

Fort Worth Natural Gas Air Quality Study

Michael O. Pring, Regi Oommen
Eastern Research Group, Inc., 1600 Perimeter Park, Morrisville, NC 27560
mike.pring@erg.com, regi.oommen@erg.com

John Wilhelmi
Eastern Research Group, Inc., 160 State Street, 9th Floor, Boston, MA 02109
john.wilhelmi@erg.com

ABSTRACT

Natural gas production has increased significantly across the U.S. recently due to advances in drilling and extraction technology. One such technology, hydraulic fracturing, has been used extensively in and around the City of Fort Worth, Texas, where natural gas extraction in urban areas is prevalent. This increased activity has led to efforts by various stakeholders in understanding the scope and magnitude of associated air quality impacts affecting the City. In March 2010, the City commissioned an Air Quality Committee to design a study to address air quality impacts associated with this activity. This year-long study was comprised of four tasks - ambient air monitoring to measure air pollution levels near active well pads, natural gas compressor stations, and natural gas well hydraulic fracturing activities; point source testing to measure the pollutants emitted from these sites; air dispersion modeling conducted to estimate downwind impacts from these activities; and a public health evaluation of the study's findings.

Ambient air monitoring for nearly 140 pollutants was conducted at 8 locations over a 2-month period, and point source testing was conducted at nearly 400 sites over a 4-month period. The results of the point source testing were used to conduct air dispersion modeling to estimate air pollutant impacts resulting directly from natural gas exploration and production activities. The ambient air monitoring and air dispersion modeling data were then compared to both short and long-term health-based screening levels. These comparisons were used to provide the City of Fort Worth with feedback on the adequacy of their existing setback provisions, which limit how close natural gas well pads and compressor stations may be to residences and other publically accessible locations.

INTRODUCTION

Natural gas production has increased significantly across the U.S. in the last several years due to advances in drilling and extraction technology. One such technology, hydraulic fracturing, has been used extensively in the Barnett Shale region in north central Texas. Within the Barnett Shale is the City of Fort Worth (population of over 740,000 residents), where natural gas extraction in urban areas is prevalent. This increased activity has led to efforts by various stakeholders in understanding the scope and magnitude of associated air quality impacts affecting the City. In March 2010, the City commissioned an Air Quality Committee to design the parameters of a study to answer policy-relevant questions regarding natural gas activities within the City. The study was initiated in August 2010 with four general areas: air toxics

Table 1. Average and Maximum Point Source Emission Rates by Site Type^a

Site Type	TOC (tons/yr)		VOC (tons/yr)		HAP (tons/yr)		Criteria Pollutants ^a (tons/yr)	
	Average	Max	Average	Max	Average	Max	Average	Max
Well Pad	16	445	0.07	8.6	0.02	2	-0-	-0-
Well Pad with Compressor(s)	69	430	2	22	0.9	8.8	16	236
Compressor Station	90	276	16	43	9.4	25	167	571
Processing Facility	1,293	1,293	80	80	47	47	1,128	1,128
Saltwater Treatment Facility	0.3	0.3	<0.01	<0.01	<0.01	<0.01	-0-	-0-

^a Criteria Pollutants include VOC, PM, SO₂, CO and NO_x from engine exhausts.

The following points provide general and specific conclusions drawn from the results of the point source testing, including some specific observations made while conducting the field work.

- 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); 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. In general these were smaller sites containing less equipment (tanks, wellheads, separators, and metering runs). Of these 96 sites, 82% contained 3 wells or less.
- The Total Organic Compound (TOC), Volatile Organic Compound (VOC) and Hazardous Air Pollutant (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; 5) engine emission data; and 6) 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.
- 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 releasing on an annual basis 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 4,440 tons/yr. Some of these emissions were due to the operators simply leaving the hatches unsecured as shown in Figure 2 below. Many others, however, appeared to be due to lack of proper maintenance.