



Control of VOC Flash Emissions from
Oil and Condensate Storage Tanks in
East Texas
TCEQ Project 2010 – 43

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Executive Summary

The purpose of this project was to determine the volatile organic compounds (VOC) emission reductions resulting from the implementation of requirements in Title 30 Texas Administrative Code (TAC) §115.112(d)(5) (“referenced rule,” included as Appendix A to this report) to control VOC flash emissions from crude oil and condensate storage tanks at wellhead sites in the Houston-Galveston-Brazoria (HGB) 1997 eight-hour ozone nonattainment area (Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties). The study also evaluated the potential VOC emission reductions should the referenced rule be extended to two other geographic areas:

- Beaumont-Port Arthur (BPA) eight-hour ozone nonattainment area (Hardin, Jefferson, and Orange Counties); and
- Haynesville Shale area (Gregg, Harrison, Marion, Nacogdoches, Panola, Rusk, San Augustine, Smith, Shelby, and Upshur Counties).¹

Survey responses from operators of oil and condensate storage tanks in Other Counties of Interest (Bexar, Travis, and Williamson Counties) were also evaluated, but VOC emission reductions potentially resulting from implementation of the referenced rule were not evaluated for these counties as this was beyond the scope of work for this project.

ENVIRON International Corp. (ENVIRON) used data received from electronic questionnaires, 2009 oil or condensate production data reported to the Railroad Commission of Texas (RRC) and a similar survey performed by the Texas Commission on Environmental Quality (TCEQ) Region 12. A summary of responses, including response rates is presented in Table ES-1.

Table ES-1. Summary of Survey Responses

Geographic Area	Surveys			Included in Survey Responses			
	Sent	Received	Response Rate (%)	No. of Tank Batteries	No. of Tanks	Total Storage Capacity (bbl)	Total Production (bbl)
HGB (ENVIRON)	14	4	29	71	157	68,872	1,619,304
HGB (TCEQ)	104	63	61	245	NR	NR	4,819,703
BPA	14	5	36	40	150	58,350	1,817,770
Haynesville Shale	20	8	40	1,584	305	85,310	2,634,078
Bexar County	6	1	17	6	16	3,450	8,107
Travis County	1	1	100	2	6	1,240	1,814
Williamson County	1	0	0	NA	NA	NA	0

NR = not reported, NA = not applicable

¹ The Haynesville Shale area refers to oil and gas wells and their associated tank batteries located in the referenced counties but is not limited to wells producing in the Haynesville Shale geologic formation.

Values presented in Table ES-1 are inclusive of survey respondents that store oil, condensate or both. Total production is taken from data reported to the Railroad Commission of Texas (RRC).

The TCEQ Region 12 survey requested HGB tank battery VOC emissions as reported by the operators. Using the 2009 production rates reported to TCEQ Region 12 and the emission factors in the referenced rule, ENVIRON calculated emissions for the 213 tank batteries that responded to the TCEQ survey. The results are presented in Table ES-2. As shown, the number of tank batteries with calculated emissions of 25 tons per year (tpy) or greater is approximately 4.4 times higher than those with reported emissions of 25 tpy or greater.

Table ES-2. Comparison of HGB Area Reported and Calculated VOC Emissions

Tank Battery Type	Number of Tank Batteries with Reported Emissions of 25 tpy or More	Number of Tank Batteries with Calculated Emissions of 25 tpy or More
Oil	8	28
Condensate	26	122
Total	34	150

This discrepancy indicates that, in some cases, operators may be using alternative methods for estimating VOC emissions (e.g. use of E&P TANK or AP-42). This could result in lower rule effectiveness than expected as some operators could calculate VOC emissions less than 25 tpy and not trigger the emission control requirements.

Both the ENVIRON and TCEQ surveys requested information on current controls. Responses are summarized in Table ES-3. As shown, the majority of tank batteries in all geographic areas, including the HGB, are currently uncontrolled.

Table ES-3. Emission Controls Currently Installed

Geographic Area	Tank Battery Vapor Controls				Type of Control			
	Status Reported ¹	No Control	With Control	% Control	VRU Only	Flare Only	VRU + Flare ²	Other / Unspecified
HGB – ENVIRON	71	50	21	29.6	7	14	0	0
HGB – TCEQ and ENVIRON	245	157	88	35.9	33	52	3	0
BPA	40	31	9	22.5	0	5	4	0
Haynesville Shale	1,584	1,573	11	0.7	3	7	1	0
Bexar County	6	6	0	0.0	0	0	0	0
Travis County	2	2	0	0.0	0	0	0	0

¹ Includes tank batteries that reported control status, regardless of whether site was producing or non-producing during 2009

² Several tank batteries in the HGB and BPA areas report use of both VRUs and Flares. At these sites, the VRU is the primary control device, while the flare serves as back-up control if the VRU is not operational or if the site experiences an upset event.

Table ES-4 summarizes controls installed as a result of the referenced rule. The criteria for this determination is that the controls must have been installed after January 1, 2007, or are currently planned for installation. Controls installed prior to that date, even if they were potentially installed in anticipation of the referenced rule, are considered “voluntary” (at least with respect to this study) and not resulting from referenced rule implementation.

Table ES-4. Controls Installed in Response to the Referenced Rule in the HGB

Tank Type	Tank Battery Control Status Reported	Tank Battery Emissions Controlled as a Result of Rule	% Control
Oil	65	16	24.6
Condensate	180	37	20.6
Total	245	53	21.6

As shown, controls were installed on approximately 22% of the oil and condensate tank batteries surveyed as a result of referenced rule implementation or, in other words, the rule was 22% effective. This compares to 36% of the surveyed oil and condensate tank batteries that are currently controlled, indicating that approximately 14% of the surveyed tank batteries in the HGB have voluntarily installed controls.

Using 2009 reported production rates and the emission factors in the referenced rule to estimate uncontrolled VOC emissions, ENVIRON estimated the number of tank batteries in the other geographic areas that would potentially require control if the referenced rule was extended to that area. Those results are shown in Table ES-5.

Table ES-5. Tank Batteries Requiring Control in BPA and Haynesville Shale Should Referenced Rule be Extended to Those Areas

Geographic Area	Oil Tank Battery Sites			Condensate Tank Battery Sites		
	Status Reported ¹	Not Currently Controlled but Would be Under Referenced Rule	% Control	Status Reported	Not Currently Controlled but Would be Under Referenced Rule	% Control
BPA	13	6	46.2	26	13	50.0
Haynesville Shale	106	0	0	523	64	12.2

¹ Only includes tank batteries with production data provided by survey respondents sufficient to calculate VOC emissions

As shown, using the given assumptions, extension of the referenced rule to the BPA area would result in approximately 49% of the surveyed tank batteries installing controls. This compares to the approximately 22% of surveyed tank batteries in the BPA that currently have controls. These currently controlled tank batteries were not reviewed to determine whether they would have required controls under the referenced rule. With respect to the Haynesville Shale, extension of the referenced rule would result in no additional control of emissions from oil tank

batteries and approximately 12% of condensate tank batteries would be required to install controls.²

ENVIRON calculated the uncontrolled emissions by geographic area using 2009 RRC production data as well as the appropriate (oil or condensate) emission factor in the referenced rule. We also calculated the emissions following implementation of the referenced rule using survey results and methodologies described in detail within this summary report. These results are presented in Table ES-6. For the HGB, the “with Rule” values represent actual emission reductions resulting from implementation of the referenced rule. For the BPA and Haynesville Shale areas, the “with Rule” values represent emission reductions that would result from implementation of the referenced rule. Associated uncertainties are presented in Table ES-7.

Table ES-6. Summary of Emission Reductions Resulting from Referenced Rule Implementation

Geographic Area	VOC Emissions (tpy)					
	Condensate			Oil		
	Uncontrolled	w/ Rule	% Reduction	Uncontrolled	w/ Rule	% Reduction
HGB	57,581	48,332	16.06	7,145	5,711	20.07
BPA	90,541	57,946	36.0	2,054	1,371	33.23
Haynesville Shale	90,175	82,230	8.81	5,379	5,379	0.0

Table ES-7. Uncertainty Associated with VOC Emissions Following Referenced Rule Implementation

Geographic Area	VOC Emissions from Condensate (tpy)			VOC Emissions from Oil (tpy)		
	Calculated w/ Rule	Upper Bound	Lower Bound	Calculated w/ Rule	Upper Bound	Lower Bound
HGB	48,332	51,499	45,165	5,711	6,643	4,708
BPA	57,946	90,541	9,054	1,371	1,971	771
Haynesville Shale	82,230	90,175	70,427	5,379	NA*	NA*

*Confidence interval not available due to small sample size and lack of any tank batteries eligible for control reported by survey respondents.

It must be noted that the values for uncontrolled emissions and for emissions following implementation of the referenced rule do not take into consideration the implementation of voluntary controls. With consideration of voluntary controls, actual emissions for both scenarios would be lower.

By incorporating the TCEQ Region 12 survey results into this study, calculated VOC flash emissions reduction from crude oil and condensate storage tanks at wellhead sites in the HGB area were determined with high to moderate certainty (condensate and oil, respectively).

² None of the surveyed oil tank batteries would require the installation of VOC emission control devices if the referenced rule were extended to that area. However, due to the small sampling size, no definitive conclusions can be drawn.

Uncertainty levels for HGB area condensate tanks ranged from approximately $\pm 7\%$, while the range was from $\pm 17\%$ for oil tanks.

The potential VOC emission reductions resulting from the referenced requirements in the BPA area are highly uncertain. Uncertainty levels for BPA area condensate tanks ranged from -84.4% to 56.3%, while the range was from -43.7% to 43.7% for oil tanks. Although approximately 49% of the surveyed tank batteries in the BPA area would require installation of controls should the referenced rule be extended to that area, the total number of surveyed tank batteries is, most likely, much less than the total number of tank batteries in the BPA area leading to the high degree of uncertainty in the results.

The potential VOC emission reductions resulting from the referenced requirements in the Haynesville Shale area were determined with moderate certainty. Uncertainty levels for Haynesville Shale area condensate tanks ranged from -14.4% to 9.7%. The confidence interval for oil tanks was not available due to the small sample size and lack of any tank batteries eligible for control reported by survey respondents.

1 Introduction

1.1 Project Purpose

The purpose of this project was to determine the volatile organic compounds (VOC) emission reductions resulting from the implementation of requirements in Title 30 Texas Administrative Code (TAC) §115.112(d)(5) (referenced rule) to control VOC flash emissions from crude oil and condensate storage tanks at wellhead sites in the Houston-Galveston-Brazoria (HGB) 1997 eight-hour ozone nonattainment area (Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties). The referenced rule is included as Appendix A. The study also evaluated the potential VOC emission reductions should the referenced rule be extended to other geographic areas including:

- Beaumont-Port Arthur (BPA) eight-hour ozone nonattainment area (Hardin, Jefferson, and Orange Counties);
- Haynesville Shale area (Gregg, Harrison, Marion, Nacogdoches, Panola, Rusk, San Augustine, Smith, Shelby, and Upshur Counties); and
- Other counties of interest (Bexar, Travis, and Williamson Counties); however, potential VOC emission reductions were not evaluated for these counties.

1.2 Background

One of the primary goals of the second Texas Air Quality Study (TexAQS II) was to identify VOC emission sources that have been historically under-estimated, unreported, or under-reported in the Texas Commission on Environmental Quality (TCEQ) emissions inventory (EI) and could potentially be contributing to a discrepancy between actual and reported emissions. The TexAQS II remote sensing project results indicated that VOC flash emissions from storage tanks have been underestimated, unreported, or under-reported in the TCEQ EI. In May 2007, the TCEQ revised the 30 TAC Chapter 115, Subchapter B, Division 1 requirements for VOC storage tanks located in the HGB 1997 eight-hour ozone nonattainment area to reduce VOC emissions resulting from uncontrolled flash emissions at upstream oil and gas exploration and production sites and other sources of tank emissions.

Flash emissions occur when a liquid containing dissolved gases experiences a decrease in pressure. As the pressure decreases, some of the lighter VOC compounds dissolved in the liquid are released or flashed. Also, some of the compounds that are liquids at the initial pressure transform from a liquid into a vapor and are also released from the liquid. As these gases and vapors are released, some of the heavier compounds in the liquids may become entrained in these gases and will be emitted with them.

Houston Advanced Research Center (HARC) Project H051C was performed to quantify emissions from storage tank batteries associated with the upstream oil and gas industry in the East Texas counties, including the BPA, Dallas-Fort Worth (DFW), and HGB ozone nonattainment areas. The HARC Project H051C final report documented speciated VOC

emissions measurements from oil and condensate storage tanks at wellhead and gathering site tank batteries in this region. The report also estimated uncontrolled wellhead and gathering site tank battery emissions for this region by multiplying the average measured emission factors for oil and condensate storage tank batteries by 2005 oil and condensate production data downloaded from the Texas Railroad Commission Web site. The tank batteries sampled during HARC Project H051C represent only a small fraction of the total number in the East Texas Region and the total number of tank batteries that are controlled in the East Texas Region is unknown. Although a limited number of the tank batteries sampled were equipped with vapor recovery units, the HARC Project H051C emission studies did not account for any controls. HARC Project H051C estimated the 2005 total uncontrolled VOC emissions for the East Texas Region were 1,318 tons per day (tpd) including: 846 tpd from East Texas Attainment Counties, 38 tpd in the DFW area, 145 tpd in the BPA area and 289 tpd in the HGB area.

1.3 ENVIRON Scope of Work

ENVIRON's Scope of Work as detailed in TCEQ Work Order No. 582-7-84005-FY10-22, Amendment 3, is as follows:

- **Task 1 – Work Plan:** Submit and obtain approval of a Work Plan describing the work to be performed for TCEQ. As part of Task 1, ENVIRON was also to submit and obtain approval of a Quality Assurance Project Plan (QAPP) describing the quality assurance / quality control (QA/QC) procedures to be followed in executing the Work Order.
- **Task 2 – Survey Planning and Facility Questionnaire:** Prepare and submit an electronic questionnaire to survey participants. The questionnaire was to be sent to certain oil and natural gas condensate producers in the geographic areas in the Project Purpose (Section 1.1 of this report). The Survey Planning Report prepared by ENVIRON and submitted to the TCEQ in April 2010 details the survey methodologies.
- **Task 3 – Data Collection:** Collect and manage data received from survey participants. As part of this task, ENVIRON was to prepare and maintain a database that contains information including dates of contact, the information received from survey participants and, as appropriate, follow-up contact attempts. In addition to the survey database, ENVIRON was to provide the TCEQ with a summary of survey responses, including tank counts, VOC emission control information, and other relevant statistics for the geographic study areas.
- **Task 4 – Estimation of VOC Emissions:** Calculate state implementation plan (SIP)-creditable VOC emission reductions associated with the implementation of the requirements in the referenced rule to control VOC flash emissions from crude oil and condensate storage tanks at wellhead sites in the HGB area. Working with the TCEQ, ENVIRON was to determine a baseline emission inventory year and calculate potential VOC emissions from the BPA and Haynesville Shale areas. ENVIRON was then to use the same methodology discussed for the HGB area to evaluate potential VOC emission reductions should the control requirements of the referenced rule be extended to the BPA

and Haynesville Shale areas. As part of this process, the HARC Project H051C methodology was to be evaluated for application in the BPA and Haynesville Shale areas.

- **Task 5 – Develop the NEI-Formatted Emissions Inventory Control File:** Provide to the TCEQ a control data file developed for this project in National Emissions Inventory (NEI) Input Format (NIF) 3.0 text files that meet the NEI reporting requirements suitable for entry into TexAER.
- **Task 6 – Preparation of Draft and Final Reports:** Report on the methodologies and findings of this study.

2 Survey Methodology

2.1 Overview

ENVIRON used an electronic questionnaire, transmitted to survey participants via email or facsimile, to gather information deemed necessary to determine the effectiveness of the requirements of the referenced rule in controlling VOC flash emissions from crude oil and condensate storage tanks at wellhead sites in the HGB area. The questionnaire was sent to select oil and condensate producers in the following geographic areas:

- HGB area (Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties);
- BPA area (Hardin, Jefferson, and Orange Counties);
- Haynesville Shale area (Gregg, Harrison, Marion, Nacogdoches, Panola, Rusk, San Augustine, Smith, Shelby, and Upshur Counties); and
- Other counties of interest: Bexar, Travis, and Williamson counties.

Information collected was also used in evaluating potential VOC emission reductions should the referenced rule be extended to the BPA and Haynesville Shale areas. Information collected from the other counties of interest (i.e., Bexar, Travis, and Williamson Counties) was not used to evaluate potential VOC emission reductions in these counties.

2.2 Survey Design

ENVIRON developed an electronic survey in Microsoft Excel format for each of the geographic areas included in the survey. The survey design incorporated preliminary feedback from an industry representative. Each survey consisted of three parts:

- *Introduction* – Project introduction and survey completion instructions
- *Area Information* – Site owner or operator information; identification of tank battery sites within the specified geographic area; 2009 oil or condensate production by county within the specified geographic area; amount or fraction of 2009 oil or condensate production controlled by county and by control device type within the specified geographic area
- *Site Information* - Requests the following information for each tank battery site:
 - General information about the site (e.g., name, address, physical location, etc.);
 - Types of storage tanks;
 - Tank counts;
 - Storage capacity for each tank;
 - Production equipment available on site, such as heater treater, high or low pressure separator;
 - Annual production rate or throughput (only for BPA area, Haynesville Shale area and Bexar, Travis, and Williamson Counties);

- Tank contents, including a composition analysis sufficient to allow determination of VOC fraction;
- True vapor pressure;
- VOC emission controls implemented on each tank including the date of installation, type of control device, expected or measured control efficiency and emission test results; and
- Any plans to install control measures if VOC emissions are not controlled currently.

Because of potential compliance concerns for owners or operators in the HGB area, the HGB area survey differed slightly in structure from the BPA area, Haynesville Shale area and Bexar, Travis and Williamson County surveys. Because control requirements are effective for the HGB area as of January 1, 2009, requesting specific information on individual tank battery oil or condensate throughputs could be a compliance concern for site owners or operators if certain tank batteries that should be controlled have not yet been controlled. Therefore, the survey requested the amount or fraction of production controlled by county instead.

The survey requested additional information, including data required for the development of an NEI-formatted emissions inventory control file. The facility questionnaires are included in Appendix A to this report.

Each survey included document tracking and version numbers. Document tracking numbers followed the general format “2010-43-XXX-YYY,” where XXX represented the area (HGB, BPA, HAY [Haynesville Shale], BEX [Bexar County], TRA [Travis County], and WIL [Williamson County]) and YYY represented the site owner/operator from 001 to the total number of operators receiving the survey for the geographic area.

2.3 Identification of Survey Recipients

Following the methodology presented within the TCEQ-reviewed and approved April 2010 Survey Planning Report, ENVIRON developed a list of potential target site owners or operators using publicly available information from the Railroad Commission of Texas (RRC) searchable database. Research focused on identifying companies that own or operate the majority of oil and natural gas condensate production in the identified geographic areas for calendar year 2009. The RRC maintains a searchable database of oil and gas production data including owners and operators by county.³ The RRC also maintains general contact information for all producers in the State of Texas. The specific inputs used in the database search are included in Appendix B. Results of the database search performed for this project have been delivered to the TCEQ in electronic format.

ENVIRON used the General Production Query (GPQ) search to determine the oil and condensate production data for January 2009 through December 2009 for each owner or operator in each county. ENVIRON selected the 2009 production period because it represents the first year of implementation of the control requirements in the referenced rule for sites in the

³ <http://webapps.rrc.state.tx.us/PDQ/generalReportAction.do>

HGB area. It also represents a current inventory of owners or operators and the latest production records for owners or operators in the other geographic areas that do not currently have control requirements (i.e., BPA, Haynesville Shale, Bexar, Travis, and Williamson Counties).

The GPQ search returned a list of all owners or operators in the specified county and corresponding oil, gas and condensate production rates in units of barrels (bbl) for the specified period. From these results, ENVIRON determined the relative contribution of each owner or operator to the total production for the geographic area. ENVIRON then ranked all owners or operators in descending order to determine the owners or operators producing the majority (i.e., at least 50%) of geographic area-wide oil or condensate production during the 2009 production period. Tables 1a and 2a list the producers identified via this methodology for participation in the ENVIRON survey. ENVIRON survey response rates are discussed in Section 3.1. The statistical validity of this sampling approach is described in terms of sampling uncertainty, which is applied to the calculated controlled VOC emissions. The sampling methodology and statistical validity of the methodology are discussed in detail in Section 3.

During the survey period, TCEQ Region 12 also conducted a similar survey of oil and condensate producers in the HGB area. TCEQ Region 12 has provided ENVIRON with a summary of the completed surveys as of June 28, 2010. TCEQ Region 12 asked for the following information for each individual tank battery:

- Lease Name;
- RRC ID# Number;
- Tank Battery Name or ID# Number;
- Physical Address or Location Description;
- Latitude/Longitude;
- Total condensate or oil throughput for calendar year 2009;
- Estimated quantity of uncontrolled VOC emissions in 2009 and calculation methodology; and
- VOC control equipment requirements and date first operational.

ENVIRON used TCEQ data, specifically the VOC control equipment requirements and date first operational, to supplement the VOC emission calculations for the HGB area. All owners or operators that received and responded to a TCEQ Region 12 survey are listed in Tables 1b and 2b. Common owners or operators between the ENVIRON and TCEQ Region 12 survey are indicated by an asterisk. Note that all operators who received an ENVIRON survey also received a TCEQ Region 12 survey. TCEQ Region 12 survey response rates are also discussed in Section 3.1.

The RRC maintains general contact information for all producers in the State of Texas. Where possible, the ENVIRON survey was submitted to the President or General Manager of the company with instructions for completion and return. For some owners or operators, ENVIRON

identified the environmental manager with responsibility for the tank battery sites and submitted the survey to them with instructions for completion and return.

