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ENVIRONMENT
& HEALTH

MEMO

Date: **May 6, 2024**

To: **Natalie Noyes, Senior Project Manager, David J Powers & Associates**

From: **Michael Keinath**

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Subject: **CEQA AIR QUALITY AND HEALTH RISK ASSESSMENT FOR THE 455 SOUTH B STREET (BESPOKE) COMMERCIAL/RESIDENTIAL MIXED-USE PROJECT, SAN MATEO, CALIFORNIA**

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Ramboll conducted California Environmental Quality Act (CEQA) air quality and health risk analyses for the proposed mixed-use development at 455 South B Street (also known as Bespoke) in San Mateo, California (the "Project").

According to the Project sponsor, the Project would redevelop the site with two buildings including a seven-story affordable housing building that would include 71 residential units and a center for Self-Help for the Elderly, and a six-story commercial building that would include 148,939 square feet of office space and 13,995 square feet of retail space. Surrounding land uses include commercial uses to the northwest along East 4th avenue; the Caltrain line to the northeast along South Railroad Avenue; proposed office, retail and residential uses to the southwest along South B Street; and commercial uses to the southeast along E. 5th Avenue. The Project would include an emergency generator and electric fire pump during operation.

The proposed land uses at the Project site are listed in **Table 1**.

CEQA THRESHOLDS OF SIGNIFICANCE

The City of San Mateo is the lead agency responsible for Project approval. Per City of San Mateo requirements, Ramboll evaluated the Project in accordance with the current Bay Area Air Quality Management District (BAAQMD) CEQA Guidelines, which were updated in April 2023, but are designated as the "2022 Guidelines." [1] These guidelines present methods for evaluating compliance with CEQA as well as thresholds for determining significance. With respect to the Project, the BAAQMD thresholds of significance are as follows:

[1] BAAQMD. 2023. 2022 California Environmental Quality Act (CEQA) Air Quality Guidelines. Available online at: https://www.baaqmd.gov/plans-and-climate/california-environmental-quality-act-ceqa/updated-ceqa-guidelines

BAAQMD CEQA Thresholds of Significance	
Criteria Air Pollutants (and Precursors)	**Construction-Related Average Daily Emissions (lbs/day)**
ROG	54
NO_X	54
PM_{10}	82 (exhaust only)
$PM_{2.5}$	54 (exhaust only)
$PM_{10}/PM_{2.5}$ (fugitive dust)	Best Management Practices
CO (local concentration)	None
Health Risks	**Construction- and Operation-Related Risks and Hazards for New Sources and Receptors**
Individual Project	Compliance with Qualified Community Risk Reduction Plan OR Increased cancer risk of >10.0 in a million Increased non-cancer risk of > 1.0 Hazard Index (HI, chronic or acute) Ambient $PM_{2.5}$ increase: > 0.3 µg/m^3 annual average Zone of Influence: 1,000-foot radius from fence line of source or receptor
Cumulative Threshold	Compliance with Qualified Community Risk Reduction Plan OR Increased cancer risk of >100 in a million (from all local sources) Increased non-cancer risk of >10 HI (from all local sources) (chronic) Ambient $PM_{2.5}$ increase: > 0.8 µg/m^3 annual average (from all local sources) Zone of Influence: 1,000-foot radius from fence line of source or receptor
Odors	None
Abbreviations: CO = Carbon Monoxide Lbs = pounds MT of CO_2e/yr = metric tons of carbon dioxide equivalent per year MT CO_2e/SP/yr = metric tons carbon dioxide equivalent per service population per year NOx = oxides of nitrogen $PM_{2.5}$ = Particulate Matter less than 2.5 microns PM_{10} = Particulate Matter less than 2.5 microns ROG = Reactive Organic Gas µg/m^3 = micrograms per cubic meter.	

Since the City of San Mateo has separately arranged for a GHG analysis, this Technical Memorandum only evaluates construction Criteria Air Pollutants (CAP) emissions and health effects of toxic air contaminant (TAC) emissions emitted during Project construction and operation, including a cumulative assessment from all sources within the zone of influence.

The 2022 BAAQMD CEQA Guidelines Appendices provide an Excel-based tool that generates a conservative indication of whether implementing a proposed mixed land use project could result in potentially significant criteria air pollutants and precursors impacts. Using the "Mixed Land Use Screening Tool for Criteria Pollutants and Precursors" provided by BAAQMD and the land use sizes provided in **Table 1**, the proposed project is below operational criteria pollutant screening levels, shown in **Appendix A**. As a result, an operational CAP assessment is not included in this memorandum.

SUMMARY OF RESULTS

Construction emissions are presented in **Table 2**. The CAP emissions for construction are below the BAAQMD thresholds of significance. However, since the unmitigated $PM_{2.5}$ concentration at the maximally exposed nearby receptor exceeded thresholds, mitigation for fugitive dust was developed to bring the $PM_{2.5}$ concentration below thresholds. The proposed mitigation measure is:

- Best management practices for fugitive dust: During Project construction, the Project sponsor shall comply with the BAAQMD's current basic control measures for reducing construction emissions of fugitive PM_{10} and $PM_{2.5}$. The fugitive PM emissions are assumed to be mitigated by watering the construction site two times per day, using CalEEMod[2] default reduction percentages for the specified control measures.

Unmitigated and mitigated health risk impacts from the Project are shown in **Table 3** and **Table 4**, respectively. Health risk impacts on a cumulative basis are shown in **Table 5**.

With the mitigation measure applied, the air quality and health risk impacts from the Project are below the BAAQMD thresholds of significance. The cumulative impacts exceed thresholds; however, the Project would not result in a cumulatively considerable contribution to the significant impact considering the cancer risk exceedance is driven by the nearby railway, as discussed in greater detail below.

DATA SOURCES AND EMISSIONS METHODOLOGIES

The following sections describe the input data and methodologies used in the construction and operational emissions analysis. Detailed information for each section can be found in the referenced tables and appendices.[3]

Construction CAP Emissions Estimation

Ramboll utilized methodology consistent with the California Emission Estimator Model version 2022.1 (CalEEMod to quantify all construction CAP emissions. CalEEMod is a statewide program designed to calculate both CAP and GHG emissions for development projects in California. CalEEMod provides a simple platform to calculate both construction emissions and operational emissions from a land use project. It calculates both the daily maximum and annual average for CAPs as well as total or annual GHG emissions.

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[2] California Air Pollution Control Officers Association (CAPCOA). 2022. California Emissions Estimator Model. Available at: http://www.CalEEMod.com/.

[3] Following quantification of the project's construction CAP emissions, the applicant submitted revised plans that include a slight increase to the self-help use that was categorized in Table 1 as General Office Building. This increase (1,342 square feet) would be accommodated within the same construction phasing assumptions and would not change the project's modeled emissions.

CalEEMod utilizes widely accepted models for emission estimates combined with appropriate default data that can be used if site-specific information is not available. CalEEMod uses sources such as the US Environmental Protection Agency (USEPA) AP-42 emission factors,[4] California Air Resources Board's (CARB) on-road and off-road equipment emission models such as the EMission FACtor model (EMFAC) and the Emissions Inventory Program model (OFFROAD), and studies commissioned by California agencies such as the California Energy Commission (CEC) and CalRecycle.

Construction emissions from the Project include both on-site, off-road heavy equipment as well as off-site, on-road vehicle travel. As described below, Ramboll updated several default assumptions to Project-specific information to generate emission estimates with CalEEMod, for consistency with BAAQMD and California Air Pollution Control Officer Association (CAPCOA) methods. Where project-specific data were not available, Ramboll used CalEEMod defaults for the land uses shown in **Table 1**. The construction phasing, equipment, and trip rate assumptions are shown in **Tables 6, 7,** and **8**. It was assumed that construction would start as early as 2026. Project construction is assumed to use statewide fleet-average tier diesel engines for all equipment. Construction equipment during a given construction year in the OFFROAD model is a mix of Tier 1, 2, 3, Tier 4 Interim and Tier 4 Final engines based on statewide equipment inventory for that given year. This assumes that the Project would use construction equipment as available and not specify a particular engine Tier level. Emissions from paving and architectural coating off-gassing were also estimated using methodologies consistent with CalEEMod and are summarized in **Tables 9** and **10**.

Updates to CalEEMod Default Assumptions

In preparing Project construction emissions, several updates were made to modify the CalEEMod default factors and assumptions. These include the following areas:

- Off-road equipment hours were updated to reflect utilization of each equipment per phase as provided by the Project sponsor.
- The vendor and haul truck trips for all subphases were provided by the Project sponsor and are shown in **Table 8**.
- Under the mitigated scenario, the construction site is assumed to be watered twice per day to reduce fugitive PM emissions.

LOCAL COMMUNITY RISK AND HAZARD IMPACTS

Local Carbon Monoxide (CO) Impacts

According to the 2022 BAAQMD CEQA Guidelines, the Project would result in less-than-significant localized CO concentrations if it meets the following criteria:

1. Is consistent with county and local congestion management plans, and
2. Does not increase traffic volumes at affected intersections to more than 24,000 vehicles per hour.

Based on the traffic volume data provided by the Project sponsor, presented in **Appendix B**, the traffic volumes generated by the proposed project will not result in the overall traffic volumes

[4] The USEPA maintains a compilation of Air pollutant Emission Factors and process information for several air pollution source categories. The data is based on source test data, material balance studies, and engineering estimates. Available at: https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors.

exceeding 24,000 vehicles per hour at any nearby intersections. Thus, operational impacts from Project CO emissions would be less than significant.

Toxic Air Contaminant (TAC) and $PM_{2.5}$ Emissions

The TAC emissions associated with the Project construction were calculated with the following assumptions and exceptions:

1. Diesel Particulate Matter (DPM): DPM emissions were used to evaluate the cancer risk and non-cancer chronic HI from Project construction. In this analysis, both on-site (i.e., construction equipment) and local off-site (i.e., construction mobile sources) particulate matter less than 10 microns (PM_{10}) exhaust emissions[5] were calculated as DPM and modeled within the Project boundary (as discussed in the next section). This analysis also conservatively assumed the small fraction of non-diesel PM_{10} (i.e., PM_{10} emissions from gasoline fueled passenger vehicles) was DPM, which has greater human health impacts.
2. $PM_{2.5}$: Exhaust and fugitive particulate matter less 2.5 microns ($PM_{2.5}$) emissions were used to evaluate the $PM_{2.5}$ concentration due to the Project construction. Fugitive PM emissions were calculated using CalEEMod methodologies as shown in **Tables 11-17**. The modeled emissions were calculated using the same conservative assumptions as the DPM calculation.

Based on the construction schedule provided by the Project sponsor, the Project construction will be completed in one phase. All emissions from Project construction were summed by year and modeled on an annual basis. These modeled construction emission rates are shown in **Table 18.**

TAC emissions from Project operation were estimated for the proposed emergency generator based on the kilowatt and tier rating provided by the Project sponsor. The exhaust temperature, outlet diameter, and outlet velocity of the generators were provided by the Project sponsor and the default stack height was assumed based off the 2022 BAAQMD CEQA Guidelines. As recommended by the City of San Mateo, project emissions for the emergency generator is based on the BAAQMD rule limiting the hours of non-emergency operation for emergency standby diesel engines to a maximum of 50 hours per year of testing and maintenance, which is consistent with the maximum allowed testing time from the Airborne Toxic Control Measure for Stationary Compression Ignition Engines.[6] Annual emissions of PM_{10} and $PM_{2.5}$ from the proposed generator were estimated using ARB standards for diesel generator engines.[7] Similar to construction TAC sources, PM_{10} exhaust emissions from the proposed generator were conservatively calculated as DPM. The emission factors and modeled emission rates for the proposed emergency generator are summarized in **Table 19**. TAC emissions from the emergency fire pump were not analysed since the fire pump will be electric.

