANE [Fraction]	0.222	22.200		22.20
ETHYLBENZENE [Fraction]	0.0018	0.180		0.18
o-XYLENE [Fraction]	0.0022	0.220		0.22
n-NONANE [Fraction]	0.0431	4.310		4.31
n-DECANE [Fraction]	0.1615	16.150		16.15
		99.994		99.994

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

Identification

User Identification:	E&H Condensate 2015 actuals
City:	
State:	New Mexico
Company:	
Type of Tank:	Vertical Fixed Roof Tank
Description:	E&H Receiver (3) 300-bbl condensate tanks 31,772 2015 bpy actual throughput assume each tank gets all of annual thruput nitrogen thru propane added to butanes

Tank Dimensions

Shell Height (ft):	15.00
Diameter (ft):	12.00
Liquid Height (ft) :	14.00
Avg. Liquid Height (ft):	7.00
Volume (gallons):	11,844.41
Turnovers:	112.66
Net Throughput(gal/yr):	1,334,424.00
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:	Cone
Height (ft)	0.00
Slope (ft/ft) (Cone Roof)	0.06

Breather Vent Settings

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

Meterological Data used in Emissions Calculations: Grand Junction, Colorado (Avg Atmospheric Pressure = 12.37 psia)

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

E&H Condensate 2015 actuals - Vertical Fixed Roof Tank

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
E&H condensate July 2016	All	63.14	51.01	75.26	56.01	5.7231	4.4579	7.2462	64.3041			96.14	
2,2,4-Trimethylpentane (isooctane)						0.6516	0.4572	0.9108	114.2300	0.0012	0.0002	114.23	Option 2: A=6.8118, B=1257.84, C=220.74
Benzene						1.2732	0.9053	1.7574	78.1100	0.0081	0.0027	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Decane (-n)						0.0359	0.0271	0.0474	142.2900	0.1615	0.0015	142.29	Option 1: VP60 = .033211 VP70 = .041762
Ethylbenzene						0.1210	0.0788	0.1812	106.1700	0.0018	0.0001	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Heptane (-n)						0.6714	0.4650	0.9534	100.2000	0.2388	0.0419	100.20	Option 3: A=37358, B=8.2585
Hexane (-n)						2.0749	1.5069	2.8080	86.1700	0.1274	0.0691	86.17	Option 2: A=6.876, B=1171.17, C=224.41
i-butane						27.7317	22.0390	34.4463	58.1300	0.0274	0.1982	58.13	Option 1: VP60 = 26.098 VP70 = 31.306
Isopentane						10.7970	8.1027	14.0059	72.1500	0.0514	0.1450	72.15	Option 1: VP60 = 10.005 VP70 = 12.53
n-butane						27.7317	22.0390	34.4463	58.1300	0.0584	0.4228	58.13	Option 1: VP60 = 26.098 VP70 = 31.306
Nonane (-n)						0.0709	0.0527	0.0950	128.2600	0.0431	0.0008	128.26	Option 1: VP60 = .065278 VP70 = .08309
Octane (-n)						0.1589	0.1157	0.2174	114.2300	0.2220	0.0092	114.23	Option 1: VP60 = .145444 VP70 = .188224
Pentane (-n)						7.3255	5.5795	9.5000	72.1500	0.0567	0.1085	72.15	Option 3: A=27691, B=7.558
Toluene						0.3638	0.2480	0.5223	92.1300	0.0000	0.0000	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylenes (mixed isomers)						0.1008	0.0654	0.1516	106.1700	0.0022	0.0001	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)

E&H Condensate 2015 actuals - Vertical Fixed Roof Tank

Annual Emission Calcaulations

Standing Losses (lb):	3,196.4838
Vapor Space Volume (cu ft):	918.9159
Vapor Density (lb/cu ft):	0.0656
Vapor Space Expansion Factor:	0.5033
Vented Vapor Saturation Factor:	0.2886
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	918.9159
Tank Diameter (ft):	12.0000
Vapor Space Outage (ft):	8.1250
Tank Shell Height (ft):	15.0000
Average Liquid Height (ft):	7.0000
Roof Outage (ft):	0.1250
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.1250
Roof Height (ft):	0.0000
Roof Slope (ft/ft):	0.0625
Shell Radius (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0656
Vapor Molecular Weight (lb/lb-mole):	64.3041
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	5.7231
Daily Avg. Liquid Surface Temp. (deg. R):	522.8068
Daily Average Ambient Temp. (deg. F):	52.9333
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	515.6833
Tank Paint Solar Absorptance (Shell):	0.6800
Tank Paint Solar Absorptance (Roof):	0.6800
Daily Total Solar Insulation Factor (Btu/sqft day):	1,578.3125
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.5033
Daily Vapor Temperature Range (deg. R):	48.5071
Daily Vapor Pressure Range (psia):	2.7883
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	5.7231
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	4.4579
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	7.2462
Daily Avg. Liquid Surface Temp. (deg R):	522.8068
Daily Min. Liquid Surface Temp. (deg R):	510.6801
Daily Max. Liquid Surface Temp. (deg R):	534.9336
Daily Ambient Temp. Range (deg. R):	25.6333
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.2886
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	5.7231
Vapor Space Outage (ft):	8.1250

