HALE AVENUE EXTENSION PROJECT AIR QUALITY ASSESSMENT

Morgan Hill, California

June 8, 2016

Prepared for:
Demetri Loukas
David J. Powers & Associates, Inc.
1871 The Alameda, Suite 200
San José, CA 94126

Prepared by:

Keith Pommerenck &
Josh Carman

ILLINGWORTH & RODKIN, INC.
Acoustics • Air Quality

1 Willowbrook Court, Suite 120
Petaluma, CA 94954
(707) 794-0400

Project: 16-002

Introduction

The project proposes the construction of approximately 0.93 miles of new roadway alignment between Main Avenue and the DeWitt/Spring intersection. The roadway will be a two lane divided roadway with a relatively low volume and speed.

Background

Hale Avenue is part of the Santa Teresa Corridor, which is a north-south arterial through Morgan Hill from Tilton Avenue to Watsonville Road that parallels US Highway 101. While the City's General Plan identifies this continuous corridor as Santa Teresa Boulevard, it is currently a disjointed thoroughfare with significant portions missing and other portions being made up of a series of north-south streets of different names. To make Santa Teresa corridor continuous, Hale Avenue needs to be extended and the Santa Teresa Corridor between Dewitt Avenue and Watsonville Road needs to be realigned and widened. These improvements would be constructed in two phases; Phase I and Phase II. Phase I is the extension of Hale Avenue from West Main Avenue to Dewitt/Spring Avenue intersection and is anticipated to be constructed within the next three to four years. Phase II is the realignment and widening of the Santa Teresa Corridor from the Dewitt/Spring Avenue intersection to Watsonville Road, and is anticipated to be constructed in the next 10 to 15 years. This air quality assessment evaluates the potential for the construction and operation of Phase I, hereinafter referred to as the Hale Avenue Extension, to result in air quality impacts as defined under CEQA.

Project Description

As proposed, the Hale Avenue Extension will be a two-lane road with a center median/turn lane in a rural configuration that does not have curb and gutter. One side of the street would have a detached sidewalk while the other side will have a wider linear park with a Class 1 bike path and landscaping. Street lights will be included. At the intersections of Main Avenue, W. Dunne Avenue, and DeWitt Avenue some kind of a controlled intersection will be required. This could be a traffic signal, a round-about, or stop sign controlled. Also included in the project will be a water line extended through the entire length and drainage structures at various locations. Overhead utility lines will be placed underground at certain locations where the voltage permits. In addition, an old block structure owned by PG&E and located near the Hale Avenue/Main Avenue intersection and a residence located at Warren Avenue will need to be removed for the project.

2010 General Plan Circulation Element Update

Until 2010, the ultimate width of the Hale Avenue Extension has been described as a 4-lane arterial roadway with median and detached sidewalks within a 110' wide right of way.

However, in February 2010, the City Council adopted a Circulation Element Update, which downgraded Hale Avenue (and the entire Santa Teresa Corridor) to a 2-lane multi-modal arterial. Multi-modal simply means accommodating pedestrians and bike riders. Currently, north-south traffic west of Monterey Road uses a circuitous route through residential neighborhoods where houses face and take access to the streets from driveways. When the Hale Avenue Extension connection is complete, north-south traffic will be able to use an arterial street with very few houses facing the street, thus providing a safer and more efficient means of driving north or south through the western part of Morgan Hill.

The Morgan Hill City Council, acting as the Redevelopment Agency, has identified completion of the Santa Teresa/Hale Avenue Extension as a high priority, and the City's 5-year Capital Improvement Program has included the design and construction of this road segment.

Purpose of this Report

The purpose of this report is to address air quality and community risk impacts associated with the proposed extension of Hale Avenue. There are residences located to the east, south, and west of the project. Additionally, a school and a health care facility (Pacific Hills Manor) are located west of the project site.

The air quality assessment predicts construction and operational period emissions. Community risk impacts could occur due to temporary construction emissions affecting nearby sensitive receptors and the operation of the new roadway. This analysis addresses those issues following the guidance provided by the Bay Area Air Quality Management District (BAAQMD).

Air Quality Setting

The project is located in the southern portion of Santa Clara County, which is in the San Francisco Bay Area Air Basin. Ambient air quality standards have been established at both the State and federal level. The San Francisco Bay Area meets all ambient air quality standards with the exception of ground-level ozone, respirable particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$).

High ozone levels are caused by the cumulative emissions of reactive organic gases (ROG) and nitrogen oxides (NO_x). These precursor pollutants react under certain meteorological conditions to form high ozone levels. Controlling the emissions of these precursor pollutants is the focus of the Bay Area's attempts to reduce ozone levels. The highest ozone levels in the Bay Area occur in the eastern and southern inland valleys that are downwind of air pollutant sources. High ozone levels aggravate respiratory and cardiovascular diseases, reduced lung function, and increase coughing and chest discomfort.

Particulate matter is another problematic air pollutant of the Bay Area. Particulate matter is assessed and measured in terms of respirable particulate matter or particles that have a diameter of 10 micrometers or less (PM_{10}) and fine particulate matter where particles have a diameter of 2.5 micrometers or less ($PM_{2.5}$). Elevated concentrations of PM_{10} and $PM_{2.5}$ are the result of both region-wide (or cumulative) emissions and localized emissions. High particulate matter levels aggravate respiratory and cardiovascular diseases, reduce lung function, increase mortality (e.g., lung cancer), and result in reduced lung function growth in children.

Toxic air contaminants (TAC) are a broad class of compounds known to cause morbidity or mortality (usually because they cause cancer) and include, but are not limited to, the criteria air pollutants. TACs are found in ambient air, especially in urban areas, and are caused by industry, agriculture, fuel combustion, and commercial operations (e.g., dry cleaners). TACs are typically found in low concentrations, even near their source (e.g., diesel particulate matter (DPM) near a freeway). Because chronic exposure can result in adverse health effects, TACs are regulated at the regional, State, and federal level.

Diesel exhaust is the predominant TAC in urban air and is estimated to represent about three-quarters of the cancer risk from TACs (based on the Bay Area average). According to the California Air Resources Board (CARB), diesel exhaust is a complex mixture of gases, vapors, and fine particles. This complexity makes the evaluation of health effects of diesel exhaust a complex scientific issue. Some of the chemicals in diesel exhaust, such as benzene and formaldehyde, have been previously identified as TACs by the CARB, and are listed as carcinogens either under the state's Proposition 65 or under the Federal Hazardous Air Pollutants programs.

Regulatory Setting

The U.S. Environmental Protection Agency (U.S. EPA) is responsible for enforcing the federal Clean Air Act and the 1990 amendments to it, as well as the national ambient air quality standards (federal standards) that the U.S. EPA establishes. These standards identify levels of air quality for six criteria pollutants, which are considered the maximum levels of ambient air pollutants considered safe, with an adequate margin of safety, to protect public health and welfare. The six criteria pollutants are ozone (O_3), carbon dioxide (CO_2), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respirable particulate matter with an aerodynamic diameter of 10 micrometers (PM_{10}), fine particulate matter with an aerodynamic diameter of 2.5 micrometers ($PM_{2.5}$), and lead (Pb). The U.S. EPA also has regulatory and enforcement jurisdiction over emission sources beyond State waters (outer continental shelf) and sources that are under the exclusive authority of the federal government, such as aircraft, train locomotives, and interstate trucking. As part of its enforcement responsibilities, the U.S. EPA requires each State with nonattainment areas (i.e., areas that do not meet national ambient air quality standards) to prepare and submit a State Implementation Plan (SIP) that demonstrates the means to attain the federal standards. The SIP must integrate federal, State, and local plan components and regulations to identify specific measures to reduce pollution in nonattainment areas, using a combination of performance standards and market-based programs.

The CARB, a department of the California EPA, oversees air quality planning and control throughout California. It is primarily responsible for ensuring implementation of the 1989 amendments to the California Clean Air Act (CCAA), responding to the federal Clean Air Act Amendment requirements, and regulating emissions from motor vehicles and consumer products within the state. CARB has established emission standards for vehicles sold in California and for various types of equipment available commercially. It also sets fuel specifications to further reduce vehicular emissions and develops airborne toxic control measures to reduce TACs identified under CARB regulations.

The ambient air quality standards cover what are called "criteria" pollutants because the health and other effects of each pollutant are described in criteria documents. The federal and State ambient standards were developed independently with differing purposes and methods, although both processes attempted to avoid health-related effects. As a result, federal and State standards differ in some cases. In general, California standards are more stringent. This is particularly true for ozone and PM_{10}. The BAAQMD is the regional agency tasked with managing air quality in the region. At the State level, the CARB oversees regional air district activities and regulates air quality. The BAAQMD has published the California Environmental Quality Act (CEQA) Air Quality Guidelines that are used in this assessment to evaluate the air quality impacts of projects.[1]

Greenhouse Gas Emissions

This section provides a general discussion of global climate change and focuses on emissions from human activities that alter the chemical composition of the atmosphere. The discussion on global climate change and greenhouse gas (GHG) emissions is based in part upon the California Global Warming Solutions Act of 2006 (Assembly Bill (AB) 32) and research, information and analysis completed by the International Panel on Climate Change (IPCC), the U.S. EPA, and the California Air Resources Board (CARB).

Global climate change refers to changes in weather including temperatures, precipitation, and wind patterns. Global temperatures are modulated by naturally occurring and anthropogenic (generated by mankind) atmospheric gases such as carbon dioxide (CO2), methane (CH4), and nitrous oxide (NOx).[2] These gases allow sunlight into the earth's atmosphere but prevent heat

[1] Bay Area Air Quality Management District. 2011. BAAQMD CEQA Air Quality Guidelines. May.
[2] 19 IPCC, 2007: Summary for Policymakers. In: Climate Change 2007: The Physical Science Bases. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S.,

from radiating back out into outer space and escaping from the earth's atmosphere, thus altering the earth's energy balance. This phenomenon is known as the greenhouse effect.

