Appendix DR2-E
Ventura Compressor Station Modernization Project Electric-Driven Compressor Installation Only Alternative – Air Quality and Greenhouse Gas Emissions Analysis

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Subject: Response to the California Public Utilities Commission Data Request #2, DR 2.2b and 2.2c, on the Proponent's Environmental Assessment for the Ventura Compressor Station Modernization Project (VCM Project) (A.23-08-019)

Dear Ms. Freund:

In response to a request from SoCalGas, Yorke Engineering, LLC (Yorke) is providing this letter, responsive to Data Requests (DR) 2.2b and 2.2c from the California Public Utilities Commission (CPUC) Data Request #2 letter. In DR 2.2, *Effects of Operating the Supplemental EDC Alternative*, the CPUC states that "The CPUC requests additional details on the anticipated operations of the Supplemental EDC Alterative to refine the PEA comparison of alternatives." Bullets 2.2b and 2.2c request that SoCalGas:

2.2b: "… quantify the foreseeable changes under the Supplemental EDC Alternative for criteria pollutant emissions rates and toxic air pollutant scores relative to 2021-2022 operations (PEA Table 5.3-4a/5.3-4[1] and Table 5.3-4b/5.3-7[2]), greenhouse gas emissions (PEA Table 5.8-3[3]), and noise levels[4]"; and

2.2c: "… quantify foreseeable changes in consumption of electricity at the site and indirectly-generated greenhouse gas emissions related to the power supply for the electric-driven compressors in the Supplemental EDC Alternative."

The Supplemental Electric-Driven Compressor Installation Only Alternative (Supplemental EDC Alternative) is described under Section 6.2.2 of the Proponent's Environmental Assessment (PEA) as an alternative in which the existing compressor station remains in its current state and two new 2,500 nominal horsepower (HP) electric-driven compressors (EDCs) and associated infrastructure are installed at the Ventura Compressor Station (VCS).

The data request asks for a comparison of criteria pollutants, health screening scores, GHG emissions, and energy consumption for the Supplemental EDC Alternative to the 2021-2022 operations at the existing facility, referred herein as the baseline. For the comparison of baseline

[1] The Data Request refers to PEA Table 5.3-4a (Baseline criteria pollutant emissions). This table is PEA Table 5.3-4 in the July 2024 version of the PEA. Throughout this document and its attachment, all PEA references reflect the July 2024 version of the PEA.

[2] The Data Request refers to PEA Table 5.3-4b (Baseline Air Toxic "Hot Spots" Program Prioritization Score). This table is PEA Table 5.3-7 in the July 2024 version of the PEA.

[3] PEA Table 5.8-3 (Baseline GHG emissions).

[4] This letter does not address noise levels.

criteria pollutants to the Supplemental EDC Alternative, both the (1) projected emissions (likely emissions based on historical actual emissions) and (2) potential emissions (maximum emissions based on the potential to emit [PTE] pursuant to the permit) are analyzed for Supplemental EDC Alternative.

In addition to the requested comparisons to the Supplemental EDC Alternative, this response also includes comparisons of the baseline criteria pollutants to the proposed Ventura Compressor Station Modernization Project (VCM Project) with respect to both (1) projected emissions and (2) potential emissions, given that the PEA only compared the baseline criteria pollutants to the VCM Project's potential emissions, not to its projected emissions.

In addition, as noted above, this document also compares the health risk (based on both projected and potential emissions), GHG emissions (projected), and electricity consumption (projected) for both the Supplemental EDC Alternative and the VCM Project. Comparison of the baseline to the VCM Project is included to demonstrate how the Supplemental EDC Alternative GHG emissions, health risk, and electricity consumption compare to those of the VCM Project.

This response:

- *Response 2.2b* estimates projected and potential criteria pollutant emissions for the Supplemental EDC Alternative, for comparison to the historical actual baseline from PEA Table 5.3-4 and the projected and potential criteria pollutant emissions for the VCM Project;
- *Response 2.2b* estimates projected and potential health risk for the Supplemental EDC Alternative, for comparison to the historical actual baseline from PEA Table 5.3-7 and the projected and potential health risk for the VCM Project;
- *Response 2.2b* estimates projected GHG emissions for the Supplemental EDC Alternative, for comparison to the historical actual baseline from PEA Table 5.8-3 and the projected GHG emissions for the VCM Project; and
- *Response 2.2c* estimates foreseeable changes in consumption of electricity at the site related to the power supply for the EDCs, for comparison to the historical actual baseline from PEA Table 5.6-5 and the VCM Project projected electricity consumption.

Response 2.2b

> *Please quantify the foreseeable changes under the Supplemental EDC Alternative for criteria pollutant emissions rates and toxic air pollutant scores relative to 2021-2022 operations (PEA Table 5.3-4 and Table 5.3-7), greenhouse gas emissions (PEA Table 5.8-3) …"*

The Supplemental EDC Alternative includes:

- The three existing natural-gas-engine-driven compressors (gas engines);
- The new replacement emergency generator described under PEA Section 3.2.2.1;
- 4 worker vehicles; and
- The 2 new 2,500 HP electric-driven compressors (EDCs) and associated infrastructure, and other, existing electric loads.

Criteria Pollutant Emissions – Comparison to PEA Table 5.3-4

Two sets of comparisons of criteria pollutant emissions are provided. The first set compares the historical actual baseline criteria pollutant emissions from PEA Table 5.3-4, the Supplemental EDC Alternative projected criteria pollutant emissions, and the VCM Project projected criteria pollutant emissions. The second set compares the historical actual baseline criteria pollutant emissions from PEA Table 5.3-4, the Supplemental EDC Alternative potential criteria pollutant emissions (PTE), and the VCM Project potential criteria pollutant emissions (PTE) from PEA Table 5.3-5.

The Supplemental EDC Alternative projected and potential criteria pollutant emissions from the compressor engines are estimated using:

- As applicable, the projected natural gas consumption developed by SoCalGas and the potential natural gas consumption allowed under Ventura County Air Pollution Control District (VCAPCD) Permit to Operate (PTO) 00061-241, Condition No. 4;
- The ROC, NO_x, and CO permit limits from Ventura County Air Pollution Control District (VCAPCD) Permit to Operate (PTO) 00061-241, Condition No. 5; and
- The $PM_{10}/PM_{2.5}$ and SO_x emission factors from Table B-4b of Appendix B from the PEA's Air Quality and GHG Emissions Technical Report.

VCM Project projected and potential criteria pollutant emissions from the compressor engines are estimated using:

- As applicable, the projected natural gas consumption levels that were presented in the PEA for GHG emissions (the projected operational level) and the projected natural gas consumption levels that were presented in the PEA for criteria pollutant emissions (the maximum operational level); and
- The ROC, NO_x, CO, $PM_{10}/PM_{2.5}$, and SO_x Best Available Control Technology (BACT) emission factors from the PEA.

In all scenarios, the replacement emergency generator and worker vehicle emissions are directly from the PEA.

Historical actual baseline criteria pollutant emissions from PEA Table 5.3-4 are compared to the Supplemental EDC Alternative projected criteria pollutant emissions and the VCM Project projected criteria pollutant emissions in Attachment 1 Table 1.3a, where the Supplemental EDC Alternative projected criteria pollutant emissions are developed in Attachment 1 Table 1.1a and the VCM Project projected criteria pollutant emissions are developed in Attachment 1 Table 1.2a. Total emissions are shown in Table 1a; net differences are shown in Table 2a.

Historical actual baseline criteria pollutant emissions from PEA Table 5.3-4 are compared to the Supplemental EDC Alternative potential criteria pollutant emissions and the VCM Project potential criteria pollutant emissions in Attachment 1 Table 1.3b, where the Supplemental EDC Alternative potential criteria pollutant emissions are developed in Attachment 1 Table 1.1b and the VCM Project potential criteria pollutant emissions are developed in Attachment 1 Table 1.2b. Total emissions are shown in Table 1b; net differences are shown in Table 2b.