Working Losses (lb):	5,062.3898
Vapor Molecular Weight (lb/lb-mole):	64.3041
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	5.7231
Annual Net Throughput (gal/yr.):	1,334,424.0000
Annual Turnovers:	112.6600
Turnover Factor:	0.4330
Maximum Liquid Volume (gal):	11,844.4147
Maximum Liquid Height (ft):	14.0000
Tank Diameter (ft):	12.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	8,258.8736

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

Emissions Report for: Annual

E&H Condensate 2015 actuals - Vertical Fixed Roof Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
E&H condensate July 2016	5,062.39	3,196.48	8,258.87
i-butane	1,003.45	633.60	1,637.05
n-butane	2,140.41	1,351.49	3,491.90
Isopentane	733.96	463.44	1,197.40
Pentane (-n)	549.32	346.85	896.17
Hexane (-n)	349.60	220.74	570.35
2,2,4-Trimethylpentane (isooctane)	1.03	0.65	1.69
Benzene	13.64	8.61	22.25
Heptane (-n)	212.03	133.88	345.91
Toluene	0.01	0.01	0.01
Octane (-n)	46.64	29.45	76.09
Ethylbenzene	0.29	0.18	0.47
Xylenes (mixed isomers)	0.29	0.19	0.48
Nonane (-n)	4.04	2.55	6.59
Decane (-n)	7.67	4.84	12.51

Emission Calculations

Truck Loading

(L-1)

E&H Receiver VOC Emissions from Truck Loading of Condensate
Proposed Emissions

Unit Number: L-1
Description: Truck Loading of Condensate

	loading loss (lb/Mgal)	product throughput (Mgal/yr)	loading loss (lb/yr)	loading loss (tpy)
truck loading losses - natural gas condensate	10.0	2,100	21,044	**10.52**

Product throughput = 50,000 bbl/yr **Projected Volume for PTE**

Loading Loss, L_L = 12.46 (S)(TVP)(MW)/T (AP-42, section 5.2)

L_L = loading loss, lb/Mgal of liquid loaded
S = saturation factor for submerged loading, dedicated normal service = 0.6
TVP = true vapor pressure, psia @ 70 ^oF = 7.25
(from Tanks4 analysis 07-25-16, at conservative daily surface temp of 75.26 ^oF)
MW = molecular weight (from Tanks4 analysis 07-25-16) = 96.14
T = temperature, Rankin (= ^oF+460) (annual mean average temp = 60 ^oF) = 520

vapor collection efficiency 98.7 % trucks pass NSPS-level annual leak tests (AP-42, section 5.2)

Gas composition = Flash Gas wt% from VMGSim (07-25-16)
bsaed on 06-23-16 E&H condensate analysis

Pollutant	**Wt. %**	**HAP estimate tpy (HAP estimate = loading loss tpy * HAP Wt%)**
Carbon Dioxide	0.9100	
Nitrogen	0.0819	
Methane	12.1700	
Ethane	17.0300	
Propane	28.5400	
IsoButane	8.1100	
Normal Butane	15.9000	
IsoPentane	6.0800	
Normal Pentane	5.1400	
2-Methylpentane	2.5100	
n-Hexane	1.2100	**0.13**
Heptanes	1.6100	
2,2,4 Trimethylpentane	9.31E-03	**0.001**
Benzene	0.1900	**0.020**
Toluene	9.85E-05	**0.00001**
Ethylbenzene	3.28E-03	**0.0003**
Xylenes	2.91E-03	**0.0003**
C8+ heavies	0.5060	
TOTAL	100.0035	

E&H Receiver VOC Emissions from Truck Loading of Condensate
Proposed Emissions

Unit Number: L-1
Description: Truck Loading of Condensate

	loading loss (lb/Mgal)	product throughput (Mgal/yr)	loading loss (lb/yr)	loading loss (tpy)
truck loading losses - natural gas condensate	10.0	1,334	13,372	**6.69**

Product throughput = 31,772 bbl/yr **actual 2015 12-month throughput**

Loading Loss, L_L = 12.46 (S)(TVP)(MW)/T (AP-42, section 5.2)

L_L = loading loss, lb/Mgal of liquid loaded
S = saturation factor for submerged loading, dedicated normal service = 0.6
TVP = true vapor pressure, psia @ 70 ^oF = 7.25
(from Tanks4 analysis 07-25-16, at conservative daily surface temp of 75.26 ^oF)
MW = molecular weight (from Tanks4 analysis 07-25-16) = 96.14
T = temperature, Rankin (= ^oF+460) (annual mean average temp = 60 ^oF) = 520

vapor collection efficiency 98.7 % trucks pass NSPS-level annual leak tests (AP-42, section 5.2)

