3.0 Point Source Testing

ERG subcontracted the point source testing task to Sage Environmental Consulting LP (Sage). This section discusses how the point source testing task was conducted and the results that were obtained.

This section has seven sub-sections:

- 3.1 Introduction – Provides a summary of the purpose of the point source study, the scope of work, and the project timeline.
- 3.2 Point Source Survey Sampling Equipment – This section describes the field instrumentation.
- 3.3 Point Source Survey and Sampling Procedures – This section discusses survey procedures, documentation of emission points, the collection of emission data, canister sampling, and data archival procedures.
- 3.4 Emissions Calculation Procedures – The development of canister-derived emissions, the application of correlation equations, the creation of surrogate tank and non-tank emissions profiles, the use of EPA default-zero emissions factors, the use of engine emissions tables, and the calculation of Screening Emissions Factors are discussed in this section.
- 3.5 Point Source Emissions Results – The results of the point source study are provided in the charts and tables of this section.
- 3.6 Quality Control (QC) Results – This section contains the results of the QC procedures specified in the Final Point Source Test Plan including instrument calibration checks, canister sample collection procedures, and laboratory analytical checks.
- 3.7 Point Source Testing Conclusions – This section presents conclusions of the point source testing task.
- Appendix 3-A: Emissions summary for each point source site surveyed.
- Appendix 3-B: Two DVD discs containing the emissions calculation workbook, "MASTER - Well Char Emission Data 2011-07-13_FINAL" together with the data collected for each point source site.
- Appendix 3-C: One DVD containing the canister sample logbooks and the canister analytical results, the laboratory quality control results and the canister chain-of custody documentation.

3.1 Introduction

The purpose of the point source emissions study was to characterize emissions from natural gas-related point sources located within the Fort Worth city limits. These sources are categorized in seven groups:

- Well Pads – Comprising the largest group of sites visited, natural gas well pads typically contained several active wells, produced water storage tanks, separators, and

metering runs (piping). Approximately one-third (123) of the well pads also had lift compressors used to increase a well's gas production rate. Emission sources typically related with well pads include equipment leaks, produced water and condensate storage and loading, and lift compressors. The amount of condensate production and related emissions are usually dependant on whether the produced gas is wet or dry gas.

- Compressor Stations – Compressor stations contain one or more large (generally 250 horsepower (hp) or greater) line compressors which provide the necessary pressure to move the natural gas through many miles of transmission lines. The most significant emissions from compressors stations are usually from combustion at the compressor engines or turbines. Other emissions sources may include equipment leaks, storage tanks, glycol dehydrators, flares, and condensate and/or wastewater loading. None of the compressor stations visited included turbines.
- Processing Facilities – Processing facilities generally remove impurities from the natural gas, such as carbon dioxide, water, and hydrogen sulfide. These facilities may also be designed to remove ethane, propane, and butane fractions from the natural gas for downstream marketing. Processing facilities are usually the largest emitting natural gas-related point sources including multiple emission sources such as, but not limited to equipment leaks, storage tanks, separator vents, glycol dehydrators, flares, condensate and wastewater loading, compressors, amine treatment and sulfur recovery units. The Processing Plant visited included most of these sources except for sulfur recovery units.
- Saltwater Treatment Facility – The single saltwater treatment facility permitted for operation within the City's boundaries uses underground injection to dispose of well production liquids such as oilfield brine, drilling mud, fracture materials, and well treatment fluids. Emission sources typically related with salt water treatment facilities include equipment leaks, storage tanks, and generators.
- Drilling Operation – Drilling of a new well is typically a two to three week process from start to finish and involves several large diesel-fueled generators. Other emission sources related to drilling operations may include equipment leaks and waste storage.
- Fracking Operation – Fracking is the high pressure injection of water mixed with sand and a variety of chemical additives into the well to fracture the shale and stimulate natural gas production from the well. Fracking operations can last for several weeks and involve many large diesel-fueled generators. Other emission sources related to fracking operations may include equipment leaks and waste storage.
- Flowback – Flowback is a well completion activity that occurs following the conclusion of a fracking operation. Flowback thus entails the removal of fracking fluids from the well in preparation either for a subsequent phase of treatment or for cleanup and returning the well to production. Similar to fracking operations, other related emission sources may include equipment leaks and waste storage.

The point source teams surveyed a total of 388 sites (including repeat visits at two sites). The sites are identified by owner and type in Table 3.1-1. Figure 3.1-1 locates each site on an overlay map of Fort Worth. Figure 3.1-2 indicates which well pads were considered to be wet gas, and which were considered to be dry gas. For purposes of this study, a site was considered to be a wet gas site if it produced more than 1 barrel of condensate/day as indicated by the Texas Railroad Commission records.

> ***Key Point: Sites Surveyed***
> This study included surveying a total of 388 sites comprised of well pads, compressor stations, processing facilities, a salt water treatment facility, drilling operations, fracking operations, and completion operations.

The point source emissions survey occurred in two phases. Phase I was completed in the fall of 2010 (August 30 – October 21, 2010). Phase II took place during the beginning months of 2011 (January 4 – February 16, 2011). There were no significant differences in methodology or scope between the two phases. Any slight differences between the methodologies are discussed below. During Phase I, 199 point source sites were surveyed and are identified using Point Source ID's PS-001 through PS-201. An additional 189 sites were completed in Phase II and are identified as Point Source ID's 6 through 487.

Quality Control results indicate that the field and the laboratory equipment were in a state of control during the point source survey and that project quality control checks were followed. Site-by-site emission summaries are provided in Appendix 3-A of this report. Appendix 3-B provides the field data and emission calculation workbook on two DVD discs. Appendix 3-C contains the canister analytical data on one DVD disc.

3.2 Point Source Emissions Survey Sampling Equipment

The point source surveys were carried out by two teams of two persons each. In Phase I each team was staffed by a Sage employee and an employee from Hicks & Co. Environmental (Hicks). This changed in Phase II to one team of two Sage employees while the other team remained a Sage and a Hicks employee. The point source teams were equipped with the following test equipment:

- FLIR™ Infrared (IR) Camera.
- Thermo Environmental ™ Toxic Vapor Analyzer.
- Bacharach™ Hi Flow Sampler.
- Summa Passivated Stainless Steel Canisters from TestAmerica™.
- Miscellaneous Support Equipment (Global Positioning System (GPS) Finder, Laser Distance Finder, Weather meter, Digital Camera).

Table 3.1-1. Point Source Sites by Owner and Type

Owners	Well Pad	Compressor Station	Processing Facility	Saltwater Treatment Facility	Drilling Operation	Fracking Operation	Completion Operation (Flowback)	Total
Burnett Oil Production	2							**2**
Chesapeake Operating Inc.	84 [a]	2		1				**87**
Crosstex			1					**1**
Crow Creek Operating Inc	3							**3**
Devon Energy Production Co	105							**105**
Eagle Oil And Gas	1							**1**
Encana Oil & Gas (USA) Inc	18 [b]							**18**
Finley	2							**2**
Frost Brothers	2							**2**
Grand Operating Inc	1							**1**
Lakota Energy LTD	1							**1**
Newark Energy	1							**1**
Proven Resources	3							**3**
Quicksilver Resources	28	1				1	1	**31**
Range Production Co	16	3						**19**
Vargus Energy LTD	1							**1**
Williams Production	5							**5**
XTO Energy Inc	102	2			1			**105**
Grand Total	**375**	**8**	**1**	**1**	**1**	**1**	**1**	**388**

[a] Includes repeat visits to the same site i.e., Site IDs: PS-192 and 294.
[b] Includes repeat visits to the same site i.e., Site IDs: PS-086 and 260.

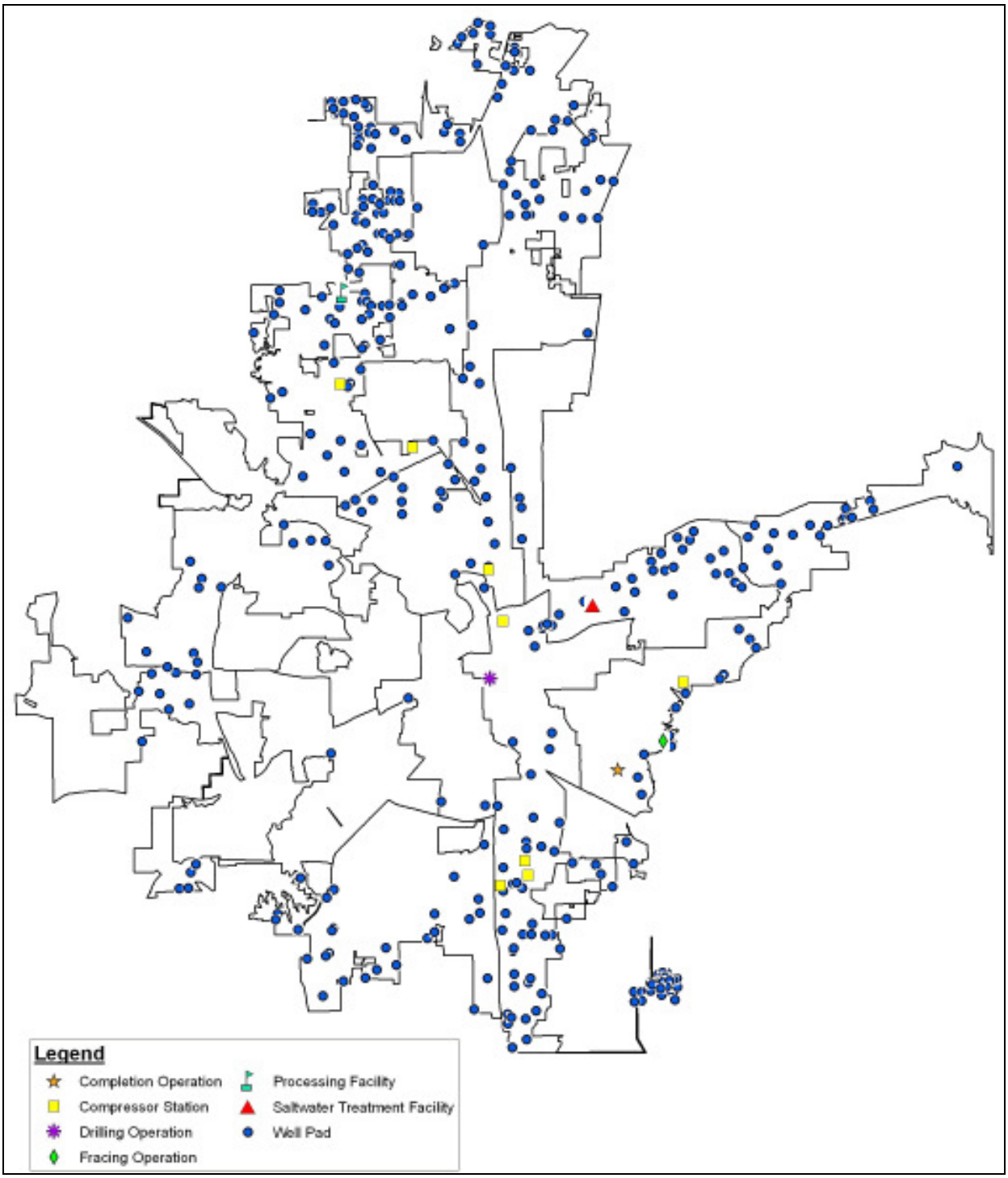


Figure 3.1-1. Point Source Survey Sites (August 2010 – February 2011)

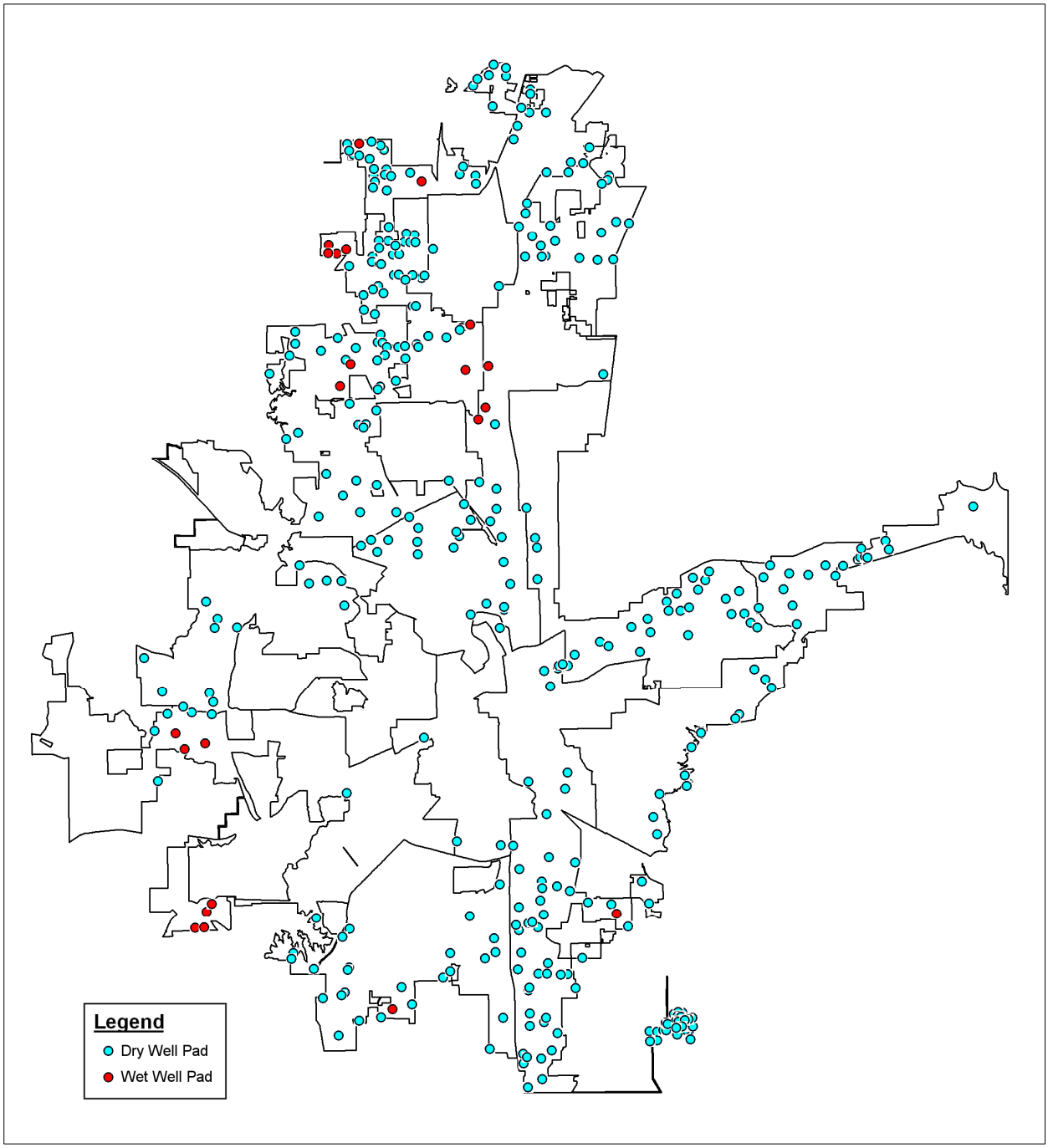


Figure 3.1-2. Wet Gas and Dry Gas Well Pads

3.2.1 The FLIR™ Infrared Camera

FLIR™ infrared cameras were used to survey all equipment in natural gas service at each point source site visited. The IR camera enables rapid detection of large emission sources (for instance, sources with concentrations > 10,000 parts per million by volume (ppmv). Moreover, the infrared camera is well suited to detecting methane emissions, the largest constituent of

natural gas, as well as ethane, propane, and butane. Figure 3.2-1 illustrates the use of a FLIR™ infrared camera at a well site.

Figure 3.2-1. IR Camera Imaging at a Well Site

Two models of infrared camera were used on this project. One team used the GasFindIR™ camera equipped with a 50 mm lens and an external COWAN™ video recorder. The second team used the FLIR™ Model GF-320 infrared camera. While the two cameras share identical performance characteristics, the GF-320 has more user-friendly features (such as built-in video recorder and digital camera). All infrared camera imaging was performed by trained Level 1 or Level 2 Thermographers.

3.2.2 The Toxic Vapor Analyzer (TVA)

The TVA is a portable, battery-powered, intrinsically safe, hydrocarbon analyzer with a measurement range extending from 0.5 ppmv (parts per million by volume) to 50,000 ppmv hydrocarbon. This instrument was used to screen a random selection of site valves and connectors for leaks below the detection limit of the IR camera. It was also used to measure emissions detected with the camera, although in most cases these measurements resulted in a "flame-out" of the analyzer (that is, a reading greater than 50,000 ppmv). Figure 3.2-2 illustrates the use of a TVA at a well site.

> ***Key Point: IR Camera and TVA Detection Limits***
> The Infrared camera is typically used to detect large emission sources at concentrations >10,000 ppmv whereas the TVA can detect emissions with concentrations as low as 0.5 ppmv.

Figure 3.2-2. Method 21 Screening with the TVA at a Well Site

Use of the TVA followed EPA Method 21 procedures (40 CFR 60 Appendix A), which prescribes how to screen various components for fugitive emissions. Each TVA was calibrated daily prior to use with methane-in-air calibration standards.

3.2.3 The Hi Flow Sampler

The Hi Flow Sampler is a portable, intrinsically safe instrument designed to measure the rate of gas leakage around various pipe fittings, valve packings and compressor seals found at natural gas facilities. Because of its high flow rate (8 to 10 standard cubid feet per minute (SCFM)) the Hi Flow Sampler is able to completely capture any gas emitting from a component. The rate of the gas leak is determined by accurately measuring the flow rate of the sampling stream and the natural gas concentration. Figure 3.2-3 illustrates the sampling of a tank vent with the Hi Flow sampler.

Figure 3.2-3. Sampling a Tank Vent with the Hi Flow Sampler

To make an emission measurement with the Hi Flow Sampler, an attachment is chosen that is suitable for capturing the entire leak. An assortment of attachments are available to enable testing of a wide variety of components. For instance, for thief hatchs or tank vents, a large nylon bag attachment was used. A plunger-style attachment was used to enclose small valves. Flanges were enclosed with a plastic strap and secured with Velcro™. For equipment that could not be enclosed with the standard Hi Flow Sampler attachments, plastic wrapping was used. With one end of the attachment enclosing the emission source and the other end attached to the instrument's main sampling hose, the Sampler was switched on and sampling initiated using the menu options available through the unit's controller. An entire Hi Flow Sampler test run lasted approximately 3 to 5 minutes.

For the point source surveys the Hi Flow Sampler was operated in its Automatic 2-Stage Mode, performing a leak rate measurement first at a high flow rate setting for one minute, and then automatically switching to a lower flow rate for a second minute of additional sampling. The unit calculated the degree of comparison between two measurements and displayed the total sample flow rate in cubic feet per minute (CFM) and the leak as percent methane and as the percent of the sample flow rate (% CFM).

3.2.4 Summa Canisters

Evacuated, six-liter, canisters provided by TestAmerica's™ Austin, Texas laboratory, were used to collect gas samples from selected emission points for VOC and HAP analysis by Gas chromatograph/Mass spectrometer (GC/MS) and for methane analysis by gas chromatography with a thermal conductivity detector (TCD). Canisters were shipped to the field office in a pre-cleaned, evacuated condition. Completed canisters were returned within several days of sample collection, together with chain-of-custody documentation, to TestAmerica™ for analysis. Unused canisters were kept securely stored in the project field office. Figure 3.2-4 illustrates how a canister sample was collected from the exhaust port of the Hi Flow Sampler.

Figure 3.2-4. Collecting a Canister Sample from the Exhaust Port of the Hi Flow Sampler

3.2.5 Miscellaneous Equipment

In addition to the equipment described above the point source teams also employed:

- A GPS receiver to document a site's North and West coordinates.
- A Kestrel Weathermeter™ to measure wind speed, temperature, relative humidity, and barometric pressure during a site visit.
- A laser distance finder to measure heights of emission points.
- An Archer™ field computer to record site data.
- A digital camera for site and equipment photos.

3.3 Point Source Survey and Sampling Procedures

This section discusses pre-test equipment preparation, site survey procedures, and data retrieval/archiving activities. The point source survey and sampling procedures followed were consistent with the Point Source Test Plan previously submitted and approved by the City of Fort Worth. Any deviations from this plan are discussed in the following sections as applicable.

3.3.1 Pre-Test Equipment Preparation

Equipment was prepared for use each morning prior to the first site visit. Preparations included:

- The IR Camera Daily Demo.
- A calibration check of the Hi Flow Sampler.
- A multipoint calibration of the TVA.

IR Camera Daily Demo Quality Assurance Check

The IR Camera Daily Demo provides a validation of the camera's operation by releasing a known mass emission rate of gas (100% propane) and measuring the distance from which the release can be reliably viewed. This validation was performed first thing each morning with both cameras at two mass emission rates: a low emission rate of 10 grams/hour propane and a higher emission rate of 31 grams/hour propane. The distance from which each emission rate could be detected (i.e. sighting distance) was recorded, together with wind direction, wind speed, temperature, relative humidity, barometric pressure, and percent cloud cover information. The equipment used to perform the daily demo included a steel compressed gas cylinder of 100% propane gas, a single stage gas regulator, a calibrated rotameter, flow control valves and tubing to position the emission flow at eye-level. The results of the daily demos are provided in Section 3.6 of this report and further documented in the field log notes included in Appendix 3-B.

Calibration Check of the Hi Flow Samplers

The Hi Flow Sampler contains two sensors – a background sensor and a leak sensor. Both sensors were calibrated at the start of Phase I and at the start of Phase II using certified standards of 2.5% methane-in-air and 100% methane. On a daily basis, prior to testing, the background and leak sensors of each Sampler were calibration-checked with the 2.5% methane standard. If an error greater than 10% resulted, the instrument was re-calibrated. Each Monday, the background and leak sensors of both instruments were calibration-checked with both the 2.5% and the 100% methane standards. Again, errors above 10% required re-calibration of the instrument.

The results of the Hi Flow Sampler daily calibration checks are provided in Section 3.6 of this report and further documented in the field log notes included in Appendix 3-B.

Multipoint Calibration of the TVAs

A multipoint calibration of each TVA was performed daily prior to testing with the following gases:

- Zero gas (<0.1 ppmv total hydrocarbon).
- Low Level Span gas (nominally 500 ppmv methane-in-air).
- Mid Level Span gas (nominally 1,000 ppmv methane-in-air).
- High Level Span gas (nominally 10,000 ppmv methane-in-air).

Following the calibration, each TVA would be re-checked with the same gases. The instrument was considered to be in a state of control if its response to each gas was accurate to within +/- 10%. Failure to meet this criterion required recalibration, repair, or replacement of the instrument.

3.3.2 Final Preparations

Following the instrument performance checks, data from the previous day would be reviewed for completeness and accuracy, the City Chief Gas Inspector would be called with the addresses of the first sites to be visited, and the vans would be loaded with the instrumentation and canisters. There would be a brief group safety discussion, the field office would then be locked, and the each team would depart to the first of their assigned sites for the day.

> ***KeyPoint: Random Site Selection***
> To reduce bias in the survey relative to owner, operator, location, or any other variable, sites were selected for surveying on a random basis.

Sites were selected for surveying on a random basis. During the day, City Gas Inspectors were only told of the next scheduled site upon departure. These procedures were followed to avoid the possibility of site owners learning of the survey schedule in advance.

3.3.3 Site Arrival

Upon arrival at the designated point source site, the survey team met with the City Gas Inspector who unlocked the site gate to allow entrance to the site. On no occasion did the team enter a site without the City Gas Inspector also being present. Customarily at this time, a picture was taken of the front gate signage as part of the site documentation (Figure 3.3-1 shows an example of front gate signage).

Figure 3.3-1. Front Gate Signage

Immediately after arrival, a brief safety screening of the site would be conducted with the TVA to avoid entering an area of potentially dangerous pollutant concentrations.

One objective of each point source site visit was to document important site parameters such as the number of wells, storage tanks, and compressors, the site's GPS coordinates, the site's Railroad Commission (RRC) postings, and site throughput. Much of this information would be collected on preformatted data forms at the start of the survey. The use of pre-formatted forms helped to ensure a consistent data collection effort between the two teams as well as between sites. Figure 3.3-2 illustrates the site characterization form on which much of this information was recorded. In the "SITE LAYOUT" section of the form a sketch illustrating the positions of all major pieces of equipment would be drawn. All forms completed during the site surveys are included in Appendix 3-B.

SITE CHARACTERIZATION FORM	
TEAM:	
SITE ID:	
OWNER:	
ADDRESS:	
DATE:	
ARRIVE:	
DEPART:	
RRC:	
THRUPUT (MCF):	
GPS: North	
GPS: West	
#WELLS	
#VALVES	
#CONNECTORS:	
#TANKS:	
#COMPRESSORS:	
OTHER EQUIP:	

SITE LAYOUT:

SITE PHOTOS

Picture ID	Description

COMPRESSORS

ID#	Use (Lift/Line)	Type (NG-D-E	Manufacturer	Model	HP	Duty Cycle (%)

SUMMARY:

#M21 Valves	
#M21 Connect.	
#M21≥500 ppm	
# HiFlows	
#IRs	
# Canisters	

NOTES:

Figure 3.3-2. Point Source Site Characterization Form

3.3.4 IR Camera Survey

The IR camera survey of a site began with the thermographer starting at one end of the site and working his way in logical fashion to the opposite end so that all equipment was surveyed. In a typical route, for instance, the thermographer would begin at the well pads, carefully surveying all of the valves and connectors associated with each well. From the well pads he would proceed to the compressor if one was present. Next, he might image the metering run and from there proceed to the piping and separators inside the tank battery. Finally he would finish the survey with a careful imaging of each storage tank, climbing up the stairs to the tank walkway in order to view each thief hatch and pressure relief valve (PRV) vent line. Depending on circumstances, such as the size and amount of equipment on the site and the number of

detected emission points, an IR camera site survey of a typical well pad might last from one to several hours.

When an emission was detected with the IR camera, a video recording of the IR imaging would be made, a photograph of the emission source would be taken and the following data documented:

- Date and time.
- Equipment description and size.
- Emission point height above ground (feet).
- GPS coordinates of emission point (Phase II only).
- Sighting distance (feet).
- TVA reading of emission (ppmv).
- Tank height and radius if tank emission (feet).
- Video file name.
- Maximum sighting distance (feet) – The maximum sighting distance is the distance from which the emission can be reliably detected with the IR camera and provides a measure of the emission's magnitude (i.e. large emissions can be detected from further away).
- Weather conditions (Wind Direction, Wind Speed, Temperature, Relative Humidity, Barometric Pressure, and Cloud Cover).

As standard practice, the thermographer would image equipment from different angles. This is necessary since environmental conditions such as sunlight, wind, and background (i.e. air, piping, concrete or heat profiles) can cause an emission stream to be difficult to see from one angle, but easily detected from another.

With the GasFindIR™ camera integration settings would be switched to enable viewing of very hot surfaces (typically found at compressors), manual mode would be used on occasion to verify the absence or presence of a subtle emission, and "nuking" would be employed as required to eliminate optical background noise. Nuking adjusts the GasFindIR's background so that a more uniform pixel response is obtained.

With the GF-320 camera the thermographer would frequently shift to High Sensitivity mode to confirm or detect a more subtle emission that was hard to see. All field data forms, digital photographs and videos are provided in electronic form in Appendix 3-B.

3.3.5 Method 21 Site Survey with the Toxic Vapor Analyzer

While one team member conducted the IR camera site survey, the second member calculated the total number of site valves and connectors. This was done by first determining the valve count and then applying a multiplying factor to arrive at the number of connectors. For this

project, a connector multiplier of 7 was conservatively used, based upon detailed connector counts performed at the beginning of both Phase I and Phase II. Thus if it was determined that a site contained 245 valves, then a connector count of 1,715 (7 x 245) was assumed. The 7:1 connector to valve ratio held true for all equipment except at compressor skids where a higher ratio was often noted. Consequently the number of connectors at compressor skids was estimated separately by multiplying the number of compressor valves by factors ranging from 10 to 15, depending on the size and complexity of the compressor.