Table 1a: Criteria Pollutant Emissions: Comparison of Supplemental EDC Alternative Projected[1] Emissions to Baseline from PEA Table 5.3-4 and VCM Project Projected [1] Emissions

Pollutant	Compressor Engines[2] (tpy)	Emergency Generator[3] (tpy)	Worker Vehicles[4] (tpy)	Total (tpy)
Baseline[5] (VCS 2021-2022 Operations | Historical Actual Emissions)				
ROC	0.47	0.0002	0.003	0.48
NO_x	2.88	0.004	0.002	2.89
$PM_{10}/PM_{2.5}$	0.44	0.0004	0.00	0.45
SO_x	0.03	0.00001	0.0001	0.03
CO	0.60	0.005	0.036	0.64
Supplemental EDC Alternative[6] Projected[1] Emissions				
ROC	2.02	0.14	0.003	2.16
NO_x	1.86	0.14	0.003	2.00
$PM_{10}/PM_{2.5}$	0.11	0.04	0.016	0.17
SO_x	0.01	0.002	0.0002	0.01
CO	1.19	0.56	0.048	1.80
VCM Project[7] Projected[1] Emissions				
ROC	0.68	0.14	0.003	0.82
NO_x	0.68	0.14	0.003	0.82
$PM_{10}/PM_{2.5}$	0.15	0.04	0.016	0.21
SO_x	0.01	0.002	0.0002	0.01
CO	2.73	0.56	0.048	3.34

Notes:

1. Emission estimates in this table are based on the projected level of operation in the future.
2. For both the baseline and the Supplemental EDC Alternative projected emissions, compressor engines correspond to the existing 1,100 HP Superior Model 8GTLB Lean Burn engines. Each existing engine is equipped with a pre-combustion chamber and has its emissions vented to an oxidation catalyst. For the VCM Project projected emissions, compressor engines correspond to the new replacement 1,900 HP Waukesha Model VHP – L7044GSI S5 Rich Burn engines. Each new engine is equipped with a Non-Selective Catalytic Reduction (NSCR) 3-way catalyst.
3. For the baseline, emergency generator corresponds to the existing emergency engine. For the Supplemental EDC Alternative projected emissions and VCM Project projected emissions, emergency generator corresponds to the new replacement emergency generator described under PEA Section 3.2.2.1.
4. For the baseline, there are 3 worker vehicles; for the Supplemental EDC Alternative projected emissions and VCM Project projected emissions, there are 4 worker vehicles.
5. Baseline emissions are from PEA Table 5.3-4.
6. Supplemental EDC Alternative projected emissions are from Attachment 1 Table 1.1a.
7. VCM Project projected emissions are from Attachment 1 Table 1.2a.

Table 1b: Criteria Pollutant Emissions: Comparison of Supplemental EDC Alternative Potential to Emit to Baseline from PEA Table 5.3-4 and VCM Project Potential to Emit

Pollutant	Compressor Engines[1] (tpy)	Emergency Generator[2] (tpy)	Worker Vehicles[3] (tpy)	Total (tpy)
Baseline[4] (VCS 2021-2022 Operations | Historical Actual Emissions)				
ROC	0.47	0.0002	0.003	0.48
NO_x	2.88	0.004	0.002	2.89
$PM_{10}/PM_{2.5}$	0.44	0.0004	0.000	0.45
SO_x	0.03	0.00001	0.0001	0.03
CO	0.60	0.005	0.036	0.64
Supplemental EDC Alternative[5] Potential to Emit				
ROC	22.80	0.14	0.003	22.94
NO_x	21.06	0.14	0.003	21.20
$PM_{10}/PM_{2.5}$	1.24	0.04	0.016	1.30
SO_x	0.06	0.002	0.0002	0.06
CO	13.38	0.56	0.048	13.99
VCM Project[6] Potential to Emit				
ROC	5.50	0.14	0.003	5.64
NO_x	5.50	0.14	0.003	5.64
$PM_{10}/PM_{2.5}$	1.24	0.04	0.016	1.30
SO_x	0.08	0.002	0.0002	0.08
CO	22.00	0.56	0.048	22.61

Notes:

1. For both the baseline and the Supplemental EDC Alternative PTE, compressor engines correspond to the existing 1,100 HP Superior Model 8GTLB Lean Burn engines. Each existing engine is equipped with a pre-combustion chamber and has its emissions vented to an oxidation catalyst. For the VCM Project PTE, compressor engines correspond to the new replacement 1,900 HP Waukesha Model VHP – L7044GSI S5 Rich Burn engines. Each new engine is equipped with a Non-Selective Catalytic Reduction (NSCR) 3-way catalyst.
2. For the baseline, emergency generator corresponds to the existing emergency engine. For the Supplemental EDC Alternative PTE and VCM Project PTE, emergency generator corresponds to the new replacement emergency generator described under PEA Section 3.2.2.1.
3. For the baseline, there are 3 worker vehicles; for the Supplemental EDC Alternative PTE and VCM Project PTE, there are 4 worker vehicles.
4. Baseline emissions are from PEA Table 5.3-4.
5. Supplemental EDC Alternative PTE is from Attachment 1 Table 1.1b.
6. VCM Project PTE is from Attachment 1 Table 1.2b.

Table 2a: Criteria Pollutant Emissions: Comparison of Net Difference from Baseline to Supplemental EDC Alternative Projected[1] Emissions and Net Difference from Baseline to VCM Project Projected[1] Emissions

Pollutant	Net Emissions from Baseline to Supplemental EDC Alternative Projected[1] Emissions[2,3] (tpy)	Net Emissions from Baseline to VCM Project Projected[1] Emissions[2,3] (tpy)	Net Emissions from VCM Project to Supplemental EDC Alternative Projected[1] Emissions[2,3] (tpy)
ROC	1.68	0.34	1.34
NO_x	-0.89	-2.07	1.18
$PM_{10}/PM_{2.5}$	-0.28	-0.24	-0.04
SO_x	-0.02	-0.02	0.00
CO[4]	1.16	2.70	-1.54

Notes:
1. Emission estimates in this table are based on the projected level of operation in the future.
2. Values are from Attachment 1 Table 1.3a.
3. A negative value for the net emissions indicated reduction in emissions; a positive value indicates an increase in emissions.
4. The VCM Project will have higher CO emissions than the Supplemental EDC Alternative due to the relative control efficiencies of the existing lean burn engines with an oxidation catalyst compared to the proposed rich burn engines with a NSCR 3-way catalyst, which favors NO_x reduction over CO.

Table 2b: Criteria Pollutant Emissions: Comparison of Net Difference from Baseline to Supplemental EDC Alternative Potential to Emit and Net Difference from Baseline to VCM Project Potential to Emit

Pollutant	Net Emissions from Baseline to Supplemental EDC Alternative PTE[1,2] (tpy)	Net Emissions from Baseline to VCM Project PTE[1,2] (tpy)	Net Emissions from VCM Project to Supplemental EDC Alternative PTE[1,2] (tpy)
ROC	22.46	5.16	17.30
NO_x	18.31	2.75	15.56
$PM_{10}/PM_{2.5}$	0.85	0.85	0.00
SO_x	0.03	0.05	-0.02
CO[3]	13.35	21.97	-8.62

Notes:
1. Values are from Attachment 1 Table 1.3b.
2. A negative value for the net emissions indicated reduction in emissions; a positive value indicates an increase in emissions.
3. The VCM Project will have higher CO emissions than the Supplemental EDC Alternative due to the relative control efficiencies of the existing lean burn engines with an oxidation catalyst compared to the proposed rich burn engines with a NSCR 3-way catalyst, which favors NO_x reduction over CO.

Health Risk – Comparison to PEA Table 5.3-7

Two sets of comparisons of health risk are provided. The first set compares the historical actual baseline health risk from PEA Table 5.3-7, the Supplemental EDC Alternative projected health risk, and the VCM Project projected health risk. The second set compares the historical actual baseline health risk from PEA Table 5.3-7, the Supplemental EDC Alternative potential health risk, and the VCM Project potential health risk. In both sets of comparisons, the baseline from PEA Table 5.3-7 is based on a Health Risk Assessment (HRA) completed for the VCAPCD for 2021 operations under the AB 2588 Air Toxics Program.

Rather than preparing an HRA, Supplemental EDC Alternative projected and potential health risk are estimated by scaling the baseline values from PEA Table 5.3-7 by the ratio of Supplemental EDC Alternative projected and potential fuel consumption, as applicable, to baseline fuel use. Likewise, VCM Project projected health risk is estimated by scaling the VCM Project potential health risk from PEA Table 5.3-11 by the ratio of VCM Project projected fuel consumption to VCM Project potential fuel consumption.

Historical actual baseline health risk from PEA Table 5.3-7 is compared to the Supplemental EDC Alternative projected health risk and the VCM Project projected health risk in Attachment 1 Table 1.4a. This comparison is reproduced in Table 3a.

Historical actual baseline health risk from PEA Table 5.3-7 is compared to the Supplemental EDC Alternative projected health risk and the VCM Project potential health risk in Attachment 1 Table 1.4b. This comparison is reproduced in Table 3b.

