Appendix B2 Air Quality Impact Analysis

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Air Quality Impact Analysis for a Renewable Natural Gas Plant for Biofuels Coyote Canyon Biogas, LLC Newport Beach, California

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01221270.00 Task 1 | December 2023

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1.0 EXECUTIVE SUMMARY

This document was prepared by SCS Engineers (SCS) on behalf of Biofuels Coyote Canyon Biogas, LLC (BCCB) located at the Coyote Canyon Landfill (CCL). This is model report detailing the air quality impact assessment (AQIA) required to be submitted in addition to Permit to Construct (PTC)/Permit to Operate (PTO) application. The application is for a new Renewable Natural Gas (RNG) Plant (RNG Plant).

The AQIA assessed the offsite concentrations of criteria air pollutants carbon monoxide (CO), nitrogen dioxide (NO_2), particulate matter smaller than 2.5 microns ($PM_{2.5}$), particulate matter smaller than 10 microns (PM_{10}) and sulfur dioxide (SO_2) that result from the combustion of landfill gas (LFG) in the proposed RNG flare and thermal oxidizer (TOX). The United States Environmental Protection Agency (EPA) regulatory model, AERMOD, was used to assess the ground level concentrations (glc) of criteria pollutants and compare those concentrations with significance thresholds. For simplicity the model was run at 1 pound per hour for each averaging time. The model results are then multiplied by the actual pound per hour emission rate, which is called the Chi over Q method (X/Q). If any significance threshold is exceeded, modeled impact will be compared to the applicable Ambient Air Quality Standards (AAQS).

The stack parameters for dispersion modeling were based on manufacturer's information for the proposed flare and TOX. SCAQMD provided five years of representative meteorological data from the John Wayne Airport for the timeframe from 2012 through 2016.

Table 1 summarizes the criteria pollutant modeling results.

Table 1. Criteria Pollutant Modeling Results Compared to SIL/SC[1]

Pollutant	Avg. Time	Conc.[1]	SIL/SC[2]	Under SIL/SC?
		µg/m³	µg/m³	Y/N
CO	1-hr	89.86	2,000/1,100	Y/Y
CO	8-hrs	26.05	500/500	Y/Y
NO_2	Ann	0.41	1/1	Y/Y
NO_2	1-hr	29.45	7.5/20	N/N
$PM_{2.5}$	Ann	0.13	0.2/2.5	Y/Y
$PM_{2.5}$	24-hrs[3]	0.56	2.5/1.0	Y/Y
PM_{10}	Ann	0.13	5/2.5	Y/Y
PM_{10}	24-hrs	1.77	2.5/1.0	Y/N
SO_2	Ann	0.16	1/None	Y/Y
SO_2	1-hr	11.29	7.8/None	N/Y
SO_2	3-hrs	6.31	25/None	Y/Y
SO_2	24-hrs	1.58	5/None	Y/Y

[1] Model results are with regulatory defaults, including terrain. Annual results are for the highest individual year, 2012-2016.
[2] SIL represents PSD Class 2 Significant Impact Level. SC represents "Significant Change in Air Quality" under the California Environmental Quality Act (CEQA).
[3] 8th Highest receptor taken as the ambient air quality standard is for the 98th percentile.

The results of dispersion modeling demonstrate that criteria pollutant impacts from the proposed flare are insignificant under SIL and SC levels with the exception of NO_2 1-hour, PM_{10} 24-hour and SO_2 1-hr results. These three model results are then compared to the AAQS after including background concentrations in Table 2 below.

Table 2. Criteria Pollutant Modeling Results Compared to AAQS[1]

Pollutant	Avg. Time	Modeled Conc.[1]	Background Conc.	Total Conc.	AAQS	Under Threshold?
		µg/m³	µg/m³	µg/m³	µg/m³	
NO_2	1-hr	29.45	100.05	129.49	188	Y
PM_{10}	24-hrs	1.77	115	116.77	150	Y
SO_2	1-hr	11.29	5.76	17.05	196.5	Y

[1] Model results are with regulatory defaults, including terrain. Annual results are for the highest individual year, 2012-2016.