Naturally occurring GHGs include water vapor,[3] CO2, CH4, NOx, and ozone (O3). Several classes of halogenated substances that contain fluorine, chlorine, or bromine are also GHGs, but are for the most part solely a product of industrial activities.

Unlike emissions of criteria and toxic air pollutants, which have local or regional impacts, emissions of GHGs have a broader, global impact. Emissions of GHGs contributing to global climate change are attributable in large part to human activities associated with the transportation, industrial/manufacturing, utility, residential, commercial, and agricultural sectors. Impacts to California from climate change include shifting precipitation patterns, increasing temperatures, increasing severity and duration of wildfires, earlier melting of snow pack and effects on habitats and biodiversity. Sea levels along the California coast have risen up to seven inches over the last century, and average annual temperatures have been increasing. These and other effects will likely intensify in the coming decades and significantly impact the State's public health, natural and manmade infrastructure, and ecosystems.[4]

Agencies at the international, national, state, and local levels are considering strategies to control emissions of gases that contribute to global warming. There is no comprehensive strategy that is being implemented on a global scale that addresses climate change; however, in California a multi-agency "Climate Action Team," has identified a range of strategies and the Air Resources Board, under AB 32, has approved the *Climate Change Scoping Plan* (Scoping Plan). AB 32 requires achievement by 2020 of a Statewide greenhouse gas emissions limit equivalent to 1990 emission levels, and the adoption of rules and regulations to achieve the maximum technologically feasible and cost-effective greenhouse gas emissions reductions. The CARB and other State agencies are currently working on regulations and other initiatives to implement the Scoping Plan. By 2050, the State plans to reduce emissions to 80 percent below 1990 levels.

Bay Area 2010 Clean Air Plan

D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. Available at: <http://ipcc.ch/ >. Accessed March 25, 2013

[3] Concentrations of water are highly variable in the atmosphere over time, with water occurring as vapor, cloud droplets and ice crystals. Changes in its concentration are also considered to be a result of climate feedbacks rather than a direct result of industrialization or other human activities. For this reason, water vapor is not discussed further as a greenhouse gas

[4] State of California Energy Commission. *2009 California Climate Adaptation Strategy Discussion Draft. Frequently Asked Questions.* August 3, 2009. <www.climatechange.ca.gov/adaptation/documents/2009-07-31_Discussion_Draft-Adaptation_FAQs.pdf>. Accessed March 25, 2013.

The Bay Area 2010 Clean Air Plan (CAP) is a multi-pollutant plan prepared by BAAQMD that addresses GHG emissions along with other air emissions in the San Francisco Bay Area Air Basin. One of the key objectives in the CAP is climate protection. The 2010 CAP includes emission control measures in five categories: Stationary Source Measures, Mobile Source Measures, Transportation Control Measures, Land Use and Local Impact Measures, and Energy and Climate Measures. Consistency of a project with current control measures is one measure of its consistency with the CAP. The current CAP also includes performance objectives, consistent with the State's climate protection goals under AB 32 and SB 375, designed to reduce emissions of GHGs to 1990 levels by 2020 and 40 percent below 1990 levels by 2035.

Significance Thresholds

In June 2010, BAAQMD adopted thresholds of significance to assist in the review of projects under CEQA. These thresholds were designed to establish the level at which BAAQMD believed air pollution emissions would cause significant environmental impacts under CEQA and were posted on BAAQMD's website and included in the Air District's updated CEQA Guidelines (updated May 2011). The significance thresholds identified by BAAQMD and used in this analysis are summarized in Table 1.

Table 1. Air Quality Significance Thresholds

Pollutant	Construction Thresholds	Operational Thresholds	
	Average Daily Emissions (lbs./day)	Average Daily Emissions (lbs./day)	Annual Average Emissions (tons/year)
Criteria Air Pollutants			
ROG	54	54	10
NO_x	54	54	10
PM_{10}	82	82	15
$PM_{2.5}$	54	54	10
CO	Not Applicable	9.0 ppm (8-hour average) or 20.0 ppm (1-hour average)	
Fugitive Dust	Construction Dust Ordinance or other Best Management Practices	Not Applicable	
Health Risks and Hazards for Single Sources			
Excess Cancer Risk	>10 per one million		
Chronic or Acute Hazard Index	>1.0		
Incremental annual average $PM_{2.5}$	>0.3 µg/m^3		
Health Risks and Hazards for Combined Sources (Cumulative from all sources within 1,000 foot zone of influence)			
Excess Cancer Risk	>100 per one million		
Chronic Hazard Index	>10.0		
Annual Average $PM_{2.5}$	>0.8 µg/m^3		
Greenhouse Gas Emissions			
GHG Annual Emissions	Compliance with a Qualified GHG Reduction Strategy OR 1,100 metric tons or 4.6 metric tons per capita		

Note: ROG = reactive organic gases, NOx = nitrogen oxides, PM_{10} = course particulate matter or particulates with an aerodynamic diameter of 10 micrometers (µm) or less, $PM_{2.5}$ = fine particulate matter or particulates with an aerodynamic diameter of 2.5µm or less; and GHG = greenhouse gas.

BAAQMD's adoption of significance thresholds contained in the 2011 CEQA Air Quality Guidelines was called into question by an order issued March 5, 2012, in California Building Industry Association (CBIA) v. BAAQMD (Alameda Superior Court Case No. RGI0548693). The order requires the BAAQMD to set aside its approval of the thresholds until it has conducted environmental review under CEQA. The ruling made in the case concerned the environmental impacts of adopting the thresholds and how the thresholds would indirectly affect land use development patterns. In August 2013, the Appellate Court struck down the lower court's order to set aside the thresholds (Cal. Court of Appeal, First Appellate District, Case Nos. A135335 & A136212). CBIA sought review by the California Supreme Court on three issues, including the appellate court's decision to uphold the BAAQMD's adoption of the thresholds, and the Court granted review on just one: Under what circumstances, if any, does CEQA require an analysis of how existing environmental conditions will impact future residents or users of a proposed project? In December 2015, the Supreme Court determined that an analysis of the impacts of the environment on a project – known as "CEQA-in-reverse" – is only required under two limited circumstances: (1) when a statute provides an express legislative directive to consider such impacts; and (2) when a proposed project risks exacerbating environmental hazards or conditions that already exist (Cal. Supreme Court Case No. S213478). The Supreme Court reversed the Court of Appeal's decision and remanded the matter back to the appellate court to reconsider the case in light of the Supreme Court's ruling. Accordingly, the case is currently pending back in the Court of Appeal. Because the Supreme Court's holding concerns the effects of the environment on a project (as contrasted to the effects of a proposed project on the environment), and not the science behind the thresholds, the significance thresholds contained in the 2011 CEQA Air Quality Guidelines are applied to this project.

Impacts and Mitigation Measures

Impact 1: Conflict with or obstruct implementation of the applicable air quality plan? ***Less-than-significant.***

The most recent Clean Air Plan is the *Bay Area 2010 Clean Air Plan* that was adopted by BAAQMD in September 2010. The proposed project would not conflict with the latest Clean Air planning efforts since the project would have emissions below the BAAQMD criteria pollutant thresholds (see Impact 2).

Impact 2: Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable State or federal ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)? ***Less-than-significant with construction-period mitigation measures.***

The Bay Area is considered a non-attainment area for ground-level ozone and $PM_{2.5}$ under both the Federal Clean Air Act and the California Clean Air Act. The area is also considered non-attainment for PM_{10} under the California Clean Air Act, but not the federal act. The area has attained both State and federal ambient air quality standards for carbon monoxide. As part of an effort to attain and maintain ambient air quality standards for ozone, PM_{10}, and $PM_{2.5}$ the BAAQMD has established thresholds of significance for these air pollutants and their precursors. These thresholds apply to both construction period and operational period impacts and are listed in Table 1.

Road Construction and Operational Modeling

Emissions of air pollutants that could affect both regional and local air quality were addressed by modeling emissions and comparing them to the significance thresholds identified in Table 1. This included emissions for both construction and operational periods.

Construction Period Emissions

Average daily construction exhaust emissions were predicted using the Sacramento Metropolitan Air Quality Management District's (SMAQMD) Road Construction Emissions Model version 7.1.5.1 or RoadMod. Inputs to the model included the construction year, total expected duration and project length. Other model inputs such as area of disturbance and soil imported on a daily basis were estimated based on conservative and reasonable assumptions for similar construction projects. The model predicts emissions of ozone precursor pollutants (i.e., ROG and NO_x) and particulate matter (i.e., PM_{10} and $PM_{2.5}$). The model also computes emissions of CO_2. The project schedule assumes that the project would be built out over a period of approximately 10 months beginning in mid-2017, or an estimated 220 construction workdays (based on an average of 22 workdays per month). Average daily emissions were computed by dividing the total construction emissions by the number of construction days. Table 2 shows average daily construction emissions of ROG, NO_x, PM_{10} exhaust, and $PM_{2.5}$ exhaust during construction of the project. As indicated in Table 2, predicted project emissions would not exceed the BAAQMD significance thresholds. *Attachment 1* includes the RoadMod output for construction emissions.

Construction activities, particularly during site preparation and grading, would temporarily generate fugitive dust in the form of PM_{10} and $PM_{2.5}$. Sources of fugitive dust would include disturbed soils at the construction site and trucks carrying uncovered loads of soils. Unless properly controlled, vehicles leaving the site would deposit mud on local streets, which could be an additional source of airborne dust after it dries. The BAAQMD CEQA Air Quality Guidelines consider these impacts to be less-than-significant if best management practices are implemented to reduce these dust emissions. *Mitigation Measure AQ-1 would implement BAAQMD-recommended best management practices.*

Table 2. Construction Period Emissions

Scenario	**ROG**	**NO_x**	**PM_{10} Exhaust**	**$PM_{2.5}$ Exhaust**
Construction emissions (tons)	0.49	5.23	0.24	0.22
Average daily emissions (pounds)[1]	4.1	47.6	2.2	2.0
BAAQMD Thresholds (pounds per day)	*54* lbs.	*54* lbs.	*82* lbs.	*54* lbs.
Exceed Threshold?	**No**	**No**	**No**	**No**
Notes: [1] Assumes 220 workdays.				

