This section summarizes the criteria and hazardous air pollutant emission calculation methodologies and provides emission calculations for the emission sources at the proposed new Longhorn Gas Plant.

Detailed emission calculation spreadsheets, including example calculations, are included at the end of this section. These emission estimates reflect the emission limits chosen as Best Management Practices (BMP) and/or Best Available Control Technology (BACT) in Section 11.

The following emission units are included in the emission calculations provided at the end of this section:

- Three natural gas heaters (Emission Point Numbers [EPN] 1, 3, 4);
- One amine treating unit (Facility Identification Number [FIN] 15);
- One TEG dehydrator (FIN 2);
- One RTO (EPN 5);
- Two flares (EPN 6, 6-MSS, 15, 15-MSS);
- Nine storage tanks (EPNs 10, 11, 12, 13, 14, 16, 17, 18, 19) and an open drain sump (EPN 21);
- Fugitive emissions from truck loading (EPN FUG-2);
- Fugitive emissions from piping components (EPN FUG-1); and
- Fugitive emissions from maintenance, start-up and shutdown activities (EPNs 5-MSS, 7-MSS, 8-MSS, 20-MSS, FUG-MSS).

7.1. HEATERS

The Longhorn Gas Plant will include three natural gas-fired heaters: TEG Reboiler (EPN 1), Regeneration Heater (EPN 3), and Amine Unit Reboiler (Hot Oil Heater [EPN 4]). Combustion of natural gas will result in emissions of NO_x, CO, VOC, $PM/PM_{10}/PM_{2.5}$, and SO_2.

Emissions factors for the TEG Reboiler (EPN 1) and Amine Unit Reboiler (Hot Oil Heater [EPN 4]) for NO_x and CO are based on manufacturer guarantees; VOC, $PM/PM_{10}/PM_{2.5}$, and SO_2 emission factors are obtained from U.S. EPA AP-42 Section 1.4, Table 1.4-2.[5] Emission factors for the Regeneration Heater (EPN 3) for NO_x, CO, and VOC are based on manufacturer guarantees; $PM/PM_{10}/PM_{2.5}$ and SO_2 emission factors are obtained from U.S. EPA AP-42 Section 1.4, Table 1.4-2.[6]

The emission factors for VOC, $PM/PM_{10}/PM_{2.5}$, and SO_2 obtained from AP-42 Table 1.4-2 are converted from lb/MMscf of natural gas fired to lb/MMBtu heat input by dividing the emission factor by the average natural gas heating value of 1,020 Btu/scf, per AP-42 Table 1.4-2, footnote a. The emission factors also were converted to the site-specific natural gas heating value by multiplying by the ratio of the site-specific heating value to the average heating value of 1,020 Btu/scf. An example conversion calculation follows:

$$\text{Emission Factor}\left(\frac{\text{lb}}{\text{MMBtu}}\right) = \frac{\text{AP-42 Emission Factor}\left(\frac{\text{lb}}{\text{MMscf}}\right)}{1{,}020\left(\frac{\text{Btu}}{\text{scf}}\right)} \times \frac{\text{Site-Specific Heating Value}\left(\frac{\text{Btu}}{\text{scf}}\right)}{1{,}020\left(\frac{\text{Btu}}{\text{scf}}\right)}$$

5 U.S. EPA AP-42 Section 1.4, Natural Gas Combustion from External Combustion Sources (July 1998).

6 Ibid.

The PM emission factor obtained from AP-42 Table 1.4-2 represents total PM (i.e., filterable plus condensable). Additionally, all PM is assumed to be less than 1.0 micrometer in diameter, according to AP-42 Table 1.4-2, footnote c. Therefore, the total PM emission factor is used to estimate total PM_{10} and total $PM_{2.5}$.