> ***Key Point: Method 21 Screening***
> To estimate low level emissions from fugitive equipment leaks, at least 10% of the valve and connector population at each site surveyed was screened.

These component counts were necessary since one objective of the point source testing was to estimate low level emissions (i.e. emissions below the detection limits of the IR camera) from fugitive equipment leaks. This objective was accomplished by screening at least ten percent of the valve and connector population at each point source site with the TVA. Thus while the IR camera survey was in progress, Method 21 screening of the site's valves and connectors was performed with the TVA on one of every ten valves and one of every ten connectors until ten percent of the total valve and connector counts was reached. This procedure ensured that the required number of components was screened and that the screening population was evenly distributed across all areas of the site. This screening was conducted independent of the IR camera survey. Once it was completed, the TVA was then used to screen any emission points identified by the IR camera.

Following Method 21 procedures, valves were screened at their three primary leak areas: the stem, the packing, and the bonnet flange. Method 21 screening entails placing the TVA's probe at the various leak interfaces and sampling the complete circumference. Flanges were screened by placing the TVA probe at the edge of the flange-gasket interface. Connectors were screened by sampling the circumference of the threaded sections. All other components were monitored through a peripheral traverse of the seal interface. Whenever an elevated reading was obtained the sample probe was left at this elevated point for at least twice the instrument's response time (i.e. at least for 8 seconds) to ensure that the maximum concentration was measured.

When an emission at or above 500 ppmv was detected with the TVA the following data would be recorded:

- Date and time.
- Screening concentration (ppmv).
- Equipment Description.
- Equipment Location (GPS coordinates in Phase II only).

3.3.6 Hi Flow Sampler Emissions Testing

The Hi Flow Sampler, as discussed previously, provides a quick and effective means of quantifying emissions by sampling at a high enough flow rate to capture all the emissions escaping from a component. By accurately measuring the flow rate of the sample stream and the natural gas concentration within the stream, the instrument is able to determine the gas leak rate expressed both as percent methane and percent CFM. When this data is combined with canister analytical data, mass emission rates for individual compounds can be calculated as explained in Section 3.4.

Hi Flow Sampler testing was conducted at all emission points identified with the IR Camera (high level emissions) as well as at each emission point identified through Method 21 screening with a concentration $\geq$500 ppmv (low level emissions). A number of low level emissions in Phase I were below the detection capability of the Hi Flow Sampler. Emissions from these points have had to be subsequently estimated. In Phase II this was remedied by sampling the exhaust stream of the Hi Flow Sampler with the TVA and using the resulting TVA concentration to calculate the low level emission rate.

The following data was documented for each Hi Flow Sampler test:

- Date and time.
- The percent difference in leak rate between the sample flow rates.
- Total sample flow (CFM).
- Background concentration (%).
- Leak rate as % methane (% CH_4).
- Leak rate as % of total sample flow (% CFM).

3.3.7 Canister Sampling

> ***Key Point: Canister Sampling***
> 164 canister samples were collected throughout Fort Worth during the study. Data obtained from the 164 canister samples were used to develop surrogate canister emission profiles and correlation equations to characterize emissions from those points not directly sampled.

As documented in the Point Source Test Plan, it was originally intended that a canister sample be collected at each emission point identified by the IR camera. However, as Phase I testing commenced, it became apparent that the sampling teams were observing an unexpectedly high frequency of camera-detected emission points. Therefore, an alternative canister sampling strategy was needed; neither the project budget nor laboratory resources would be able to keep up with the canister demand otherwise. A revised canister sampling plan was developed and subsequently approved by the City of Fort Worth. The revised canister sampling plan was based upon three criteria.

A canister sample would be collected from an emission point only if:

1. The % CFM reading obtained with the Hi Flow Sampler from that point exceeded the daily rolling average % CFM for all Hi Flow Sampler tests conducted thus far. In other words, the emission rate had to equal or exceed the average emission rate. The average emission rate was originally expressed as the rolling average of the third quartile % CFM; this was later changed to the rolling average % CFM.

2. Less than three canister samples have been collected from a similar component at other sites.

3. Less than three canister samples had been collected in the general geographical region. Geographical regions will be defined as the north, east, south, and west quadrants of the City of Fort Worth as well as any particular region in which the characteristics of the natural gas are substantially different from other regions (for instance, regions with wet gas and regions with dry gas).

If all of these conditions were not met, a canister sample was not collected. This approach succeeded in reducing the canister demand to a manageable level and was followed through the remainder of Phase I and through all of Phase II (a total of 164 canister samples were collected, not including 8 duplicate canister samples). Data obtained from these 164 canister samples were then used to develop surrogate canister emission profiles and correlation equations to characterize points for which no canister sample was taken.

Figure 3.3-3 provides a map of Fort Worth indicating the locations where canister samples were collected, as well as those locations where no samples were taken. As indicated in the map, the locations where canister samples were collected provide a well distributed characterization of canister samples. In other words, there were no large geographic locations in which there were no canister samples taken.

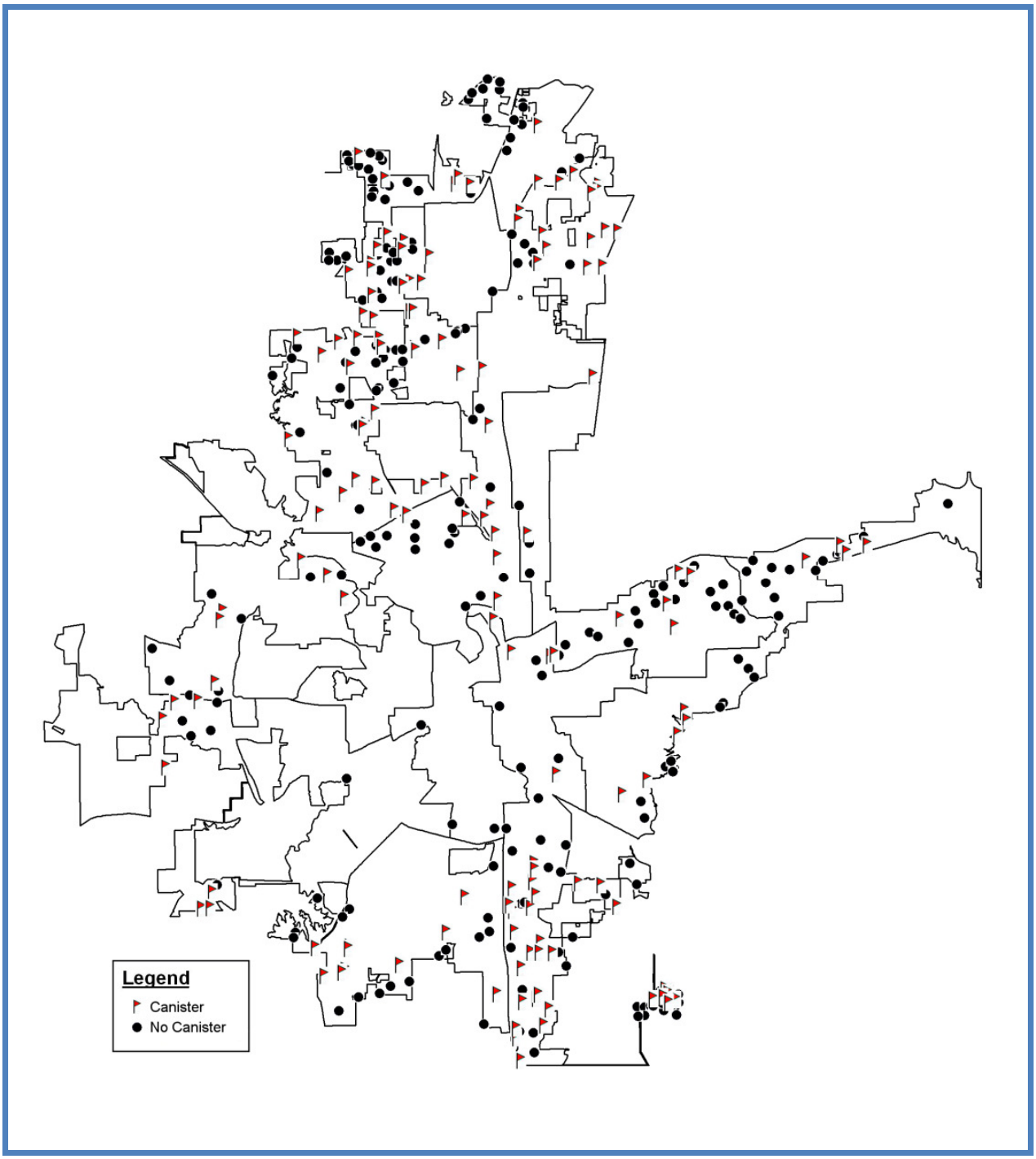


Figure 3.3-3. Canister Sample Locations

Whenever a canister sample was to be collected, the collection process followed specific protocols. A canister sampling manifold (Figure 3.3-4) consisting of a flow control valve and vacuum gauge was connected to the canister inlet port, and the canister's initial vacuum was checked. If less than 25-inches Hg vacuum was measured the canister was not used for sampling and was returned to the laboratory (this occurred only once).

To collect a sample, the canister's sample probe was directed into the exhaust port of the Hi Flow Sampler. Since it was possible, if the canister was opened very quickly, for the canister inlet flow to exceed the exhaust flow of the Hi Flow and thereby dilute the sample with ambient air, the sampling flow was carefully controlled. This was accomplished by adjusting the sample valve located upstream of the vacuum gauge (Figure 3.3-4) to ensure a slow but steady decrease in the canister vacuum. In practice, canister fill times were never less than 20 seconds and more typically, were between 30 seconds and 1 minute, far longer than the less than 2 second fill rate required to overcome the Hi Flow's exhaust rate.

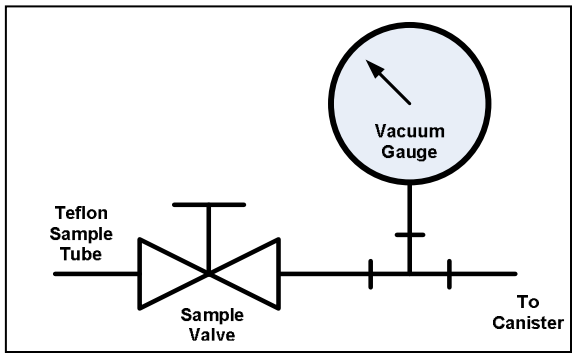


Figure 3.3-4. Canister Sampling Manifold

A canister was never filled completely but rather enough sample was collected to bring the canister vacuum up between 10 to 5 inches Hg. Following the collection of a canister sample the following data was documented both in a canister collection logbook and in the site's data form:

- Sample ID Number.
- Site Address.
- Date and Time.
- Initial Vacuum (inches Hg).

Similar information was also recorded on the canister's tag. Copies of the canister collection logbook entries are provided in Appendix 3-C.

3.3.8 Completion of the Site Survey

Following completion of the IR camera survey, the Method 21 screening, the Hi Flow Sampler testing of low level and high level emission points, and the canister sampling, the major equipment-containing areas of the site were documented both in photographs and with a site layout sketch. Figures 3.3-5, 3.3-6, and 3.3-7 provide typical examples of site photographs. Figure 3.3-8 illustrates a completed site layout sketch. Copies of all field data including site photos and site videos are provided in Appendix 3-B.

Figure 3.3-5. Site Documentation – Wells

Figure 3.3-6. Site Documentation – Tanks and Separators

Figure 3.3-7. Site Documentation – Lift Compressor

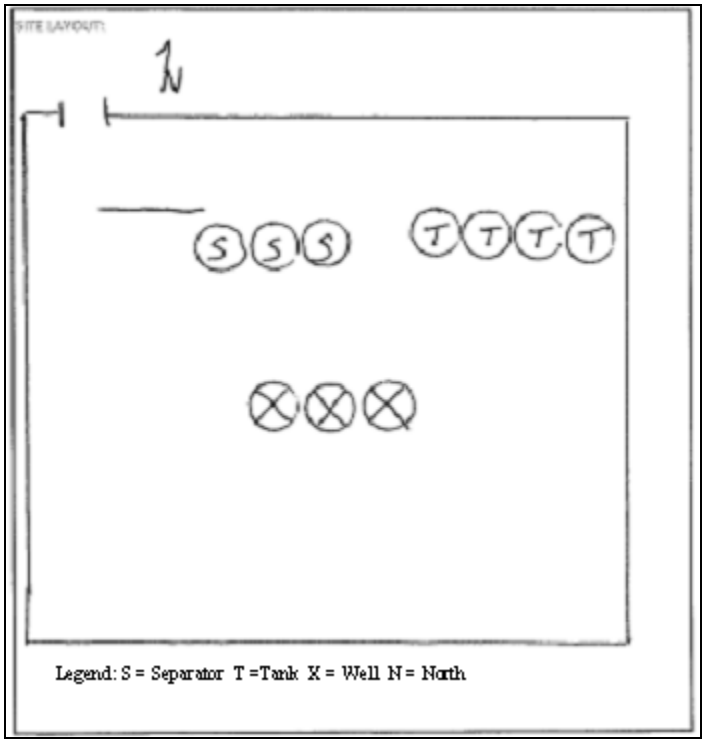


Figure 3.3-8. Example Site Sketch

Following this, the point source team prepared to depart from the site. The site data forms were checked for completeness and accuracy, any temporary flagging was removed the site's equipment, all well and tank battery gates were closed and secured, and the departure time was documented. The gas inspector was then told the address of the next site to visit, and the facility's main gate was locked behind the departing vehicles.

At the end of the day both teams returned to the field office where the equipment was off loaded from the project vans. Any canister samples taken that day were securely stored. The collected field data for that day was downloaded to a computer, printed out, and backed up.

Data archiving consisted of setting up separate computer site folders for the site's visited that day. Each folder was populated with the completed data forms, the site IR videos, and the site photos. Each team stored their data on the team computer and backed it up on dedicated hard drives. In addition, hardcopy printouts of the completed data forms were kept in large loose-leaf binders organized in chronological order. While one team member handled the data archiving, the other team member unloaded the van and prepared for the next work day. IR Camera, Hi Flow Sampler, TVA, digital camera and Archer data logger batteries were set up for overnight charging and facility field sketches were copied onto the printed out data forms. The completed data forms were quality control reviewed on a regular basis, either at the end of the day, the first thing the next day, or on the following weekend.

3.4 Emissions Calculation Procedures

This section describes the emissions calculation procedures used to derive a total emissions profile for each point source site. It is important to understand that for this study, not all of the site's emissions were calculated and/or characterized. For purposes of this study, in most cases, the emissions were calculated from only those sources in which emissions were detected and/or could be measured following the procedures described in the previous section. Hence, emissions were only estimated from piping and instrumentation equipment leaks, storage tanks, and compressors, which contribute the majority of emissions from natural gas-related facilities. Other sources of emissions, including but not limited to, storage tank breathing and standing losses, glycol dehydrator reboiler vents, wastewater and/or condensate loading, and flaring were not calculated. Non-routine emissions such as those generated during upsets or from maintenance, startup, and shutdown activities were also not measured or calculated as part of this study unless they were observed at the time of the site visit.

Annual emission estimates for each site were derived based on data obtained during the site visit and by assuming that conditions during the visit were representative of site conditions throughout the year. While it is important to note that emissions at any individual site can fluctuate depending on day-to-day operating and equipment conditions, the variation in emissions over the entire population were captured as a whole and are encompassed in this study as a result of breadth and depth of the point source testing and the use of surrogate emission profiles.

3.4.1 Well Pad, Compressor Station, Gas Plant, and Salt Water Disposal Facility Emissions

Total speciated emissions were calculated for each well pad, compressor station, gas plant and salt water disposal facility visited by the point source teams. These calculations fall into two categories: 1) Direct and 2) Indirect. Direct emission calculations were based upon the analytical results of the canister samples. Indirect emission measurements were derived from

several sources including the emission results from the canister sampling, correlation equations, calculated surrogate emission rates, EPA emission factors, and engine emission data for both natural gas and diesel powered engines. Each site's total emissions were calculated as a combination of direct and indirect emissions results. Figure 3.4-1 illustrates the overall approach followed in calculating total site emissions.

3.4.2 Direct Emission Calculations

Direct calculation of speciated emissions from a canister result was accomplished in 3 steps:

- Step 1: Convert the ppmv canister result to mg/m3 using Equation 5-1:

$$C = \frac{ppmv * MW}{24.45}$$

Where:

C	=	Concentration in mg/m^3
ppmv	=	Parts per million by volume
MW	=	Molecular Weight of analyte in gram/mols
24.45	=	Molar Volume @ 25^oC and 1 atmosphere in L/mols.

- Step 2: Convert the actual Hi Flow Sampler gas flow to standard gas flow using Equation 5-2:

$$CFMstd = (CFMact)\left(\frac{Tstd}{Tact}\right)\left(\frac{Pact}{Pstd}\right)$$

Where:

CFM_{std}	=	Flow rate corrected for standard conditions (ft^3/min)
CFM_{act}	=	Flow rate at actual conditions (ft^3/min)
T_{std}	=	Absolute gas temperature at standard conditions (^oR)
T_{act}	=	Absolute gas temperature at actual conditions (^oR)
P_a	=	Absolute gas pressure at actual conditions (psia)
P_{std}	=	Absolute gas pressure at standard conditions (psia).

- Step 3: Calculate the emission rate using Equation 5-3:

$$ER = C * CFMstd * CF * 8760$$

Where:

ER	=	Emission Rate (lb/yr)
C	=	Analyte Concentration (mg/m^3)
CFM_{std}	=	Flow rate (ft^3/min) corrected to standard conditions
CF	=	Units Conversion Factor = 3.75E-06 (1 m^3/35.32147 ft^3) x 60 minutes/hour x (1 pound/453592.37 mg)
8760	=	Hours per year

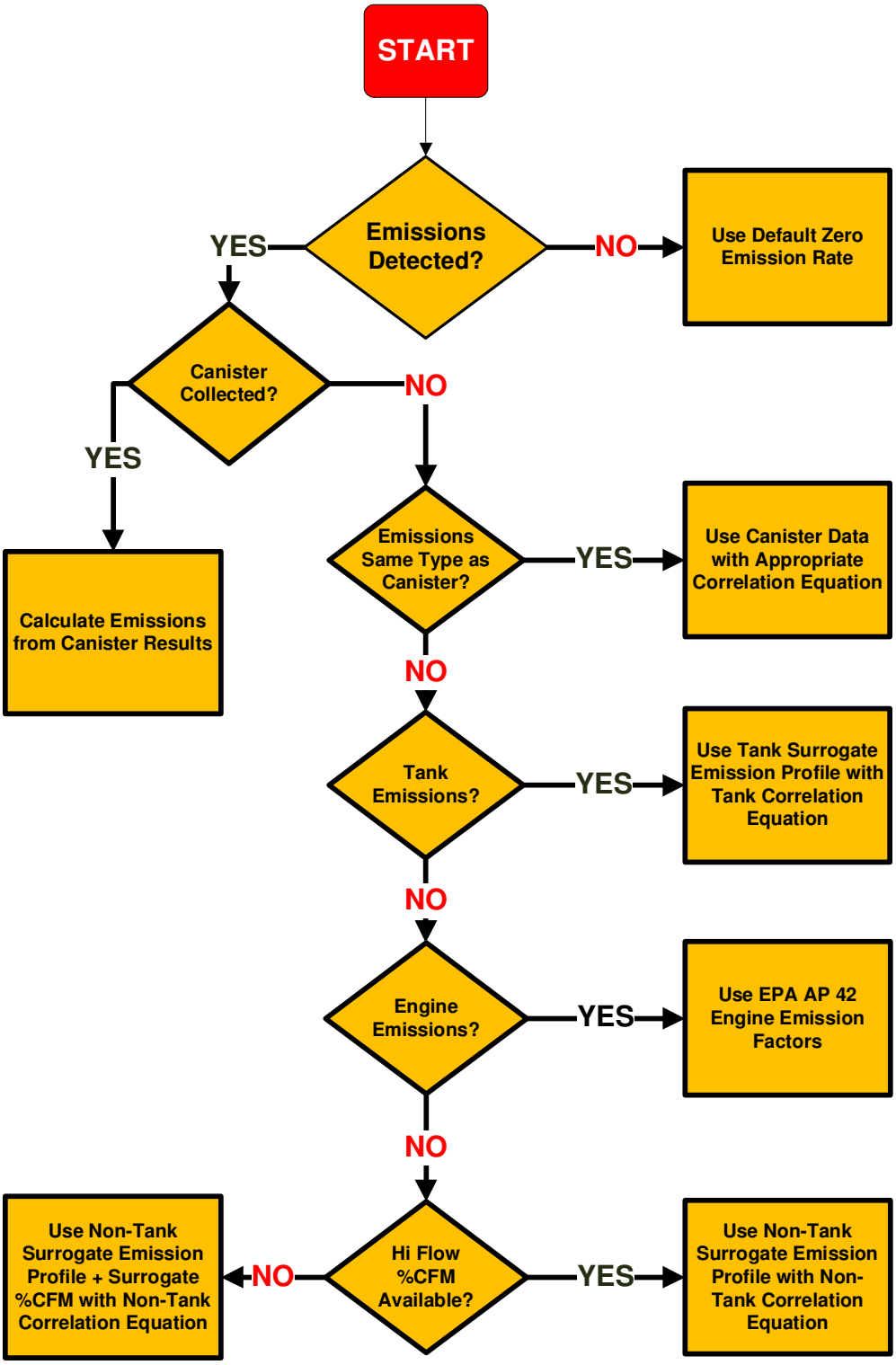


Figure 3.4-1. Emissions Calculation Flowchart

3.4.3 Indirect Emission Calculations -- Correlation Equation Development

The results of the canister samples were used to estimate emissions from those emission points that did not have a canister sample through the use of correlation equations. Two correlation equations, one for tank emissions and one for non-tank emissions, were developed based upon guidance from Section 2 and Appendix B of EPA's 1995 *Protocol for Equipment Leak Emission Estimates*.[7]

The first step in the development of the tank and non-tank correlation equations was the calculation of the natural logarithm of each canister's mass emission of total organic compounds (TOC) (lbs/yr) and its corresponding % CFM value.

The second step performed a linear regression in log space with the TOC values as the dependent variable (Y) and the % CFM values as the independent variable (X). The resulting regression line took the following form:

> ***KeyPoint: Normality Correction***
> To estimate emissions from those sources not directly sampled with a canister, a correlation equation was developed between the calculated TOC (lb/yr) and the corresponding measured % CFM from those sources that were sampled. Since the data used to develop the correlation was not normally distributed, it was necessary to normalize the data by taking the natural logarithm of the data. A scale bias correction factor was then used to convert back to the arithmetic space.

$$\text{Emission Rate} = \beta_0 + \beta_1(\%\ \text{CFM})$$

Where:

Emission Rate = Natural log of the leak rate determined by the canister results;

$\%\ CFM_i$ = Natural log of the $\%\ CFM_i$;
β_0 = Intercept of regression line, and
β_1 = Slope of regression line.

The Mean Square Error (MSE) was then calculated by:

$$\text{MSE} = \frac{1}{n-2}\sum_{i=1}^{n} r_i^{\,2}$$

Where:
$r_i = Y_i - \beta_O - \beta_1\, x_i$.

In the final step, the slope and intercept and a scale bias correction factor (SBCF) were used to transform the regression equations from log space to arithmetic space resulting in the tank and non-tank correlation equations:

$$\text{Leak Rate} = \text{SBCF} \times e^{\beta_0} \times \%\ \text{CFM}^{\beta_1}$$

Where:
Leak Rate = Emission rate of TOC's from the individual source (lb/yr)

SBCF = Scale Bias Correction Factor
β_0, β_1 = Regression constants, and
% CFM = Cubic feet per minute measured by the Hi Flow Sampler.

The SBCF corrects for the variability of the log space data. It was calculated by summing 15 significant numbers of the terms from the infinite series:

$$SBCF = 1 + \frac{(m-1)*T}{m} + \frac{(m-1)^3 * T^2}{m^2 * 2!*(m+1)} + \frac{(m-1)^5 * T^3}{m^3 * 3!*(m+1)*(m+3)} + ...$$

Where:
T = MSE/2.
MSE = mean square error from the regression.
m = number of data pairs.

3.4.4 Applying Canister Results to Non-Canister Emission Points

Canister-derived emission profiles were used to characterize non-canister emission points if 1) the non canister emission point was from the same site as the canister sample and 2) if the emission source types were the same (i.e. tank or non-tank).

For instance, if non-canister emissions were detected from a tank source, and if a canister had been collected at that site from another tank source, then that canister's data would be used to characterize the non-canister emission point. If the reverse was true, if the emissions were from a non-tank component, then a surrogate non-tank canister profile was used.

The distinction between tank and non-tank emission sources was made due to the differences in emissions characteristics observed between these two emission types. Tank emissions develop from the volatilization of heavier hydrocarbons entrained in the liquids produced by the facility separators, whereas non-tank emissions (i.e., particularly fugitive equipment leaks) are generally lighter gas emissions. Consequently, the chemical profile of each is somewhat different. For example, Table 3.4-1 provides a comparison of the average TOC, VOC, and HAP emissions resulting from a tank and non-tank canister sample collected during the study.

Table 3.4-1. Comparison of Emissions Between Tank and Non-Tank Emission Sources

Source Type (Canister Site ID)	TOC (tons/yr)	VOC (tons/yr)	HAP (tons/yr)
Non-Tank (PS-126)	6.65	0.01	0.00
Tank (295)	18.18	0.21	0.19

As indicated by the above comparison, tank emissions commonly exceed fugitive gas emissions.

Pairing a canister sample with a non-canister emission point provides the latter with a chemical composition. To calculate its emission rate, the Hi Flow Sampler results were used as follows:

1. The % CFM for the sample was entered into the correlation equation developed for the emission type (tank or non-tank) to determine the TOC mass emission rate.
2. The constituent contribution for each compound was determined from the weight percentages of the canister sample result.

This was done for each constituent so that the resulting products represented the speciated emission profile for the non-canister component.

For example, in Table 3.4-2 a canister sample (#A002) was collected from a leaking ¼-inch tubing connector – a non-tank sample type. Two other non-tank emission sources were detected at this site – a tee union connector and a pneumatically actuated valve. Since canister samples were not collected from these two sources, their emission profiles were be derived as follows:

1. The non-canister total organic compound emission rate was calculated by the non-tank correlation equation. For the tee union with a % CFM of 0.39 the TOC emission rate was 11,644.25 lb/yr calculated as:

$$LR = 2.3759 * e^{9.674501743} * 0.39^{1.250318323} = 11{,}644.25 lbs / year .$$

   Where:
   LR = TOC Leak Rate.
   2.3759 = SBCF
   9.674502= non-tank correlation equation intercept.
   1.250318 = non-tank correlation equation slope.

2. Similarly, for the pneumatic valve which had a % CFM of 0.05 the TOC emission rate was 892.71 lb/yr calculated as:

$$LR = 2.3443 * e^{9.674501743} * 0.05^{1.2502318323} = 892.71 lbs / year .$$

3. The non-canister emissions were assumed to have the same composition as the canister sample since they are both from the same site and from non-tank sources.

4. The speciated emissions of the non-canister were generated by multiplying the canister's speciated results by product of the ratio of each canister compound's emission to the canister TOC emission and the correlation equation TOC emission. The Tee union's methane emission rate, for instance, was 11,643.77 lbs/yr calculated as:

$$\frac{13{,}993.20}{13{,}993.78} * 11{,}644.25 = 11{,}643.77 \text{ lbs/yr methane.}$$

Where:
13,993.20 = Canister CH_4 lbs/yr.
13,993.78 = Canister TOC lbs/yr.
11,644.25 = Correlation Equation TOC lbs/yr.