Project Operational Period Emissions

Operational air pollutant emissions from the project would be generated primarily from traffic. Evaporative emissions from architectural coatings and maintenance products (classified as consumer products) would also occur. CT-EMFAC2014 Version 6.0 model was used to predict emissions from operation of the proposed project assuming full build out and operation. Inputs to the model are described below.

<u>Year of Analysis</u>

Emissions associated with vehicle travel depend on the year of analysis because emission control technology requirements are phased-in over time. Therefore, the earlier the year analyzed in the model, the higher the emission rates utilized by CT-EMFAC. The earliest year the project could possibly be constructed and fully operating would be 2018. The existing year (2016) the opening year (2020) and the General Plan Horizon year (2035) were analyzed.

<u>Traffic Inputs</u>

Traffic inputs to CT-EMFAC were provided by *Hexagon Transportation Consultants, Inc*. The traffic report provided a peak and off-peak hour volumes and the average daily traffic (ADT) that was used in the CT-EMFAC model.

Hexagon Transportation Consultants, Inc. developed the traffic information used for the CO project-level analysis. ABAG and MTC are responsible for determining area-wide population and employment forecasts, modeling regional traffic demand and developing the Regional Transportation Plan and Transportation Improvement Program. The traffic information used for the CO project-level analysis was based on the latest population and employment projections, consistent with those used to develop the regional projections. Specifically, traffic forecasts for the proposed project were developed using the Santa Clara Valley Transportation Authority (VTA) Travel Demand Forecasting Model.

<u>Project Air Pollutant Emissions</u>

Table 3 reports the predicted air pollutant emission in terms of annual emissions in tons for the project. The net average daily operational emissions, assuming 365 days of operation per year, are also reported in Table 3. As shown in Table 3, average daily and annual emissions of ROG, NO_x, PM_{10}, or $PM_{2.5}$ emissions associated with operation would not exceed the BAAQMD significance thresholds.

Table 3. Project Operational Emissions

Scenario	ROG	NO_x	PM_{10}	$PM_{2.5}$
Annual Project Operation (tons)	0.001	0.004	0.001	0.001
BAAQMD Thresholds (tons per year)	*10*	*10*	*15*	*10*
Exceed Threshold?	***No***	***No***	***No***	***No***
Net Average daily emissions (pounds per day)[1]	11.6	23.9	2.7	1.7
BAAQMD Thresholds (pounds per day)	*54* lbs.	*54* lbs.	*82* lbs.	*54* lbs.
Exceed Threshold?	***No***	***No***	***No***	***No***
[1] Assumes 365-day operation.				

Attachment 1 to this report includes the construction and operation assumptions (schedule and equipment), RoadMod, and CT-EMFAC model output files for the proposed project emission factors and modeling calculations.

***Mitigation Measure AQ-1*: Include basic measures to control dust and exhaust during construction.**

During any construction period ground disturbance, the applicant shall ensure that the project contractor implements measures to control dust and exhaust. Implementation of the measures recommended by BAAQMD and listed below would reduce the air quality impacts associated with grading and new construction to a less-than-significant level. The contractor shall implement the following best management practices that are required of all projects:

1. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.

2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered.

3. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.

4. All vehicle speeds on unpaved roads shall be limited to 15 miles per hour (mph).

5. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible.

6. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.

7. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.

8. Post a publicly visible sign with the telephone number and person to contact at the Lead Agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.

Effectiveness of Mitigation Measure AQ-1

Implementation of Mitigation Measure AQ-1 would be consistent with recommendations in the BAAQMD CEQA Air Quality Guidelines for controlling fugitive dust emissions that contribute to localized elevated concentrations of PM_{10} and $PM_{2.5}$. The impact would be reduced to less than significant.

Impact 3: Violate any air quality standard or contribute substantially to an existing or projected air quality violation? ***Less-than-significant.***

As discussed under Impact 2, project emissions would be below the BAAQMD thresholds for ozone (i.e., ozone precursors) and particulate matter. Therefore, the project would not violate an air quality standard or contribute substantially to existing or projected violations. Carbon monoxide emissions from traffic generated by the project would be the pollutant of greatest concern at the local level. Congested intersections with a large volume of traffic have the greatest potential to cause high-localized concentrations of carbon monoxide. Air pollutant monitoring data indicate that carbon monoxide levels have been at healthy levels (i.e., below State and federal standards) in the Bay Area since the early 1990s. As a result, the region has been designated as attainment for the standard. The highest measured level over any 8-hour averaging period during the last three years in the Bay Area is less than 3.0 parts per million (ppm), compared to the ambient air quality standard of 9.0 ppm. Intersections affected by the project would have traffic volumes less than the BAAQMD screening criteria and, thus, would not cause a violation of an ambient air quality standard or have a considerable contribution to cumulative violations of these standards.[5]

Impact 4: Expose sensitive receptors to substantial pollutant concentrations? ***Less-than-significant with construction-period mitigation measures.***

[5] For a land-use project type, the BAAQMD CEQA Air Quality Guidelines state that a proposed project would result in a less-than-significant impact to localized carbon monoxide concentrations if the project would not increase traffic at affected intersections with more than 44,000 vehicles per hour.

Project impacts related to increased community risk can occur either by introducing a new sensitive receptor, such as a residential use, in proximity to an existing source of TACs or by introducing a new source of TACs with the potential to adversely affect existing sensitive receptors in the project vicinity. The BAAQMD recommends using a 1,000-foot screening radius around a project site for purposes of identifying community health risk from siting a new sensitive receptor or a new source of TACs. There are thresholds that address both the impact of single and cumulative TAC sources (see Table 1). Construction activity would generate dust and equipment exhaust on a temporary basis that could affect nearby sensitive receptors.

Sensitive receptors potentially affected by the proposed road construction include residences, a nursing home, and a K-8 school. The nearest residence is located approximately 75 feet east of the proposed road extension on Warren Road. The K-8 school (St. Catherine School) and the nursing home are located approximately 750 and 400 feet west of the proposed road extension, respectively. This community risk assessment models concentrations of DPM, and $PM_{2.5}$ at the nearest sensitive receptors which are then used to evaluate potential cancer risk, non-cancer health hazards, and annual concentrations of $PM_{2.5}$.

Health Impact Evaluation Methodology

A health risk assessment (HRA) for exposure to TACs requires the application of a risk characterization model to the results from the air dispersion model to estimate potential health risk at each sensitive receptor location. The State of California Office of Environmental Health Hazard Assessment (OEHHA) and CARB develop recommended methods for conducting health risk assessments. The most recent OEHHA risk assessment guidelines were published in February of 2015.[6] These guidelines incorporate substantial changes designed to provide for enhanced protection of children, as required by State law, compared to previous published risk assessment guidelines. CARB has provided additional guidance on implementing OEHHA's recommended methods.[7] BAAQMD has not formally adopted recommended procedures for applying the newest OEHHA guidelines. However, BAAQMD is in the process of developing new guidance and has proposed HRA Guidelines as part of the amendments to Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants.[8] Exposure parameters from the 2015 OEHHA guidelines and newly proposed BAAQMD HRA Guidelines were used in this evaluation.

---

[6] OEHHA, 2015. *Air Toxics Hot Spots Program Risk Assessment Guidelines, The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*. Office of Environmental Health Hazard Assessment. February.

[7] CARB, 2015. *Risk Management Guidance for Stationary Sources of Air Toxics*. July 23.

[8] BAAQMD, 2016. *Workshop Report. Proposed Amendments to Air District Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants. Appendix C. Proposed Air District HRA Guidelines*. January 2016.

Cancer Risk

Potential increased cancer risk from inhalation of TACs is calculated based on the TAC concentration over the period of exposure, inhalation dose, the TAC cancer potency factor, and an age sensitivity factor to reflect the greater sensitivity of infants and children to cancer causing TACs. The inhalation dose depends on a person's breathing rate, exposure time and frequency of exposure, and the exposure duration. These parameters vary depending on the age, or age range, of the persons being exposed and whether the exposure is considered to occur at a residential location or other sensitive receptor location.

The current OEHHA guidance recommends that cancer risk be calculated by age groups to account for different breathing rates and sensitivity to TACs. Specifically, they recommend evaluating risks for the third trimester of pregnancy to age zero, ages zero to less than two (infant exposure), ages two to less than 16 (child exposure), and ages 16 to 70 (adult exposure). Age sensitivity factors (ASFs) associated with the different types of exposure are an ASF of 10 for the third trimester and infant exposures, an ASF of 3 for a child exposure, and an ASF of 1 for an adult exposure. Also associated with each exposure type are different breathing rates, expressed as liters per kilogram of body weight per day (L/kg-day). As recommended by the BAAQMD, 95^{th} percentile breathing rates are used for the third trimester and infant exposures, and 80^{th} percentile breathing rates for child and adult exposures. Additionally, CARB and the BAAQMD recommend the use of a residential exposure duration of 30 years for sources with long-term emissions (e.g., roadways).

Under previous OEHHA and BAAQMD HRA guidance, residential receptors are assumed to be at their home 24 hours a day, or 100 percent of the time. In the 2015 Risk Assessment Guidance, OEHHA includes adjustments to exposure duration to account for the fraction of time at home (FAH), which can be less than 100 percent of the time, based on updated population and activity statistics. The FAH factors are age-specific and are: 0.85 for third trimester of pregnancy to less than 2 years old, 0.72 for ages 2 to less than 16 years, and 0.73 for ages 16 to 70 years. BAAQMD recommends using these FAH factors for residential exposures.