Hourly emission rates are based on the maximum heat input rating (MMBtu/hr) for each heater. Annual emission rates are based on maximum operation equivalent to 8,760 hrs/yr. The following are example calculations for hourly and annual NO_X, CO, VOC, $PM/PM_{10}/PM_{2.5}$, and SO_2 emission rates from the heaters:

$$\text{Hourly Emission Rate}\left(\frac{\text{lb}}{\text{hr}}\right) = \text{Heat Input Rating}\left(\frac{\text{MMBtu}}{\text{hr}}\right) \times \text{Emission Factor}\left(\frac{\text{lb}}{\text{MMBtu}}\right)$$

$$\text{Annual Emission Rate (tpy)} = \text{Hourly Emission Rate}\left(\frac{\text{lb}}{\text{hr}}\right) \times \text{Hours of Operation}\left(\frac{\text{hr}}{\text{yr}}\right) \times \left(\frac{\text{ton}}{\text{2,000 lb}}\right)$$

7.2. AMINE TREATER

The Longhorn Gas Plant will include one amine treater (FIN 15). Emissions during normal operations from the amine still vent will be routed to the RTO (EPN 5), which has a destruction rate efficiency (DRE) of 99%. During RTO downtime, the amine emissions will be routed to the flare (EPN 15) which has a DRE of 99% for compounds containing no more than 3 carbons that contain no elements other than carbon and hydrogen. The DRE is 98% for all other compounds. A discussion of emissions that occur during normal operations when the amine still vent is routed to the RTO is located in Section 7.4. A discussion of the emissions that occur during RTO downtime when the vent is routed to the flare is located in Section 7.5.

7.3. GLYCOL DEHYDRATOR

The Longhorn Gas Plant will include one TEG dehydrator (FIN 2), which has a condenser to aid in the control of emissions. Emissions during normal operations from the condenser stream will be routed to the RTO (EPN 5), which has a DRE of 99%. During RTO downtime the condenser stream emissions will be routed to the flare (EPN 15) which has a DRE of 99% for compounds containing no more than 3 carbons that contain no elements other than carbon and hydrogen. The DRE is 98% for all other compounds. A discussion of emissions that occur during normal operations when the condenser stream is routed to the RTO is located in Section 7.4. A discussion of the emissions that occur during RTO downtime when the vent is routed to the flare is located in Section 7.5.

7.4. REGENERATIVE THERMAL OXIDIZER

The Longhorn Gas Plant will be equipped with one RTO (EPN 5) to control emissions from the amine unit and glycol dehydrator. Emissions of NO_x, CO, VOC, SO_2, H_2S, and HAPs from the RTO will result from the combustion of the amine still vent (FIN 15) and TEG dehydrator (FIN 2) waste streams. Additionally, the RTO will utilize a gas-fired burner system during startup. The RTO has a control efficiency of 99%.

7.4.1. RTO Normal Operations

Uncontrolled emissions from the RTO during normal operation will result due to the 1% inefficiency of the RTO. The calculations are discussed in more detail below.

VOC and HAP Hourly Emissions

Uncontrolled VOC and HAP hourly emissions from the amine unit and TEG dehydrator are calculated using the ProMax® output for the condenser and waste streams. The following equation is used to estimate hourly VOC and HAP emission rates:

$$\text{Uncontrolled Hourly Emission Rate}\left(\frac{\text{lb}}{\text{hr}}\right) = \text{ProMax Output Stream Data}\left(\frac{\text{lb}}{\text{hr}}\right) \times (1 - \text{DRE}\ [\%])$$

The ProMax Simulation output file for the amine unit and TEG dehydrator is provided in Appendix A for reference. The inlet gas speciation to the amine unit and dehydrator is also contained in the output file. The speciation does not contain H_2S because the site will be processing sweet natural gas.

H_2S Hourly Emissions

Uncontrolled hourly H_2S emissions are based on an estimated H_2S content of 70 ppmv or 0.007 mol % maximum. The following equation is used to estimate hourly emission rates for H_2S:

$$\begin{aligned}&\text{Uncontrolled Hourly } H_2S \text{ Emissions Rate}\left(\frac{\text{lb}}{\text{hr}}\right)\\ &= H_2S\ \text{MW}\left(\frac{\text{lb}}{\text{lb} - \text{mol}}\right) \times H_2S\ \text{ Composition (mol \%)} \times \text{ Waste Gas Flowrate}\left(\frac{\text{MMscf}}{\text{day}}\right)\\ &\times \left(\frac{10^6\ \text{scf}}{\text{MMscf}}\right) \times \left(\frac{1\ \text{day}}{24\ \text{hr}}\right) \times \left(\frac{1\ \text{lb} - \text{mole}}{379.5\ \text{scf}}\right) \times (1 - \text{DRE}\ [\%])\end{aligned}$$

Annual Emissions

Annual emission rates for uncontrolled VOC, HAP, and H_2S are estimated based on the hourly emission rate as shown in the following equation:

$$\begin{aligned}&\text{Uncontrolled Annual Emission Rate (tpy)}\\ &= \text{Hourly Emission Rate}\left(\frac{\text{lb}}{\text{hr}}\right) \times \text{ Annual Hours of Operation}\left(\frac{\text{hr}}{\text{yr}}\right) \times \left(\frac{\text{ton}}{2{,}000\ \text{lb}}\right)\end{aligned}$$

The controlled emissions resulting from the combustion of the waste streams during normal operation are discussed below.