Table 1a. Oil Producers That Received ENVIRON Survey

Geographic Area	Owner or Operator	Percentage of 2009 Area-Wide Production ¹	Completed Survey (Yes/No)
HGB	Denbury Onshore, LLC	11%	No
	ERG Resources, L.L.C.	5%	No
	Exxon Mobil Corporation	6%	No
	Jetta Operating Company, Inc.	9%	No
	Quail Creek Oil Company, Inc.	4%	Yes
	TexCal Energy (GP) LLC	5%	No
	Wapiti Operating, LLC	11%	No
	Total Percentage of HGB Production from Top Owners or Operators	51%	--
BPA	Benchmark Oil and Gas Company	3%	Yes
	Cimarex Energy Co.	3%	Yes
	Cobra Oil and Gas Corporation	3%	No
	Foundation Oil Company, Inc.	5%	No
	Kingwood Exploration LLC	3%	No
	Merit Energy Company	7%	No
	Milestone Operating, Inc.	3%	No
	Papco, Inc.	3%	No
	Porter, James W. Special	3%	Yes
	Rutherford Oil Corporation	3%	No
	Square Mile Energy, L.L.C.	9%	Yes
	XTO Energy Inc.	6%	Yes
	Total Percentage of BPA Production from Top Owners or Operators	51%	--
Haynesville Shale	Basa Resources, Inc.	22%	No
	Cabot Oil and Gas Corporation	3%	No
	Chevron U.S.A. Inc.	3%	Yes
	Danmark Operating Company LLC	8%	No
	Goldston Oil Corporation	3%	No
	Linder, John Operating Co., LLC	3%	No
	Samson Lone Star, LLC	3%	No
	SND Operating, L.L.C.	6%	No
	Vess Oil Corporation	3%	No
	Total Percentage of Haynesville Shale Production from Top Owners or Operators	54%	--
Bexar	Aminex USA, Inc.	16%	No
	Diamond Horseshoe Oper Comp, LLC	7%	Yes
	Everett Oil	10%	No
	Seagull Operating Co., Inc.	12%	No
	Seeker Oil Company, Incorporated	5%	No
	U. D. Man, Inc.	5%	No
	Total Percentage of Bexar County Production from Top Owners or Operators	55%	--

Table 1a. Oil Producers That Received ENVIRON Survey

Geographic Area	Owner or Operator	Percentage of 2009 Area-Wide Production ¹	Completed Survey (Yes/No)
Travis	Electragas, Inc.	100%	Yes
Williamson	Cibolo Energy Operating, Inc.	63%	No

¹ Based on 2009 calendar year production records obtained from Railroad Commission of Texas.

Table 1b. HGB Oil Producers That Received TCEQ Region 12 Survey

Geographic Area	Owner or Operator ¹	Percentage of 2009 Area-Wide Production ²	Completed Survey (Yes/No)
HGB	Ballard Exploration Company, Inc.	0.44%	Yes
	Cimarex Energy Co.	1.97%	Yes
	CML Exploration, LLC	0.84%	No
	Cobra Oil and Gas Corporation	1.11%	Yes
	Denbury Onshore, LLC*	11.21%	No
	Devon Energy Production Co., L.P.	1.38%	Yes
	Dune Operating Company	0.61%	Yes
	ERG Resources, L.L.C.*	5.15%	No
	ETOCO, L.P.	0.72%	No
	Exxon Mobil Corporation*	5.95%	Yes
	Famcor Oil, Inc.	0.39%	Yes
	Foothills Texas, Inc.	2.44%	Yes
	Gaither Petroleum Corporation	1.68%	Yes
	Hamman Oil and Refining Company	2.04%	No
	Hilcorp Energy Company	0.65%	Yes
	Horizon Production and Operating, LLC	0.72%	Yes
	Houston Energy, L.P.	0.65%	Yes
	Houston Oil Prod Enterprises, Inc.	1.65%	Yes
	Jay Management Company, LLC	1.33%	No
	Jetta Operating Company, Inc.*	9.46%	Yes
	Josey Oil Company, Ltd.	0.53%	No
	LA-TEX Operating Company	0.92%	Yes
	McGowan Working Partners, Inc.	2.18%	No
	Morgan Enterprises, Inc.	0.47%	Yes
	Quail Creek Oil Corporation*	3.75%	Yes
	R.T.C. Resources, L.P.	0.39%	No
	Slawson Exploration Company, Inc.	0.45%	Yes
	Texas Independent Exploration, Ltd.	0.42%	No
	TEXCAL Energy (GP) LLC *	4.90%	Yes
	Triangle Three Resources, L.L.C.	0.68%	Yes
Walter Oil and Gas Corporation	0.37%	Yes	
Wapiti Operating, LLC*	10.95%	No	
Wheeler Operating Corporation	0.45%	Yes	
	Total Percentage of HGB Production	76.85%	--

¹ Survey respondents as of June 28, 2010. Common owners or operators between ENVIRON and TCEQ Region 12 survey are indicated by an asterisk.
² Based on 2009 calendar year production records obtained from Railroad Commission of Texas.

Table 2a. Natural Gas Producers That Received ENVIRON Survey

Geographic Area	Owner or Operator	Percentage of 2009 Area-Wide Production ¹	Completed Survey (Yes/No)
HGB	Ballard Exploration Company, Inc.	14%	Yes
	Carrizo Oil and Gas, Inc.	3%	No
	Choice Exploration, Inc.	4%	No
	Crimson Exploration Oper., Inc.	7%	No
	Davis Petroleum Corp.	4%	No
	Hilcorp Energy Company	7%	Yes
	SandRidge Onshore, LLC	13%	Yes
	Total Percentage of HGB Production from Top Owners/Operators	52%	--
	BPA	Cimarex Energy Co.	18%
Samson Lone Star, LLC		48%	No
Total Percentage of BPA Production from Top Owners/Operators		66%	--
Haynesville Shale	BP America Production Company	5%	Yes
	Cabot Oil and Gas Corporation	3%	No
	Devon Energy Production Co, L.P.	14%	Yes
	EOG Resources, Inc.	5%	Yes
	EXCO Operating Company, LP	3%	Yes
	Exxon Mobil Corporation	3%	No
	Forest Oil Corporation	4%	Yes
	Goodrich Petroleum Company	3%	Yes
	Penn Virginia Oil and Gas, L.P.	3%	No
	Samson Lone Star, LLC	6%	No
	XTO Energy Inc.	4%	Yes
	Total Percentage of Haynesville Shale Production from Top Owners/Operators	53%	--

¹ Based on 2009 calendar year production records obtained from Railroad Commission of Texas.

Table 2b. HGB Natural Gas Producers That Received TCEQ Region 12 Survey

Geographic Area	Owner or Operator ¹	Percentage of 2009 Area-Wide Production ²	Completed Survey (Yes/No)
HGB	Aspect Energy, LLC	0.51%	No
	Ballard Exploration Company, Inc.*	14.30%	Yes
	Bopco, L.P.	1.66%	Yes
	Brammer Engineering, Inc.	0.35%	No
	Camden Resources, LLC	1.28%	No
	Carrizo Oil and Gas, Inc.*	3.13%	Yes
	Chalker Operating Inc.	0.01%	No
	Chesapeake Operating, Inc.	0.09%	Yes
	Choice Exploration, Inc.*	3.81%	No
	Cimarex Energy Co.	2.62%	Yes

Table 2b. HGB Natural Gas Producers That Received TCEQ Region 12 Survey

Geographic Area	Owner or Operator¹	Percentage of 2009 Area-Wide Production²	Completed Survey (Yes/No)
	Cimarex Energy Co. Of Colorado	0.86%	Yes
	CML Exploration, LLC	1.63%	No
	Cobra Oil and Gas Corporation	0.18%	Yes
	ConocoPhillips Company	2.80%	Yes
	Coronado Energy E&P Company, LLC	1.80%	Yes
	Crawford Hughes Operating Co.	0.18%	No
	Crimson Exploration Oper., Inc.*	6.90%	No
	Crossroads Energy L.P.	0.03%	No
	Cypress E & P Corporation	0.19%	No
	Davis Operating Company, Inc.	0.37%	Yes
	Davis Petroleum Corp.*	4.08%	Yes
	Davis Southern Operating Co LLC	0.33%	Yes
	Denbury Onshore, LLC	0.31%	No
	Devon Energy Production Co, L.P.	1.62%	Yes
	Duncan Oil, Inc.	0.06%	Yes
	Dune Operating Company	1.53%	Yes
	ECA Holdings, L.P.	0.38%	Yes
	Edge Petroleum Oper. Co., Inc.	0.40%	Yes
	Elliott Oil and Gas Operating Co.	2.90%	No
	Endeavor Natural Gas, LP	0.22%	No
	EOG Resources, Inc.	0.28%	No
	Etoco, L.P.	0.55%	No
	Forest Oil Corporation	1.48%	No
	Fort Apache Energy, Inc.	0.02%	No
	Fortune Resources LLC	0.11%	Yes
	Gaither Petroleum Corporation	0.12%	Yes
	Horizon Prod. And Operating, LLC	1.90%	Yes
	Joy Resources, Inc.	0.37%	Yes
	Kaiser-Francis Oil Company	0.29%	Yes
	Lapis Operating, Inc.	0.45%	No
	Layton Energy Inc.	0.08%	Yes
	Legend Natural Gas li, LP	0.07%	No
	Marquee Corporation	0.27%	Yes
	Noble Energy Inc	1.06%	Yes
	Nordstrand Engineering, Inc.	0.06%	No
	Noxxe Oil And Gas, LLC	0.09%	No
	Petropro Energy Partners, L.P.	0.02%	Yes
	Phoenix Hydrocarbons Operating	0.80%	Yes
	Quantum Resources Management,LLC	0.29%	No
	R.T.C. Resources, L.P.	0.05%	No
	Reef Exploration, L.P.	1.26%	Yes
	Resaca Resources, L.L.C.	0.57%	Yes
	Royal Production Company, Inc.	0.08%	Yes
	Rutherford Oil Corporation	0.28%	No
	Sandridge Onshore, LLC*	12.76%	Yes
	Senora Resources, Inc.	0.12%	No

Table 2b. HGB Natural Gas Producers That Received TCEQ Region 12 Survey

Geographic Area	Owner or Operator ¹	Percentage of 2009 Area-Wide Production ²	Completed Survey (Yes/No)
	Sojourner Offshore, Llc	0.02%	No
	Square Mile Energy, L.L.C.	2.70%	Yes
	Strand Energy, L.C.	0.94%	Yes
	Sue-Ann Operating, L.C.	0.12%	Yes
	Synergy Oil and Gas, L.P.	0.09%	Yes
	Tandem Energy Corporation	0.51%	No
	Tema Oil And Gas Company	0.28%	Yes
	Tempest Energy Resources, LP	0.05%	No
	Texas Petroleum Investment Co.	0.09%	Yes
	Texcal Energy (Gp) Llc	0.30%	Yes
	Wynn-Crosby Operating, Ltd.	0.10%	Yes
	XTO Energy Inc.	1.00%	Yes
	Yuma E & P Company, Inc.	0.56%	No
	Zenergy, Inc.	1.57%	No
	Hilcorp Energy Company*	7.33%	Yes
	Total Percentage of HGB Production	93.62%	--

¹ Survey respondents as of June 28, 2010. Common owners or operators between ENVIRON and TCEQ Region 12 survey are indicated by an asterisk.

² Based on 2009 calendar year production records obtained from Railroad Commission of Texas.

2.4 Tank Battery Counts

ENVIRON performed research to estimate the number of oil and condensate tank batteries by county in the target geographic areas. This information was identified in the TCEQ Work Order as potentially useful in determining survey response rates, validating survey results, and in performing quality assurance/quality control (QA/QC) and statistical analyses of the data contained within the survey responses. Through considerable research and inquiry, ENVIRON determined that actual tank battery counts by county are not publicly or readily available. This conclusion was validated through discussions with representatives of the Railroad Commission of Texas (RRC), Texas Oil and Gas Association (TXOGA), and select oil and gas industry companies.

ENVIRON evaluated two potential methods for the determination of county-by-county total tank battery counts. The first method would overlay geographic information system (GIS) oil and gas well location data on digital orthophoto quadrangle (DOQ) images for the purpose of manually counting the tanks associated with a given oil or gas wellhead. The TCEQ provided ENVIRON with the GIS data for the HGB, BPA and Haynesville Shale areas. DOQ images are available for the state. However, this method does not distinguish between tank types (e.g., fixed roof, internal floating roof, external floating roof), stored material (e.g., oil, condensate, produced water), operating status, or tanks being used for non-oil and gas producing activities. The second method would use RRC data on oil and gas leases and production. Given the availability of RRC data and the ability to automate the process, as compared to the manual tank battery count method described above, ENVIRON selected this second method for the

determination of county-by-county total tank battery counts. Following is a description of the method along with the required assumptions.

- *Assumption* - Assume each oil or gas lease has at least one associated tank battery. Through discussion with industry representatives, ENVIRON learned that multiple wells on the same lease under common control often share a single tank battery. Therefore, assuming one tank battery per wellhead would almost certainly result in an overestimation of the number of tank batteries. Assuming one tank battery per lease appears to be a more reasonable assumption.
- Step 1 - Determine the total number of oil or gas leases per county based on 2009 production data from the RRC. Assuming one tank battery per lease, this value represents the potential number of oil or condensate tank batteries per county.
- Step 2 – Refine the potential number of oil or condensate tank batteries based on 2009 oil or condensate throughput. ENVIRON assumed that leases with no oil or condensate production during 2009 do not maintain active tank batteries.⁴

A potential third step would further refine the results of Step 2 by accounting for multiple leases using a single tank battery. This refinement could be achieved based on survey response data and extrapolation. However, limited information of this type was provided by survey respondents. Only one operator in the Haynesville Shale area provided detailed information on multiple leases using a single tank battery. Therefore, an extrapolation is not appropriate.

The configuration of the tank battery at oil leases can be influenced by many factors, including:⁵

- Daily oil production rate, which regulates the size of the tanks installed;
- Oil sales method, which determines the length of time that tanks are unavailable when oil is being sold to pipeline or loaded into trucks and consequently the number of tanks needed;
- Lease size, which determines the area available for tank storage; and
- Quality of oil produced, which can eliminate or minimize the need for atmospheric storage.

Similar considerations exist for tank battery configuration for storage of condensates. Because of these considerations and other uncertainties, an accurate estimate of the actual number of individual storage tanks is not practical.

⁴ The number of leases with no oil or condensate production during 2009 for Nacogdoches, Rusk, and Upshur Counties was not practically available using this method. Therefore, ENVIRON relied upon the most recent number of regular producing wells (February 2010) from the well distribution by county located at <http://www.rrc.state.tx.us/data/wells/wellcount/index.php>.

⁵ *The Lease Pumper's Handbook*, Chapter 10 The Tank Battery (http://www.ok.gov/marginalwells/Publications/Pumper's_Handbook.html)

Through the course of this study, ENVIRON has learned that often wells from multiple leases feed to a common tank battery. Field verifications of a limited number of tank battery sites in the HGB, BPA, and Haynesville Shale areas indicated that a majority of the verified tank battery sites receive production from wells from multiple leases. Without a verification of each operation in each county, it is not possible to accurately determine the number of tank batteries per county. Therefore, it appears that the estimates in Tables 3 and 4 may present an overestimation of the actual number of tank batteries in each county.

Table 3. Estimated Number of Tank Batteries by County

Geographic Area	County	Estimated Number of Potential Oil Tank Batteries	Estimated Number of Potential Condensate Tank Batteries
HGB	Brazoria	269	507
	Chambers	308	351
	Fort Bend	144	319
	Galveston	144	150
	Harris	306	424
	Liberty	397	305
	Montgomery	48	333
	Waller	102	256
	Total	1,718	2,645
BPA	Hardin	464	157
	Jefferson	212	281
	Orange	98	77
	Total	774	515
Haynesville Shale	Gregg	865	1,274
	Harrison	394	3,240
	Marion	205	164
	Nacogdoches	40	1,798
	Panola	382	6,593
	Rusk	827	2,948
	San Augustine	18	83
	Shelby	70	745
	Smith	316	692
	Upshur	84	866
Total	3,201	18,403	
Bexar, Travis, and Williamson	Bexar	454	28
	Travis	6	0
	Williamson	22	2
	Total	482	30

Table 4. Refined Estimate of the Number of Tank Batteries by County, Excluding Leases with No Production During 2009

Geographic Area	County	Estimated Number of Oil Tank Batteries	Estimated Number of Condensate Tank Batteries
HGB	Brazoria	140	151
	Chambers	111	46
	Fort Bend	91	123
	Galveston	71	46
	Harris	157	106
	Liberty	217	154
	Montgomery	24	82
	Waller	68	60
	Total	879	768
BPA	Hardin	294	81
	Jefferson	83	117
	Orange	54	38
	Total	431	236
Haynesville Shale	Gregg	687	824
	Harrison	209	2,072
	Marion	93	97
	Nacogdoches ¹	21	1,409
	Panola	182	3,256
	Rusk ¹	588	2,641
	San Augustine	14	65
	Shelby	48	417
	Smith	226	587
	Upshur ¹	55	789
Total	2,123	12,157	
Bexar, Travis, and Williamson	Bexar	283	0
	Travis	2	0
	Williamson	9	0
	Total	294	0

¹ The number of leases with no oil or condensate production during 2009 for Nacogdoches, Rusk, and Upshur Counties was not practically available using the referenced method. Therefore, ENVIRON relied upon the most recent number of regular producing wells (February 2010) from the well distribution by county located at <http://www.rrc.state.tx.us/data/wells/wellcount/index.php>.

3 Survey Responses

3.1 Response Rates

ENVIRON identified producers contributing to the majority of oil or condensate production in a given geographic area. As shown in Table 5, the percentage of geographic area 2009 production represented by survey respondents was highly variable for the ENVIRON survey. In the primary geographic areas of interest (i.e., HGB, BPA and Haynesville Shale areas), ENVIRON received survey responses totaling less than the targeted majority of production. In contrast, the TCEQ Region 12 survey of HGB oil and condensate producers received higher participation. All owners or operators who received an ENVIRON survey also received a TCEQ Region 12 survey. The voluntary nature of the ENVIRON survey as compared to the mandatory response requirement of the TCEQ Region 12 survey most likely influenced the survey response rates in the HGB area. With limited resources to respond to these related demands, producers may not have focused their efforts on preparing a timely response to ENVIRON’s voluntary survey for the HGB area. A comparison of 2009 production data and control device information provided by the survey respondent in the two surveys showed good agreement. Consequently, ENVIRON used the survey data collected by TCEQ Region 12 to supplement the VOC emission calculations for the HGB area.

Table 5 summarizes the survey response rates by geographic area for both the ENVIRON and TCEQ Region 12 surveys. In most cases, a producer was identified as either an oil or condensate producer in the geographic area and the expectation was that they would provide that data only. However, in some cases, targeted producers of either oil or condensate provided information on both oil and condensate production and tank batteries.

Table 5. Survey Response Rates

Geographic Area	Oil Producers That Received Surveys	Condensate Producers That Received Surveys	Producers that Responded to Surveys	Overall Response Rate ¹	Percentage of Area 2009 Production Represented by Survey Respondents ²	
					Oil	Condensate
HGB – ENVIRON	7	7	Ballard Exploration Company Hilcorp Energy Company Quail Creek Oil Company SandRidge Onshore	29%	5%	34%
HGB – TCEQ	33	71	Refer to Tables 1b and 2b.	61%	29%	65%
BPA	12	2	Cimarex Energy Company James W. Porter Square Mile Energy Benchmark Oil and Gas Company XTO Energy	36%	24%	22%

Table 5. Survey Response Rates

Geographic Area	Oil Producers That Received	Condensate Producers That Received	Producers that Responded to Surveys	Overall Response Rate ¹	Percentage of Area 2009 Production Represented by Survey Respondents ²	
Haynesville Shale	9	11	BP America Production Co Chevron USA Devon Energy Production Co. EOG Resources EXCO Operating Company Forest Oil Company Goodrich Petroleum Company XTO Energy	40%	7%	40%
Bexar	6	0	Diamond Horseshoe Operating	17%	7%	N/A
Travis	1	0	Electragas, Inc.	100%	100%	N/A
Williamson	1	0	None	0%	0%	N/A

¹ The overall response rate was calculated as follows: No. of Producers that Responded to Surveys / (No. of Oil Producers that Received Surveys + No. of Condensate Producers that Received Surveys)

² Based on 2009 calendar year production data as reported to the RRC.

3.2 Tank Information

Table 6 summarizes the number of producing tank batteries, the material stored at the site, the total number of storage tanks and the total storage capacity for survey respondents by geographic area.

Table 6. Tank Battery Summary

Geographic Area	No. of Producing Tank Batteries ¹	Number of Tank Batteries by Material Stored ²			Total No. of Tanks ³	Total Storage Capacity (bbl)
		Oil	Condensate	Both		
HGB – ENVIRON	71	33	35	3	157	68,872
HGB – TCEQ ⁴	149	31	118	0	NR	N/A
BPA	39	12	26	1	150	58,350
Haynesville Shale	629	106	523	0	305	85,310
Bexar County	6	5	0	1	16	3,240
Travis County	2	2	0	0	6	1,240

¹ Only includes the number of tank batteries for which production information was provided by survey respondents
² Information on material stored at the site was not given in all survey responses. Therefore the number of tank batteries in these columns may not sum to the total number of tank batteries.
³ Only includes tanks at producing sites for which tank capacity was also provided
⁴ Only includes tanks that reported 2009 production to TCEQ Region 12
NR = not reported
N/A = not available

Maps showing the locations of the tank batteries included in the ENVIRON survey responses are included as Appendix C. Only those tank batteries with geographic coordinates provided in the ENVIRON survey responses are included in the maps. Maps are not shown for the limited number of tank batteries in Bexar and Travis Counties included in the survey responses.

With few exceptions, tanks used to store oil or condensate are fixed-roof tanks, typically vertical. Only a few open-top water storage tanks were identified by survey respondents.

With respect to additional production equipment at each site, that information is contained within the responses to the survey questionnaire and included in electronic documents submitted to the TCEQ by ENVIRON. The ENVIRON survey requested that owners or operators indicate whether the following equipment was installed at each tank battery site:

- Heater/Treater;
- High Pressure Separator;
- Low Pressure Separator;
- Compressor;
- Pumpjack;
- Dehydration Unit;
- Amine or Sweetening Unit; or
- Other (to be specified by owner or operator).

Survey results for oil tank batteries, condensate tank batteries and combined tank batteries by geographic area are summarized in Tables 7a, 7b, and 7c, respectively.