Gas composition = Flash Gas wt% from VMGSim (07-25-16)
bsaed on 06-23-16 E&H condensate analysis

Pollutant	**Wt. %**	**HAP estimate tpy** (HAP estimate = loading loss tpy * HAP Wt%)
Carbon Dioxide	0.9100	
Nitrogen	0.0819	
Methane	12.1700	
Ethane	17.0300	
Propane	28.5400	
IsoButane	8.1100	
Normal Butane	15.9000	
IsoPentane	6.0800	
Normal Pentane	5.1400	
2-Methylpentane	2.5100	
n-Hexane	1.2100	**0.08**
Heptanes	1.6100	
2,2,4 Trimethylpentane	9.31E-03	**0.001**
Benzene	0.1900	**0.013**
Toluene	9.85E-05	**0.00001**
Ethylbenzene	3.28E-03	**0.0002**
Xylenes	2.91E-03	**0.0002**
C8+ heavies	0.5060	
TOTAL	100.0035	

E&H Flash Gas composition from VMGSim 07-25-16

	/Total_Flash	
In.Mole Fraction [Fraction]	mol frac	mol%
NITROGEN [Fraction]	0.0011	0.11
METHANE [Fraction]	0.2885	28.85
CARBON DIOXIDE [Fraction]	0.0079	0.79
ETHANE [Fraction]	0.2153	21.53
PROPANE [Fraction]	0.246	24.6
ISOBUTANE [Fraction]	0.053	5.3
n-BUTANE [Fraction]	0.104	10.4
ISOPENTANE [Fraction]	0.0321	3.21
n-PENTANE [Fraction]	0.0271	2.71
2-METHYLPENTANE [Fraction]	0.0111	1.11
n-HEXANE [Fraction]	0.0053	0.53
2,2,4-TRIMETHYLPENTANE [Fraction]	3.10E-05	0.0031
BENZENE [Fraction]	9.17E-04	0.0917
n-HEPTANE [Fraction]	0.0061	0.61
TOLUENE [Fraction]	4.06E-07	4.06E-05
n-OCTANE [Fraction]	0.0015	0.15
ETHYLBENZENE [Fraction]	1.17E-05	0.00117
o-XYLENE [Fraction]	1.04E-05	0.00104
n-NONANE [Fraction]	7.74E-05	0.00774
n-DECANE [Fraction]	8.02E-05	0.00802
	0.999028	100.0128
	1.68E-04	

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)

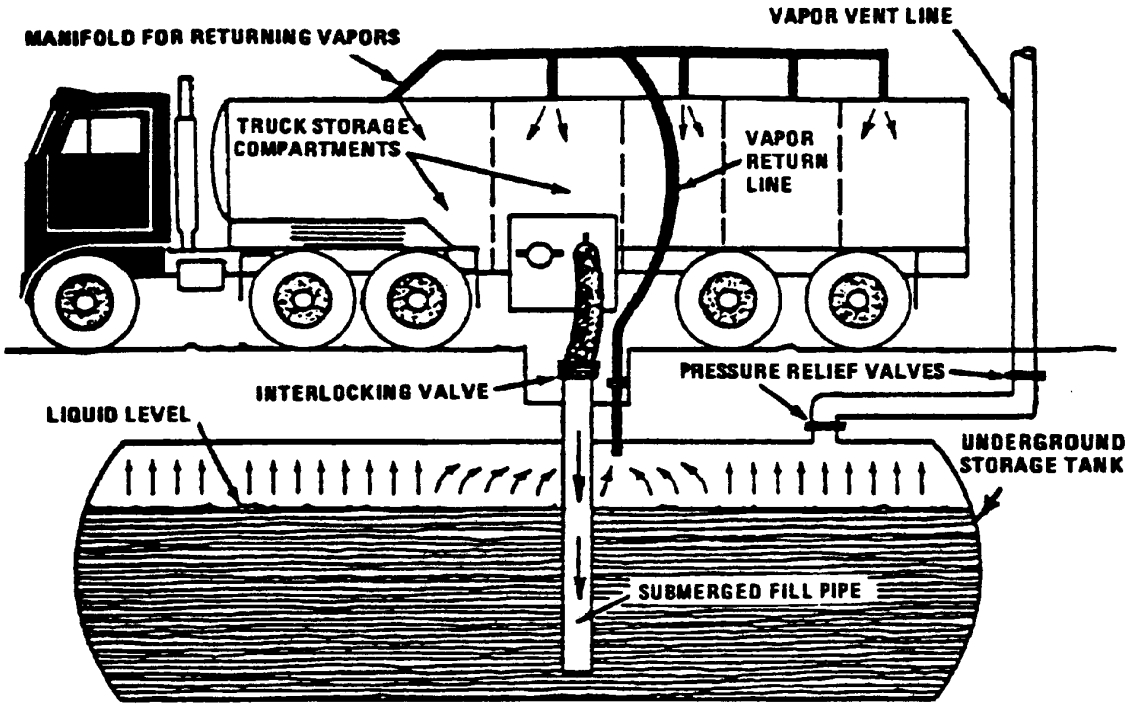


Figure 5.2-5. Tank truck unloading into a service station underground storage tank and practicing "vapor balance" form of emission control.