NO_x and CO Hourly Emissions

Emissions factors for NO_x and CO are based on manufacturer guarantees for the stack gas concentration. Hourly emission rates are based on the stack flowrate (lb-mol/hr), as shown in the following equation:

$$\begin{aligned}&\text{Hourly Emission Rate}\left(\frac{\text{lb}}{\text{hr}}\right)\\ &= \text{Stack Flowrate}\left(\frac{\text{lb-mol}}{\text{hr}}\right) \times \frac{\text{Stack Gas Concentration (ppm)}}{1{,}000{,}000} \times \text{Molecular Weight}\left(\frac{\text{lb}}{\text{lb-mol}}\right)\end{aligned}$$

H_2S, VOC, and HAP Hourly Emissions

Controlled hourly emission rates of VOC, H_2S and HAP, as controlled by the RTO, are estimated using the inlet to RTO as calculated above and the guaranteed DRE. The following equation is used to estimate hourly VOC, H_2S, and HAP emission rates from the controlled streams:

$$\text{Controlled Hourly Emission Rate}\left(\frac{\text{lb}}{\text{hr}}\right) = \text{Inlet to RTO}\left(\frac{\text{lb}}{\text{hr}}\right) \times [1 - \text{Destruction Rate Efficiency (\%)}]$$

SO_2 Hourly Emissions

SO_2 emissions are based on the conversion of sulfur during the destruction of inlet H_2S using a mass balance equation for the amount of H_2S that goes into and out of the RTO and the ratio of the molecular weights of SO_2 and H_2S. The equation is used to estimate hourly SO_2 emission rates from the controlled streams:

$$\text{Controlled Hourly SO}_2\text{ Emission Rate}\left(\frac{\text{lb}}{\text{hr}}\right) = \text{Inlet H}_2\text{S to RTO}\left(\frac{\text{lb}}{\text{hr}}\right) - \text{Outlet H}_2\text{Sto RTO}\left(\frac{\text{lb}}{\text{hr}}\right) \times \left(\frac{\frac{64.06\text{ lb}}{\text{lb-mol}}}{\frac{34.08\text{ lb}}{\text{lb-mol}}}\right)$$

Annual Emissions

Annual emission rates of NO_x, CO, VOC, SO_2, H_2S, and HAPs are based on hourly emission rates and maximum operation equivalent to 8,760 hrs/yr, as shown in the following equation:

$$\text{Annual Emissions (tpy)} = \text{Hourly Emissions}\left(\frac{\text{lb}}{\text{hr}}\right) \times \text{Hours of Operation}\left(\frac{\text{hrs}}{\text{yr}}\right) \times \left(\frac{\text{ton}}{2{,}000\text{ lb}}\right)$$

7.4.2. RTO Startup Operations

The RTO may periodically be shutdown for planned maintenance activities. The RTO will utilize a gas-fired burner system (EPN 5-MSS) to bring the RTO up to combustion temperature during startup. After the system has reached temperature, the burners will be shut off and the system will function using the energy content of the amine and dehydrator waste streams alone to support combustion. Emissions from the startup burner system will result from the combustion of pipeline quality natural gas. No emissions are expected from the RTO during shutdown or maintenance activities. Emissions from the amine and dehydrator streams during RTO downtime are addressed in Section 7.5.