Table 3.4-2. Non-Canister Methane Emissions Calculation Example

Emission Pt.	HF % CFM	Canister ID	Methane (lbs/yr)	Methane (tons/yr)
¼-inch tubing	1.01	A002	13,993	6.99
Tee Union	0.39	--	11,644	5.82
Pneumatic Valve	0.05	--	893	0.45

3.4.5 Surrogate Canister Profiles

For emission points which could not be directly tied to a canister profile, either because a canister was not collected at the site or because the canister sample from the site was from a non-matching source (i.e. tank vs. non-tank), then a surrogate canister profile was used in the emissions calculations. Two canister surrogate emission profiles with the units of pounds/yr were developed: 1) a non-tank surrogate emission profile and 2) a tank surrogate emission profile (Table 3.4-3). The non-tank surrogate emission profile was used for components associated with valves, connectors, and other piping and instrumentation equipment located at well heads, metering runs, separator pads and compressor skids. The tank surrogate emission profile was used to characterize emissions primarily from tank thief hatches and tank relief vents.

Table 3.4-3. Surrogate Tank and Non-Tank Emission Profiles

Category	Type	TOC (pounds/yr)	Non-VOC (pounds/yr)	VOC (pounds/yr)	HAP (pounds/yr)
Wet/Dry Gas	Non-Tank	13,256	13,252	4.12	0.78
Wet/Dry Gas	Tank	27,786	27,768	17.20	4.12

An attempt was made to further distinguish between emissions from sites in wet gas service versus sites in dry gas service for both tank and non-tank sources, but the number of emission sources in wet gas service turned out to be too small to draw statistically reliable inferences. At wet gas sites, emissions were detected from only 3 tank component types and 6 non-tank component types. At least 30 data points are needed to form reliable statistical conclusions.

The two surrogate emission profiles were developed using standard statistical procedures referenced in EPA's 1995 *Protocol for Equipment Leak Emission Estimates*:

1. The canister data for each emission type was checked for normality using probability plots to evaluate the correlation between the data and a normal distribution.
2. Since, in both cases, the data turned out to be non-normal, a natural logarithmic transformation of both sets of canister data was performed.
3. The normality of the transformed data was again checked using probability plots and found to be sufficiently linear.
4. The surrogate compositions were determined as the anti-logarithmic mean of the transformed data.

For summary purposes, Table 3.4-2 indicates the surrogate emission profiles only for categories of compounds (i.e. TOC, VOC, etc.). It is important to note that each surrogate profile also contains the emission rates for all of the individual compounds found in the aggregate canister samples used to generate the surrogate emission profiles.

Once the use of a surrogate canister profile was applied to an emission point, the emission calculation was performed according to the procedures described above in Section 3.4.3.

In Phase I there were several instances in which a low level emission fell below the detection limit of the Hi Flow Sampler (this limitation was overcome in Phase II by measuring the hydrocarbon concentration of the Hi Flow Sampler's exhaust stream with the TVA). For these occasions a surrogate % CFM was derived as the anti-log mean value of the normalized % CFM readings recorded in Phase II with the TVA.

3.4.6 Calculation of Non-Sampled Low Level Emission Points

While all site piping and instrumentation equipment was surveyed with the IR camera for high level emissions, only ten percent of the components at a site were sampled for low level emissions using a TVA following Method 21 screening procedures. Two separate emission calculations were used to arrive at emission rate estimates for the ninety percent not screened with the TVA:

1. The percent of components found leaking in the Method 21 screening was applied to the total non-sampled population of valves and connectors at the site and the non-tank correlation equation was used to estimate their emissions.

2. The remaining components were assumed to be non-leaking and their emissions were calculated using the Synthetic Organic Chemical Manufacturing Industry (SOCMI) default zero values listed in EPA's 1995 *Protocol for Equipment Leak Emission Estimates* (Figure 3.4-2). Studies by EPA have demonstrated that non-leaking equipment actually have low level emissions. These emission values are termed "default zeros" and are routinely used across the petroleum industry in the calculation of emission inventories.

TABLE 2-12. DEFAULT-ZERO VALUES: PETROLEUM INDUSTRY

Equipment type/service	Default-zero emission rates[a,b] (kg/hr/source)
Valves/all	7.8E-06
Pump seals/all	2.4E-05
Others[c]/all	4.0E-06
Connectors/all	7.5E-06
Flanges/all	3.1E-07
Open-ended lines/all	2.0E-06

[a]Default zero emission rates were based on the combined 1993 refinery and marketing terminal data only (default zero data were not collected from oil and gas production facilities).

[b]These default zero emission rates are for total organic compounds (including non-VOC's such as methane and ethane).

[c]The "other" equipment type was developed from instruments, loading arms, pressure relief valves, stuffing boxes, vents, compressors, and dump lever arms. This "other" equipment type should be applied to any equipment type other than connectors, flanges, open-ended lines, pumps, or valves.

Figure 3.4-2. Default-Zero Values

As an example, a site component count indicates a site contains 150 valves and 1,050 connectors. Method 21 screening is therefore performed on 15 of the valves and 105 connectors (i.e. 10%). Emissions at or above 500 ppmv are detected on 3 of the valves (20%) and 2 of the connectors (1.9%). The remaining 135 valves and 945 connectors that were not monitored are assumed to have the same leak percentages. Accordingly an additional 27 valves (20% of 135) and 18 connectors (1.9% of 945) would be assumed to be leaking at this site. The emission rates of these components would be determined as follows:

1. For valves, the valve minor emission % CFM would be multiplied by 27. For connectors a multiplier of 18 would be used.
2. The resulting % CFMs would be entered into the non-tank correlation equation to calculate a single TOC emission for the additional 27 valves and a single TOC emission for the additional 18 connectors presumed leaking.
3. The calculated weight percentages from the non-tank surrogate profile would be applied to derive speciated emissions for each result.

The remaining 108 valves (135-27) and 927 connectors (945-18) would have the valve and connector default zero emission rates applied to them. This would be done by converting the default zero kg/hr emission rates to % CFM as methane. The resulting value would be then entered into the non-tank correlation equation to calculate TOC emissions. Speciated results would be obtained using the calculated weight percentages from the non-tank surrogate profile.

3.4.7 Compressor Engine Emissions

A total of 186 natural gas compressor engines were encountered during the site surveys. Of these, 150 were located at 123 well pad sites, 12 were located at the gas processing facility, 1 was located at the salt water treatment facility, and 23 were located at the eight line compressor stations. The majority of the compressor engines located on well pads functioned as lift compressors.

Emissions from compressor engines were derived from field data collected during the site surveys, vendor specification sheets and published emission factors. In calculating emissions for compressor engines, a 100% compressor duty cycle was conservatively assumed (i.e. 24 hours/day/ for 365 days/year). In addition, it was conservatively assumed that these engines were uncontrolled. Multiple XTO facilities were noted as having catalyst controls on their engines, but as stack testing of the exhaust from compressor engines was not included in the scope of this study, the control efficiency of these engines is unknown.

> ***Key Point: Compressor Engine Controls***
> Emissions from compressor engines were estimated using the best available data collected during the point source testing. Where data was limited, conservative assumptions were used including but not limited to, the use of uncontrolled emission factors where controls where known to be present but no control efficiency data was readily available.

3.4.8 Well Drilling and Fracking Engine Emissions

Criteria pollutant, VOC and HAP emissions from natural gas and diesel engines used in well drilling and fracking operations were conservatively estimated based upon vendor specifications and published emission factors. Engine emissions from well drilling assume 504 hours of continuous operation (3 weeks, 7 days/week, 24 hours/day). Engine emissions associated with a fracking operation are based upon 120 hours of non-continuous operation (3 weeks, 5 days/week, 8 hours/day).

3.4.9 Calculation of Method 21 TOC Screening Emission Factors

Method 21 screening results were used to calculate VOC emission factors for non-tank equipment in natural gas service so that emissions due to future build out can be predicted based upon Method 21 monitoring results. Emission factors were calculated for the following equipment /screening categories:

- Valves: 500 ppmv to 999 ppmv and 1,000 ppmv to 10,000 ppmv.
- Connectors: 500 ppmv to 999 ppmv and 1,000 ppmv to 10,000 ppmv

- Other (sump pumps, pneumatic valve controllers, regulators, flow meters, knock-out pots, vents, etc.): 500 ppmv to 999 ppmv and 1,000 ppmv to 10,000 ppmv.

The emission factors were derived in a five step procedure:

1. Step 1: Filter for Phase II data since this data contained a larger data set of Hi Flow Sampler emission measurements for low level emissions.
2. Step 2: Sequentially filter the result of Step 1 by component type (valve, connector or other).
3. Step 3: Sequentially filter the result of Step 2 by the desired range of screening values (500 – 999 ppmv or 1000 – 10,000 ppmv).
4. Step 4: Sum the individual TOC emissions for the filtered results to produce total TOC emissions (lbs/hr) for each.
5. Calculate the emission factor for the selected component type and screening value range as the median of the Step 5 results and convert from pounds per hour to kilograms per hour.

3.5 Point Source Emissions Results

A total of 388 point source emissions sites were surveyed, including two repeated sites, for natural gas emissions in the point source study. Of these, 375 well pads and 8 compressor stations were visited, which comprised approximately 75% of the population. This section provides the point source survey results as TOC, VOC, HAP and Criteria Pollutant emissions in tons/yr. TOC are the sum of non-VOCs and VOCs. VOCs are the sum of non-HAP VOCs and HAPs. Criteria pollutants are VOCs, particulate matter (PM), Oxides of Nitrogen (NO_x), Carbon Monoxide (CO), and sulfur dioxide (SO_2).

Table 3.5-1 lists the average and maximum emission rates by site type. Emissions are extrapolated over a one year period (i.e. tons per year) for different site types. The average and maximum values are the same for processing and saltwater treatment facilities because only one of each was surveyed.

Table 3.5-1. Average and Maximum Point Source Emission Rates by Site Type[a]

Site Type	TOC (tons/yr)		VOC (tons/yr)		HAP (tons/yr)	
	Average	Max	Average	Max	Average	Max
Well Pad	16	445	0.07	8.6	0.02	2
Well Pad with Compressor(s)	68	4433	2	22	0.9	8.8
Compressor Station	99	276	17	43	10	25
Processing Facility	1,293	1,293	80	80	47	47
Saltwater Treatment Facility	1.5	1.5	0.65	0.65	0.4	0.4

[a] For values reported as <0.01 see Appendix 3-A for actual emissions expressed in scientific notation.

Table 3.5-2 summarizes the average emission volumes for each site type as measured by the Hi Flow Sampler. Note that engine emission volumes are not included in this table.

Table 3.5-2. Average Point Source Emission Volumes by Site Type

Site Type	TOC (cubic feet/yr)
Well Pad	148,552
Well Pad with Compressor(s)	218,035
Compressor Station	188,236
Processing Facility	372,019
Saltwater Treatment Facility	526

Table 3.5-1 shows the contribution compressor engines make to total site-wide emissions. In addition to increasing TOC, VOC and HAP emissions, the exhaust from a compressor engine contains the criteria pollutants (PM, SO_2, CO and NO_x). By way of illustration, Figure 3.5-1 compares the average annual emissions from a well pad without a compressor to one with a compressor. Clearly, compressor engines are a significant contributor of emissions at natural gas-related facilities.

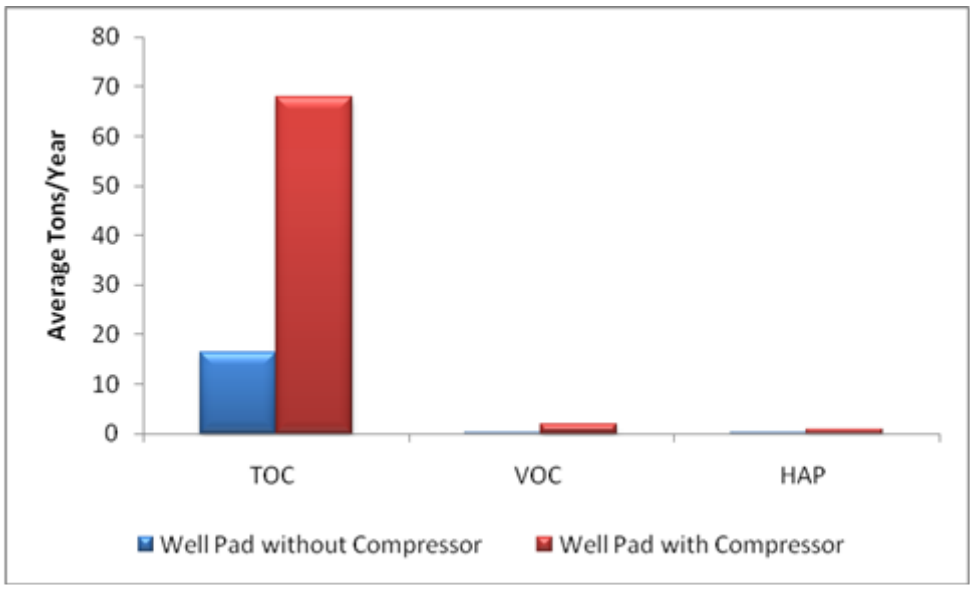


Figure 3.5-1. The Effect of Compressors on Site Emissions

Table 3.5-3 summarizes the emissions rates for all criteria pollutants and HAPs per each site surveyed during the point source testing. For each site, the summary provides the number of emission sources by type (e.g., compressor engines, storage tanks, fugitive leaks) and their contribution to total site-wide VOCs. Furthermore, the table provides for each site surveyed, the number of leaks detected by the IR camera and the number of leaks detected above 500 ppm using Method 21 screening.

Table 3.5-3. Point Source Emissions Summary by Site [a]

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
PS-001	16791 WOODSIDE DR	WELL PAD	2	89	384	2	0	6	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-002	2098 BRENNAN; F6	WELL PAD	3	347	2040	10	1	7	4	0.05	0.70	18.85	<0.01	0.68	0.68	<0.01	<0.01	0.40	0.27	<0.01
PS-003	16616 FORD OAKS LN; F1	WELL PAD	1	65	320	2	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-004	2033 J CHESHEIR RD; F1	WELL PAD	1	73	286	1	0	3	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-005	SAM REYNOLDS; F1	WELL PAD	1	76	710	2	0	4	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-006	1101 HWY 114; F1	WELL PAD	1	59	590	2	0	2	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-007	1850 BLK HWY 114; F1	WELL PAD	1	22	220	1	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-008	2690 HWY 114 (BEECH) (C-PAD); F1	WELL PAD	3	214	2140	3	0	1	2	-0-	-0-	-0-	-0-	0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-009	2690 HWY 114 (BEECH) (B-PAD); F1	WELL PAD	2	198	1386	2	0	5	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-010	2598 HWY 114 (BEECH) (A-PAD); F1	WELL PAD	2	109	388	1	0	4	3	-0-	-0-	-0-	-0-	0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-011	15096 AMERICAN WAY (A-COMMERCE) (B-PAD); F1	WELL PAD	2	128	984	6	0	4	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-012	12601 KATY RD; G1	WELL PAD	1	207	1149	2	1	0	3	0.01	3.18	5.21	<0.01	0.17	0.17	<0.01	<0.01	0.10	0.07	<0.01
PS-013	CAYLOR RD; G3	WELL PAD	1	65	390	1	0	1	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-014	12497 OLD DENTON RD POWELL 1; G3	WELL PAD	1	8	48	0	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-015	12497 OLD DENTON RD POWELL 2; G3	WELL PAD	2	113	791	3	0	1	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-016	12698 OLD DENTON RD; G3	WELL PAD	1	9	56	0	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-017	12498 ALTA VISTA ; G3	WELL PAD	1	105	735	1	1	1	4	0.04	0.57	11.17	<0.01	0.58	0.58	<0.01	<0.01	0.34	0.23	<0.01
PS-018	3897 LITSEY RD; G1	WELL PAD	3	234	1190	6	1	4	0	0.05	0.70	18.85	<0.01	0.68	0.68	<0.01	<0.01	0.40	0.27	<0.01
PS-019	15695 NORTH FWY (BEECH) (E-PAD); G3	WELL PAD	5	298	1888	5	0	3	4	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01

Table 3.5-3. Point Source Emissions Summary by Site (Continued)

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
PS-020	2660 PETTY PLACE; G1	WELL PAD	1	77	548	2	0	0	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-021	16280 3 WILD DRIVE; G1	WELL PAD	3	172	1204	3	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-022	2898 HWY 114; G1	WELL PAD	2	87	609	2	0	1	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-023	2297 SILVER CREEK RD; C6	WELL PAD	1	53	371	2	0	1	3	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-024	2297 SILVER CREEK RD (PAD 2); C6	WELL PAD	2	82	574	3	0	0	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-025	3193 JIMISONS LN (XTO) (SURBER CA/CWS); J6	WELL PAD	3	209	1254	4	0	2	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-026	11494 MOSIER VALLEY RD (XTO) (REGAN); J6	WELL PAD	1	77	440	1	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-027	11468 MOSIER VALLEY RD (XTO) (KNAPP); J6	WELL PAD	1	84	500	1	0	0	3	-0-	-0-	-0-	-0-	0.01	<0.01	0.01	<0.01	<0.01	-0-	<0.01
PS-028	11693 MOSIER VALLEY RD (XTO) (EULESS A); J6	WELL PAD	4	273	1530	4	0	3	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-028.1	14193 JOHN DAY RD (H-PAD); E1	WELL PAD	2	96	672	2	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-029	14193 JOHN DAY RD (G-PAD); E1	WELL PAD	4	209	1449	4	0	0	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-030	14193 JOHN DAY RD (F-PAD); E1	WELL PAD	3	136	952	3	0	1	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-031	14193 JOHN DAY RD (D-PAD); E1	WELL PAD	1	48	336	1	0	1	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-032	11591 TRINITY BLVD (XTO) (EULESS C); J6	WELL PAD	1	78	468	1	0	1	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-033	11696 MOSIER VALLEY RD (XTO) (JW ARLINGTON); J6	WELL PAD	4	255	1300	4	0	2	3	-0-	-0-	-0-	-0-	0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01

Table 3.5-3. Point Source Emissions Summary by Site (Continued)

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
PS-034	12196 TRINITY BLVD (XTO) (EULESS B); J6	WELL PAD	5	214	1284	5	0	0	2	-0-	-0-	-0-	-0-	0.01	<0.01	0.01	<0.01	<0.01	-0-	<0.01
PS-035	141931 JOHN DAY RD (C-PAD); E1	WELL PAD	1	50	350	1	0	1	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-036	14193 JOHN DAY RD (A-PAD); E1	WELL PAD	2	117	819	2	0	1	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-037	14193 JOHN DAY RD (E-PAD); E1	WELL PAD	2	105	735	2	0	0	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-038	14193 JOHN DAY RD (B-PAD); E1	WELL PAD	1	65	455	1	0	1	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-039	493 AVONDALE HASLET RD (DEVON) (GARNETT-LAPRELLE); E2	WELL PAD	2	194	1620	2	0	0	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-040	493 AVONDALE HASLET RD (XTO) (HUFFMAN); E2	WELL PAD	2	137	1218	3	0	2	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-041	1701 AVONDALE HASLET RD (DEVON) (MOSS) (A-PAD); E2	WELL PAD	2	140	840	1	0	1	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-042	1701 AVONDALE HASLET RD (DEVON) (MOSS) (B-PAD); E2	WELL PAD	2	150	1244	2	0	2	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-043	1502 AVONDALE HASLET RD (DEVON) (MORRIS HARMONSON) (F-PAD); E2	WELL PAD	2	131	917	2	0	1	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-044	1400 AVONDALE HASLET RD (DEVON) (MORRIS HARMONSON) (C-PAD); E2	WELL PAD	1	57	342	2	0	2	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01

Table 3.5-3. Point Source Emissions Summary by Site (Continued)

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
PS-045	4594 HWY 360 SOUTH PAD; K5	WELL PAD	1	160	1120	3	0	1	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-046	10896 TRINITY BLVD; J6	WELL PAD	2	255	1785	3	0	1	4	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-047	1480 AVONDALE HASLET RD (DEVON) (MORRIS HARMONSON) (E-PAD); E2	WELL PAD	3	203	1421	3	0	0	4	-0-	-0-	-0-	-0-	0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-048	13800 SENDERA RANCH BLVD (DEVON) (MORRIS HARMONSON) (A-PAD); E2	WELL PAD	3	178	1176	3	0	3	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-049	694 AVONDALE HASLET (DEVON) (LBJ) (B-PAD); E2	WELL PAD	1	60	420	1	0	0	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-050	694 AVONDALE HASLET RD (XTO) (SONNY NANCE) (A-PAD); E2	WELL PAD	2	68	340	0	0	3	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-051	694 AVONDALE HASLET RD (XTO) (SONNY NANCE) (B-PAD); E2	WELL PAD	1	22	154	0	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-052	694 AVONDALE HASLET (DEVON) (LBJ) (K-PAD); E2	WELL PAD	2	127	889	2	0	0	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-053	694 AVONDALE HASLET RD (XTO) (SONNY NANCE) (C-PAD); E2	WELL PAD	1	86	516	2	0	1	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-054	694 AVONDALE HASLET (BOAZ) (N-PAD); E2	WELL PAD	3	196	1332	3	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01

Table 3.5-3. Point Source Emissions Summary by Site (Continued)

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
PS-055	12494 HWY 287 (DEVON) (PHASE 3) (A-PAD); E2	WELL PAD	1	63	441	1	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-056	290 BLUE MOUND RD (DEVON) (GARNETT-LAPRELLE) (B-PAD); E2	WELL PAD	2	137	822	2	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-057	4950 PAINT HORSE DR; G6	WELL PAD	6	291	2037	3	0	7	8	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-058	2796 PREMIER ST; G6	WELL PAD	1	197	1429	4	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-059	694 AVONDALE HASLET (DEVON) (LBJ) (A-PAD); E2	WELL PAD	1	62	434	1	0	1	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-060	694 AVONDALE HASLET (DEVON) (LBJ) (D-PAD); E2	WELL PAD	2	137	959	4	0	1	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-061	694 AVONDALE HASLET (DEVON) (LBJ) (E-PAD); E2	WELL PAD	1	69	414	1	0	0	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-062	1400 AVONDALE HASLET RD (DEVON) (MORRIS HARMONSON) (D-PAD); E2	WELL PAD	1	63	441	1	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-064	694 AVONDALE HASLET (DEVON) (LBJ) (F-PAD); E2	WELL PAD	2	120	840	4	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-065	694 AVONDALE HASLET (DEVON) (LBJ) (J-PAD); E2	WELL PAD	2	126	882	4	0	1	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-066	3399 E LONG AVE; G6	WELL PAD	5	472	5345	3	3	11	18	0.32	4.71	47.67	0.02	4.74	4.71	0.01	0.01	2.80	1.89	0.07

Table 3.5-3. Point Source Emissions Summary by Site (Continued)

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
PS-067	694 AVONDALE HASLET (DEVON) (LBJ) (G-PAD); E2	WELL PAD	2	118	708	3	0	1	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-068	694 AVONDALE HASLET (DEVON) (LBJ) (H-PAD); E2	WELL PAD	1	62	372	1	0	1	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-069	694 AVONDALE HASLET (DEVON) (LBJ) (I-PAD); E2	WELL PAD	1	47	329	1	0	2	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-070	694 AVONDALE HASLET (DEVON) (LBJ) (M-PAD); E2	WELL PAD	3	200	1230	3	0	1	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-071	694 AVONDALE HASLET (DEVON) (LBJ) (L-PAD); E2	WELL PAD	1	62	434	1	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-072	2292 N TARRANT PKWY; F4	WELL PAD	4	438	3456	8	1	14	9	0.10	1.50	17.21	<0.01	1.39	1.38	0.01	<0.01	0.82	0.55	0.02
PS-073	693 AVONDALE HASLET (DEVON) (LBJ) (O-PAD); E2	WELL PAD	1	59	416	1	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-074	693 AVONDALE HASLET (DEVON) (LBJ) (N-PAD); E2	WELL PAD	1	65	390	1	0	0	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-075	693 AVONDALE HASLET (DEVON) (LBJ) (Q-PAD); E2	WELL PAD	2	126	882	4	0	2	1	-0-	-0-	-0-	-0-	3.57	<0.01	<0.01	3.57	0.72	-0-	<0.01
PS-076	693 AVONDALE HASLET (DEVON) (LBJ) (R-PAD); E2	WELL PAD	1	85	425	2	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-077	693 AVONDALE HASLET (DEVON) (LBJ) (S-PAD); E2	WELL PAD	2	147	735	3	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-078	1300 BLUFF SPRINGS RD (DEVON) (BOAZ) (B-PAD); E2	WELL PAD	1	54	324	1	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01

Table 3.5-3. Point Source Emissions Summary by Site (Continued)

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
PS-079	1301 BLUFF SPRINGS RD (DEVON) (BOAZ) (C-PAD); E2	WELL PAD	1	60	360	1	0	0	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-080	1101 DURANGO SPRINGS DR (DEVON) (BOAZ) (A-PAD); E2	WELL PAD	1	61	376	1	0	3	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-081	1417 WHISPER WILLOWS (DEVON) (BOAZ) (D-PAD); E2	WELL PAD	1	50	315	1	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-082	8191 HORSEMAN RD; F4	WELL PAD	4	508	3646	6	1	8	3	0.15	2.00	6.38	<0.01	2.18	2.18	<0.01	<0.01	1.29	0.87	0.03
PS-083	9191 BLUE MOUND RD; F4	WELL PAD	1	152	1064	3	1	4	4	0.04	0.57	11.17	<0.01	0.59	0.58	<0.01	<0.01	0.35	0.23	<0.01
PS-084	7598 BLUE MOUND RD; F4	WELL PAD	1	109	763	2	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-085	2591 BASSWOOD BLVD; F4	WELL PAD	4	368	2100	5	1	4	5	0.10	1.57	5.02	<0.01	1.38	1.38	<0.01	<0.01	0.82	0.55	0.02
PS-086	11398 WEST FWY; B8	WELL PAD	3	217	1519	6	0	4	8	-0-	-0-	-0-	-0-	8.65	<0.01	8.65	<0.01	1.99	-0-	0.02
PS-087	4496 LOST CREEK BLVD; B8	WELL PAD	1	83	581	4	0	4	2	-0-	-0-	-0-	-0-	0.20	<0.01	0.20	<0.01	0.02	-0-	<0.01
PS-088	10293 OLD WEATHERFORD RD; C7	WELL PAD	2	130	910	4	0	2	4	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-090	14193 JOHN DAY RD (DEVON) (I-POOL PAD); E2	WELL PAD	2	101	707	2	0	3	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-091	14193 JOHN DAY RD (DEVON) (L-POOL PAD); E2	WELL PAD	1	62	372	1	0	1	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-092	14193 JOHN DAY RD (J-POOL PAD); E2	WELL PAD	1	68	476	1	0	2	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-093	14193 JOHN DAY RD (K-BLAKLEY PAD); E2	WELL PAD	4	198	1336	3	0	1	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01

Table 3.5-3. Point Source Emissions Summary by Site (Continued)

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
PS-094	14193 JOHN DAY RD (M-BLAKLEY PAD); E2	WELL PAD	2	122	732	2	0	1	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-095	14193 JOHN DAY RD (N-BLAKLEY PAD); E2	WELL PAD	5	216	1512	3	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-096	14193 JOHN DAY RD (W-BLAKLEY PAD); E2	WELL PAD	4	283	1698	4	0	1	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-097	14193 JOHN DAY RD (O-POOL PAD); E2	WELL PAD	2	134	1164	2	0	1	9	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-098	14193 JOHN DAY RD (P-BLAKLEY PAD); E2	WELL PAD	5	225	1870	3	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-099	14293 SNAFFLE BIT TRL (Q-BLAKLEY PAD); E2	WELL PAD	4	258	2020	4	0	1	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-100	14193 JOHN DAY RD (U-BLAKLEY PAD); E2	WELL PAD	7	480	4016	7	0	2	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-101	14193 JOHN DAY RD (V-BLAKLEY PAD); E2	WELL PAD	5	131	1870	3	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-102	9767 VERNA TRAIL N; C7	WELL PAD	4	288	1816	4	0	5	4	-0-	-0-	-0-	-0-	0.53	<0.01	0.53	<0.01	0.07	-0-	0.02
PS-103	1299 W LOOP 820; C7	WELL PAD	1	65	455	2	0	2	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-104	9798 WESTPOINT DR; C7	WELL PAD	2	203	1550	2	1	0	8	0.07	1.04	2.91	<0.01	1.01	1.01	<0.01	<0.01	0.60	0.40	0.01
PS-105	9596 OLD WEATHERFORD; C7	WELL PAD	1	103	721	2	0	0	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-106	10590 OLD WEATHERFORD; B7	WELL PAD	2	142	994	4	0	2	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01