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.

Emission Calculations

Produced Water Storage Tanks

(TK-4 & TK-5)

E&H Receiver VOC Emissions from Produced Water

Unit Number: Tanks TK-4 and TK-5
Description: Produced Water Tanks

Throughput

10,000 bbl/yr

PTE

Annual liquid throughput (2015 = 6691 bbl)

Williams Four Corners LLC

Emission Rates

Pollutant	Emission Factor, lb/bbl	Uncontrolled, Emission Rate, tpy
VOC	0.262	1.31
n-Hexane	0.022	1.10E-01
Benzene	0.007	3.50E-02
Toluene	0.009	4.50E-02
Ethylbenzene	0.0007	3.50E-03
Xylene	0.006	3.00E-02

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

E&H Receiver VOC Emissions from Produced Water

Unit Number Tanks TK-4 and TK-5
Description: Produced Water Tanks

Throughput

6,169 bbl/yr **actual 2015 12-month throughput** Williams Four Corners LLC

Emission Rates

Pollutant	Emission Factor, lb/bbl	Uncontrolled, Emission Rate, tpy
VOC	0.262	0.81
n-Hexane	0.022	6.79E-02
Benzene	0.007	2.16E-02
Toluene	0.009	2.78E-02
Ethylbenzene	0.0007	2.16E-03
Xylene	0.006	1.85E-02

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

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT
Stationary Sources Program / Air Pollution Control Division

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.

Topic **Page**

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

Emission Calculations

Receiver Drip Tank

(TK-6)

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

Identification

User Identification:	E&H Receiver BGT tank
City:	
State:	New Mexico
Company:	
Type of Tank:	Vertical Fixed Roof Tank
Description:	E&H Receiver Receiver 40-bbl Below-Grade Tank receiving avg 1 bbl per week

Tank Dimensions

Shell Height (ft):	5.50
Diameter (ft):	7.50
Liquid Height (ft) :	5.00
Avg. Liquid Height (ft):	3.00
Volume (gallons):	1,652.40
Turnovers:	2.00
Net Throughput(gal/yr):	3,304.80
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:	Cone
Height (ft)	0.00
Slope (ft/ft) (Cone Roof)	0.06

Breather Vent Settings

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

Meterological Data used in Emissions Calculations: Grand Junction, Colorado (Avg Atmospheric Pressure = 12.37 psia)

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

E&H Receiver BGT tank - Vertical Fixed Roof Tank

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
E&H condensate July 2016	All	63.14	51.01	75.26	56.01	5.7231	4.4579	7.2462	64.3041			96.14	
2,2,4-Trimethylpentane (isooctane)						0.6516	0.4572	0.9108	114.2300	0.0012	0.0002	114.23	Option 2: A=6.8118, B=1257.84, C=220.74
Benzene						1.2732	0.9053	1.7574	78.1100	0.0081	0.0027	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Decane (-n)						0.0359	0.0271	0.0474	142.2900	0.1615	0.0015	142.29	Option 1: VP60 = .033211 VP70 = .041762
Ethylbenzene						0.1210	0.0788	0.1812	106.1700	0.0018	0.0001	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Heptane (-n)						0.6714	0.4650	0.9534	100.2000	0.2388	0.0419	100.20	Option 3: A=37358, B=8.2585
Hexane (-n)						2.0749	1.5069	2.8080	86.1700	0.1274	0.0691	86.17	Option 2: A=6.876, B=1171.17, C=224.41
i-butane						27.7317	22.0390	34.4463	58.1300	0.0274	0.1982	58.13	Option 1: VP60 = 26.098 VP70 = 31.306
Isopentane						10.7970	8.1027	14.0059	72.1500	0.0514	0.1450	72.15	Option 1: VP60 = 10.005 VP70 = 12.53
n-butane						27.7317	22.0390	34.4463	58.1300	0.0584	0.4228	58.13	Option 1: VP60 = 26.098 VP70 = 31.306
Nonane (-n)						0.0709	0.0527	0.0950	128.2600	0.0431	0.0008	128.26	Option 1: VP60 = .065278 VP70 = .08309
Octane (-n)						0.1589	0.1157	0.2174	114.2300	0.2220	0.0092	114.23	Option 1: VP60 = .145444 VP70 = .188224
Pentane (-n)						7.3255	5.5795	9.5000	72.1500	0.0567	0.1085	72.15	Option 3: A=27691, B=7.558
Toluene						0.3638	0.2480	0.5223	92.1300	0.0000	0.0000	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylenes (mixed isomers)						0.1008	0.0654	0.1516	106.1700	0.0022	0.0001	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)