NO_x, CO, VOC, and SO_2 Hourly Emissions

Emission factors for NO_X and CO for the startup burner system are based on manufacturer guarantees. Hourly emission rates are based on the startup burner rating (MMBtu/hr).
Combustion emissions from VOC and SO_2 for the burner system are calculated using the emission factors from U.S. EPA AP-42 Section 1.4, Table 1.4-2.[7] The emission factors for VOC and SO_2 obtained from AP-42 Table 1.4-2

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[7] U.S. EPA AP-42 Section 1.4, Natural Gas Combustion from External Combustion Sources (July 1998).

are converted from lb/MMscf of natural gas fired to lb/MMBtu heat input by dividing the emission factor by the average natural gas heating value of 1,020 Btu/scf, per AP-42 Table 1.4-2, footnote a. The emission factors also were converted to the site-specific natural gas heating value by multiplying by the ratio of the site-specific heating value to the average heating value of 1,020 Btu/scf. An example conversion calculation follows:

$$\text{Emission Factor}\left(\frac{\text{lb}}{\text{MMBtu}}\right)=\frac{\text{AP-42 Emission Factor}\left(\frac{\text{lb}}{\text{MMscf}}\right)}{1{,}020\ \left(\frac{\text{Btu}}{\text{scf}}\right)}\times\frac{\text{Site-Specific Heating Value}\ \left(\frac{\text{Btu}}{\text{scf}}\right)}{1{,}020\ \left(\frac{\text{Btu}}{\text{scf}}\right)}$$

The following equation is used to estimate hourly NO_X, CO, VOC and SO_2 emission rates from the startup burner system:

$$\text{Hourly Emission Rate}\ \left(\frac{\text{lb}}{\text{hr}}\right)=\text{Startup Burner Rating}\left(\frac{\text{MMBtu}}{\text{hr}}\right)\times\ \text{Emission Factor}\ \left(\frac{\text{lb}}{\text{MMBtu}}\right)$$

<u>Annual Emissions</u>

Annual RTO startup emissions of NO_X, CO, VOC and SO_2 are estimated based on hourly emissions and the expected startup duration frequency, as shown in the equation below:

$$\begin{aligned}&\text{Annual Emission Rate (tpy)}\\&=\text{Hourly Emission Rate}\ \left(\frac{\text{lb}}{\text{hr}}\right)\times\ \text{Hours per Event}\left(\frac{\text{hr}}{\text{event}}\right)\times\ \text{Events per Year}\left(\frac{\text{event}}{\text{yr}}\right)\\&\times\ \left(\frac{\text{ton}}{2{,}000\ \text{lb}}\right)\end{aligned}$$

7.5. FLARES

The Longhorn Gas Plant will be equipped with two flares. One flare (EPN 6) will be used to destroy the off-gas produced during emergency situations, pigging, and electric-driven compressor blowdowns. Emissions from emergency events are not included in this application since they are non-routine. The other flare (EPN 15) will be used to control the emissions from the amine still vent and TEG dehydrator waste streams when the RTO is down for maintenance.

7.5.1. Flare #1 (EPN 6)

Emissions of NO_X, CO, VOC, SO_2, and HAPs from the flare will result from the combustion of pipeline quality natural gas in the pilot (EPN 6) and the combustion of gas vented during pigging and electric-driven compressor blowdowns (EPN 6-MSS). Emissions from pilot gas combustion are estimated using the design pilot gas flowrate, and the residue gas analysis. Emissions from combusting gas vented during pigging operations are estimated using the expected gas volume and the inlet gas analysis. It is expected that the entire gas volume vented during pigging will be routed to the flare. However, a small portion of gas may be vented to the atmosphere, as discussed in Section 7.9. Emissions from residue compressor blowdown gas combustion are estimated using the expected blowdown gas volume and the residue gas analysis. Emissions from refrigeration compressor blowdown gas combustion are estimated using the expected blowdown gas volume and refrigerant propane composition.

7.5.2. Flare #2 (EPN 15)

Emissions of NO_x, CO, VOC, SO_2, and HAPs from the flare will result from the combustion of pipeline quality natural gas in the pilot (EPN 15) and the combustion of gas vented from the amine still vent and dehydrator waste streams during RTO downtime (EPN 15-MSS). Emissions from pilot gas combustion are estimated using the design pilot gas flowrate, and the residue gas analysis. Emissions from combusting gas from the amine still vent stream, dehydrator vent stream, and supplemental fuel stream are estimated using the equations noted in the sections below.