Table 3.5-3. Point Source Emissions Summary by Site (Continued)

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
PS-107	5291 EVERMAN KENNEDALE BURLESON RD (CFW SOUTH); H10	WELL PAD	4	286	2002	4	1	0	3	0.07	0.98	32.48	<0.01	1.22	0.99	0.23	<0.01	0.64	0.40	0.03
PS-108	7196 WICHITA (GARRETT); G9	WELL PAD	2	105	805	2	0	0	1	-0-	-0-	-0-	-0-	0.02	<0.01	<0.01	0.02	<0.01	-0-	<0.01
PS-109	5691 CA ROBERSON BLVD (FWISD); G9	WELL PAD	8	547	3329	10	2	3	1	0.09	1.40	37.69	<0.01	1.40	1.36	<0.01	0.04	0.81	0.55	0.02
PS-110	2400 BLK CAMPUS ST (SMP); G9	WELL PAD	1	68	476	2	1	2	1	0.05	0.70	18.85	<0.01	0.68	0.68	<0.01	<0.01	0.40	0.27	<0.01
PS-111	11495 WHITE SETTLEMENT RD (B-PAD); B7	WELL PAD	3	224	1568	4	0	3	3	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-112	10595 WEST CLEBURNE RD; E11	WELL PAD	6	549	4480	8	1	9	8	0.05	0.70	18.85	<0.01	0.69	0.68	<0.01	<0.01	0.40	0.27	<0.01
PS-113	10495 W CLEBURNE; E11	WELL PAD	3	236	2744	3	2	5	7	0.09	1.40	37.69	<0.01	1.38	1.36	<0.01	0.01	0.81	0.55	0.02
PS-114	6599 OAK GROVE RD (CARTER TRUST); G9	WELL PAD	3	316	2212	3	2	6	10	0.82	13.33	69.56	0.05	11.99	11.93	0.02	0.03	7.10	4.79	0.17
PS-115	10296 OLD CLEBURNE CROWLEY RD; E11	WELL PAD	1	146	1399	2	1	5	7	0.05	0.70	18.85	<0.01	0.69	0.68	<0.01	<0.01	0.41	0.27	0.01
PS-116	10699 OLD GRANDBURY RD; D11	WELL PAD	6	632	5022	8	1	9	12	0.05	0.70	18.85	<0.01	0.69	0.68	<0.01	<0.01	0.41	0.27	<0.01
PS-117	3595 ANGLE RD	WELL PAD	7	31	207	6	1	0	4	0.05	0.70	18.85	<0.01	0.70	0.68	<0.01	0.02	0.41	0.27	0.01
PS-118	590 NW LOOP 820; KS	COMPRESSOR STATION	0	1414	9888	3	6	2	7	0.02	51.42	269.95	0.18	42.69	42.59	<0.01	0.11	25.31	17.08	0.60
PS-119	6900 E ROSEDALE; I8; KS	COMPRESSOR STATION	0	985	6895	8	7	5	9	0.02	45.77	240.30	0.16	37.80	37.79	<0.01	0.01	22.46	15.16	0.53
PS-120	2298 E 4TH ST; F7; KS	COMPRESSOR STATION	0	325	2548	1	1	2	11	0.05	0.70	18.85	<0.01	0.72	0.68	<0.01	0.03	0.41	0.27	0.01
PS-121	7091 OAK GROVE; G10; KS	COMPRESSOR STATION	0	208	1456	0	1	0	3	<0.01	5.07	11.76	0.02	4.88	4.87	<0.01	<0.01	2.90	1.95	0.07

Table 3.5-3. Point Source Emissions Summary by Site (Continued)

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
PS-122	7091 OAK GROVE; G10	WELL PAD	4	208	1456	4	0	3	5	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-123	7695 OAK GROVE; G10	WELL PAD	5	204	1408	6	0	5	6	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-124	7695 OAK GROVE; G10; KS	COMPRESSOR STATION	5	242	1694	6	2	1	5	<0.01	10.14	23.52	0.04	9.76	9.75	<0.01	0.01	5.79	3.91	0.14
PS-125	7997 SOUTH FWY; G10; KS	COMPRESSOR STATION	2	357	4020	4	1	7	13	0.41	6.66	34.78	0.03	6.42	5.97	<0.01	0.45	3.56	2.39	0.09
PS-126	7997 SOUTH FWY; G10	WELL PAD	2	128	896	4	0	1	4	-0-	-0-	-0-	-0-	0.02	<0.01	0.01	<0.01	<0.01	-0-	<0.01
PS-127	5296 BAILEY BOSWELL; E4; KS	COMPRESSOR STATION	0	414	2898	4	3	6	11	1.61	24.33	545.08	0.10	23.70	23.56	0.11	0.04	14.02	9.45	0.34
PS-128	580 E ROSEDALE	DRILLING OPERATION	0	0	0	0	0	0	0	0.37	11.74	6.42	4.51	0.04	0.04	<0.01	<0.01	0.01	<0.01	<0.01
PS-129	10091 OLD GRANBURY RD; D11	WELL PAD	3	212	1913	4	1	2	9	0.05	0.70	18.85	<0.01	0.92	0.68	0.21	0.03	0.42	0.27	0.02
PS-130	6597 OAK GROVE (CARTER ALCON); G9	WELL PAD	5	517	3619	5	0	1	7	-0-	-0-	-0-	-0-	0.29	<0.01	0.25	0.04	0.06	-0-	0.03
PS-131	6799 OAK GROVE (CARTER TRUST); G9	WELL PAD	3	244	2458	3	1	1	3	0.07	0.98	32.48	<0.01	0.99	0.99	<0.01	<0.01	0.59	0.40	0.01
PS-132	2795 QUAIL RD (EXELON); H8	WELL PAD	4	338	2296	4	0	3	3	-0-	-0-	-0-	-0-	0.02	<0.01	<0.01	0.02	<0.01	-0-	<0.01
PS-133	6099 WILBARGER (OLCOTT SOUTH); H8	WELL PAD	8	613	4291	6	0	6	5	-0-	-0-	-0-	-0-	0.27	<0.01	0.27	<0.01	0.07	-0-	0.02
PS-134	5199 VILLAGE CREEK RD; H9	COMPLETION OPERATION	4	0	0	0	0	0	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-135	6293 HATCHERY RD; D6	WELL PAD	5	279	1953	5	1	1	17	0.05	0.70	18.85	<0.01	1.42	0.68	0.04	0.70	0.44	0.27	0.02
PS-136	6497 SHADY OAKS MANOR RD; D6	WELL PAD	3	232	2027	3	1	3	12	0.05	0.70	23.20	<0.01	1.06	0.71	0.05	0.31	0.45	0.28	0.02
PS-137	6791 NW LOOP 820; D6	WELL PAD	3	161	1127	3	0	1	6	-0-	-0-	-0-	-0-	0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01

Table 3.5-3. Point Source Emissions Summary by Site (Continued)

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
PS-138	4993 FREEMAN DR (KATES); H9	WELL PAD	1	84	588	1	0	2	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-139	7797 E LANCASTER AVE (GREEN OAKS); I8	WELL PAD	6	603	4219	6	2	6	6	0.09	1.40	37.69	<0.01	1.37	1.36	<0.01	0.01	0.81	0.55	0.02
PS-140	6896 NW LOOP 820; D6	WELL PAD	4	227	1589	4	0	2	5	-0-	-0-	-0-	-0-	0.05	<0.01	0.01	0.04	<0.01	-0-	<0.01
PS-141	2693 ROBERTS CUT-OFF RD; D6	WELL PAD	2	123	861	2	0	1	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-142	3291 NW LOOP 820; E6	WELL PAD	2	158	1706	2	1	0	11	0.05	0.70	23.20	<0.01	0.76	0.71	0.04	0.01	0.43	0.28	0.01
PS-143	3091 NW LOOP 820; E6	WELL PAD	3	116	813	3	0	3	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-144	2399 DOTTIE LYNN (SOWELL N); I7	WELL PAD	4	419	2933	4	2	9	5	0.11	1.74	21.75	<0.01	1.70	1.69	<0.01	0.01	1.01	0.68	0.02
PS-145	6093 WILBARGER (OLCOTT NORTH); H8	WELL PAD	12	366	2562	0	0	7	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-146	5693 E LOOP 820 S (DUKE); H9	WELL PAD	2	199	1393	2	0	4	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-147	5195 E LOOP 820 S (820 MARTIN); H9	WELL PAD	8	536	3752	4	1	9	8	0.05	0.70	18.85	<0.01	0.83	0.68	0.14	0.02	0.44	0.27	0.02
PS-148	3093 NW LOOP 820; E6	WELL PAD	2	202	1817	2	1	2	13	0.07	0.98	32.48	<0.01	1.14	0.99	0.12	0.03	0.62	0.40	0.02
PS-149	7500 RANDOL MILL RD (BLAKEMAN); I7	WELL PAD	1	129	903	1	1	0	2	0.07	0.98	32.48	<0.01	1.01	0.99	0.02	<0.01	0.59	0.40	0.02
PS-150	7891 RANDOL MILL RD (MORRIS); I7	WELL PAD	1	121	847	1	1	1	0	0.05	0.70	23.20	<0.01	0.71	0.71	<0.01	<0.01	0.42	0.28	<0.01
PS-151	8096 RANDOL MILL RD (DOREX); I7	WELL PAD	1	121	847	2	1	0	2	0.05	0.70	18.85	<0.01	0.68	0.68	<0.01	<0.01	0.40	0.27	<0.01
PS-152	8390 RANDOL MILL RD (BUZZYS); I7	WELL PAD	2	143	1001	2	1	1	4	0.01	3.18	5.21	<0.01	0.18	0.17	<0.01	<0.01	0.10	0.07	<0.01
PS-153	2298 PRECINCT LINE (DUCK LAKE) (D-PAD); I7	WELL PAD	2	151	1057	3	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01

Table 3.5-3. Point Source Emissions Summary by Site (Continued)

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
PS-153.1	2298 PRECINCT LINE (DUCK LAKE) (B-PAD); I6	WELL PAD	4	0	0	3	1	0	0	0.05	0.70	18.85	<0.01	0.68	0.68	<0.01	<0.01	0.40	0.27	<0.01
PS-154	8091 BRENTWOOD STAIR RD (CLANECO); I7	WELL PAD	1	154	1078	2	0	1	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-155	3598 ANGLE AVE; E6	WELL PAD	2	108	756	1	0	2	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-156	2095 NW LOOP 820; E6	WELL PAD	4	234	1638	4	0	3	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-157	4592 ANGLE AVE (LS); E6	WELL PAD	4	198	1386	2	0	2	6	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-158	3491 LINCOLN AVE (A-PAD); E6	WELL PAD	2	107	749	2	0	1	3	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-159	10488 HICKS FIELD RD (CROSSTEX AMINE TREATMENT CENTER)	PROCESSING FACILITY	0	1800	12590	10	12	10	67	1.00	87.74	1038.90	0.34	79.93	79.58	<0.01	0.34	47.32	31.93	1.14
PS-160	7595 E LANCASTER AVE (BOSWELL); I8	WELL PAD	7	429	3007	0	0	4	6	-0-	-0-	-0-	-0-	0.02	<0.01	<0.01	0.02	<0.01	-0-	<0.01
PS-161	7397 RANDOL MILL RD (DUCKHEAD); I6	WELL PAD	3	256	2176	0	1	4	4	0.07	1.04	2.91	<0.01	1.01	1.01	<0.01	<0.01	0.60	0.40	0.01
PS-162	1999 PRECINCT RD (RIVERBEND); I6	WELL PAD	2	226	1869	6	1	1	2	0.05	0.70	18.85	<0.01	0.69	0.68	<0.01	<0.01	0.41	0.27	<0.01
PS-163	490 E RENDON CROWLEY RD (N SPINKS); G11	WELL PAD	3	212	1484	4	0	1	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-164	14091 STONE RD (S SPINKS); G11	WELL PAD	4	260	1820	4	2	5	6	0.09	1.40	37.69	<0.01	1.36	1.36	<0.01	<0.01	0.81	0.55	0.02
PS-165	7996 TRAMMEL DAVIS RD (DUCK LAKE) (A-PAD); I6	WELL PAD	6	356	2492	2	1	1	4	0.05	0.70	18.85	<0.01	0.68	0.68	<0.01	<0.01	0.40	0.27	<0.01
PS-166	9799 TRAMMEL DAVIS RD (TXI A); I6	WELL PAD	1	140	973	2	1	0	3	0.05	0.70	18.85	<0.01	0.68	0.68	<0.01	<0.01	0.40	0.27	<0.01
PS-167	3198 S NORWOOD DR (TXI); I6	WELL PAD	1	144	1008	2	1	1	5	0.05	0.70	18.85	<0.01	0.78	0.68	0.10	<0.01	0.43	0.27	0.02

Table 3.5-3. Point Source Emissions Summary by Site (Continued)

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
PS-168	9992 TRINITY BLVD (BELL) (B-PAD); I6	WELL PAD	3	264	1848	6	1	2	3	0.05	0.70	18.85	<0.01	0.68	0.68	<0.01	<0.01	0.40	0.27	<0.01
PS-169	10190 TRINITY BLVD (BELL) (A-PAD); I6	WELL PAD	3	264	1848	4	1	1	2	0.05	0.70	18.85	<0.01	0.68	0.68	<0.01	<0.01	0.40	0.27	<0.01
PS-170	4697 ENON RD (KARANGES); G10	WELL PAD	3	273	1911	3	1	0	6	0.07	0.98	32.48	<0.01	1.09	0.99	<0.01	0.09	0.61	0.40	0.02
PS-171	3892 LON STEVENSON RD (WALLS COLEMAN); G10	WELL PAD	4	433	3031	4	2	3	6	0.14	1.96	64.96	<0.01	2.02	1.98	0.04	<0.01	1.19	0.79	0.03
PS-172	8290 ANGLIN CR (MOORE); G10	WELL PAD	3	161	1127	3	0	3	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-173	2999 LANA LN (HOSLER); G10	WELL PAD	3	183	1281	5	0	3	1	-0-	-0-	-0-	-0-	0.03	<0.01	<0.01	0.03	<0.01	-0-	<0.01
PS-174	5591 E 1ST ST (CARTER STATE) (SALT WATER DISPOSAL SITE); G7	SALTWATER TREATMENT FACILITY	3	211	1477	8	1	3	0	0.05	0.70	1.96	<0.01	0.65	0.65	<0.01	<0.01	0.39	0.26	<0.01
PS-176	1375 OAK GROVE SHELBY RD (SHULTZ); G10	WELL PAD	1	54	378	1	0	2	2	-0-	-0-	-0-	-0-	0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-177	9499 SOUTH RACE ST (HARRISON); G10	WELL PAD	1	88	616	1	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-178	10198 FOREST HILL EVERMAN RD (MISSION) (A-PAD); G10	WELL PAD	2	183	1775	2	1	1	2	0.07	0.98	32.48	<0.01	1.01	0.99	0.02	<0.01	0.59	0.40	0.01
PS-179	3691 MOPAC (PEARSON); E8	WELL PAD	4	30	210	0	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-180	695 E NORTHSIDE DR (STOCKYARDS); F7	WELL PAD	3	70	490	4	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-181	3298 VAN HORN AVE (CRAIN); G7	WELL PAD	1	75	525	3	0	1	2	-0-	-0-	-0-	-0-	0.02	<0.01	0.02	<0.01	<0.01	-0-	<0.01

Table 3.5-3. Point Source Emissions Summary by Site (Continued)

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
PS-182	691 BEACH ST (FROST); G7	WELL PAD	3	115	705	4	0	2	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-184	10590 CHAPIN RD (CHAPEL CREEK); E9	WELL PAD	1	144	2408	2	1	0	12	0.30	4.01	12.76	0.02	22.32	4.36	<0.01	17.95	4.09	1.75	0.16
PS-185	10199 OAK GROVE RD (BEAN) (A-PAD); G10	WELL PAD	3	143	1001	3	0	0	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-186	394 EVERMAN PKWY (MARITZ); F10	WELL PAD	4	207	1449	4	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-187	9198 FORUM WAY (UNION PACIFIC); F10	WELL PAD	3	166	1162	3	0	3	4	-0-	-0-	-0-	-0-	0.01	<0.01	0.01	<0.01	<0.01	-0-	<0.01
PS-188	1298 W RISINGER RD (HOLT HICKMAN); F10	WELL PAD	2	117	819	2	0	1	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-189	2990 BRASWELL DR (RP STEPHENS); F6	WELL PAD	1	83	797	1	1	0	0	0.01	3.18	5.21	<0.01	0.17	0.17	<0.01	<0.01	0.10	0.07	<0.01
PS-190	796 MEACHAM BLVD (PRIME RAIL); F6	WELL PAD	3	146	1022	3	0	0	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-191	3592 DEEN RD; F6	WELL PAD	3	173	1211	3	0	3	4	-0-	-0-	-0-	-0-	0.05	<0.01	0.04	<0.01	<0.01	-0-	<0.01
PS-192	2299 MERCADO DRIVE; F6	WELL PAD	10	616	4312	13	2	6	12	0.13	2.08	5.81	<0.01	2.20	2.01	0.15	0.03	1.26	0.81	0.06
PS-193	5900 WILLBARGER (FRACKING JOB)	FRACKING OPERATION	3	0	0	0	0	0	0	0.51	16.37	8.26	5.82	0.05	0.05	<0.01	<0.01	0.02	<0.01	<0.01
PS-194	10395 CAMP BOWIE W (JOHNSON HUBBELL); E9	WELL PAD	1	93	652	2	0	0	4	-0-	-0-	-0-	-0-	0.02	<0.01	0.02	<0.01	<0.01	-0-	<0.01
PS-195	3497 LONGVUE (HAVENER); E9	WELL PAD	2	134	938	4	0	2	9	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-196	792 DE COSTA (EASTSIDES); G7	WELL PAD	4	215	1405	3	2	0	8	0.16	4.83	16.69	0.02	4.98	4.85	0.09	0.03	2.94	1.95	0.09

Table 3.5-3. Point Source Emissions Summary by Site (Continued)

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
PS-197	692 BEACH ST (FROST); G7	WELL PAD	1	228	1596	3	1	2	7	0.07	1.04	2.91	<0.01	1.10	1.01	0.09	0.01	0.63	0.40	0.03
PS-198	5699 RANDOL MILL RD (GOODMAN); H7	WELL PAD	3	260	1824	4	1	4	2	0.05	0.70	1.96	<0.01	0.66	0.65	<0.01	<0.01	0.39	0.26	<0.01
PS-199	7094 JACK NEWELL BLVD S (TRIMBLE); H7	WELL PAD	2	118	826	4	0	2	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-200	7092 ENTERPRISE AVE (PARROT) (B-PAD); H7	WELL PAD	2	41	294	0	0	1	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
PS-201	5895 MARINE CREEK PKWY (MARINE CREEK) (A-PAD); E5	WELL PAD	2	183	1645	3	1	2	6	-0-	-0-	-0-	-0-	1.11	0.99	0.11	0.01	0.60	0.40	0.02
6	HWY 114	WELL PAD	1	62	134	1	0	1	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
20	4190 LITSEY RD	WELL PAD	2	103	960	8	0	5	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
23	4192 LITSEY RD	WELL PAD	6	448	3584	0	1	2	6	0.05	0.70	1.96	<0.01	0.65	0.65	<0.01	<0.01	0.39	0.26	<0.01
24	3596 ELIZABETHTOWN CEMETERY RD	WELL PAD	6	434	2738	6	1	3	2	0.05	0.70	1.96	<0.01	0.65	0.65	<0.01	<0.01	0.39	0.26	<0.01
25	14797 ELIZABETHTOWN CEMETERY RD	WELL PAD	5	206	1650	4	1	4	6	0.05	0.70	1.96	<0.01	0.67	0.65	<0.01	0.01	0.39	0.26	<0.01
26	14798 ELIZABETHTOWN CEMETERY RD	WELL PAD	6	463	4270	6	1	3	9	0.05	0.70	1.96	<0.01	0.66	0.65	<0.01	<0.01	0.39	0.26	<0.01
27	4791 HENRIETTA CREEK RD	WELL PAD	1	99	996	2	1	3	4	0.05	0.70	1.96	<0.01	0.65	0.65	<0.01	<0.01	0.39	0.26	<0.01
28	4794 HENRIETTA CREEK RD	WELL PAD	1	76	768	2	1	3	5	0.05	0.70	1.96	<0.01	0.65	0.65	<0.01	<0.01	0.39	0.26	<0.01
29	14404 CHAPARRAL	WELL PAD	2	154	1482	4	1	2	3	0.05	0.70	1.96	<0.01	0.65	0.65	<0.01	<0.01	0.39	0.26	<0.01
32	13794 NORTH FWY	WELL PAD	8	506	3542	8	1	1	8	0.05	0.70	1.96	<0.01	0.67	0.65	0.01	<0.01	0.39	0.26	0.01
33	13593 NORTH FWY	WELL PAD	8	539	4672	6	2	6	8	0.09	1.40	3.92	<0.01	1.34	1.31	0.03	<0.01	0.78	0.52	0.02
35	2890 WESTPORT PKWY	WELL PAD	1	68	476	2	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01

Table 3.5-3. Point Source Emissions Summary by Site (Continued)

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
36	3397 ALLIANCE GATEWAY	WELL PAD	8	549	4747	1	1	4	15	0.07	1.04	2.91	<0.01	1.04	1.01	<0.01	0.03	0.60	0.40	0.02
37	5198 WESTPORT PKWY	WELL PAD	2	128	1256	4	1	0	1	0.07	0.98	2.76	<0.01	1.00	1.00	<0.01	<0.01	0.59	0.40	0.01
38	5290 WESTPORT PKWY	WELL PAD	1	74	662	2	1	2	4	0.03	0.48	12.87	<0.01	0.45	0.45	<0.01	<0.01	0.26	0.18	<0.01
39	13195 PARK VISTA BLVD	WELL PAD	3	166	1282	3	1	4	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
41	3398 ALLIANCE GATEWAY	WELL PAD	12	801	7041	1	1	4	25	0.05	0.70	1.96	<0.01	0.67	0.65	<0.01	<0.01	0.39	0.26	0.01
44	12695 OLD DENTON	WELL PAD	1	193	1331	2	0	2	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
50	11498 HARMON RD	WELL PAD	2	218	1526	3	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
55	5696 N TARRANT PKWY	WELL PAD	2	275	2181	3	1	2	3	0.05	0.70	1.96	<0.01	0.67	0.65	<0.01	0.01	0.39	0.26	0.01
57	1098 BLK EAST BONDS RANCH RD S SIDE	WELL PAD	2	164	1099	1	0	2	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
59	1392 BLK E BONDS RANCH RD S-SIDE	WELL PAD	1	24	175	0	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
62	1098 E BONDS RANCH RD	WELL PAD	1	6	42	0	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
63	1096 EAST BONDS RANCH RD	WELL PAD	1	59	413	1	0	0	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
98	13393 SENDERA RANCH BLVD	WELL PAD	2	102	816	2	0	0	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
110	12595 WILLOW SPRINGS	WELL PAD	1	60	420	1	0	3	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
111	12591 BLK WILLOW SPRINGS RD W-SIDE	WELL PAD	1	74	518	1	0	0	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
125	12690 WILLOW SPRINGS RD	WELL PAD	1	53	371	1	0	2	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
126	693 AVONDALE HASLET RD	WELL PAD	3	220	1540	3	0	1	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
130	290 BLUE MOUND RD WEST	WELL PAD	2	133	931	3	0	0	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01

Table 3.5-3. Point Source Emissions Summary by Site (Continued)

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
132	12294 NW HWY 287 CFW	WELL PAD	2	151	1057	2	0	2	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
134	12290 NW HWY 287	WELL PAD	2	75	525	1	0	2	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
136	998 BLUE MOUND RD WEST	WELL PAD	7	421	2947	3	0	6	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
138	1096 BLK W BLUE MOUND AT HWY-287 N-SIDE	WELL PAD	3	245	1855	3	0	2	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
139	1099 BLUE MOUND RD W	WELL PAD	2	160	1120	2	0	1	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
141	692 BLUE MOUND RD	WELL PAD	1	60	420	2	0	2	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
142	392 BLUE MOUND RD WEST	WELL PAD	3	191	1337	3	0	3	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
143	893 BLUE MOUND RD W	WELL PAD	2	167	1169	3	0	1	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
147	12890 BLK SAGINAW BLVD	WELL PAD	2	162	1079	3	1	2	0	0.05	0.70	1.96	<0.01	0.65	0.65	<0.01	<0.01	0.39	0.26	<0.01
147A	12700 BLK HWY 287 & 81 S-SIDE	WELL PAD	1	60	420	1	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
149	12700 SAGINAW RD	WELL PAD	1	38	266	1	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
150	12700 SAGINAW RD	WELL PAD	1	42	294	1	0	1	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
153	2492 BLUE MOUND RD W	WELL PAD	2	128	896	3	0	5	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
154	11996 WILLOW SPRINGS RD	WELL PAD	1	87	609	1	0	2	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
155	11693 WILLOW SPRINGS RD	WELL PAD	4	315	2205	4	0	1	4	-0-	-0-	-0-	-0-	0.02	<0.01	0.02	<0.01	<0.01	-0-	<0.01
156	11498 WILLOW SPRINGS RD	WELL PAD	3	217	1519	3	0	0	3	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
159	LPA BONDS RANCH RD	WELL PAD	4	314	2198	3	0	5	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
160	1892 W BONDS RANCH RD	WELL PAD	5	377	2639	4	0	1	7	-0-	-0-	-0-	-0-	0.26	<0.01	0.26	<0.01	0.06	-0-	0.02

Table 3.5-3. Point Source Emissions Summary by Site (Continued)

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
161	10999 WILLOW SPRINGS RD	WELL PAD	4	330	2310	4	0	2	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
164	11300 BLK HWY 287 & 81	WELL PAD	4	309	2163	3	0	3	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
165	452 WEST BONDS RANCH RD	WELL PAD	5	328	2672	2	1	5	1	0.05	0.70	1.96	<0.01	0.65	0.65	<0.01	<0.01	0.39	0.26	<0.01
167	4099 W BONDS RANCH RD	WELL PAD	2	76	725	2	0	1	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
168	3091 W BONDS RANCH RD	WELL PAD	4	245	1715	4	0	2	5	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
171	11593 SAGINAW BLVD	WELL PAD	7	286	2288	4	0	3	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
172	4099 W BONDS RANCH RD	WELL PAD	4	264	3248	8	0	5	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
174	9698 BOAT CLUB ROAD	WELL PAD	1	70	490	1	1	1	2	0.02	3.74	6.13	<0.01	0.20	0.20	<0.01	<0.01	0.12	0.08	<0.01
176	11593 SAGINAW BLVD	WELL PAD	5	371	2597	3	1	2	2	0.05	0.70	1.96	<0.01	0.65	0.65	<0.01	<0.01	0.39	0.26	<0.01
178	11601 BLK SAGINAW BLVD	WELL PAD	5	374	2597	3	0	2	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
182	1898 W BONDS RANCH RD	WELL PAD	3	189	1323	1	0	3	3	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
187	10398 HICKS FIELD RD	WELL PAD	5	200	1400	5	0	2	2	-0-	-0-	-0-	-0-	0.02	<0.01	0.02	<0.01	<0.01	-0-	<0.01
188	10398 HICKS FIELD RD	WELL PAD	1	53	371	2	0	1	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
189	10398 HICKS FIELD RD	WELL PAD	2	119	833	2	0	0	3	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
191	10094 HICKS FIELD RD	WELL PAD	2	130	910	3	0	2	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
192	LPA WAGLEY ROBERTSON RD	WELL PAD	1	167	1170	4	0	0	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
193	10197 WAGLEY ROBERTSON RD	WELL PAD	3	66	462	0	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01