E&H Receiver BGT tank - Vertical Fixed Roof Tank

Annual Emission Calcaulations

Standing Losses (lb):	770.2734
Vapor Space Volume (cu ft):	113.8981
Vapor Density (lb/cu ft):	0.0656
Vapor Space Expansion Factor:	0.5033
Vented Vapor Saturation Factor:	0.5612
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	113.8981
Tank Diameter (ft):	7.5000
Vapor Space Outage (ft):	2.5781
Tank Shell Height (ft):	5.5000
Average Liquid Height (ft):	3.0000
Roof Outage (ft):	0.0781
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.0781
Roof Height (ft):	0.0000
Roof Slope (ft/ft):	0.0625
Shell Radius (ft):	3.7500
Vapor Density	
Vapor Density (lb/cu ft):	0.0656
Vapor Molecular Weight (lb/lb-mole):	64.3041
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	5.7231
Daily Avg. Liquid Surface Temp. (deg. R):	522.8068
Daily Average Ambient Temp. (deg. F):	52.9333
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	515.6833
Tank Paint Solar Absorptance (Shell):	0.6800
Tank Paint Solar Absorptance (Roof):	0.6800
Daily Total Solar Insulation Factor (Btu/sqft day):	1,578.3125
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.5033
Daily Vapor Temperature Range (deg. R):	48.5071
Daily Vapor Pressure Range (psia):	2.7883
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	5.7231
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	4.4579
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	7.2462
Daily Avg. Liquid Surface Temp. (deg R):	522.8068
Daily Min. Liquid Surface Temp. (deg R):	510.6801
Daily Max. Liquid Surface Temp. (deg R):	534.9336
Daily Ambient Temp. Range (deg. R):	25.6333
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.5612
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	5.7231
Vapor Space Outage (ft):	2.5781

Working Losses (lb):	28.9578
Vapor Molecular Weight (lb/lb-mole):	64.3041
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	5.7231
Annual Net Throughput (gal/yr.):	3,304.8032
Annual Turnovers:	2.0000
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	1,652.4016
Maximum Liquid Height (ft):	5.0000
Tank Diameter (ft):	7.5000
Working Loss Product Factor:	1.0000
Total Losses (lb):	799.2312

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

Emissions Report for: Annual

E&H Receiver BGT tank - Vertical Fixed Roof Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
E&H condensate July 2016	28.96	770.27	799.23
	5.74	152.68	158.42
i-butane	12.24	325.68	337.92
n-butane	4.20	111.68	115.88
Isopentane Pentane (-n)	3.14	83.58	86.72
Hexane (-n)	2.00	53.19	55.19
2,2,4-Trimethylpentane (isooctane)	0.01	0.16	0.16
	0.08	2.08	2.15
Benzene Heptane (-n)	1.21	32.26	33.48
Toluene	0.00	0.00	0.00
Octane (-n)	0.27	7.10	7.36
Ethylbenzene	0.00	0.04	0.05
Xylenes (mixed isomers)	0.00	0.04	0.05
Nonane (-n)	0.02	0.61	0.64
Decane (-n)	0.04	1.17	1.21

Emission Calculations

Fugitives

(F-1)

E&H Receiver Fugitive VOC Emissions Speciation

Unit Numb F-1
Descriptior Valves, Connectors, Seals, Flanges, & Open-Ended Lines

Equipment	Number of Components (#)	Emission Factor (kg/hr/source)	Emission Factor (lb/hr/source)	TOC Emission Rate (lb/hr)	(tpy)
Valves	35	4.50E-03	9.90E-03	0.347	1.518
Connectors	13	2.00E-04	4.40E-04	0.006	0.025
Pump Seals	0	2.40E-03	5.28E-03	0.000	0.000
Flanges	45	3.90E-04	8.58E-04	0.039	0.169
Other	5	8.80E-03	1.94E-02	0.097	0.424
Pressure Relief Valves	1	8.80E-03	1.94E-02	0.019	0.085
Open-Ended Lines	0	2.00E-03	4.40E-03	0.000	0.000
TOTAL				**0.507**	**2.221**

Emission factors are from the EPA "1995 Protocol for Equipment Leak Emission Estimates"
Annual emissions are calculated assuming 8,760 hours per year of operation