7.5.3. Emission Calculation Methodologies

NO_X and CO Hourly Emissions

Emission factors for NO_X and CO are obtained from the TCEQ guidance for flares and vapor oxidizers, Table 4.[8] The emission rates are based on the hourly gas stream heat inputs using the following equation:

$$\text{Hourly Gas Stream Heat Input}\left(\frac{\text{MMBtu}}{\text{hr}}\right) = \text{Hourly Flowrate}\left(\frac{\text{scf}}{\text{hr}}\right) \times \text{Gas Stream Heat Value}\left(\frac{\text{Btu}}{\text{scf}}\right) \times \left(\frac{\text{MMBtu}}{10^6\ \text{Btu}}\right)$$

The following equation is used to estimate hourly NO_X and CO emission rates from the pilot and MSS activities:

$$\text{Hourly Emission Rate}\left(\frac{\text{lb}}{\text{hr}}\right) = \text{Flare Emission Factor}\left(\frac{\text{lb}}{\text{MMBtu}}\right) \times \text{Hourly Gas Stream Heat Input}\left(\frac{\text{MMBtu}}{\text{hr}}\right)$$

H_2S, VOC, and HAP Hourly Emissions

Uncontrolled H_2S inlet to the flare is based on an estimated sulfur content of 2 grains / 100 scf. The following equation is used to estimate the hourly inlet rate to the flare:

$$\text{Hourly } H_2S \text{ Vented to Flare}\left(\frac{\text{lb}}{\text{hr}}\right) = \text{Sulfur Content}\left(\frac{\text{grains}}{100\ \text{scf}}\right) \times \left(\frac{\text{lb}}{7{,}000\ \text{grains}}\right) \times \text{Hourly Flowrate}\left(\frac{\text{scf}}{\text{hr}}\right)$$

Uncontrolled VOC and HAP inlet to the flare is based on the gas analysis and maximum hourly flowrates for each stream routed to the flare. The following equation is used to estimate the hourly inlet rate to the flare:

[8] TCEQ Air Permit Technical Guidance for Chemical Sources: Flares and Vapor Oxidizers (October 2000).

$$\text{Hourly Emission Rate Vented to Flare}\left(\frac{\text{lb}}{\text{hr}}\right)$$
$$= \text{Maximum Hourly Flowrate}\left(\frac{\text{scf}}{\text{hr}}\right) \times \text{Composition (mol \%)} \times \text{Molecular Weight}\left(\frac{\text{lb}}{\text{lb}-\text{mol}}\right) \times \left(\frac{\text{lb}-\text{mol}}{379.5\text{ scf}}\right)$$

Controlled hourly emission rates of VOC, H_2S and HAP, as controlled by the flare, are estimated using the inlet to flare as calculated above and the guaranteed DRE. The following equation is used to estimate hourly VOC, H_2S, and HAP emission rates from the controlled streams:

$$\text{Controlled Hourly Emission Rate}\left(\frac{\text{lb}}{\text{hr}}\right) = \text{Inlet to Flare}\left(\frac{\text{lb}}{\text{hr}}\right) \times [1 - \text{Destruction Rate Efficiency (\%)}]$$

<u>SO_2 Emissions</u>

SO_2 emissions are based on the conversion of sulfur during the destruction of inlet H_2S using a mass balance equation for the amount of H_2S that goes into and out of the RTO and the ratio of the molecular weights of SO_2 and H_2S. The equation is used to estimate hourly SO_2 emission rates from the controlled streams:

$$\text{Controlled Hourly SO}_2\text{ Emission Rate}\left(\frac{\text{lb}}{\text{hr}}\right) = \text{Inlet H}_2\text{S to Flare}\left(\frac{\text{lb}}{\text{hr}}\right) - \text{ Outlet H}_2\text{Sto Flare}\left(\frac{\text{lb}}{\text{hr}}\right) \times \left(\frac{\frac{64.06\text{ lb}}{\text{lb}-\text{mol}}}{\frac{34.08\text{ lb}}{\text{lb}-\text{mol}}}\right)$$

<u>Annual Emissions</u>

Annual emission rates of NO_x and CO are based on flare emission factors and annual gas stream heat input, as shown in the following equation:

$$\text{Annual Emission Rate Vented to Flare(tpy)}$$
$$= \text{Annual Flowrate}\left(\frac{\text{MMscf}}{\text{yr}}\right) \times \text{Composition (mol \%)} \times \text{Molecular Weight}\left(\frac{\text{lb}}{\text{lb}-\text{mol}}\right) \times \left(\frac{\text{lb}-\text{mol}}{379.5\text{ scf}}\right) \times \left(\frac{10^6\text{ scf}}{\text{MMscf}}\right) \times \left(\frac{\text{ton}}{2{,}000\text{ lb}}\right)$$