Table 7a. Summary of Production Equipment at Surveyed Oil Tank Batteries

Geographic Area	Number of Tank Batteries with Specified Production Equipment							
	Heater Treater	High Pressure Separator	Low Pressure Separator	Compressor	Pumpjack	Dehydration Unit	Amine or Sweetening Unit	Other ¹
HGB	20	15	16	11	0	3	0	1
BPA	7	7	7	2	0	4	0	0
Haynesville Shale	5	15	21	11	27	0	0	1
Bexar County	0	0	0	0	0	0	0	0
Travis County	0	0	0	0	2	0	0	0
Total	32	37	44	24	29	7	0	2
¹ List of other equipment by geographic area: HGB – free water knockout Haynesville Shale – gun barrel tank								

Table 7b. Summary of Production Equipment at Surveyed Condensate Tank Batteries

Geographic Area	Number of Tank Batteries with Specified Production Equipment							
	Heater Treater	High Pressure Separator	Low Pressure Separator	Compressor	Pumpjack	Dehydration Unit	Amine or Sweetening Unit	Other ¹
HGB	24	32	32	15	1	29	4	1
BPA	19	22	22	13	0	20	4	0
Haynesville Shale	5	81	73	49	26	5	0	1
Bexar County	0	0	0	0	0	0	0	0
Travis County	0	0	0	0	0	0	0	0
Total	48	135	127	77	27	54	8	2

¹ List of other equipment by geographic area:
HGB – JT Unit
Haynesville Shale – gun barrel tank

Table 7c. Summary of Production Equipment at Surveyed Combination Tank Batteries

Geographic Area	Number of Tank Batteries with Specified Production Equipment							
	Heater Treater	High Pressure Separator	Low Pressure Separator	Compressor	Pumpjack	Dehydration Unit	Amine or Sweetening Unit	Other ¹
HGB	1	3	2	2	0	0	0	2
BPA	1	0	1	0	1	0	0	0
Haynesville Shale	3	3	12	7	6	1	0	0
Bexar County	0	0	0	0	0	0	0	0
Travis County	0	0	0	0	0	0	0	0
Total	5	6	15	9	7	1	0	2

¹ List of other equipment by geographic area:
HGB – fuel gas scrubber and flare scrubber

3.3 Production Rates

Table 8 summarizes production data as reported by survey respondents. Because of potential compliance implications, the ENVIRON survey did not request 2009 production data for individual tank battery sites in the HGB area. Instead, the ENVIRON survey requested 2009 production data and the amount controlled on an area-wide basis. Among the geographic areas surveyed, only the condensate production reported by TCEQ Region 12 survey respondents amounted to more than 50% of the 2009 area production. This reduced the uncertainty in the calculated VOC emissions rates from condensate in the HGB area as compared to VOC emission rates calculated for the other areas.

Table 8. Production Data

Geographic Area	Tank Batteries with Production Data ¹			2009 Total Production ² (bbl)			2009 Average Production per Tank Battery (bbl)		
	Oil	Cond.	Both	Oil	Cond.	Both	Oil	Cond.	Both
HGB – ENVIRON ³	33	35	3	539,959	977,289	--	16,362	25,718	--
HGB – TCEQ	31	118	0	1,618,829	2,335,837	--	52,220	19,795	--
BPA ⁴	12	26	1	434,488	1,196,723	--	33,422	46,028	--
Haynesville Shale	106	523	0	469,817	2,018,527	--	4,432	3,860	--
Bexar County ⁵	5	0	1	11,500	--	--	1,917	--	--
Travis County	2	0	0	1,900	--	--	950	--	--

¹ The ENVIRON survey did not request 2009 production data on a tank battery specific basis. Instead, the ENVIRON survey requested 2009 production data on an area-wide basis. For HGB – ENVIRON, these are the number of reported tank batteries.

² 2009 total production as reported by survey respondents

³ Production at the three combination tank battery sites was categorized as condensate based on ratio of condensate to oil production.

⁴ Production at the one combination tank battery site was categorized as oil based on ratio of oil to condensate production. Also, one reported tank battery did not have production in 2009.

⁵ Production at the one combination tank battery site was categorized as oil based on ratio of oil to condensate production.

ENVIRON compared 2009 total production data as reported by survey respondents to 2009 total production data as reported to the RRC. When the production rates did not match, ENVIRON used 2009 production data as reported to the RRC for consistency as that is the basis of the uncontrolled VOC emission calculations described in Section 4. A summary of this analysis for the HGB, BPA and Haynesville Shale areas is provided in Table 9. Production rates for the other areas of interest (i.e., Bexar, Travis, and Williamson Counties) were not compared because these rates are not used in VOC emission calculations. As shown in Table 9, the 2009 production reported through the survey response was generally lower than that reported to the RRC. However, this varied by individual operator. Although not specified by any survey respondent, differences could be due to differing accounting practices within divisions of the company or due to the definitions of condensate and oil used by operators. At least one

operator surveyed indicated that condensate and oil are handled the same way in the field. Oftentimes, the term “oil” is used interchangeably with condensate.

Table 9. Comparison of 2009 Production Data Reported in Survey Response and Reported to RRC

Geographic Area	Reported 2009 Oil Production (bbl)			Reported 2009 Condensate Production (bbl)		
	Survey	RRC	Difference	Survey	RRC	Difference
HGB – ENVIRON	539,959	432,993	106,966	977,289	1,186,311	-209,022
HGB – TCEQ	1,618,829	2,574,638	-955,809	2,335,887	2,245,065	90,772
BPA	434,488	613,938	-179,450	1,196,723	1,203,832	-7,109
Haynesville Shale ¹	469,817	453,747	16,070	2,018,527	2,180,331	-161,804

¹ Some Haynesville Shale survey respondents provided production rates on a daily average basis and not on an annual basis. ENVIRON calculated annual production by multiply the daily average survey results by 365 days per year.

In addition to 2009 oil or condensate production rates, the TCEQ Region 12 survey requested the VOC emissions calculated by the owner or operator for each tank battery. The number of oil and condensate tank batteries with reported and calculated VOC emissions of 25 tpy or greater is presented in Table 10. The calculated VOC emissions are based on 2009 production reported to TCEQ Region 12 and the referenced rule emission factors.

Table 10. Comparison of HGB Area Reported and Calculated VOC Emissions

Tank Battery Type	Number of Tank Batteries with Reported Emissions of 25 tpy or More	Number of Tank Batteries with Calculated Emissions of 25 tpy or More
Oil	8	28
Condensate	26	122
Total	34	150

As shown, the number of tank batteries with reported VOC emissions of 25 tpy or greater is less than the number of tank batteries with VOC emissions of 25 tpy or greater using the referenced calculation approach. Clearly, there is a discrepancy between what operators believe their tank battery emissions to be – typically based on calculations using models such as E&P TANK – and emissions estimated by using production data and the referenced rule emission factors.

3.4 Compositional Analysis

ENVIRON requested site-specific information about VOC content and true vapor pressure for liquids stored at the individual tank batteries. Responses were limited, but are discussed below.

Figure 1 summarizes the number of tank batteries for each geographic area for which some information on liquid compositional analysis was provided by one or more survey respondents. No compositional analysis was provided for stored liquids in Bexar, Travis or Williamson Counties.

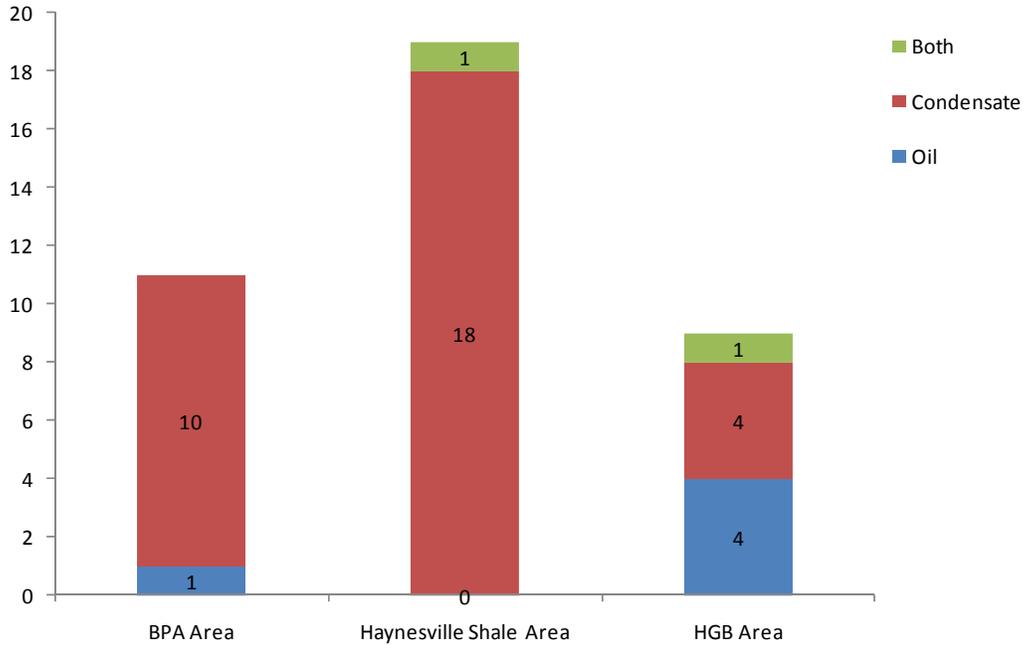


Figure 1. Tank Batteries for Which a Compositional Analysis was Provided

Figure 2 presents the average non-methane hydrocarbon mass fraction of the stored liquid for the sites where this information was provided: four condensate tank batteries in the HGB, one oil and condensate tank battery in the HGB, and one combined oil and condensate storage tank battery in the Haynesville Shale area. Note that certain anomalies in the data received for the one oil and condensate tank battery in the HGB make the presented value suspect. However, for completeness, the data is reported. For the suspect data, the sum of the mole percents does not add to 100 percent; the sum total is only 7.7 percent.

Average Non-Methane Hydrocarbon Mass Fraction

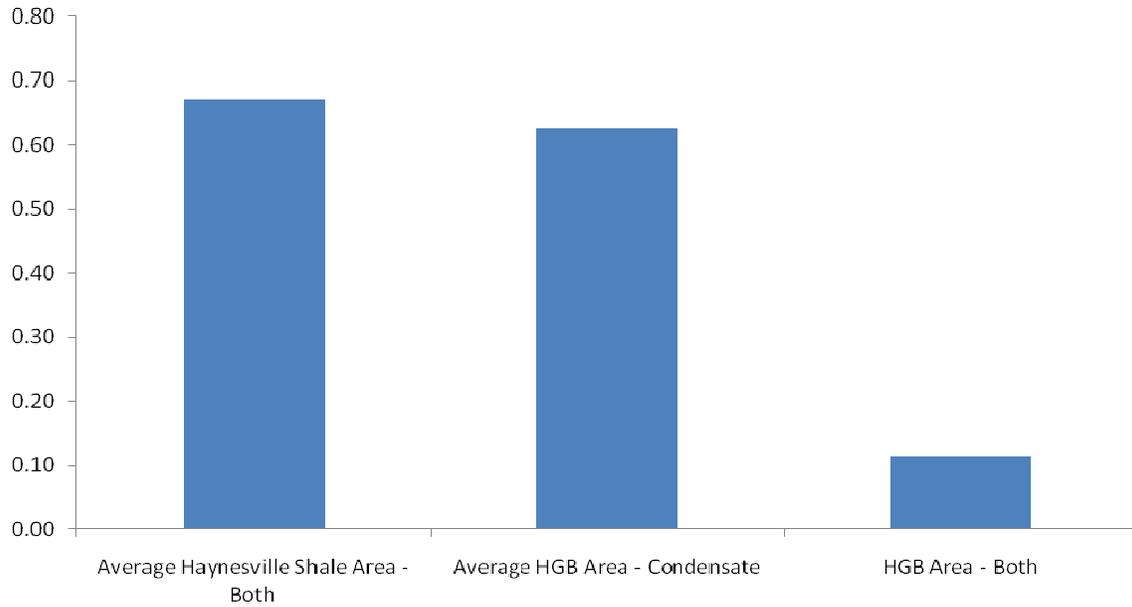


Figure 2. Average Non-Methane Hydrocarbon Mass Fraction

Figure 3 presents the compositional analysis for the one oil storage tank battery in the BPA for which this information was provided. This tank battery is located in Hardin County and stores oil from the Sour Lake Easter field.

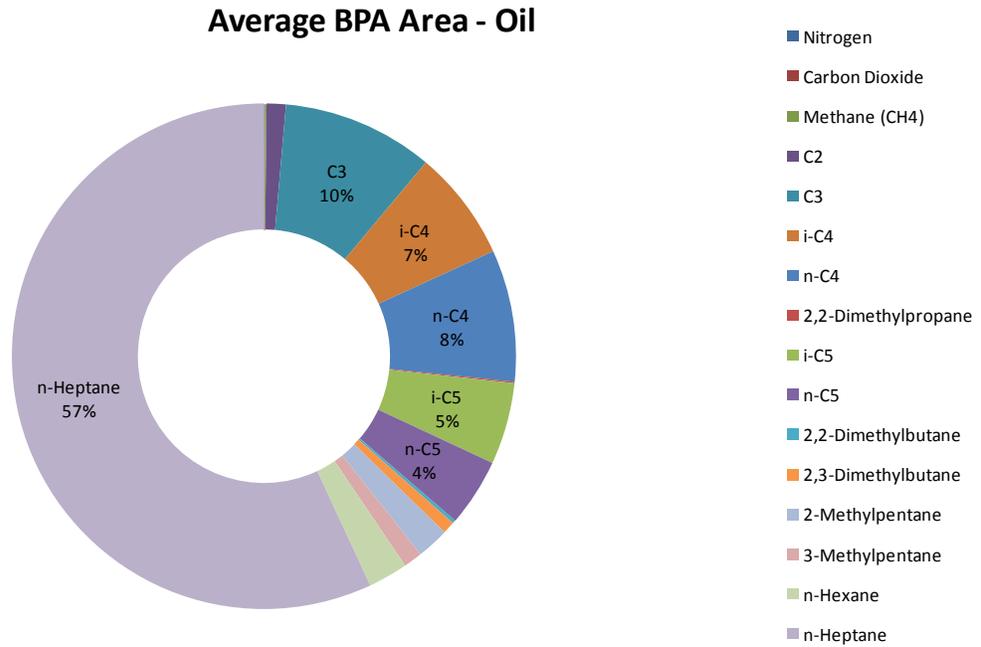


Figure 3. Compositional Analysis – BPA Stored Oil

Figure 4 presents the average compositional analysis for the 18 condensate storage tank batteries in the BPA for which this information was provided. The tank batteries are located in Hardin and Jefferson Counties and store condensate produced from the Sour Lake Easter, Hilderbrandt Bayou, Constitution, French Bayou and Perl fields.

Average BPA Area - Condensate

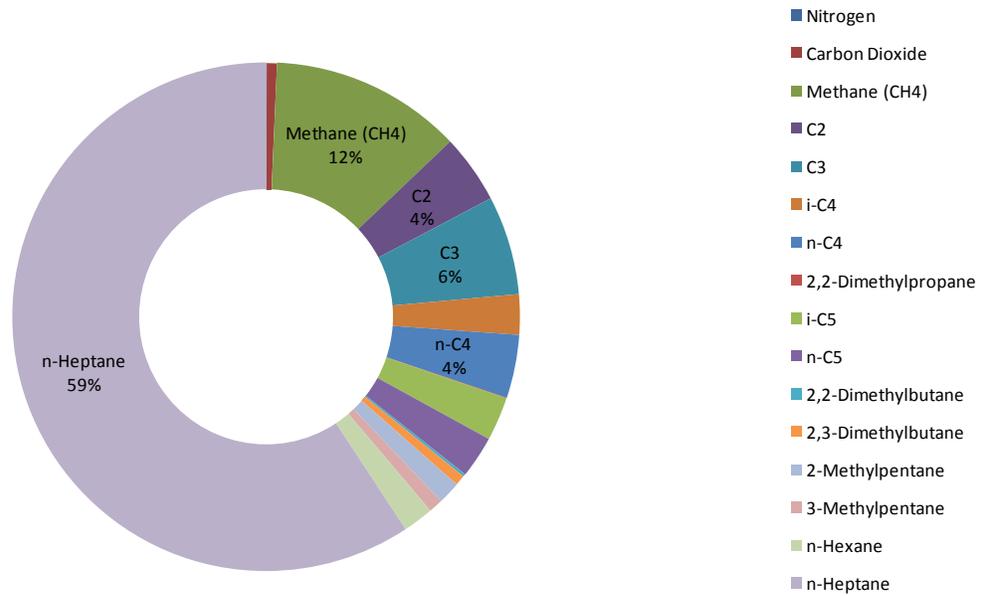


Figure 4. Compositional Analysis – BPA Stored Condensate

Figure 5 presents the compositional analysis for the one oil and condensate storage tank battery in the Haynesville Shale for which this information was provided. This tank battery is located in Rusk County and stores oil and condensate from the Henderson South field.

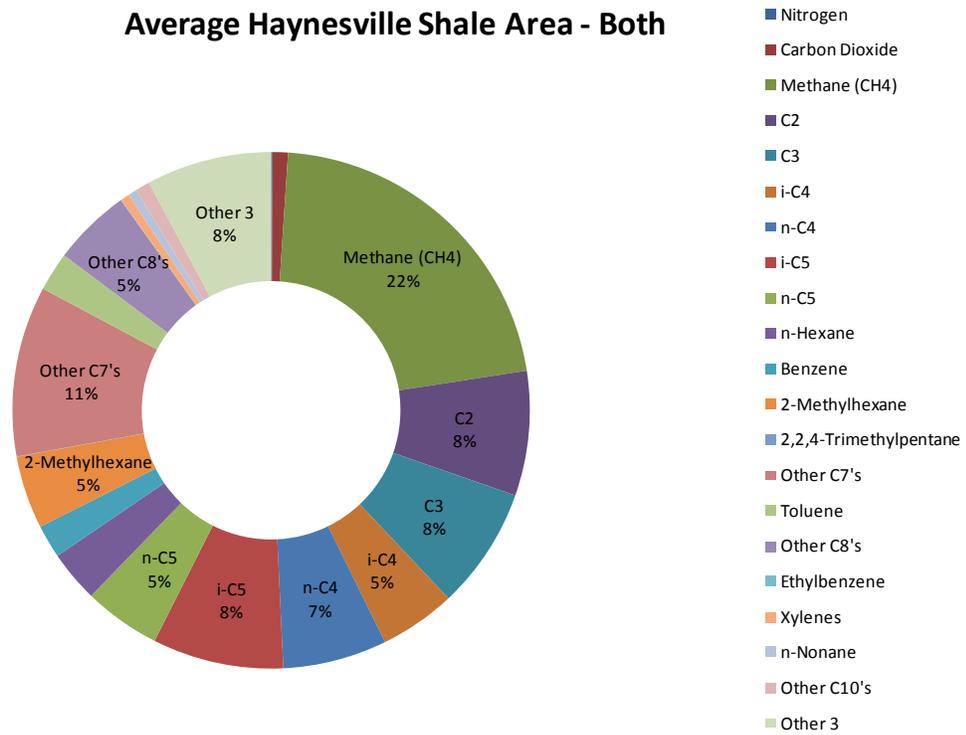


Figure 5. Compositional Analysis – Haynesville Shale Stored Oil and Condensate

Figure 6 presents the compositional analysis for the one condensate storage tank battery in the Haynesville Shale for which this information was provided. This tank battery is located in Gregg County and stores condensate from the Danville field.

Average Haynesville Shale Area - Condensate

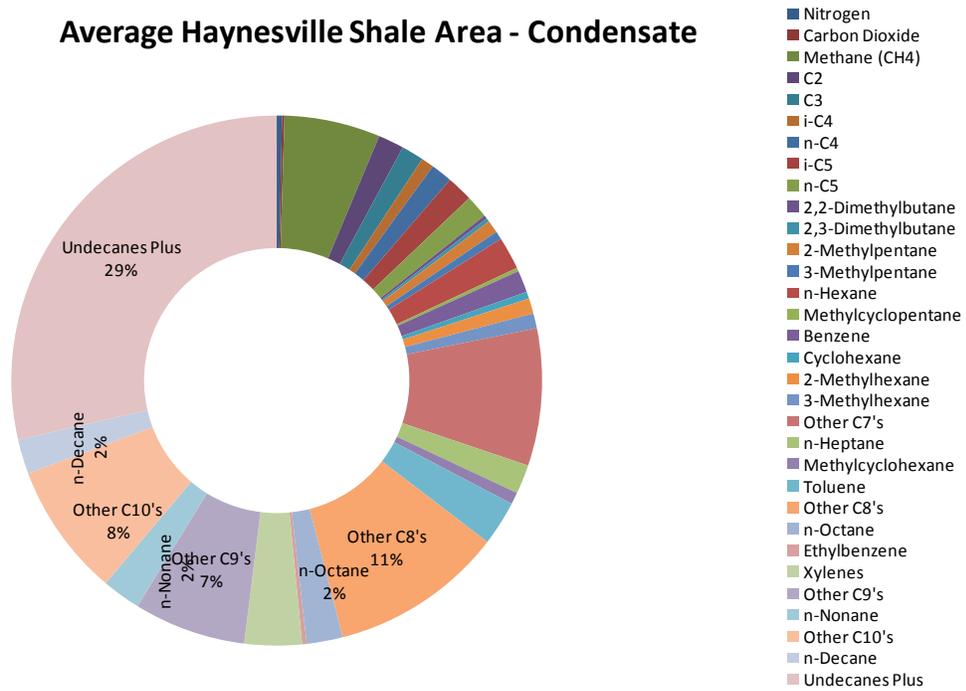


Figure 6. Compositional Analysis – Haynesville Shale Stored Condensate

Figure 7 shows the average compositional analysis for the four oil storage tank batteries in the HGB for which this information was provided. These tank batteries are located in Liberty County and store oil from the Hull field.

Figure 7 shows the average compositional analysis for the four oil storage tank batteries in the HGB for which this information was provided. These tank batteries are located in Liberty County and store oil from the Hull field.