All pollutants with averaging times over SIL or SC levels are shown to be under the AAQS. Therefore, no additional modeling is needed and the proposed project is in compliance with the standards.

2.0 INTRODUCTION

BCCB is proposing to divert the current LFG, and future quantities of LFG collected, to a new RNG Plant, and as a result, put the LFG to a more valuable use. The LFG is currently being flared by the Orange County Waste & Recycling (OCWR), who owns and operates the CCL. None of the existing operations at the CCL will be under common ownership or control with the proposed RNG Plant.

The RNG Plant will convert LFG into a pipeline quality natural gas equivalent, by removing hydrogen sulfide (H_2S), VOCs, carbon dioxide (CO_2), nitrogen, (N_2), and oxygen (O_2). The RNG will be injected into the Southern California Gas Company pipeline.

The bulk of the H_2S contained in the LFG is converted into elemental sulfur. The remaining H_2S, nearly all the VOCs, CO_2, N_2 and oxygen are removed from the LFG and routed to a TOX for destruction. The gas routed to the TOX is referred to as waste gas. The waste gas contains approximately 6-8.5 percent (%) methane (CH_4) (varies as raw gas composition changes). To ensure stable combustion of the waste gas, at a minimum of 1,500 degrees Fahrenheit (°F), it is necessary to provide supplemental fuel (conventional natural gas) to the TOX.

BCCB also requests to install an enclosed RNG flare to burn off-specification RNG and waste gases from the H_2S and VOC removal systems. The pipeline receiving the RNG has a strict minimum requirement for CH_4 content and strict upper limits for the content of CO_2, N_2 and O_2. If these limits are exceeded, it will be necessary to divert the off spec RNG to the flare until such time as the RNG quality returns to within the acceptable limits.

This study addresses the potential exposure to criteria (AQIA) air pollutants from the RNG flare and TOX. Predicted offsite concentrations of criteria pollutants are compared with the Prevention of Significant Deterioration (PSD) Class 2 Significant Impact levels (SIL) as well as the significance change (SC) in air quality levels under the California Environmental Quality Act (CEQA). If the predicted concentration is below the SIL and SC, the impact from that pollutant at that averaging time is considered insignificant, and no further analysis is required. If the impact is significant, the monitored background concentration is added to the predicted impact and the total is compared to the California and National AAQS (whichever is more stringent). If the total is below the applicable AAQS, compliance is demonstrated.

Figure 1. Aerial View of the BCCB, CCL, and Vicinity

Figure 2. BCCB Boundary and Source Locations

GPS Coordinates: TOX 33.613, -117.822 RNG Flare 36.612, -117822

Source	East UTM NAD83	North UTM NAD83	Elevation
	meters	meters	feet
TOX	423,786.00	3,719,539.00	780.84
Flare	423759.91	3719546.10	780.84

[1] Site grade, feet above mean sea level (msl), per Google Earth.

3.0 CLIMATE AND PREVAILING WINDS

3.1 METEOROLOGICAL DATA

Data taken from John Wayne Airport, located about 8 kilometers (km) to the Northwest of BCCB, has five consecutive years of historic hourly meteorological data for the period January 1, 2012 through December 31, 2016. SCAQMD processed and provided this data for this analysis.

No significant intervening elevated terrain is observed between the town and the landfill. Figure 3 includes a wind rose of the meteorological dataset.