Operational traffic can also contribute vehicular TAC emissions, predominantly from gasoline fueled engines, if the Project would substantially increase traffic volumes on nearby roadways. Based on BAAQMD's risk requirement, a major roadway with at least 10,000 average annual daily traffic (AADT) should be identified as mobile source. [8] However, since the Project is

[5] Local off-site (mobile source) emissions were conservatively calculated by including CalEEMod® on-road emissions for the entire default trip length in the screening model.

[6] California Air Resources Board (CARB). 2011. Final Regulations Order: Amendments to the Airborne Toxic Control Measure for Stationary Compression Ignition Engines. Available at: https://ww2.arb.ca.gov/sites/default/files/classic/diesel/documents/finalreg2011.pdf.

[7] California Air Resources Board (CARB). Non-road Diesel Engine Certification Tier Chart. Available at: https://ww2.arb.ca.gov/resources/documents/non-road-diesel-engine-certification-tier-chart

[8] BAAQMD. 2022. CEQA Guidelines- Risk and Hazard Screening Analysis Process Flow Chart. Available at: https://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/tools/2020_02_20-screening-approach-flow-chart-pdf.pdf?la=en.

relatively small, it will generate less than 10,000 AADT distributed to nearby roadways. Therefore, operational on-road vehicles were not modeled as a TAC source.

Project-Level Health Risk Assessment

Ramboll analyzed Project construction-related and operational health risks by estimating ambient air concentrations of DPM and $PM_{2.5}$.

Air Dispersion Modeling

To estimate air concentrations of DPM and $PM_{2.5}$, Ramboll used AERMOD Version 23132, a steady-state Gaussian plume model developed by USEPA for regulatory applications. AERMOD requires emission source locations and release parameters, receptor locations, and processed meteorological data. The construction and operational source parameters are shown in **Table 20** and **Table 21**, respectively. Ramboll used five years of meteorological data from the San Francisco International Airport, which was the nearest available dataset to the Project.

Turbulent eddies can form on the downwind side of buildings and may cause a plume from a stack or point source located near the building to be drawn towards the ground to a greater degree than if the building were not present. This is referred to as the "building downwash" effect. The effect can increase the resulting ground-level pollutant concentrations downwind of a building. AERMOD takes this effect into account for sources modeled as point sources. The dimensions and locations of the Project and the commercial buildings adjacent to the Project site were included, as shown in **Figure 1**, to allow AERMOD to incorporate algorithms to evaluate the downwash effect on dispersion of point sources. Building heights were obtained from the plans of the proposed Project and the adjacent buildings. The direction-specific building downwash dimensions were determined by the latest version (04274) of the Building Profile Input Program, PRIME (BPIP PRIME). Point sources were used only to model the Project generator, so building downwash was only evaluated in the Project operational generator modeling.

The AERMOD input files are provided electronically as **Appendix C**. The source and building setup are shown in **Figure 1**. The modeled receptor grid is shown in **Figure 2**. As recommended in 2022 BAAQMD CEQA Guidelines, receptor heights were modeled at 1.5 meters to represent the breathing zone of an adult.

Exposure Parameters and Cancer Risk Calculation

In February 2015, Office of Environmental Health Hazard Assessment (OEHHA) released the updated Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, which combines information from previously-released and adopted technical support documents to delineate OEHHA's revised risk assessment methodologies based on current science.[9] In accordance with OEHHA's revised HRA guidelines, the 2022 BAAQMD CEQA Guidelines has adopted an intake methodology that addresses children's greater sensitivity and health impacts from early exposure to carcinogenic compounds.[10] The updated calculation procedures include the use of age-specific weighting factors, breathing rates, fraction of time at home, and reduced exposure durations, as shown in the 2022 BAAQMD CEQA Guidelines Appendix E. This analysis followed the recommended methodology from the 2022 BAAQMD CEQA Guidelines.

[9] OEHHA. 2015. Air Toxics Hot Spots Program. Risk Assessment Guidelines. Guidance Manual for Preparation of Health Risk Assessments. February.

[10] BAAQMD. 2023. 2022 California Environmental Quality Act (CEQA) Air Quality Guidelines. Available online at: https://www.baaqmd.gov/plans-and-climate/california-environmental-quality-act-ceqa/updated-ceqa-guidelines.

Ramboll conservatively evaluated Project impacts due to construction emissions using default exposure assumptions for a resident child from OEHHA unless otherwise noted.[11] The resident child scenario assumes a much higher daily breathing rate and age-sensitivity factor (ASF) than other sensitive receptor populations and therefore is the most conservative scenario to evaluate for this analysis. For the construction and operation exposure scenario, off-site residential receptors exposed to the entire construction period and 30 years of Project operation were evaluated to determine the maximum health impacts of the Project; for the operation-only scenario, the Project residential receptors were assumed to be exposed at the start of Project operation for 30 years. The locations for sensitive receptor including daycares, childcares and elementary schools were identified using a report from Environmental Data Resources (EDR). Worker receptor's locations were identified using the City of San Mateo Zoning Map.[12] Exposure periods for each of the non-residential sensitive land uses are assumed to be the same as the age range accepted at the location. The exposure parameters used to estimate excess lifetime cancer risks for the nearby sensitive receptors are presented in **Table 22**.

The dose estimated for each exposure pathway is a function of the concentration of a chemical and the intake of that chemical. The intake factor for inhalation, IF_{inh}, can be calculated as follows:

$$IF_{inh} = \frac{DBR * FAH * EF * ED * CF * ASF * FY}{AT}$$

Where:

IF_{inh}	=	Intake Factor for Inhalation (m^3/kg-day)
DBR	=	Daily Breathing Rate (L/kg-day)
FAH	=	Fraction of Time at Home (unitless)
EF	=	Exposure Frequency (days/year)
ED	=	Exposure Duration (years)
AT	=	Averaging Time (days)
CF	=	Conversion Factor, 0.001 (m^3/L)
ASF	=	Age Sensitivity Factor (unitless)
FY	=	Fraction of Year, to correct annualization of partial year emissions

The chemical intake or dose is estimated by multiplying the inhalation intake factor, IF_{inh}, by the chemical concentration in air, C_i. When coupled with the chemical concentration, this calculation is mathematically equivalent to the dose algorithm given in the OEHHA Hot Spots guidance.[13]

The toxicity assessment characterizes the relationship between the magnitude of exposure and the nature and magnitude of adverse health effects that may result from such exposure. This HRA evaluated theoretical exposures to TACs for two categories of potential adverse health effects, cancer and non-cancer endpoints. Toxicity values used to estimate the likelihood of adverse effects occurring

[11] OEHHA. 2015. Air Toxics Hot Spots Program. Risk Assessment Guidelines. Guidance Manual for Preparation of Health Risk Assessments. February.

[12] City of San Mateo. 2022. City of San Mateo Zoning Map. Available online at: https://www.cityofsanmateo.org/DocumentCenter/View/66332/CDD-Planning---Zoning?bidId=.

[13] OEHHA. 2015. Air Toxics Hot Spots Program. Risk Assessment Guidelines. Guidance Manual for Preparation of Health Risk Assessments. February.

in humans at different exposure levels are identified as part of the toxicity assessment component of a risk assessment.

Excess lifetime cancer risk and chronic hazard quotient (HQs) calculations for Project construction and operation utilized the toxicity values for DPM. Toxicity values for DPM are as presented in **Table 23**.

BAAQMD recommends applying an adjustment factor to the annual average concentration modeled assuming continuous emissions (i.e., 24 hours per day, seven days per week), when the actual emissions are less than 24 hours per day and exposures are concurrent with activities occurring as part of the Project. For construction activities, emissions only impact receptors during certain hours of the day when activities are occurring. However, the TAC concentrations modeled during those hours are annualized assuming 24 hour per day in the modeling outputs. Thus, a modeling adjustment factor (MAF) is recommended to be applied to the annual average concentration used in the evaluation to account for an emissions schedule that is not occurring 24 hours per day, seven days per week if the exposure takes place preferentially during hours during which work, school or recreational activities are occurring. Thus, a MAF of 4.2 was applied to all receptor types except for residents to adjust from 24 hours per day to 8 hours per day and from 7 days a week to 5 days week ([24 hours/ 8 hours] * [7 days/ 5 days] = 4.2). Resident types are expected to be exposed 24 hours/day and 7 days/week; as a result, the MAF is 1. Operational sources could potentially operate at any time of day; as a result, the MAF is 1 for all receptors for operational sources. The MAF values are presented with exposure parameters in **Table 22**.

The potential for exposure to result in adverse chronic noncancer effects is evaluated by comparing the estimated annual average air concentration (which is equivalent to the average daily air concentration) to the noncancer chronic reference exposure level (cREL) for each chemical. When calculated for a single chemical, the comparison yields a ratio termed a hazard quotient (HQ). To evaluate the potential for adverse chronic noncancer health effects from simultaneous exposure to multiple chemicals, the chronic HQs for all chemicals are summed, yielding a non-cancer chronic HI.

$$HI = \sum HQ_i = \sum (C_i / cREL_i)$$

Where:

HQ_i	=	Chronic hazard quotient for chemical i
HI	=	Hazard index
C_i	=	Annual average concentration of chemical i ($\mu g/m^3$)
$cREL_i$	=	Chronic noncancer reference exposure level for chemical i ($\mu g/m^3$)

As shown in **Table 3**, the unmitigated construction activities and operations scenario would result in a maximum cancer risk of 9.87 in a million (threshold of 10), a maximum chronic HI of 0.017 (threshold of 1.0), and a maximum $PM_{2.5}$ concentration of 0.48 micrograms per cubic meter ($\mu g/m^3$) (threshold of 0.3 $\mu g/m^3$) at the maximally exposed individuals (MEIs). The unmitigated $PM_{2.5}$ would therefore exceed the BAAQMD's thresholds from the construction and operations scenario. As shown in **Table 4**, the mitigated maximum annual average PM2.5 concentration is reduced to 0.24 $\mu g/m^3$. The operations only scenario results in a maximum cancer risk of 6.9 in a million, a maximum chronic HI of 0.0020, and a maximum $PM_{2.5}$ concentration of 0.010 micrograms per cubic meter ($\mu g/m^3$) at the MEIs. As a result of the proposed mitigation to control fugitive dust, all health impacts would be below BAAQMD's thresholds for both the construction and operations scenario and the operations only scenario. The

locations of the MEIs for the overall maximum health impacts are shown in **Figure 1.** The locations of the MEI's are the same for both the unmitigated and mitigated scenarios.

The Project's air quality and health risks on off-site sensitive receptors are all below the BAAQMD thresholds of significance with the use best management practices for fugitive dust. Thus, health risk impacts associated with the Project are less than significant.