Annual emission rates of VOC, SO_2, H_2S, and HAPs are based on the gas analysis and expected annual flowrates for each stream routed to the flare, as shown in the following equation:

$$\text{Annual Emissions (tpy)} = \text{Hourly Emissions}\left(\frac{\text{lb}}{\text{hr}}\right) \times \text{Hours of Operation}\left(\frac{\text{hrs}}{\text{yr}}\right) \times \left(\frac{\text{ton}}{2{,}000\text{ lb}}\right)$$

7.6. ATMOSPHERIC STORAGE TANKS

The proposed Longhorn Gas Plant includes the following tanks:

Table 7-1. Atmospheric Storage Tanks and Drain Sumps Located at Longhorn Gas Plant

EPN	Tank Description	Tank Size (gal)
10	Hot Oil Tank Hot Oil Storage 210 bbl	8,820
11	MEOH-1 Methanol Storage	1,000
12	Amine Tank Amine Storage 10 bbl	420
13	Lube Oil Tank-1 3612 Oil 100 bbl	4,200
14	Lube Oil Tank-2 Ref Oil 100 bbl	4,200
16	Wastewater Tank 210 bbl	8,820
17	Low Pressure Condensate Tank-1 210 bbl	8,820
18	Low Pressure Condensate Tank-2 210 bbl	8,820
19	TEG Tank TEG Storage 210 bbl	8,820
21	Open Drain Sump	-

Tanks 10, 12, 13, 14, and 19 have both a low vapor pressure and low throughput. Therefore, based on engineering judgment, the emissions from these tanks are assumed negligible. The open drain sump will collect rain water and skid drain liquids, which will flow to the produced water tank (EPN 16). The contents of the open drain sump are expected to be mostly water and lube oil. Therefore, emissions from the open drain sump (EPN 21) are estimated to be 0.01 lb/hr and 0.01 tpy.

Working and breathing losses from the remaining tanks (EPNs 11, 16, 17, and 18) are estimated using the U.S. EPA TANKS 4.09d software, tank characteristics, and expected throughput. The condensate characteristics are obtained from a similar Targa site. The produced water is conservatively assumed to be 10% condensate.

Hourly tank emissions are estimated based on the maximum monthly emissions from the TANKS output. Annual tank emissions are taken directly from the TANKS output. All TANKS output reports are included in Appendix B.

7.6.1. Normal Operation

The condensate tanks (EPN 17 and EPN 18) and produced water tank (EPN 16) will operate in series to separate produced water from the condensate. A condensate-produced water mixture will exit from the different separation processes at the plant to the closed drain system at high pressure. To reduce the potential for flash emissions, Targa proposes to install a flash bullet tank to "step down" the pressure of the liquids before entering the atmospheric tank. All flash emissions will be 95% controlled by one of the two VRUs at the site. The purpose of the redundancy is so that when one of the VRUs is down for maintenance the other will compensate. Flash emissions from the condensate tanks are estimated using E&P Tanks. The E&P Tank output files are contained in Appendix B. The hourly modeled throughput for the condensate tanks was assumed to be 651 bbl/day, which was estimated by calculating the daily throughput from the annual throughput. The daily throughput was then conservatively assumed to be equal to the hourly throughput. The annual modeled throughput was assumed to be 27 bbl/day, which was calculated from the annual throughput.

From the flash tank, the condensate-produced water mixture will be routed through the series of tanks. The condensate will remain in the first two tanks, while the produced water will separate from the condensate and will be stored in the last tank. The condensate tanks will operate with a residue gas blanket on them. The condensate tanks will be 95% controlled by two VRUs. The produced water tank will remain uncontrolled.

The only tank emissions will consist of working and breathing losses from the methanol tank, condensate tanks, and the produced water tank and flash emissions from the two condensate tanks.

7.7. TRUCK LOADING LOSSES

Low pressure condensate and produced water will be loaded into tanker trucks and removed offsite (EPN FUG-2). VOC and HAP emissions will result from vapors in the tanker truck that will be displaced by the loaded liquids.