Functionally, cancer risk is calculated using the following parameters and formulas:

Cancer Risk (per million) = $CPF \times Inhalation\ Dose \times ASF \times ED/AT \times FAH \times 10^6$

Where:

CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$
ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = $C_{air} \times DBR \times A \times (EF/365) \times 10^{-6}$

Where:

C_{air} = concentration in air (µg/m^3)
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

The health risk parameters used in this evaluation are summarized as follows:

	Exposure Type →	**Infant**		**Child**	**Adult**
Parameter	***Age Range →***	**3rd Trimester**	**0<2**	**2 < 16**	**16 - 30**
DPM Cancer Potency Factor (mg/kg-day)$^{-1}$		1.10E+00	1.10E+00	1.10E+00	1.10E+00
Daily Breathing Rate (L/kg-day)*		361	1,090	572	261
Inhalation Absorption Factor		1	1	1	1
Averaging Time (years)		70	70	70	70
Exposure Duration (years)		0.25	2	14	14
Exposure Frequency (days/year)		350	350	350	350
Age Sensitivity Factor		10	10	3	1
Fraction of Time at Home		0.85-1.0	0.72-1.0	0.72-1.0	0.73

* 95th percentile breathing rates for 3rd trimester and infants and 80th percentile for children and adults

Non-Cancer Hazards

Potential non-cancer health hazards from TAC exposure are expressed in terms of a hazard index (HI), which is the ratio of the TAC concentration to a reference exposure level (REL). OEHHA has defined acceptable concentration levels for contaminants that pose non-cancer health hazards. TAC concentrations below the REL are not expected to cause adverse health impacts, even for sensitive individuals. The total HI is calculated as the sum of the HIs for each TAC evaluated and the total HI is compared to the BAAQMD significance thresholds to determine whether a significant non-cancer health impact from a project would occur.

Typically, for roadway projects located near sensitive receptors, the primary TAC of concern with non-cancer health effects is diesel particulate matter (DPM). For DPM, the chronic inhalation REL is 5 micrograms per cubic meter (µg/m^3).

Annual $PM_{2.5}$ Concentrations

While not a TAC, $PM_{2.5}$ has been identified by the BAAQMD as a pollutant with potential non-cancer health effects that should be included when evaluating potential community health impacts under the CEQA. The thresholds of significance for $PM_{2.5}$ (project level and cumulative) are in terms of an increase in the annual average concentration. When considering $PM_{2.5}$ impacts, the contribution from all sources of $PM_{2.5}$ emissions should be included. For roadways, the $PM_{2.5}$

impacts should include those from vehicle exhaust emissions, $PM_{2.5}$ generated from vehicle tire and brake wear, and fugitive emissions from re-suspended dust on the roads.

Community Risk from Project Operation

The proposed roadway would be constructed adjacent to existing sensitive receptors including residences, a school, and a nursing home. Substantial sources of air pollution, such as roadways, can adversely affect nearby sensitive receptors as part of implementing new projects.

Screening Local Roadway Community Risk

For local roadways, BAAQMD has provided the *Roadway Screening Analysis Calculator* to assess whether roadways with traffic volumes of over 10,000 vehicles per day may have a potentially significant effect on sensitive receptors. Two adjustments were made to the cancer risk predictions made by this calculator: (1) adjustment for latest vehicle emissions rates and (2) adjustment of cancer risk to reflect new OEHHA guidance described above.

The calculator uses EMFAC2011 emission rates for the year 2014. Overall, emission rates will decrease by the time the project is constructed and operating. The project is not likely to be operating prior to 2018. In addition, a new version of the emissions factor model, EMFAC2014 is available. This version predicts much lower emission rates than EMFAC2011 and the rates for 2018 are lower than the rates for 2014. Using a fleet mix typical of local roadways operating at 30 mph, EMFAC2014 predicts diesel $PM_{2.5}$ aggregate emission rates in 2018 that are 46 percent of EMFAC2011 rates for 2014.[9] Total Organic Gases (TOG) for gasoline-powered vehicle rates are 56 percent of EMFAC2011 year 2014 rates. For these reasons, an adjustment factor of 0.5 was applied to the *Roadway Screening Analysis Calculator* results.

The adjusted predicted cancer risk was then adjusted again using a factor of 1.3744 to account for new OEHHA guidance (see discussion above regarding cancer risk calculation methodology). This factor was provided by BAAQMD for use with their CEQA screening tools that are used to predict cancer risk.[10]

Traffic volumes for Hale Avenue were based on the traffic data prepared for this project and conservatively used the 2035 With Project condition. The highest average daily traffic (ADT) volume for Hale Avenue in 2035 is 15,230. The edge of the travel way for this north-south roadway was entered as 25 feet from the nearest receptor. The roadway orientation, distance and direction, and traffic volume were input to the BAAQMD *Roadway Screening Analysis Calculator* for Santa Clara County. Based on the BAAQMD screening calculator, potential

[9] Comprised mostly of light- and medium-duty vehicles.
[10] Email from Virginia Lau, BAAQMD to Bill Popenuck of Illingworth & Rodkin, Inc, dated November 15, 2015.

excess cancer risk would be 8.7 in one million, which is below the BAAQMD significance threshold of 10.0 in one million. Annual $PM_{2.5}$ concentration would be 0.3 µg/m^3, which would not exceed the BAAQMD significance threshold of greater than 0.3 µg/m^3. Non-cancer hazards from the future roadway would be well below the BAAQMD significance threshold of 1.0 for a single source.

Project Construction Activity

Diesel construction equipment and diesel heavy-duty truck traffic for the proposed road construction would generate diesel particulate matter, which is a known TAC.[11] Construction exhaust emissions may pose community risks for sensitive receptors in the vicinity of the construction activities. The primary community risk impact issues associated with construction emissions are cancer risk and exposure to $PM_{2.5}$. Diesel exhaust poses both a potential health and nuisance impact to nearby receptors.

A community risk assessment of the project construction activities was conducted that evaluated potential health effects on sensitive receptors from construction emissions of DPM and $PM_{2.5}$. Sensitive receptors potentially affected by the proposed road construction include residences, a nursing home, and a K-8 school. The nearest residence is located approximately 75 feet east of the proposed road extension on Warren Road. The K-8 school (St. Catherine School) and the nursing home are located approximately 750 and 400 feet west of the proposed road extension, respectively. A dispersion model was used to predict the off-site DPM concentrations resulting from project construction so that increased cancer risks could be predicted. Figure 1 shows the proposed roadway alignment in relation to the sensitive receptor locations where the potential community risk impacts were evaluated.

Construction Period Emissions

Construction period emissions were computed using the RoadMod emissions model along with projected construction activity, as described above. The RoadMod model provided total annual $PM_{2.5}$ exhaust emissions (assumed to be DPM) from the off road construction equipment and heavy duty trucks used for the proposed road construction of 0.216 tons (432 pounds) over the construction period. Fugitive dust $PM_{2.5}$ emissions were also computed and included in this analysis. The model predicts emissions of 0.194 tons (388 pounds) of fugitive $PM_{2.5}$ over the construction period. These emissions were used in modeling DPM and $PM_{2.5}$ concentrations at residences and sensitive receptors near the construction areas.

Dispersion Modeling

[11] DPM is identified by California as a toxic air contaminant due to the potential to cause cancer.

The U.S. EPA ISCST3 dispersion model was used to predict DPM and $PM_{2.5}$ concentrations at residential and sensitive receptor locations during construction of the proposed roadway alignment. The ISCST3 dispersion model is a BAAQMD-recommended model for roadway projects.[12] Project construction emissions were grouped into two categories, exhaust emissions (DPM) and fugitive dust emissions ($PM_{2.5}$).

The ISCST3 modeling utilized area sources to represent all construction activities. For modeling both DPM and fugitive $PM_{2.5}$ dust emissions eight area sources were used for modeling the road construction between Spring Avenue and W. Dunne Avenue, seven area sources were used for modeling the road construction between W. Dunne Avenue and W. Main Avenue, and four area sources were used for modeling construction activities at the intersections of the new road with existing roads (Spring Avenue, Dewitt Avenue, W. Dunne Avenue, and W. Main Avenue). For exhaust emissions from construction equipment, an emission release height of 6 meters (20 feet) was used for the area sources. The elevated source height reflects the height of the equipment exhaust pipes plus an additional distance for the height of the exhaust plume above the exhaust pipes to account for plume rise of the exhaust gases. For modeling fugitive $PM_{2.5}$ emissions, a near-ground level release height of 2 meters (6.6 feet) was used for the area sources. Construction emissions were modeled as occurring daily between 7 a.m. and 4 p.m., when the majority of the construction activity involving equipment usage would occur.

The modeling used a five-year data set (2001 to 2005) of hourly meteorological data from the San Martin Airport that was prepared for use with the ISCST3 model by the BAAQMD. The airport is about four miles south-southeast from the road construction area. Annual DPM and $PM_{2.5}$ concentrations from construction activities during 2017 were calculated using the model. DPM and $PM_{2.5}$ concentrations were calculated at sensitive receptors in the vicinity of the road construction work areas at a receptor height of 1.5 meters (4.9 feet).

Predicted Cancer Risk and Hazards

The maximum modeled DPM and $PM_{2.5}$ concentrations occurred at a residence near the northern end of the proposed new Hale Avenue near W. Main Avenue, as shown on Figure 1. The cancer risk calculations were based on using the maximum modeled DPM concentrations for each type of sensitive receptor and applying the methods described above. Results of this assessment are summarized in Table 4. As shown in Table 4, the maximum increased cancer risk for a residential child exposure would be above the BAAQMD significance threshold of a cancer risk of 10 in one million or greater and this would be considered a potentially *significant impact*.

Table 4. Maximum Community Risks from Project Construction Activities

[12] Bay Area Air Quality Management District (BAAQMD), 2012. *Recommended Methods for Screening and Modeling Local Risks and Hazards, Version 3.0.* May.

Location and Exposure Type	Cancer Risk (per million)	Annual $PM_{2.5}$ ($\mu g/m^3$)[1]	Chronic Hazard Index
Maximum Residential			
Child	28.0	0.5	0.03
Adult	0.5	0.5	0.03
Pacific Hills Manor			
Adult	0.2	0.1	0.01
St. Catherine School			
Child	0.9	0.1	0.01
BAAQMD Significance Threshold	> 10.0	> 0.3	> 1.0
Exceed Threshold	***Yes***	***Yes***	**No**

Note: [1]The annual $PM_{2.5}$ concentration is the sum of the DPM and fugitive $PM_{2.5}$ concentrations.