Cumulative Health Risk Assessment

In accordance with BAAQMD CEQA Guidelines, Ramboll conducted a cumulative HRA for off-site sensitive receptors. The cumulative assessment tabulates the impact of Project-related risks plus existing off-site sources (stationary and mobile) and future foreseeable cumulative development projects at the off-site MEI location for cancer risk, located on a residential receptor, and off-site MEI location for chronic health impacts and $PM_{2.5}$ concentration,[14] located on a worker receptor. The evaluation requires the identification of any existing stationary and mobile sources within 1,000 feet of the Project boundary and any future foreseeable cumulative development projects identified by the City of San Mateo. For this project the City of San Mateo identified the following as foreseeable future cumulative development projects to be included in the cumulative HRA:

- 435 East 3rd Avenue,
- 500 East 3rd Avenue,
- 222 East 4th Avenue,
- 616 B Street,
- 500 East 4th Avenue, and
- 477 9th Avenue.

In addition to the evaluation of each single source, the combined health risk from all TAC and $PM_{2.5}$ sources are evaluated.

Stationary Sources, Railway, and Roadway Sources

Sources evaluated in the cumulative health risk assessment include any BAAQMD permitted stationary sources, other major source of emissions within the zone of influence such as railways and roadways, and construction impacts from the future development projects at listed above. The BAAQMD provides tools with conservative estimates of impacts from many of these sources, including a stationary source tool and raster files for railways and major roadways.

The stationary source screening tool from the BAAQMD provides generalized risk estimates and estimated $PM_{2.5}$ concentrations for the existing stationary sources, which represents a screening-level analysis based on the size and type of activity that occurs on site.

BAAQMD's raster files are intended to assist conducting cumulative cancer risk and hazard analyses from roadway sources (freeways and surface streets) and rail sources (rail lines and selected railyards). The roadway raster file includes impacts based on 2019 data for the entire Bay Area from three vehicle classes: (1) non-trucks (passenger cars, light duty trucks, buses, motorcycles, and motor homes), (2) Truck 1 (light heavy-duty trucks weighing 8,501 to 14,000lbs), and (3) Truck 2 (medium heavy-duty weighing 14,001 to 33,000 lbs and heavy heavy-duty trucks weighing 33,000 lbs

[14] The BAAQMD tools for cumulative health risk assessments use the most conservative exposure parameters, which assumes residential exposure for 30 years. Using these tools conservatively estimates the impacts at maximally exposed worker receptors.

and above). The railway raster file includes impacts across the Bay Area from diesel locomotives used to transport freight along Class I rail lines, to transport people along commuter/passenger rail lines (i.e., Caltrain lines), and for goods movements at railyards in West Oakland and Richmond/North Richmond/San Pablo. Impacts are estimated based on arrival/departure schedules for commuter/passenger trains from the Fall of 2021 and 2020 fuel consumption rates for the freight lines operated by the Burlington Northern Santa Fe Corporation (BNSF) and Union Pacific (UP) rail companies. The raster files and stationary source screening tools were used to estimate the health impacts from roadways, railways, and stationary sources and combined with the impacts from all other sources at the MEI.

Future Foreseeable Cumulative Development Sources

For the impacts from the construction and operation of future foreseeable cumulative development projects, Ramboll utilized methodology consistent with CalEEMod to quantify all construction and operational TAC emissions. Construction TAC emissions from these projects include DPM and $PM_{2.5}$ emissions from both on-site, off-road heavy equipment and off-site, on-road vehicle travel. Operational TAC emissions, including DPM and $PM_{2.5}$ emissions from emergency generators or fire pumps, are from the projects at 500 E. 3rd Avenue (Block 21) and 222 East 4th Avenue. Ramboll analyzed construction and operation related health risks by estimating ambient air concentrations of DPM and $PM_{2.5}$ using consistent methodology used to estimate health risks for the Project. The health impacts from these future foreseeable development sources at the Project's MEI locations were combined with the impacts from all other sources at the construction and operational off-site MEIs.

Summary of Cumulative Analysis

Details of each source included in the cumulative analysis are presented in **Table 5**. The combined impact from all the sources results in a maximum excess cancer risk of 156 in a million compared to a threshold of 100 in a million. The primary contributors to the cumulative cancer risk at the off-site MEI is the nearby Caltrain operation, located about 25 feet from the off-site MEI, accounting for approximately 130 in a million (83%). The railway sources caused the exceedance of the cumulative cancer risk over the cumulative threshold of 100 in a million. The BAAQMD raster file provides generalized risk estimates and estimated cancer risks for railway sources, which represents a screening-level analysis based on the train schedules, 2020 fuel consumption rates, and does not account for Caltrain electrification.[15] Therefore, the identified concentrations and risks are conservative. If this railway source were not operational or if Caltrain were to be electrified, it is likely the cumulative contribution from the rail line would decrease dramatically and there would be no cumulative impact associated with the Project and the rest of the cumulative sources. Further, the Project's contribution are below the single source (Project level) thresholds. Therefore, the Project would not result in a cumulatively considerable contribution to the significant impact.

The combined impact from all the sources results in noncancer chronic HI of 0.11 compared to a threshold of 10 at the offsite MEI. The maximum combined $PM_{2.5}$ concentrations is 0.75 $\mu g/m^3$ compared to a threshold of 0.8 $\mu g/m^3$ at the offsite MEI.

CLOSING

The analysis presented above represents emissions and health risk impacts from construction and operation of the proposed Project. Overall, the Project does not exceed any BAAQMD CEQA

[15] BAAQMD. 2023. 2022 California Environmental Quality Act (CEQA) Air Quality Guidelines. Appendix E. Page E-90. Available online at: https://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa-guidelines-2022/appendix-e-recommended-methods-for-screening-and-modeling-local-risks-and-hazards_final-pdf.pdf.

significance thresholds, with the mitigation measures to control fugitive dust by watering the construction site two times per day. On a cumulative level, the project does not result in a cumulatively considerable impact to health risks.

Attachments:

Tables

Figures

Appendix A: Mixed Land Use Screening Tool for Criteria Pollutants and Precursors

Appendix B: Traffic Study

Appendix C: AERMOD Input Files (provided Electronically)

TABLES

Table 1
Land Use Summary for Proposed Project
445 South B Street - Bespoke
San Mateo, CA

Phase	Project Description Land Use Type[1]	CalEEMod® Land Use Type	CalEEMod® Land Use Subtype	Value	Units	Square Footage
Single Phase	Office Space	Commercial	General Office Building	154	1000sqft	153,561
	Retail	Retail	Strip Mall	14.0	1000sqft	13,989
	Office Parking Garage	Parking	Enclosed Parking Structure	25.5	1000sqft	25,500
	Residential	Residential	Apartment Mid Rise	77.3	1000sqft	77,341
	Residential Parking Garage	Parking	Enclosed Parking Structure	22.0	1000sqft	22,000

Notes:

[1] Project land use type and square footage provided by the Project Applicant.

Abbreviations:

CalEEMod® - California Emissions Estimator Model®

References:

California Air Pollution Control Officers Association (CAPCOA). California Emissions Estimator Model (CalEEMod®), Version 2022.1. Available online at http://www.caleemod.com/

Table 2
Criteria Air Pollutants Emissions from Proposed Project Construction
445 South B Street - Bespoke
San Mateo, CA

Summary of Construction Emissions by Source

Phase	Year	Source	CAP Emissions[1]			
			ROG	NOx	PM_{10}	$PM_{2.5}$
			lb/yr			
Demolition	2026	Off-Road Equipment	6.9	80	1.2	1.2
		Onroad Vehicles	4.4	86	0.79	0.75
Site Preparation	2026	Off-Road Equipment	1.6	8.2	0.31	0.31
		Onroad Vehicles	0.67	10	0.10	0.093
Grading/Excavation	2026	Off-Road Equipment	12	74	2.3	2.3
		Onroad Vehicles	2.9	86	0.78	0.74
Trenching/Foundation	2026	Off-Road Equipment	2.5	13	0.49	0.49
		Onroad Vehicles	--	--	--	--
Podium	2026	Off-Road Equipment	2.8	15	0.56	0.56
		Onroad Vehicles	--	--	--	--
Building Construction	2026	Off-Road Equipment	2.1	40	0.31	0.31
		Onroad Vehicles	23	131	1.2	1.2
	2027	Off-Road Equipment	7.6	145	1.2	1.2
		Onroad Vehicles	80	454	4.2	4.0
Interior/Architectural	2,026	Architectural Coating	286	--	--	--
		Off-Road Equipment	--	--	--	--
		Onroad Vehicles	--	--	--	--
	2,027	Architectural Coating	2,576	--	--	--
		Off-Road Equipment	--	--	--	--
		Onroad Vehicles	--	--	--	--
Paving	2027	Paving	2.9	--	--	--
		Off-Road Equipment	1.0	8.0	0.19	0.19
		Onroad Vehicles	3.3	2.2	0.043	0.040

Average Construction Emissions by day

Year	ROG	NOx	PM_{10}	$PM_{2.5}$
	lb/day			
2026	1.4	2.3	0.034	0.033
2027	12	2.8	0.025	0.024
BAAQMD Thresholds[2]	54	54	82	54
Exceeds Thresholds?	**No**	**No**	**No**	**No**

Notes:

1. Construction emissions were estimated with methodology equivalent to CalEEMod® 2022.1. Off-road equipment represents emissions from construction equipment, while onroad vehicles includes emissions from worker, vendor, and hauling trucks.
2. Thresholds are from BAAQMD Guidance for Assessing and Mitigating Air Quality Impacts.

Abbreviations:

BAAQMD - Bay Area Air Quality Management District
CalEEMod® - California Emissions Estimator Model®
CAP - Criteria Air Pollutants
lb/day - pound(s) per day
lb/yr - pound(s) per year
NOx - nitrogen oxides
PM_{10} - particulate matter less than 10 microns
$PM_{2.5}$ - particulate matter less than 2.5 microns
ROG - reactive organic gases

References:

California Air Pollution Control Officers Association (CAPCOA). California Emissions Estimator Model (CalEEMod®), Version 2022.1. Available online at http://www.caleemod.com/

BAAQMD. 2023. Bay Area Air Quality Management District California Environmental Quality Act Air Quality Guidelines. Available at: https://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa-guidelines-2022/ceqa-guidelines-chapter-5-project-air-quality-impacts_final-pdf.pdf?la=en

Table 3
Unmitigated Maximum Project Excess Lifetime Cancer Risk, Chronic HI and PM2.5
445 South B Street - Bespoke
San Mateo, CA

Source Category	Project Construction + Operation			Project Operation		
	Excess Lifetime Cancer Risk[1]	Chronic HI[2,3]	$PM_{2.5}$ Concentration[3]	Excess Lifetime Cancer Risk[1]	Chronic HI[2,3]	$PM_{2.5}$ Concentration[3]
	in a million	unitless ratio	µg/m³	in a million	unitless ratio	µg/m³
Construction	8.1	0.017	0.48	--	--	--
Generator	1.80	--	--	6.9	0.0020	0.010
Unmitigated Total	**9.87**	**0.017**	**0.48**	**6.9**	**0.0020**	**0.010**
Significance Threshold	**10**	**1.0**	**0.30**	**10**	**1.0**	**0.30**
Exceeds thresholds?	**No**	**No**	**Yes**	**No**	**No**	**No**
Receptor Type	Offsite Resident	Offsite Worker	Offsite Worker	Onsite Resident	Offsite Worker	Offsite Worker
Year	**--**	2026	2026	--	All	All
UTMx	560040	560020	560020	560020	560040	560040
UTMy	4157760	4157700	4157700	4157740	4157720	4157720
Address	300 E 5th Ave, San Mateo, CA 94401	306 E 5th Ave, San Mateo, CA 94401	306 E 5th Ave, San Mateo, CA 94401	306 E 5th Ave, San Mateo, CA 94401	Central San Mateo, San Mateo, CA 94401	Central San Mateo, San Mateo, CA 94401

Note:

1. Excess lifetime cancer risks were estimated using the following equation:

   $Risk_{inh} = \Sigma C_i \times CF \times IF_{inh} \times CPF_i \times ASF$

   Where:

   $Risk_{inh}$ = Cancer Risk for the Inhalation Pathway (unitless)
   C_i = Annual Average Air Concentration for Chemical "i" ug/m³
   CF = Conversion Factor (mg/ug)
   IF_{inh} = Intake Factor for Inhalation (m³/kg-day)
   CPF_i = Cancer Potency Factor $(mg/kg\text{-}day)^{-1}$
   ASF = Age Sensitivity Factor (unitless)

2. Chronic HI for each receptor was estimated using the following equation:

   $HI_{inh} = \Sigma C_i / cREL$

   Where:

   HI_{inh} = Chronic HI for the Inhalation Pathway (unitless)
   C_i = Annual Average Air Concentration for Chemical "i" (ug/m³)
   cREL = Chronic Reference Exposure Level (ug/m³)

3. $PM_{2.5}$ concentration and Non-Cancer Hazard Index values represent annual values.