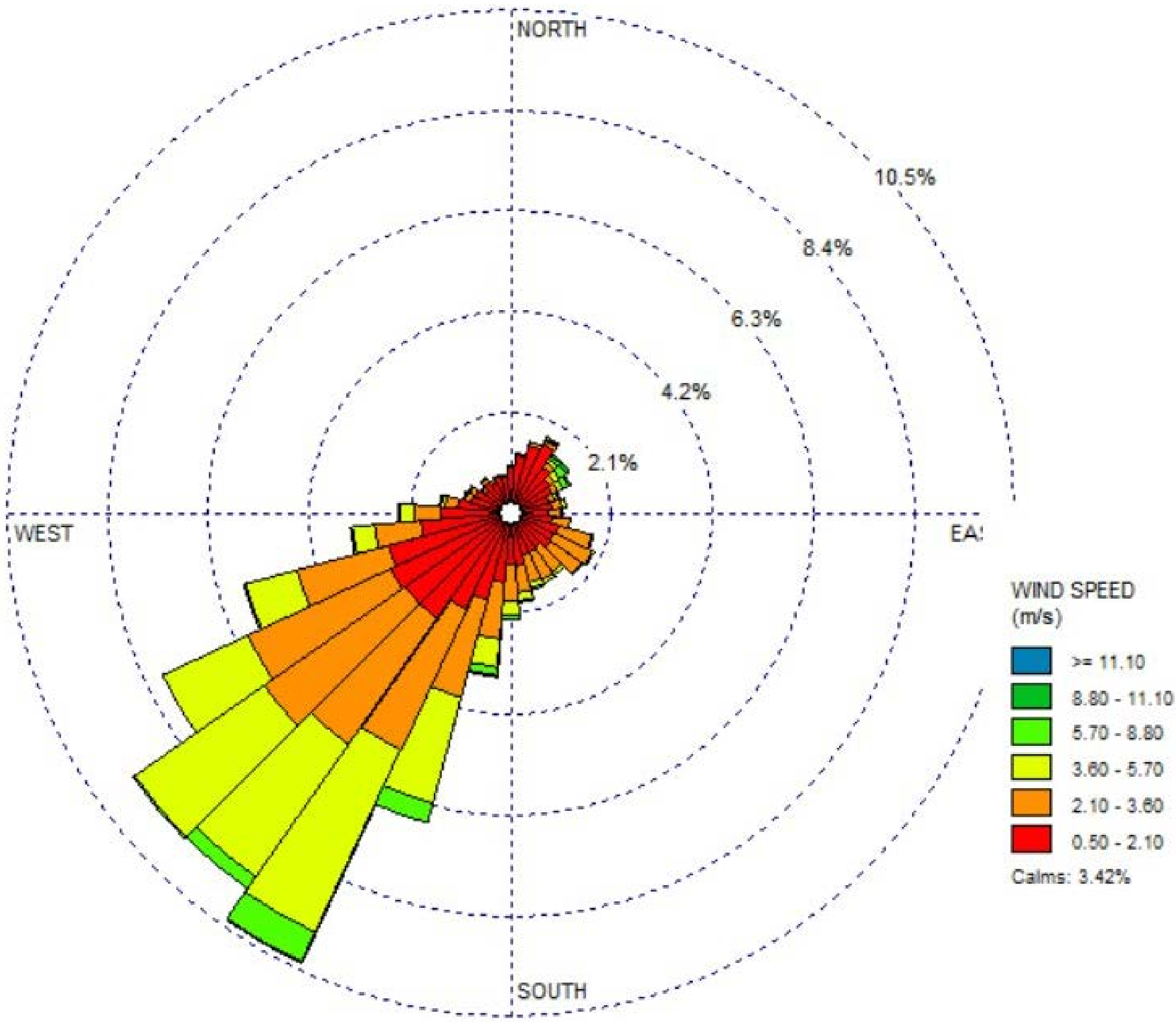

Figure 3. John Wayne Airport Met Station (KSNA) Windrose

1/1/2012 – 12/31/2016
Wind Direction "From"

4.0 ATMOSPHERIC DISPERSION MODELING

This section describes the methods that were followed to complete the air dispersion modeling element of the AQIA.