Table 3a: Health Risk: Comparison of Supplemental EDC Alternative Projected[1] Health Risk to Baseline from Table 5.3-7 and VCM Project Projected[1] Health Risk

Health Impact	Baseline[2,3](VCS 2021 Operations | Historical Actual Emissions)	Supplemental EDC Alternative[2,4] Projected[1] Health Risk	VCM Project [2,5] Projected[1] Health Risk
Cancer Risk (in One Million)	0.871	0.230	0.35 [Residential] 0.16 [Worker]
Chronic Hazard Index (HIC)	0.0247	0.0065	0.001 [Residential] 0.001 [Worker] 0.006 [8-hour]
Acute Hazard Index (HIA)	0.618	0.618	0.03 [Residential] 0.02 [Worker]

Notes:

1. Health risk estimates are based on the projected level of operation in the future.
2. Values are from Attachment 1 Table 1.4a.
3. Baseline health risk is from PEA Table 5.3-7 and is based on an HRA completed for the VCAPCD for 2021 operations under the AB 2588 Air Toxics Program.
4. For the Supplemental EDC Alternative projected health risk, cancer risk and HIC are estimated by multiplying the baseline value by the ratio of total projected natural gas consumption in the existing gas engines for the Supplemental EDC Alternative to total natural gas consumption in the existing gas engines for the baseline. As HIA is typically based on maximum potential hourly emissions, HIA for the Supplemental EDC Alternative projected health risk is assumed to be the same as HIA for the baseline.
5. For the VCM Project projected health risk, cancer risk and HIC are estimated by multiplying the health risk from PEA Table 5.3-11 by the ratio of projected natural gas consumption to the potential natural gas

consumption used to develop PEA Table 5.3-11. As HIA is typically based on maximum potential hourly emissions, HIA for the VCM Project projected health risk is assumed to be the same as HIA from PEA Table 5.3-11.

Table 3b: Health Risk: Comparison of Supplemental EDC Alternative Potential Health Risk to Baseline from Table 5.3-7 and VCM Project Potential Health Risk

Health Impact	Baseline[1,2] (VCS 2021 Operations | Historical Actual Emissions)	Supplemental EDC Alternative[1,3] Potential Health Risk	VCM Project[1,4] Potential Health Risk
Cancer Risk (in One Million)	0.871	2.593	2.81 [Residential] 1.25 [Worker]
Chronic Hazard Index (HIC)	0.0247	0.0735	0.009 [Residential] 0.01 [Worker] 0.05 [8-hour]
Acute Hazard Index (HIA)	0.618	0.618	0.03 [Residential] 0.02 [Worker]

Notes:

1. Values are from Attachment 1 Table 1.4b.
2. Baseline health risk is from PEA Table 5.3-7 and is based on an HRA completed for the VCAPCD for 2021 operations under the AB 2588 Air Toxics Program.
3. For the Supplemental EDC Alternative potential health risk, cancer risk and HIC are estimated by multiplying the baseline value by the ratio of total potential natural gas consumption in the existing gas engines for the Supplemental EDC Alternative to total natural gas consumption in the existing gas engines for the baseline. As HIA is typically based on maximum potential hourly emissions, HIA for the Supplemental EDC Alternative potential health risk is assumed to be the same as HIA for the baseline.
4. For the VCM Project, cancer risk, HIC, and HIA are from PEA Table 5.3-11.

GHG Emissions – Comparison to PEA Table 5.8-3

A comparison of the historical actual baseline GHG emissions from Table 5.8-3 to the Supplemental EDC Alternative projected GHG emissions, and the VCM Project projected GHG emissions is provided in Table 4.

Supplemental EDC Alternative projected GHG emissions from the compressor engines are estimated from:

- The projected natural gas consumption developed by SoCalGas; and
- The GHG emission factors from Table F-3c of Appendix F from the PEA's Air Quality and GHG Emissions Technical Report.

Supplemental EDC Alternative projected GHG emissions from electricity consumption are estimated from:

- The projections of electricity consumed in the new 2,500 HP EDCs and all other plant loads developed by SoCalGas; and
- The GHG emission factors from Table F-3c of Appendix F from the PEA's Air Quality and GHG Emissions Technical Report.

VCM Project projected GHG emissions are from PEA Table 5.8-4 (Case 1).

In all scenarios, emergency generator and worker vehicle emissions are directly from the PEA.

Historical actual baseline GHG emissions from PEA Table 5.8-3 are compared to the Supplemental EDC Alternative projected GHG emissions and the VCM Project projected GHG emissions in Attachment 1 Table 1.6, where the Supplemental EDC Alternative projected GHG emissions are developed in Attachment 1 Table 1.5. Total emissions are shown in Table 4.

Table 4: GHG Emissions: Comparison of Supplemental EDC Alternative Projected[1] Emissions to Baseline from PEA Table 5.8-3 and VCM Project Projected[1] Emissions

Pollutant	Compressor Engines[2] (MT/yr)	Emergency Generator[3] (MT/yr)	Worker Vehicles[4] (MT/yr)	Indirect Electricity Consumption[5] (MT/yr)	Total (MT/yr)
Baseline[6] (VCS 2021-2022 Operations | Historical Actual Emissions)					
CO_2	4,845	1	51	92	4,988
CH_4	0.09	0.00003	0.0004	0.01	0.10
N_2O	0.01	0.00001	0.0008	0.001	0.01
CO_2e	4,850	1	51	93	4,994
Supplemental EDC Alternative[7] Projected[1] Emissions					
CO_2	1,195	79	67	2,476	3,818
CH_4	0.02	0.002	0.0006	0.31	0.34
N_2O	0.002	0.0001	0.001	0.04	0.04
CO_2e	1,196	79	68	2,495	3,838
VCM Project[8] Projected[1] Emissions					
CO_2	1,723	79	67	2,526	4,346
CH_4	0.03	0.002	0.0006	0.32	0.35
N_2O	0.003	0.0001	0.001	0.04	0.04
CO_2e	1,725	79	68	2,546	4,368

Notes:

1. Emission estimates are based on the projected level of operation in the future.
2. For both the baseline and the Supplemental EDC Alternative projected emissions, compressor engines correspond to the existing gas engines. For the VCM Project projected emissions, compressor engines correspond to the new replacement gas engines associated with the VCM Project. Engine descriptions are provided in footnote 2 to Table 1a.
3. For the baseline, emergency generator corresponds to the existing emergency engine. For the Supplemental EDC Alternative projected emissions and VCM Project projected emissions, emergency generator corresponds to the new replacement emergency generator described under PEA Section 3.2.2.1.
4. For the baseline, there are 3 worker vehicles; for the Supplemental EDC Alternative projected emissions and VCM Project projected emissions, there are 4 worker vehicles.
5. For the Supplemental EDC Alternative and VCM Project projected emissions, indirect electricity consumption corresponds to the new 2,500 HP EDCs, and all other VCS plant loads.
6. Baseline emissions are from PEA Table 5.8-3.
7. Supplemental EDC Alternative projected emissions are from Attachment 1 Table 1.5.
8. VCM Project projected emissions are from PEA Table 5.8-4 (Case 1).

Response 2.2c

Please quantify foreseeable changes in consumption of electricity at the site and indirectly-generated greenhouse gas emissions related to the power supply for the electric-driven compressors in the Supplemental EDC Alternative.

Indirectly generated GHG emissions for the Supplemental EDC Alternative projected GHG emissions, the baseline, and the VCM Project projected GHG emissions are shown in Table 4.

Attachment 1 Table 1.7 compares electricity consumption associated with the Supplemental EDC Alternative projected consumption to the baseline from PEA Table 5.6-3 and the VCM Project projected consumption from PEA Table 5.6-5 (Case 1). This comparison is reproduced in Table 5.

Table 5: Electricity Consumption: Comparison of Supplemental EDC Alternative Projected[1] Consumption to Baseline from PEA Table 5.6-3 and VCM Project Projected[1] Consumption

Equipment	Rating (kW)	Annual Electricity Consumption (MWh/yr)
Baseline[2,3] (VCS 2021-2022 Operations | Historical Actual Consumption)		
Plant Electricity Consumption	62.7	549
Supplemental EDC Alternative[2] Projected[1] Consumption		
New Unit 1 EDC	1,963.2	7,942
New Unit 2 EDC	1,963.2	7,942
Plant Electricity Consumption	576.1	5,047
Total	4,502.5	20,932
VCM Project[2,4] Projected[1] Consumption		
New Unit 1 EDC	1,963.2	7,451
New Unit 2 EDC	1,963.2	7,451
Plant Electricity Consumption	736.8	6,454
Total	4,663.2	21,356

Notes:
1. Electricity consumption estimates are based on the projected level of operation in the future.
2. Values are from Attachment 1 Table 1.7. Supplemental EDC Alternative projected consumption divides the projected total value by two for consistency with the VCM Project. Additionally, it is not anticipated that one EDC will preferentially be operated over the other.
3. Baseline electricity consumption is from PEA Table 5.6-3.
4. VCM Project projected consumption is from PEA Table 5.6-5 (Case 1).

Should you have any questions or concerns related to these responses to DR 2.2b and 2.2c, please contact me at (949) 248-8490 or via e-mail at JAdams@YorkeEngr.com.