Abbreviations:

BAAQMD - Bay Area Air Quality Management District
HI - Hazard Index
m³ - cubic meter
OEHHA - Office of Environmental Health Hazard Assessment
PM - particulate matter
µg - microgram
UTMx, UTMy - Universal Transverse Mercator coordinates

Reference:

BAAQMD. 2023. California Environmental Quality Act Air Quality Guidelines. Available at: https://www.baaqmd.gov/plans-and-climate/california-environmental-quality-act-ceqa/updated-ceqa-guidelines

OEHHA. 2015. Air Toxics Hot Spots Program Risk Assessment Guidelines. Guidance Manual for Preparation of Health Risk Assessments. February.

Table 4
Mitigated Maximum Project Excess Lifetime Cancer Risk, Chronic HI and PM2.5
445 South B Street - Bespoke
San Mateo, CA

Source Category	Project Construction + Operation			Project Operation		
	Excess Lifetime Cancer Risk[1]	Chronic HI[2,3]	$PM_{2.5}$ Concentration[3]	Excess Lifetime Cancer Risk[1]	Chronic HI[2,3]	$PM_{2.5}$ Concentration[3]
	in a million	unitless ratio	$\mu g/m^3$	in a million	unitless ratio	$\mu g/m^3$
Construction	8.07	1.7E-02	0.24	--	--	--
Generator	1.8	--	--	6.9	0.0020	0.010
Mitigated Total	**9.87**	**0.017**	**0.24**	**6.9**	**0.0020**	**0.010**
Significance Threshold	**10**	**1.0**	**0.30**	**10**	**1.0**	**0.30**
Exceeds thresholds?	**No**	**No**	**No**	**No**	**No**	**No**
Receptor Type	Offsite Resident	Offsite Worker	Offsite Worker	Onsite Resident	Offsite Worker	Offsite Worker
Year	--	2026	2026	--	All	All
UTMx	560040	560020	560020	560020	560040	560040
UTMy	4157760	4157700	4157700	4157740	4157720	4157720
Address	499-401 S Railroad Ave, San Mateo, CA 94401	Central San Mateo, San Mateo, CA 94401	306 E 5th Ave, San Mateo, CA 94401	S Railroad Ave, San Mateo, CA 94401	Central San Mateo, San Mateo, CA 94401	Central San Mateo, San Mateo, CA 94401

Note:

1. Excess lifetime cancer risks were estimated using the following equation:

   $Risk_{inh} = \Sigma C_i \times CF \times IF_{inh} \times CPF_i \times ASF$

   Where:

   $Risk_{inh}$ = Cancer Risk for the Inhalation Pathway (unitless)
   C_i = Annual Average Air Concentration for Chemical "i" ug/m^3
   CF = Conversion Factor (mg/ug)
   IF_{inh} = Intake Factor for Inhalation (m^3/kg-day)
   CPF_i = Cancer Potency Factor $(mg/kg\text{-}day)^{-1}$
   ASF = Age Sensitivity Factor (unitless)

2. Chronic HI for each receptor was estimated using the following equation:

   $HI_{inh} = \Sigma C_i / cREL$

   Where:

   HI_{inh} = Chronic HI for the Inhalation Pathway (unitless)
   C_i = Annual Average Air Concentration for Chemical "i" (ug/m^3)
   cREL = Chronic Reference Exposure Level (ug/m^3)

3. $PM_{2.5}$ concentration and Non-Cancer Hazard Index values represent annual values.

Abbreviations:

BAAQMD - Bay Area Air Quality Management District
HI - Hazard Index
m^3 - cubic meter
OEHHA - Office of Environmental Health Hazard Assessment
PM - particulate matter
µg - microgram
UTMx, UTMy - Universal Transverse Mercator coordinates

Reference:

BAAQMD. 2023. California Environmental Quality Act Air Quality Guidelines. Available at: https://www.baaqmd.gov/plans-and-climate/california-environmental-quality-act-ceqa/updated-ceqa-guidelines

OEHHA. 2015. Air Toxics Hot Spots Program Risk Assessment Guidelines. Guidance Manual for Preparation of Health Risk Assessments. February.

Table 5
Cumulative Risks and Hazards
445 South B Street - Bespoke
San Mateo, CA

Source		Lifetime Excess Cancer Risk (in a million)	Noncancer Chronic HI	$PM_{2.5}$ Concentration ($\mu g/m^3$)
Stationary Sources[1]		2.4	0.0083	6.3E-04
Roadways[2]		11	0.060	0.41
Railways[2]		130	0.020	0.092
Foreseeable Future Cumulative Development Projects[3]	435 E 3rd Avenue	0.027	6.0E-05	9.9E-05
	500 East 3rd Avenue	0.21	4.0E-05	2.0E-04
	222 East 4th Avenue	1.4	5.2E-04	0.0026
	616 South B Street	0.079	--	--
	500 E 4th Avenue	0.71	5.5E-05	8.2E-05
	477 9th Avenue	0.36	1.0E-04	5.2E-04
Mitigated Project Construction and Operations[4]		9.87	0.017	0.24
Total		**156**	**0.11**	**0.75**
Exceeds Threshold?		**YES**	**NO**	**NO**
Year		--	2026	2026
UTMx		560040	560020	560020
UTMy		4157760	4157700	4157700
Receptor Type		Offsite Resident	Offsite Worker	Offsite Worker
Threshold		**100**	**10**	**0.8**

Notes:

1. Health impacts from Stationary Sources estimated using BAAQMD Stationary Source Screening Analysis Tool. Risk values listed are maximum values, not expected values. Results have been adjusted by the BAAQMD-recommended distance multiplier, where relevant.
2. Health risks from roadways and railways were determined using BAAQMD screening tools and are based on the maximum impact of a raster cell located on the identified sensitive receptors.
3. Foreseeable future cumulative development projects for this project include the mixed-use development projects listed. There is not reported chronic HI risk or PM2.5 concentration for 616 South B Street since it does not have operational sources and construction commences in 2025.
4. Risks reported for the cumulative analysis are the maximum mitiated project impacts, as reported in Table 4.

Abbreviations:

HI - hazard index

$PM_{2.5}$ - particulate matter less than 2.5 microns

$\mu g/m^3$ - microgram per cubic meter

UTMx UTMy - Universal Transverse Mercator coordinates

References:

Bay Area Air Quality Management District (BAAQMD). 2020. Permitted Sources Risk and Hazards Map. June. Available at: https://baaqmd.maps.arcgis.com/apps/webappviewer/index.html?id=2387ae674013413f987b1071715daa65

Bay Area Air Quality Management District (BAAQMD). 2022. CEQA Roadway Screening Tool - Cancer Risk. Available at: https://data.bayareametro.gov/Environment/CEQA-Roadway-Screening-Tool-Cancer-Risk/kz4a-ueki

Bay Area Air Quality Management District (BAAQMD). 2022. CEQA Roadway Screening Tool - Chronic Hazard. Available at: https://data.bayareametro.gov/Environment/CEQA-Roadway-Screening-Tool-Chronic-Hazard/sfnx-xg6j

Bay Area Air Quality Management District (BAAQMD). 2022. CEQA Roadway Screening Tool - PM2.5. Available at: https://data.bayareametro.gov/Environment/CEQA-Roadway-Screening-Tool-PM2-5/r9gy-qwxe

Bay Area Air Quality Management District (BAAQMD). 2022. CEQA Rail Screening Tool - Cancer Risk. Available at: https://data.bayareametro.gov/Environment/CEQA-Rail-Screening-Tool-Cancer-Risk/6eut-z6mm

Bay Area Air Quality Management District (BAAQMD). 2022. CEQA Rail Screening Tool - Chronic Hazard. Available at: https://data.bayareametro.gov/Environment/CEQA-Rail-Screening-Tool-Chronic-Hazard/p57h-bktk

Bay Area Air Quality Management District (BAAQMD). 2022. CEQA Rail Screening Tool - PM2.5. Available at: https://data.bayareametro.gov/Environment/CEQA-Rail-Screening-Tool-Chronic-Hazard/p57h-bktk

Table 6
Construction Schedule
445 South B Street - Bespoke
San Mateo, CA

Phase	CalEEMod Subphase	Start Date	End Date	Number of Work Days	Days per Week
Demolition	Demolition	2/1/2026	3/27/2026	40	5
Site Preparation	Site Preparation	3/30/2026	4/13/2026	10	5
Grading/Excavation	Grading/Excavation	4/14/2026	6/9/2026	40	5
Trenching/Foundation	Building Construction	6/10/2026	8/12/2026	45	5
Podium	Building Construction	8/13/2026	10/8/2026	40	5
Building Construction	Building Construction	10/9/2026	11/5/2027	280	5
Interior/Architectural Coating	Interior/Architectural Coating	12/4/2026	11/5/2027	240	5
Paving	Paving	7/9/2027	10/1/2027	60	5

Notes:

1. The construction schedule was provided by the Project Applicant.

Table 7
Construction Equipment
445 South B Street - Bespoke
San Mateo, CA

Phase	Equipment[1]	CalEEMod Equipment[2]	Fuel[3]	Number[1]	Horsepower[1]	Daily Usage[4] (hours/day)	Utilization[5]	Engine Tier[6]
Demolition	Rubber Tired Dozers	Rubber Tired Dozers	Diesel	1	367	8	100%	No Specific Tier
	Excavators	Excavators	Diesel	2	36	8	100%	No Specific Tier
Site Preparation	Rubber Tired Dozers	Rubber Tired Dozers	Diesel	1	367	8	100%	No Specific Tier
	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	84	8	100%	No Specific Tier
Grading/Excavation	Excavators	Excavators	Diesel	1	36	8	63%	No Specific Tier
	Rubber Tired Dozers	Rubber Tired Dozers	Diesel	2	367	8	63%	No Specific Tier
	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	84	8	63%	No Specific Tier
	Bore/Drill Rigs	Bore/Drill Rigs	Diesel	1	221	8	100%	No Specific Tier
Trenching/Foundation	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	3	84	8	67%	No Specific Tier
Podium	Cranes	Cranes	Diesel	1	367	8	75%	No Specific Tier
Building Construction	Cranes	Cranes	Diesel	1	367	4	25%	No Specific Tier
	Forklifts	Forklifts	Diesel	2	82	4	27%	No Specific Tier
	Welders	Welders	Diesel	3	46	6	26%	No Specific Tier
Paving	Pavers	Pavers	Diesel	1	81	8	8%	No Specific Tier
	Paving Equipment	Paving Equipment	Diesel	1	89	8	8%	No Specific Tier
	Rollers	Rollers	Diesel	1	36	8	8%	No Specific Tier
	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	84	6	50%	No Specific Tier

Notes:

1. Equipment list was provided by the Project Applicant. The Applicant has confirmed that there will be no equipment associated with the architectural coating phase.
2. CalEEMod® equipment types are assigned using CalEEMod® User's Guide Appendix G.
3. All equipment is conservatively assumed to be diesel-fueled.
4. Construction activities are assumed to occur during 7AM to 7PM, consistent with the City of San Mateo guidelines.
5. Utilization was provided by the Project Applicant; otherwise, it was assumed to be at full capacity.
6. Equipment tier is based on a fleetwide average from CalEEMod® 2022.1.