U.S. EPA AP-42 emission factors are used to estimate emissions from truck loading.[9] The loading method is submerged loading, dedicated normal service which corresponds to a saturation factor (S) of 0.6. The loading loss emission factor is calculated using the following equation:

$$L_L = \frac{12.46 \times SPM}{T}$$

where

L_L = loading loss (lb/1,000 gal loaded)
S = saturation factor (from AP-42, Section 5.2, Table 5.2-1)
P = true vapor pressure of loaded liquid (psia)
M = molecular weight of vapor (lb/lb-mol)
T = temperature of bulk liquid (°R = °F + 460)

The condensate characteristics are obtained from a similar Targa site. The produced water is conservatively assumed to be 10% condensate.

The following equations are used to estimate hourly and annual emission rates from the tank loading operations:

$$\text{Hourly Emission Rate}\left(\frac{\text{lb}}{\text{hr}}\right) = \text{loading loss}\left(\frac{\text{lb}}{1{,}000\text{ gal}}\right) \times \text{ Maximum Hourly Throughput}\left(\frac{\text{gal}}{\text{hr}}\right)$$

$$\text{Annual Emission Rate (tpy)} = \text{loading loss}\left(\frac{\text{lb}}{1{,}000\text{ gal}}\right) \times \text{ Maximum Annual Throughput}\left(\frac{\text{gal}}{\text{yr}}\right) \times \left(\frac{\text{ton}}{2{,}000\text{ lb}}\right)$$

[9] Section 5.2, Transportation and Marketing of Petroleum Liquids (July 2008).

7.8. EQUIPMENT LEAK FUGITIVES

Process fugitive emissions of VOC result from leaking components such as valves and flanges and from sampling equipment used to evaluate the gas streams at the plant such as gas chromatographs and O_2 sensors (EPN FUG-1).

Emissions from fugitive equipment leaks are calculated using fugitive component counts for the proposed equipment at the Longhorn Gas Plant, the VOC content of each stream for which component counts are placed in service, and emission factors for each component type taken from the TCEQ Air Permit Technical Guidance for Chemical Sources: Equipment Leak Fugitives.[10] Targa has selected the 28 VHP Monitoring Program, and these control efficiencies are applied to the equipment leak fugitive calculations. The representative analyses used in the fugitive calculations are provided in Appendix C. The analysis was taken from the Chico Gas Plant (RN100238716) located in Chico, Wise County, TX. The representative facility inlet analysis is a combination of the 2011 analyses taken of the discharge streams from the New Harp (RN106119266) and Waggoner (RN102977311) compressor stations. The New Harp sample was taken on August 4, 2011 and the Waggoner sample was taken on April 21, 2011, so the data is not older than 2 years. The New Harp and Waggoner compressor stations are both located in Wise County, which is also the proposed location of the Longhorn Gas Plant. Due to the close proximity of the sites, the gas processed by Longhorn will be very similar in speciation to the New Harp and Waggoner compressor stations. Since the gas for the Longhorn Plant is not currently being produced, this is the most representative analysis that can be provided at this time. The speciation does not contain hydrogen sulfide because the site will be processing sweet natural gas.

Hourly Emissions

Hourly emissions of VOC from traditional fugitive components (i.e., valves, pumps, flanges, compressors, relief valves, and connectors) are estimated using TCEQ emission factors, component counts, and the VOC content of each stream. The following equation is used to estimate hourly VOC emissions:

$$\begin{aligned}&\text{Hourly Emission Rate (lb/hr)}\\&\quad= \text{TCEQ Emission Factor}\left(\frac{\text{lb}}{\text{hr-comp}}\right)\times\ \text{Number of Components (\# comp)}\\&\quad\times \text{VOC Weight Percent (\% wt)}\times\big(1-28\text{ VHP Control Factor(\%)}\big)\end{aligned}$$

Speciated VOC and HAP emissions from traditional fugitive components are estimated based on the total VOC emissions as estimated above and the speciated gas analysis for each stream. The following equation is used to estimate speciated VOC and HAP emissions for each compound in the stream:

$$\begin{aligned}&\text{Speciated Hourly Emission Rate (lb/hr)}\\&\quad= \text{TCEQ Emission Factor}\left(\frac{\text{lb}}{\text{hr-comp}}\right)\times\ \text{Number of Components (\# comp)}\\&\quad\times \text{Compound Weight Percent (\% wt)}\times\big(1-28\text{ VHP Control Factor(\%)}\big)\end{aligned}$$