The maximum modeled annual $PM_{2.5}$ concentration was 0.5 $\mu g/m^3$, occurring at the same receptor that would have the maximum residential cancer risk. This $PM_{2.5}$ concentration would exceed the threshold of 0.3 $\mu g/m^3$ used to judge the significance of health impacts from $PM_{2.5}$. This would be considered a potentially *significant impact*.

The maximum computed hazard index for each sensitive receptor type are listed in Table 4. All HIs would be much lower than the BAAQMD significance criterion of 1.0. This would be considered a *less-than-significant impact. Attachment 1* includes the emission calculations used for the area source modeling and the cancer risk calculations.

Without mitigation, the proposed project would have a *significant impact* with respect to community risk caused by construction activities. *Implementation of Mitigation Measures AQ-1 and AQ-2 would reduce this impact to a less-than-significant level.*

Mitigation Measure AQ-2: **Use of newer, retrofitted, or alternatively powered construction equipment to minimize emissions. Such equipment selection would include the following:**

> The project applicant shall develop a plan to demonstrate at least a 65 percent reduction in DPM emissions. The following measures could be implemented to achieve such reductions: All diesel-powered construction equipment larger than 50 hp and operating on site for more than two days continuously shall meet U.S. EPA particulate matter emissions standards for Tier 4 engines or equivalent. Equipment retrofitted with CARB Level 3 Verified Diesel Emissions Control Strategy (VDECS) would also meet this standard.

Note that the construction contractor could use other measures to minimize construction period DPM emissions to reduce the predicted cancer risk below the thresholds. Such measures may be the use of alternative powered equipment (e.g., LPG powered forklifts), alternative fuels (e.g., biofuels), added exhaust devices, or a combination of measures, provided that these measures are approved by the lead agency.

<u>Effectiveness of Mitigation Measures AQ-1 and AQ-2</u>

Implementation of Mitigation Measure AQ-1 is considered to reduce DPM emissions by 5 percent. Implementation of Mitigation Measure AQ-2 would further reduce on-site diesel exhaust emissions by at least 65 percent. The cancer risk would be reduced to 9.8 in one million or less. Annual $PM_{2.5}$ emissions would be reduced such that the maximum concentration would be 0.3 $\mu g/m^3$ or less, which is below the single-source significance threshold of greater than 0.3 $\mu g/m^3$.

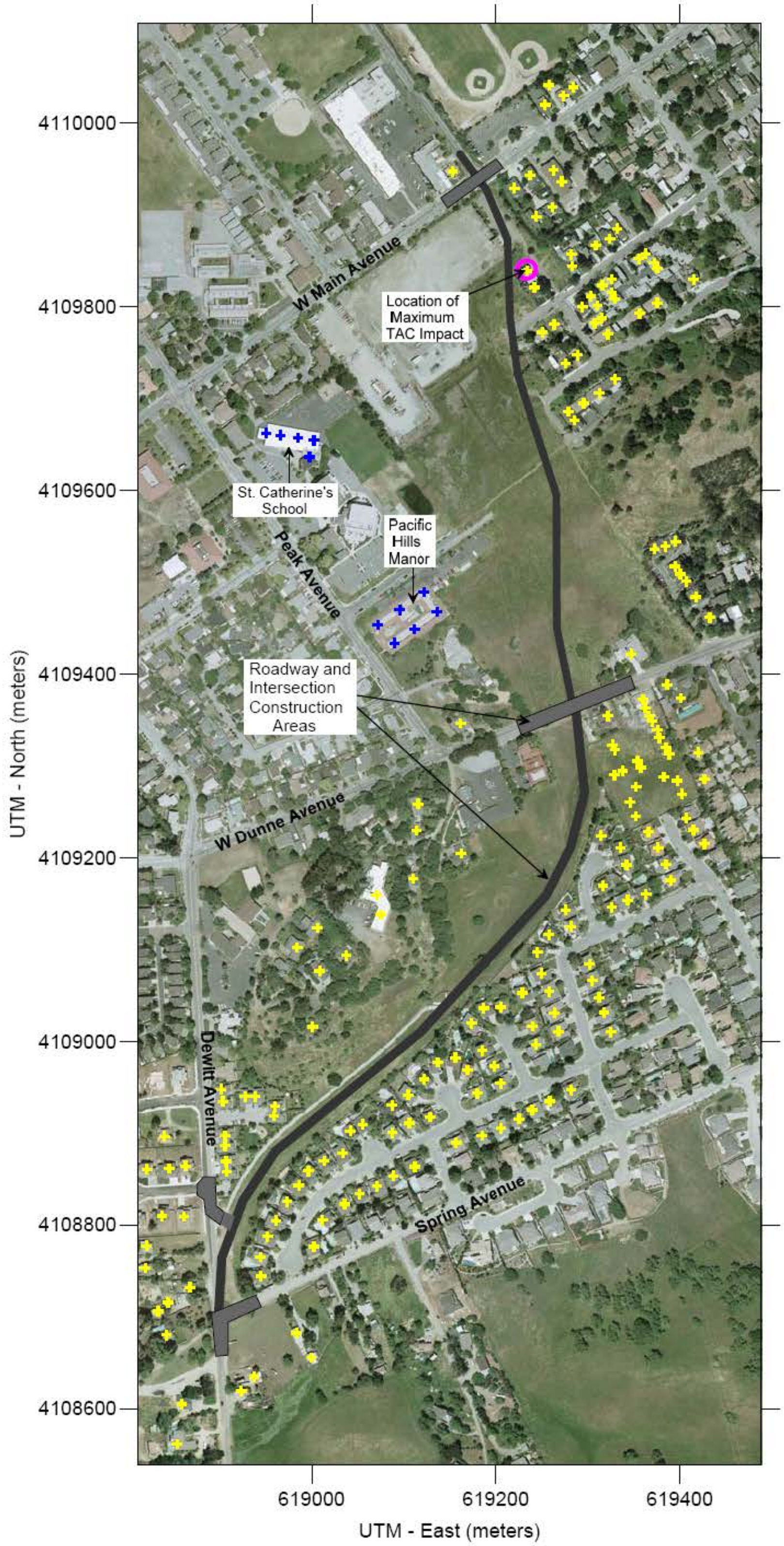
Cumulative Construction Risk

Cumulative TAC impacts associated with construction of the project were assessed by predicting the combined community risk impacts from the project and nearby sources at the sensitive receptor most affected by the project, or maximally exposed individual (MEI). A review of the project area identified the other sources of TAC emissions that could adversely affect the project construction MEI. These sources were characterized using BAAQMD screening tools. The combined maximum cancer risk, non-cancer HI, and annual $PM_{2.5}$ concentration at this receptor are reported in Table 5. The predicted cumulative cancer risk, non-cancer hazard, and annual $PM_{2.5}$ concentration from construction would be below the significance thresholds.

Table 5. Combined Community Risk Impacts

Source	Maximum Cancer Risk (per million)	Maximum Annual $PM_{2.5}$ Concentration ($\mu g/m^3$)	Maximum Hazard Index
Impacts to Off-Site Receptors (at MEI)			
Unmitigated Project Construction	28.0	0.5	0.03
Hale Avenue (Roadway Screening Calculator)	8.7	0.3	<0.03
Plant 12813, Dryclean A+ (Stationary Source Screening Tool)	>7.5	0.0	<0.02
Cumulative Total	<44.2	0.8	<0.08
BAAQMD Threshold – Cumulative Sources	***>100***	***>0.8***	***>10.0***
Significant	***No***	***No***	***No***

Figure 1. Project Construction Areas, Locations of Nearby Sensitive Receptors and Location of Maximum TAC Impact



Impact 6: Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment? ***Less than significant.***

GHG emissions associated with development of the proposed project would occur over the short-term from construction activities, consisting primarily of emissions from equipment exhaust and worker and vendor trips. There would also be long-term operational emissions associated with vehicular traffic on the new roadway. Emissions for the proposed project are discussed below and were analyzed using the methodology recommended in the BAAQMD CEQA Air Quality Guidelines.[13]

Existing Conditions

Under existing conditions, there is no roadway and the potential for direct GHG emissions is nonexistent. Indirect emissions are generated from the burning of fuel required for site maintenance (e.g., infrequent disking and/or mowing to control fire hazards, etc.).

Construction Greenhouse Gas Emissions (Temporary Emissions)

GHG emissions for transportation projects can be divided into those produced during construction and those produced during operations. Construction GHG emissions include emissions produced as a result of material processing, emissions produced by on-site construction equipment, and emissions arising from traffic delays due to construction. These emissions will be produced at different levels throughout the construction phase; their frequency and occurrence can be reduced through innovations in plans and specifications and by implementing better traffic management during construction phases. In addition, with innovations such as longer pavement lives, improved traffic management plans, and changes in materials, the GHG emissions produced during construction can be reduced to some degree by longer intervals between maintenance and rehabilitation events. Currently, neither City of Morgan Hill nor BAAQMD have adopted GHG significance thresholds that apply to construction projects. For informational purposes, GHG emissions from project construction are estimated to be 601 metric tons of CO_2 over the course of the entire construction project based on RoadMod modeling described above. The emissions will be below the lowest threshold adopted by BAAQMD and given that the project site is in an urban setting close to construction supplies and equipment, manufacture and construction of the project will not contribute substantially to local or regional greenhouse gas emissions.

[13] BAAQMD, 2011. *Op cit.*

Operational Greenhouse Gas Emissions (Ongoing Emissions)

GHG emissions (e.g., carbon dioxide, methane, and nitrous oxide) from operation of the project will include fuel burned while traveling on the new roadway. There will be a shift in traffic from other congested routes which will increase the overall effectiveness of the transportation system and have a positive impact to GHG emissions. These emissions were evaluated using CT-Emfac 2014. The EMFAC 2014 emissions factors were developed using the latest version of the CT-EMFAC model (Version 6.0, November 2015), developed by *Sonoma Technology, Inc.* CT-Emfac provides composite emission rates based on vehicle mix, speed, year, and area (i.e., County). The model was run using the procedures described in the UC Davis Methodology for Santa Clara County. The GHG emissions were calculated to be below the BAAQMD significance threshold of 1,100 MT CO_2e per year, as shown in Table 6.