Pollutant	Mole Percent (%)	Molecular Weight (MW)	Weighted Sum (Mole%*MW)	Weight Percent (%)	**VOC Emission Rate (lb/hr)**	**(tpy)**
NITROGEN	0.11	28.013	3.081	0.1147	--	--
CARBON DIOXIDE	0.79	44.010	34.768	1.2942	--	--
METHANE	28.85	16.043	462.841	17.2292	--	--
ETHANE	21.530	30.070	603.129	22.4514	--	--
PROPANE	24.6	44.097	394.658	14.6911	--	--
ISOBUTANE	5.3	58.123	159.371	5.9326	--	--
n-BUTANE	10.4	58.123	458.609	17.0717	0.087	0.379
ISOPENTANE	3.21	72.150	186.575	6.9452	0.035	0.154
n-PENTANE	2.71	70.134	157.513	5.8634	0.030	0.130
2-METHYLPENTANE	1.11	86.178	95.658	3.5608	0.018	0.079
n-HEXANE	0.53	86.178	38.240	1.4235	0.007	0.032
2,2,4-TRIMETHYLPENTANE	0.0031	114.231	0.217	0.0081	0.000	0.000
BENZENE	0.0917	78.114	7.903	0.2942	0.001	0.007
n-HEPTANE	6.10E-01	100.204	69.681	2.5939	0.013	0.058
TOLUENE	4.06E-05	92.141	0.003	0.0001	0.000	0.000
n-OCTANE	0.15	106.167	15.031	0.5595	0.003	0.012
ETHYLBENZENE	1.17E-03	106.167	0.108	0.0040	0.000	0.000
o-XYLENE	1.04E-03	114.232	0.110	0.0041	0.000	0.000
n-NONANE	7.74E-03	128.259	0.822	0.0306	0.000	0.001
n-DECANE	8.02E-03	142.286	1.141	0.0425	0.000	0.001
TOTAL	100.0128		2686.3755	100.000	**0.195**	**0.853**

Gas composition = Flash Gas mol% from VMGSim (07-25-16)
bsaed on 06-23-16 E&H condensate analysis

The VOC emissions are calculated as percentages of the TOC emissions

E&H Receiver Fugitive VOC Emissions Components

Unit Numb F-1
Descriptior Valves, Connectors, Seals, Flanges, & Open-Ended Lines

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

PROCESS EQUIPMENT DESCRIPTION	EQUIPMENT COUNT									
	Valves	Connectors	Pump Seals	Flanges	Other	Pressure Relief Valves	Open-end	Flow	Level	Pressure
Blow off head assembly	6	0	0	0	0	1	0	0	0	0
Trunk S and Trunk H Junction	4	8	0	2	0	0	0	0	0	0
Pig receiver dump valves	5	4	0	7	0	0	0	0	0	0
Trunk S separator assembly	7	1	0	3	0	0	0	0	0	0
Pig receiver junction to Trunk H	4	0	0	2	0	0	0	0	0	0
Bullet Tank	14	0	0	4	2	0	0	0	0	0
Condensate tanks (3)	10	0	0	0	3	0	0	0	0	0
TOTAL	50	13	0	18	5	1	0	0	0	0
ADJUSTED TOTAL	50	13	0	18	5	1	0			
	35			45						

An onsite survey was conducted by WFC personnel on April 5, 2016 to verify component counts for the two largest source groups - valves and flanges.
The inspection produced a count of 5 motor valves, 30 valves of 2" diameter or less, and 45 flanges.
These updated component counts are incoporated into this workbook

E&H Flash Gas composition from VMGSim 07-25-16

	/Total_Flash	
In.Mole Fraction [Fraction]	mol frac	mol%
NITROGEN [Fraction]	0.0011	0.11
METHANE [Fraction]	0.2885	28.85
CARBON DIOXIDE [Fraction]	0.0079	0.79
ETHANE [Fraction]	0.2153	21.53
PROPANE [Fraction]	0.246	24.6
ISOBUTANE [Fraction]	0.053	5.3
n-BUTANE [Fraction]	0.104	10.4
ISOPENTANE [Fraction]	0.0321	3.21
n-PENTANE [Fraction]	0.0271	2.71
2-METHYLPENTANE [Fraction]	0.0111	1.11
n-HEXANE [Fraction]	0.0053	0.53
2,2,4-TRIMETHYLPENTANE [Fraction]	3.10E-05	0.0031
BENZENE [Fraction]	9.17E-04	0.0917
n-HEPTANE [Fraction]	0.0061	0.61
TOLUENE [Fraction]	4.06E-07	4.06E-05
n-OCTANE [Fraction]	0.0015	0.15
ETHYLBENZENE [Fraction]	1.17E-05	0.00117
o-XYLENE [Fraction]	1.04E-05	0.00104
n-NONANE [Fraction]	7.74E-05	0.00774
n-DECANE [Fraction]	8.02E-05	0.00802
	0.999028	100.0128
	1.68E-04	

EPA-453/R-95-017

1995 Protocol for Equipment Leak Emission Estimates

Emission Standards Division

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Radiation
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

November 1995

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.

Emission Calculations

Fugitives – Pig Receiver Venting

(F-2)

E&H Receiver Fugitive VOC Pig Receiver Venting Emissions

Unit Number: F-2
Description: Pig Receiver Venting

pipeline pressure	130	psig		
pipeline diameter	16	in =	1.33	ft
pipeline length	7	ft		
pipeline volume	9.77			
atmospheric pressure	12	psia		
blowdown volume	106	cu ft	at atmospheric pressure	
Total blowdown volume =	106	cu ft		
Venting occurs once a week,	104	times/year =	11,024	scf/yr