Hourly emissions of VOC and HAP from O_2 sensors and gas chromatographs are estimated based on the sum of the speciated VOC and HAP compound emissions. The speciated VOC and HAP emissions are estimated based on

[10] TCEQ, Air Permit Technical Guidance for Chemical Sources: Equipment Leak Fugitives, October 2000.

the leak rate of the components and the speciated gas analysis for each stream, as shown in the following equation:

$$\text{Hourly Emission Rate (lb/hr)} = \text{Leak Rate}\left(\frac{\text{scf}}{\text{hr}}\right) \times \text{Compound Molecular Weight}\left(\frac{\text{lb}}{\text{lb-mol}}\right) \times \left(\frac{\text{lb}-\text{mol}}{379.5\ \text{scf}}\right) \times \text{Number of Components} \times \text{Compound Content (wt \%)}$$

Annual Emissions

Annual emissions are estimated based on hourly emissions rates and maximum operation equivalent to 8,760 hrs/yr, as shown in the following equation:

$$\text{Annual Emission Rate (tpy)} = \text{Hourly Emission Rate}\left(\frac{\text{lb}}{\text{hr}}\right) \times \text{Hours of Operation}\left(\frac{\text{hr}}{\text{yr}}\right) \times \left(\frac{\text{ton}}{2{,}000\ \text{lb}}\right)$$

7.9. FUGITIVE MSS ACTIVITIES

Additional fugitive MSS activities are included in this application that may occur at the Longhorn Gas Plant. These emissions include pigging (EPNs 7-MSS, 8-MSS), meters (EPN FUG-MSS), and truck unloading of refrigerant propane (EPN 20-MSS) and will be vented directly to the atmosphere. It is expected that the entire gas volume vented during pigging will be routed to the flare. However, a small portion of gas may be vented to the atmosphere. The calculation of emissions for fugitive MSS activities is based on the frequency of the event, the event duration, the amount vented during each event, and the VOC content of the stream vented.

Hourly Emissions

The following equation is used to estimate speciated hourly VOC emission rates from the gaseous MSS activities (i.e., pigging and meters) for each compound in the stream. For events expected to last less than one hour, it is assumed that no more than one event occurs per hour. Total VOC and HAP emissions from each MSS activity are taken as the sum of the speciated VOC and HAP emission rates.

$$\text{Hourly Emission Rate}\left(\frac{\text{lb}}{\text{hr}}\right) = \text{Gas Volume per Event}\left(\frac{\text{scf}}{\text{event}}\right) \times \frac{1}{\text{Event Duration}\left(\frac{\text{hr}}{\text{event}}\right)} \times \text{Compound Content (mol \%)} \times \text{Compound Molecular Weight}\left(\frac{\text{lb}}{\text{lb-mol}}\right) \times \left(\frac{\text{lb-mol}}{379.5\ \text{scf}}\right)$$

The following equation is used to estimate hourly liquid propane emission rates from refrigerant propane unloading. For events expected to last less than hour in duration, it is assumed that no more than one event occurs per hour.

$$\text{Hourly Emission Rate}\left(\frac{\text{lb}}{\text{hr}}\right)$$
$$= \text{Liquid Volume per Event}\left(\frac{\text{scf}}{\text{event}}\right) \times \text{Propane Liquid Density}\left(\frac{\text{lb}}{\text{scf}}\right) \times \frac{1}{\text{Event Duration}\left(\frac{\text{hr}}{\text{event}}\right)}$$

Annual Emissions

Annual VOC emission rates from all MSS activities are estimated based on hourly emission rates, event frequency, and event duration, using the following equation:

$$\text{Annual Emission Rate (tpy)}$$
$$= \text{Hourly Emission Rate}\left(\frac{\text{lb}}{\text{hr}}\right) \times \text{Event Frequency}\left(\frac{\text{event}}{\text{yr}}\right) \times \text{Event Duration}\left(\frac{\text{hr}}{\text{event}}\right)$$
$$\times \left(\frac{\text{ton}}{2{,}000\ \text{lb}}\right)$$