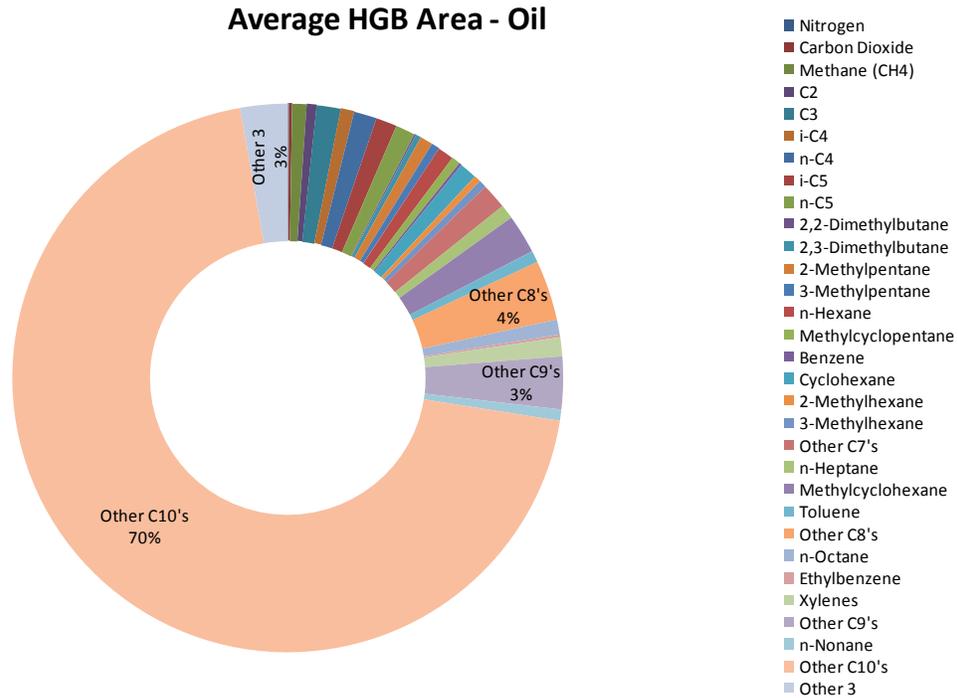


Figure 7. Compositional Analysis – HGB Stored Oil

3.5 Flash Gas Analysis

Flash gas analysis was provided for six sites:

- Four condensate storage tank batteries in the HGB area;
- One oil and condensate storage tank battery in the HGB area; and
- One oil and condensate storage tank battery in the Haynesville Shale area.

The flash gas volumes are presented in Table 11.

Table 11. Flash Gas Volumes

Site ID	Geographic Area	Material Stored	Flash Gas Volume (scf/bbl)
113	HGB	Condensate	32
114	HGB	Condensate	32
119	HGB	Condensate	91
123	HGB	Condensate	146
36	HGB	Oil and Condensate	10
83	Haynesville Shale	Oil and Condensate	1,874

As shown in Table 11, the flash gas volume for the one Haynesville Shale storage tank battery is much higher than the five HGB storage tank batteries. Discussions with the survey respondent indicate that this sample may have been collected prior to the high pressure separator. The gas from that well, as shown from the compositional analysis in Figure 5, has a very high percentage of light-end hydrocarbons, with nearly half of the hydrocarbons being C4 or lighter. The only other compositional analysis provided for a tank battery located in the Haynesville shale, as shown in Figure 6, has a very low percentage of light-end hydrocarbons. While no flash gas volume was provided for the Figure 6 tank battery, given the very low percentage of light-end hydrocarbons in the condensate, it is reasonable to assume that flash gas volumes would also be low. From these two data points alone, no general conclusions can be drawn regarding typical flash gas volumes from Haynesville Shale producing sites.

Since ENVIRON's survey did not request a flash gas composition analysis, only a tank content composition analysis, an accurate estimation of flash emissions cannot be made using the flash gas volumes. However, assuming an average flash gas molecular weight equal to ethane and standard conditions (1 atm, 25°C), the Ideal Gas Law can be used to estimate emissions. The following example illustrates how the flash gas volumes in Table 11 could be used to estimate a total hydrocarbon emission factor and the range of emissions depending on the flash gas volume:

$$\text{Emissions} = (PV/RT) \times MW, \text{ where}$$

- P = 1 atm
- V = 1 ft³
- R = 0.7302 atm-ft³/lbmole-°R
- T = 537°R (equal to 25°C)
- MW = 30 lbs/lbmole

Flash emissions are estimated as 0.077 lbs/ft³ of flash gas. For a flash gas volume of 10 scf/bbl, a rough estimation of flash emissions using this approach is 0.77 lbs/bbl. For a flash gas volume of 1,874 scf/bbl, emissions are roughly estimated as 143 lbs/bbl. [Note: this

estimate is for flash emissions of total hydrocarbons, including non-VOC constituents methane and ethane.]

3.6 Vapor Pressure

True Vapor Pressure data was provided for six sites:

- Four oil storage tank batteries in the HGB,
- One oil and condensate storage tank battery in the HGB, and
- One oil and condensate storage tank battery in the Haynesville Shale.

The vapor pressures are presented in Table 12.

Table 12. True Vapor Pressure

Site ID	Geographic Area	Material Stored	True Vapor Pressure (psia)
16	HGB	Oil	2.0
12	HGB	Oil	1.2
7	HGB	Oil	4.3
4	HGB	Oil	4.0
36	HGB	Oil & Condensate	6.7
83	Haynesville Shale	Oil & Condensate	8.5

A comparison of Tables 11 and 12 shows two common sites, 36 in the HGB area and 83 in the Haynesville Shale area. It appears that true vapor pressure is not directly related to the flash gas volume or that the Haynesville Shale sample was collected from a different location in the process than the other samples. Sites 36 and 83 have similar true vapor pressures, but very different flash gas volumes.

3.7 Emission Controls

Table 13 presents information on emission controls currently employed at tank batteries included in survey responses. For the HGB area, these data represent all existing controls, including those that were installed prior to the referenced rule, which became effective on June 14, 2007. Compliance with the rule was not required until January 1, 2009. The results also include voluntary controls which have been installed in the other geographic areas. The installation of controls on tank batteries could be dependent upon several factors, including the methodology used to calculate VOC emissions and permitting options. For example, use of alternative methods (e.g., E&P TANK) to calculate potential VOC emissions can result in lower calculated VOC emission rates. Also, some facilities may wish to limit VOC emissions to levels allowed under Permit by Rule (PBR) authorizations (i.e., 25 tpy). This could result in voluntary

emission controls installed prior to the rule that are not accounted for in the effectiveness of the rule.

Table 13. Emission Controls Currently Installed

Geographic Area	Tank Battery Vapor Controls				Type of Control			
	Status Reported ¹	No Control	With Control	% Control	VRU Only	Flare Only	VRU + Flare ²	Other / Unspecified
HGB – ENVIRON	71	50	21	29.6	7	14	0	0
HGB – TCEQ and ENVIRON	245	157	88	35.9	33	52	3	0
BPA	40	31	9	22.5	0	5	4	0
Haynesville Shale	1,584	1,573	11	0.7	3	7	1	0
Bexar County	6	6	0	0.0	0	0	0	0
Travis County	2	2	0	0.0	0	0	0	0

¹ Includes tank batteries that reported control status, regardless of whether site was producing or non-producing during 2009

² Several tank batteries in the HGB and BPA areas report use of both VRUs and Flares. At these sites, the VRU is the primary control device, while the flare serves as back-up control if the VRU is not operational or if the site experiences an upset event.

As shown in Table 13, the percentage of tank batteries with vapor controls in the BPA area is similar to those with vapor controls in the HGB area even though Chapter 115 does not currently require control of tank batteries in the BPA area. Based on discussions with BPA area survey respondents, we believe the primary rationale for the installation of vapor controls was to qualify for PBR authorization instead of having to obtain a 30 TAC Chapter 116 preconstruction permit.

None of the tank batteries reported for Bexar or Travis Counties currently have vapor controls.

In determining the VOC emission reductions resulting from the referenced rule in the HGB area and the VOC emission reductions that would potentially result in the BPA and Haynesville Shale areas, it is necessary to calculate and apply a more refined control percentage. In the HGB area, this control percentage only considers those controls that were installed or planned for installation solely as a result of the referenced rule. In the BPA and Haynesville Shale areas, the control percentage only considers controls that would be required if the referenced rule was extended to those areas. Specifically, a tank battery with VOC emissions of 25 tpy or more – calculated using 2009 production values and referenced rule emission factors – and no controls currently installed or currently planned for installation. These refined control percentage numbers are presented in Tables 14a and 14b for the HGB area and BPA and Haynesville Shale areas, respectively.

Table 14a. VOC Emission Controls Installed in Response to the Referenced Rule in the HGB Area

Tank Type	Tank Battery Control Status Reported	Tank Battery Emissions Controlled as a Result of Rule	% Control
Oil	65	16	24.6
Condensate	180	37	20.6
Total	245	53	21.6

Table 14b. Newly Required VOC Emission Controls for BPA and Haynesville Shale Areas

Geographic Area	Oil Tank Battery Sites			Condensate Tank Battery Sites		
	Status Reported ¹	Not Currently Controlled but Would be Under Referenced Rule	% Control	Status Reported ¹	Not Currently Controlled but Would be Under Referenced Rule	% Control
BPA	13	6	46.2	26	13	50.0
Haynesville Shale	106	0	0	523	64	12.2

¹ Only includes tank batteries with production data provided by survey respondents sufficient to determine calculated VOC emissions

3.8 Field Verifications

To verify the information reported by survey respondents, ENVIRON conducted field verifications of 15 tank batteries in the HGB area, nine tank batteries in the BPA area, and eight tank batteries in the Haynesville Shale area during July 2010. These field verifications constitute 21% of the tank batteries surveyed by the ENVIRON survey in the HGB area and a combined 1% of the tank batteries surveyed by the ENVIRON survey in the BPA and Haynesville Shale areas. ENVIRON was accompanied by owner or operator personnel at all site visits. No verifications were conducted in Bexar, Travis or Williamson Counties. The tank batteries included in the field verification campaign are identified in Table 15.

Table 15. Field Verification Sites

Geographic Area	Producer	Site Name
HGB	Ballard Exploration Company	Channelview Townsite #1 - #6
		Houston Ship Channel #1 - #2
	Quail Creek Oil Company	Alpha Heimple A, B and C
		Barngrove Heirs
		Dolbear and H&TC Commingled
		E. Brooks Battery
		E.M. Scarbrough Battery No. 1
		E.M. Scarbrough Battery No. 2
		Morris Phillips et. Al
		Phoenix Development Co. et al
		W. L. Bingle
		Wm. Smith Fee
	Hillcorp Energy Company	SMART LEASE
		OOU #226
ALTA LOMA - TACQUARD		
BPA	Cimarex Energy Company	Two Sisters/Amazon Queen Facilities
		Sharon Crissey
		Nine Dragons
		Jefferson Airplane Facility
		Jack Knife
		GTO
		Garth Oil and Gas Production Facility
		Clubb West Oil and Gas Production Facility
		Blackstone Hamilton
Haynesville Shale	BP	East Mountain
		Cheairs
		Garrett CCF
		Jones CCF
		Allison CTC
		Wilcots CTB
	XTO	Willow Springs South
		Whelan North

Items validated during field verification activities include:

- Number of tanks in the battery;
- Tank types (e.g. fixed roof tank);

- Presence of a vapor recovery unit; and [Note that ENVIRON verified the presence of a vapor recovery unit at the site. However, we did not verify that the VRU was properly installed or functioning.]
- Presence of a flare.

Field verification activities confirmed the content of the survey responses for the sites identified in Table 15.

3.9 Statistical Analysis

ENVIRON used statistical analysis methods as described in the TCEQ-approved Survey Planning Report to evaluate the survey responses. As described in Section 2.3, surveys were sent to the set of majority producers in each target geographic area (HGB, BPA, Haynesville Shale areas, and other counties of interest). Survey responses were used to calculate the following:

- Fraction of tank batteries in the HGB area that installed VOC emission controls as required by the referenced control requirements; and
- Fraction of tank batteries in the BPA and Haynesville Shale areas that would be required to install new controls if the referenced control requirements were extended to those areas.

The statistical validity of the sampling method is expressed in terms of sampling uncertainty. In the HGB area, this sampling uncertainty is described by the uncertainty in the probability that a tank battery site selected at random had installed VOC emission controls as a result of the referenced control requirements. For purposes of this project, an owner or operator installed VOC emission controls as required by the referenced control requirements if all of the following conditions were met:

- The tank battery site was uncontrolled prior to January 1, 2007;
- The tank battery site had throughput sufficient to trigger the control rule requirement (i.e., VOC emissions of 25 tpy or more); and
- The control equipment was installed on or after January 1, 2007 or is a planned installation.

From the survey responses, it is possible to calculate the fraction of the survey responses that meet these requirements and calculate the uncertainty as described below. For the BPA and Haynesville Shale areas, uncertainty in emissions after a HGB-type rule is extended to those areas results in part from uncertainty in the rule penetration factor (i.e., what fraction of tank batteries will operators actually install controls on in response to the new rule). This uncertainty has two parts: (1) uncertainty in the fraction of tank batteries that are large enough to trigger the rule requirement (i.e., have uncontrolled VOC emissions of 25 tpy or more); and (2) uncertainty in the degree of compliance with the rule. For (1), ENVIRON used the survey results to estimate the uncertainty in the probability that a tank battery chosen at random is large enough

to trigger the rule requirements using the same general method as applied to the HGB area. For (2), ENVIRON assumed a fixed compliance rate of 80%.

As described in Section 4 of this report, uncertainty bounds in the form of 95% statistical confidence intervals were calculated for the calculated 2009 controlled emissions.⁶ For the purpose of this project, the relative percent error from the calculated controlled emissions is defined in terms of low, moderate, or high uncertainty. Low uncertainty is defined as relative percent error of $\pm 10\%$ or less. Moderate uncertainty is defined as relative percent error of $\pm 20\%$ or less. Relative percent error above $\pm 20\%$ is considered highly uncertain. Survey responses were used to calculate the uncertainty in the fraction of tank batteries in the HGB area that installed VOC emission controls as required by the referenced control requirements and in the fraction of tank batteries in the BPA and Haynesville Shale areas that would be required to install new controls if the referenced control requirements were extended to those areas (i.e., the sampling uncertainty). As each operator holds multiple leases, the survey is essentially a cluster sampling procedure and we can estimate using Equation (1) the variance of the probability, p :

- That a lease in the HGB area installed VOC emission controls as required by the referenced control requirements; and
- That a lease in the BPA or Haynesville Shale area would be required to install new controls if the referenced control requirements were extended to those areas.

$$\text{Equation (1)} \quad V(p) = (1 - f) / (n \bar{m}^2) * (1 / (n - 1)) * [\sum a_i^2 - 2p \sum a_i m_i + p^2 \sum m_i^2]$$

Where:

m_i = number of leases held by the i^{th} operator

a_i = number of leases held by the i^{th} operator with control equipment installed

p_i = a_i / m_i

p = $\sum a_i / \sum m_i$

\bar{m} = $\sum m_i / n$

f = n / N

n = number of operators in sample

N = total number of operators

⁶ The level of confidence associated with the interval is 95%. There is 95% confidence that the calculated 2009 controlled emissions fall within the interval.

This calculation takes into account the fact that some operators may be more likely than others to have installed controls on the leases they own. An approximate $\alpha = 95\%$ confidence limit for p can be calculated using Equation (2) assuming p is approximately normally distributed as:

$$\text{Equation (2)} \quad p \pm [t_{\alpha/2}s(1 - f)^{1/2} + (1 / 2n)]$$

where, $s = (V(p))^{1/2}$ and $t_{\alpha/2}$ is the .05/2 critical value from the Student's t distribution. The resulting upper and lower confidence bounds for p were then used to calculate lower and upper confidence bounds, respectively, for the 2009 controlled emissions in each geographic region. In some cases, the above normal approximation to the confidence interval for p is not very accurate but is retained here for the sake of simplicity. The lower bound for p is restricted to be ≥ 0 .

It is important to note that the above calculation is based on the assumption that operators are selected for inclusion in the survey at random. As noted previously, however, selection of operators to survey was not done at random. Instead, the largest operators that together comprise just over half of the total condensate or oil production in each geographic area were selected for the survey. These operators typically each hold more leases than the average operator and thus the survey results can be expected to account for a greater percentage of leases within the geographic areas than would be the case if operators were chosen at random. This in turn reduces the level of uncertainty in the estimate of p somewhat below the value calculated via the method described above. In this sense, the above calculation can be considered as an upper bound on the sampling uncertainty. ENVIRON considered expanding the survey to include the operators that together comprise up to 70% of the total condensate or oil production in each geographic area, but learned that TCEQ Region 12 would be surveying at least those levels. Therefore, ENVIRON followed the original methodology proposed in the Survey Planning Report.

As shown in Tables 1b and 2b, TCEQ Region 12 sent surveys to operators that together comprise 77% of the total oil production and 94% of the total condensate production for the HGB area. These operators consist of both small and large operators in terms of production. Because of the higher response rate to the TCEQ Region 12 survey, a larger number of tank batteries, and consequently a larger percentage of production, was represented by the survey responses. When adding the ENVIRON survey results, the level of uncertainty in the estimate of p is further reduced. This is supported by the lower percentage of uncertainty for VOC emissions for HGB area condensate tank batteries as shown in Table 18b.

The impact of the sampling uncertainty on the estimate of controlled VOC emissions was then calculated via the method described above. Results are presented in Section 4.2.

4 Emissions Estimates

This section discusses the methodology used to estimate SIP-creditable VOC emission reductions associated with the implementation of the requirement in the referenced rule to control VOC flash emissions from crude oil and condensate storage tanks at wellhead sites in the HGB area and the potential reductions in VOC emissions in the BPA and Haynesville Shale areas if the referenced rule was extended to these areas.

4.1 Emission Calculation Methodology

In accordance with the referenced rule, baseline 2009 uncontrolled VOC flash emissions from crude oil and condensate tank batteries for the HGB, BPA and Haynesville Shale areas were estimated using a factor of 33.3 pounds of VOC per barrel of condensate produced or 1.6 pounds of VOC per barrel of oil produced and 2009 oil and condensate production data from the RRC website. Survey results were used to determine

- Fraction of tank batteries in the HGB area that installed VOC emission controls as required by the referenced control requirements; and
- Fraction of tank batteries in the BPA and Haynesville Shale areas that would be required to install new controls if the referenced control requirements were extended to those areas.

For the remaining operators, the fraction of tank batteries controlled was assumed to be the same as was determined from the survey results. For the BPA and Haynesville Shale areas, the fraction was calculated based on the number of producing tank batteries during 2009.

4.1.1 HGB Area

Requirements in the referenced rule specify that storage tanks storing crude oil or condensate prior to custody transfer, or at a pipeline breakout station, must route flashed gases to a vapor recovery unit (VRU) or control device if the uncontrolled VOC emissions from an individual storage tank, or from the aggregate of tanks in a tank battery, have the potential to equal or exceed 25 tons per year (tpy) on a rolling 12-month basis. Currently, these requirements only apply to tank batteries located in the HGB area. For HGB area operators, survey responses were used to determine the fraction of tank batteries that installed VOC emission controls as required by the referenced control requirements. For purposes of this project, an owner or operator installed VOC emission controls as required by the referenced control requirements if all of the following conditions were met:

- The tank battery site was uncontrolled prior to January 1, 2007;
- The tank battery site had throughput sufficient to trigger the control rule requirement (i.e., VOC emissions of 25 tpy or more calculated using 2009 oil or condensate production data and corresponding emission factors from the referenced rule; and
- The control equipment was installed on or after January 1, 2007 or is a planned installation.

These criteria ensure that only those controls required due to the referenced rule were counted. The HGB survey responses indicated that some control devices were installed prior to January 2007 and those were not counted, as this analysis only considers controls installed between January 1, 2007 and the present (August 2010) and planned installations. Also, when the control installation date was not provided or insufficient information was provided by the owner or operator, it was assumed that the control device was installed prior to January 2007 and not considered in this analysis. Some of the operators indicated tank batteries controlled by both VRU and flare control devices. In such cases it was assumed that the tank battery was controlled primarily by VRU and that flare was used as backup. However, a control efficiency of 90% was used for all control devices because 90% is the SIP-creditable control efficiency as specified in the referenced rule.

For operators who responded to the survey (surveyed operators), total VOC emissions from crude oil and condensate storage tank batteries were estimated using surveyed production rates (as reported by owner or operator to RRC), 90% control efficiency for the tank batteries that installed VOC emission controls as required by the referenced rule, the fraction of tank batteries that installed VOC emission controls as required by the referenced rule, and an emission factor of 33.3 pounds of VOC per barrel of condensate produced or 1.6 pounds of VOC per barrel of oil produced according to Equation (3).

Equation (3)

$$VOC_{i,j(\text{total, survey})} = \sum_{\text{operator}} [(P_{(i,j)o} \times f_{(i,j)o} \times (1 - CE) \times EF_{i,j}) / 2,000 + (P_{(i,j)o} \times (1 - f_{(i,j)}) \times EF_{i,j}) / 2,000]$$

Where,

- $VOC_{i,j(\text{total, survey})}$ = Total emissions for surveyed operators (tpy)
- i,j = Oil and condensate tank, respectively
- O = Surveyed operator
- P = Surveyed production (bbl, as reported by owner or operator to RRC)
- f = Fraction of surveyed tank batteries that installed VOC emission controls as required by the referenced control requirements (% , see Table 14a)
- CE = Control efficiency (90%)
- EF = Emission factor (33.3 lb VOC/bbl for condensate or 1.6 lb VOC/bbl for oil)

For the remaining operators (un-surveyed), the total VOC emissions were derived from the fraction of surveyed tank batteries that installed VOC emission controls as required by the

referenced control requirements, un-surveyed oil or condensate production, and control efficiency as shown in Equation (4).

Equation (4)

$$\text{VOC}_{i,j(\text{total, un-surveyed})} = [(P_{(i,j)} \times f_{(i,j)} \times (1 - \text{CE}) \times \text{EF}_{(i,j)}) / 2,000] + (P_{(i,j)} \times (1 - f_{(i,j)}) \times \text{EF}_{i,j}) / 2,000]$$

Where,

$\text{VOC}_{i,j(\text{total, un-surveyed})}$ = Un-surveyed controlled emissions (tpy)

i,j = Oil and condensate tank, respectively

P = Un-surveyed production (bbl, difference between surveyed production and 2009 total production for HGB area as reported to RRC)

f = Fraction of surveyed tank batteries that installed VOC emission controls as required by the referenced control requirements (% , see Table 14a)

CE = Control efficiency (90%)

EF = Emission factor (33.3 lb VOC/bbl for condensate or 1.6 lb VOC/bbl for oil)

Although the information on which type of control device was installed for un-surveyed operators was unknown, ENVIRON calculated a single estimate of controlled emissions for un-surveyed operators using a control efficiency of 90%. Total controlled VOC emissions for each geographic area are estimated as shown in equation (5).