Table 6. GHG Emissions in Metric Tons

GHG Emissions	Existing with Project	2020 Build	2035 Build
Daily	2.21	2.14	2.07
Annual	806.65	781.1	755.6
Threshold	1,100	1,100	1,100

Attachment 1: RoadMod and CTEMFAC Inputs and Outputs, and Construction Emissions and Risk Modeling Calculations

Road Construction Emissions Model, Version 7.1.5.1

Emission Estimates for -> Hale Road Extension				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (English Units)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	PM10 (lbs/day)	PM10 (lbs/day)	PM10 (lbs/day)	PM2.5 (lbs/day)	PM2.5 (lbs/day)	PM2.5 (lbs/day)	CO2 (lbs/day)
Grubbing/Land Clearing	0.9	6.3	10.6	10.4	0.4	10.0	2.5	0.4	2.1	1,391.9
Grading/Excavation	6.0	33.9	74.6	13.3	3.3	10.0	4.9	2.9	2.1	9,844.8
Drainage/Utilities/Sub-Grade	3.8	20.5	40.6	12.0	2.0	10.0	3.9	1.8	2.1	4,610.9
Paving	1.9	11.6	16.6	1.1	1.1	-	1.0	1.0	-	2,258.0
Maximum (pounds/day)	6.0	33.9	74.6	13.3	3.3	10.0	4.9	2.9	2.1	9,844.8
Total (tons/construction project)	0.5	2.5	5.2	1.2	0.2	0.9	0.4	0.2	0.2	663.3
Notes: Project Start Year ->	2017									
Project Length (months) ->	10									
Total Project Area (acres) ->	8									
Maximum Area Disturbed/Day (acres) ->	1									
Total Soil Imported/Exported (yd^3/day)->	600									

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> Hale Road Extension				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (Metric Units)	ROG (kgs/day)	CO (kgs/day)	NOx (kgs/day)	PM10 (kgs/day)	PM10 (kgs/day)	PM10 (kgs/day)	PM2.5 (kgs/day)	PM2.5 (kgs/day)	PM2.5 (kgs/day)	CO2 (kgs/day)
Grubbing/Land Clearing	0.4	2.9	4.8	4.7	0.2	4.5	1.1	0.2	0.9	632.7
Grading/Excavation	2.7	15.4	33.9	6.0	1.5	4.5	2.2	1.3	0.9	4,474.9
Drainage/Utilities/Sub-Grade	1.7	9.3	18.4	5.4	0.9	4.5	1.8	0.8	0.9	2,095.9
Paving	0.9	5.3	7.6	0.5	0.5	-	0.5	0.5	-	1,026.3
Maximum (kilograms/day)	2.7	15.4	33.9	6.0	1.5	4.5	2.2	1.3	0.9	4,474.9
Total (megagrams/construction project)	0.4	2.3	4.7	1.1	0.2	0.8	0.4	0.2	0.2	601.6
Notes: Project Start Year ->	2017									
Project Length (months) ->	10									
Total Project Area (hectares) ->	3									
Maximum Area Disturbed/Day (hectares) ->	0									
Total Soil Imported/Exported ($meters^3$/day)->	459									

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Traffic Data for CTEMFAC

Year	AM	PM		Hourly
	7-9	4-6	AADT	Traffic Used
2017	501	423	4760	198
	756	777	8170	340
2020	505	424	4815	201
	800	819	9215	384
2035	687	581	6210	259
	1024	1049	12350	515

File Name:	Link 23 2017.EC		
CT-EMFAC Version:	6.0.0.29548		
Run Date:	5/11/2016 8:00		
Area:	Santa Clara (SF)		
Analysis Year:	2017		
Season:	Annual		
==			
Vehicle Category	VMT Fraction	Diesel VMT Fraction	
	Across Category	Within Category	
Truck 1	0.022	0.471	
Truck 2	0.031	0.946	
Non-Truck	0.947	0.011	
==			
Road Length:	0.46	miles	
Volume:	340	vehicles per hour	
Number of Hours:	24	hours	
Avg. Idling Time:	0	minutes per vehicle	
Tot. Idling Time:	0	hours	
VMT Distribution by Speed (mph):			
	5		0.00%
	10		0.00%
	15		0.00%
	20		0.00%
	25		0.00%
	30		0.00%
	35		0.00%
	40		0.00%
	45		100.00%
	50		0.00%
	55		0.00%

Summary of Project Emissions

Pollutant Name	Running Exhaus (grams)	Idling Exh (gram	Running (gram	Tire We (gram	Brake W (gram	Total (grams)	Total (US tons
HC	157.8	0	163.9	-	-	321.7	<0.001
ROG	134.5	0	175.2	-	-	309.7	<0.001
TOG	176.1	0	175.2	-	-	351.3	<0.001
CO	4,076.00	0	-	-	-	4,076.00	0.004
NOx	1,209.80	0	-	-	-	1,209.80	0.001
CO2	1,268,556.50	0	-	-	-	1,268,556.50	1.398
CH4	34.6	0	-	-	-	34.6	<0.001
PM10	13.8	0	-	32.3	153.7	199.8	<0.001
PM2.5	13.1	0	-	8.1	65.8	87	<0.001
Benzene	4.3	0	1.8	-	-	6.1	<0.001
Acrolein	0.2	0	-	-	-	0.2	<0.001
Acetaldehyde	2.5	0	-	-	-	2.5	<0.001
Formaldehyde	6.5	0	-	-	-	6.5	<0.001
Butadiene	0.9	0	0	-	-	0.9	<0.001
Naphthalene	0.1	0	0.2	-	-	0.4	<0.001
POM	0.2	0	-	-	-	0.2	<0.001
Diesel PM	9.2	0	-	-	-	9.2	<0.001
DEOG	24.8	0	-	-	-	24.8	<0.001

File Name:	Link 22 2017.EC			
CT-EMFAC Version:	6.0.0.29548			
Run Date:	5/11/2016 8:13			
Area:	Santa Clara (SF)			
Analysis Year:	2017			
Season:	Annual			
==				
Vehicle Category	VMT Fraction	Diesel VMT Fraction		
	Across Category	Within Category		
Truck 1	0.022	0.471		
Truck 2	0.031	0.946		
Non-Truck	0.947	0.011		
==				
Road Length:	0.46	miles		
Volume:	198	vehicles per hour		
Number of Hours:	24	hours		
Avg. Idling Time:	0	minutes per vehicle		
Tot. Idling Time:	0	hours		
VMT Distribution by Speed (mph):				
	5		0.00%	
	10		0.00%	
	15		0.00%	
	20		0.00%	
	25		0.00%	
	30		0.00%	
	35		0.00%	
	40		0.00%	
	45		100.00%	
	50		0.00%	
	55		0.00%	

Summary of Project Emissions							
Pollutant Name	Running Exhaust (grams)	Idling Exhaust (grams)	Running Loss (grams)	Tire Wear (grams)	Brake Wear (grams)	Total (grams)	Total (US tons)
HC	91.9	0	95.4	-	-	187.3	<0.001
ROG	78.3	0	102	-	-	180.3	<0.001
TOG	102.6	0	102	-	-	204.6	<0.001
CO	2,373.70	0	-	-	-	2,373.70	0.003
NOx	704.5	0	-	-	-	704.5	<0.001
CO2	738,747.50	0	-	-	-	738,747.50	0.814
CH4	20.2	0	-	-	-	20.2	<0.001
PM10	8	0	-	18.8	89.5	116.4	<0.001
PM2.5	7.6	0	-	4.7	38.3	50.7	<0.001
Benzene	2.5	0	1	-	-	3.5	<0.001
Acrolein	0.1	0	-	-	-	0.1	<0.001
Acetaldehyde	1.5	0	-	-	-	1.5	<0.001
Formaldehyde	3.8	0	-	-	-	3.8	<0.001
Butadiene	0.5	0	0	-	-	0.5	<0.001
Naphthalene	<0.1	0	0.1	-	-	0.2	<0.001
POM	0.1	0	-	-	-	0.1	<0.001
Diesel PM	5.4	0	-	-	-	5.4	<0.001
DEOG	14.4	0	-	-	-	14.4	<0.001

File Name:	link 23 2020.EC				
CT-EMFAC Version:	6.0.0.29548				
Run Date:	5/11/2016 8:16				
Area:	Santa Clara (SF)				
Analysis Year:	2020				
Season:	Annual				
===					
Vehicle Category	VMT Fraction	Diesel VMT Fraction			
	Across Category	Within Category			
Truck 1	0.02	0.523			
Truck 2	0.032	0.945			
Non-Truck	0.948	0.012			
===					
Road Length:	0.46	miles			
Volume:	384	vehicles per hour			
Number of Hours:	24	hours			
Avg. Idling Time:	0	minutes per vehicle			
Tot. Idling Time:	0	hours			
VMT Distribution by Speed (mph):					
	5		0.00%		
	10		0.00%		
	15		0.00%		
	20		0.00%		
	25		0.00%		
	30		0.00%		
	35		0.00%		
	40		0.00%		
	45		100.00%		
	50		0.00%		
	55		0.00%		