Abbreviations:

CalEEMod® - California Emissions Estimator Model®

References:

California Air Pollution Control Officers Association (CAPCOA). California Emissions Estimator Model (CalEEMod®), Version 2022.1. Available online at http://www.caleemod.com/

Table 8
Construction Trips
445 South B Street - Bespoke
San Mateo, CA

Phase	Year	Construction Days	Worker Trip Rates[1] (one-way trips/day)	Vendor Trip Rates[1] (one-way trips/day)	Hauling Trip Number[2] (one-way trips/phase)	Trip Lengths[1] (miles/one way trip)			Vehicle Miles Traveled (VMT) (miles)		
						Worker	Vendor	Hauling	Worker	Vendor	Hauling
Demolition	2026	40	28	--	660	11.7	8.4	20	13,104	--	13,200
Site Preparation	2026	10	18	--	80	11.7	8.4	20	2,106	--	1,600
Grading/Excavation	2026	40	15	--	670	11.7	8.4	20	7,020	--	13,400
Trenching/Foundation	2026	45	--	--	--	11.7	8.4	20	--	--	--
Podium	2026	40	--	--	--	11.7	8.4	20	--	--	--
Building Construction	2026	60	66	32	--	11.7	8.4	20	46,332	16,128	--
	2027	220	66	32	--	11.7	8.4	20	169,884	59,136	--
Interior/Architectural Coating	2026	20	--	--	--	11.7	8.4	20	--	--	--
	2027	220	--	--	--	11.7	8.4	20	--	--	--
Paving	2027	60	20	--	--	11.7	8.4	20	14,040	--	--

EMFAC Data[8]

Trip Type	EMFAC Settings	Fleet Mix	Fuel Type
Worker	San Mateo County Calendar Years 2026-2027 Annual Season Aggregated Model Year EMFAC2007 Vehicle Categories	25% LDA, 50% LDT1, 25% LDT2	Gasoline
Vendor		50% MHDT, 50% HHDT	Diesel
Hauling		100% HHDT	Diesel

Notes:

1. Worker and vendor daily trip rates were provided by the Project Applicant. Trip lengths are based on CalEEMod® Appendix G defaults for San Mateo County. The Applicant has confirmed that trips for the Trenching/Foundation, Podium, and Architectural Coa subphases are accounted for in other overlapping construction subphases.
2. Hauling trip rates are provided by the Project Applicant.

Abbreviations:

CalEEMod® - California Emissions Estimator Model®
EMFAC2021 - California Air Resources Board EMission FACtor model
LDA - light-duty automobiles
LDT - light-duty trucks
HHDT - heavy-heavy duty trucks
MHDT - medium-heavy duty trucks
VMT - vehicle miles traveled

References:

California Air Pollution Control Officers Association (CAPCOA). California Emissions Estimator Model (CalEEMod®), Version 2022.1. Available online at http://www.caleemod.com/
California Air Resources Board (ARB) 2021. EMFAC2021. Available at: https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/msei-modeling-tools

Table 9
Estimated Emissions from Construction Paving Off-Gassing
445 South B Street - Bespoke
San Mateo, CA

Phase	Year	Land Use	Asphalt-Paved Area (sqft)[1]	Asphalt-Paved Area (acre)[1]	Asphalt Paving Off-Gassing ROG Emission Factor (lb/acre)[2]	Asphalt Paving Off-Gassing ROG Emissions (lb)
Paving	2027	Office Parking Garage	25,500	0.59	2.6	1.5
		Residential Parking Garage	22,000	0.51	2.6	1.3

Notes:

1. Based on CalEEMod defaults, assumes 100% asphalt paving for the entire parking lot.
2. Emission factor from CalEEMod User's Guide, Appendix C.

Abbreviations:

lb - pound
ROG - reactive organic gas
sqft - square foot

References:

California Air Pollution Control Officers Association (CAPCOA). California Emissions Estimator Model (CalEEMod®), Version 2022.1. Available online at http://www.caleemod.com/

Table 10
Estimated Emissions from Construction Architectural Coating Off-Gassing
445 South B Street - Bespoke
San Mateo, CA

Inputs[1,2]

Parameter		Input	Units
Residential Surface Area to Floor Area Ratio		2.7	--
Non-Residential Surface Area to Floor Area Ratio		2.0	
Painted Area in Parking Structures		6%	--
Application Rate		100%	--
Reapplication Rate		10%	--
Fraction of Surface Area (Non-Parking)	Interior Surfaces	75%	--
	Exterior Shell	25%	--
Fraction of Surface Area (Parking)	Interior Surfaces	90%	--
	Exterior Shell	10%	--
Total surface for painting by acreage (in square feet) for parking lot		5%	--
Indoor Paint VOC Content		100	g/L
Exterior Paint VOC Content		150	g/L
Parking VOC Content		100	g/L

Emissions

Phase		Land Use Type	Year	Square Footage[2] (square feet)	Building Surface Area Painted[2] (square feet)	Interior Area Painted[3] (square feet)	Exterior Area Painted[3] (square feet)	Parking Area for Stripes and Symbols (square feet)	Architectural Coating VOC emissions (lb)
Single Phase	Architectural Coating	General Office Building	2026	153,561	307,122	230,342	76,781	--	177
			2027						1,425
		Enclosed Parking Structure (Office)	2026	25,500	1,275	1,148	128	1,530	1.5
			2027						12
		Strip Mall	2026	13,989	27,978	20,984	6,995	--	16
			2027						130
		Enclosed Parking Structure (Residential)	2026	22,000	1,100	990	110	1,320	1.0
			2027						11
		Apartment Mid Rise	2026	77,341	208,821	156,616	52,205	--	90
			2027						999
Total VOC Emissions by Year								**2026**	**286**
								2027	**2,576**

Notes:

1. Inputs and assumptions are consistent with CalEEMod® 2022.1 for BAAQMD. Indoor and outdoor paint VOC content parameters were obtained from CalEEMod Appendix G Table G-17 Architectural Coating Emissions Factors by Air District.
2. Building type square footage is based on information provided by the Project sponsor. For residential land use types, building surface area are assumed to be 2.7 times the square footage; for non-residential land use types, building surface area are assumed to be 2.0 times the square footage; For parking land use types, building surface area is assumed to be 0.05 times the lot acreage (converted to square feet), consistent with CalEEMod® Appendix C.
3. For residential and commercial land use types: calculated based on CalEEMod® assumption that 1 gallon of paint covers 180 square feet and that building area is assumed to be 75% indoors and 25% outdoors. For parking land use types: calculated based on CalEEMod® assumption that 1 gallon of paint covers 180 square feet and that building area is assumed to be 90% indoors and 10% outdoors.

Abbreviations:

CalEEMod® - California Emissions Estimator Model
EF - Emission Factor
g - grams
L - liter
lb - pound
VOC - Volatile Organic Compound

References:

The California Emissions Estimator Model (CalEEMod). Available at: http://www.caleemod.com/

Table 11
Silt Loading Emission Factors
445 South B Street - Bespoke
San Mateo, CA

Entrained Roadway Dust Constants for San Mateo County		
Roadway Category	**Silt Loading[1] (g/m^2)**	**Travel Fraction[1]**
Freeway	0.015	63%
Major	0.032	27%
Collector	0.032	5%
Local	0.32	5%
Weighted Silt Loading Factor	0.036	100%

Notes:

1. Travel fraction by roadway category and silt loading are from the ARB's Entrained Road Travel Emission Inventory Source Methodology, Tables 2 and 4, respectively.

Abbreviations:

ARB - [California] Air Resources Board

g - gram

m^2 - meter squared

References:

California Air Resources Board. 2021. Miscellaneous Process Methodology 7.9, Entrained Road Travel, Paved Road Dust. March. Available online at: https://ww3.arb.ca.gov/ei/areasrc/fullpdf/2021_paved_roads_7_9.pdf

Table 12
Emission Factors for Entrained Roadway Dust
445 South B Street - Bespoke
San Mateo, CA

Road Dust Equation[1]

E [lb/VMT] = k*(sL)^0.91 * (W)^1.02 * (1-P/4N)

Parameters	Value
E = annual average emission factor in the same units as k	[calculated]
k = particle size multiplier for particle size range	
$PM_{2.5}$ (lb/VMT)	3.3E-04
sL = roadway silt loading [grams per square meter - g/m^2]	0.036
W = average weight of vehicles traveling the road [tons]	2.4
P = number of "wet" days in county with at least 0.1 in of precipitation during the annual averaging period	17
N = number of days in the averaging period	365

Entrained Road Dust Emission Factors	
$PM_{2.5}$ Emission Factor [lb/VMT]	3.8E-05

Notes:

1. Road dust equation and parameters are from the California Air Resources Board's (ARB) 2021 Miscellaneous Process Methodology 7.9 for Entrained Road Travel, Paved Road Dust. The silt loading emission factor assumes San Mateo county default roadway fractions and silt loading levels from ARB 2021. The number of "wet" days for San Mateo county is from CalEEMod® Appendix G Table 2. Other parameters (average weight of vehicles, size multipliers) are from ARB 2021. $PM_{2.5}$ is assumed to be 15% of PM_{10} based on paved road dust sampling in California (ARB Speciation Profile #471), which is a more representative fraction than provided in the older AP-42 fugitive dust methodology as discussed in ARB 2021 (page 10).