Equation (5) Total VOC Emissions $_{i,j}$ = $\text{VOC}_{i,j(\text{total, survey})} + \text{VOC}_{i,j(\text{total, un-surveyed})}$

4.1.1 BPA and Haynesville Shale Areas

As previously discussed, the control requirements in the referenced rule currently do not apply to the BPA or Haynesville Shale areas. Therefore, it was necessary to determine the fraction of tank batteries that would potentially be required to install control if the referenced rule was extended to these geographic areas.

ENVIRON determined the fraction of tank batteries potentially requiring controls as a result of rule implementation. As explained above, the referenced rule requires control if the uncontrolled VOC emissions from an individual storage tank or battery of tanks have the potential to equal or exceed 25 tpy on a rolling 12-month basis. Hence, the fraction of tank batteries potentially requiring newly installed controls as a result of rule implementation using

the survey data was estimated based on the criteria that uncontrolled emissions equal or exceed 25 tpy and that no controls were currently installed or planned for installation.

A similar calculation approach was followed for the BPA and Haynesville Shale areas as in the HGB area except that the fraction of tank batteries potentially requiring newly installed controls was used in Equation (6) instead of the fraction of surveyed tank batteries that installed VOC emission controls as required by the referenced rule control requirements. The fraction of tank batteries potentially requiring newly installed controls also incorporates the assumed rule penetration factor, r , of 80%. Because the surveyed operators in the BPA and Haynesville Shale areas have not installed controls in response to the referenced rule, the calculation for those areas uses the total 2009 area production for all operators.

Equation (6)

$$\text{VOC}_{i,j(\text{total})} = [(P_{(i,j)} \times f_{(i,j)} \times r_{(i,j)} \times (1 - \text{CE}) \times \text{EF}_{(i,j)}) / 2,000] + (P_{(i,j)} \times (1 - f_{(i,j)} \times r_{(i,j)}) \times \text{EF}_{i,j}) / 2,000]$$

Where,

$\text{VOC}_{i,j(\text{total})}$	= Total controlled emissions (tpy)
i,j	= Oil and condensate tank, respectively
P	= Total 2009 area production (bbl, as reported to RRC)
f	= Fraction of surveyed tank batteries that would be required to install new controls if the referenced control requirements were extended to those areas (% , see Table 14b)
r	= Rule penetration factor (assumed 80%)
CE	= Control efficiency (90%)
EF	= Emission factor (33.3 lb VOC/bbl for condensate or 1.6 lb VOC/bbl for oil)

4.2 Results

Total 2009 uncontrolled and controlled VOC emissions from oil and condensate storage tanks for the HGB, BPA and Haynesville Shale areas are presented in Table 16. The uncontrolled emissions are total VOC emissions from oil and condensate tank batteries based on 2009 oil or condensate production rates and emission factors. Total controlled VOC emissions are a summation of the controlled emissions from surveyed as well as un-surveyed operators and were calculated as described in Sections 4.1.1 and 4.1.2.

Table 16. Summary of 2009 Uncontrolled and Controlled VOC Emissions by Geographic Area

Geographic Area	VOC Emissions (tpy)			
	Condensate		Oil	
	Uncontrolled ¹	Controlled ²	Uncontrolled ¹	Controlled ²
HGB	57,581	48,332	7,145	5,711
BPA	90,541	57,946	2,054	1,371
Haynesville Shale	90,175	82,230	5,379	5,379

¹ Uncontrolled VOC emissions were calculated by multiplying the 2009 oil or condensate production rate from RRC records by the oil or condensate emission factor, respectively.
² Controlled VOC emissions were calculated based on survey data.

Table 16 results are presented graphically in Figures 8 and 9.

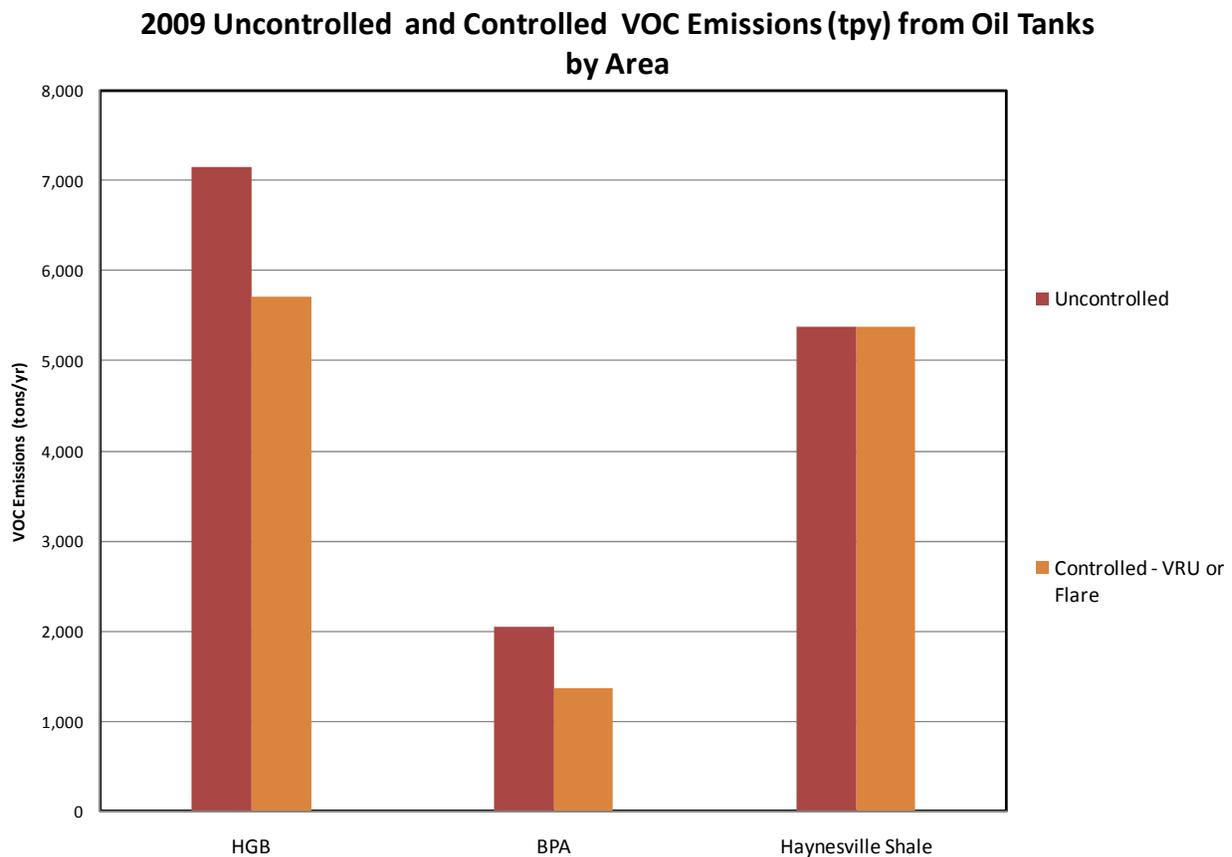


Figure 8. Uncontrolled, Baseline and Controlled VOC Emissions (tpy) from Oil Tanks by Geographic Area

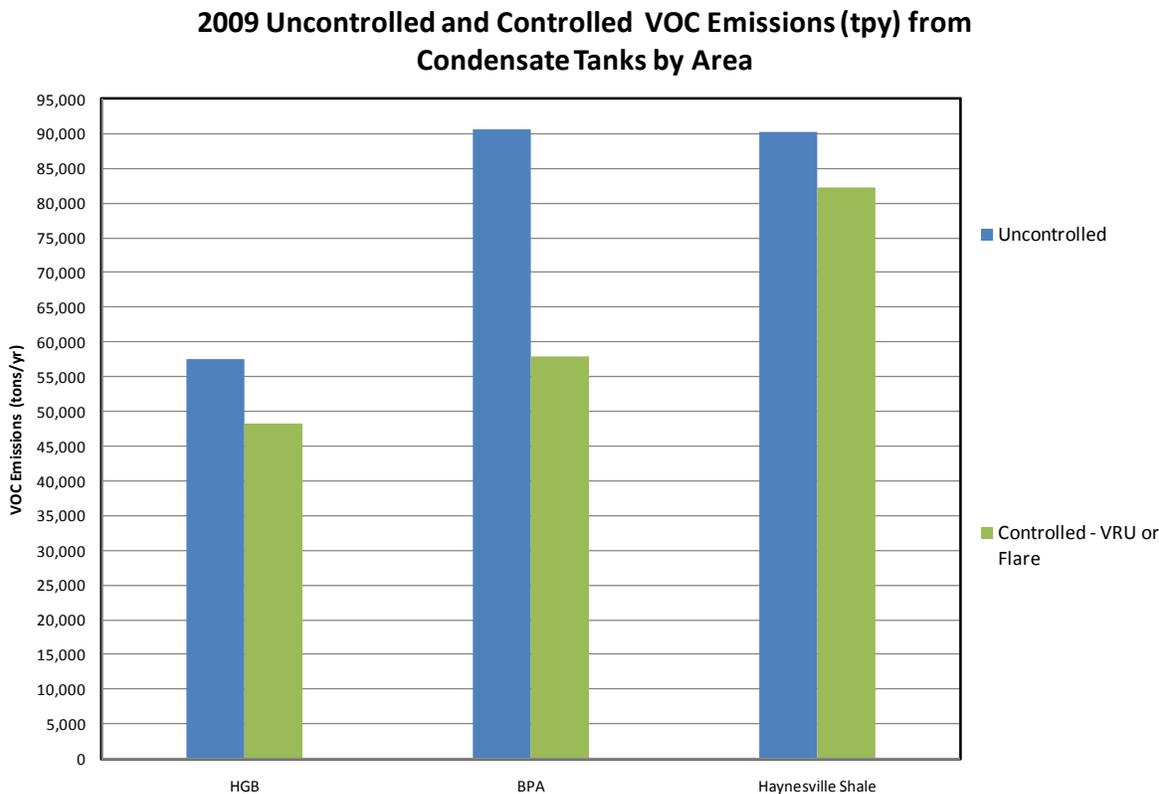


Figure 9. Uncontrolled and Controlled VOC Emissions (tpy) from Condensate Tanks by Geographic Area

The percentage of VOC emission reductions due to implementation of emission control requirements in the HGB area and the percentage of potential VOC emission reductions that would result from newly installed VOC control devices in the BPA and Haynesville Shale areas are summarized in Table 17. The percentage reductions were calculated using a percentage difference method. For example, the percentage reduction for the BPA area for condensate tank battery emissions was calculated as:

Percentage Reduction in VOC Emissions (BPA area, Condensate tank) =

[(2009 BPA uncontrolled VOC emissions for condensate – 2009 BPA controlled VOC emissions for condensate) / 2009 BPA uncontrolled VOC emissions for condensate]

Table 17. Summary of Percentage Reduction in VOC Emissions from Uncontrolled Emissions by Geographic Area

Geographic Area	Percentage Reduction (%)	
	Condensate	Oil
HGB	16.06%	20.07%
BPA	36.0%	33.23%
Haynesville Shale	8.81%	0.00%

Controlled VOC emissions and the associated uncertainty bounds are shown in Table 18. ENVIRON applied the uncertainty bounds calculated as described in Section 3.9 to the calculated controlled VOC emissions by geographic area.

Table 18. 2009 Controlled VOC Emissions and Uncertainty Bounds

Geographic Area	VOC Emissions from Condensate (tpy)			VOC Emissions from Oil (tpy)		
	Calculated	Upper Bound	Lower Bound	Calculated	Upper Bound	Lower Bound
HGB	48,332	51,499	45,165	5,711	6,643	4,708
BPA	57,946	90,541	9,054	1,371	1,971	771
Haynesville Shale	82,230	90,175	70,427	5,379	NA*	NA*

*Confidence interval not available due to small sample size and lack of any tank batteries eligible for control reported by survey respondents.

As shown in Figures 10 and 11, the resulting uncertainty varies considerably among the geographic areas. In general, the size of the sampling uncertainty depends on the fraction of operators who provide completed surveys, the average fraction of leases with controlled tank batteries as calculated from the survey results, and the variability from one operator to the next in the fraction of leases with controlled tank batteries. The HGB area had the highest ratio of sampled operators to total operators in the geographic area and the lowest uncertainty in results for both condensate and oil tank battery emissions. As noted above, the assumption of a normal distribution in the calculation of uncertainty is an approximation which may introduce errors in the uncertainty bounds, especially where the uncertainty is large. Thus, the uncertainty bounds shown in Table 18 for the BPA and Haynesville Shale areas should be viewed as rough approximations to the true uncertainty.

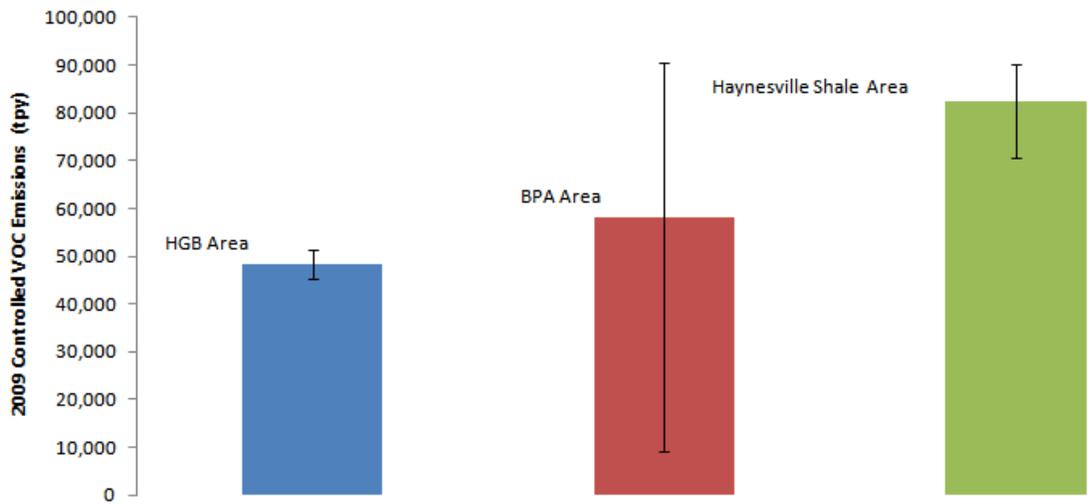


Figure 10. Controlled VOC Emissions (tpy) and Associated Uncertainty from Condensate Tanks by Geographic Area

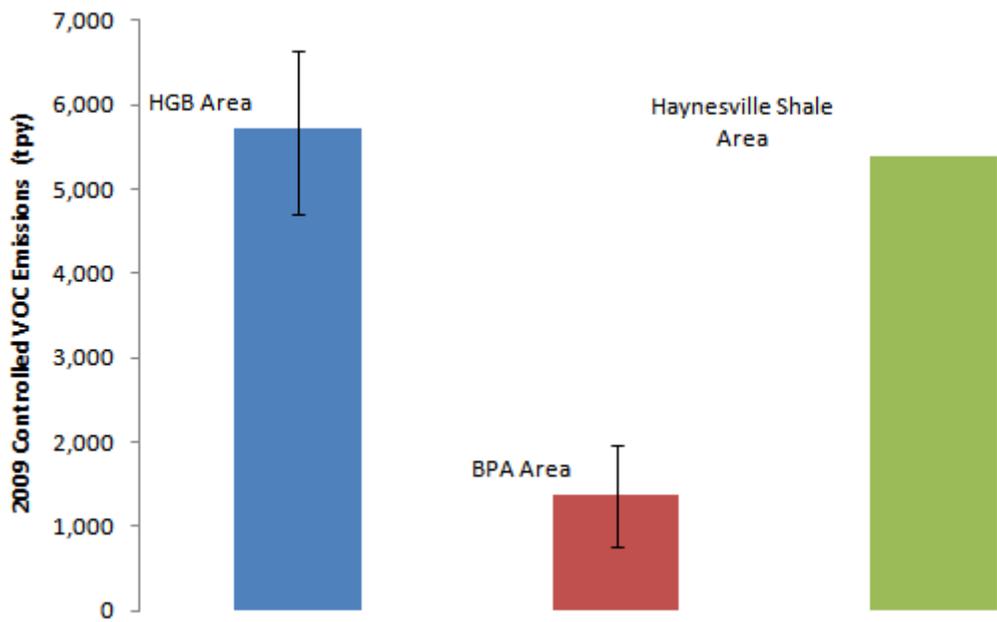


Figure 11. Controlled VOC Emissions (tpy) and Associated Uncertainty from Oil Tanks by Geographic Area

4.3 NEI-Formatted Emissions Inventory Control File

ENVIRON is providing separately a control data file developed for this project in National Emissions Inventory (NEI) Input Format (NIF) 3.0 text files that meet the NEI reporting requirements suitable for entry into TexAER.

5 Additional Considerations

5.1 Industry Concerns About Use of HARC Project H51C Emission Factor

As required by the Work Order, ENVIRON used the emission factor in the referenced rule which was developed as part of the HARC Project H51C emission factors in estimating uncontrolled emissions from natural gas condensate storage tank batteries.⁷ That emission factor is 33.3 lb VOC/bbl of condensate production.

Members of the natural gas production community have expressed to ENVIRON during the course of this study concern about use of the HARC Project H51C emission factor for estimating VOC emissions from natural gas condensate storage tank batteries. It is ENVIRON's understanding that the primary concern is the potential error in measurement via tank gauging for sites producing small amounts of condensate (e.g. less than 10 bbl/day). Presented in Figure 12 is the relationship between estimated VOC emission rate in lb/bbl and condensate production in bbl/day for the 21 condensate storage tank batteries tested as part of H51C. As shown, a number of the test sites with high emission rates had production of less than 10 bbl/day of condensate during the time of the testing.

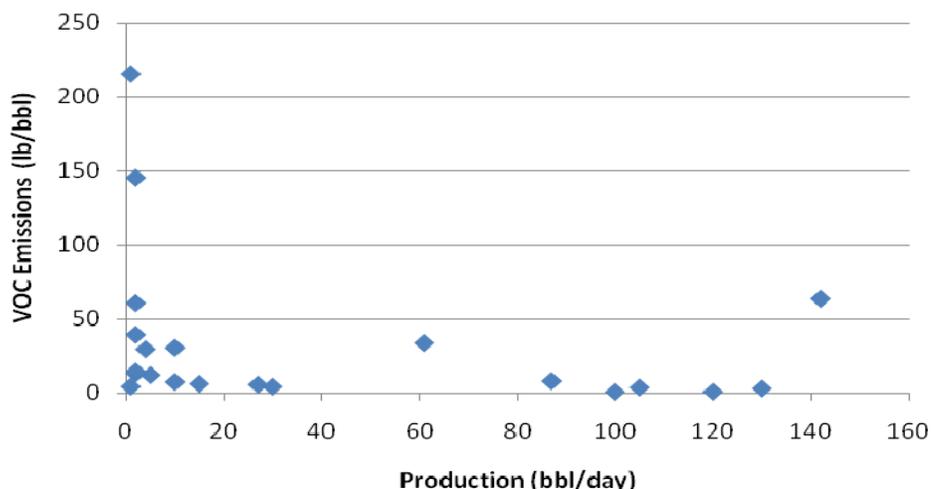


Figure 12. HARC Project H51C Estimated VOC Emission Rates for 21 Condensate Storage Tank Batteries

Representatives of industry also referenced the emission factors developed by the State of Colorado for estimating emissions from condensate storage operations. Colorado Department

⁷ Houston Advanced Research Center, *VOC Emissions from Oil and Condensate Storage Tanks*, October 31, 2006. <http://files.harc.edu/Projects/AirQuality/Projects/H051C/H051CFinalReport.pdf>

of Public Health and Environment-approved VOC emission factors for condensate tanks are presented in Table 15.⁸

Table 19. Colorado Condensate Tank Emission Factors

County	Condensate Tank VOC Emission Factor (lb/bbl)
Adams, Arapahoe, Boulder, Broomfield, Crowley, Denver, Douglas, El Paso, Elbert, Jefferson, Larimer, Logan, Morgan, Phillips, Pueblo, Sedgwick, Washington, Weld, and Yuma	13.7
Garfield, Mesa, Rio Blanco, and Moffat	10.0
Cheyenne, Kiowa, Kit Carson and Lincoln	3.0
All Other Counties	11.8

Devon Energy provided a summary of VOC emissions calculated using E&P TANK run with site-specific sampling inputs for 13 condensate tank batteries in the Haynesville Shale area. XTO Energy provided emissions estimated using the HYSIS Version 2006.5 process simulator for eight natural gas condensate tank batteries in the Haynesville Shale. Inputs to HYSIS include actual flash gas composition and other analytically-determined specifications for each tank battery. Information provided by Devon Energy and XTO Energy is presented in Table 20.

⁸ Colorado Department of Public Health and Environment, PS Memo 05-01, *Oil and Gas Atmospheric Condensate Storage Tank Batteries, Regulatory Definitions and Permitting Guidance*, October 1, 2009 (<http://www.cdphe.state.co.us/ap/down/ps05-01.pdf>).

Table 20. Producer-Supplied VOC Emissions for Condensate Tank Batteries in Haynesville Shale Area

Site Number	Separator Pressure (psig)	Separator Temperature (°F)	API Gravity @ 60°F	NMEVOC Emissions (lb/bbl)
1	45	80	50.6	2.67
2	40	80	49.6	8.45
3	25	86	54.2	5.38
4	95	89	55.4	1.67
5	16	97	59.5	1.09
6	30	70	55.3	1.45
7	60	78	64.6	8.91
8	120	89	55.0	10.24
9	95	80	55.0	11.97
10	60	75	52.4	4.62
11	80	72	57.0	3.98
12	120	85	55.0	11.97
13	60	77	53.8	3.49
14	40	85	N/A	1.16
15	108	98	N/A	0.31
16	752	82	N/A	15.84
17	76	90	N/A	0.32
18	110	80	N/A	0.85
19	690	70	N/A	14.79
20	560	98	N/A	0.73
21	230	90	N/A	11.83
Average				5.80

5.2 Collective Management of Oil and Condensate

From discussions with certain operators in the Haynesville Shale area during the course of this project, it is ENVIRON’s understanding that some tank batteries are used to store what some might consider both oil and condensate in the same tank(s). When asked whether a tank battery in question was used to store oil or condensate, one operator responded “it’s the same thing.” This may be problematic when attempting to estimate emissions and determine potential rule effectiveness since the referenced rule emission factors are very different for oil and condensate: 33.3 lbs/bbl for condensate storage tanks and 1.6 lbs/bbl for oil storage tanks.