Sincerely,

James J. Adams
Senior Engineer
Yorke Engineering, LLC
JAdams@YorkeEngr.com

Enclosures:

1. Attachment 1 – Emissions and Health Risk Estimates

ATTACHMENT 1 – EMISSIONS AND HEALTH RISK ESTIMATES

Table No.	Title / Contains
1.1a	Criteria Pollutant Emissions: Supplemental EDC Alternative Projected Emissions Table 1.1a contains criteria pollutant emission estimates for the projected Supplemental EDC Alternative. Criteria pollutant emissions for the existing gas engines are estimated from: (1) the projected annual natural gas consumption; (2) the ROC, NO_x, and CO permit limits from VCAPCD PTO 00061-241, Condition No. 5; and (3) the $PM_{10}/PM_{2.5}$ and SO_x emission factors from Table B-4b of Appendix B from the PEA's Air Quality and GHG Emissions Technical Report. Criteria pollutant emissions for the new replacement emergency generator and worker vehicles are taken directly from PEA Table 5.3-5.
1.1b	Criteria Pollutant Emissions: Supplemental EDC Alternative Potential to Emit Table 1.1b contains criteria pollutant emission estimates for the potential Supplemental EDC Alternative. Criteria pollutant emissions for the existing gas engines are estimated from: (1) the potential annual natural gas consumption allowed under VCAPCD PTO 00061-241, Condition No. 4; (2) the ROC, NO_x, and CO permit limits from VCAPCD PTO 00061-241, Condition No. 5; and (3) the $PM_{10}/PM_{2.5}$ and SO_x emission factors from Table B-4b of Appendix B from the PEA's Air Quality and GHG Emissions Technical Report. Criteria pollutant emissions for the new replacement emergency generator and worker vehicles are taken directly from PEA Table 5.3-5.
1.2a	Criteria Pollutant Emissions: VCM Project Projected Emissions Table 1.2a contains criteria pollutant emission estimates for the VCM Project. Criteria pollutant emissions for the new gas engines are estimated from: (1) the projected annual natural gas consumption used to develop PEA Table 5.8-4 (Case 1); and (2) the criteria pollutant emission factors from Table B-2b of Appendix B from the PEA's Air Quality and GHG Emissions Technical Report. Criteria pollutant emissions for the new replacement emergency generator and worker vehicles are taken directly from PEA Table 5.3-5.
1.2b	Criteria Pollutant Emissions: VCM Project Potential to Emit Table 1.2b contains criteria pollutant emission estimates for the VCM Project. Criteria pollutant emissions for the new gas engines are estimated from: (1) the projected annual natural gas consumption used to develop PEA Table 5.8-4 (Case 1); and (2) the criteria pollutant emission factors from Table B-2b of Appendix B from the PEA's Air Quality and GHG Emissions Technical Report. Criteria pollutant emissions for the new replacement emergency generator and worker vehicles are taken directly from PEA Table 5.3-5.
1.3a	Criteria Pollutant Emissions: Comparison of Supplemental EDC Alternative Projected Emissions to Baseline from PEA Table 5.3-4 and VCM Project Projected Emissions Table 1.3a compares the historical actual baseline criteria pollutant emissions from PEA Table 5.3-4 to the Supplemental EDC Alternative projected criteria pollutant emissions from Attachment 1 Table 1.1a and the VCM Project projected criteria pollutant emissions from Attachment 1 Table 1.2a.
1.3b	Criteria Pollutant Emissions: Comparison of Supplemental EDC Alternative Potential to Emit to Baseline from PEA Table 5.3-4 and VCM Project Potential to Emit Table 1.3b compares the historical actual baseline criteria pollutant emissions from PEA Table 5.3-4 to the Supplemental EDC Alternative potential criteria pollutant emissions from Attachment 1 Table 1.1b and the VCM Project potential criteria pollutant emissions from Attachment 1 Table 1.2b.

1.4a	Health Risk: Comparison of Supplemental EDC Alternative Projected Health Risk to Baseline from Table 5.3-7 and VCM Project Projected Health Risk Table 1.4a compares the Supplemental EDC Alternative projected health risk to the baseline from PEA Table 5.3-7 and the VCM Project projected health risk. Long-term projected health risk for the Supplemental EDC Alternative is estimated by multiplying the health risk for the baseline by the ratio of projected natural gas consumption in the existing gas engines for the Supplemental EDC Alternative to natural gas consumption in the existing gas engines for the baseline. Short-term projected health risk for the Supplemental EDC Alternative is assumed to be identical to the baseline, since short-term health risk is typically calculated from maximum potential hourly emissions rather than actual emissions. Long-term projected health risk for the VCM Project is estimated by multiplying the health risk for the VCM Project from PEA Table 5.3-11 by the ratio of projected natural gas consumption to the potential natural gas consumption used to develop PEA Table 5.3-11. Short-term projected health risk for the VCM Project is assumed to be identical to PEA Table 5.3-11, since short-term health risk is typically calculated from maximum potential hourly emissions rather than actual emissions.
1.4b	Health Risk: Comparison of Supplemental EDC Alternative Potential Health Risk to Baseline from Table 5.3-7 and VCM Project Potential Health Risk Table 1.4b compares the health risk for the Supplemental EDC Alternative potential health risk to the baseline from PEA Table 5.3-7 and the VCM Project potential health risk. Long-term potential health risk for the Supplemental EDC Alternative is estimated by multiplying the health risk for the baseline by the ratio of potential natural gas consumption in the existing gas engines for the Supplemental EDC Alternative to natural gas consumption in the existing gas engines for the baseline. Short-term potential health risk for the Supplemental EDC Alternative is assumed to be identical to the baseline, since short-term health risk is typically calculated from maximum potential hourly emissions rather than actual emissions. Potential health risk for the VCM Project is from PEA Table 5.3-11.
1.5	GHG Emissions: Supplemental EDC Alternative Projected Emissions Table 1.5 contains GHG emission estimates for the projected Supplemental EDC Alternative. GHG emissions for the existing gas engines are estimated from: (1) the projected annual natural gas consumption; and (2) the GHG emission factors from Table F-3c of Appendix F from the PEA's Air Quality and GHG Emissions Technical Report. GHG emissions for the new replacement emergency generator and worker vehicles are taken directly from PEA Table 5.8-4 (Case 1). GHG emissions associated with electricity consumption are estimated from projections of electricity consumed in the new 2,500 HP EDCs and all other plant electric loads, and the emission factors from Table F-3c of Appendix F from the PEA's Air Quality and GHG Emissions Technical Report.
1.6	GHG Emissions: Comparison of Supplemental EDC Alternative Projected Emissions to Baseline from PEA Table 5.8-3 and VCM Project Projected Emissions Table 1.6 compares the Supplemental EDC Alternative projected GHG emissions from Attachment 1 Table 1.5 to the historical actual baseline GHG emissions from PEA Table 5.8-3 and the VCM Project projected GHG emissions from PEA Table 5.8-4 (Case 1).

1.7	Electricity Consumption: Comparison of Supplemental EDC Alternative Projected Consumption to Baseline from PEA Table 5.6-3 and VCM Project Projected Consumption Table 1.7 compares the Supplemental EDC Alternative projected consumption to the historical actual baseline consumption from PEA Table 5.6-3 and the VCM Project projected consumption from PEA Table 5.6-5 (Case 1).

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Table 1.1a Criteria Pollutant Emissions: Supplemental EDC Alternative Projected* Emissions

Equipment	Projected Annual Hours of Operation[2]	Projected Annual Natural Gas Consumption[3] (mmscf/yr)	Projected Annual Electricity Consumption[4] (MWh/yr)	ROC Emission Factor[5] (lb/mmscf)	NO_x Emission Factor[5] (lb/mmscf)	$PM_{10}/PM_{2.5}$ Emission Factor[5] (lb/mmscf)	SO_x Emission Factor[5] (lb/mmscf)	CO Emission Factor[5] (lb/mmscf)	ROC Emissions[6] (tpy)	NO_x Emissions[6] (tpy)	$PM_{10}/PM_{2.5}$ Emissions[6] (tpy)	SO_x Emissions[6] (tpy)	CO Emissions[6] (tpy)
Existing Unit 1 Gas Engine[1]	510	20.64	--	182.96	169.08	10	0.6	107.49	1.89	1.74	0.10	0.01	1.11
Existing Unit 2 Gas Engine[1]	36	1.46	--	182.96	169.08	10	0.6	107.49	0.13	0.12	0.01	0.00	0.08
Existing Unit 3 Gas Engine[1]	0	0.00	--	182.96	169.08	9.7	0.6	107.49	0.00	0.00	0.00	0.00	0.00
New Emergency Generator[1]	--	--	--	--	--	--	--	--	0.14	0.14	0.04	0.002	0.56
Worker Vehicles[1]	--	--	--	--	--	--	--	--	0.003	0.003	0.016	0.0002	0.048
New Unit 1 EDC	4,046	--	7,942.5	--	--	--	--	--	--	--	--	--	--
New Unit 2 EDC	4,046	--	7,942.5	--	--	--	--	--	--	--	--	--	--
Plant Electricity Consumption[1]	8,760	--	5,047	--	--	--	--	--	--	--	--	--	--

* All emission estimates are based on the projected level of operation in the future.