4.1 AIR DISPERSION MODEL SELECTION

The air dispersion model selected for air quality modeling analyses is AERMOD. AERMOD is a state-of-the-art model that allows for modeling of complex emission sources. The AERMOD modeling suite consists of AERMOD, the air dispersion model; AERMET, a meteorological data preprocessor, and AERMAP, a terrain data preprocessor. A primary enhancement of AERMOD over earlier models (especially ISCST3) is the more realistic handling of plume dispersion in both stable and convective conditions within the planetary boundary layer (PBL). Plumes encountering terrain more realistically move either over or around terrain features. AERMOD incorporates the PRIME building downwash algorithms developed by the Electric Power Research Institute (EPRI). To properly represent dispersion processes, the meteorological data input requirements for AERMOD are rigorous as compared to previous models such as ISCST3.

Modeling for criteria air pollutants was done for the averaging time periods for which each pollutant has a standard. Regulatory averaging time periods for criteria pollutants are shown in Table 1.

4.2 POLLUTANTS MODELED

Modeling was conducted for each criteria pollutant. Maximum permitted emission rates were input for criteria pollutants. For simplicity the model was run at 1 pound per hour for each different averaging time. The model results are then multiplied by the actual pound per hour emission rate, which is called the Chi over Q method (X/Q).

If any significance threshold is exceeded, modeled impact will be compared to the applicable Ambient Air Quality Standards (AAQS).

4.3 MODEL INPUTS

This section describes the AERMOD model inputs that were used for calculating ground level concentrations (glcs) at receptors.

4.3.1 Model Options

Modeling was done to calculate offsite concentrations of criteria pollutants. Averaging times corresponding to applicable ambient air quality standards were used for criteria pollutants. Regulatory default options were applied as shown:

- AERMOD
- No Dry Deposition
- No Wet Deposition
- No Gas Deposition
- No Particulate Deposition
- Calculation of Average Concentration Values

- Rural Dispersion Only
- Model Uses Regulatory DEFAULT Options:
  - Stack-tip Downwash
  - Accounts for Elevated Terrain Effects
  - Uses Calms Processing Routine
  - Uses Missing Data Processing Routine
  - No Exponential Decay
- Model Assumes No Flagpole Receptor Heights
- Default Dispersion Coefficients
- Default Wind Speed with Elevation Coefficients

Though SCAQMD's modeling guidelines specify using the urban option, clearly the land use in the 3-kilometer radius of the source is rural as less than 50 percent of the land within 3 km of the source is undeveloped, so the rural option was selected.

4.3.2 Release Parameters

Source release parameters are presented in Table 3. The proposed flare is modeled as a point source. All flares are enclosed flares, not utility or candlestick flares, so no flare adjustment was applied.

Table 3. Release Parameters

Source	Stack Height, feet	Stack Exit Diameter, feet	Stack Exit Temperature, ºF	Stack Exhaust Velocity, feet/sec
Point Sources				
TOX	60	3.17	748	23.66
Flare	40	13	1,600	18,29

For the purpose of this analysis, the flare and TOX are assumed to operate continuously 24 hours per day, 7 days per week, and 52 weeks per year. This is conservative since it is not expected that the RNG flare will operate more than 875 hours annually.

4.3.3 Source Locations

The flare and TOX locations and base elevations are presented in Table 4.

Table 4. Flare and TOX Location and Elevation at Grade[1]

Source	East UTM NAD83	North UTM NAD83	Elevation
	meters	meters	feet
TOX	423,786.00	3,719,539.00	780.84
Flare	423759.91	3719546.10	780.84

[1] Site grade, feet above mean sea level (msl), per Google Earth.

4.3.4 Building Structures and BPIP-PRIME Dimensions

The BPIP-PRIME model algorithms are generally used to calculate direction-specific structure downwash effects. The dimensions of structures within about 5 building widths of point sources can cause downwash to occur. One structure was identified at BCCB that has the potential to contribute to building downwash. This building is 18 meters West of the flare and 35 meters Southwest of the TOX, with a height of 10 feet as well as length and width of 13 meters and 10 meters, respectively.

4.3.5 Receptors

A Cartesian receptor grid was developed:

- Fine grid receptors were spaced at approximately 25-meter intervals out to 500 meters from the property line.
- Medium grid receptors were spaced at approximately 50 meters spacing out to 1000 meters from the property boundary.
- Additional medium grid receptors were spaced at 100 meters spacing to 2000 meters.