Table 3.5-3. Point Source Emissions Summary by Site (Continued)

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
194	LPA WAGLEY ROBERTSON RD	WELL PAD	1	92	930	1	1	0	5	0.05	0.79	21.19	<0.01	0.76	0.76	<0.01	<0.01	0.45	0.31	0.01
195	10094 HICKS FIELD RD	WELL PAD	1	55	385	2	0	2	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
196	10000 BLK HICKS FIELD RD	WELL PAD	1	52	364	2	0	0	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
197	10200 BLK WAGLEY ROBERTSON RD	WELL PAD	3	170	1190	3	0	3	3	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
198	10196 EVENING VIEW DR	WELL PAD	4	162	1134	1	0	1	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
199	293 W BONDS RANCH RD	WELL PAD	3	184	1288	2	0	3	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
201	10191 NW HIGHWAY 287	WELL PAD	2	124	868	1	0	2	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
207	8799 WAGLEY ROBERTSON RD	WELL PAD	1	101	716	2	0	2	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
208	7999 WAGLEY ROBERTSON RD	WELL PAD	1	78	555	1	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
209	9491 SAGINAW BLVD	WELL PAD	2	187	1790	2	1	4	4	0.01	3.58	5.87	<0.01	0.19	0.19	<0.01	<0.01	0.11	0.08	<0.01
213	10999 SAGINAW RD	WELL PAD	1	80	560	2	0	0	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
214	9500 BLK PARK DR	WELL PAD	1	173	1211	2	1	4	1	0.03	0.46	12.35	<0.01	0.43	0.43	<0.01	<0.01	0.26	0.17	<0.01
216	9098 PARK DR	WELL PAD	1	51	357	1	0	0	3	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
217	8793 OLD DECATUR RD	WELL PAD	4	247	2262	3	1	4	11	0.05	0.70	1.96	<0.01	0.68	0.65	0.01	0.01	0.39	0.26	0.01
222	5299 W BAILEY BOSWELL RD	WELL PAD	2	73	511	3	0	3	4	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
223	5293 W BAILEY BOSWELL RD	WELL PAD	3	134	938	3	0	1	5	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
225	5696 W J BOAZ RD	WELL PAD	2	69	490	2	0	1	2	-0-	-0-	-0-	-0-	0.18	<0.01	0.18	<0.01	<0.01	-0-	<0.01
227	6325 CROMWELL MARINE CREEK RD	WELL PAD	1	82	572	1	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
228	5693 CROMWELL MARINE CREEK RD	WELL PAD	1	108	920	2	1	0	4	0.05	0.70	1.96	<0.01	0.66	0.65	<0.01	<0.01	0.39	0.26	<0.01

Table 3.5-3. Point Source Emissions Summary by Site (Continued)

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
230	5996 BOWMAN ROBERTS RD	WELL PAD	2	163	1615	2	1	3	4	0.07	0.98	2.74	<0.01	1.01	0.99	<0.01	0.02	0.59	0.40	0.01
234	5492 TEN MILE BRIDGE RD	WELL PAD	1	48	320	1	0	0	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
235	6493 TEN MILE BRIDGE RD	WELL PAD	1	71	491	1	0	0	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
238	798 INDUSTRIAL ROAD	WELL PAD	2	691	5185	4	2	4	10	0.53	15.71	219.33	0.06	14.24	14.12	0.11	<0.01	8.42	5.67	0.21
240	1392 CANELL SAMPSON RD	WELL PAD	2	298	2586	2	1	0	5	0.05	0.70	1.96	<0.01	0.67	0.65	0.02	<0.01	0.39	0.26	0.01
241	1895 NORTHEAST LOOP 820	WELL PAD	2	218	1676	2	1	2	1	0.07	0.99	2.77	<0.01	1.00	1.00	<0.01	<0.01	0.59	0.40	0.01
247	1290 SILVER CREEK RD	WELL PAD	4	478	4646	4	0	2	4	-0-	-0-	-0-	-0-	0.97	<0.01	0.97	<0.01	0.11	-0-	0.02
257	10999 OLD WEATHERFORD RD	WELL PAD	3	253	2863	4	2	5	16	0.07	1.06	11.58	<0.01	20.93	1.01	19.91	<0.01	4.93	0.41	0.11
258	9595 OLD WEATHERFORD RD	WELL PAD	3	145	1015	2	0	0	5	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
260	11398 WEST FWY	WELL PAD	3	217	1519	6	0	4	8	-0-	-0-	-0-	-0-	0.02	<0.01	0.01	<0.01	<0.01	-0-	<0.01
261	10499 CHAPIN RD	WELL PAD	2	147	1029	4	0	1	6	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
266	11392 TIGER TRL	WELL PAD	5	310	1740	10	1	7	6	0.05	0.70	1.96	<0.01	1.43	0.65	0.01	0.77	0.46	0.26	0.01
267	11392 TIGER TRL	WELL PAD	5	445	3115	20	1	6	26	0.14	1.98	24.21	<0.01	19.87	2.00	17.85	0.02	3.02	0.80	0.16
268	11395 TIGER TRL	WELL PAD	5	311	3732	0	1	1	7	0.14	1.98	24.21	<0.01	4.30	2.00	<0.01	2.30	1.34	0.80	0.04
269	11392 TIGER TRL	WELL PAD	8	657	4599	0	0	1	3	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
282	4490 OLD DECATUR RD	WELL PAD	6	378	2485	6	1	3	13	0.05	0.70	1.96	<0.01	0.70	0.65	0.03	0.02	0.40	0.26	0.01
284	998 RAILHEAD RD	WELL PAD	2	138	966	2	0	2	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
285	4890 BLUE MOUND RD	WELL PAD	1	84	588	1	0	1	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
287	4201 BLUE MOUND RD	WELL PAD	1	151	357	1	0	0	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
288	291 NE 38TH ST	WELL PAD	4	175	1225	5	0	2	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
289	4999 MARK IV PKWY	WELL PAD	2	233	1781	2	1	3	3	0.05	0.70	1.96	<0.01	0.66	0.65	<0.01	<0.01	0.39	0.26	<0.01

Table 3.5-3. Point Source Emissions Summary by Site (Continued)

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
290	1990 GREAT SOUTHWEST PKWY	WELL PAD	2	152	1064	2	0	0	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
291	2591 DOWNING DR	WELL PAD	4	181	1267	4	0	1	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
294K	2299 MERCADO DR	COMPRESSOR STATION	0	436	3310	0	2	4	6	0.80	12.94	67.54	0.05	11.59	11.59	<0.01	<0.01	6.89	4.65	0.16
294	2299 MERCADO DR	WELL PAD	10	616	4312	13	2	5	22	0.13	2.08	5.81	<0.01	2.16	2.01	0.13	0.02	1.21	0.81	0.03
295	1099 NIXON ST	WELL PAD	9	1010	7262	11	1	2	7	0.40	6.47	33.77	0.02	6.02	5.79	0.21	0.01	3.63	2.32	0.13
302	2099 MARTIN LYDON AVE	WELL PAD	2	150	1376	4	1	0	4	0.05	0.70	1.96	<0.01	0.67	0.65	0.02	<0.01	0.39	0.26	0.01
303	5092 SOUTH FWY	WELL PAD	4	437	3649	5	1	0	1	0.05	0.70	1.96	<0.01	0.66	0.65	<0.01	<0.01	0.39	0.26	<0.01
308	5990 COLUMBUS TRAIL	WELL PAD	4	368	2576	4	1	4	0	0.05	0.70	1.96	<0.01	0.65	0.65	<0.01	<0.01	0.39	0.26	<0.01
309	6091 COLUMBUS TRAIL	WELL PAD	1	75	525	2	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
310	9290 GRANBURY RD	WELL PAD	4	257	1799	4	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
311	9292 GRANBURY RD	WELL PAD	2	173	1211	2	0	2	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
312	9198 GRANBURY RD	WELL PAD	2	192	1344	2	0	2	1	-0-	-0-	-0-	-0-	1.50	<0.01	1.50	<0.01	1.08	-0-	0.23
315	5701 W RISINGER RD	WELL PAD	1	184	1288	2	1	3	1	0.05	0.70	1.96	<0.01	0.66	0.65	<0.01	<0.01	0.39	0.26	<0.01
316	8699 BREWER BLVD	WELL PAD	9	743	5201	12	0	5	6	-0-	-0-	-0-	-0-	0.05	<0.01	<0.01	0.05	<0.01	-0-	<0.01
317	9991 STEWART FELTZ RD	WELL PAD	5	223	1631	6	0	2	7	-0-	-0-	-0-	-0-	0.02	<0.01	<0.01	0.02	<0.01	-0-	<0.01
318	5892 STEWART FELTZ RD	WELL PAD	8	516	4128	12	0	4	7	-0-	-0-	-0-	-0-	0.07	<0.01	<0.01	0.07	<0.01	-0-	<0.01
324	10193 OLD CROWLEY CLEBURNE RD	WELL PAD	3	300	2100	4	1	1	1	0.05	0.70	1.96	<0.01	0.66	0.65	<0.01	<0.01	0.39	0.26	<0.01
325	9599 WEST CLEBURNE	WELL PAD	1	67	469	1	0	0	1	-0-	-0-	-0-	-0-	0.02	<0.01	0.02	<0.01	<0.01	-0-	<0.01
327	2998 N CROWLEY CLEBURNE RD	WELL PAD	3	226	2193	4	1	3	4	0.07	1.04	2.91	<0.01	1.01	1.01	<0.01	<0.01	0.60	0.40	0.01
328	2592 NORTH CROWLEY CLEBURNE RD	WELL PAD	2	176	924	4	1	1	3	0.05	0.70	1.96	<0.01	0.66	0.65	<0.01	<0.01	0.39	0.26	<0.01
329	2195 CUNNINGHAM	WELL PAD	1	110	866	1	1	0	4	0.05	0.70	1.96	<0.01	0.67	0.65	0.02	<0.01	0.39	0.26	0.01

Table 3.5-3. Point Source Emissions Summary by Site (Continued)

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
332	9590 TECHNOLOGY RD	WELL PAD	2	95	665	2	0	2	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
335	7393 CROWLEY RD	WELL PAD	1	95	897	1	1	1	4	0.05	0.70	1.96	<0.01	0.69	0.65	0.03	<0.01	0.39	0.26	0.01
336	293 ALTAMESA BLVD	WELL PAD	4	416	2912	4	0	3	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
338	11790 SOUTH FWY	WELL PAD	3	733	5805	4	2	8	7	<0.01	17.85	93.74	0.06	14.86	14.74	0.11	0.01	8.83	5.91	0.24
339	599 W RENDON CROWLEY RD	WELL PAD	6	492	3444	7	0	10	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
341	13790 WILDCAT WAY SOUTH	WELL PAD	3	263	1641	4	0	3	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
342	296 PACE ALSBURY COURT	WELL PAD	1	80	560	1	0	0	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
344	12795 SOUTH FWY	WELL PAD	1	223	1561	4	0	1	3	-0-	-0-	-0-	-0-	0.01	<0.01	0.01	<0.01	<0.01	-0-	<0.01
346	13790 WILDCAT WAY SOUTH	WELL PAD	3	198	1386	4	0	4	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
348	12298 OAK GROVE ROAD SOUTH	WELL PAD	8	553	5301	10	3	5	15	0.12	1.86	16.27	<0.01	1.77	1.74	0.02	<0.01	1.04	0.70	0.03
349	1297 E RENDON CROWLEY	WELL PAD	5	272	1904	4	0	1	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
350	495 OLD HWY 1187	WELL PAD	5	410	2870	5	0	6	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
351	1099 E RENDON CROWLEY RD	WELL PAD	4	268	1966	4	1	2	8	0.05	0.70	1.96	<0.01	0.67	0.65	<0.01	<0.01	0.39	0.26	0.01
352	1099 E RENDON CROWLEY RD	WELL PAD	4	230	1610	5	0	0	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
353	11799 SOUTH FWY	WELL PAD	2	130	910	2	0	5	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
354	492 GARDEN ACRES DR	WELL PAD	3	432	4064	3	1	2	1	0.05	0.70	1.96	<0.01	0.66	0.65	<0.01	<0.01	0.39	0.26	<0.01
355	10598 OAK GROVE RD	WELL PAD	2	224	1568	4	0	1	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
356	9798 OLD BURLESON RD	WELL PAD	3	276	2308	4	1	4	3	0.07	1.04	2.91	<0.01	1.01	1.01	<0.01	<0.01	0.60	0.40	0.01
357	10199 OAK GROVE RD	WELL PAD	3	208	1728	3	1	1	6	0.05	0.70	1.96	<0.01	0.67	0.65	<0.01	0.01	0.39	0.26	<0.01
360	10596 FOREST HILL-EVERMAN RD	WELL PAD	4	288	2016	5	0	2	4	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01

Table 3.5-3. Point Source Emissions Summary by Site (Continued)

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
362	10196 FOREST HILL EVERMAN RD	WELL PAD	2	84	588	2	0	2	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
368	8598 WILL ROGERS BLVD	WELL PAD	1	53	371	1	0	1	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
369	8490 OAK GROVE RD	WELL PAD	5	236	1652	5	0	2	11	-0-	-0-	-0-	-0-	0.04	<0.01	<0.01	0.04	<0.01	-0-	<0.01
371	7893 WILL ROGERS RD	WELL PAD	2	115	805	3	1	1	1	0.08	1.23	3.45	<0.01	1.13	1.13	<0.01	<0.01	0.67	0.45	0.02
373	1290 JOHN BURGESS DR	WELL PAD	4	84	588	0	0	0	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
374	6994 WILL ROGERS BLVD	WELL PAD	2	273	2295	2	1	4	15	0.08	1.23	3.45	<0.01	1.24	1.13	0.01	0.10	0.69	0.45	0.02
381	1191 INTERMODEL PKWY	WELL PAD	12	759	6072	12	0	8	19	-0-	-0-	-0-	-0-	0.13	<0.01	0.13	<0.01	0.03	-0-	0.01
382	6197 SOUTH FWY	WELL PAD	1	119	833	1	0	0	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
392	5091 SOUTH FREEWAY	WELL PAD	1	69	483	2	0	1	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
396	2295 E SEMINARY DR	WELL PAD	10	858	6144	10	1	8	10	0.05	0.70	1.96	<0.01	0.66	0.65	<0.01	<0.01	0.39	0.26	<0.01
397	1294 E BERRY ST	WELL PAD	2	588	4494	5	3	2	2	0.85	13.64	69.50	0.05	12.24	12.24	<0.01	<0.01	7.27	4.91	0.17
399	4296 MITCHELL BLVD	WELL PAD	5	374	2986	6	1	6	3	0.05	0.70	1.96	<0.01	0.66	0.65	<0.01	<0.01	0.39	0.26	<0.01
400	3997 MITCHELL BLVD	WELL PAD	6	379	2989	8	1	3	7	0.07	1.04	2.91	<0.01	1.01	1.01	<0.01	<0.01	0.60	0.40	0.01
403	1999 BOMAR AVE	WELL PAD	4	467	3395	4	1	0	0	0.05	0.70	1.96	<0.01	0.65	0.65	<0.01	<0.01	0.39	0.26	<0.01
405	892 BEACH ST	WELL PAD	5	362	3619	0	1	1	2	0.05	0.70	1.96	<0.01	0.65	0.65	<0.01	<0.01	0.39	0.26	<0.01
409	4298 EAST FIRST ST	WELL PAD	3	278	1946	4	0	0	3	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
411	5391 EAST FIRST ST	WELL PAD	9	1143	8136	9	1	3	6	0.07	1.04	2.91	<0.01	1.01	1.01	<0.01	<0.01	0.60	0.40	0.01
415	7092 ENTERPRISE AVE	WELL PAD	1	76	670	1	1	2	2	0.03	0.46	12.35	<0.01	0.44	0.43	<0.01	<0.01	0.26	0.17	<0.01
416	5290 BOCA RATON BLVD	WELL PAD	3	238	1666	4	0	3	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
419	7090 ENTERPRISE AVE	WELL PAD	9	389	4049	12	2	3	19	0.13	2.08	5.81	<0.01	2.02	2.01	<0.01	0.01	1.20	0.81	0.03
420	7094 JACK NEWELL BLVD S	WELL PAD	2	159	1750	4	1	3	3	0.05	0.70	1.96	<0.01	0.66	0.65	<0.01	<0.01	0.39	0.26	<0.01

Table 3.5-3. Point Source Emissions Summary by Site (Continued)

Site ID	Address	Site Type	No. Wells	No. Valves	No. Conn-ectors	No. Tanks	No. Comp-ressors	No. M21 >500 ppm	No. IRs	PM (tons/yr)	NOx (tons/yr)	CO (tons/yr)	SO2 (tons/yr)	VOCs (tons/yr)				HAPS [b] (tons/yr)		
														VOC Total	Engine VOC	Tank VOC	Fugitive VOC	HAP Total	Formal dehyde	Benzene
421	2392 AUSTIN RD	WELL PAD	2	146	1581	2	1	5	6	0.05	0.70	1.96	<0.01	0.66	0.65	<0.01	<0.01	0.39	0.26	<0.01
422	7213 ATCO DR	WELL PAD	3	137	959	3	0	1	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
423	7603 TRINITY BLVD	WELL PAD	3	273	2730	4	0	1	4	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
424	7498 MOSIER VIEW CT	WELL PAD	4	434	4510	4	4	4	11	0.19	2.80	7.84	0.01	2.63	2.61	0.01	<0.01	1.55	1.05	0.04
426	692 BRIDGEWOOD DR	WELL PAD	5	735	5427	5	2	1	11	0.09	1.40	3.92	<0.01	1.31	1.31	<0.01	<0.01	0.78	0.52	0.02
427	7990 TRINITY BLVD	WELL PAD	6	144	1008	0	0	0	6	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
428	7990 TRINITY BLVD	WELL PAD	5	780	6015	12	3	6	10	0.18	2.78	7.77	0.01	2.67	2.67	<0.01	<0.01	1.58	1.07	0.04
429	8097 TRINITY BLVD	WELL PAD	1	143	1337	2	1	2	4	0.05	0.70	1.96	<0.01	0.65	0.65	<0.01	<0.01	0.39	0.26	<0.01
438	9290 KEMP ST	WELL PAD	3	301	2786	5	1	0	2	0.05	0.70	1.96	<0.01	0.65	0.65	<0.01	<0.01	0.39	0.26	<0.01
447	2598 GREENBELT RD	WELL PAD	2	200	1400	2	1	2	5	0.05	0.70	1.96	<0.01	0.65	0.65	<0.01	<0.01	0.39	0.26	<0.01
457	1992 EAST CHASE PKWY	WELL PAD	1	119	786	2	0	1	1	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
462	6796 ROSEDALE ST	WELL PAD	13	600	4200	0	0	5	6	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
468	1593 INTERMODEL PKWY	WELL PAD	12	743	5201	0	0	2	3	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
469	7098 ROBERTSON RD	WELL PAD	11	260	1820	3	0	1	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
470	7294 ROBERTSON RD	WELL PAD	2	167	1570	6	1	1	4	0.01	3.58	5.87	<0.01	0.21	0.19	<0.01	<0.01	0.12	0.08	<0.01
471	1597 INTERMODEL PKWY	WELL PAD	6	383	2481	0	0	0	7	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
472	1791 INTERMODEL PKWY	WELL PAD	7	482	3374	0	0	5	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
474	6593 DIRKS RD	WELL PAD	1	80	560	1	0	3	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
480	5096 N SYLVANIA AVE	WELL PAD	3	357	2499	3	0	1	0	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01
483	4898 MARINE CREEK PKWY	WELL PAD	1	70	1095	1	1	0	7	0.05	0.70	1.96	<0.01	0.67	0.65	<0.01	0.02	0.39	0.26	<0.01
485	4691 E LOOP 820 S	WELL PAD	9	447	3465	6	2	2	19	0.09	1.40	3.92	<0.01	1.36	1.31	0.01	0.04	0.79	0.52	0.02
487	3490 BRYANT IRVIN RD	WELL PAD	2	97	679	2	0	0	2	-0-	-0-	-0-	-0-	<0.01	<0.01	<0.01	<0.01	<0.01	-0-	<0.01

[a] For values reported as <0.01, see Appendix 3-A for actual emissions expressed in scientific notation.
[b] The HAP Total emissions listed include all HAP emissions that were measured and calculated as part of this study. For a complete list of estimated HAPs emissions, see Appendix 3-A.

Figure 3.5-2 shows the average TOC emissions for the three basic component categories found at the natural gas facilities which were surveyed by the point source team: Valves, Connectors, and Other. Valves include manual valves, automatic actuation valves, and pressure relief valves. Connectors include flanges, threaded unions, tees, plugs, caps and open-ended lines where the plug or cap was missing. The category "Other" consists of all remaining components such as tank thief hatches, pneumatic valve controllers, instrumentation, regulators, gauges, vents, etc.

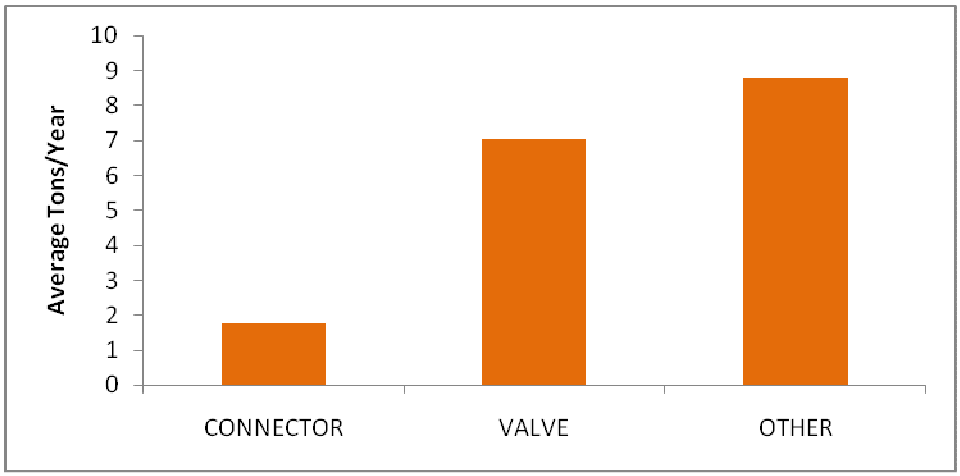


Figure 3.5-2. Average TOC Emissions by Component Category

As indicated in Figure 3.5-2, average TOC emissions from components in the "Other" category exceeded emissions from valves and connectors. Figure 3.5-3 identifies individual equipment types in the "Other" category with the highest average TOC emissions. Among these, tank thief hatches have the largest average TOC emission contribution, followed by miscellaneous equipment, tank vents, pneumatic valve controllers, and gas regulators. Miscellaneous equipment included a variety of emission sources such as holes and cracks in tank roofs, various types of instrumentation and meters, sumps, compressor shafts, orifice plates, sight glasses, and underground piping.

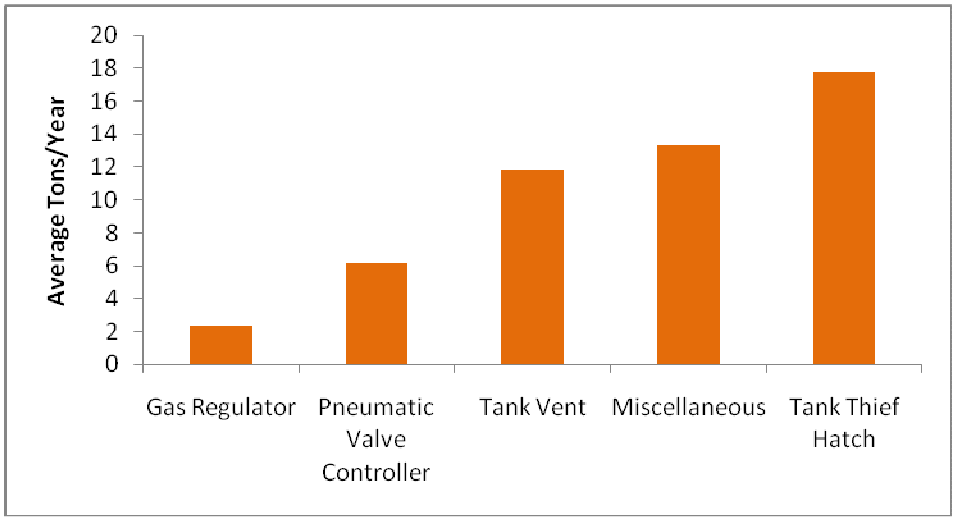


Figure 3.5-3. Average TOC Emissions in Category "Other"

Figure 3.5-4 summarizes the average annual TOC, VOC, HAP, and Criteria Pollutant emissions from compressor engines alone. Criteria pollutant emission data is based upon vendor-provided and published engine emission factors and pertains to those compressors encountered at well pad sites.

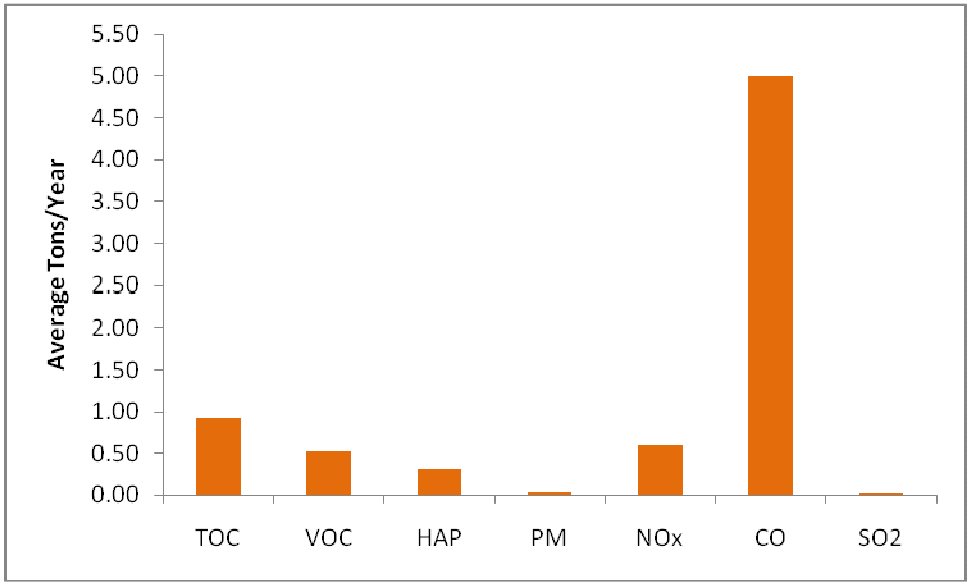


Figure 3.5-4. Average Annual Emissions from Well Pad Compressor Engines

Figure 3.5-5 compares VOC and HAP average annual emissions from Non-Tank and Tank sources.