Certain surveyed operators requested a definition for condensate based on American Petroleum Institute (API) gravity, although API has not suggested a specific API gravity to define

condensate. The State of Colorado defines condensate as a hydrocarbon liquid that has an API gravity greater than or equal to 40° API at 60° F.

6 Conclusions

ENVIRON makes the following conclusions with respect to the work conducted under this work order.

1. The configuration of the tank battery at oil and gas leases can be influenced by many factors, including wells from multiple leases sharing a common tank battery. Without a verification of each operation in each county, it is not possible to accurately determine the number of tank batteries per county.
2. Based on responses to the TCEQ Region 12 survey of oil and gas producers in the HGB area, the number of tank batteries reporting VOC emissions of 25 tpy or more was much less than the number of tank batteries with calculated VOC emissions of 25 tpy or more using oil or condensate production rate and the oil or condensate emission factors in the referenced rule. This discrepancy indicates that, in some cases, owners or operators may be using alternative VOC emission calculation methodologies that result in lower estimated VOC emissions. As a result of these differences in approach, there may be tank battery sites that would require controls if using the emission factors in the referenced rule that have not installed controls.
3. In the HGB area, a higher percentage of tank batteries are currently controlled by VOC control devices (35.9%) than were required to install VOC emission controls by the referenced rule (21.6%). This indicates the presence of voluntary VOC control devices on oil and condensate tanks prior to the implementation of the referenced control requirements, which is most likely due to owners or operators reducing VOC emissions to qualify for authorization under PBR. It should be noted that some of these tank batteries that voluntarily installed controls may have uncontrolled VOC emissions greater than 25 tpy and, if not for installation of voluntary controls prior to the effective date of the referenced rule, those tank batteries would have had to install controls per rule.
4. By incorporating the TCEQ Region 12 survey results into this study, calculated VOC emission reductions associated with the implementation of the requirements in the referenced rule to control VOC flash emissions from crude oil and condensate storage tanks at wellhead sites in the HGB area were determined with moderate certainty. Uncertainty levels for HGB area condensate tank emissions were estimated to be approximately $\pm 7\%$, while uncertainty in oil tank emissions was estimated to be approximately $\pm 17\%$.
5. The potential VOC emission reductions that would result from newly required VOC control devices in the BPA area are highly uncertain. Uncertainty levels for BPA area condensate tanks ranged from -85.5% to 41.8%, while the range was from -34.0% to 34.0% for oil tanks. Although approximately 49% of the surveyed tank batteries in the BPA area would be required to install controls should the rule be extended to that area, the total number of surveyed tank batteries is much less than the total number of tank batteries in the BPA area leading to the high degree of uncertainty in the results. The

small sample size resulted from a low response rate and a low percentage of total 2009 production represented by the survey respondents.

6. The potential VOC emission reductions resulting from newly required VOC control devices in the Haynesville Shale area were determined with moderate certainty. Uncertainty levels for Haynesville Shale area condensate tanks ranged from -16.8% to 6.8%. The confidence interval for oil tanks was not available due to the small sample size and lack of any tank batteries eligible for control reported by survey respondents.

7 Recommendations

ENVIRON makes the following recommendations with respect to the work conducted under this work order and for future investigations.

1. As required by the work order, the questionnaires prepared and submitted as part of this project requested a great deal of information about the oil and condensate tank batteries under operational control of the recipient producers. Based on our discussions with some of the producers, we believe that the scope of the survey and the level of detail requested, most likely, reduced survey participation. We recommend that future surveys balance the desire for information with the need for higher survey participation.
2. The timing of the information collection request submitted to oil and gas producers by TCEQ Region 12 enforcement personnel, in our opinion based upon discussions with survey recipients, most likely had a negative impact on survey participation by HGB producers. ENVIRON suggests that the TCEQ explore opportunities to avoid similar overlapping requests in the future.
3. If high participation rates are required for regulatory development purposes, ENVIRON recommends that the TCEQ consider collecting information from oil and gas producers through mandatory special inventories such as the one recently conducted for production in the Barnett Shale.
4. A definition of condensate based on API gravity should be developed so that the appropriate emission factors are applied to tank liquids, including those tanks that store what operators consider to be a combination of oil and condensate.

8 Project Personnel Contact Information

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Appendix A:
30 Texas Administrative Code §115.112(d)(5)

[<<Prev Rule](#)

Texas Administrative Code

[Next Rule>>](#)**TITLE 30****ENVIRONMENTAL QUALITY****PART 1****TEXAS COMMISSION ON ENVIRONMENTAL QUALITY****CHAPTER 115****CONTROL OF AIR POLLUTION FROM VOLATILE ORGANIC COMPOUNDS****SUBCHAPTER B****GENERAL VOLATILE ORGANIC COMPOUND SOURCES****DIVISION 1****STORAGE OF VOLATILE ORGANIC COMPOUNDS****RULE §115.112****Control Requirements**

(a) For all persons in the Beaumont/Port Arthur, Dallas/Fort Worth, El Paso, and until January 1, 2009, in the Houston/Galveston/Brazoria areas as defined in §115.10 of this title (relating to Definitions), the following requirements apply.

(1) No person shall place, store, or hold in any stationary tank, reservoir, or other container any volatile organic compound (VOC) unless such container is capable of maintaining working pressure sufficient at all times to prevent any vapor or gas loss to the atmosphere, or is equipped with at least the control device specified in Table I(a) of this paragraph for VOC other than crude oil and condensate, or Table II(a) of this paragraph for crude oil and condensate.

Attached Graphic

(2) For floating roof storage tanks subject to the provisions of paragraph (1) of this subsection, the following requirements apply.

(A) All openings in an internal or external floating roof except for automatic bleeder vents (vacuum breaker vents) and rim space vents must provide a projection below the liquid surface or be equipped with a cover, seal, or lid. Any cover, seal, or lid must be in a closed (i.e., no visible gap) position at all times except when the device is in actual use.

(B) Automatic bleeder vents (vacuum breaker vents) must be closed at all times except when the roof is being floated off or landed on the roof leg supports.

(C) Rim vents, if provided, must be set to open only when the roof is being floated off the roof leg supports or at the manufacturer's recommended setting.

(D) Any roof drain that empties into the stored liquid must be equipped with a slotted membrane fabric cover that covers at least 90% of the area of the opening.

(E) There must be no visible holes, tears, or other openings in any seal or seal fabric.

(F) For external floating roof storage tanks, secondary seals must be the rim-mounted type (the seal must be continuous from the floating roof to the tank wall). The accumulated area of gaps that exceed 1/8 inch (0.32 centimeter) in width between the secondary seal and tank wall must be no greater than 1.0 square inch per foot (21 square centimeters per meter) of tank diameter.

(3) Vapor recovery systems used as a control device on any stationary tank, reservoir, or other container must maintain a minimum control efficiency of 90%.

(b) For all persons in Gregg, Nueces, and Victoria Counties, the following requirements shall apply:

(1) No person shall place, store, or hold in any stationary tank, reservoir, or other container any volatile organic compound (VOC), unless such container is capable of maintaining working pressure sufficient at all times to prevent any vapor or gas loss to the atmosphere, or is equipped with at least the control device specified in Table I(a) for VOC other than crude oil and condensate or Table II(a) for crude oil and condensate.

(2) For floating roof storage tanks subject to the provisions of paragraph (1) of this subsection, the following requirements shall apply.

(A) All openings in an internal or external floating roof, except for automatic bleeder vents (vacuum breaker vents) and rim space vents, must provide a projection below the liquid surface or be equipped with a cover, seal, or lid. Any cover, seal, or lid must be in a closed (i.e., no visible gap) position at all times, except when the device is in actual use.

(B) Automatic bleeder vents (vacuum breaker vents) are to be closed at all times except when the roof is being floated off or landed on the roof leg supports.

(C) Rim vents, if provided, are to be set to open only when the roof is being floated off the roof leg supports or at the manufacturer's recommended setting.

(D) Any roof drain that empties into the stored liquid shall be equipped with a slotted membrane fabric cover that covers at least 90% of the area of the opening.

(E) There shall be no visible holes, tears, or other openings in any seal or seal fabric.

(F) For external floating roof storage tanks, secondary seals shall be the rim-mounted type (the seal shall be continuous from the floating roof to the tank wall). The accumulated area of gaps that exceed 1/8 inch (0.32 centimeter) in width between the secondary seal and tank wall shall be no greater than 1.0 square inch per foot (21 square centimeters/meter) of tank diameter.

(c) For all persons in Aransas, Bexar, Calhoun, Matagorda, San Patricio, and Travis Counties, the following requirements shall apply.

(1) No person may place, store, or hold in any stationary tank, reservoir, or other container any VOC, other than crude oil or condensate, unless such container is capable of maintaining working pressure sufficient at all times to prevent any vapor or gas loss to the atmosphere, or is designed and equipped with at least the control device specified in Table I(b) for VOC other than crude oil and condensate.

Attached Graphic

(2) For floating roof storage tanks subject to the provisions of paragraph (1) of this subsection, the following requirements shall apply.

(A) There shall be no visible holes, tears, or other openings in any seal or seal fabric.

(B) All tank gauging and sampling devices shall be vapor-tight except when gauging and sampling is taking place.

(3) No person in Matagorda or San Patricio Counties shall place, store, or hold crude oil or condensate in any stationary tank, reservoir, or other container, unless such tank, reservoir, or other container is a pressure tank capable of maintaining working pressures sufficient at all times to prevent vapor or gas loss to the atmosphere or is equipped with one of the following vapor-loss control devices, properly maintained and operated:

(A) an internal floating cover or external floating roof as defined in §115.10 of this title (relating to Definitions). This control equipment shall not be permitted if the VOC has a true vapor pressure of 11.0 psia (75.8 kPa) or greater. All tank-gauging and tank-sampling devices shall be vapor-tight, except when gauging or sampling is taking place; or

(B) a vapor recovery system as defined in §115.10 of this title (relating to Definitions).

(d) For all persons in the Houston/Galveston/Brazoria area the following requirements apply beginning January 1, 2009.

(1) No person shall place, store, or hold in any stationary tank, reservoir, or other container any VOC unless such

container is capable of maintaining working pressure sufficient at all times to prevent any vapor or gas loss to the atmosphere, or is equipped with at least the control device specified in either Table I(a) of subsection (a)(1) of this section for VOC other than crude oil and condensate, or Table II(a) of subsection (a)(1) of this section for crude oil and condensate.

(2) For floating roof storage tanks subject to the provisions of paragraph (1) of this subsection, the following requirements apply.

(A) All openings in an internal floating cover or external floating roof as defined in §115.10 of this title (relating to Definitions) except for automatic bleeder vents (vacuum breaker vents), and rim space vents must provide a projection below the liquid surface. All openings in an internal floating cover or external floating roof except for automatic bleeder vents (vacuum breaker vents), rim space vents, leg sleeves, and roof drains must be equipped with a deck cover. The deck cover must be equipped with a gasket in good operating condition between the cover and the deck. The deck cover must be closed (i.e. no gap of more than 1/8 inch) at all times, except when the cover must be open for access.

(B) Automatic bleeder vents (vacuum breaker vents) and rim space vents must be equipped with a gasketed lid, pallet, flapper, or other closure device and must be closed (i.e. no gap of more than 1/8 inch) at all times except when required to be open to relieve excess pressure or vacuum, in accordance with the manufacturer's design.

(C) Each opening into the internal floating cover for a fixed roof support column may be equipped with a flexible fabric sleeve seal instead of a deck cover.

(D) Any roof drain that empties into the stored liquid must be equipped with a slotted membrane fabric cover that covers at least 90% of the area of the opening or an equivalent control that must be kept in a closed (i.e., no gap of more than 1/8 inch) position at all times except when the drain is in actual use. Stub drains on internal floating roof tanks are not subject to this requirement.

(E) There must be no visible holes, tears, or other openings in any seal or seal fabric.

(F) For external floating roof storage tanks, secondary seals must be the rim-mounted type (the seal must be continuous from the floating roof to the tank wall with the exception of gaps that do not exceed the following specification). The accumulated area of gaps that exceed 1/8 inch (0.32 centimeter) in width between the secondary seal and tank wall must be no greater than 1.0 square inch per foot (21 square centimeters per meter) of tank diameter.

(G) Each opening for a slotted guidepole in an external floating roof tank must be equipped with one of the control device configurations specified in clauses (i) - (vi) of this subparagraph.

(i) A pole wiper and a pole float. The wiper or seal of the pole float must be at or above the height of the pole wiper.

(ii) A pole wiper and a pole sleeve.

(iii) An internal sleeve emission control system.

(iv) Retrofit to a solid guidepole system.

(v) A flexible enclosure system.

(vi) A cover on an external floating roof tank.

(H) The floating roof must be floating on the liquid surface at all times except when the floating roof is supported by the leg supports or other support devices (e.g., hangers from the fixed roof) during the initial fill (including refill after the tank has been degassed and cleaned in accordance with §§115.541 - 115.547 of this title (relating to Degassing or Cleaning of Stationary, Marine, and Transport Vessels) or as allowed under the following circumstances:

- (i) when necessary for maintenance or inspection;
 - (ii) when necessary for supporting a change in service to an incompatible liquid);
 - (iii) when the storage tank has a capacity of less than 25,000 gallons or the vapor pressure of the material stored is less than 1.5 psia;
 - (iv) when the vapors are routed to a control device from the time the floating roof is landed until the floating roof is within ten percent by volume of being refloated;
 - (v) when all emissions from the tank, including emissions from roof landings, have been included in a floating roof storage tank emissions limit or cap approved under Chapter 116 of this title (relating to Control of Air Pollution by Permits for New Construction or Modification); or
 - (vi) when all emissions from floating roof landings at the regulated entity as defined in §101.1 of this title (relating to Definitions) are less than 25 tons per year.
- (3) Vapor recovery systems used as a control device on any stationary tank, reservoir, or other container must maintain a minimum control efficiency of 90%.
- (4) Storage tanks storing condensate prior to custody transfer must route flashed gases to a vapor recovery system or control device if the liquid throughput through an individual tank or the aggregate of tanks in a tank battery exceeds 1,500 barrels (63,000 gallons) per year.
- (5) Storage tanks storing crude oil or condensate prior to custody transfer or at a pipeline breakout station must route flashed gases to a vapor recovery system or control device if the uncontrolled VOC emissions from an individual storage tank, or from the aggregate of tanks in a tank battery, have the potential to equal or exceed 25 tons per year on a rolling 12-month basis. Uncontrolled emissions must be estimated by one of the following methods; however, if emissions determined using direct measurements or other methods approved by the executive director under subparagraphs (A) or (D) of this paragraph are higher than emissions estimated using the default factors or charts in subparagraphs (B) or (C) of this paragraph, the higher values must be used:
- (A) direct measurement using the measuring instruments and methods specified in §115.115 of this title (relating to Approved Test Methods);
 - (B) using a factor of 33.3 pounds of VOC per barrel (42 gallons) of condensate produced or 1.6 pounds of VOC per barrel (42 gallons) of oil produced;
 - (C) for crude oil storage only, using the chart in Exhibit 2 of the United States Environmental Protection Agency publication *Lessons Learned from Natural Gas STAR Partners: Installing Vapor Recovery Units on Crude Oil Storage Tanks*, October 2003, and assuming that the hydrocarbon vapors have a molecular weight of 34 pounds per pound mole and are 48% by weight VOC; or
 - (D) other test method or computer simulation approved by the executive director.

Source Note: The provisions of this §115.112 adopted to be effective February 19, 1990, 15 TexReg 549; amended to be effective July 17, 1991, 16 TexReg 3713; amended to be effective August 1, 1992, 17 TexReg 4683; amended to be effective January 27, 1995, 20 TexReg 221; amended to be effective March 7, 1996, 21 TexReg 1548; amended to be effective May 22, 1997, 22 TexReg 4213; amended to be effective June 14, 2007, 32 TexReg 3178

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Appendix B:
Inputs to Railroad Commission of Texas Searchable
Database

RR ONLINE SYSTEM

Oil & Gas Production Data Query

- Production Data
- FAQs
- PDQ Help
- General Production Query
- Specific Lease Query

Caution: Using the browser's Back button causes inconsistent query results. Use the Query Path links provided in your resulting data to navigate.

General Query Criteria

Use this form to specify the type of information you want to see.
For information about a specific lease, use the [Specific Lease Query](#).

Search Criteria:

*Initial View: Lease Operator Field District County

*Date Range: from 2009 to 2009

*Choose One: Both Oil Leases Gas Wells

***Select one Geographic Region from the options below:**

District:

Onshore County:

Offshore Area:

Field:

Limit query to a specific Operator (optional):

Operator:

*required information

- Related Links**
- [County/District List](#)
 - [Offshore County Map](#)

Production volumes and dispositions for January 2005 production and any reports filed after February 11, 2005 may include separation/extraction loss and disposition code conversions by Railroad Commission staff to conform with formats used prior to implementation of the new PR form. To view actual reported production data, go to [Production Reports](#).

Table A1. Inputs to Railroad Commission of Texas Searchable Database¹

Search Criteria:	
*Initial View	Operator
*Date Range	From Jan 2009 to Dec 2009
*Choose One	Both
*Select one Geographic Region from the options below:²	
District	None Selected (default)
Onshore County	Brazoria Chambers Fort Bend Galveston Harris Liberty Montgomery Waller Hardin Jefferson Orange Gregg Harrison Marion Nacogdoches Panola Rusk San Augustine Smith Shelby Upshur Bexar Travis Williamson
Offshore Area	None Selected (default)
Field	None Selected (default)
Limit Query to a Specific Operator (optional)	
Operator	None Selected (default)
* Indicates required information	
¹ http://webapps.rrc.state.tx.us/PDQ/generalReportAction.do	
² Individual queries were run for each listed county.	

Appendix C
Facility Questionnaires

Texas Commission on Environmental Quality
Work Order No. 582-7-84005-FY10-22
Control of Volatile Organic Compounds (VOC) Flash Emissions from Oil and Condensate Storage Tanks in East Texas
Bexar County

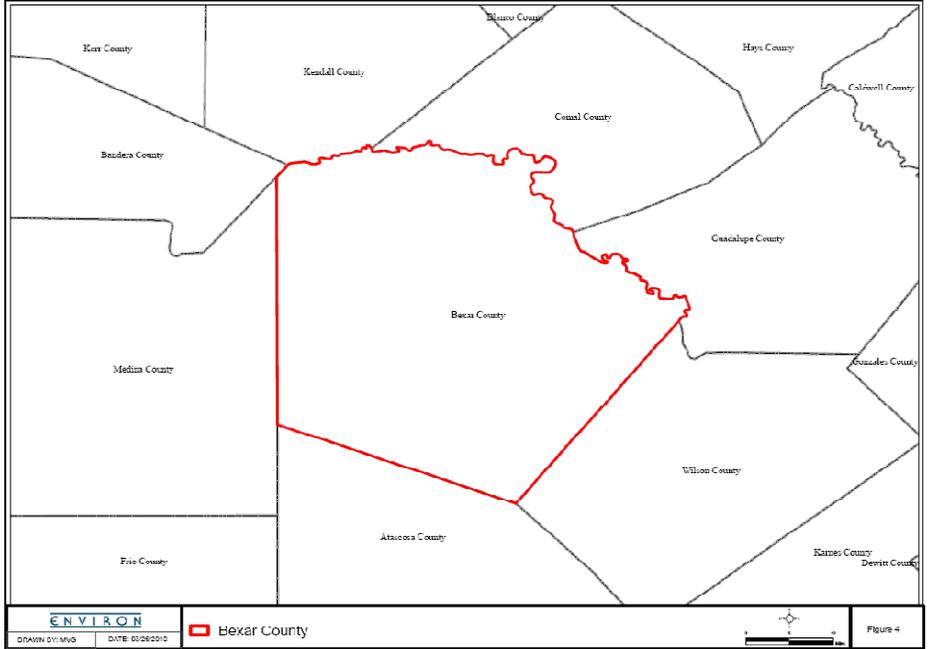
Background:
Flash emissions occur when a liquid containing dissolved gases experiences a decrease in pressure. As the pressure decreases, some of the lighter VOC compounds dissolved in the liquid are released or flashed. Also, some of the compounds that are liquids at the initial pressure transform from a liquid into a vapor and are also released from the liquid. As these gases and vapors are released, some of the heavier compounds in the liquids may become entrained in these gases and will be emitted with them.

Objective:
The purpose of this project is to determine the volatile organic compound (VOC) emission reductions resulting from the implementation of requirements in Title 30 Texas Administrative Code (TAC), §115.112(d)(5) to control VOC flash emissions from crude oil and condensate storage tanks at wellhead sites in the Houston-Galveston-Brazoria (HGB) 1997 eight-hour ozone nonattainment area (Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties). The study will also evaluate the potential VOC emission reductions should the referenced rule be extended to other geographic areas including: Beaumont-Port Arthur (BPA) eight-hour ozone nonattainment area (Hardin, Jefferson, and Orange Counties), Haynesville Shale area (Gregg, Harrison, Marion, Nacogdoches, Panola, Rusk, San Augustine, Smith, Shelby and Upshur counties), and other counties of interest (Bexar, Travis and Williamson counties).

Primary Survey Goal:
Determine on a county-by-county basis the fraction of 2009 oil and condensate production with controlled and uncontrolled flash emissions and, if controlled, the type of controls used.

- The following worksheets should be completed as part of this survey -**
1. Area Information - applies to all production within Bexar County.
 2. Site Information - to be completed for each producing tank battery in Bexar County.*
- * Copy and paste the Site Information worksheet for the number of sites in the geographic area.