Summary of Project Emissions

Pollutant Name	Running Exhaust (grams)	Idling Exhaust (grams)	Running Loss (grams)	Tire Wear (grams)	Brake Wear (grams)	Total (grams)	Total (US tons)
HC	131.5	0	150.5	-	-	282	<0.001
ROG	110.3	0	160.9	-	-	271.2	<0.001
TOG	146.4	0	160.9	-	-	307.4	<0.001
CO	3,445.60	0	-	-	-	3,445.60	0.004
NOx	953.1	0	-	-	-	953.1	0.001
CO2	1,319,933.50	0	-	-	-	1,319,933.50	1.455
CH4	30.3	0	-	-	-	30.3	<0.001
PM10	11	0	-	36.6	172.8	220.4	<0.001
PM2.5	10.3	0	-	9.2	74	93.5	<0.001
Benzene	3.5	0	1.6	-	-	5.1	<0.001
Acrolein	0.2	0	-	-	-	0.2	<0.001
Acetaldehyde	2	0	-	-	-	2	<0.001
Formaldehyde	5.2	0	-	-	-	5.2	<0.001
Butadiene	0.7	0	0	-	-	0.7	<0.001
Naphthalene	<0.1	0	0.2	-	-	0.3	<0.001
POM	0.1	0	-	-	-	0.1	<0.001
Diesel PM	5.7	0	-	-	-	5.7	<0.001
DEOG	19.8	0	-	-	-	19.8	<0.001

File Name:	link 22 2020.EC			
CT-EMFAC Version:	6.0.0.29548			
Run Date:	5/11/2016 8:16			
Area:	Santa Clara (SF)			
Analysis Year:	2020			
Season:	Annual			
===				
Vehicle Category	VMT Fraction	Diesel VMT Fraction		
	Across Category	Within Category		
Truck 1	0.02	0.523		
Truck 2	0.032	0.945		
Non-Truck	0.948	0.012		
===				
Road Length:	0.46	miles		
Volume:	201	vehicles per hour		
Number of Hours:	24	hours		
Avg. Idling Time:	0	minutes per vehicle		
Tot. Idling Time:	0	hours		
VMT Distribution by Speed (mph):				
	5		0.00%	
	10		0.00%	
	15		0.00%	
	20		0.00%	
	25		0.00%	
	30		0.00%	
	35		0.00%	
	40		0.00%	
	45		100.00%	
	50		0.00%	
	55		0.00%	

Summary of Project Emissions

Pollutant Name	Running Exhaust (grams)	Idling Exhaust (grams)	Running Loss (grams)	Tire Wear (grams)	Brake Wear (grams)	Total (grams)	Total (US tons)
HC	68.8	0	78.8	-	-	147.6	<0.001
ROG	57.7	0	84.2	-	-	142	<0.001
TOG	76.6	0	84.2	-	-	160.9	<0.001
CO	1,803.50	0	-	-	-	1,803.50	0.002
NOx	498.9	0	-	-	-	498.9	<0.001
CO2	690,902.70	0	-	-	-	690,902.70	0.762
CH4	15.9	0	-	-	-	15.9	<0.001
PM10	5.8	0	-	19.2	90.4	115.4	<0.001
PM2.5	5.4	0	-	4.8	38.8	49	<0.001
Benzene	1.8	0	0.8	-	-	2.7	<0.001
Acrolein	<0.1	0	-	-	-	<0.1	<0.001
Acetaldehyde	1	0	-	-	-	1	<0.001
Formaldehyde	2.7	0	-	-	-	2.7	<0.001
Butadiene	0.4	0	0	-	-	0.4	<0.001
Naphthalene	<0.1	0	0.1	-	-	0.2	<0.001
POM	<0.1	0	-	-	-	<0.1	<0.001
Diesel PM	3	0	-	-	-	3	<0.001
DEOG	10.4	0	-	-	-	10.4	<0.001

File Name:	Link 23 2035.EC			
CT-EMFAC Version:	6.0.0.29548			
Run Date:	5/11/2016 8:19			
Area:	Santa Clara (SF)			
Analysis Year:	2035			
Season:	Annual			
==				
Vehicle Category	VMT Fraction	Diesel VMT Fraction		
	Across Category	Within Category		
Truck 1	0.016	0.658		
Truck 2	0.037	0.945		
Non-Truck	0.947	0.014		
==				
Road Length:	0.46	miles		
Volume:	515	vehicles per hour		
Number of Hours:	24	hours		
Avg. Idling Time:	0	minutes per vehicle		
Tot. Idling Time:	0	hours		
VMT Distribution by Speed (mph):				
	5		0.00%	
	10		0.00%	
	15		0.00%	
	20		0.00%	
	25		0.00%	
	30		0.00%	
	35		0.00%	
	40		0.00%	
	45		100.00%	
	50		0.00%	
	55		0.00%	

Summary of Project Emissions

Pollutant Name	Running Exhaust (grams)	Idling Exhaust (grams)	Running Loss (grams)	Tire Wear (grams)	Brake Wear (grams)	Total (grams)	Total (US tons)
HC	93.6	0	103.3	-	-	196.8	<0.001
ROG	78.8	0	110.4	-	-	189.2	<0.001
TOG	103.90	0	110.4	-	-	214.20	<0.001
CO	2,201.80	0	-	-	-	2,201.80	0.002
NOx	323.20	0	-	-	-	323.20	<0.001
CO2	1,246,905.50	0	-	-	-	1,246,905.50	1.374
CH4	21.2	0	-	-	-	21.2	<0.001
PM10	5.2	0	-	49.8	230.8	285.8	<0.001
PM2.5	4.9	0	-	12.4	98.9	116.2	<0.001
Benzene	2.5	0	1.1	-	-	3.6	<0.001
Acrolein	0.1	0	-	-	-	0.1	<0.001
Acetaldehyde	1.5	0	-	-	-	1.5	<0.001
Formaldehyde	3.8	0	-	-	-	3.8	<0.001
Butadiene	0.5	0	0	-	-	0.5	<0.001
Naphthalene	<0.1	0	0.2	-	-	0.2	<0.001
POM	<0.1	0	-	-	-	<0.1	<0.001
Diesel PM	1.6	0	-	-	-	1.6	<0.001
DEOG	14.7	0	-	-	-	14.7	<0.001

File Name:	Link 22 2035.EC			
CT-EMFAC Version:	6.0.0.29548			
Run Date:	5/11/2016 8:18			
Area:	Santa Clara (SF)			
Analysis Year:	2035			
Season:	Annual			
==				
Vehicle Category	VMT Fraction	Diesel VMT Fraction		
	Across Category	Within Category		
Truck 1	0.016	0.658		
Truck 2	0.037	0.945		
Non-Truck	0.947	0.014		
==				
Road Length:	0.46	miles		
Volume:	259	vehicles per hour		
Number of Hours:	24	hours		
Avg. Idling Time:	0	minutes per vehicle		
Tot. Idling Time:	0	hours		
VMT Distribution by Speed (mph):				
	5		0.00%	
	10		0.00%	
	15		0.00%	
	20		0.00%	
	25		0.00%	
	30		0.00%	
	35		0.00%	
	40		0.00%	
	45		100.00%	
	50		0.00%	
	55		0.00%	

Summary of Project Emissions							
Pollutant Name	Running Exhaust (grams)	Idling Exhaust (grams)	Running Loss (grams)	Tire Wear (grams)	Brake Wear (grams)	Total (grams)	Total (US tons)
HC	47.1	0	51.9	-	-	99	<0.001
ROG	39.6	0	55.5	-	-	95.1	<0.001
TOG	52.2	0	55.5	-	-	107.7	<0.001
CO	1,107.30	0	-	-	-	1,107.30	0.001
NOx	162.5	0	-	-	-	162.5	<0.001
CO2	627,084.50	0	-	-	-	627,084.50	0.691
CH4	10.6	0	-	-	-	10.6	<0.001
PM10	2.6	0	-	25	116	143.7	<0.001
PM2.5	2.5	0	-	6.3	49.7	58.4	<0.001
Benzene	1.3	0	0.6	-	-	1.8	<0.001
Acrolein	<0.1	0	-	-	-	<0.1	<0.001
Acetaldehyde	0.8	0	-	-	-	0.8	<0.001
Formaldehyde	1.9	0	-	-	-	1.9	<0.001
Butadiene	0.3	0	0	-	-	0.3	<0.001
Naphthalene	<0.1	0	<0.1	-	-	0.1	<0.001
POM	<0.1	0	-	-	-	<0.1	<0.001
Diesel PM	0.8	0	-	-	-	0.8	<0.001
DEOG	7.4	0	-	-	-	7.4	<0.001

Hale Avenue Extension, Morgan Hill, CA
DPM and PM2.5 Emissions Rates used for Area Source Modeling

	Road Coordinates UTM-X	UTM-Y	Road Elevation		Segment Length	Construction Width	Area	DPM Emissions		Fugitive PM2.5 Emissions	
Road Segment/ Area	**(m)**	**(m)**	**(ft)**	**(m)**	**(m)**	**(m)**	**(sq m)**	**(lb/year)**	**($g/s/m^2$)**	**(lb/year)**	**($g/s/m^2$)**
Spring Ave to West Dunne	618899.0	4108707.6	427	130.1							
	618902.3	4108764.2	424	129.2	56.7	27	1532.1	16.9	4.24E-07	15.2	3.805E-07
	618924.9	4108826.1	417	127.1	65.9	27	1780.1	19.7	4.24E-07	17.7	3.805E-07
	618960.2	4108879.9	407	124.1	64.3	27	1736.4	19.2	4.24E-07	17.2	3.805E-07
	619118.0	4109009.8	385	117.3	204.4	27	5518.7	61.0	4.24E-07	54.7	3.805E-07
	619254.7	4109159.1	368	112.2	202.5	27	5467.2	60.4	4.24E-07	54.2	3.805E-07
	619281.0	4109210.9	363	110.6	58.1	27	1568.5	17.3	4.24E-07	15.6	3.805E-07
	619296.4	4109271.0	372	113.4	62.0	27	1674.4	18.5	4.24E-07	16.6	3.805E-07
	619287.2	4109357.5	368	112.2	86.9	27	2347.1	25.9	4.24E-07	23.3	3.805E-07
Subtotal					***800.9***		***21624.4***	***238.8***	***4.24E-07***	***214.5***	***3.805E-07***
West Dunne to West Main	619282.0	4109373.3	372	113.4							
	619266.1	4109450.5	398	121.3	78.8	20	1576.9	17.4	4.24E-07	15.6	3.805E-07
	619265.7	4109595.4	386	117.7	144.9	20	2897.3	32.0	4.24E-07	28.7	3.805E-07
	619223.6	4109727.3	361	110.0	138.5	20	2769.3	30.6	4.24E-07	27.5	3.805E-07
	619215.5	4109787.6	357	108.8	60.8	20	1216.7	13.4	4.24E-07	12.1	3.805E-07
	619212.7	4109873.8	348	106.1	86.2	20	1724.7	19.1	4.24E-07	17.1	3.805E-07
	619189.6	4109928.0	346	105.5	58.9	20	1178.5	13.0	4.24E-07	11.7	3.805E-07
	619160.9	4109966.5	345	105.2	48.0	20	960.5	10.6	4.24E-07	9.5	3.805E-07
Subtotal					***616.2***		***12324.0***	***136.1***	***4.24E-07***	***122.3***	***3.805E-07***
Construction Areas											
Spring-Dewitt Area	-	-	427.5	130.3	-	-	1336.0	14.8	4.24E-07	13.3	3.805E-07
Dewitt Area	-	-	419	127.7	-	-	814.2	9.0	4.24E-07	8.1	3.805E-07
West Dunne Area	-	-	368.7	112.4	-	-	2063.5	22.8	4.24E-07	20.5	3.805E-07
West Main Area	-	-	345.3	105.2	-	-	950.0	10.5	4.24E-07	9.4	3.805E-07
Subtotal							***5163.7***	***57.0***		***51.2***	
Total Construction Area							**39,112.1**	**432**	**4.24E-07**	**388**	**3.805E-07**