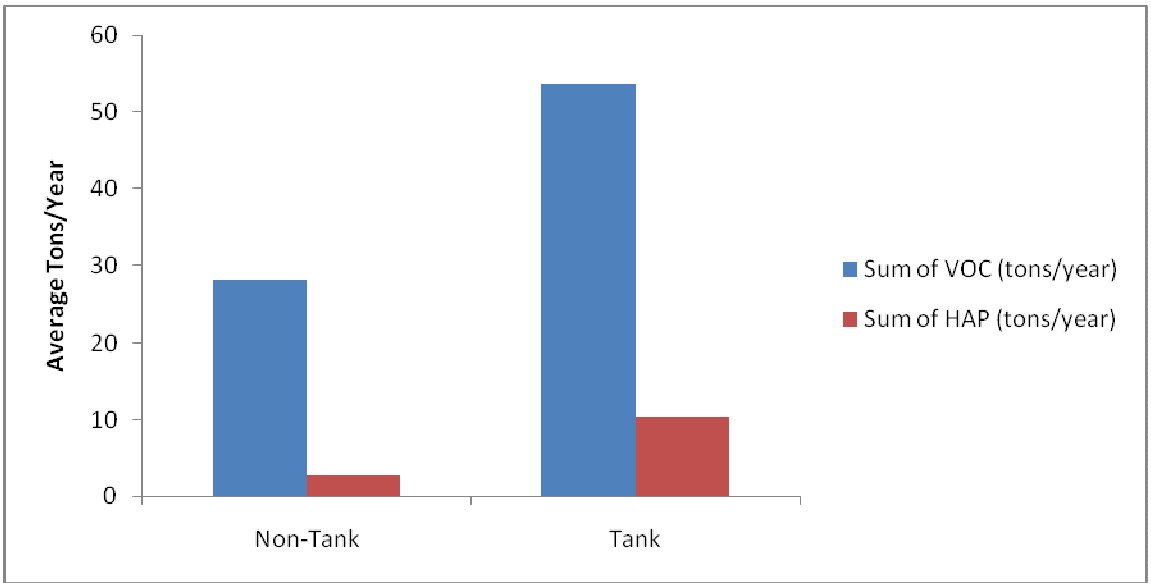


Figure 3.5-5. Non-Tank vs. Tank: Average VOC and HAP Emissions

Figures 3.5-6 and 3.5-7 compare TOC, VOC, and HAP average emissions from dry gas and wet gas sites. For purposes of this study, a site was considered to be a wet gas site if it produced more than 1 barrel of condensate/day as indicated by the Texas Railroad Commission.

Figure 3.5-6 indicates that average TOC emissions from wet gas well pad sites were higher than those from dry gas well pad sites. Also, indicated in Figure 3.5-7, wet gas well pad sites were found to have higher average VOC and HAP emissions.

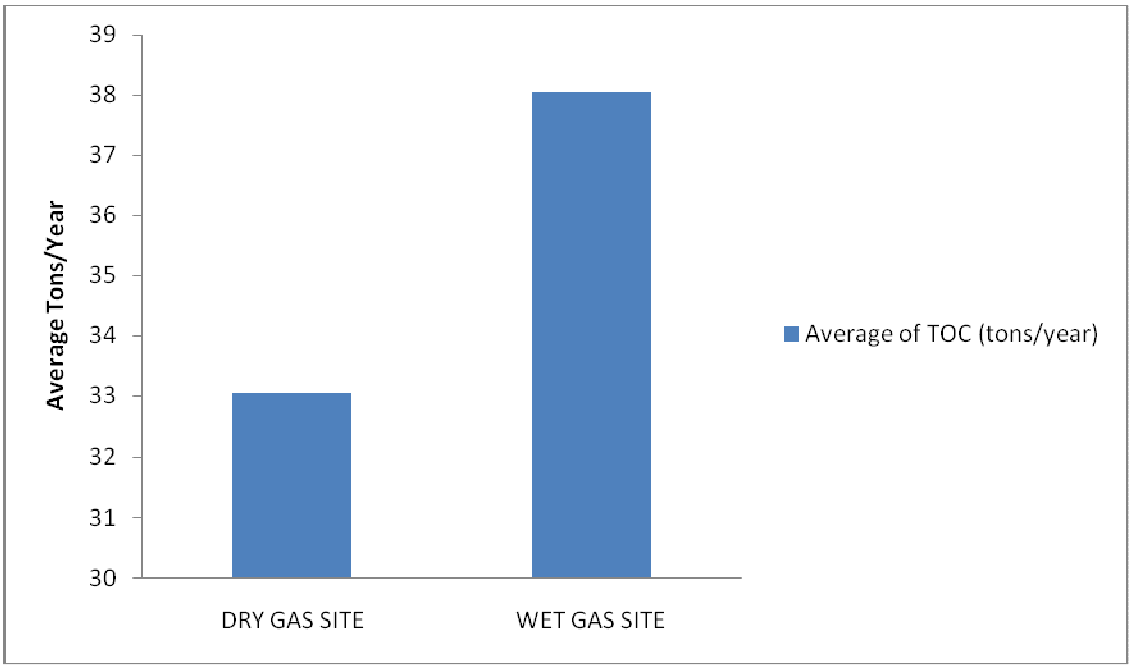


Figure 3.5-6. Average Wet Gas vs. Dry Gas TOC Emissions

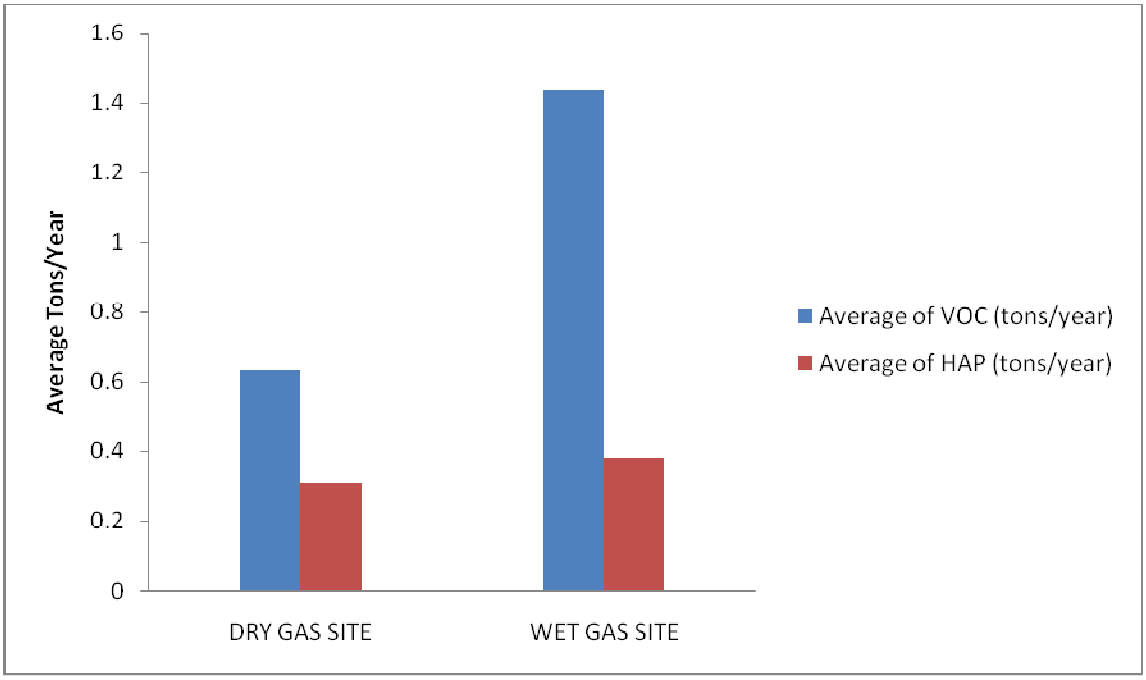


Figure 3.5-7. Average Wet Gas vs. Dry Gas VOC and HAP Emissions

At the City's request, the point source team re-visited two sites in Phase II that had been previously surveyed in Phase I. The Chesapeake site at 2299 Mercado Drive was surveyed on October 20, 2010 (Point Source ID PS -192) and again on February 15, 2011 (Point Source ID 294). The ENCANA site at 11398 West Freeway was surveyed in Phase I on September 21, 2010 (Point Source ID PS -086) and again, in Phase II on February 16, 2011 (Point Source ID 260). Table 3.5-4 summarizes the results of each survey.

Table 3.5-4. Summary of Repeat Surveys[a]

Site/Date	Temp °F[b]	# IR Detects[c]	# M21 Detects[d]	TOC (tons/yr)	VOC (tons/yr)	HAP (tons/yr)
Chesapeake - 2299 Mercado Drive (Site IDs: PS-192 and 294)						
20-Oct-10	88	12	6	188	2.2	1.3
15-Feb-11	64	22	5	181	2.15	1.2
ENCANA - 11398 West Fwy (Site IDs: PS-086 and 260)[e]						
21-Sep-10	87	8	4	25.7	8.7	1.9
16-Feb-11	65	8	4	35.7	<0.1	<0.1

[a] For values reported as <0.01 see Appendix 3-A for actual emissions expressed in scientific notation.
[b] Ambient site temperature in degrees Fahrenheit
[c] Number of emission points detected with the IR camera
[d] Number of emission points detected by Method 21 screening procedures.
[e] During the first site visit, one canister sample was collected from a tank emission point and the results used to estimate the site's emissions accordingly, During the second site visit, no canister was collected. Therefore, consistent with the point source test plan, a surrogate emission rate was used to estimate the site's emissions during the second visit.

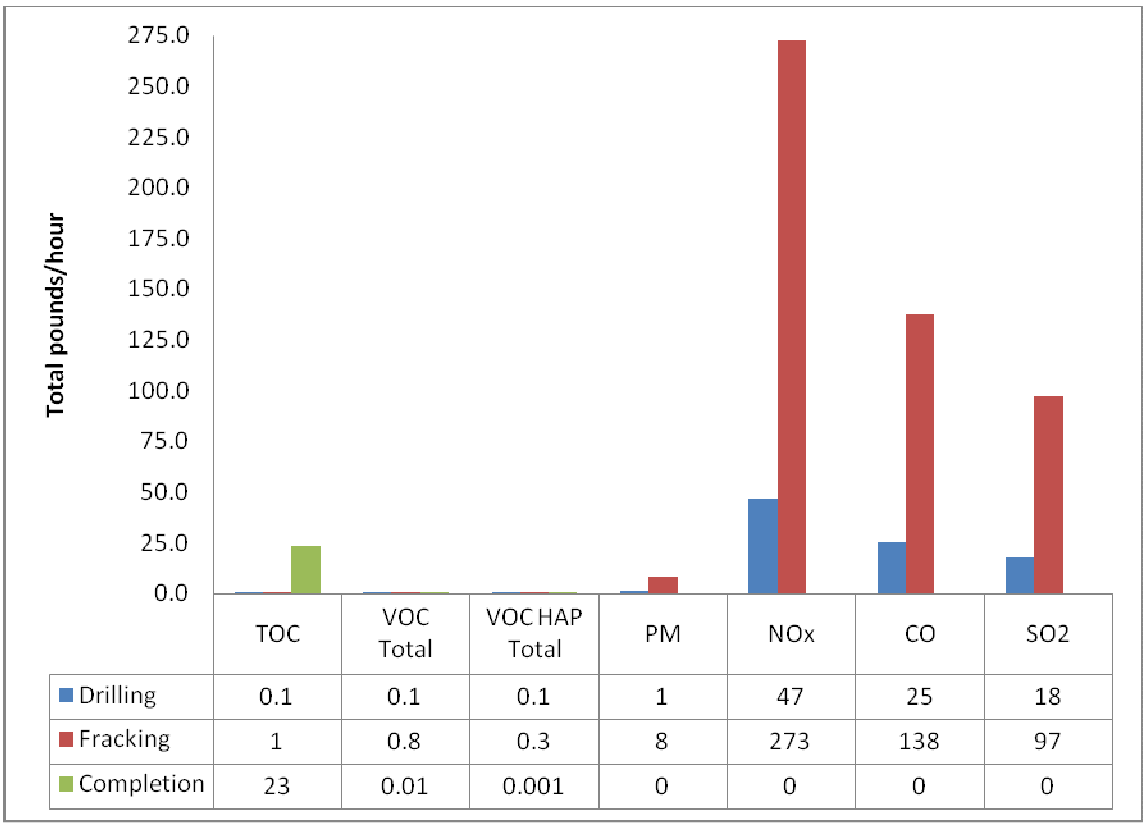
Detailed site-by-site emission results are provided in Appendix 3-A.

3.5.1 Well Activity Emissions

In addition to well pads, compressor stations, a natural gas processing facility and a salt water treatment facility, three types of exploration and stimulation activities were surveyed for emissions:

- Well Drilling.
- Fracking.
- Completion.

Figure 3.5-8 summarizes the hourly emissions from these operations. Since each lasts approximately three weeks or less, emissions are presented on a pounds/hour basis rather than annual basis.



	TOC	VOC Total	VOC HAP Total	PM	NOx	CO	SO2
Drilling	0.1	0.1	0.1	1	47	25	18
Fracking	1	0.8	0.3	8	273	138	97
Completion	23	0.01	0.001	0	0	0	0

Figure 3.5-8. Well Activity Emissions (lbs/hr)

Well Drilling

A drilling site located at 580 East Rosedale and operated by XTO (Point Source ID PS-128) was surveyed on October 1, 2010. During the time of the site visit, the drilling operation was in process and operating under normal conditions. An IR camera scan was performed on all aspects of the drilling operation. No emissions from leaking components or drilling mud were detected by the camera during this survey. Estimated combustion emissions from the drilling rig engines are based on engine data obtained during the site survey. Detailed combustion emissions are provide in Appendix 3-A.

Fracking

A large fracking operation was surveyed on October 20, 2010 at 5900 Wilbarger (Point Source ID PS-193). During the time of the site visit, the fracking operation was in process and operating under normal conditions. The operation included the following equipment: 8 sand trucks, 11 diesel engine pump trucks, 8 mobile water trucks, 3 sand hoppers, 1 chemical injection flatbed trailer, and 1 chemical injection truck. Two complete IR camera scans were performed on all equipment. No emissions from leaking components or fluids handling were detected by the camera. Combustion emissions from the pump engines have been estimated and are based on engine data obtained during the site survey. Detailed combustion emissions are provide in Appendix 3-A.

Well Completion

A flowback operation was surveyed by the point source team on October 5, 2010 at 5199 Village Creek Road (Point Source ID PS-134). One emission point was detected with the IR camera and five low level emission points were identified with the TVA during Method 21 screening while the flowback operation was in progress. Detailed emissions are provide in Appendix 3-A.

3.5.2 Method 21 TOC Screening Emission Factors

Emission factors for the Method 21 screening ranges 500-999 ppmv and 1,000 to 10,000 ppmv were calculated for the equipment categories valves, connectors, and others according to the procedures explained in Section 3.4.2. Unfortunately, an insufficient number of valves and other equipment were found with emissions in the 500 – 999 ppmv category (two and four respectively) to derive reliable emission factors for this screening range. The remaining categories however were sufficiently populated to enable the derivation of the emission factors provided in Table 3.5-5 below.

Table 3.5-5. TOC Screening Emission Factors

Concentration Range	Valves	Connectors	Other
500 – 999 ppmv	—	2.17E-04 kg/hr 4.78E-04 lbs/hr	—
1000 – 10,000 ppmv	1.10E-03 kg/hr 2.43E-03 lbs/hr	4.70 E-04 kg/hr 1.04E-03 lbs/hr	1.60E-02 kg/hr 3.52E-02 lbs/hr

3.6 Quality Control Results

Point Source project Quality Assurance/Quality Control (QA\QC) was ensured through both field and analytical quality control procedures. Field QC procedures included:

- IR Camera Daily Demo.
- Hi Flow Sampler Daily Calibration Verification.
- TVA Daily Calibration and Drift Checks.
- Regular review of completed field data forms.
- Canister sampling protocols.
- Duplicate canister sample collection.

Analytical QC procedures included:

- Method Blanks.
- Surrogate Recoveries.
- Laboratory Control Samples and Control Sample Duplicates.
- Continuing Calibration Verification.

The results of the field QC checks are provided in the tables following. The results of the analytical QC are provided with the TestAmerica™ laboratory reports in the Appendix 3-C.

3.6.1 IR Camera Daily Demo Results

Three IR cameras were used during this project. IR cameras "GasFindIR" and "GF-320 were used continuously throughout the project. IR camera "Dexter" was used only for one day as a temporary replacement. The sensitivity of each IR camera was evaluated daily prior to testing (i.e. Daily Demo). The Daily Demo was performed at two flow rates: ~10 grams/hour propane and ~30 grams/hour propane. The maximum distance from which the two flow rates could be observed with the cameras was recorded together with current weather data. The results of the IR camera daily demos are provided in Tables 3.6-1 through 3.6-5.

3.6.2 Hi Flow Sampler Calibration Verification

Three Hi Flow Samplers were used during the project. Hi Flow Samplers #QS1002 was used in both Phase I and II. Hi Flow Sampler #QS 1005 was used in Phase I and was replaced in Phase II with Hi Flow Sampler #QX 1007. Each Hi Flow Sampler was calibrated at the start of Phase I and Phase II testing using certified gas cylinders of 2.5% and 99% methane. A calibration verification check of both background and sample sensors was performed daily prior to testing with the 2.5% methane standard. Once each week the calibration verification check of both sensors was performed with the 2.5% and the 99% methane gas standards with an acceptance criterion of +/- 10% agreement. The results of Hi Flow Sampler daily calibration verification checks are summarized in Tables 3.6-6 through 3.6-9.

Table 3.6-1. IR Camera ID: GasFindIR Daily Demo
September – October, 2010

Timestamp	Low Flow[a]		Hi Flow[b]		WD[c] (from)	WS[d] (mile/hr)	Temp[e] (°F)	RH[f] (%)	BP[g] (kPa)	Cloud (%)
	Sighting Distance (feet)	Video File	Sighting Distance (feet)	Video File						
9/1/10 9:26	27.00	100831_002	68.01	100831_003	N	6.5	84.5	73.4	99.4	35
9/2/10 10:15	24.16	100901_006	40.50	100901_007	S	1.5	76.7	89.1	98.7	95
9/3/10 7:39	27.72	100902_001	39.11	100902_002	W	5.5	72.1	61.0	99.9	100
9/7/10 7:25	50.10	100906_001	163.70	100906_002	CALM	CALM	84.2	72.0	99.6	100
9/8/10 8:33	53.25	100907_002	72.90	100907_001	CALM	CALM	80.0	82.8	99.2	0
9/9/10 8:20	28.32	100908_001	53.04	100908_002	N	2.6	91.3	86.5	99.17	100
9/10/10 8:30	39.04	100909_001	65.21	100909_002	SE	1.1	85.0	88.7	99.01	85
9/16/10 7:30	22.20	100915_001	36.90	100915_003	W	1.8	81.2	75.4	99.4	4
9/17/10 7:00	26.54	100916_001	31.16	100916_002	CALM	CALM	80.2	61.5	99.5	10
9/20/10 7:20	29.90	100919_001	39.65	100919_002	CALM	1.0	80.3	67.2	99.7	1
9/21/10 7:30	31.90	100920_001	52.24	100920_002	S	2.8	78.8	81.2	99.3	15
9/22/10 7:28	25.20	100921_002	42.92	100921_003	SE	2.3	75.7	83.8	99.5	0
9/23/10 7:20	27.10	100922_001	43.47	100922_002	E	3.4	78.0	81.1	99.4	97
9/24/10 7:25	32.68	100923_001	59.69	100923_002	SE	1.4	79.9	81.0	99.8	80
9/27/10 7:28	27.07	100926_001	38.12	100926_002	SW	1.5	57.5	65.8	99.8	0
9/28/10 7:26	26.61	100927_002	37.54	100927_003	SW	1.4	59.3	78.7	99.5	0
9/29/10 7:20	25.07	100928_001	35.94	100928_002	NW	4.0	63.8	71.0	99.1	0
9/30/10 7:45	30.92	100929_001	48.38	100929_002	CALM	CALM	64.3	72.1	99.5	0
9/31/10 7:45	26.70	100930_001	41.50	100930_002	CALM	CALM	64.3	71.9	101.2	0
10/4/10 7:44	14.60	101003_001	35.15	101003_002	CALM	CALM	61.4	68.1	100.7	5
10/5/10 7:45	16.50	101004_002	33.60	101004_003	CALM	CALM	51.6	69.4	100.7	0
10/6/10 7:50	15.90	101005_001	32.30	101005_002	CALM	CALM	59.2	67.5	100.7	0
10/7/10 7:37	26.53	101006_001	45.91	101006_001	CALM	CALM	57.8	72.5	100.4	0
10/8/10 7:45	22.73	101007_001	32.14	101007_002	CALM	CALM	58.9	66.9	100.1	0
10/11/10 7:36	27.54	101010_001	45.25	101010_002	CALM	CALM	72.1	70.8	99.2	100

Table 3.6-1. GasFindIR Daily Demo (Continued)

Timestamp	Low Flow[a]		Hi Flow[b]		WD[c] (from)	WS[d] (mile/hr)	Temp[e] (°F)	RH[f] (%)	BP[g] (kPa)	Cloud (%)
	Sighting Distance (feet)	Video File	Sighting Distance (feet)	Video File						
10/12/10 7:30	18.28	101011_001	36.51	101011_002	W	1.9	62.5	77.5	99.6	4
10/13/10 7:40	23.50	101012_001	35.28	101012_002	W	1.2	64.7	69.7	100.3	0
10/14/10 7:45	18.00	101013_001	29.80	101013_002	CALM	CALM	57.8	54.1	100.8	0
10/15/10 7:50	22.10	101014_001	33.80	101014_002	CALM	CALM	60.1	69.1	100.1	0
10/18/10 7:40	17.50	101017_001	27.45	101017_002	CALM	CALM	69.5	78.4	99.5	0
10/19/10 7:40	22.16	101018_001	35.21	101018_002	CALM	CALM	70.5	71.3	99.4	0
10/20/10 7:35	21.78	101019_001	30.03	101019_002	N	2.5	67.3	65.5	99.8	60
10/21/10 7:53	16.89	101020_001	31.38	101020_002	CALM	CALM	68.5	82.7	99.7	67

[a] 10 grams/hour propane.
[b] 31.4 grams/hour propane.
[c] WD – Wind Direction
[d] WS – Wind Speed (mile/hour)
[e] TEMP – Temperature (°F)
[f] RH – Relative Humidity (%)
[g] BP – Barometric Pressure (kPa)

Table 3.6-2. IR Camera ID: GF-320 Daily Demo
September – October, 2010

Timestamp	Low Flow[a]		Hi Flow[b]		WD[c] (from)	WS[d] (mile/hr)	Temp[e] (°F)	RH[f] (%)	BP[g] (kPa)	Cloud (%)
	Sighting Distance (feet)	Video File	Sighting Distance (feet)	Video File						
9/7/10 8:30	38.83	0025	70.85	0026	CALM	CALM	84.2	72.0	99.6	100
9/8/10 8:30	53.25	0034	71.57	0033	CALM	CALM	80.0	82.8	99.21	0
9/9/10 8:08	9.00	0041	22.00	0042	S	2.3	80.0	90.3	99.9	100
9/10/10 7:45	18.50	0054	27.00	0055	SE	1.1	82.9	84.7	99.01	85
9/13/10 8:45	48.69	0058	77.18	0059	E	1.9	80.5	82.7	99.85	80
9/14/10 7:20	18.93	0069	228.36	0020	CALM	CALM	81.1	77.8	99.63	0
9/15/10 7:17	20.17	0079	25.30	0080	N	1.5	76.5	76.8	99.5	0
9/16/10 7:10	19.00	0086	23.00	0087	W	1.8	81.2	75.4	99.4	4
9/17/10 0:00	9.40	0109	18.80	0110	CALM	CALM	80.2	61.5	99.5	10
9/20/10 7:45	8.60	0121	23.50	0122	CALM	CALM	80.3	67.2	99.7	1
9/21/10 7:30	13.60	0135	31.30	0136	S	2.8	78.8	81.2	99.3	15
9/22/10 7:24	7.80	0151	24.70	0152	SE	2.3	75.7	83.8	99.5	1
9/23/10 7:40	6.50	0175	28.30	0176	E	3.4	78.0	81.1	99.4	97
9/24/10 7:28	16.80	0199	34.90	0200	SE	1.8	79.9	81.0	99.8	80
9/27/10 7:35	13.10	0221	21.30	0222	SW	1.5	57.5	65.8	99.8	0
9/28/10 7:26	14.60	0234	26.00	0235	SW	1.4	59.3	78.7	99.5	0
9/29/10 7:15	16.40	0247	23.30	0248	CALM	CALM	63.8	71.0	99.1	0
9/30/10 7:45	10.30	0268	24.50	0269	CALM	CALM	64.3	72.1	99.5	0
9/31/10 7:35	14.86	0299	20.70	0300	CALM	CALM	64.3	71.9	100	0

[a] 10 grams/hour propane.
[b] 31.4 grams/hour propane.
[c] WD – Wind Direction
[d] WS – Wind Speed (mile/hour)
[e] TEMP – Temperature (°F)
[f] RH – Relative Humidity (%)
[g] BP – Barometric Pressure (kPa)

Table 3.6-2. GF-320 Daily Demo (Continued)

Timestamp	Low Flow[a]		Hi Flow[b]		WD[c] (from)	WS[d] (mile/hr)	Temp[e] (°F)	RH[f] (%)	BP[g] (kPa)	Cloud (%)
	Sighting Distance (feet)	Video File	Sighting Distance (feet)	Video File						
10/4/10 7:35	17.57	0313	30.80	0314	CALM	CALM	61.4	68.1	100.7	5
10/5/10 7:35	13.42	0325	24.80	0326	CALM	CALM	51.6	69.4	100.7	0
10/6/10 7:58	12.44	0345	21.00	0346	CALM	CALM	59.2	67.5	100.7	0
10/7/10 7:32	29.78	0368	36.25	0372	CALM	CALM	57.8	72.5	100.8	0
10/12/10 7:36	18.20	0423	24.20	0424	W	1.9	62.5	77.5	99.6	4
10/13/10 7:40	23.00	0436	31.00	0437	W	1.2	64.7	69.7	100.3	0
10/14/10 7:50	18.10	0460	26.60	0461	CALM	CALM	57.4	54.0	100.8	0
10/15/10 7:50	17.00	0504	25.80	0505	CALM	CALM	60.4	69.0	100.1	0
10/18/10 7:50	7.80	0506	14.60	0507	CALM	CALM	69.5	78.4	99.5	0
10/18/10 7:55	12.02	0511	19.17	0512	CALM	CALM	70.5	94.0	99.4	0
10/20/10 7:49	12.30	0529	24.60	0530	N	2.5	67.3	65.5	99.8	60
10/21/10 7:55	13.7	0549	23.9	0550	CALM	CALM	68.5	82.7	99.7	67

Table 3.6-3. IR Camera ID: Dexter Daily Demo
September – October, 2010

Timestamp	Low Flow[a]		Hi Flow[b]		WD[c] (from)	WS[d] (mile/hr)	Temp[e] (°F)	RH[f] (%)	BP[g] (kPa)	Cloud (%)
	Sighting Distance (feet)	Video File	Sighting Distance (feet)	Video File						
9/15/10 7:45	3.00	VID0016	4.00	VID0015	N	1.5	76.5	76.8	99.5	0

[a] 10 grams/hour propane.
[b] 31.4 grams/hour propane.
[c] WD – Wind Direction
[d] WS – Wind Speed (mile/hour)
[e] TEMP – Temperature (°F)
[f] RH – Relative Humidity (%)
[g] BP – Barometric Pressure (kPa)