- [Please continue to Area Information - Oil Producing Tank Battery Sites](#)
- [Please continue to Area Information - Condensate Producing Tank Battery Sites](#)
- [Please continue to Site Information - Site 1](#)
- [Please continue to Site Information - Site 2](#)
- [Please continue to Site Information - Site 3](#)
- [Please continue to Site Information - Site 4](#)
- [Please continue to Site Information - Site 5](#)



BEXAR COUNTY INFORMATION - OIL

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell

Operator Information

Name of operating company:

Name of operating company contact person:

Title of operating company contact person:

Telephone number for operating company contact person:

Email for operating company contact person:

Total number of oil producing tank battery sites in Bexar County:

Total 2009 production (barrels of oil per year) in Bexar County:

2009 oil production where tank battery emissions are controlled:

Controlled by vapor recovery unit:

Controlled by flare that meets the design requirements of 40 CFR 60.18 (Refer to note at bottom of page):

Controlled by flare that does not meet the design requirements of 40 CFR 60.18:

Controlled by other type of control device:

Please denote units: production in barrels per year, percentage of production, etc.

Note -

Following are the control device requirements per 40 CFR 60.18 -

- 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
- 2) Flares shall be operated with a flame present at all times;
- 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1&idno=40> for additional details for 60.18 flares.

BEXAR COUNTY INFORMATION - CONDENSATE

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell

Operator Information

Name of operating company:

Name of operating company contact person:

Title of operating company contact person:

Telephone number for operating company contact person:

Email for operating company contact person:

Total number of condensate producing tank battery sites in Bexar County:

Total 2009 production (barrels of condensate per year) in Bexar County:

2009 condensate production where tank battery emissions are controlled:

Controlled by vapor recovery unit:

Controlled by flare that meets the design requirements of 40 CFR 60.18 (Refer to note at bottom of page):

Controlled by flare that does not meet the design requirements of 40 CFR 60.18:

Controlled by other type of control device:

Please denote units: production in barrels per year, percentage of production, etc.

Note -

Following are the control device requirements per 40 CFR 60.18 -

- 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
- 2) Flares shall be operated with a flame present at all times;
- 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:60.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 1

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
 Following are the control device requirements per 40 CFR 60.18 -
 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
 2) Flares shall be operated with a flame present at all times;
 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 2

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
 Following are the control device requirements per 40 CFR 60.18 -
 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
 2) Flares shall be operated with a flame present at all times;
 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 3

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
Following are the control device requirements per 40 CFR 60.18 -
1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
2) Flares shall be operated with a flame present at all times;
3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 4

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
 Following are the control device requirements per 40 CFR 60.18 -
 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
 2) Flares shall be operated with a flame present at all times;
 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 5

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
Following are the control device requirements per 40 CFR 60.18 -
1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
2) Flares shall be operated with a flame present at all times;
3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1.1&idno=40> for additional details for 60.18 flares.

Texas Commission on Environmental Quality
Work Order No. 582-7-84005-FY10-22
Control of Volatile Organic Compounds (VOC) Flash Emissions from Oil and Condensate Storage Tanks in East Texas
Beaumont - Port Arthur Area (Hardin, Jefferson and Orange Counties)

Background:

Flash emissions occur when a liquid containing dissolved gases experiences a decrease in pressure. As the pressure decreases, some of the lighter VOC compounds dissolved in the liquid are released or flashed. Also, some of the compounds that are liquids at the initial pressure transform from a liquid into a vapor and are also released from the liquid. As these gases and vapors are released, some of the heavier compounds in the liquids may become entrained in these gases and will be emitted with them.

Objective:

The purpose of this project is to determine the volatile organic compound (VOC) emission reductions resulting from the implementation of requirements in Title 30 Texas Administrative Code (TAC), §115.112(d)(5) to control VOC flash emissions from crude oil and condensate storage tanks at wellhead sites in the Houston-Galveston-Brazoria (HGB) 1997 eight-hour ozone nonattainment area (Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties). The study will also evaluate the potential VOC emission reductions should the referenced rule be extended to other geographic areas including: Beaumont-Port Arthur (BPA) eight-hour ozone nonattainment area (Hardin, Jefferson, and Orange Counties), Haynesville Shale area (Gregg, Harrison, Marion, Nacogdoches, Panola, Rusk, San Augustine, Smith, Shelby and Upshur counties), and other counties of interest (Bexar, Travis and Williamson counties).

Primary Survey Goal:

Determine on a county-by-county basis the fraction of 2009 oil and condensate production with controlled and uncontrolled flash emissions and, if controlled, the type of controls used.

The following worksheets should be completed as part of this survey -

1. Area Information - applies to all production within the BPA area.
 2. Site Information - to be completed for each producing tank battery in the BPA area.*
- * Copy and paste the Site Information worksheet for the number of sites in the geographic area.

[Please continue to Area Information - Oil Producing Tank Battery Sites](#)

[Please continue to Area Information - Condensate Producing Tank Battery Sites](#)

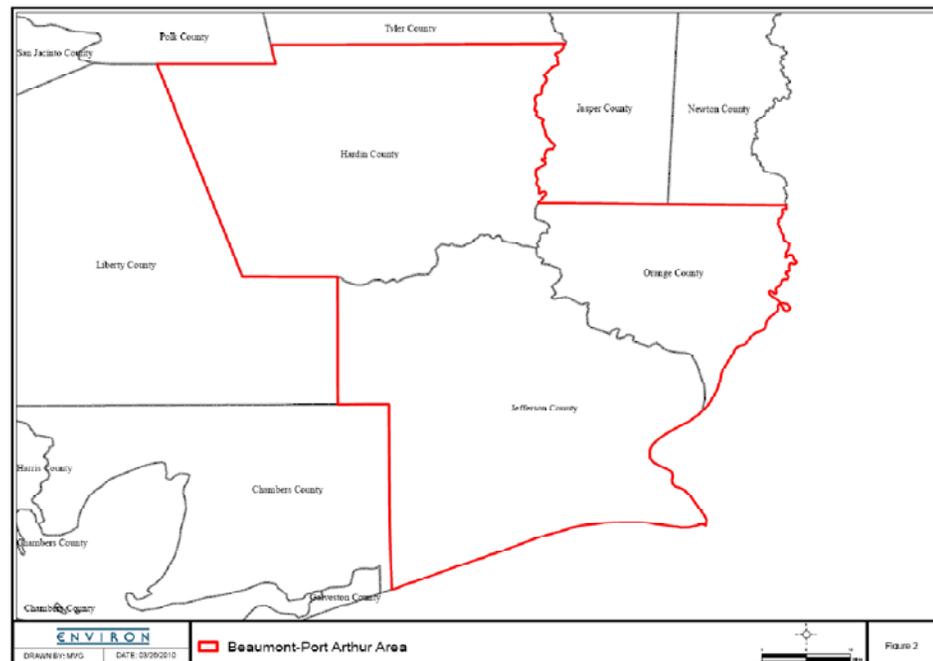
[Please continue to Site Information - Site 1](#)

[Please continue to Site Information - Site 2](#)

[Please continue to Site Information - Site 3](#)

[Please continue to Site Information - Site 4](#)

[Please continue to Site Information - Site 5](#)



BPA AREA INFORMATION - OIL

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell

Operator Information

Name of operating company:
Name of operating company contact person:
Title of operating company contact person:
Telephone number for operating company contact person:
Email for operating company contact person:

Total number of oil producing tank battery sites in the 3 BPA area counties:

--

Number of oil producing tank battery sites, by county:

Hardin	Jefferson	Orange

Total 2009 production (barrels of oil per year) in the 3 BPA area counties:

--

2009 production (barrels of oil per year), by county:

Hardin	Jefferson	Orange

2009 oil production where tank battery emissions are controlled, by county:

Controlled by vapor recovery unit:
Controlled by flare that meets the design requirements of 40 CFR 60.18 (Refer to note at bottom of page):
Controlled by flare that does not meet the design requirements of 40 CFR 60.18.
Controlled by other type of control device:
Please denote units: production in barrels per year, percentage of production, etc.

Hardin	Jefferson	Orange

Note -

Following are the control device requirements per 40 CFR 60.18 -
1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
2) Flares shall be operated with a flame present at all times;
3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1&idno=40> for additional details for 60.18 flares.

BPA AREA INFORMATION - CONDENSATE

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell

Operator Information

Name of operating company:

 Name of operating company contact person:

 Title of operating company contact person:

 Telephone number for operating company contact person:

 Email for operating company contact person:

Total number of condensate producing tank battery sites in the 3 BPA area counties:

Number of condensate producing tank battery sites, by county:

Hardin	Jefferson	Orange

Total 2009 production (barrels of condensate per year) in the 3 BPA area counties:

2009 production (barrels of condensate per year), by county:

Hardin	Jefferson	Orange

2009 condensate production where tank battery emissions are controlled, by county:

Hardin	Jefferson	Orange

Controlled by vapor recovery unit:
 Controlled by flare that meets the design requirements of 40 CFR 60.18.
 Controlled by flare that does not meet the design requirements of 40 CFR 60.18.
 Controlled by other type of control device.
 Please denote units: production in barrels per year, percentage of production, etc.

Note -

Following are the control device requirements per 40 CFR 60.18 -

- 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
- 2) Flares shall be operated with a flame present at all times;
- 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:60.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 1

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
 Following are the control device requirements per 40 CFR 60.18 -
 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
 2) Flares shall be operated with a flame present at all times;
 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 2

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
 Following are the control device requirements per 40 CFR 60.18 -
 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
 2) Flares shall be operated with a flame present at all times;
 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 3

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
Following are the control device requirements per 40 CFR 60.18 -
1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
2) Flares shall be operated with a flame present at all times;
3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 4

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
Following are the control device requirements per 40 CFR 60.18 -
1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
2) Flares shall be operated with a flame present at all times;
3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 5

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
Following are the control device requirements per 40 CFR 60.18 -
1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
2) Flares shall be operated with a flame present at all times;
3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1.1&idno=40> for additional details for 60.18 flares.

Texas Commission on Environmental Quality
Work Order No. 582-7-84005-FY10-22
Control of Volatile Organic Compounds (VOC) Flash Emissions from Oil and Condensate Storage Tanks in East Texas
Haynesville Shale Area (Gregg, Harrison, Marion, Nacogdoches, Panola, Rusk, San Augustine, Smith, Shelby and Upshur Counties)

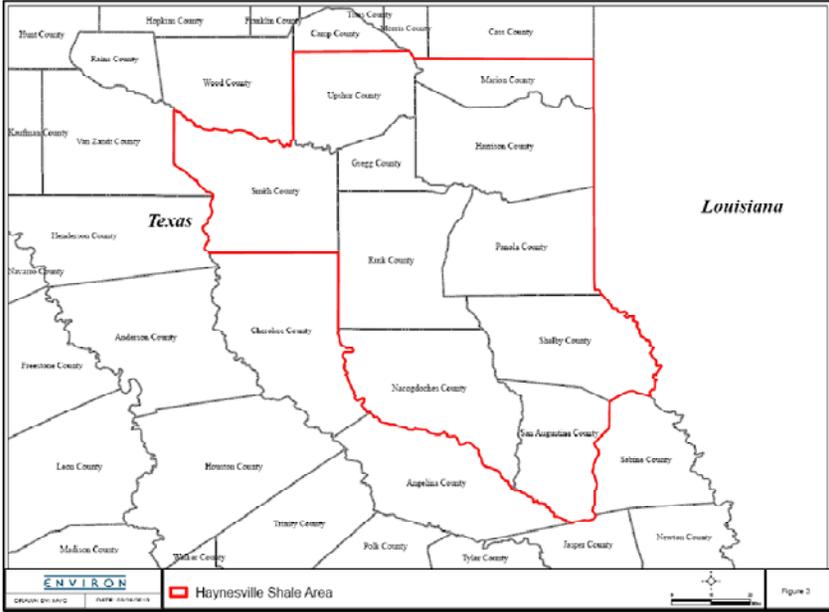
Background:
Flash emissions occur when a liquid containing dissolved gases experiences a decrease in pressure. As the pressure decreases, some of the lighter VOC compounds dissolved in the liquid are released or flashed. Also, some of the compounds that are liquids at the initial pressure transform from a liquid into a vapor and are also released from the liquid. As these gases and vapors are released, some of the heavier compounds in the liquids may become entrained in these gases and will be emitted with them.

Objective:
The purpose of this project is to determine the volatile organic compound (VOC) emission reductions resulting from the implementation of requirements in Title 30 Texas Administrative Code (TAC), §115.112(d)(5) to control VOC flash emissions from crude oil and condensate storage tanks at wellhead sites in the Houston-Galveston-Brazoria (HGB) 1997 eight-hour ozone nonattainment area (Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties). The study will also evaluate the potential VOC emission reductions should the referenced rule be extended to other geographic areas including: Beaumont-Port Arthur (BPA) eight-hour ozone nonattainment area (Hardin, Jefferson, and Orange Counties), Haynesville Shale area (Gregg, Harrison, Marion, Nacogdoches, Panola, Rusk, San Augustine, Smith, Shelby and Upshur counties), and other counties of interest (Bexar, Travis and Williamson counties).

Primary Survey Goal:
Determine on a county-by-county basis the fraction of 2009 oil and condensate production with controlled and uncontrolled flash emissions and, if controlled, the type of controls used.

- The following worksheets should be completed as part of this survey -**
1. Area Information - applies to all production within the Haynesville Shale area.
 2. Site Information - to be completed for each producing tank battery in the Haynesville Shale area.
- * Copy and paste the Site Information worksheet for the number of sites in the geographic area.

- [Please continue to Area Information - Oil Producing Tank Battery Sites](#)
- [Please continue to Area Information - Condensate Producing Tank Battery Sites](#)
- [Please continue to Site Information - Site 1](#)
- [Please continue to Site Information - Site 2](#)
- [Please continue to Site Information - Site 3](#)
- [Please continue to Site Information - Site 4](#)
- [Please continue to Site Information - Site 5](#)



HAYNESVILLE SHALE AREA INFORMATION - CONDENSATE

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell

Operator Information

Name of operating company:
Name of operating company contact person:
Title of operating company contact person:
Telephone number for operating company contact person:
Email for operating company contact person.

Total number of condensate producing tank battery sites in the 10 Haynesville Shale area counties:

--

Number of condensate producing tank battery sites, by county:

Gregg	Harrison	Marion	Nacogdoches	Panola	Rusk	San Augustine	Smith	Shelby	Upshur

Total 2009 production (barrels of condensate per year) in the 10 Haynesville Shale area counties:

--

2009 production (barrels of condensate per year), by county:

Gregg	Harrison	Marion	Nacogdoches	Panola	Rusk	San Augustine	Smith	Shelby	Upshur

2009 condensate production where tank battery emissions are controlled, by county:

Controlled by vapor recovery unit:
Controlled by flare that meets the design requirements of 40 CFR 60.18 (Refer to note at bottom of page):
Controlled by flare that does not meet the design requirements of 40 CFR 60.18.
Controlled by other type of control device:
Please denote units: production in barrels per year, percentage of production, etc.

Gregg	Harrison	Marion	Nacogdoches	Panola	Rusk	San Augustine	Smith	Shelby	Upshur

Note -

Following are the control device requirements per 40 CFR 60.18 -

- 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
- 2) Flares shall be operated with a flame present at all times;
- 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 1

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
Following are the control device requirements per 40 CFR 60.18 -
1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
2) Flares shall be operated with a flame present at all times;
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Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 2

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
 Following are the control device requirements per 40 CFR 60.18 -
 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
 2) Flares shall be operated with a flame present at all times;
 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 3

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
Following are the control device requirements per 40 CFR 60.18 -
1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
2) Flares shall be operated with a flame present at all times;
3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 4

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
 Following are the control device requirements per 40 CFR 60.18 -
 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
 2) Flares shall be operated with a flame present at all times;
 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 5

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
 Following are the control device requirements per 40 CFR 60.18 -
 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
 2) Flares shall be operated with a flame present at all times;
 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1.1&idno=40> for additional details for 60.18 flares.

Texas Commission on Environmental Quality
Work Order No. 582-7-84005-FY10-22
Control of Volatile Organic Compounds (VOC) Flash Emissions from Oil and Condensate Storage Tanks in East Texas
Houston-Galveston-Brazoria Area (Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery and Waller Counties)

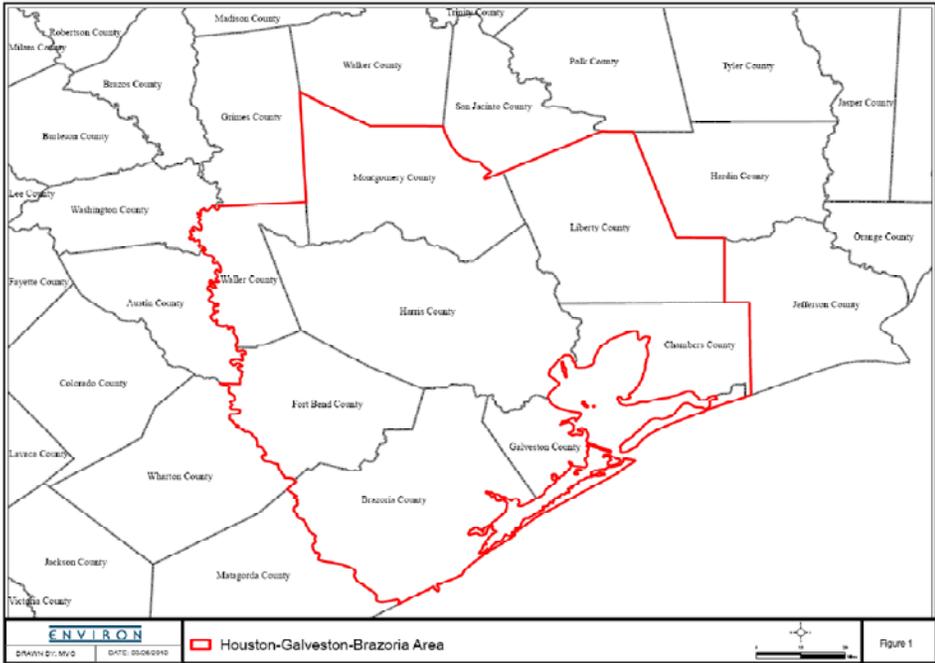
Background:
Flash emissions occur when a liquid containing dissolved gases experiences a decrease in pressure. As the pressure decreases, some of the lighter VOC compounds dissolved in the liquid are released or flashed. Also, some of the compounds that are liquids at the initial pressure transform from a liquid into a vapor and are also released from the liquid. As these gases and vapors are released, some of the heavier compounds in the liquids may become entrained in these gases and will be emitted with them.

Objective:
The purpose of this project is to determine the volatile organic compound (VOC) emission reductions resulting from the implementation of requirements in Title 30 Texas Administrative Code (TAC), §115.112(d)(5) to control VOC flash emissions from crude oil and condensate storage tanks at wellhead sites in the Houston-Galveston-Brazoria (HGB) 1997 eight-hour ozone nonattainment area (Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties). The study will also evaluate the potential VOC emission reductions should the referenced rule be extended to other geographic areas including: Beaumont-Port Arthur (BPA) eight-hour ozone nonattainment area (Hardin, Jefferson, and Orange Counties), Haynesville Shale area (Gregg, Harrison, Marion, Nacogdoches, Panola, Rusk, San Augustine, Smith, Shelby and Upshur counties), and other counties of interest (Bexar, Travis and Williamson counties).

Primary Survey Goal:
Determine on a county-by-county basis the fraction of 2009 oil and condensate production with controlled and uncontrolled flash emissions and, if controlled, the type of controls used.

- The following worksheets should be completed as part of this survey -**
1. Area Information - applies to all production within the HGB area.
 2. Site Information - to be completed for each producing tank battery in the HGB area.
- * Copy and paste the Site Information worksheet for the number of sites in the geographic area.

- [Please continue to Area Information - Oil Producing Tank Battery Sites](#)
- [Please continue to Area Information - Condensate Producing Tank Battery Sites](#)
- [Please continue to Site Information - Site 1](#)
- [Please continue to Site Information - Site 2](#)
- [Please continue to Site Information - Site 3](#)
- [Please continue to Site Information - Site 4](#)
- [Please continue to Site Information - Site 5](#)



SITE INFORMATION - SITE 1

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cel
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down lis

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
Following are the control device requirements per 40 CFR 60.18 -
1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
2) Flares shall be operated with a flame present at all times;
3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 2

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cel
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down lis

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
Following are the control device requirements per 40 CFR 60.18 -
1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
2) Flares shall be operated with a flame present at all times;
3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 3

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cel
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down lis

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
 Following are the control device requirements per 40 CFR 60.18 -
 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
 2) Flares shall be operated with a flame present at all times;
 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 4

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cel
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down lis

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
 Following are the control device requirements per 40 CFR 60.18 -
 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
 2) Flares shall be operated with a flame present at all times;
 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 5

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cel
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down lis

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
Following are the control device requirements per 40 CFR 60.18 -
1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
2) Flares shall be operated with a flame present at all times;
3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1&idno=40> for additional details for 60.18 flares.

Texas Commission on Environmental Quality
Work Order No. 582-7-84005-FY10-22
Control of Volatile Organic Compounds (VOC) Flash Emissions from Oil and Condensate Storage Tanks in East Texas
Travis County

Background:

Flash emissions occur when a liquid containing dissolved gases experiences a decrease in pressure. As the pressure decreases, some of the lighter VOC compounds dissolved in the liquid are released or flashed. Also, some of the compounds that are liquids at the initial pressure transform from a liquid into a vapor and are also released from the liquid. As these gases and vapors are released, some of the heavier compounds in the liquids may become entrained in these gases and will be emitted with them.

Objective:

The purpose of this project is to determine the volatile organic compound (VOC) emission reductions resulting from the implementation of requirements in Title 30 Texas Administrative Code (TAC), §115.112(d)(5) to control VOC flash emissions from crude oil and condensate storage tanks at wellhead sites in the Houston-Galveston-Brazoria (HGB) 1997 eight-hour ozone nonattainment area (Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties). The study will also evaluate the potential VOC emission reductions should the referenced rule be extended to other geographic areas including: Beaumont-Port Arthur (BPA) eight-hour ozone nonattainment area (Hardin, Jefferson, and Orange Counties), Haynesville Shale area (Gregg, Harrison, Marion, Nacogdoches, Panola, Rusk, San Augustine, Smith, Shelby and Upshur counties), and other counties of interest (Bexar, Travis and Williamson counties).