Abbreviations:

ARB - [California] Air Resources Board
CalEEMod® - California Emissions Estimator Model
EMFAC - EMission FACtor Model
g - gram
lb - pound
$PM_{2.5}$ - particulate matter less than 2.5 microns
PM_{10} - particulate matter less than 10 microns
VMT - vehicle miles traveled

References:

California Air Resources Board. 2021. Miscellaneous Process Methodology 7.9, Entrained Road Travel, Paved Road Dust. March. Available online at: https://ww3.arb.ca.gov/ei/areasrc/fullpdf/2021_paved_roads_7_9.pdf

California Air Pollution Control Officers Association (CAPCOA). California Emissions Estimator Model (CalEEMod®), Version 2022.1. Available online at http://www.caleemod.com/

Table 13
Emissions Calculations for Entrained Road Dust
445 South B Street - Bespoke
San Mateo, CA

Entrained Road Dust Emission Factors

$PM_{2.5}$ Emission Factor [lb/VMT]	3.8E-05

Phase	Year	Construction Days	Total VMT (miles)	Total Emissions (lb)
				Fugitive $PM_{2.5}$
Demolition	2026	40	26,304	1.0
Site Preparation	2026	10	3,706	0.14
Grading/Excavation	2026	40	20,420	0.78
Trenching/Foundation	2026	45	--	--
Podium	2026	40	--	--
Building Construction	2026	60	62,460	2.4
	2027	220	229,020	8.8
Interior/Architectural Coating	2026	20	--	--
	2027	220	--	--
Paving	2027	60	14,040	0.54

Abbreviations:

lb - pound(s)
VMT - vehicle miles travelled
$PM_{2.5}$ - particulate matter less than 2.5 microns

Table 14
Fugitive Dust Emissions from Building Demolition Waste
445 South B Street - Bespoke
San Mateo, CA

Construction Phase	Year	Number of Days	Building Waste[1]	Emission Factor - Mechanical or Explosive Dismemberment[2]	Emission Factor - Debris Loading[3]	Unmitigated Emissions[4]	Mitigated Emissions[4,5]
				$PM_{2.5}$	$PM_{2.5}$	$PM_{2.5}$	$PM_{2.5}$
		days	ton	lb/ton	lb/ton	ton/yr	ton/yr
Demolition	2026	40	1,472	4.5E-04	0.0031	2.6E-03	1.7E-03

Notes:

1. Demolition building square footage was provided by the Project Applicant. Building waste in ton was converted from square footage using the CalEEMod default conversion 0.046 ton/ft^2.
2. Emission factor calculated following guidance in the CalEEMod User's Guide, Appendix C Mechanical or Explosive Dismemberment, which is based of AP 42 Section 13.2.4.3 for batch drop operations. The equation is:
   $EF = k*(0.0032)*(U/5)^{1.3}/(M/2)^{1.4}$ (lb/ton of debris)
   0.053 = k, $PM_{2.5}$ particle size multiplier (dimensionless)
   10.51 = U, mean wind speed (mph)
   2 = M, material moisture content (%)
3. Emission factor calculated following guidance in the CalEEMod User's Guide, Appendix C Debris Loading, which is based of AP 42 Section 13.2. The equation is:
   $EF = k*EF_{L\text{-}TSP}$
   0.053 = k, $PM_{2.5}$ particle size multiplier (dimensionless)
   0.058 = $EF_{L\text{-}TSP}$, lb/ton
4. The mass emissions shown below are converted from ton per year to gram per second for the health risk assessment. The conversion is based on 365 days per year and 12 hours per day, consistent with the modeled hours from 7 AM - 7 PM.
5. Fugitive PM emissions will be mitigated by watering the construction site two times per day, which is estimated to reduce emissions by 36% per CalEEMod® recommendation.

Abbreviations:

CalEEMod - California Emissions Estimator Model
cy - cubic yard(s)
EF - emission factor
lb - pound(s)
$PM_{2.5}$ - particulate matter less than 2.5 microns
VMT - vehicle miles traveled
yr - year(s)

References:

California Air Pollution Control Officers Association (CAPCOA). California Emissions Estimator Model (CalEEMod®), Version 2022.1. Available online at http://www.caleemod.com/

Table 15
Fugitive Dust Emissions from Offroad Grading Activity
445 South B Street - Bespoke
San Mateo, CA

Construction Phase	Year	Equipment	Maximum Area Disturbed[1]	Grading VMT[2]	$PM_{2.5}$ Emission Factor[3]	Unmitigated Emissions[4]	Mitigated Emissions[4,5]
						$PM_{2.5}$	$PM_{2.5}$
			acre/day	mile/day	lb/VMT	ton/yr	ton/yr
Site Preparation	2026	Rubber Tired Dozers	0.50	0.34	0.17	2.9E-04	1.1E-04
Grading/Excavation	2026	Rubber Tired Dozers	0.50	0.34	0.17	1.1E-03	4.5E-04

Notes:

1. Maximum graded area calculated following guidance in the CalEEMod® User's Guide, Appendix C.
2. Based on CalEEMod® default daily acres graded by equipment type, below.

Equipment	Acres Graded per 8 Hour Day
Crawler Tractors	0.5
Graders	0.5
Rubber Tired Dozers	0.5
Scrapers	1

3. VMT per day calculated following guidance in the CalEEMod® User's Guide, Appendix C, which is based on AP-42, Section 11.9 for grading equipment. The equation is:
   $VMT = A_S/W_b \times (43{,}560\ sqft/acre)/(5{,}280\ ft/mile)$, where:
   $A_S = A_S$, acres graded per day (varies by sub-activity); in this case using maximum estimated disturbed acres/day
   $12 = W_b$, blade width of grading equipment (CalEEMod® default) in ft
3. Emission factors calculated following guidance in the CalEEMod® User's Guide, Appendix C, which is based on AP-42, Section 11.9 for grading equipment. The equations are:
   $EF_{PM2.5} = 0.04 \times (S)^{2.5} \times F_{PM2.5}$ where:
   $7.1 = S$, mean vehicle speed (mph) (AP-42 default)
   $0.031 = F_{PM2.5}$, $PM_{2.5}$ scaling factor (AP-42 default)
4. The mass emissions shown below are converted from ton per year to gram per second for the health risk assessment. The conversion is based on 365 days per year and 12 hours per day, consistent with the modeled hours from 7 AM - 7 PM.
5. Fugitive PM emissions will be mitigated by watering the construction site two times per day, which is estimated to reduce emissions by 61% per CalEEMod® recommendation.

Abbreviations:

CalEEMod® - California Emissions Estimator Model
EF - emission factor
ft - feet
lb - pound(s)
mph - miles per hour
$PM_{2.5}$ - particulate matter less than 2.5 microns
VMT - vehicle miles traveled
yr - year

References:

California Air Pollution Control Officers Association (CAPCOA). California Emissions Estimator Model (CalEEMod®), Version 2022.1. Available online at http://www.caleemod.com/

Table 16
Fugitive Dust Emissions from Truck Loading Activity
445 South B Street - Bespoke
San Mateo, CA

Construction Phase	Year	Number of Days	Haul Trips	Total Material Loaded[1]	Material Loaded	Emission Factor[2]	Unmitigated Emissions[3]	Mitigated Emissions[3,4]
						$PM_{2.5}$	$PM_{2.5}$	$PM_{2.5}$
		days	# trips	ton	ton	lb/ton	ton/yr	ton/yr
Demolition	2026	40	660	1,472	1,472	3.6E-05	2.7E-05	1.0E-05
Site Preparation	2026	10	80	42,350	4,517		8.2E-05	3.2E-05
Grading	2026	40	670		37,832		6.9E-04	2.7E-04

Notes:

1. Total materials loaded for demolition phases were the building waste converted from square feet to tons assuming an average soil density of 1.5 grams per cubic centimeter. Total material loaded for other phases was calculated using the total material exported provided by Project Applicant and subtracted the total material loaded for demolition.
2. Emission factor calculated following guidance in the CalEEMod User's Guide, Appendix C, which is based on AP-42, Section 13.2.4 for aggregate handling. The equation is:
   EF *= k x (0.0032) x $(U/5)^{1.3}$ / $(M/2)^{1.4}$, where the following default values are used:

   0.053 = k, $PM_{2.5}$ particle size multiplier
   4.7 = mean wind speed (U), meters per second
   10.5 = mean wind speed (U), miles per hour
   12 = material moisture content (M), %
3. The mass emissions shown below are converted from ton per year to gram per second for the health risk assessment. The conversion is based on 365 days per year and 12 hours per day, consistent with the modeled hours from 7 AM - 7 PM.
4. Fugitive PM emissions will be mitigated by watering the construction site two times per day, which is estimated to reduce emissions by 61% per CalEEMod® recommendation.

Abbreviations:

CalEEMod - California Emissions Estimator Model
EF - emission factor
lbs - pound(s)
$PM_{2.5}$ - particulate matter less than 2.5 microns

References:

California Air Pollution Control Officers Association (CAPCOA). California Emissions Estimator Model (CalEEMod®), Version 2022.1. Available online at http://www.caleemod.com/

Table 17
Fugitive Dust Emissions from Off-Road Bulldozing Activity
445 South B Street - Bespoke
San Mateo, CA

Construction Phase[1]	Construction Subphase[1]	Equipment	Year	Quantity	Utilization %	Avg. Usage Hours per Day	Emission Factor[2]	Unmitigated Emissions[3]	Mitigated Emission[3,4]
							$PM_{2.5}$	$PM_{2.5}$	$PM_{2.5}$
					%	hr/day	lb/hr	ton/yr	ton/yr
Site Preparation	Site Preparation	Rubber Tired Dozers	2026	1	100%	8	0.41	0.017	0.006
Grading/Excavation	Grading/Excavation	Rubber Tired Dozers	2026	2	63%	8	0.41	0.083	0.033

Notes:

1. Fugitive dust emission factors from site preparation, and grading. The fugitive dust loading/unloading emission factors for paving are assumed to be negligible due to high moisture content of the material.

2. Emission factor for bulldozing calculated following guidance in the CalEEMod® User's Guide, Appendix C, which is based on AP-42, Section 11.9. The equation is:
$EF_{PM2.5} = C_{TSP} * s^{(1.2)} / M^{(1.3)} * F_{PM2.5}$

5.7	= C_{TSP}
7.90	= M % (Material moisture content)
6.90	= s %, material silt content
0.105	= $F_{PM2.5}$,scaling factor

3. The mass emissions shown below are converted from ton per year to gram per second for the health risk assessment. The conversion is based on 365 days per year and 12 hours per day, consistent with the modeled hours from 7 AM - 7 PM.

4. Fugitive PM emissions will be mitigated by watering the construction site two times per day, which is estimated to reduce emissions by 61% per CalEEMod® recommendation.

Abbreviations:

CalEEMod® - California Emissions Estimator Model
EF - emission factor
lb - pound(s)
$PM_{2.5}$ - particulate matter less than 2.5 microns
yr - year

References:

California Air Pollution Control Officers Association (CAPCOA). California Emissions Estimator Model (CalEEMod®), Version 2022.1. Available online at http://www.caleemod.com/

Table 18
Modeled Emission Rates from Proposed Project Construction Sources
445 South B Street - Bespoke
San Mateo, CA

Phase	Year	Construction Emissions Rates[1,2]						
		Offroad				Onroad		
		DPM	$PM_{2.5}$			DPM	$PM_{2.5}$	
			Exhaust	Fugitive Unmitigated	Fugitive Mitigated[3]		Exhaust	Fugitive
		g/s						
Demolition	2026	4.8E-04	4.4E-04	1.5E-04	9.6E-05	6.0E-07	6.2E-07	4.2E-06
Site Preparation	2026	1.2E-04	1.1E-04	0.0010	3.8E-04	7.2E-08	7.7E-08	6.0E-07
Grading/Excavation	2026	6.5E-04	6.0E-04	0.0049	0.0019	6.1E-07	6.0E-07	3.3E-06
Trenching/Foundation	2026	9.0E-05	8.3E-05	--	--	--	--	--
Podium	2026	1.2E-04	1.1E-04	--	--	--	--	--
Building Construction	2026	8.1E-05	7.5E-05	--	--	1.8E-06	2.0E-06	1.4E-05
	2027	2.6E-04	2.4E-04	--	--	6.2E-06	7.0E-06	5.2E-05
Interior/Architectural Coating	2026	--	--	--	--	--	--	--
	2027	--	--	--	--	--	--	--
Paving	2027	4.1E-05	3.8E-05	--	--	--	4.8E-08	2.3E-06

Notes:

1. Construction TAC emissions were estimated from on-site off-road and on-road emissions, where all PM_{10} tailpipe emissions from diesel fueled vehicles and equipment are assumed to be DPM (although a portion of this is likely not from diesel sources). On-road emissions from worker, hauling and vendor vehicles were estimated using a modeled trip length of 1.6 miles.
2. The modeled emission rates in g/s are calculated assuming a construction schedule between 7 am - 7 pm (12 hours).
3. The offroad mitigated futigive dust emissions assume the BAAQMD Best Management Practices for controlling fugitive dust is applied.