Component	mol%	MW	mol% * MW	flowrate lb/yr
NITROGEN	0.11	28.013	3.081	0.90
CARBON DIOXIDE	0.79	44.010	34.768	10.10
METHANE	28.85	16.043	462.841	134.48
ETHANE	21.530	30.070	647.407	188.11
PROPANE	24.6	44.097	1084.786	315.20
ISOBUTANE	5.3	58.123	308.052	89.51
n-BUTANE	10.4	58.123	604.479	175.64
ISOPENTANE	3.21	72.150	231.602	67.30
n-PENTANE	2.71	70.134	190.063	55.23
2-METHYLPENTANE	1.11	86.178	95.658	27.79
n-HEXANE	0.53	86.178	45.674	13.27
2,2,4-TRIMETHYLPENTANE	0.0031	114.231	0.354	0.10
BENZENE	0.0917	78.114	7.163	2.08
n-HEPTANE	6.10E-01	100.204	61.124	17.76
TOLUENE	4.06E-05	92.141	0.004	0.00
n-OCTANE	0.15	106.167	15.925	4.63
ETHYLBENZENE	1.17E-03	106.167	0.124	0.04
o-XYLENE	1.04E-03	114.232	0.119	0.03
n-NONANE	7.74E-03	128.259	0.993	0.29
n-DECANE	8.02E-03	142.286	1.141	0.33
Sum	100.0128		3795.358	1102.79

mass flowrate (lb/yr) = gas flowrate (cf/yr) / 379.4 (scf/mol) * mol% * MW(lb/lb-mol)

VOC release emissions, lb/yr: 769.2

ton/yr: 0.38

Gas composition = Flash Gas mol% from VMGSim (07-25-16)
based on 06-23-16 E&H condensate analysis

E&H Flash Gas composition from VMGSim 07-25-16

	/Total_Flash	
In.Mole Fraction [Fraction]	mol frac	mol%
NITROGEN [Fraction]	0.0011	0.11
METHANE [Fraction]	0.2885	28.85
CARBON DIOXIDE [Fraction]	0.0079	0.79
ETHANE [Fraction]	0.2153	21.53
PROPANE [Fraction]	0.246	24.6
ISOBUTANE [Fraction]	0.053	5.3
n-BUTANE [Fraction]	0.104	10.4
ISOPENTANE [Fraction]	0.0321	3.21
n-PENTANE [Fraction]	0.0271	2.71
2-METHYLPENTANE [Fraction]	0.0111	1.11
n-HEXANE [Fraction]	0.0053	0.53
2,2,4-TRIMETHYLPENTANE [Fraction]	3.10E-05	0.0031
BENZENE [Fraction]	9.17E-04	0.0917
n-HEPTANE [Fraction]	0.0061	0.61
TOLUENE [Fraction]	4.06E-07	4.06E-05
n-OCTANE [Fraction]	0.0015	0.15
ETHYLBENZENE [Fraction]	1.17E-05	0.00117
o-XYLENE [Fraction]	1.04E-05	0.00104
n-NONANE [Fraction]	7.74E-05	0.00774
n-DECANE [Fraction]	8.02E-05	0.00802
	0.999028	100.0128
	1.68E-04	

Section 6

Description of the Routine Operations of the Facility

Liquids from the pigging of a natural gas gathering line are intermittently received at WFC's Trunk E & H Receiver facility. Liquids are automatically transferred from the receiver to a pressurized bullet tank. With the manual opening of a valve on the pressurized bullet tank, liquids are transferred by pressure into the condensate tank(s). Tank flash occurs first from the pressurized bullet tank, then as the liquids are transferred from the pressurized bullet tank to the atmospheric storage tanks, releasing volatile organic compounds (VOCs) to the atmosphere. There are three 300-bbl condensate tanks plumbed together in series. As needed, the contents of the condensate tanks are loaded onto truck(s) for sale or appropriate disposal. The water phase that separates from the condensate is drawn off the condensate tank by gravity feed into one of two produced water tanks. As needed, the contents of the produced water tanks are hauled for appropriate disposal. Vapors released from the receiver during the pig removal process are accounted for in the insignificant emission source F-2. Liquids remaining in the receiver are drained to the receiver drip tank, TK-6, also an insignificant emission source.

Four catalytic heaters located at the site are used to prevent liquids from freezing in the system. The initial (2010) Part 71 application had included these sources, estimating their emissions by using external combustion emission factors from AP-42, Chapter 1.4. However, as catalytic heaters, these have no combustion emissions, and thus these units have been removed from the application with this update.