Total DPM (ton/year) =	0.216	
Total Fugitive PM2.5 (ton/year) =	0.194	
Hours Construction per day =	9	(7am - 4 pm)
Modeled Hours per year =	3285	

Hale Avenue Extension, Morgan Hill, CA - Construction Health Impact Summary

Maximum Impacts at Off-Site Residences

Construction Year	Maximum Concentrations: Exhaust PM2.5/DPM ($\mu g/m^3$)	Maximum Concentrations: Fugitive PM2.5 ($\mu g/m^3$)	Cancer Risk (per million): Infant	Cancer Risk (per million): Adult	Hazard Index (-)	Maximum Annual PM2.5 Concentration ($\mu g/m^3$)
2017	0.1706	0.3080	**28.0**	**0.5**	**0.03**	**0.48**

Maximum Impacts at Pacif Hills Manor Nursing Home & Senior Rehabilitation

Construction Year	Maximum Concentrations: Exhaust PM2.5/DPM ($\mu g/m^3$)	Maximum Concentrations: Fugitive PM2.5 ($\mu g/m^3$)	Adult Cancer Risk (per million)	Hazard Index (-)	Maximum Annual PM2.5 Concentration ($\mu g/m^3$)
2017	0.0615	0.0664	**0.2**	**0.01**	**0.13**

Maximum Impacts at School for St. Catherine School- Child Exposures

Construction Year	UNMITIGATED				
	Maximum Concentrations: Exhaust PM2.5/DPM ($\mu g/m^3$)	Maximum Concentrations: Fugitive PM2.5 ($\mu g/m^3$)	Child Cancer Risk (per million)	Hazard Index (-)	Maximum Annual PM2.5 Concentration ($\mu g/m^3$)
2017	0.0334	0.0329	**0.9**	**0.01**	**0.07**

Hale Avenue Extension, Morgan Hill, CA- Construction Impacts - Unmitigated Emissions
Maximum DPM Cancer Risk Calculations From Construction
Off-Site Residential Receptor Locations - 1.5 meters

Cancer Risk (per million) = CPF x Inhalation Dose x ASF x ED/AT x FAH x 1.0E6

Where: CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$
ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = C_{air} x DBR x A x (EF/365) x 10^{-6}

Where: C_{air} = concentration in air ($\mu g/m^3$)
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

Values

	Infant/Child			Adult
Age -->	**3rd Trimester**	**0 - 2**	**2 - 16**	**16 - 30**
Parameter				
ASF =	10	10	3	1
CPF =	1.10E+00	1.10E+00	1.10E+00	1.10E+00
DBR* =	361	1090	572	261
A =	1	1	1	1
EF =	350	350	350	350
AT =	70	70	70	70
FAH =	1.00	1.00	1.00	0.73

* 95th percentile breathing rates for infants and 80th percentile for children and adults

Construction Cancer Risk by Year - Maximum Impact Receptor Location

			Infant/Child - Exposure Information			Infant/Child	Adult - Exposure Information			Adult		
	Exposure				Age	Cancer	Modeled		Age	Cancer		
Exposure	Duration		DPM Conc (ug/m3)		Sensitivity	Risk	DPM Conc (ug/m3)		Sensitivity	Risk	Fugitive	Total
Year	(years)	Age	Year	Annual	Factor	(per million)	Year	Annual	Factor	(per million)	PM2.5	PM2.5
0	0.25	-0.25 - 0*	-	-	10	-	-	-	-	-	-	-
1	1	0 - 1	2017	0.1706	10	28.02	2017	0.1706	1	0.49	0.308	0.48
2	1	1 - 2		0.0000	10	0.00		0.0000	1	0.00		
3	1	2 - 3		0.0000	3	0.00		0.0000	1	0.00		
4	1	3 - 4		0.0000	3	0.00		0.0000	1	0.00		
5	1	4 - 5		0.0000	3	0.00		0.0000	1	0.00		
6	1	5 - 6		0.0000	3	0.00		0.0000	1	0.00		
7	1	6 - 7		0.0000	3	0.00		0.0000	1	0.00		
8	1	7 - 8		0.0000	3	0.00		0.0000	1	0.00		
9	1	8 - 9		0.0000	3	0.00		0.0000	1	0.00		
10	1	9 - 10		0.0000	3	0.00		0.0000	1	0.00		
11	1	10 - 11		0.0000	3	0.00		0.0000	1	0.00		
12	1	11 - 12		0.0000	3	0.00		0.0000	1	0.00		
13	1	12 - 13		0.0000	3	0.00		0.0000	1	0.00		
14	1	13 - 14		0.0000	3	0.00		0.0000	1	0.00		
15	1	14 - 15		0.0000	3	0.00		0.0000	1	0.00		
16	1	15 - 16		0.0000	3	0.00		0.0000	1	0.00		
17	1	16-17		0.0000	1	0.00		0.0000	1	0.00		
18	1	17-18		0.0000	1	0.00		0.0000	1	0.00		
19	1	18-19		0.0000	1	0.00		0.0000	1	0.00		
20	1	19-20		0.0000	1	0.00		0.0000	1	0.00		
21	1	20-21		0.0000	1	0.00		0.0000	1	0.00		
22	1	21-22		0.0000	1	0.00		0.0000	1	0.00		
23	1	22-23		0.0000	1	0.00		0.0000	1	0.00		
24	1	23-24		0.0000	1	0.00		0.0000	1	0.00		
25	1	24-25		0.0000	1	0.00		0.0000	1	0.00		
26	1	25-26		0.0000	1	0.00		0.0000	1	0.00		

Hale Avenue Extension, Morgan Hill, CA- Construction Impacts - Unmitigated Emissions
Maximum DPM Cancer Risk Calculations From Construction
Off-Site Residential Receptor Locations - Pacific Hills Manor Adult Exposure - 1.5 meters

Cancer Risk (per million) = CPF x Inhalation Dose x ASF x ED/AT x FAH x 1.0E6

Where: CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$
ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = C_{air} x DBR x A x (EF/365) x 10^{-6}

Where: C_{air} = concentration in air ($\mu g/m^3$)
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

Values

	Infant/Child			Adult
Age -->	**3rd Trimester**	**0 - 2**	**2 - 16**	**16 - 30**
Parameter				
ASF =	10	10	3	1
CPF =	1.10E+00	1.10E+00	1.10E+00	1.10E+00
DBR* =	361	1090	572	261
A =	1	1	1	1
EF =	350	350	350	350
AT =	70	70	70	70
FAH =	1.00	1.00	1.00	1.00

* 95th percentile breathing rates for infants and 80th percentile for children and adults

Construction Cancer Risk by Year - Maximum Impact Receptor Location

		Adult - Exposure Information			Adult		
	Exposure	Modeled DPM Conc (ug/m3)		Age	Cancer		
Exposure	Duration			Sensitivity	Risk	Fugitive	Total
Year	(years)	Year	Annual	Factor	(per million)	PM2.5	PM2.5
1	1	2017	0.0615	1	0.24	0.0664	0.128
Total Increased Cancer Risk					**0.2**		

Hale Avenue Extension, Morgan Hill, CA- Construction Impacts - Unmitigated Emissions
Maximum DPM Cancer Risk Calculations From Construction
St Catherine School -School Child Exposures

Cancer Risk (per million) = CPF x Inhalation Dose x ASF x ED/AT x FAH x 1.0E6

Where: CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$
ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = C_{air} x DBR x A x (EF/365) x 10^{-6}

Where: C_{air} = concentration in air ($\mu g/m^3$)
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

Values

	Infant/Child			Adult
Age -->	**3rd Trimester**	**0 - 2**	**2 - 16**	**16 - 30**
Parameter				
ASF =	10	10	3	1
CPF =	1.10E+00	1.10E+00	1.10E+00	1.10E+00
DBR* =	361	1090	572	261
A =	1	1	1	1
EF =	350	350	350	350
AT =	70	70	70	70
FAH =	1.00	1.00	1.00	0.73

* 95th percentile breathing rates for infants and 80th percentile for children and adults

Construction Cancer Risk by Year - Maximum Impact Receptor Location

		Student - Exposure Information			Student		
	Exposure			Age*	Cancer		
Exposure	Duration	DPM Conc (ug/m3)		Sensitivity	Risk	Fugitive	Total
Year	(years)	Year	Annual	Factor	(per million)	PM2.5	PM2.5
2017	1	2017	0.0334	3	**0.86**	0.0329	0.066

* Students assumed to be older than 2 years of age