Abbreviations:

DPM - diesel particulate matter
$PM_{2.5}$ - particulate matter less than 2.5 microns
g/s - gram(s)/second

Table 19
Emissions for Generator
445 South B Street - Bespoke
San Mateo, CA

Emergency Engine Emission Factors for Diesel Engines

Fuel	Engine Tier	Engine Size Range (hp)		Engine Emission Factors[1] (g/bhp-hr)				
		Minimum	Maximum	ROG	NO_x	PM_{10}	$PM_{2.5}$	CO_2e
Diesel	Tier 2	750	9,999	0.26	4.6	0.15	0.15	523

Emergency Engine Information[2]

Scenario	Engine Type	Engine Control	Number of Engines	Load Factor	Size	Size	Fuel Type	Annual Operation[3]
					kW	hp		hr/yr
Project Operation	Generator	Tier 2	1	0.73	563	755	Diesel	50

Emergency Engine Emissions

Scenario	Engine Type	Size (hp)	Quantity	Annual Emissions (ton/yr)				(MT/yr)
				ROG	NO_x	PM_{10}	$PM_{2.5}$	CO_2e
Project Operation	Generator	755	1	0.0078	0.14	0.0046	0.0046	16
			Total Emissions	**0.0078**	**0.14**	**0.0046**	**0.0046**	**16**

Notes:

1. Engine emission factors for PM_{10} and $PM_{2.5}$ (assumed all engines are diesel fueled and that all PM_{10} is diesel particulate matter) based on ARB standards for diesel generator engines. Emission factors for ROG were converted from NMHC values provided in the Tier standards using EPA hydrocarbon conversion factors. When an emission factor was specified as a combined NMHC+NOx factor, the NMHC/NOx ratio of 5%/95% were taken from BAAQMD guidance. The emission factors for CO_2e are based on diesel emergency generator CO_2, CH_4, and N_2O emission factors from CalEEMod® User's Guide Appendix G, Table G-40, along with a GWP of 25 for CH_4 and 298 for N_2O.
2. Number, size, and fuel of emergency engines were provided by the Project Applicant.
3. Per guidance from the City of San Mateo, operational hours include operation for routine maintenance and testing which was conservatively assumed to be 50 hours per year, the maximum allowable by the Airborne Toxics Control Measure (ATCM) for Stationary Compression Ignition Engines (17 CCR 93115).

Abbreviations:

ARB - [California] Air Resources Board
BAAQMD - Bay Area Air Quality Management District
CalEEMod® - CALifornia Emissions Estimator MODel®
CH_4 - methane
CO_2e - carbon dioxide equivalent
EPA - US Environmental Protection Agency
g/bhp-hr - grams per brake horsepower hour
GWP - global warming potential
hp - horsepower
kW - kilowatt
MT - metric ton
N_2O - nitrous oxide
NMHC - non-methanic hydrocarbons
NOx - oxides of nitrogen
PM - particulate matter
PM_{10} - PM less than 10 microns in aerodynamic diameter
$PM_{2.5}$ - PM less than 2.5 microns in aerodynamic diameter
ROG - reactive organic gases
yr - year
hr - hour

References:

BAAQMD. 2004. CARB Emission Factors for CI Diesel Engines - Percent HC in Relation to NMHC + NOx. Available at: https://www.baaqmd.gov/~/media/files/engineering/policy_and_procedures/engines/emissionfactorsfordieselengines.pdf

BAAQMD. 2022. Bay Area Air Quality Management District California Environmental Quality Act Air Quality Guidelines. Available at: https://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa-guidelines-2022/ceqa-guidelines-chapter-5-project-air-quality-impacts_final-pdf.pdf?la=en

California Air Pollution Control Officers Association (CAPCOA). California Emissions Estimator Model (CalEEMod®), Version 2022.1. Available online at http://www.caleemod.com/

California Air Resources Board. Non-road Diesel Engine Certification Tier Chart. Available online at: https://ww2.arb.ca.gov/resources/documents/non-road-diesel-engine-certification-tier-chart

USEPA. 2010. Conversion Factors for Hydrocarbon Emission Components, NR-002d. EPA-420-R-10-015. July. Available online at: https://nepis.epa.gov/Exe/ZyPDF.cgi/P10081RP.PDF?Dockey=P10081RP.PDF

Table 20
Construction Modeling Parameters
445 South B Street - Bespoke
San Mateo, CA

Construction Area Sources

Source[1]	Source Type	Number of Sources	Area Source Dimension (m^2)	Release Height[2] (m)	Initial Vertical Dimension[3] (m)
Construction Equipment - Exhaust	Area[2]	1	2,374	5	1.16
Construction Equipment - Fugitive Dust	Area[2]	1	2,374	0	1

Construction Volume Sources

Source[1]	Source Type	Leg	Top of Plume[4] (m)	Width of Plume[4] (m)	Release Height[4] (m)	Initial Vertical Dimension[4] (m)	Initial Lateral Dimension[4] (m)
On-Road Haul Trucks	Volume	E. 3rd Ave	6.8	21	3.4	3.16	9.8
		S. Claremont St	6.8	19	3.4	3.16	8.8
		E. 4th Ave	6.8	20	3.4	3.16	9.3
		9th Ave	6.8	19	3.4	3.16	8.8
		South B St	6.8	19	3.4	3.16	8.8

Notes:

1. Modeled emission rates for emission sources are 1 gram/second to generate unit dispersion factors. The complete AERMOD input file can be found in Appendix C.
2. Exhaust area source release height is assumed to be 5 meters and fugitive area source release height is assumed to be 0 meters, consistent with SCAQMD LST Guidance.
3. Consistent with USEPA's AERMOD guidance, the initial vertical dimension of the modeled construction equipment exhaust area sources is the release height divided by 4.3. Fugitive emissions from construction equipment were modeled with an initial vertical dimension of 1, consistent with SCAQMD LST Guidance.
4. Consistent with USEPA Haul Road Guidance, the top of the plume was calculated as 1.7*the vehicle height, which was assumed to be 3 meters, and the width of the plume was calculated as the width of the roadway + 6 meters. USEPA Haul Guidance calculates the release height for haul trucks as 0.5 times the top of the plume. According to USEPA AERMOD guidance, the initial vertical dimension can be calculated as the top of the plume divided by 2.15 and the initial lateral dimension can be calculated as the width of the plume divided by 2.15. 2.15 is derived from the standard deviation of the estimated Gaussian normally distributed plume concentration which is 4.3. Since these volume sources are adjacent to one another, the plume expansion happens in only one direction (i.e., 4.3/2 = 2.15).

Abbreviations:

m - meter
m^2 - square meter
AERMOD - Atmospheric Dispersion Modeling
SCAQMD - South Coast Air Quality Management District
LST - Localized Significance Thresholds
USEPA - United States Environmental Protection Agency

References:

SCAQMD. 2008. Final Localized Significance Threshold Methodology. July. Available at: http://www.aqmd.gov/docs/default-source/ceqa/handbook/localized-significance-thresholds/final-lst-methodology-document.pdf?sfvrsn=2

BAAQMD. 2023. Bay Area Air Quality Management District California Environmental Quality Act Air Quality Guidelines. Available at: https://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa-guidelines-2022/ceqa-guidelines-chapter-5-project-air-quality-impacts_final-pdf.pdf?la=en

USEPA. 2022. User's Guide for the AMS/EPA Regulatory Model (AERMOD). U.S. EPA Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina. Available at: https://gaftp.epa.gov/Air/aqmg/SCRAM/models/preferred/aermod/aermod_userguide.pdf

Table 21
Generator Modeling Parameters
445 South B Street - Bespoke
San Mateo, CA

Source	Source Type	Number of Sources	Release Height[2]	Exit Temperature[2]	Exit Diameter[2]	Exit Velocity[2]
			(m)	(K)	(m)	(m/s)
Generator[1]	Point	1	3.66	735.9	0.203	45.3

Notes:

1. One generator rated 755 horsepower would be located at the proposed building.
2. Generator parameters including exit diameter, exit temperature, and exit velocity were provided by the applicant for the specific engine. Default parameters from the BAAQMD's 2022 CEQA guidelines were used for release height.
3. Annual emissions of DPM and PM2.5 were based on 50 hours of non-emergency operation, as shown in Table 19.

Abbreviations:

DPM - diesel particulate matter
g/s - grams per second
K - Kelvin
m - meter
m/s - meters per second
$PM_{2.5}$ - particulate matter less than 2.5 microns in diameter

References:

Bay Area Air Quality Management District (BAAQMD). 2023. Air Quality Guidelines Appendix E: Recommended Methods for Screening and Modeling Local Risks and Hazards. Available online at: https://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa-guidelines-2022/appendix-e-recommended-methods-for-screening-and-modeling-local-risks-and-hazards_final-pdf.pdf?la=en

Table 22
Construction and Operational Exposure Parameters
445 South B Street - Bespoke
San Mateo, CA

Construction + Operation Scenario

Receptor Type	Project Phase	Year	Receptor Age Group	Exposure Parameters							
				Daily Breathing Rate (DBR)[1]	Exposure Duration (ED)[2]	Fraction of Time at Home (FAH)[3]	Exposure Frequency (EF)[4]	Age Sensitivity Factor[5]	Averaging Time (AT)[6]	Modeling Adjustment Factor[7]	Adjusted Intake Factor, Inhalation (IFinh)
				[L/kg-day]	[years]	[unitless]	[days/year]		[days]	[unitless]	[m^3/kg-day]
Offsite Resident	Construction	2026	3rd Trimester	361	0.27	1.0	350	10	25,500	1	0.014
			Age 0-<2	1,090	0.73	1.0		10		1	0.109
		2027	Age 0-<2	1,090	0.85	1.0		10		1	0.13
	Operation	2027	Age 0-<2	1,090	0.15	1.0		10		1	0.023
		2028+	Age 2-<16	572	14	1.0		3		1	0.33
			Age >16	261	13.73	0.73		1		1	0.04
School	Construction	2026	Age 2-<16	520	1	--	250	3		4.2	0.064
		2027	Age 2-<16	520	1	--		3		4.2	0.064
	Operation	2027	Age 2-<16	520	0.15	--		3		1	0.002
		2028+	Age 2-<16	520	4	--		3		1	0.061
Daycare	Construction	2026	Age 0-<2	1,090	1	--	350	10		4.2	0.628
		2027	Age 0-<2	1,090	1	--		10		4.2	0.63
	Operation	2027	Age 2-<16	520	0.15	--	250	3		1	0.002
		2028+	Age 2-<16	520	4	--		3		1	0.061
Pre K-8th	Construction	2026	Age 2-<16	520	1	--	250	3		4.2	0.064
		2027	Age 2-<16	520	1	--		3		4.2	0.064
	Operation	2027	Age 2-<16	520	0.15	--		3		1	0.002
		2028+	Age 2-<16	520	10	--		3		1	0.15
Offsite Worker	Construction	2028+	Age 16-70	230	1	--	250	1		4.2	9.5E-03
		2028+	Age 16-70	230	1	--		1		4.2	9.5E-03
	Operation	2028+	Age 16-70	230	0.15	--		1		1	3.4E-04
		2028+	Age 16-70	230	23	--		1		1	0.052

