Appendix B

Health Risk Assessment Results

APPENDIX B

HEALTH RISK ASSESSMENT

Introduction

The proposed Hydrogen Plant must show that modeled impacts from various pollutants do not exceed significance thresholds. The Hydrogen Plant must show that the modeled impacts of PM_{10} risk and CO emissions increases will not exceed listed significanant concentration thresholds. Chevron is a RECLAIM facility and is subject to Rule 2005, which requires NO_2 impacts to be below the ambient air quality standards. Health risk assessment calculations are required to determine if the emissions from listed toxic air contaminants (TACs) result in: 1) a maximum individual cancer risk (MICR) that exceeds 10 in one million; or 2) a noncancer chronic or acute hazard index (HI) is greater than 1.0.

The Rule 1303 and Rule 2005 modeling study was completed following the requirements outlined in Rule 1303 Appendix A. The health risk study was completed following the SCAQMD's *Risk Assessment Procedures for Rules 1401 and 212 Version 6.0* (August 2000). The modeling inputs and results are presented below. As discussed, maximum criteria pollutant impacts will not exceed the significant concentration thresholds. Maximum off-site health risk impacts will not exceed the established risk thresholds.

Ambient Air Quality Modeling Analysis

To calculate air concentrations of the criteria pollutant, air dispersion modeling was completed using the SCREEN3 model with worst-case meteorological conditions. The SCREEN3 Dispersion Model requires the following inputs:

Stack Height:	100 ft
Stack Inside Diameter:	12.3 ft
Stack Exit Velocity:	32.7 ft/sec
Stack Gas Temperature:	304 F
Building Downwash Parameters:	31 ft (L) x 42 ft (W) x 70 ft (H)

Maximum 1-hour normalized concentrations (χ/Qs) were calculated by inputting a 1 g/sec emission rate. Persistence factors were used to calculate the annual, 24-hour and 8-hour χ/Qs. The emission rate (in g/sec) of each compound was multiplied by the applicable 1-hour, 8-hour, 24-hour, or annual average modeled χ/Q, as needed to obtain air concentrations. Highest background concentrations measured at the Hawthorne station over the last three years were used to obtain results. The total concentration, obtained as the sum of modeled concentration and background concentration for each compound, was compared against the California Ambient Air Quality Standards (CAAQS) and the National Ambient Air Quality Standards (NAAQS) to determine Rule 1303 and Rule 2005 compliance. Table B-1 shows the concentration calculations and comparison to standards in detail. As shown in Table B-1, the criteria pollutant concentrations do not exceed the significance thresholds.

Health Risk Assessment

A Tier 3 Health Risk Assessment was completed using the District default emission factors for natural gas combustion in heaters (> 100 MMBtu/hr). The exception is ammonia, assuming a 9 ppm slip from the SCR unit. The maximum normalized concentrations (χ/Qs) from SCREEN3 were used as inputs to the Risk Assessment to calculate maximum TAC concentrations. Applicable TAC emissions from the Reformer considered included acetaldehyde, acrolein, ammonia, benzene, ethylbenzene, formaldehyde, hexane, naphthalene, PAHs (non-naphthalene), propylene, toluene, and xylenes. Cancer risk analysis is required for acetaldehyde, benzene, formaldehyde, and PAHs. A chronic risk analysis is required for all compounds except PAHs. Annual average emissions were calculated for the cancer risk and chronic non-cancer risk analyses. An acute risk analysis is required for acrolein, ammonia, benzene, formaldehyde, toluene, and xylenes. Maximum 1-hour emissions were calculated for acute risk compounds. The Reformer is assumed to operate 24 hours/day, 365 days/year. The receptor distances that are required for the modeling are as follows:

Nearest Residential Receptor:	440 m
Nearest Commercial Receptor:	600 m
Nearest Offsite Location:	400 m

To calculate maximum cancer risk for each compound, the annual average concentration was multiplied by a cancer inhalation unit risk factor and a multi-pathway factor (for multi-pathway pollutants only). Similarly, to calculate the chronic and acute noncancer HI's for each applicable compound, the maximum one-hour average concentration was multiplied by the multi-pathway factor (chronic or acute) and divided by the Reference exposure level (chronic or acute respectively). Cumulative cancer risks and noncancer HIs were calculated by adding the cancer risks or noncancer HIs from each compound. A detailed summary of the cancer risk and noncancer HI calculations is provided in the attached Table B-2. The maximum cumulative risks obtained are as follows:

	Threshold	**MEI**
Maximum Cumulative Cancer Risk	10×10^{-6}	4.0×10^{-8}
Maximum Cumulative Chronic HI	1	0.001
Maximum Cumulative Acute HI	1	0.002

The maximum cancer risk and chronic HI occurred at a residential location, 440 m south of the proposed location. While the maximum acute HI occurred at an offsite location, 400 m south of the proposed location. As shown above, the maximum cancer and noncancer risks are below the significance thresholds. Therefore, no further risk analysis is required. This analysis is highly conservative since no credit has been taken for reduction in off-site health risk impacts from the shutdown of the existing SMR Reformer.

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