The above-described nested receptor grid resulted in 4,161 receptors.

4.4 TERRAIN DATA

Terrain hill profiles for the modeling domain were processed with the AERMAP terrain data preprocessor using the U.S. Department of Agriculture National Elevation Dataset (NED) at a grid size of one arc-second. AERMAP locates the height and location of terrain (Height Scale factor) that has the greatest influence on each receptor. Receptor terrain elevations (z coordinates) were assigned based upon the highest elevation of the four DEM nodes forming a “box” around each receptor location.

Source and building grade elevations were obtained from Google Earth and not processed via AERMAP. Site grade is at 781 feet above mean sea level (msl).

5.0 AIR QUALITY IMPACT ASSESSMENT

The project consists of a proposed flare and TOX. Maximum emissions of Nitrogen Oxides (NO_x), Carbon Monoxide (CO), Particulate Matter (PM) less than 10 and 2.5 microns in diameter (PM_{10} and $PM_{2.5}$) and SO_2 are shown in Table 5.

Table 5. Criteria Pollutant Emissions

Pollutant	Flare Emission Rate	TOX Emission Rate
	lb/hr	lb/hr
CO	4.67	4.07
NO_x	1.94	1.23
PM_{10}	1.37	0.24
$PM_{2.5}$	1.37	0.24
SO_2	0.75	0.47

Air dispersion modeling was completed to demonstrate compliance with the National and California AAQS. Pollutants currently in attainment with National AAQS are NO_2, CO, 24-hour PM_{10} and SO_2. Per Rule 1303, Appendix A, modeling for compliance with California AAQS is not required for SO_2, although SO_2 modeling is required for comparison with the 1-hour National AAQS. Modeling is also not required for VOCs as there are no ambient air quality standards for VOC.

Modeling was conducted for CO, NO_x, PM_{10}. $PM_{2.5}$ and SO_2. NO_x was conservatively assumed to be fully converted to Nitrogen Dioxide (NO_2). Model inputs, ambient air quality analysis methods and receptors are discussed in Section 4. Modeling was performed using the X/Q method with 1 pound per hour emissions from both the flare and TOX at each of the averaging periods addressed in the AAQS. Model results are detailed below in Table 6.

Table 6. Model Results at Each Averaging Period

Avg. Period	Flare Modeled Maximum Impact ($\mu g/m^3$ per lb/hr)	TOX Modeled Maximum Impact ($\mu g/m^3$ per lb/hr)
1-hour	4.33	17.11
3-hour	2.44	9.54
8-hour	1.63	4.53
24-hour	0.98	1.79
24-hour (8^{th} high for PM2.5 24-hour standard)	0.22	1.06
Annual	0.050	0.256

Each lb/hr emission rate from Table 5 above can be multiplied by the model results in Table 6 to get a maximum impact concentration in µg/m³ from each source. The maximum calculated concentrations for flare and TOX are then added together for a conservative maximum concentration to compare to the AAQS. The Pollutant Concentration excel file included with the modeling file submittal shows these calculations.

A summary of the applicable regulatory standards and significance thresholds are listed in Table 7.

Table 7. Summary of AAQS, Class II PSD Increment and Significant Change in Air Quality Concentration Values

Pollutant	Avg. Period	National AAQS[1,2] (µg/m³)	California AAQS[2] (µg/m³)	Class II PSD Increment (µg/m³)	PSD Class 2 SILs[3] (µg/m³)	Significant Change in Air Quality Conc.[2] (µg/m³)
CO	1-hour	40,000	23,000	None	2,000	1,100
CO	8-hour	10,000	10,000	None	500	500
NO_2	Annual	100	57[1]	25	1	1
NO_2	1-hour	188	339[1]	None	7.5	20
PM_{10}	Annual	None	20	17	1	2.5
PM_{10}	24-hour	150	50	30	5	1.0
$PM_{2.5}$	Annual	12	12	4	1.2	2.5
$PM_{2.5}$	24-hour	35	None	9	0.2	1.0
SO_2	Annual	79	None	20	1	None
SO_2	1-hour	196	655	None	7.9	None
SO_2	3-hour	1,300[4]	None	512	25	None
SO_2	24-hour	367	105	91	5	None