Table 3.6-4. IR Camera ID: GasFindIR Daily Demo
January – February, 2011

Timestamp	Low Flow[a]		Hi Flow[b]		WD[c] (from)	WS[d] (mile/hr)	Temp[e] (°F)	RH[f] (%)	BP[g] (kPa)	Cloud (%)
	Sighting Distance (feet)	Video File	Sighting Distance (feet)	Video File						
1/4/11 7:50	34.1	110103_001	84.7	110103_002	E	1.4	64.2	58.5	99.9	0
1/5/11 7:21	23.94	110104_001	54.6	110104_002	CALM	CALM	46.2	64.9	99.5	0
1/6/11 7:28	30.81	110105_001	51.46	110105_002	E	1.8	51.3	36.7	99.38	5
1/7/11 7:35	32.81	110106_001	57.17	110106_002	N	1	51.1	42.9	99.1	10
1/8/11 7:32	21.66	110107_001	38.87	110107_002	CALM	CALM	48.5	45.4	99.5	0
1/10/11 7:36	10.178	110109_001	31.96	110109_002	N	2.1	38.4	59.3	99.8	100
1/13/11 7:26	21.86	110112_001	52.41	110112_002	E	1.4	34.7	65.3	101.6	100
1/14/11 7:23	14.45	110113_001	30.49	110113_002	CALM	CALM	41.2	35.2	100.5	100
1/15/11 8:05	17.51	110114_001	50.4	110114_002	SE	3.2	38.2	69.2	100.4	100
1/18/11 7:20	8.38	110117_001	17.36	110117_002	2.7	W	44.9	78.1	99.1	100
1/19/11 7:30	12.74	110118_001	24.86	110118_002	CALM	CALM	38.9	45.6	99.7	5
1/20/11 7:31	14.36	110119_001	22.79	110119_002	N	4.8	38.6	72.3	99.8	100
1/21/11 7:27	16.9	110120_001	30.78	110120_002	CALM	CALM	33	39.5	100.1	50
1/22/11 7:08	18.2	110121_001	31.8	110121_002	CALM	CALM	39.1	50.0	99.7	0
1/24/11 7:23	21	110123_001	29.6	110123_002	CALM	CALM	36.3	55.7	99.9	0
1/25/11 7:18	11.4	110124_001	11.4	110124_002	NW	3.8	42.1	46.3	100.5	100
1/26/11 7:15	13.7	110125_001	30.7	110125_002	CALM	CALM	38.8	46.6	100.1	0
1/27/11 7:15	12.6	110126_001	20.1	110126_002	CALM	CALM	33.6	75.3	100.2	0
1/28/11 6:50	24.6	110127_001	47.5	110127_002	CALM	CALM	37.3	73.6	99.8	0

[a] 10 grams/hour propane.
[b] 31.4 grams/hour propane.
[c] WD – Wind Direction
[d] WS – Wind Speed (mile/hour)
[e] TEMP – Temperature (°F)
[f] RH – Relative Humidity (%)
[g] BP – Barometric Pressure (kPa)

Table 3.6-4. GasFindIR Daily Demo (Continued)

Timestamp	Low Flow[a]		Hi Flow[b]		WD[c] (from)	WS[d] (mile/hr)	Temp[e] (°F)	RH[f] (%)	BP[g] (kPa)	Cloud (%)
	Sighting Distance (feet)	Video File	Sighting Distance (feet)	Video File						
1/31/11 7:25	39.7	110130_002	62.4	110130_003	NW	2.4	44.5	62.9	99.6	100
2/3/11 10:35	20.9	110202_001	44.1	110202_002	NW	5.2	20.5	50.1	101.5	100
2/5/11 11:15	41.3	110204_001	78.4	110204_002	W	2.4	51.5	38.7	99.1	0
2/6/11 8:14	26.5	110105_001	79.4	110205_002	CALM	CALM	44.1	61.1	98.9	10
2/7/11 8:41	8	110206_001	21.3	110206_002	W	7.1	40.1	62.8	100.6	0
2/8/11 7:28	20.8	110207_001	35	110207_002	E	4.2	37.3	57.4	100.1	0
2/10/11 10:05	30.1	110209_001	52.7	110209_002	N	4.1	26.1	38.1	101	0
2/11/11 7:10	11.6	110210_001	20.6	110210_002	CALM	CALM	30.6	64.8	100.6	0
2/14/11 7:17	51.3	110213_001	79.4	110213_002	CALM	CALM	49.4	76.8	100	30
2/15/11 7:25	60	110214_001	130.9	110214_002	SE	2.3	59.8	86.0	99.86	90
2/16/11 7:28	41.1	110215_001	109.9	110215_002	S	6.8	64.3	77.9	99.53	95

Table 3.6-5. IR Camera ID: GF-320 Daily Demo
January – February, 2011

Timestamp	Low Flow[a]		Hi Flow[b]		WD[c] (from)	WS[d] (mile/hr)	Temp[e] (°F)	RH[f] (%)	BP[g] (kPa)	Cloud (%)
	Sighting Distance (feet)	Video File	Sighting Distance (feet)	Video File						
1/4/11 8:15	17.4	827	53.4	828	E	1.4	64.2	58.5	99.9	0
1/5/11 7:31	11.1	840	17.04	841	W	5	46.2	64.9	99.5	0
1/6/11 7:48	16.41	859	37.63	860	E	1.8	51.3	36.7	99.38	5
1/7/11 7:13	15.7	879	37.58	880	N	1	51.1	42.9	99.1	10
1/8/11 7:17	10.21	916	15.52	917	N	3.0	48.5	45.4	99.5	0
1/10/11 7:46	9.14	934	20.35	935	N	2.1	38.4	59.3	99.8	100
1/11/11 7:35	7.08	963	21.51	964	NW	3.2	24.7	38.8	101.6	0
1/12/11 7:26	11.25	986	38.72	987	NW	2.7	29.1	37.9	102.1	95
1/13/11 7:17	21.24	1004	41.82	1005	E	1.4	44.7	65.3	101.6	100
1/14/11 7:13	12.22	1020	18.48	1021	CALM	CALM	41.2	35.2	100.5	100
1/15/11 7:15	13	1046	18.81	1047	SE	3.2	38.2	69.2	100.4	100
1/18/11 7:20	4.50	1062	15.24	1063	2.7	W	44.9	78.1	99.1	100
1/19/11 7:15	10.37	1081	25.86	1082	CALM	CALM	48.9	45.6	99.7	5
1/20/11 7:14	6.87	1113	15.1	1114	N	4.8	38.6	72.3	99.8	100
1/21/11 6:58	15.88	1123	28.45	1124	CALM	CALM	33	39.5	100.1	50
1/22/11 6:45	8.6	1132	17.8	1133	CALM	CALM	39.1	50.0	99.7	0
1/24/11 7:06	11.8	1141	18.9	1142	CALM	CALM	36.3	55.7	99.9	0
1/25/11 7:00	6.9	1157	10.5	1158	NW	3.8	42.1	46.3	100.5	100
1/26/11 7:03	10.7	1191	26.5	1192	CALM	CALM	38.8	46.6	100.1	0

[a] 10 grams/hour propane.
[b] 31.4 grams/hour propane.
[c] WD – Wind Direction
[d] WS – Wind Speed (mile/hour)
[e] TEMP – Temperature (°F)
[f] RH – Relative Humidity (%)
[g] BP – Barometric Pressure (kPa)

Table 3.6-5. GF-320 Daily Demo (Continued)

Timestamp	Low Flow[a]		Hi Flow[b]		WD[c] (from)	WS[d] (mile/hr)	Temp[e] (°F)	RH[f] (%)	BP[g] (kPa)	Cloud (%)
	Sighting Distance (feet)	Video File	Sighting Distance (feet)	Video File						
1/27/11 7:07	8.8	1209	16	1210	CALM	CALM	33.6	75.3	100.2	0
1/28/11 6:50	11.1	1223	22.4	1224	W	4.0	37.3	73.6	99.8	0
1/31/11 7:15	22.9	1247	53.6	1248	NW	2.4	44.5	62.9	99.6	100
2/3/11 10:17	14.4	1270	50.7	1271	NW	5.2	20.5	50.1	101.5	100
2/5/11 11:05	16.5	1283	35.9	1284	W	2.4	51.5	38.7	99.1	0
2/6/11 8:24	16.5	1287	32.4	1288	CALM	CALM	44.1	61.1	98.9	10
2/7/11 8:30	5	1300	16.6	1301	W	7.1	40.1	62.8	100.6	0
2/8/11 7:15	12	1316	17.6	1317	E	4.2	37.3	57.4	100.1	0
2/10/11 9:57	10.5	1333	39.5	1334	N	4.1	26.1	38.1	101	0
2/11/11 7:00	12.7	1354	18.1	1355	CALM	CALM	30.6	64.8	100.6	0
2/14/11 7:05	15.1	1370	51.2	1371	CALM	CALM	49.4	76.8	100	30
2/15/11 7:08	10	1398	19.2	1399	SE	2.3	59.8	86.0	99.86	90
2/16/11 7:15	10.4	1413	19.3	1414	S	6.8	64.3	77.9	99.53	95

Table 3.6-6. Hi Flow ID: QS1002 Verification
September – October 2010

Timestamp	Input: 2.5% CH_4		Input: 99% CH_4	
	Background Sensor % Difference[a]	Leak Sensor % Difference[b]	Background Sensor % Difference	Leak Sensor % Difference
9/8/10 8:46	-0.8	0.4	-5.5	0.3
9/9/10 18:13	-1.2	-2.8	--	--
9/10/10 7:43	-0.8	-0.8	--	--
9/13/10 7:12	-1.2	-0.8	-2.8	-0.9
9/14/10 7:12	0.0	-0.8	--	--
9/15/10 7:15	-1.2	0.8	--	--
9/16/10 7:21	-1.2	-1.2	--	--
9/18/10 6:48	-2.0	0.4	--	--
9/20/10 7:34	5.6	0.8	--	--
9/21/10 7:28	-3.2	0.0	--	--
9/22/10 7:08	-2.8	0.4	--	--
9/23/10 7:17	-3.2	0.4	--	--
9/24/10 7:27	-0.8	-0.4	--	--
9/27/10 9:40	1.6	0.0	-0.1	-0.1
9/28/10 7:13	0.4	-0.4	--	--
9/29/10 7:12	-1.2	-0.8	--	--
9/30/10 7:55	-1.6	-0.4	--	--
10/1/10 7:33	0.0	-1.6	--	--
10/4/10 7:53	-0.4	-0.8	--	--
10/5/10 7:23	-0.8	-1.2	--	--
10/6/10 7:15	0.8	-3.2	--	--
10/7/10 7:14	0.4	-2.0	--	--
10/8/10 7:25	0.0	-3.2	--	--
10/11/10 7:15	-0.4	-4.8	--	--
10/12/10 7:22	-0.8	-4.4	--	--
10/13/10 7:26	-0.4	-3.6	--	--
10/14/10 7:21	-1.2	-3.2	--	--
10/15/10 7:26	-0.8	-2.4	--	--
10/18/10 7:23	-2.4	-3.6	--	--
10/19/10 7:19	-2.8	-3.6	--	--
10/20/10 7:25	-15.2	-4.8	--	--

[a] Background Sensor Percent Difference = ((Output-Input)/Input) x 100
[b] Leak Sensor Percent Difference = ((Output-Input)/Input) x 100

Table 3.6-7. Hi Flow ID: QS1005 Verification
September – October 2010

Timestamp	Input: 2.5% CH_4		Input: 99% CH_4	
	Background Sensor % Difference[a]	Leak Sensor % Difference[b]	Background Sensor % Difference	Leak Sensor % Difference
9/8/10 8:27	-0.4	-0.8	-1.01	-3.84
9/9/10 6:51	1.2	0.4	--	--
9/10/10 7:31	8.0	-1.2	--	--
9/13/10 8:26	-7.6	0.4	--	--
9/14/10 7:45	-0.4	0.4	--	--
9/15/10 7:35	-4.8	1.2	--	--
9/16/10 7:15	-2.0	-2.0	--	--
9/17/10 6:32	0.0	1.2	--	--
9/20/10 7:40	1.2	-0.8	--	--
9/21/10 7:20	-2.0	-0.4	-1.11	-1.72
9/22/10 7:31	4.8	-1.2	--	--
9/23/10 7:14	1.6	-1.2	--	--
9/24/10 7:27	6.0	-0.4	--	--
10/4/10 8:12	-4.4	0.0	--	--
10/5/10 7:55	-2.0	-1.6	-1.92	1.11
10/6/10 7:10	-3.2	0.0	--	--
10/7/10 7:16	0.8	7.6	--	--
10/8/10 7:22	-0.4	10.4	--	--
10/11/10 7:13	-2.8	13.2	--	--
10/12/10 7:15	1.2	0.4	--	--
10/13/10 7:20	1.6	0.0	--	--
10/14/10 7:17	2.8	-1.6	--	--
10/15/10 7:30	2.4	3.2	--	--
10/18/10 7:40	1.2	3.2	--	--
10/19/10 7:23	2.8	4.8	--	--
10/20/10 7:30	3.2	4.0	--	--
10/21/10 7:34	2.8	5.2	--	--

[a] Background Sensor Percent Difference = ((Output-Input)/Input) x 100
[b] Leak Sensor Percent Difference = ((Output-Input)/Input) x 100

Table 3.6-8. Hi Flow ID: QS1002 Verification
January – February, 2011

Timestamp	Input: 2.5% CH_4		Input: 100% CH_4	
	Background Sensor % Difference[a]	Leak Sensor % Difference[b]	Background Sensor % Difference	Leak Sensor % Difference
1/4/11 8:20	-1.2	2.0	--	--
1/5/11 7:26	-0.4	3.2	--	--
1/6/11 7:25	-0.4	3.6	--	--
1/7/11 7:41	-1.2	2.8	--	--
1/8/11 7:36	-0.8	3.2	--	--
1/10/11 7:50	-1.2	3.6	-1.9	0.0
1/11/11 7:30	0.4	4.0	--	--
1/12/11 7:36	0.4	4.0	--	--
1/13/11 7:26	-3.2	4.0	--	--
1/14/11 7:14	2.4	3.6	--	--
1/15/11 7:35	19.2	2.8	--	--
1/18/11 7:15	-30	0.8	-7.0	0.0
1/19/11 7:01	0	2.0	--	--
1/20/11 7:05	2.8	0.0	--	--
1/21/11 6:58	3.6	2.4	--	--
1/22/11 7:01	0.8	2.0	--	--
1/24/11 7:09	0	0.8	-2.2	0.0
1/25/11 6:51	25.2	2.0	-2.5	0.0
1/26/11 7:13	0	-0.8	0.0	0.0
1/27/11 6:45	-1.6	-0.8	--	--
1/28/11 6:40	-11.2	-0.8	--	--
1/31/11 7:40	0	1.2	0.0	-2.5
2/3/11 10:26	-8	-1.2	--	--
2/5/11 11:07	0	-1.6	--	--
2/6/11 8:07	0	-1.2	--	--
2/7/11 8:34	0	-1.2	-1.3	-0.1
2/8/11 7:05	0	-0.4	--	--
2/10/11 9:48	-0.4	0.8	--	--
2/11/11 7:04	-0.8	-1.2	--	--
2/14/11 6:55	0	-1.6	-0.7	-2.0
2/15/11 7:25	0	-0.4	--	--
2/16/11 7:06	0	-1.2	--	--

[a] Background Sensor Percent Difference = ((Output-Input)/Input) x 100
[b] Leak Sensor Percent Difference = ((Output-Input)/Input) x 100

Table 3.6-9. Hi Flow ID: QX1007 Verification
January – February, 2011

Date/Time	Input: 2.5% CH_4		Input: 100% CH_4	
	Background Sensor % Difference[a]	Leak Sensor % Difference[b]	Background Sensor %	Leak Sensor % Difference
1/4/11 8:35	2.0	0.8	--	--
1/5/11 7:25	2.0	2.0	--	--
1/6/11 7:29	1.2	2.0	--	--
1/7/11 7:50	2.0	1.6	--	--
1/8/11 7:33	2.8	2.4	--	--
1/10/11 7:48	3.2	1.6	-0.5	-2.0
1/13/11 7:36	1.6	1.2	--	--
1/14/11 7:12	3.2	1.2	--	--
1/15/11 7:58	2.0	0.8	--	--
1/18/11 7:30	1.6	0.8	-2.0	0.0
1/19/11 6:55	2.8	0.4	--	--
1/20/11 6:59	2.4	0.4	--	--
1/21/11 6:50	4.0	1.6	--	--
1/22/11 6:58	3.2	1.6	--	--
1/24/11 6:58	2.8	0.0	0.0	0.0
1/25/11 6:35	4.0	0.8	-0.7	-3.5
1/26/11 6:55	3.2	0.4	--	--
1/27/11 6:40	2.8	0.8	--	--
1/28/11 6:35	2.0	0.0	--	--
1/31/11 7:45	2.8	-0.4	-4.0	-5.0
2/3/11 10:22	3.2	0.4	--	--
2/5/11 11:03	2.8	0.0	--	--
2/6/11 8:20	-0.4	-0.4	--	--
2/7/11 8:27	0.0	0.0	0.0	0.0
2/8/11 7:08	0.0	0.0	--	--
2/10/11 9:45	0.4	0.0	--	--
2/11/11 6:58	0.4	0.0	--	--
2/14/11 7:15	0.0	0.4	0.0	0.0
2/15/11 7:00	1.2	1.2	--	--
2/16/11 6:56	2.0	0.8	--	--

[a] Background Sensor Percent Difference = ((Output-Input)/Input) x 100
[b] Leak Sensor Percent Difference = ((Output-Input)/Input) x 100

3.6.3 TVA Calibration Procedures

Several TVAs were used during the point source field surveys. Each TVA was calibrated daily before testing with four certified gas standards:

- Zero Air (<0.1 total hydrocarbon content).
- Low Level Span (approximately 500 ppmv methane-in-air).
- Mid Level Span (approximately 2000 ppmv methane-in-air).
- High Level Span (approximately 10,000 ppmv methane-in-air).

Drift checks were performed during the test day using the Low Level calibration standard. Tables 3.6-10 through 3.6-15 summarize the calibration and drift check results for the project TVAs.

Table 3.6-10. TVA Serial Number (S/N): 5362 Calibration and Drift Check Results September – October 2010

Timestamp	Zero (ppmv)	Low Span[a] % Difference [b]	Mid Span[c] % Difference	High Span[d] % Difference
8/30/10 10:00	-0.5	-1.22	-3.57	-9.83
9/1/10 8:05	0.4	-0.20	0.26	-0.23
9/1/10 14:50	--	-21.63	--	--
9/1/10 14:53	0.78	5.71	2.81	-0.59
9/1/10 17:25	--	25.10	--	--
9/2/10 9:03	0.61	4.90	2.24	4.06
9/2/10 17:33	--	13.27	--	--
9/3/10 9:10	0.2	0.61	0.36	-0.01
9/3/10 12:36	--	20.41	--	--
9/7/10 8:10	-0.98	-1.84	0.46	-0.46
9/8/10 8:02	-0.7	1.02	0.92	0.56
9/9/10 8:25	0.18	-3.88	-5.05	-7.20
9/9/10 16:28	--	5.31	--	--
9/10/10 8:02	-0.43	-0.20	-0.77	0.15
9/10/10 14:35	--	0.20	--	--
9/13/10 8:14	-0.37	0.20	0.10	-1.61
9/13/10 13:30	--	-0.41	--	--
9/14/10 7:13	-0.22	1.22	1.38	0.38
9/14/10 15:25	--	5.10	--	--
9/15/10 7:25	-0.17	-4.08	1.02	1.32
9/16/10 7:13	-0.27	0.41	0.66	0.03
9/17/10 7:35	-0.35	-3.06	-0.46	1.01
9/17/10 13:15	--	5.10	--	--

[a] Low Span = 490 ppm CH_4.
[b] % Difference = ((Output-Input)/Input) x 100
[c] Mid Span = 1960 ppm CH_4.
[d] High Span = 9860 ppm CH_4.

Table 3.6-10. TVA S/N: 5362 (Continued)

Timestamp	Zero (ppmv)	Low Span[a] % Difference [b]	Mid Span[c] % Difference	High Span[d] % Difference
9/20/10 7:43	-0.75	0.61	0.56	0.20
9/20/10 16:04	--	3.06	--	--
9/21/10 7:49	-0.15	0.20	1.28	0.81
9/21/10 15:20	--	2.04	--	--
9/22/10 7:41	0.24	2.04	-2.81	3.45
9/22/10 16:15	--	0.82	--	--
9/23/10 7:34	-0.08	1.63	1.79	0.66
9/23/10 15:42	--	4.49	--	--
9/24/10 7:45	0.53	-2.24	-1.53	0.11
9/24/10 13:45	--	-6.73	--	--
9/27/10 7:50	0.32	0.41	0.92	2.43
9/28/10 7:53	0.07	0.82	0.56	1.42
9/29/10 7:51	0.17	0.20	0.20	-0.12
9/30/10 3:10	-0.27	3.67	1.58	0.15
9/30/10 17:15	--	-1.63	--	--
10/4/10 7:38	-0.15	1.63	0.77	0.95
10/4/10 15:57	--	-3.27	--	--
10/5/10 7:42	0.39	-2.45	1.68	0.58
10/5/10 16:48	--	8.57	--	--
10/6/10 7:35	1.62	-4.08	-1.53	-1.52
10/6/10 16:20	--	5.10	--	--
10/7/10 7:30	0.98	-4.49	2.55	-1.12
10/7/10 16:28	--	9.80	--	--
10/8/10 7:30	1.31	2.04	0.66	-0.10
10/8/10 12:42	--	1.22	--	--
10/11/10 7:32	1.24	-2.86	-1.84	-2.13
10/11/10 16:04	--	4.49	--	--
10/12/10 7:23	-0.39	3.47	3.62	0.16
10/12/10 16:41	--	13.27	--	--
10/13/10 7:21	1.07	0.00	-25.20	-1.12
10/14/10 7:35	-0.08	0.61	0.36	6.49
10/14/10 16:59	--	-2.45	--	--
10/15/10 7:36	-0.73	1.02	0.92	-0.19
10/15/10 12:24	--	-2.45	--	--
10/18/10 7:32	0.71	1.02	1.79	0.06
10/19/10 7:28	-0.25	1.63	1.17	1.42
10/19/10 15:29	--	-2.45	--	--
10/20/10 7:34	1.51	4.49	-3.06	5.48
10/20/10 17:00	--	10.61	--	--

Table 3.6-11. TVA S/N: K10419 Calibration and Drift Check Results September – October 2010

Timestamp	Zero (ppmv)	Low Span[a] % Difference [b]	Mid Span[c] % Difference	High Span[d] % Difference
9/1/10 8:10	0.85	0.0	-0.3	-0.9
9/2/10 8:59	1.8	-0.6	-1.3	2.4
9/3/10 9:10	-0.46	1.8	1.1	1.4
9/3/10 12:36	--	-6.5	--	--
9/7/10 8:10	-0.63	-0.2	0.3	0.1
9/8/10 7:54	-0.26	0.8	-0.6	-0.2
9/9/10 7:34	1.9	0.6	0.2	0.3
9/10/10 8:10	1.13	1.0	1.0	0.4
9/13/10 7:23	0.47	-0.4	0.3	--
9/13/10 7:23	-1.33	-0.6	-0.3	1.0
9/14/10 7:25	-0.19	-1.0	1.2	0.2

[a] Low Span = 490 ppm CH_4.
[b] % Difference = ((Output-Input)/Input) x 100
[c] Mid Span = 1960 ppm CH_4.
[d] High Span = 9860 ppm CH_4.

Table 3.6-11. TVA S/N: K10419 (Continued)

Timestamp	Zero (ppmv)	Low Span[a] % Difference [b]	Mid Span[c] % Difference	High Span[d] % Difference
9/15/10 6:42	0.82	1.0	-1.3	0.0
9/16/10 7:20	0.62	0.8	1.6	1.0
9/20/10 7:43	0.73	-1.6	-0.7	-2.8
9/21/10 7:14	0.13	-0.2	0.2	0.0
9/22/10 7:28	0.42	-0.6	-0.4	1.0
9/23/10 9:29	2.7	0.2	-0.2	1.0
9/24/10 7:35	7.6	3.9	2.3	2.0
9/27/10 7:52	0.8	0.2	1.0	1.0
9/28/10 7:50	0.2	1.0	0.1	1.0
9/29/10 7:39	0.93	-1.0	-1.4	-1.5
9/30/10 8:19	0.39	-3.9	-0.6	0.0
9/30/10 17:16	--	-0.6	--	--
10/1/10 8:07	-0.35	2.4	0.6	1.0
10/4/10 8:00	1.29	1.2	2.5	1.0
10/4/10 0:00	--	3.9	--	--
10/5/10 7:45	0.49	4.5	2.1	1.0
10/6/10 7:52	0.21	0.8	0.1	0.2
10/6/10 10:23	--	-8.8	--	--
10/7/10 7:26	0.01	-2.0	0.9	1.0
10/7/10 15:26	--	7.3	--	--
10/11/10 7:29	0.45	-3.7	-1.3	-0.6
10/12/10 7:42	1.8	3.9	2.4	1.0
10/13/10 7:45	-0.25	5.1	0.4	1.0
10/13/10 17:30	--	1.2	--	--
10/14/10 7:40	1.12	0.0	-0.4	0.4
10/14/10 17:05	--	5.1	--	--
10/15/10 7:25	0.2	1.0	0.6	2.0
10/15/10 12:20	--	0.4	--	--
10/18/10 7:30	0.35	6.1	3.6	1.0
10/18/10 17:30	--	-0.6	--	--
10/19/10 7:50	1.15	-0.8	-6.6	-5.5
10/19/10 16:05	--	9.4	--	--
10/20/10 7:40	1.35	-2.0	-0.6	-1.4
10/20/10 16:40	--	-3.7	--	--
10/21/10 8:05	1.45	0.8	1.5	-0.4
10/21/10 15:40	--	-0.6	--	--

[a] Low Span = 490 ppm CH_4.
[b] % Difference = ((Output-Input)/Input) x 100
[c] Mid Span = 1960 ppm CH_4.
[d] High Span = 9860 ppm CH_4.

Table 3.6-12. TVA S/N: 5362 Calibration and Drift Check Results January – February 2011

Timestamp	Zero (ppmv)	Low Span[a] % Difference [b]	Mid Span[c] % Difference	High Span[d] % Difference
1/5/11 7:48	2.21	-1.6	-0.1	-1.2
1/6/11 7:07	-0.97	1.8	1.2	0.6
1/6/11 16:38	--	-6.7	--	--
1/7/11 15:42	--	4.1	--	--
1/8/11 7:09	-0.42	1.8	0.7	0.5
1/8/11 14:41		-3.9	--	--
1/10/11 7:35	-0.29	-2.2	2.4	1.0
1/11/11 7:18	0.39	0.0	0.6	-0.5
1/11/11 16:27		-3.1	--	--
1/12/11 7:45	-1.07	0.0	0.2	0.1
1/12/11 13:36	--	-1.6	--	--
1/12/11 16:48	--	-1.2	--	--
1/13/11 7:30	0.19	0.6	-0.1	0.0
1/13/11 14:50	--	3.3	--	--
1/13/11 17:25	--	-6.5	--	--
1/14/11 7:07	0.22	-1.6	0.8	0.0
1/14/11 17:47	--	25.9	--	--
1/15/11 7:30	1.21	0.0	-0.4	0.3
1/15/11 15:22	--	6.5	--	--
1/18/11 7:07	0.19	0.4	0.5	0.5
1/18/11 17:41	--	-6.1	--	--
1/19/11 7:22	0.51	0.8	-0.1	0.4
1/19/11 14:13	--	5.1	--	--
1/19/11 17:22	--	8.4	--	--
1/20/11 7:45	0.72	-1.0	2.3	1.0
1/20/11 18:09	--	5.9	--	--
1/21/11 7:12	1.07	0.2	0.1	0.7
1/21/11 16:11	--	0.0	--	--
1/21/11 17:00	--	2.9	--	--
1/22/11 7:19	1.2	0.4	-1.0	-0.4
1/22/11 13:45	--	-0.4	--	--
1/22/11 15:23	--	-1.0	--	--
1/24/11 7:30	0	-0.6	-0.2	-0.4
1/24/11 17:27	--	5.7	--	--
1/25/2011 6:40	0.61	-2.4	-1.6	-1.2
1/26/2011 6:55	0.13	-1.4	-0.9	-1.0
1/26/11 14:26	0.55	-3.7	-5.9	-3.8
1/26/11 17:30	--	0.4	--	--

[a] Low Span = 490 ppm CH_4.
[b] % Difference = ((Output-Input)/Input) x 100
[c] Mid Span = 1960 ppm CH_4.
[d] High Span = 9860 ppm CH_4.