Section 7

Federal Rules, Regulations, and Standards Applicability Checklist

FEDERAL REGU-LATIONS CITATION	Title	Applies to **Entire Facility**	Applies to **Unit No(s).**	**Federally Enforce-able**	**Does Not Apply**	**JUSTIFICATION:**
40 CFR 50	NAAQS	✓		✓		This regulation is applicable because it applies to all sources operating within the United States, including those located on Indian lands.
40 CFR 51	Requirements for Preparation, Adoption, and Submittal of Implementation Plans				✓	This regulation is not applicable because it applies only to local and state/tribal governmental agencies.
40 CFR 52	Approval and Promulgation of Implementation Plans				✓	This regulation is not applicable because although the facility is a major PSD source (40 CFR 52.21 Prevention of Significant Deterioration of Air Quality), the facility has not commenced construction, modification or reconstruction since January 6, 1975. The remainder of 40 CFR 52 is not applicable because it addresses approval and promulgation of implementation plans.
NSPS 40 CFR 60, Subpart A	General Provisions				✓	This regulation is not applicable since no other NSPS subpart applies.
NSPS 40 CFR 60, Subpart K	Storage Vessels for Petroleum Liquids for which Construction, Reconstruction, or Modification Commenced After June 11, 1973, and Prior to May 19, 1978				✓	This regulation is not applicable because all petroleum liquids storage tanks at the facility have capacities less than the minimum applicability threshold capacity of 40,000 gallons (see 40 CFR 60.110(a)).
NSPS 40 CFR 60, Subpart Ka	Storage Vessels for Petroleum Liquids for which Construction, Reconstruction, or Modification Commenced After May 18, 1978, and Prior to July 23, 1984				✓	This regulation is not applicable because all storage tanks at the facility have capacities less than the minimum applicability threshold capacity of 40,000 gallons (see 40 CFR 60.110a(a)).
NSPS 40 CFR 60, Subpart Kb	Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced				✓	This regulation is not applicable to any storage tank at the facility. Storage tanks at the facility have a capacity less than the minimum applicability threshold capacity of 75 cubic meters (19,813 gallons) or store condensate prior to custody transfer (40 CFR 60.110b(a)).

FEDERAL REGU-LATIONS CITATION	Title	Applies to **Entire Facility**	Applies to **Unit No(s).**	**Federally Enforce-able**	**Does Not Apply**	**JUSTIFICATION:**
	After 7/23/84					
NSPS 40 CFR 60, Subpart KKK	Leaks of VOC from Onshore Gas Plants				✓	This regulation is not applicable because the facility is not a natural gas processing plant as defined by the subpart.
NSPS 40 CFR 60, Subpart OOOO	Oil and Gas Production, Transmission and Distribution				✓	This regulation is not applicable because the potentially affected facilities have not commenced construction, modification or reconstruction since August 23, 2011.
NESHAP 40 CFR 61 Subpart A	General Provisions				✓	This regulation is not applicable as the facility is not subject to any of the standards listed.
MACT 40 CFR 63, Subpart A	General Provisions				✓	Applies if any other subpart applies.
MACT 40 CFR 63.760 Subpart HH	Oil and Natural Gas Production Facilities				✓	This regulation is not applicable as the facility is an area source for HAPs and does not contain any affected sources ("storage vessels with the potential for flash emissions", as defined in 40 CFR 63.761).
NESHAP 40 CFR 64	Compliance Assurance Monitoring				✓	This regulation is not applicable because no sources at the facility use a control device to achieve compliance with an emission limit or standard where pre control emissions equal or exceed the major source threshold (100 tons per year).
NESHAP 40 CFR 68	Chemical Accident Prevention				✓	This regulation is not applicable because the station does not store any of the identified toxic and flammable substances in quantities exceeding the applicability thresholds.
40 CFR 70	State Operating Permit Programs				✓	This regulation is not applicable, because the facility is located within the boundaries of the Jicarilla Apache Indian Reservation. As such, the EPA has jurisdiction over this facility until the Jicarilla Apache Indian Tribe develops their own rules and regulations.
40 CFR 71	Federal Operating Permit Programs	✓				This regulation is applicable because the facility is located within the Jicarilla Apache Indian Reservation, and as the Tribe has not developed their own rules and regulations concerning air emission sources, the facility is presently under the jurisdiction of the EPA. As VOC emissions exceed 100 tons per year, the station is subject to the Federal Operating Permits Program.
Title IV – Acid Rain 40 CFR 72	Acid Rain				✓	This regulation is not applicable because the facility does not operate a source subject to Title IV of the CAA.
Title VI – 40 CFR 82	Protection of Stratospheric Ozone				✓	This regulation is not applicable to the station because the facility does not produce, manufacture, transform, destroy, import, or export ozone-depleting substances; does not maintain or service motor vehicle air conditioning units or refrigeration equipment; and does not sell, distribute, or offer for sale or distribution any product that contains ozone-depleting substances.

Section 8

Alternative Operating Scenarios

No alternative operating scenarios are proposed by Williams for the E & H Receiver facility.

Section 9

Certification of Truth, Accuracy, and Completeness

See next page.

United States Environmental Protection Agency

OMB No. 2060-0336,
Approval Expires 05/31/2019

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) Jasek (First) Glen (MI) ____

Title Vice President & General Manager, FCA

Street or P.O. Box 1755 Arroyo Drive

City Bloomfield State NM ZIP 87413 - _____

Telephone (505) 632 - 4628 Ext. __ Facsimile (505) 632 - 4781

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) _____

Name (typed) Glen Jasek Date: ____ /____ /_____