Conversion Factors

kWh/MWh	1,000
lb/ton	2,000

[1] Existing Gas Engines

The existing gas engines are 1,100 HP Superior Model 8GTLB, Lean Burn engines. Each engine is equipped with a pre-combustion chamber and has its emissions vented to an oxidation catalyst.

New Emergency Generator

This equipment is driven by the 840 HP engine described in Section 3.2.2.1 of the PEA. All emissions for this equipment taken directly from the PEA Table 5.3-5.

Worker Vehicles

Per SoCalGas, the Supplemental EDC Alternative requires the same 4 worker vehicles evaluated for the VCM Project in the PEA. All emission estimates for the worker vehicles are taken directly from the PEA Table 5.3-5.

Plant Electricity Consumption

Assumes continuous operation, consistent with the PEA's Air Quality and GHG Emissions Technical Report.

[2] Existing Gas Engines

Projected annual hours of operation provided by SoCalGas.

New EDCs

Calculated under footnote 4.

[3] Existing Gas Engines

Projected annual natural gas consumption for existing engines estimated from projected total annual natural gas consumption and engine operating hours.

Projected Annual Natural Gas Consumption for Engine X (mmscf/yr) = Projected Total Annual Natural Gas Consumption (mmscf/yr) x Projected Annual Hours of Operation for Engine X / Projected Total Annual Hours of Operation

Projected Total Annual Natural Gas Consumption	22.1	mmscf/yr	Provided by SoCalGas

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Table 1.1a Criteria Pollutant Emissions: Supplemental EDC Alternative Projected* Emissions

[4] New EDCs

Projected Total Annual Electricity Consumption (kWh/yr) provided by SoCalGas.

Projected Total Annual Electricity Consumption	15,884,981	kWh/yr	Provided by SoCalGas

Projected Annual Electricity Consumption for EDC X (MWh/yr) = Projected Total Annual Electricity Consumption (kWh/yr) / kWh/MWh / 2

Projected Annual Electricity Consumption for EDC X	7,942.5	MWh/yr	

Projected Annual Hours of Operation for EDC X = Projected Annual Electricity Consumption for EDC X (MWh/yr) / (Rating for EDC x (kW) / 1,000)

Rating for EDC X	1,963.2	kW	
Projected Annual Hours of Operation for EDC X	4,046	hr/yr	

The calculations herein divide the operating hours between the two EDCs for consistency with the VCM Project. Additionally, it is not anticipated that one EDC will preferentially be operated over the other.

Plant Electricity Consumption

Plant electricity consumption provided by SoCalGas.

Plant Electricity Consumption (MWh/yr) = Plant Electricity Consumption (kW) x Projected Annual Hours of Operation / kWh/MWh

Plant Electricity Consumption	576.1	kW	Provided by SoCalGas

*This value **does not include** consumption associated with Tags CM-3600 and CM-3700, the new EDCs.*

[5] Existing Gas Engines

ROC, NO_x and CO emission factors for the existing gas engines are from VCAPCD Permit to Operate 00061 - 241, Condition No. 5.

Emission Factor (lb/mmscf) = Concentration Limit (ppmv @ 15% O_2) x 20.9 / (20.9 - 15) x F_d (dscf/mmBtu) x HHV (mmBtu/mmscf) x MW (lb/lbmol) / (Molar Volume (scf/lbmol) x 1,000,000)

F_d	8,710	dscf/mmBtu	68 Deg F, from EPA Method 19
HHV	1,020	mmBtu/mmscf	
MW	16	lb/lbmol, ROC	
	46	lb/lbmol, NO_x	
	28	lb/lbmol, CO	

Molar Volume (scf/lbmol) = R x T / p

R	0.7302	(atm x scf / lbmol x R)	
T	68	Deg F	VCAPCD Rule 2, Standard Conditions
	527.67	Deg R	
p	1	atm	VCAPCD Rule 2, Standard Conditions
Molar Volume	385.3	scf/lbmol	

ROC	140	ppmv @ 15% O_2	VCAPCD Permit to Operate 00061 - 241, Condition No. 5
	182.96	lb/mmscf	
NO_x	45	ppmv @ 15% O_2	VCAPCD Permit to Operate 00061 - 241, Condition No. 5
	169.08	lb/mmscf	
CO	47	ppmv @ 15% O_2	VCAPCD Permit to Operate 00061 - 241, Condition No. 5
	107.49	lb/mmscf	

$PM_{10}/PM_{2.5}$ and SO_x emission factors for the existing gas engines are from Table B-4b of Appendix B from the PEA's Air Quality and GHG Emissions Technical Report.

[6] Existing Gas Engines

Criteria Pollutant (tpy) = Projected Annual Natural Gas Consumption (mmscf/yr) x Criteria Pollutant Emission Factor (lb/mmscf) / lb/ton

New Emergency Generator and Worker Vehicles

Criteria Pollutant (tpy) are from PEA Table 5.3-5.

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Table 1.1b Criteria Pollutant Emissions: Supplemental EDC Alternative Potential to Emit

Equipment	Projected Annual Hours of Operation[2]	Projected Annual Natural Gas Consumption[3] (mmscf/yr)	Projected Annual Electricity Consumption[4] (MWh/yr)	ROC Emission Factor[5] (lb/mmscf)	NO_x Emission Factor[5] (lb/mmscf)	$PM_{10}/PM_{2.5}$ Emission Factor[5] (lb/mmscf)	SO_x Emission Factor[5] (lb/mmscf)	CO Emission Factor[5] (lb/mmscf)	ROC Emissions[6] (tpy)	NO_x Emissions[6] (tpy)	$PM_{10}/PM_{2.5}$ Emissions[6] (tpy)	SO_x Emissions[6] (tpy)	CO Emissions[6] (tpy)
Existing Unit 1 Gas Engine[1]	8,760	83.04	--	182.96	169.08	10	0.6	107.49	7.60	7.02	0.42	0.02	4.46
Existing Unit 2 Gas Engine[1]	8,760	83.04	--	182.96	169.08	10	0.6	107.49	7.60	7.02	0.42	0.02	4.46
Existing Unit 3 Gas Engine[1]	8,760	83.04	--	182.96	169.08	9.7	0.6	107.49	7.60	7.02	0.40	0.02	4.46
New Emergency Generator[1]	--	--	--	--	--	--	--	--	0.14	0.14	0.04	0.002	0.56
Worker Vehicles[1]	--	--	--	--	--	--	--	--	0.003	0.003	0.016	0.0002	0.048
New Unit 1 EDC	4,046	--	7,942.5	--	--	--	--	--	--	--	--	--	--
New Unit 2 EDC	4,046	--	7,942.5	--	--	--	--	--	--	--	--	--	--
Plant Electricity Consumption[1]	8,760	--	5,047	--	--	--	--	--	--	--	--	--	--

Conversion Factors

kWh/MWh	1,000
lb/ton	2,000

[1] Existing Gas Engines

The existing gas engines are 1,100 HP Superior Model 8GTLB, Lean Burn engines. Each engine is equipped with a pre-combustion chamber and has its emissions vented to an oxidation catalyst.

New Emergency Generator

This equipment is driven by the 840 HP engine described in Section 3.2.2.1 of the PEA. All emissions for this equipment taken directly from the PEA Table 5.3-5.

Worker Vehicles

Per SoCalGas, the Supplemental EDC Alternative requires the same 4 worker vehicles evaluated for the VCM Project in the PEA. All emission estimates for the worker vehicles are taken directly from the PEA Table 5.3-5.

Plant Electricity Consumption

Assumes continuous operation, consistent with the PEA's Air Quality and GHG Emissions Technical Report.

[2] Existing Gas Engines

Condition No. 4 from VCAPCD Permit to Operate 00061 - 241 allows the existing engines to operate for 8,760 hr/yr.

New EDCs

Calculated under footnote 4.

[3] Existing Gas Engines

Projected Annual Natural Gas Consumption (mmscf/yr) = Engine Rating (HP) x BSFC (Btu/HP-hr) / 1,000,000 / HHV (mmBtu/mmscf) x Projected Annual Hours of Operation (hr/yr)

Engine Rating	1,100	HP	VCAPCD Permit to Operate 00061 - 241
BSFC	8,790	Btu/HP-hr	Table D-2a of Appendix B from the PEA's Air Quality and GHG Emissions Technical Report
HHV	1,020	mmBtu/mmscf	

Existing Unit 1 Gas Engine	8,760	hr/yr
	83.04	mmscf/yr
Existing Unit 2 Gas Engine	8,760	hr/yr
	83.04	mmscf/yr
Existing Unit 3 Gas Engine	8,760	hr/yr
	83.04	mmscf/yr

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Table 1.1b Criteria Pollutant Emissions: Supplemental EDC Alternative Potential to Emit

[4] New EDCs

Projected Total Annual Electricity Consumption (kWh/yr) provided by SoCalGas.