Table 3.6-12. TVA S/N: 5362 (Continued)

Timestamp	Zero (ppmv)	Low Span[a] % Difference [b]	Mid Span[c] % Difference	High Span[d] % Difference
1/27/11 7:00	0.07	3.9	2.0	1.0
1/27/11 17:30	--	21.4	--	--
1/28/11 6:50	0.01	-0.4	-1.0	-0.3
1/28/11 18:10	--	-8.2	--	--
1/31/11 9:00	0.51	3.1	3.6	2.0
1/31/11 14:33	--	-3.1	--	--
1/31/11 17:22	--	2.4	--	--
2/3/11 10:45	0	0.4	0.1	0.1
2/3/11 17:52	--	3.7	--	--
2/5/11 11:33	0.56	1.2	1.0	-0.5
2/5/11 16:17	--	-2.4	--	--
2/6/11 8:26	0.55	0.0	-0.2	0.1
2/7/11 8:51	0	-4.1	0.2	0.0
2/7/11 15:36	--	1.2	--	--
2/7/11 17:05	--	-1.0	--	--
2/8/11 7:28	1.43	-0.2	0.4	0.7
2/8/11 16:45	--	3.3	--	--
2/10/11 11:12	0.59	0.4	2.0	0.0
2/10/11 16:45	--	5.7	--	--
2/11/11 7:25	0	0.8	0.8	-1.3
2/14/11 7:40	-1.71	-0.2	4.2	1.0
2/14/11 17:17	--	6.1	--	--
2/15/11 7:40	0.49	-0.6	-0.5	-1.1
2/15/11 16:55	--	-2.9	--	--
2/16/11 7:21	0.25	0.2	-0.1	0.8

Table 3.6-13. TVA S/N: 0528413543 Calibration and Drift Check Results January – February 2011

Timestamp	Zero (ppmv)	Low Span[a] % Difference [b]	Mid Span[c] % Difference	High Span[d] % Difference
1/4/11 8:10	0.55	-0.4	1.0	0.5
1/4/11 14:17	--	-2.7	--	--
1/5/11 7:36	1.15	-0.4	-0.3	-0.1
1/5/11 13:33	0.8	1.0	0.2	-12.5
1/5/11 14:42	--	-0.4	--	--
1/6/11 7:14	1.35	0.0	0.2	-0.5
1/6/11 12:35	--	-4.1	--	--
1/6/11 13:06	--	-2.7	--	--
1/6/11 15:18	--	-4.3	--	--
1/6/11 16:32	--	-3.3	--	--
1/7/11 7:43	N/A	-2.4	2.8	8.1
1/7/11 11:53	--	-1.8	--	--
1/7/11 15:04	--	-4.7	--	--
1/8/11 7:25	-2.14	-1.6	-1.5	-0.2
1/10/11 7:28	-8.88	-0.4	-1.5	-0.5
1/10/11 12:52	--	4.5	--	--
1/10/11 15:30	--	10.2	--	--
1/13/11 7:21	2.7	0.2	-0.2	0.0
1/13/11 14:47	--	7.3	--	--
1/13/11 16:32	--	-6.1	--	--
1/14/11 7:17	-9	0.4	0.2	-0.1

[a] Low Span = 490 ppm CH_4.
[b] % Difference = ((Output-Input)/Input) x 100
[c] Mid Span = 1960 ppm CH_4.
[d] High Span = 9860 ppm CH_4.

Table 3.6-14. TVA S/N: R6488 Calibration and Drift Check Results January – February 2011

Timestamp	Zero (ppmv)	Low Span[a] % Difference [b]	Mid Span[c] % Difference	High Span[d] % Difference
1/15/11 9:58	0	1.0	-1.5	1.0
1/15/11 17:20	--	-2.0	--	--
1/18/11 7:00	0.23	0.2	-1.5	-0.3
1/18/11 13:43	--	7.1	--	--
1/18/11 17:26	--	6.9	--	--
1/19/11 7:18	0.98	1.6	0.5	0.5
1/19/11 13:30	--	6.7	--	--
1/19/11 17:00	--	2.7	--	--
1/20/11 7:32	0.65	-3.3	0.3	0.5
1/20/11 13:50	--	7.1	--	--
1/21/11 7:05	0.89	-1.4	0.6	0.6
1/21/11 14:21	--	3.5	--	--
1/21/11 16:52	--	--	--	--
1/22/11 7:12	0.79	-2.2	-1.5	1.0
1/22/11 14:20	--	3.9	--	--
1/24/11 7:20	0	-0.4	-0.5	0.0
1/24/11 12:00	--	1.4	--	--
1/24/11 16:45	--	-17.1	--	--
1/25/11 7:00	0.01	-0.4	-0.4	-0.3
1/25/11 12:05	--	2.4	--	--
1/25/11 17:40	--	1.6	--	--
1/26/11 7:00	0.01	0.4	0.6	-0.6
1/26/11 11:45	--	1.2	--	--
1/26/11 14:55	--	1.8	--	--
1/27/11 6:50	0.03	0.2	-0.1	1.0
1/27/11 11:45	--	2.4	--	--
1/27/11 17:05	--	1.6	--	--
1/28/11 6:55	0.06	-1.6	-2.0	-0.7
1/28/11 11:45	--	2.4	--	--
1/28/11 16:20	--	1.8	--	--
1/31/11 7:39	0.5	-0.2	-2.0	-0.9
1/31/11 13:43	--	-5.3	-8.7	-7.5
1/31/11 17:55	--	-5.9	--	--
2/3/11 10:36	0	0.8	-2.0	0.0
2/3/11 15:16	--	-6.5	--	--

[a] Low Span = 490 ppm CH_4.
[b] % Difference = ((Output-Input)/Input) x 100
[c] Mid Span = 1960 ppm CH_4.
[d] High Span = 9860 ppm CH_4.

Table 3.6-14. TVA S/N: R6488 (Continued)

Timestamp	Zero (ppmv)	Low Span[a] % Difference [b]	Mid Span[c] % Difference	High Span[d] % Difference
2/5/11 11:25	1.03	-1.6	-1.1	0.3
2/5/11 14:56	--	-3.7	--	--
2/5/11 16:30	--	-6.5	--	--
2/6/11 8:20	0.12	2.4	-1.1	0.3
2/6/11 11:45	--	-0.8	--	--
2/7/11 8:39	0	0.0	0.4	0.7

Table 3.6-15. TVA S/N: R1376 Calibration and Drift Check Results January – February 2011

Timestamp	Zero (ppmv)	Low Span[a] % Difference [b]	Mid Span[c] % Difference	High Span[d] % Difference
2/8/11 10:18	0.61	-0.8	-0.2	0.2
2/8/11 13:51	--	-1.4	--	--
2/8/11 16:47	--	-2.7	--	--
2/10/11 10:59	0.23	-0.6	-0.7	-0.1
2/10/11 14:05	--	-0.8	--	--
2/11/11 7:15	0	0.4	0.6	1.0
2/11/11 16:35	--	-3.9	--	--
2/11/11 16:35	--	3.7	--	--
2/14/11 7:43	0.12	0.6	1.5	0.0
2/14/11 16:52	--	3.1	--	--
2/15/11 7:32	0.93	-0.6	-0.8	0.1
2/15/11 15:07	--	8.2	--	--
2/16/11 7:15	0.5	-0.8	-0.3	0.2
2/16/11 13:00	--	1.0	--	--
2/16/11 17:03	--	-1.0	--	--

[a] Low Span = 490 ppm CH_4.
[b] % Difference = ((Output-Input)/Input) x 100
[c] Mid Span = 1960 ppm CH_4.
[d] High Span = 9860 ppm CH_4.

3.6.4 Field Data Review

Field data was reviewed each week in Phase I by the acting QA|QC Officer. In Phase II, this role was divided between the two field team leaders. Each team leader checked the other team's field data for completeness and accuracy on a daily basis. The team leaders also checked periodically for consistency in sampling procedures and data recording between the two teams.

3.6.5 Canister Sample Collection QC

A strict canister sampling protocol was followed to ensure quality sampling results:

1. All canisters were vacuum checked prior to sampling. Canisters with vacuums less than 25 inches Hg were rejected.
2. Residual vacuums of 2 to 10 inches Hg were left in canisters following sample collection.
3. Canister collection data was recorded on data forms as well as in canister logbooks (one per team).
4. Standard canister Chain-of-Custody procedures were observed.
5. Between use and prior to shipping, canisters were kept securely in the project field office.
6. Five percent of the canister samples were collected in duplicate to provide a measure of total sampling and analytical variability.

Eight duplicate canister samples were collected. Comparisons of the analytical results for each duplicate pair are provided in Table 3.6-16 as the relative percent differences (% RPD) between analytes. Since each canister sample was analyzed by EPA Method TO-15 for VOCs and by ASTM D1946 for methane, Table 3.6-16 includes the results for both analytical techniques. The average percent relative differences for the duplicate canisters range between 11 to 61 percent. This is considered an acceptable result for field samples.

Table 3.6-16. Duplicate Canister Results

Site ID:	PS-134
Site Address:	5199 Village Creek Rd
Owner/Operator:	Quicksilver Resources
Date:	10/5/2010
Time:	10:00-11:30
Canister Numbers:	103 and HL 0887

Compounds	**Sample #A020**	**Sample #A021**	**RPD[a]**
Methane	255000	480000	61.2
Butane	16.1	32.9	68.6
Isopentane	2.30	2.51	8.7
Acetone	0.034	ND[b]	--
n-Pentane	1.53	1.08	34.5
Methylene chloride	0.0084	0.01120	28.6
Hexane	0.128	0.304	81.5
Benzene	1.87	3.01	46.7
Cyclohexane	1.10	1.32	18.2
Heptane	ND	0.0299	--
Toluene	0.852	1.93	77.5
n-Octane	ND	0.00876	--
Ethylbenzene	0.00531	0.0112	71.4
m-Xylene & p-Xylene	0.0466	0.0956	68.9
o-Xylene	0.0162	0.0316	64.4
Isopropylbenzene	0.00748	0.0134	56.7
n-Propylbenzene	0.0304	0.0574	61.5
4-Ethyltoluene	0.105	0.143	30.7
1,3,5-Trimethylbenzene	0.0599	0.12	66.8
1,2,4-Trimethylbenzene	0.145	0.381	89.7
n-Decane	ND	0.00681	--
sec-Butylbenzene	ND	0.00535	--
n-Undecane	ND	0.0187	--
n-Dodecane	0.128	1.49	168.4
		Average RPD:	61.8
		Maximum RPD:	168.4
		Minimum RPD:	8.7

[a] RPD = Relative Percent Difference = 100* Absolute Value(X1-X2)/ ((X1+X2)/2)
[b] ND = None Detected

Table 3.6-16. (Continued)

Site ID:	PS-171
Site Address:	3892 Lou Stevenson (Walls Coleman)
Owner/Operator:	Chesapeake Operating Inc.
Date:	10/14/2010
Time:	13:38-16:15
Canister Numbers:	5440 and RA 2402

Compounds	**Sample #B034**	**Sample #B035**	**RPD**
Methane	357000	334000	6.7
Chloromethane	0.00837	ND	--
Butane	8.18	7.86	4.0
Isopentane	0.486	0.494	1.6
Acetone	0.0196	0.0133	38.3
n-Pentane	0.490	0.539	9.5
Methylene chloride	0.01340	0.01450	7.9
Hexane	0.0165	0.0481	97.8
Benzene	0.188	0.370	65.2
Cyclohexane	0.183	0.249	30.6
Toluene	ND	0.0975	--
1,2,4-Trichlorobenzene	0.0199	ND	--
Naphthalene	0.0230	ND	--
n-Dodecane	0.0154	ND	--
1,2,3-Trichlorobenzene	0.0293	ND	--
Hexachlorobutadiene	0.00863	ND	--
		Average RPD:	29.1
		Maximum RPD:	97.8
		Minimum RPD:	1.6

Table 3.6-16. (Continued)

Site ID:	176
Site Address:	11593 Saginaw Blvd
Owner/Operator:	Devon Energy Production Co
Date:	1/7/2011
Time:	11:55-14:45
Canister Numbers:	HL 0979 and 240

Compounds	**Sample #A036**	**Sample #A037**	**RPD**
Methane	65800	63800	3.1
Butane	1.20	1.14	5.1
Isopentane	0.0830	0.0833	0.4
n-Pentane	0.0525	0.0525	0.0
Methylene chloride	0.01260	0.01290	2.4
Benzene	0.117	0.115	1.7
Cyclohexane	0.0321	0.0255	22.9
Toluene	0.0906	0.0755	18.2
m-Xylene & p-Xylene	0.0289	0.0182	45.4
		Average RPD:	11.0
		Maximum RPD:	45.4
		Minimum RPD:	0.0

Table 3.6-16. (Continued)

Site ID:	161
Site Address:	10999 Willow Springs Rd
Owner/Operator:	Devon Energy Production Co
Date:	1/15/2011
Time:	11:00-13:15
Canister Numbers:	RA 2247 and 221

Compounds	**Sample #A042**	**Sample #A043**	**RPD**
Methane	63800	35400	57.3
Butane	1.52	1.01	40.3
Isopentane	0.210	0.138	41.4
n-Pentane	0.103	0.0545	61.6
Methylene chloride	0.01080	0.0110	1.8
Hexane	0.0231	0.00570	120.8
Benzene	0.0803	0.0499	46.7
Cyclohexane	0.0250	0.0160	43.9
Toluene	0.0574	0.0299	63.0
m-Xylene & p-Xylene	0.0265	ND	--
1,2,4-Trimethylbenzene	0.00752	ND	--
		Average RPD:	52.9
		Maximum RPD:	120.8
		Minimum RPD:	1.8

Table 3.6-16. (Continued)

Site ID:	153
Site Address:	2492 Blue Mound Rd W
Owner/Operator:	Devon Energy Production Co
Date:	1/19/2011
Time:	14:30-17:10
Canister Numbers:	203 and 5424

Compounds	**Sample #A047**	**Sample #A048**	**RPD**
Methane	118000	76200	43.1
Butane	2.28	1.57	36.9
Isopentane	0.139	0.0903	42.5
n-Pentane	0.0850	0.0533	45.8
Methylene chloride	0.010	0.01320	27.6
Benzene	0.189	0.144	27.0
Cyclohexane	0.0431	0.0295	37.5
Toluene	0.0475	0.0483	1.7
		Average RPD:	32.8
		Maximum RPD:	45.8
		Minimum RPD:	1.7

Table 3.6-16. (Continued)

Site ID:	240
Site Address:	1392 Conell Sampson Rd
Owner/Operator:	XTO Energy Inc
Date:	1/27/2011
Time:	10:25-12:48
Canister Numbers:	KA 2315 and HL 0930

Compounds	**Sample #A059**	**Sample #A060**	**RPD**
Methane	21300	39400	59.6
Butane	1.01	1.99	65.3
Isopentane	0.0823	0.164	66.3
n-Pentane	0.0377	0.0648	52.9
Methylene chloride	0.01390	0.02050	38.4
Benzene	0.0820	0.143	54.2
Cyclohexane	0.0213	0.0362	51.8
Toluene	0.0440	0.0855	64.1
		Average RPD:	56.6
		Maximum RPD:	66.3
		Minimum RPD:	38.4

Table 3.6-16. (Continued)

Site ID:	238
Site Address:	798 Industrial Rd
Owner/Operator:	XTO Energy Inc
Date:	1/31/2011
Time:	10:55-16:25
Canister Numbers:	279 and 217

Compounds	**Sample #A065**	**Sample #A066**	**RPD**
Methane	549000	528000	3.9
Butane	132	106	21.9
Isopentane	21.0	19.8	5.9
Acetone	0.0968	0.0898	7.5
n-Pentane	6.69	5.84	13.6
Methylene chloride	0.02310	0.01680	31.6
Hexane	2.90	2.65	9.0
Benzene	17.2	16.6	3.6
Cyclohexane	4.37	4.57	4.5
Heptane	0.269	0.259	3.8
Toluene	14.2	12.6	11.9
n-Octane	0.0285	0.0242	16.3
Ethylbenzene	0.139	0.126	9.8
m-Xylene & p-Xylene	3.67	3.04	18.8
o-Xylene	0.442	0.368	18.3
n-Nonane	0.0106	ND	--
Isopropylbenzene	0.0162	0.0129	22.7
n-Propylbenzene	0.0209	0.0176	17.1
4-Ethyltoluene	0.0312	0.0242	25.3
1,3,5-Trimethylbenzene	0.214	0.144	39.1
1,2,4-Trimethylbenzene	0.178	0.101	55.2
n-Decane	0.0126	0.00762	49.3
Naphthalene	0.0232	ND	--
1,2,3-Trichlorobenzene	0.0219	ND	--
Hexachlorobutadiene	0.00995	ND	--
		Average RPD:	18.5
		Maximum RPD:	55.2
		Minimum RPD:	3.6

Table 3.6-16. (Continued)

Site ID:	426
Site Address:	692 Bridgewood Dr
Owner/Operator:	Chesapeake Operating Inc.
Date:	2/11/2011
Time:	9:50-12:25
Canister Numbers:	RA 2173 and RA 2150

Compounds	Sample #B095	Sample #B096	RPD
Methane	76600	93800	20.2
Butane	1.98	2.46	21.6
Isopentane	0.135	0.162	18.2
n-Pentane	0.0664	0.0694	4.4
Methylene chloride	0.01180	0.01200	1.7
Benzene	0.135	0.173	24.7
Cyclohexane	0.0177	0.0101	54.7
Toluene	0.0383	0.0522	30.7
		Average RPD:	22.1
		Maximum RPD:	54.7
		Minimum RPD:	1.7

3.6.6 Analytical QC Results

To ensure high quality analytical results, TestAmerica™ performed several quality control checks during the analysis of each batch of canister samples received by them from the point source team. The most significant of these were: Method Blanks, Surrogate Recoveries, Laboratory Control Samples and Control Sample Duplicates, and Continuing Calibration Verification checks.

Method Blanks

Analytical method blanks were analyzed by TestAmerica™ either daily or after a certain number samples (i.e. after each batch of 20 samples). The method blank is treated like any other sample except that a clean material, free from any of the sample targets, is used. The results of the method blank indicate if any contaminants are present in the analytical system. The only compound that routinely appeared in the analytical method blanks associated with this project's canister samples was small amounts of methylene chloride, a common laboratory solvent. In calculating the canister emission factors the amount of methylene chloride detected in the method blank was subtracted from the reported methylene chloride result. Method blank results are provided for each canister sample result in the TestAmerica™ analytical reports provided in Appendix 3-C.

Surrogate Recoveries

A surrogate standard is a non-target analyte having a chemical structure similar to the target analytes that is added to a sample prior to extraction. Six surrogate standards were added to each point source canister sample prior to extraction and their percent recoveries were evaluated following analysis of the canister's contents. The surrogates monitor the efficiency of the extraction, the cleanup, and evaporation of the solvent if any has been used on the sample. Surrogate percent recoveries for each canister result together with acceptable recovery limits are provided with each of TestAmerica's™ analytical reports contained in Appendix 3-C.

Laboratory Control Samples and Control Sample Duplicates

The Laboratory Control Sample (LCS) is a clean matrix that is fortified with the target analytes and analyzed in the same manner as a batch of samples is analyzed. Since in this case the concentration of each analyte is known, the resulting values provide a measure of the accuracy of the system for each analyte. As a further measure of quality control, the LCS is analyzed in duplicate and the relative percent difference between the two results is calculated and evaluated against the laboratory's acceptance criteria. Both LCS and LCS duplicate results are provided towards the conclusion of each TestAmerica™ report.

Continuing Calibration Verification

Continuing Calibration Verification (CCV) checks are performed over specific time periods during sample analysis to confirm the instrument's calibration and performance. A CCV check was performed by TestAmerica™ with each batch of sample analyses. The results are evaluated as the percent recoveries of the known analyte concentrations making up the CCV spike. The results of each CCV check are reported under the heading "Calibration Check" in the TestAmerica™ documentation located in Appendix 3-C.

3.7 Point Source Testing Conclusions

Point source testing was conducted to determine how much air pollution is being released by natural gas exploration in Fort Worth, and if natural gas extraction and processing sites comply with environmental regulations. The point source testing program occurred in two phases, with Phase I occurring from August through October of 2010, and Phase II occurring in January and February of 2011. Under the point source testing program, field personnel determined the amount of air pollution released at individual well pads, compressor stations, and other natural gas processing facilities by visiting 388 sites, includes two repeat visits, and testing the equipment at each site for emissions using infrared cameras, toxic vapor analyzers (TVAs), Hi Flow Samplers, and evacuated canisters to collect emission samples for laboratory analysis.

TOC, VOC, and HAP emissions were calculated on an annual basis for each site as the sum of 1) direct canister sample results; 2) adjusted canister results using correlation equations; 3) tank and non-tank surrogate emission profiles; 4) engine emission data; and 5) default zero emission factors. Emissions associated with tank unloading, tank flashing, well snubbing, glycol

reboilers, flares or any type of maintenance/repair activities were not included in the calculated site emissions profiles.

Key findings from the point source testing program are as follows:

- A total of 2,126 emission points were identified in the four month field study: 192 of the emission points were Valves, 644 were Connectors and 1,290 were classified as Other Equipment. 1,330 emission points were detected with the IR camera (i.e. high level emissions) and 796 emission points were detected by Method 21 screening (i.e. low level emissions).
- At 96 sites, no emissions were detected by the IR camera. At 46 sites, no emissions were detected by either the IR camera or the TVA. Of these 46 sites, 38 had less than three wells and subsequently lower auxiliary equipment counts such as tanks, separators, valves, and connectors.
- Emissions from lift compressors have a significant impact on well pad emissions. Most lift compressors are mobile and are moved from site to site as needed. The addition of a lift compressor to a well pad site has the effect of raising TOC emissions four-fold while emitting an average 16 tons/yr of criteria pollutants.
- The largest source of fugitive emissions detected with the IR camera was leaking tank thief hatches. Emissions were detected at 252 tank thief hatches resulting in a combined TOC emission rate of 4,483 tons/yr. Some of these emissions were due to the operators simply leaving the hatches unsecured as shown in Figure 3.7-1 below. Many others, however, appeared to be due to lack of proper maintenance.

Figure 3.7-1. Thief Hatch Left Open

- Pneumatic Valve Controllers were the most frequent emission sources encountered at well pads and compressor stations. These controllers use pressurized natural gas to

actuate separator unloading valves. Under normal operation a pneumatic valve controller is designed to release a small amount of natural gas to the atmosphere during each unloading event. Due to contaminants in the natural gas stream, however, these controllers eventually fail (often within six months of installation) and begin leaking natural gas continually. The emissions from the 489 failed pneumatic valve controllers detected by the point source team result in a combined TOC emission rate of 3,003 tons per year.

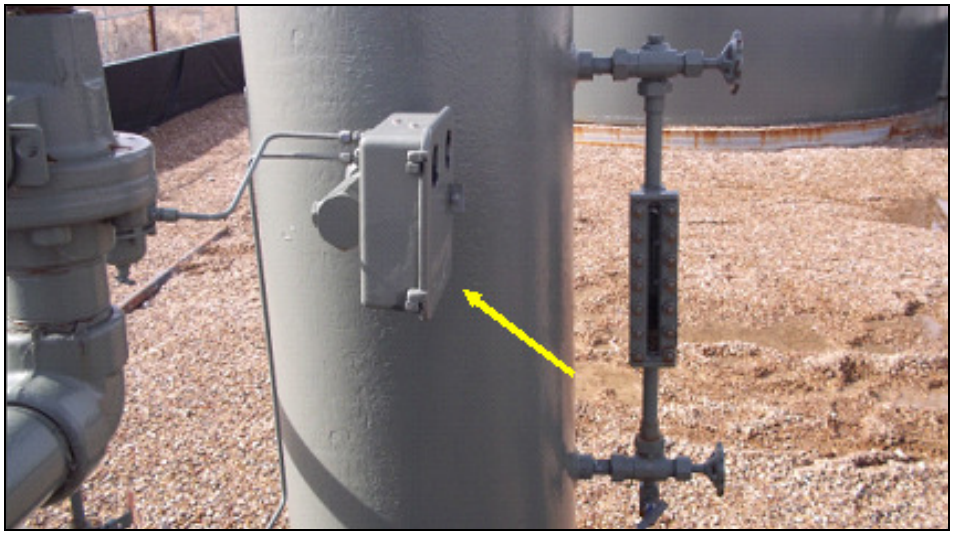


Figure 3.7-2. Pneumatic Valve Controller on Separator

- Emissions from 175 storage tank vents were detected by the IR camera accounting for a combined total of 2,076 tons of TOC per year. In numerous instances several tanks would be manifolded to one vent controlled by a pressure relief valve. In these cases, vent emissions detected with the IR camera indicated a failure of the pressure relief valve.

Figure 3.7-3. Storage Tank Vent

- Emissions from 257 leaking natural gas pressure regulators accounted for a combined TOC total of 614 tons/yr.

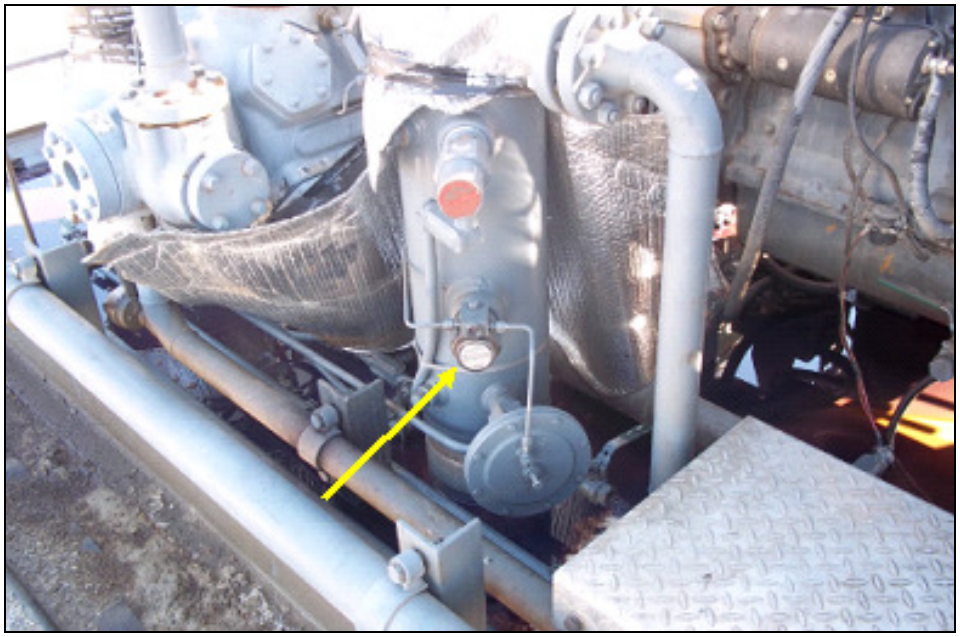


Figure 3.7-4. Natural Gas Pressure Regulator

- Fifty-five (55) instances of emissions from miscellaneous equipment were detected, accounting for a combined TOC emission rate of 731 tons/yr. Miscellaneous equipment includes pinholes, compressor shafts, sumps, knock-out pots, underground piping, glycol contactor controllers, pressure indicators, and quite frequently, holes or breaks in the tank roofs (Figure 3.7-5).

Figure 3.7-5. Hole in Tank Roof - Miscellaneous Emission Source

- No natural gas emissions associated with drilling and fracking activities were detected by the IR camera. Engine emissions associated with these activities were estimated based upon vendor data and published emission factors.
- Emissions were detected from a well completion activity with the IR camera. However, no measurements were taken using the TVA and Method 21 screening procedures and/or the highflow sampler due to safety considerations.
- Emissions were also detected at the Salt Water Treatment facility using the TVA. No emissions were detected using the IR camera. The emissions that were detected with the TVA resulted from minor fugitive emission components only. The Evaporative Unit was not able to be tested since it was out of service during the point source survey.
- Although there was little difference in average TOC emissions between dry and wet gas sites, average VOC and HAP emissions from wet gas sites proved to be considerably higher than dry gas sites as would be expected due to the additional storage and loading of condensate at wet gas sites.
- An Encana Oil & Gas Well Pad (Site ID PS-184) located at 10590 Chapin Road had the highest VOC emissions among well pads (22 tons/yr). This site had only a single well, with two tanks. However, it also had one large line compressor (Caterpillar G-399). Twelve (12) emission points were detected at this site with the IR camera: Four in the area of the separators, three on the tanks, and five at the compressor.