1 From www.epa.gov/air/criteria.html (National AAQS dated 12/20/2016) and www.arb.ca.gov/research/aaqs/aaqs2.pdf (National AAQS and California AAQS dated 5/4/2016).
2 SCAQMD Rule 1303, Table A-2 (Revised 12/6/02).
3 SIL stands for Significant Impact Level.
4 Secondary Standard

6.0 RESULTS

This section presents the AQIA results. Both were performed in accordance with applicable regulatory guidelines.

The AQIA assessed the offsite concentrations of criteria air pollutants CO, NO_2, $PM_{2.5}$, PM_{10} and SO_2 that result from the combustion of LFG in the proposed flare and TOX. The EPA regulatory model, AERMOD, was used to assess the ground-level concentration of criteria pollutants and compare those concentrations with significance thresholds and applicable AAQS.

The stack parameters for dispersion modeling were based on manufacturer's information for the proposed flare. SCAQMD provided five years of representative meteorological data from the John Wayne Airport for the timeframe from 2012 through 2016.

Table 8 summarizes the criteria pollutant modeling results.

Table 8. Criteria Pollutant Modeling Results Compared to SIL/SC[1]

Pollutant	Avg. Time	Conc.[1]	SIL/SC[2]	Under SIL/SC?
		$\mu g/m^3$	$\mu g/m^3$	Y/N
CO	1-hr	89.86	2,000/1,100	Y/Y
CO	8-hrs	26.05	500/500	Y/Y
NO_2	Ann	0.41	1/1	Y/Y
NO_2	1-hr	29.45	7.5/20	N/N
$PM_{2.5}$	Ann	0.13	0.2/2.5	Y/Y
$PM_{2.5}$	24-hrs[3]	0.56	2.5/1.0	Y/Y
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SO_2	1-hr	11.29	7.8/None	N/Y
SO_2	3-hrs	6.31	25/None	Y/Y
SO_2	24-hrs	1.58	5/None	Y/Y

[1] Model results are with regulatory defaults, including terrain. Annual results are for the highest individual year, 2012-2016.
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Table 9. Criteria Pollutant Modeling Results Compared to AAQS[1]

Pollutant	Avg. Time	Modeled Conc.[1]	Background Conc.	Total Conc.	AAQS	Under Threshold?
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NO_2	1-hr	29.45	100.05	129.49	188	Y
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[1] Model results are with regulatory defaults, including terrain. Annual results are for the highest individual year, 2012-2016.

All pollutants with averaging times over SIL or SC levels are shown to be under the AAQS. Therefore, no additional modeling is needed and the proposed project is in compliance with the standards.

7.0 CONCLUSIONS

BCCB has demonstrated via the AQIA analysis that facility emissions of criteria pollutants comply with applicable AAQS. This AQIA followed the methodology of SCAQMD and CARB. The AQIA is being submitted in addition to the PTC/PTO application for the proposed RNG plant at CCL. This model report will be submitted in hard copy as well as electronically to the SCAQMD, along with dispersion modeling files.

8.0 REFERENCES

The following references and documents were consulted:

- CARB/California Air Pollution Control Officers Association (CAPCOA), Risk Management Guidance Document, July 2015.
- OEHHA, Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, February 2015.
- United States Environmental Protection Agency (EPA), User's Guide for the AMS/EPA Regulatory Model AERMOD, EPA-450/B-03-001, September 2004.
- SCAQMD Modeling Guidelines, http://www.aqmd.gov/home/air-quality/meteorological-data/modeling-guidance.
- 40 CFR Part 51, Appendix W, Guidelines on Air Quality Models (commonly referred to as U.S. EPA's Appendix W).
- South Coast AQMD Risk Assessment Procedures for Rules 1401 and 212.