

Exhibit MM: Response to 1.4.7-2 GHG Emissions from Pre-Lay Segment Use

As described in Exhibit T: Response to 1.4.3-3 (GHG Emissions from Natural Gas Releases) of the response provided by San Diego Gas & Electric Company and Southern California Gas Company on November 30, 2015, purging an existing approximately one-mile-long pre-lay segment of pipe will be required to complete construction of the Pipeline Safety & Reliability Project (Proposed Project). The calculation methods and assumptions used to determine the greenhouse gas (GHG) emissions from this activity were identified in the November 30, 2015 response. The methodology used to calculate the GHG emissions associated with the pre-lay segment are described in more detail in the paragraphs that follow.

In order to purge the pre-lay segment, a 400,000 British thermal unit- (BTU-) per-hour heated vaporizer will be brought on site and operated 24 hours per day for approximately two months. In addition, between two and three liquefied natural gas (LNG) tanker trucks will be brought to the site each day while the heated vaporizer is in use. As a result, the total GHG emissions associated with the pre-lay segment are made up of the following three sources:

- heated vaporizer operation,
- tanker truck use, and
- pre-lay segment purging.

The calculation methodology and results from each of these sources are presented in the subsections that follow.

Heated Vaporizer Operation

The emissions associated with the heated vaporizer were calculated using the following assumptions:

- Vaporizer output: 400,000 BTU per hour
- Duration of use: Two months
- Daily hours of operation: 24 hours
- Natural gas heating value: 1,020 BTU per standard cubic foot (scf)¹

As a result, it was assumed that the vaporizer will consume 9,411.8 scf per day, or approximately 583,530 scf during the two months of use.² Table 1: Heated Vaporizer Emission Factors and Emission Rates documents the emission factors, daily emission rate, and total emissions for carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) from heated vaporizer use. Each GHG was multiplied by its global warming potential (GWP) to generate its CO₂ equivalent (CO₂e) emission.

¹ The natural gas heating value was obtained from Section 1.4 Natural Gas Combustion of AP-42.

² To evaluate the worst-case scenario, each month was assumed to last 31 days.

Table 1: Heated Vaporizer Emission Factors and Emission Rates

Compound	Emission Factor (pounds/million scf)	Daily Emission Rate (pounds/day)	Total Emissions (pounds)
CO ₂	120,000	1,129.41	70,023.53
CH ₄	2.3	0.02	1.34
N ₂ O	2.3	0.02	1.28
CO ₂ e	--	1,136.29	70,449.68

Notes: Emission factors were taken from AP-42 Tables 1.4-1 and 1.4-2. The following GWPs were used: CO₂ = 1, CH₄ = 21, N₂O = 310. -- = Not applicable.

Tanker Truck Use

The emissions associated with the use of tanker trucks to deliver LNG to the site were calculated using the following assumptions:

- Maximum trips per day: Three trips
- Total trips: 60 trips
- Round-trip distance: 100 miles

The emission factors, daily emission rate, and total emissions for CO₂, CH₄, and N₂O from the tanker truck use are presented in Table 2: Tanker Truck Emission Factors and Emission Rates.

Table 2: Tanker Truck Emission Factors and Emission Rates

Compound	Emission Factor (grams/mile)	Emission Factor (grams/day)	Daily Emission Rate (pounds/day)	Total Emissions (pounds)
CO ₂	1,723.65	13,232.66	1,227.51	24,550.29
CH ₄	0.005	--	< 0.01	0.07
N ₂ O	0.005	--	< 0.01	0.06
CO ₂ e	--	--	1,228.57	24,571.39

Notes: Emission factors for CO₂ were taken from the California Air Resources Board EMFAC2014 Web Database. Emission factors for CH₄ and N₂O were taken from Table 4: Mobile Combustion CH₄ and N₂O Emission Factors for On-Road Diesel and Alternative Fuel Vehicles from the United States Environmental Protection Agency's Emission Factors for Greenhouse Gas Inventories (www.epa.gov/sites/production/files/2015-07/documents/emission-factors_2014.pdf).

Pre-Lay Segment Purging

The calculation methodology for purging the pre-lay segment of natural gas was documented in Exhibit T: GHG Emissions from Natural Gas Releases of the November 30, 2015 response. This activity is expected to emit approximately 0.40 metric tons (MT) of CO₂ and approximately 18.40 MT of CH₄.

Conclusion

Table 3: GHG Emission from Pre-Lay Segment Use presents the anticipated GHG emissions from each of the three sources associated with the use of the pre-lay segment.

Table 3: GHG Emission from Pre-Lay Segment Use

Activity	CO ₂ Emissions (MT)	CH ₄ Emissions (MT)	N ₂ O Emissions (MT)	CO ₂ e Emissions (MT)
Heated Vaporizer Operation	31.76	< 0.01	< 0.01	31.95
Tanker Truck Use	222.72	< 0.01	< 0.01	222.91
Pre-Lay Segment Purging	0.40	18.40	--	386.73
Total Pre-Lay Emissions	254.88	18.40	<0.01	641.60

The calculations presented in Exhibit T: GHG Emissions from Natural Gas Releases incorrectly reported only one day of tanker truck use in the pre-lay segment calculations. As a result, Table 2: GHG Emissions from Natural Gas Releases of Exhibit T: GHG Emissions from Natural Gas Releases should be revised as follows.

Activity	Release Volume (scf)	CO ₂ Emissions (MT)	CH ₄ Emissions (MT)	N ₂ O Emissions (MT)	CO ₂ e Emissions (MT)
Pre-Lay	1,020,000	43.301	18.397	0.001	429.8
		<u>254.881</u>	<u>18.398</u>		<u>641.6</u>
Cold Tie-Ins	65,800	0.026	1.187	0.000	24.9
Pigging	18,775	0.007	0.339	0.000	7.1