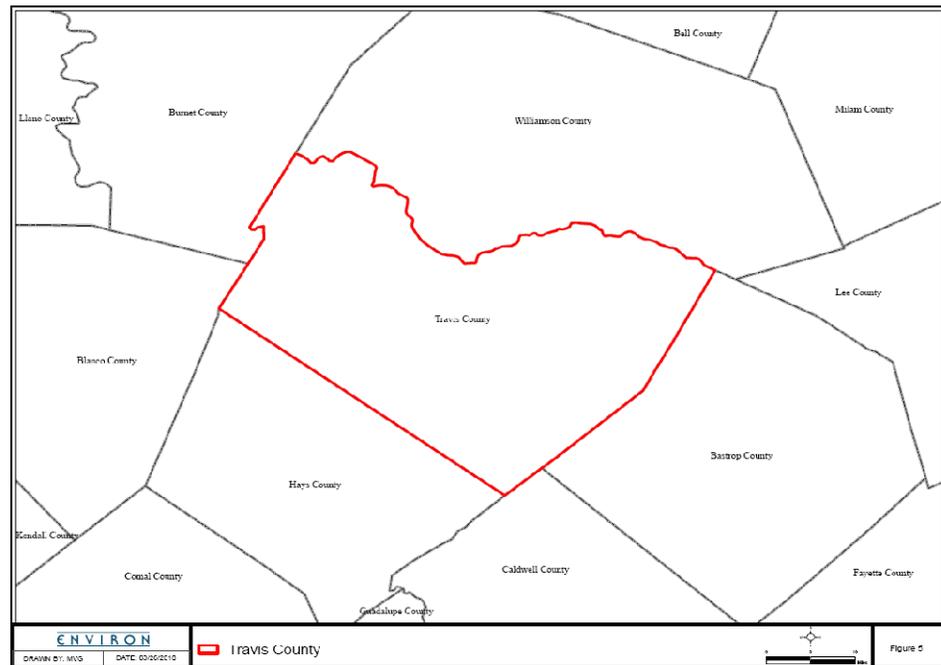
Primary Survey Goal:

Determine on a county-by-county basis the fraction of 2009 oil and condensate production with controlled and uncontrolled flash emissions and, if controlled, the type of controls used.

The following worksheets should be completed as part of this survey -

1. Area Information - applies to all production within Travis County.
 2. Site Information - to be completed for each producing tank battery in Travis County.*
- * Copy and paste the Site Information worksheet for the number of sites in the geographic area.

- [Please continue to Area Information - Oil Producing Tank Battery Sites](#)
- [Please continue to Area Information - Condensate Producing Tank Battery Sites](#)
- [Please continue to Site Information - Site 1](#)
- [Please continue to Site Information - Site 2](#)
- [Please continue to Site Information - Site 3](#)
- [Please continue to Site Information - Site 4](#)
- [Please continue to Site Information - Site 5](#)



TRAVIS COUNTY INFORMATION - OIL

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell

Operator Information

Name of operating company:
Name of operating company contact person:
Title of operating company contact person:
Telephone number for operating company contact person.
Email for operating company contact person.

Total number of oil producing tank battery sites in Travis County:

--

Total 2009 production (barrels of oil per year) in Travis County:

--

2009 oil production where tank battery emissions are controlled:

Controlled by vapor recovery unit.
Controlled by flare that meets the design requirements of 40 CFR 60.18 (Refer to note at bottom of page):
Controlled by flare that does not meet the design requirements of 40 CFR 60.18.
Controlled by other type of control device.
Please denote units: production in barrels per year, percentage of production, etc.

Note -

Following are the control device requirements per 40 CFR 60.18 -
1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
2) Flares shall be operated with a flame present at all times;
3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1&idno=40> for additional details for 60.18 flares.

TRAVIS COUNTY INFORMATION - CONDENSATE

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell

Operator Information

Name of operating company:

Name of operating company contact person:

Title of operating company contact person:

Telephone number for operating company contact person:

Email for operating company contact person:

Total number of condensate producing tank battery sites in Travis County:

Total 2009 production (barrels of condensate per year) in Travis County:

2009 condensate production where tank battery emissions are controlled:

Controlled by vapor recovery unit:

Controlled by flare that meets the design requirements of 40 CFR 60.18 (Refer to note at bottom of page):

Controlled by flare that does not meet the design requirements of 40 CFR 60.18:

Controlled by other type of control device:

Please denote units: production in barrels per year, percentage of production, etc.

Note -

Following are the control device requirements per 40 CFR 60.18 -

- 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
- 2) Flares shall be operated with a flame present at all times;
- 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 1

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
 Following are the control device requirements per 40 CFR 60.18 -
 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
 2) Flares shall be operated with a flame present at all times;
 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 2

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

- Site Name:
- Site Street Address:
- Site City:
- Site Zip Code:
- Physical Location:
- Latitude:
- Longitude:
- County:
- Field Name:
- Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

- If yes, is it a vapor recovery unit?
- A 60.18 Flare? (Refer to note at bottom of page)
- A non-60.18 flare?
- Another type of control device?
- If yes, what is it?
- When were the controls installed?
- Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

- If yes, when would controls be installed?
- What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

- If yes, what is the volume of flash produced?
- Units of flash production (e.g. cubic feet per barrel)?
- If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
Following are the control device requirements per 40 CFR 60.18 -
1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
2) Flares shall be operated with a flame present at all times;
3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 3

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
 Following are the control device requirements per 40 CFR 60.18 -
 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
 2) Flares shall be operated with a flame present at all times;
 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 4

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
 Following are the control device requirements per 40 CFR 60.18 -
 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
 2) Flares shall be operated with a flame present at all times;
 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 5

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
 Following are the control device requirements per 40 CFR 60.18 -
 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
 2) Flares shall be operated with a flame present at all times;
 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1.1&idno=40> for additional details for 60.18 flares.

WILLIAMSON COUNTY INFORMATION - OIL

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell

Operator Information

Name of operating company:

Name of operating company contact person:

Title of operating company contact person:

Telephone number for operating company contact person:

Email for operating company contact person:

Total number of oil producing tank battery sites in Williamson County:

Total 2009 production (barrels of oil per year) in Williamson County:

2009 oil production where tank battery emissions are controlled:

Controlled by vapor recovery unit:

Controlled by flare that meets the design requirements of 40 CFR 60.18 (Refer to note at bottom of page):

Controlled by flare that does not meet the design requirements of 40 CFR 60.18:

Controlled by other type of control device:

Please denote units: production in barrels per year, percentage of production, etc.

Note -

Following are the control device requirements per 40 CFR 60.18 -

- 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
- 2) Flares shall be operated with a flame present at all times;
- 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1&idno=40> for additional details for 60.18 flares.

WILLIAMSON COUNTY INFORMATION - CONDENSATE

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell

Operator Information

Name of operating company:

Name of operating company contact person:

Title of operating company contact person:

Telephone number for operating company contact person:

Email for operating company contact person:

Total number of condensate producing tank battery sites in Williamson County:

Total 2009 production (barrels of condensate per year) in Williamson County:

2009 condensate production where tank battery emissions are controlled:

Controlled by vapor recovery unit:

Controlled by flare that meets the design requirements of 40 CFR 60.18 (Refer to note at bottom of page):

Controlled by flare that does not meet the design requirements of 40 CFR 60.18:

Controlled by other type of control device:

Please denote units: production in barrels per year, percentage of production, etc.

Note -

Following are the control device requirements per 40 CFR 60.18 -

- 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
- 2) Flares shall be operated with a flame present at all times;
- 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 1

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
 Following are the control device requirements per 40 CFR 60.18 -
 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
 2) Flares shall be operated with a flame present at all times;
 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 2

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
 Following are the control device requirements per 40 CFR 60.18 -
 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
 2) Flares shall be operated with a flame present at all times;
 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 3

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
Following are the control device requirements per 40 CFR 60.18 -
1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
2) Flares shall be operated with a flame present at all times;
3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 4

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

Note -
Following are the control device requirements per 40 CFR 60.18 -
1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
2) Flares shall be operated with a flame present at all times;
3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1&idno=40> for additional details for 60.18 flares.

SITE INFORMATION - SITE 5

Instructions

Please provide complete information in 'orange' cells
Please include the units for production in the 'yellow' cell
For 'orange' cells with a drop-down menu, please select 'Yes', 'No' or 'N/A (Not Applicable)' from the drop-down list

Site Information

Site Name:
Site Street Address:
Site City:
Site Zip Code:
Physical Location:
Latitude:
Longitude:
County:
Field Name:
Section Name:

Production equipment at site (other than tanks):

Heater/Treater	High Pressure Separator	Low Pressure Separator	Compressor Engines	Pumpjack	Dehydration Unit	Amine/Sweetening Unit	Other (Please specify)

Oil or gas producing site?

Oil	Natural Gas

Number and size of fixed-roof oil / condensate storage tanks on site?

--

Are all tanks at site fixed roof?

--

If no, what other types of tanks are on site, how many, and what size are they?

--

2009 production (barrels of oil and/or condensate per year), by site:

--

Are tank emissions at this site controlled?

If yes, is it a vapor recovery unit?
A 60.18 Flare? (Refer to note at bottom of page)
A non-60.18 flare?
Another type of control device?
If yes, what is it?
When were the controls installed?
Are performance test results available?

If tanks emissions at this site are uncontrolled, are there plans to install controls?

If yes, when would controls be installed?
What type of controls are being considered?

Has a flash gas analysis been performed for the oil/condensate produced at this site?

If yes, what is the volume of flash produced?
Units of flash production (e.g. cubic feet per barrel)?
If known, what is the non-methane, non-ethane hydrocarbon fraction of the flash?

If known, what is the composition of the oil/condensate produced at this site?
(volumetric or mole fraction)

Nitrogen (N2)	
Oxygen (O2)	
Carbon Dioxide (CO2)	
Methane (CH4)	
Ethane (C2)	
Propane (C3)	
Isobutane (i-C4)	
n-Butane (n-C4)	
2,2-Dimethylpropane	
Isopentane (i-C5)	
n-Pentane (n-C5)	
2,2-Dimethylbutane	
Cyclopentane	
2,3-Dimethylbutane	
2-Methylpentane	
3-Methylpentane	
n-Hexane	
Methylcyclopentane	
Benzene	
Cyclohexane	
2-Methylhexane	
3-Methylhexane	
Dimethylcyclopentanes	
2,2,4-Trimethylpentane	
Other C7's	
n-Heptane	
Methylcyclohexane	
Toluene	
Other C8's	
n-Octane	
Ethylbenzene	
m-Xylene	
o-Xylene	
Other C9's	
n-Nonane	
Other C10's	
n-Decane	
Undecanes Plus	

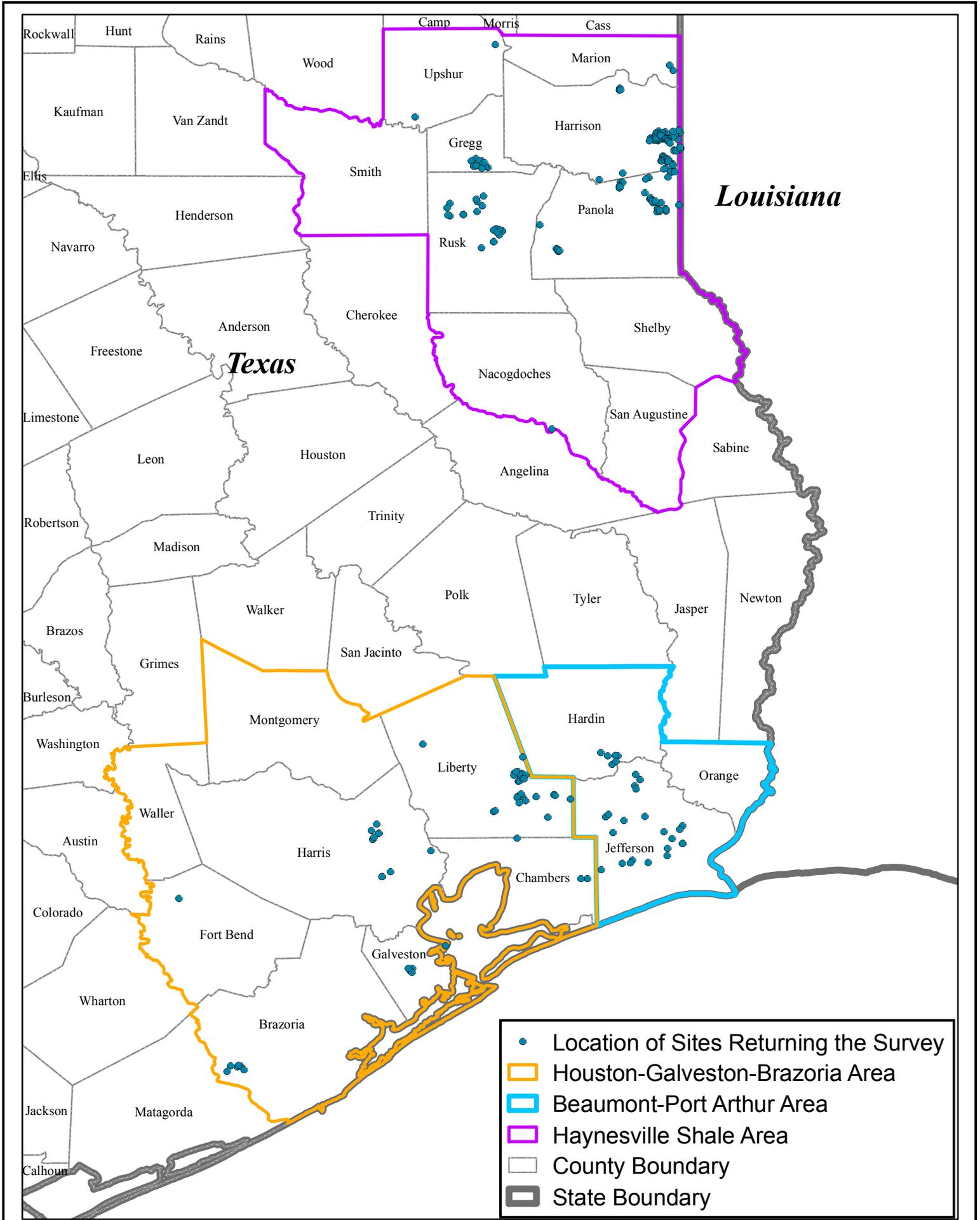
Please feel free to add any compound(s) not listed above

If known, what is the true vapor pressure of the oil/condensate produced at this site?

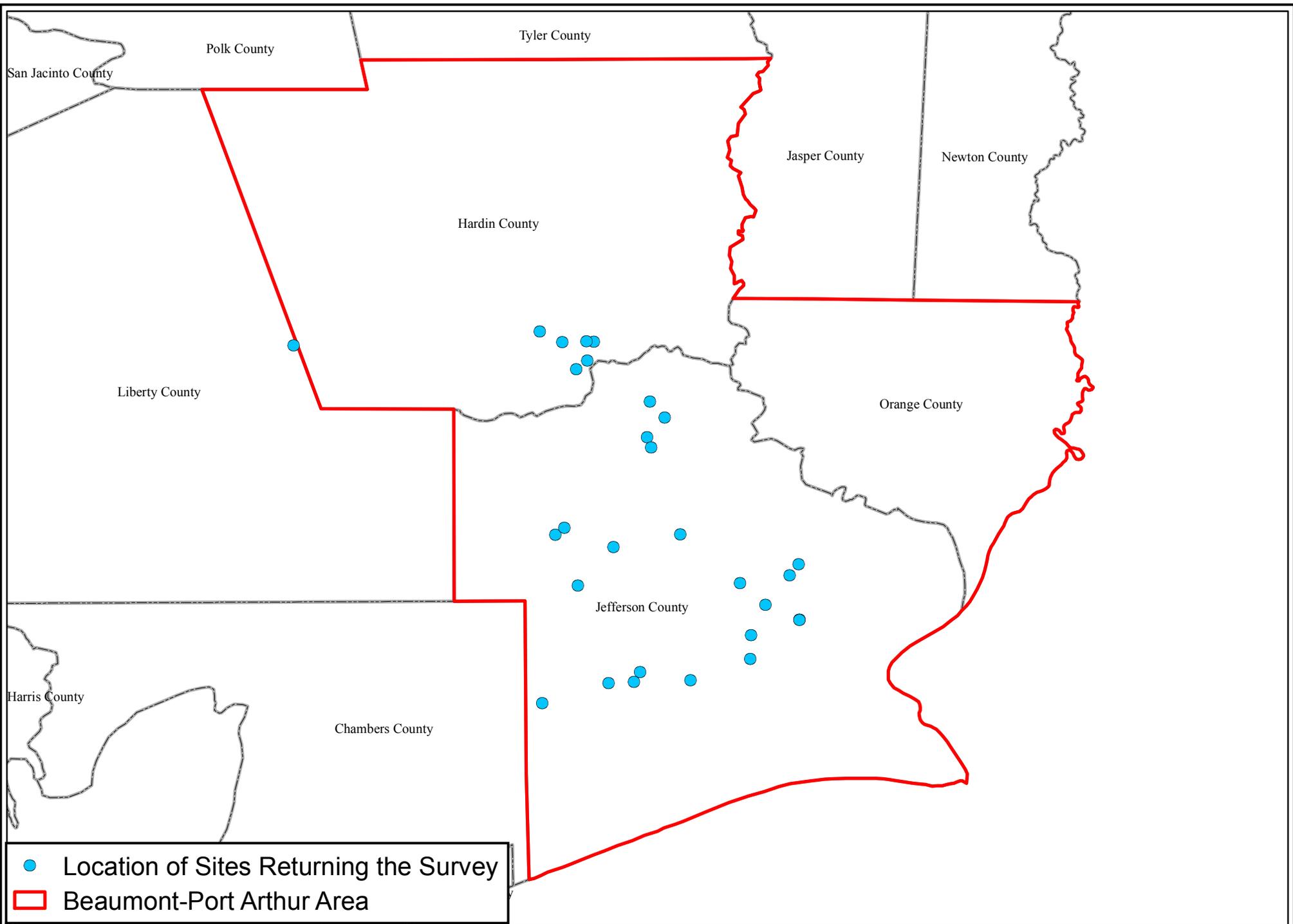
Note -
 Following are the control device requirements per 40 CFR 60.18 -
 1) Flares shall be designed for and operated with no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours;
 2) Flares shall be operated with a flame present at all times;
 3) Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is nonassisted

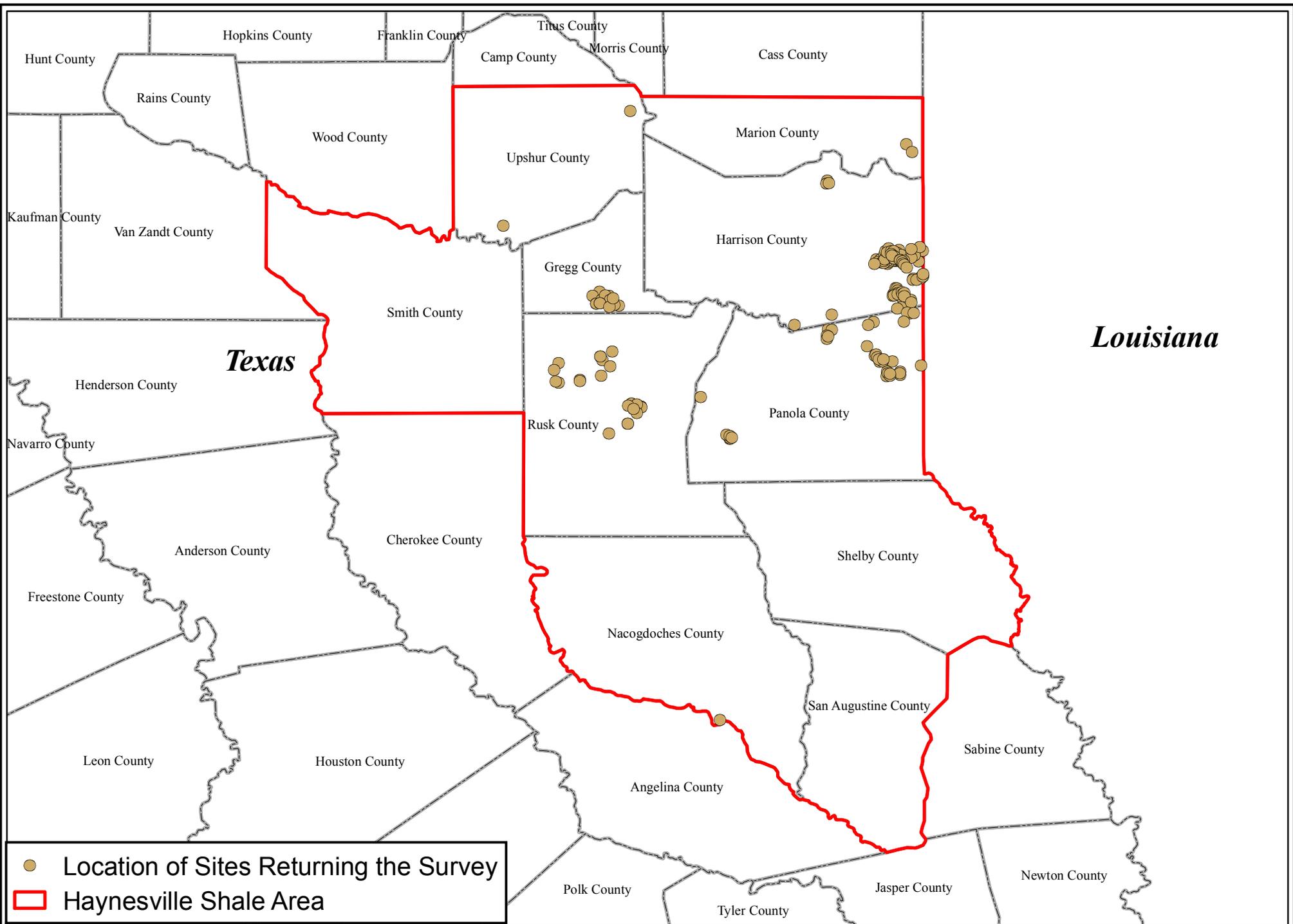
Please refer to <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div6&view=text&node=40:6.0.1.1.1.1.1&idno=40> for additional details for 60.18 flares.

Appendix D
Tank Battery Location Maps



- Location of Sites Returning the Survey
- ▭ Houston-Galveston-Brazoria Area
- ▭ Beaumont-Port Arthur Area
- ▭ Haynesville Shale Area
- ▭ County Boundary
- ▭ State Boundary





Location of Sites Returning the Survey
 Haynesville Shale Area