Projected Total Annual Electricity Consumption	15,884,981	kWh/yr	Provided by SoCalGas

Projected Annual Electricity Consumption for EDC X (MWh/yr) = Projected Total Annual Electricity Consumption (kWh/yr) / kWh/MWh / 2

Projected Annual Electricity Consumption for EDC X	7,942.5	MWh/yr	

Projected Annual Hours of Operation for EDC X = Projected Annual Electricity Consumption for EDC x (MWh/yr) / (Rating for EDC x (kW) / 1,000)

Rating for EDC X	1,963.2	kW	
Projected Annual Hours of Operation for EDC X	4,046	hr/yr	

The calculations herein divide the operating hours between the two EDCs for consistency with the VCM Project. Additionally, it is not anticipated that one EDC will preferentially be operated over the other.

Plant Electricity Consumption

Plant electricity consumption provided by SoCalGas..

Plant Electricity Consumption (MWh/yr) = Plant Electricity Consumption (kW) x Projected Annual Hours of Operation / kWh/MWh

Plant Electricity Consumption	576.1	kW	Provided by SoCalGas

*This value **does not include** consumption associated with Tags CM-3600 and CM-3700, the new EDCs.*

[5] Existing Gas Engines

ROC, NO_x, and CO emission factors for the existing gas engines are from VCAPCD Permit to Operate 00061 - 241, Condition No. 5.

Emission Factor (lb/mmscf) = Concentration Limit (ppmv @ 15% O_2) x 20.9 / (20.9 - 15) x F_d (dscf/mmBtu) x HHV (mmBtu/mmscf) x MW (lb/lbmol) / (Molar Volume (scf/lbmol) x 1,000,000)

F_d	8,710	dscf/mmBtu	68 Deg F, from EPA Method 19
HHV	1,020	mmBtu/mmscf	
MW	16	lb/lbmol, ROC	
	46	lb/lbmol, NO_x	
	28	lb/lbmol, CO	

Molar Volume (scf/lbmol) = R x T / p

R	0.7302	(atm x scf / lbmol x R)	
T	68	Deg F	VCAPCD Rule 2, Standard Conditions
	527.67	Deg R	
p	1	atm	VCAPCD Rule 2, Standard Conditions
Molar Volume	385.3	scf/lbmol	

ROC	140	ppmv @ 15% O_2	VCAPCD Permit to Operate 00061 - 241, Condition No. 5
	182.96	lb/mmscf	
NO_x	45	ppmv @ 15% O_2	VCAPCD Permit to Operate 00061 - 241, Condition No. 5
	169.08	lb/mmscf	
CO	47	ppmv @ 15% O_2	VCAPCD Permit to Operate 00061 - 241, Condition No. 5
	107.49	lb/mmscf	

PM_{10}/PM2.5 and SO_x emission factors for the existing gas engines are from Table B-4b of Appendix B from the PEA's Air Quality and GHG Emissions Technical Report.

[6] Existing Gas Engines

Criteria Pollutant (tpy) = Projected Annual Natural Gas Consumption (mmscf/yr) x Criteria Pollutant Emission Factor (lb/mmscf) / lb/ton

New Emergency Generator and Worker Vehicles

Criteria Pollutant (tpy) are from PEA Table 5.3-5.

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Table 1.2a Criteria Pollutant Emissions: VCM Project Projected* Emissions

Equipment	Projected Annual Natural Gas Consumption[2] (mmscf/yr)	ROC Emission Factor[3] (lb/mmscf)	NO_x Emission Factor[3] (lb/mmscf)	$PM_{10}/PM_{2.5}$ Emission Factor[3] (lb/mmscf)	SO_x Emission Factor[3] (lb/mmscf)	CO Emission Factor[3] (lb/mmscf)	ROC Emissions[4] (tpy)	NO_x Emissions[4] (tpy)	$PM_{10}/PM_{2.5}$ Emissions[4] (tpy)	SO_x Emissions[4] (tpy)	CO Emissions[4] (tpy)
New Gas Engines[1]	31.86	42.8	42.8	9.7	0.6	171.2	0.68	0.68	0.15	0.01	2.73
New Emergency Generator	--	--	--	--	--	--	0.14	0.14	0.04	0.002	0.56
Worker Vehicles	--	--	--	--	--	--	0.003	0.003	0.016	0.0002	0.048

* All emission estimates are based on the projected level of operation in the future.

Conversion Factors
lb/ton 2,000

[1] New Gas Engines
The new gas engines are 1,900 HP Waukesha Model VHP - L7044GSI S5, Rich Burn engines. Each engine is equipped with a Non-Selective Catalytic Reduction (NSCR) 3-way catalyst.

[2] New Gas Engines
Projected annual natural gas consumption is the same value that was used to develop PEA Table 5.8-4 (Case 1).
Projected Annual Natural Gas Consumption (mmscf/yr) = Projected Annual Natural Gas Consumption (mmBtu/yr) / HHV (mmBtu/mmscf)

Projected Annual Natural Gas Consumption	32,498	mmBtu/yr	Provided by SoCalGas
HHV	1,020	mmBtu/mmscf	

[3] New Gas Engines
Criteria pollutant emission factors for the new gas engines are from Table B-2b of Appendix B from the PEA's Air Quality and GHG Emissions Technical Report.

[4] New Gas Engines
Criteria Pollutant (tpy) = Projected Annual Natural Gas Consumption (mmscf/yr) x Criteria Pollutant Emission Factor (lb/mmscf) / lb/ton
New Emergency Generator and Worker Vehicles
Criteria Pollutant (tpy) are from PEA Table 5.3-5.

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Table 1.2b Criteria Pollutant Emissions: VCM Project Potential to Emit

Equipment	Projected Annual Natural Gas Consumption[2] (mmscf/yr)	ROC Emission Factor[3] (lb/mmscf)	NO_x Emission Factor[3] (lb/mmscf)	$PM_{10}/PM_{2.5}$ Emission Factor[3] (lb/mmscf)	SO_x Emission Factor[3] (lb/mmscf)	CO Emission Factor[3] (lb/mmscf)	ROC Emissions[4] (tpy)	NO_x Emissions[4] (tpy)	$PM_{10}/PM_{2.5}$ Emissions[4] (tpy)	SO_x Emissions[4] (tpy)	CO Emissions[4] (tpy)
New Unit 1 Gas Engine[1]	128.56	42.8	42.8	9.7	0.6	171.2	2.75	2.75	0.62	0.04	11.00
New Unit 2 Gas Engine[1]	128.56	42.8	42.8	9.7	0.6	171.2	2.75	2.75	0.62	0.04	11.00
New Emergency Generator	--	--	--	--	--	--	0.14	0.14	0.04	0.002	0.56
Worker Vehicles	--	--	--	--	--	--	0.003	0.003	0.016	0.0002	0.048

[1] New Gas Engines
The new gas engines are 1,900 HP Waukesha Model VHP - L7044GSI S5, Rich Burn engines. Each engine is equipped with a Non-Selective Catalytic Reduction (NSCR) 3-way catalyst.

[2] New Gas Engines
Projected annual natural gas consumption for the new gas engines is from Table B-2a of Appendix B from the PEA's Air Quality and GHG Emissions Technical Report.

[3] New Gas Engines
Criteria pollutant emission factors for the new gas engines are from Table B-2b of Appendix B from the PEA's Air Quality and GHG Emissions Technical Report.

[4] New Gas Engines
Criteria Pollutant (tpy) = Projected Annual Natural Gas Consumption (mmscf/yr) x Criteria Pollutant Emission Factor (lb/mmscf) / lb/ton
New Emergency Generator and Worker Vehicles
Criteria Pollutant (tpy) are from PEA Table 5.3-5.

Conversion Factors
lb/ton 2,000

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Table 1.3a Criteria Pollutant Emissions: Comparison of Supplemental EDC Alternative Projected* Emissions to Baseline from PEA Table 5.3-4 and VCM Project Projected* Emissions

	Baseline[1] [Historical Actual Fuel Consumption and Historical Actual Emission Factors]				Supplemental EDC Alternative[2] [Projected Fuel Consumption and ROC/NO_x/CO Permit Limits]				VCM Project[3] [Projected Fuel Consumption and ROC/NO_x/CO BACT Limits]				Net Differences[4]		
Pollutant	**Existing Compressor Engines (tpy)**	**Existing Emergency Generator (tpy)**	**Worker Vehicles (tpy)**	**Total [A] (tpy)**	**Existing Compressor Engines (tpy)**	**New Emergency Generator (tpy)**	**Worker Vehicles (tpy)**	**Total [B] (tpy)**	**New Compressor Engines (tpy)**	**New Emergency Generator (tpy)**	**Worker Vehicles (tpy)**	**Total [C] (tpy)**	**[B] - [A] (tpy)**	**[C] - [A] (tpy)**	**[B] - [C] (tpy)**
ROC	0.47	0.0002	0.003	0.48	2.02	0.14	0.003	2.16	0.68	0.14	0.003	0.82	1.68	0.34	1.34
NO_x	2.88	0.004	0.002	2.89	1.86	0.14	0.003	2.00	0.68	0.14	0.003	0.82	-0.89	-2.07	1.18
$PM_{10}/PM_{2.5}$	0.44	0.0004	0.00	0.45	0.11	0.04	0.016	0.17	0.15	0.04	0.016	0.21	-0.28	-0.24	-0.04
SO_x	0.03	0.00001	0.0001	0.03	0.01	0.002	0.0002	0.01	0.01	0.002	0.0002	0.01	-0.02	-0.02	0.00
CO	0.60	0.005	0.036	0.64	1.19	0.56	0.048	1.80	2.73	0.56	0.048	3.34	1.16	2.70	-1.54

* All emission estimates are based on the projected level of operation in the future.

[1] Baseline emissions are from PEA Table 5.3-4.

[2] Supplemental EDC Alternative projected emissions are from Table 1.1a.
Compressor Engines corresponds to the 'Existing Unit X Gas Engines' rows from Table 1.1a.
Emergency Generator corresponds to the 'New Emergency Generator' row from Table 1.1a. This equipment is different from the emergency generator included in the baseline.

[3] VCM Project projected emissions are from Table 1.2a.
Compressor Engines corresponds to the 'New Gas Engines' row from Table 1.2a.
Emergency Generator corresponds to the 'New Emergency Generator' row from Table 1.2a. This equipment is different from the emergency generator included in the baseline.

[4] [B] - [A] represents the net emissions change from the baseline to the Supplemental EDC Alternative.
[C] - [A] represents the net emissions change from the baseline to the VCM Project.
[B] - [C] represents the net emissions change from the VCM Project to the Supplemental EDC Alternative.

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Table 1.3b Criteria Pollutant Emissions: Comparison of Supplemental EDC Alternative Potential to Emit to Baseline from PEA Table 5.3-4 and VCM Project Potential to Emit

	Baseline[1] [Historical Actual Fuel Consumption and Historical Actual Emission Factors]				Supplemental EDC Alternative[2] [Potential Fuel Consumption and ROC/NO_x/CO Permit Limits]				VCM Project[3] [Potential Fuel Consumption and ROC/NO_x/CO BACT Limits]				Net Differences[4]		
Pollutant	**Existing Compressor Engines (tpy)**	**Existing Emergency Generator (tpy)**	**Worker Vehicles (tpy)**	**Total [A] (tpy)**	**Existing Compressor Engines (tpy)**	**New Emergency Generator (tpy)**	**Worker Vehicles (tpy)**	**Total [B] (tpy)**	**New Compressor Engines (tpy)**	**New Emergency Generator (tpy)**	**Worker Vehicles (tpy)**	**Total [C] (tpy)**	**[B] - [A] (tpy)**	**[C] - [A] (tpy)**	**[B] - [C] (tpy)**
ROC	0.47	0.0002	0.003	0.48	22.80	0.14	0.003	22.94	5.50	0.14	0.003	5.64	22.46	5.16	17.30
NO_x	2.88	0.004	0.002	2.89	21.06	0.14	0.003	21.20	5.50	0.14	0.003	5.64	18.31	2.75	15.56
$PM_{10}/PM_{2.5}$	0.44	0.0004	0.00	0.45	1.24	0.04	0.016	1.30	1.24	0.04	0.016	1.30	0.85	0.85	0.00
SO_x	0.03	0.00001	0.0001	0.03	0.06	0.002	0.0002	0.06	0.08	0.002	0.0002	0.08	0.03	0.05	-0.02
CO	0.60	0.005	0.036	0.64	13.38	0.56	0.048	13.99	22.00	0.56	0.048	22.61	13.35	21.97	-8.62

[1] Baseline emissions are from PEA Table 5.3-4.

[2] Supplemental EDC Alternative potential emissions are from Table 1.1b.
Compressor Engines corresponds to the 'Existing Unit X Gas Engines' rows from Table 1.1b.
Emergency Generator corresponds to the 'New Emergency Generator' row from Table 1.1b. This equipment is different from the emergency generator included in the baseline.

[3] VCM Project potential emissions are from Table 1.2b.
Compressor Engines corresponds to 'New Unit X Gas Engines' rows from Table 1.2b.
Emergency Generator corresponds to 'New Emergency Generator' row from Table 1.2b. This equipment is different from the emergency generator included in the baseline.

[4] [B] - [A] represents the net emissions change from the baseline to the Supplemental EDC Alternative.
[C] - [A] represents the net emissions change from the baseline to the VCM Project.
[B] - [C] represents the net emissions change from the VCM Project to the Supplemental EDC Alternative.

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Attachment 1 Emission and Health Risk Estimates

Table 1.4a Health Risk: Comparison of Supplemental EDC Alternative Projected* Health Risk to Baseline from PEA Table 5.3-7 and VCM Project Projected* Health Risk

Health Impact	Baseline[1] (VCS 2021 Operations | Historical Actual Emissions)	Supplemental EDC Alternative[2] Projected Health Risk	VCM Project[3] Projected Health Risk
Cancer Risk (in One Million)	0.871	0.230	0.35 [Residential] 0.16 [Worker]
Chronic Hazard Index (HIC)	0.0247	0.0065	0.001 [Residential] 0.001 [Worker] 0.006 [8-hour]
Acute Hazard Index (HIA)	0.618	0.618	0.03 [Residential] 0.02 [Worker]

* All health risk estimates are based on the projected level of operation in the future.

[1] Baseline Ventura Compressor Station health risk from PEA Table 5.3-7. Data from a VCAPCD report based on actual emissions in Calendar Year 2021.

[2] Supplemental EDC Alternative Projected Health Risk is estimated by multiplying baseline value by the ratio of Projected Annual Natural Gas Consumption in the existing gas engines to baseline (Calendar Year 2021) natural gas consumption in the existing gas engines.

Projected Annual Natural Gas Consumption	22.10	mmscf/yr	From Table 1.1a

Baseline natural gas consumption is from Table F-5a of Appendix F from the PEA's Air Quality and GHG Emissions Technical Report.

Existing Unit 1 Gas Engine	26.316	mmscf/yr
Existing Unit 2 Gas Engine	29.364	mmscf/yr
Existing Unit 3 Gas Engine	28.003	mmscf/yr
Total Baseline	83.683	mmscf/yr
Ratio	0.264	Note: This ratio is applied to the cancer risk value and the HIC but not the HIA. HIA is typically calculated from maximum potential hourly emissions rather than actual emissions.

PEA Table 5.3-7 Health Risk		Projected Health Risk (PEA Table 5.3-7 Health Risk x Ratio)
Cancer Risk	0.871	0.230
HIC	0.0247	0.0065
HIA	0.618	0.618

[3] VCM Project Projected Health Risk is estimated by multiplying the health risk from PEA Table 5.3-11 by the ratio of projected natural gas consumption to the potential natural gas consumption used to develop PEA Table 5.3-11.

Projected Annual Natural Gas Consumption	31.86	mmscf/yr	From Table 1.2a
Potential Annual Natural Gas Consumption	257.12	mmscf/yr	From Table B-2a of Appendix B from the PEA's Air Quality and GHG Emissions Technical Report
Ratio	0.124		Note: This ratio is applied to the cancer risk value and the HIC but not the HIA. HIA is typically calculated from maximum potential hourly emissions rather than actual emissions.

PEA Table 5.3-11 Health Risk			Projected Health Risk (PEA Table 5.3-11 Health Risk x Ratio)	
Cancer Risk	2.81	in one million, Residential	0.35	in one million, Residential
	1.25	in one million, Worker	0.16	in one million, Worker
HIC	0.009	Residential	0.001	Residential
	0.01	Worker	0.001	Worker
	0.05	8-hour	0.006	8-hour
HIA	0.03	Residential	0.03	Residential
	0.02	Worker	0.02	Worker

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Attachment 1 Emission and Health Risk Estimates

Table 1.4b Health Risk: Comparison of Supplemental EDC Alternative Potential Health Risk to Baseline from PEA Table 5.3-7 and VCM Project Potential Health Risk

Health Impact	Baseline[1] (VCS 2021 Operations | Historical Actual Emissions)	Supplemental EDC Alternative[2] Potential Health Risk	VCM Project[3] Potential Health Risk
Cancer Risk (in One Million)	0.871	2.593	2.81 [Residential] 1.25 [Worker]
Chronic Hazard Index (HIC)	0.0247	0.0735	0.009 [Residential] 0.01 [Worker] 0.05 [8-hour]
Acute Hazard Index (HIA)	0.618	0.618	0.03 [Residential] 0.02 [Worker]

[1] Baseline Ventura Compressor Station health risk from PEA Table 5.3-7. Data from a VCAPCD report based on actual emissions in Calendar Year 2021.

[2] Supplemental EDC Alternative Potential Health Risk is estimated by multiplying baseline value by the ratio of Annual Natural Gas Consumption in the existing gas engines to baseline (Calendar Year 2021) natural gas consumption in the existing gas engines.

Annual Natural Gas Consumption	249.12	mmscf/yr	From Table 1.1b

Baseline natural gas consumption is from Table F-5a of Appendix F from the PEA's Air Quality and GHG Emissions Technical Report.

Existing Unit 1 Gas Engine	26.316	mmscf/yr
Existing Unit 2 Gas Engine	29.364	mmscf/yr
Existing Unit 3 Gas Engine	28.003	mmscf/yr
Total Baseline	83.683	mmscf/yr
Ratio	2.977	

Note: This ratio is applied to the cancer risk value and the HIC but not the HIA. HIA is typically calculated from maximum potential hourly emissions rather than actual emissions.

PEA Table 5.3-7 Health Risk		Health Risk (PEA Table 5.3-7 Health Risk x Ratio)
Cancer Risk	0.871	2.593
HIC	0.0247	0.0735
HIA	0.618	0.618

[3] VCM Project Potential Health Risk is the health risk from PEA Table 5.3-11.

PEA Table 5.3-11 Health Risk		
Cancer Risk	2.81	in one million, Residential
	1.25	in one million, Worker
HIC	0.009	Residential
	0.01	Worker
	0.05	8-hour
HIA	0.03	Residential
	0.02	Worker

Attachment 1 Emission and Health Risk Estimates

Table 1.5 GHG Emissions: Supplemental EDC Alternative Projected* Emissions

Equipment	Projected Annual Hours of Operation[1]	Projected Annual Natural Gas Consumption[1] (mmscf/yr)	Projected Annual Electricity Consumption[1] (MWh/yr)	CO_2 Emission Factor[2] [Natural Gas] (kg/mmBtu) [Electricity] (lb/MWh)	CH_4 Emission Factor[2] [Natural Gas] (kg/mmBtu) [Electricity] (lb/MWh)	N_2O Emission Factor[2] [Natural Gas] (kg/mmBtu) [Electricity] (lb/MWh)	CO_2e Emission Factor[2] [Natural Gas] (kg/mmBtu) [Electricity] (lb/MWh)	CO_2 Emissions[3] (MT/yr)	CH_4 Emissions[3] (MT/yr)	N_2O Emissions[3] (MT/yr)	CO_2e Emissions[3] (MT/yr)
Existing Unit 1 Gas Engine[1]	510	20.64	--	53.02	0.001	0.0001	53.07	1,116	0.02	0.002	1,117
Existing Unit 2 Gas Engine[1]	36	1.46	--	53.02	0.001	0.0001	53.07	79	0.002	0.0001	79
Existing Unit 3 Gas Engine[1]	0	0.00	--	53.02	0.001	0.0001	53.07	0	0.00	0.00	0
New Emergency Generator[1]	--	--	--	--	--	--	--	79	0.002	0.0001	79
Worker Vehicles[1]	--	--	--	--	--	--	--	67	0.0006	0.001	68
New Unit 1 EDC	4,046	--	7,942	260.788	0.033	0.004	262.8	940	0.12	0.01	947
New Unit 2 EDC	4,046	--	7,942	260.788	0.033	0.004	262.8	940	0.12	0.01	947
Plant Electricity Consumption[1]	8,760	--	5,047	260.788	0.033	0.004	262.8	597	0.08	0.01	602

* All emission estimates are based on the projected level of operation in the future.

[1] Please refer to Table 1.1a footnotes for equipment descriptions and references to the bases for the information in these rows/columns.

[2] Natural Gas Consumption
GHG emission factors are from Table F-3c of Appendix F from the PEA's Air Quality and GHG Emissions Technical Report.
Electricity Consumption
GHG emission factors are from Table F-3c of Appendix F from the PEA's Air Quality and GHG Emissions Technical Report.

[3] Natural Gas Consumption
GHG Emissions (MT/yr) = GHG Emission Factor (kg/mmBtu) x Projected Annual Natural Gas Consumption (mmscf/yr) x HHV (mmBtu/mmscf) / kg/MT
HHV 1,020 mmBtu/mmscf
New Emergency Generator and Worker Vehicles
GHG (MT/yr) are from PEA Table 5.8-4 (Case 1).
Electricity Consumption
GHG Emissions (MT/yr) = GHG Emission Factor (lb/MWh) x Projected Annual Electricity Consumption (MWh/yr) / lb/MT

Conversion Factors

kg/MT	1,000
lb/MT	2,204.6

Attachment 1 Emission and Health Risk Estimates

Table 1.6 GHG Emissions: Comparison of Supplemental EDC Alternative Projected* Emissions to Baseline from PEA Table 5.8-3 and VCM Project Projected* Emissions

	Baseline[1]					Supplemental EDC Alternative[2]					VCM Project[3]				
Pollutant	**Compressor Engines (MT/yr)**	**Emergency Generator (MT/yr)**	**Worker Vehicles (MT/yr)**	**Indirect Electricity Consumption (MT/yr)**	**Total (MT/yr)**	**Compressor Engines (MT/yr)**	**Emergency Generator (MT/yr)**	**Worker Vehicles (MT/yr)**	**Indirect Electricity Consumption (MT/yr)**	**Total (MT/yr)**	**Compressor Engines (MT/yr)**	**Emergency Generator (MT/yr)**	**Worker Vehicles (MT/yr)**	**Indirect Electricity Consumption (MT/yr)**	**Total (MT/yr)**
CO_2	4,845	1	51	92	4,988	1,195	79	67	2,476	3,818	1,723	79	67	2,526	4,346
CH_4	0.09	0.00003	0.0004	0.01	0.10	0.02	0.002	0.0006	0.31	0.34	0.03	0.002	0.0006	0.32	0.35
N_2O	0.01	0.00001	0.0008	0.001	0.01	0.002	0.0001	0.001	0.04	0.04	0.003	0.0001	0.001	0.04	0.04
CO_2e	4,850	1	51	93	4,994	1,196	79	68	2,495	3,838	1,725	79	68	2,546	4,368

* All emission estimates are based on the projected level of operation in the future.

[1] Baseline emissions are from PEA Table 5.8-3.

[2] Supplemental EDC Alternative projected emissions are from Table 1.5.
Compressor Engines corresponds to the 'Existing Unit X Gas Engines' rows from Table 1.5.
Emergency Generator corresponds to the 'New Emergency Generator' row from Table 1.5. This equipment is different from the emergency generator included in the baseline.
Indirect Electricity Consumption corresponds to the 'New Unit X EDC' and 'Plant Electricity Consumption' rows from Table 1.5.

[3] VCM Project projected emissions are from PEA Table 5.8-4 (Case 1) (two new 2500 HP EDCs).
Compressor Engines corresponds to the two 1900 HP natural gas engines associated with the VCM Project.
Emergency Generator corresponds to the 840 HP emergency generator associated with the VCM Project.
Indirect Electricity Consumption corresponds to two 2500 HP EDCs associated with Case 1, and all other VCS plant loads.

Attachment 1 Emission and Health Risk Estimates

Table 1.7 Electricity Consumption: Comparison of Supplemental EDC Alternative Projected* Consumption to Baseline from PEA Table 5.6-3 and VCM Project Projected* Consumption

	Baseline[1]		Supplemental EDC Alternative		VCM Project[4]	
Equipment	**Rating (kW)**	**Annual Electricity Consumption (MWh/yr)**	**Rating[2] (kW)**	**Projected Annual Electricity Consumption[3] (MWh/yr)**	**Rating (kW)**	**Projected Annual Electricity Consumption (MWh/yr)**
New Unit 1 EDC	--	--	1,963.2	7,942	1,963.2	7,451
New Unit 2 EDC	--	--	1,963.2	7,942	1,963.2	7,451
Plant Electricity Consumption	62.7	549	576.1	5,047	736.8	6,454
Total	62.7	549	4,502.5	20,932	4,663.2	21,356

* All electricity consumption estimates are based on the projected level of operation in the future.

[1] Baseline values are from PEA Table 5.6-3.

[2] New EDCs
The kW rating for the new EDCs is from Tags CM-3600 and CM-3700.
Plant Electricity Consumption
The kW rating for all other plant loads is shown under footnote 4 to Table 1.1a.

[3] Supplemental EDC Alternative projected annual electricity consumption is from Table 1.1a.

[4] VCM Project projected values are from PEA Table 5.6-5 (Case 1) (two new 2,500 HP EDCs).