Operation Only Scenario

Receptor Type	Project Phase	Year	Receptor Age Group	Exposure Parameters							
				Daily Breathing Rate (DBR)[1]	Exposure Duration (ED)[2]	Fraction of Time at Home (FAH)[3]	Exposure Frequency (EF)[4]	Age Sensitivity Factor[5]	Averaging Time (AT)	Modeling Adjustment Factor[6]	Adjusted Intake Factor, Inhalation (IFinh)
				[L/kg-day]	[years]	[unitless]	[days/year]		[days]	[unitless]	[m^3/kg-day]
Resident	Operation	All	3rd Trimester	361	0.25	1.0	350	10	25,500	1	0.012
			Age 0-<2	1,090	2.00	1.0		10		1	0.30
			Age 2-<16	572	14	1.0		3		1	0.33
			Age 16-30	261	14	0.73		1		1	0.037
School	Operation	All	Age 2-<16	520	6	--	250	3		1	0.092
Daycare	Operation	All	Age 0-<2	1,090	2	--	350	10		1	0.30
	Operation	All	Age 2-<16	520	4	--	250	3		1	0.061
Pre K-8th	Operation	All	Age 2-<16	520	12	--	250	3		1	0.18
Worker	Operation	All	Age 16-70	230	25	--	250	1		1	0.056

Notes:

1. Daily breathing rates by receptor type and age bin are consistent with Table 34 of Appendix E of the 2022 BAAQMD CEQA Guidelines.
2. Annual exposure duration represents one full year. The exposure duration for all years is 1, as the health risk assessment is based on annual emissions. For the construction and operation scenario, residential receptors are assumed to begin the third trimester at the begining of construction and continue exposure for 30 years after birth; School (elementary) receptor is assumed to be exposed during age 5-11; Daycare receptor is assumed to be exposed during age 0-6. Pre K-8th receptor is assumed to be exposed during age 2-14. For the operation-only scenario, exposure begins at the start of operations.
3. Fraction of time spent at home is conservatively assumed to be 1 (i.e., 24 hours/day) for age groups from the third trimester to less than 16 years old based on the recommendation from BAAQMD (BAAQMD 2022) and OEHHA (OEHHA 2015). The fraction of time at home for adults age 16-30 reflects default OEHHA guidance (OEHHA 2015) as recommended by BAAQMD (2022).
4. Exposure frequency is consistent with 2022 BAAQMD CEQA Guidelines and was determined as follows:
   Residents: reflects default residential exposure frequency from Cal/EPA
   Daycare/School/Pre K-8th: reflects default residential exposure frequency for 0-2 age bin, consistent with 2022 BAAQMD CEQA Guidelines, and default worker exposure frequency for 2-16 age bin, assuming a child is at the daycare/school when the parents are at work.
   Worker: reflects default worker exposure frequency, consistent with 2022 BAAQMD CEQA Guidelines.
5. Age Sensitive Factors account for an "anticipated special sensitivity to carcinogens" of infants and children as recommended in the OEHHA Technical Support Document and current OEHHA guidance. This is consistent with the 2022 BAAQMD CEQA Guidelines.
6. Modeling adjustment factors are calculated based on the methodology from OEHHA's Guidance Manual for Preparation of Health Risk Assessments (2015). For construction, the MAF for the school, daycare and pre-school receptors are calculated to adjust from 24 hours/day to 8 hours/day and from 7 days/week to 5 days/week ([24 hours/8 hours] * [7 days/5 days] = 4.20); Resident types are expected to be exposed 24 hours/day and 7 days/week; as a result, the MAF is 1. Operational sources are expected 24 hours/day and 7 days/week; as a result, the MAF is 1 for all receptors.

Calculation:

IF_{inh} = DBR * FAH * EF * ED * CF / AT

CF = 0.001 (m^3/L)

$MAF=H_{Resident}/H_{Source}*D_{Resident}/D_{Source}*DF$

$DF=H_{Coin}/H_{Worker}*D_{Coin}/D_{Worker}$

Abbreviations:

AT - averaging time
BAAQMD - Bay Area Air Quality Management District
DBR - daily breathing rate
ED - exposure duration
EF - exposure frequency
FAH - fraction of time at home
$H_{Resident}$ - Hours per day of residential exposure (24 hours)
$D_{Resident}$ - Number of days per week that the resident is exposed (7 days)
DF - Discount Factor
H_{Coin} - Hour per day that the receptor's schedule coincides with when the source is emitting(hours)
D_{Worker} - Number of days that the receptor is at the site per week (days)
IF_{inh} - intake factor
kg - kilogram
L - liter
m^3 - cubic meter
OEHHA - Office of Environmental Health Hazard Assessment
MAF_{cancer} - Modeling Adjustment Factor for cancer risk
H_{Source} - Number of hours per day that the source operates (hours)
D_{Source} - Number of days per year that the source operates (days)
H_{Worker} - Hours that the receptor is at the site per day (hours)
D_{Coin} - Number of days per week that receptor's schedule coincides with when the source isemitting (days)

References:

OEHHA. 2015. Air Toxics Hot Spots Program Risk Assessment Guidelines. Guidance Manual for Preparation of Health Risk Assessments. Available at https://oehha.ca.gov/media/downloads/crnr/2015guidancemanual.pdf

BAAQMD. 2022. Air Quality Guidelines Appendix E: Recommended Methods For Screening and Modeling Local Risks and Hazards. Available at: https://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa-guidelines-2022/appendix-e-recommended-methods-for-screening-and-modeling-local-risks-and-hazards_final-pdf.pdf?la=en

Table 23
Toxicity Values
445 South B Street - Bespoke
San Mateo, CA

Chemical[1]	Cancer Potency Factor $(mg/kg\text{-}day)^{-1}$	Chronic REL ($\mu g/m^3$)
Diesel PM	1.1	5.0

Notes:

1. Chemicals presented in this table reflect air toxic contaminants in the proposed fuel types that are expected from off-road equipment and on-road truck trips.

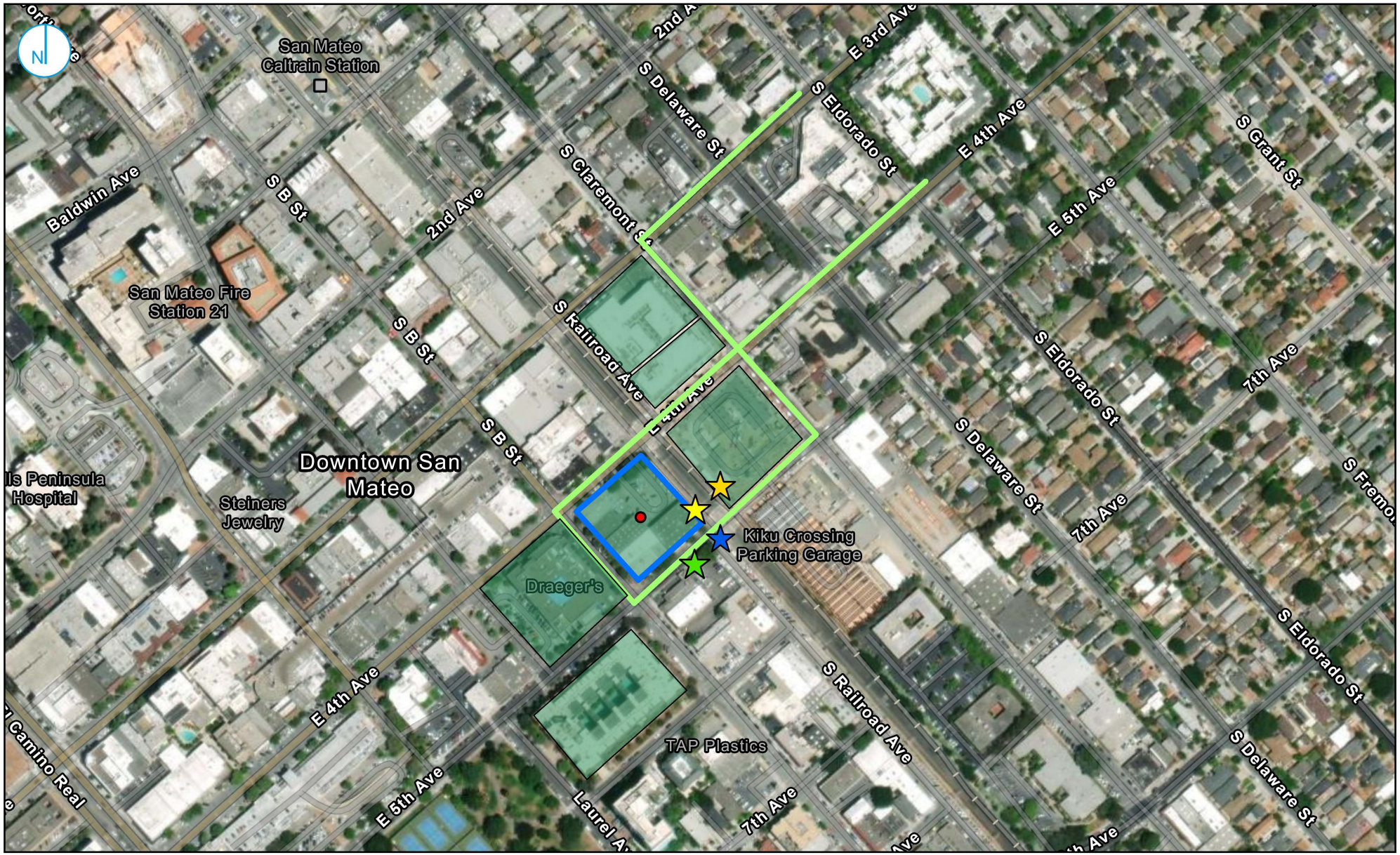
Abbreviations:

$\mu g/m^3$ - micrograms per cubic meter
ARB - California Air Resources Board
Cal/EPA - California Environmental Protection Agency
$(mg/kg\text{-}day)^{-1}$ - per milligram per kilogram-day
OEHHA - Office of Environmental Health Hazard Assessment
REL - reference exposure level

Reference:

California Air Resources Board (ARB)/ California Office of Environmental Health Hazard Assessment (OEHHA). 2023. Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values. Updated on: May 1, 2023. Available at: https://ww2.arb.ca.gov/sites/default/files/classic/toxics/healthval/contable05012023.pdf

FIGURES



- Cancer Risk MEI (Con+Ope)
- Cancer Risk MEI (Ope Only)
- Chronic HI MEI (Con+Ope), PM2.5 Concentration (Con+Ope)
- Chronic HI (Ope Only) PM2.5 Concentration MEI (Ope Only)
- Building Area Downwash
- Project Site
- Haul Route
- Generator

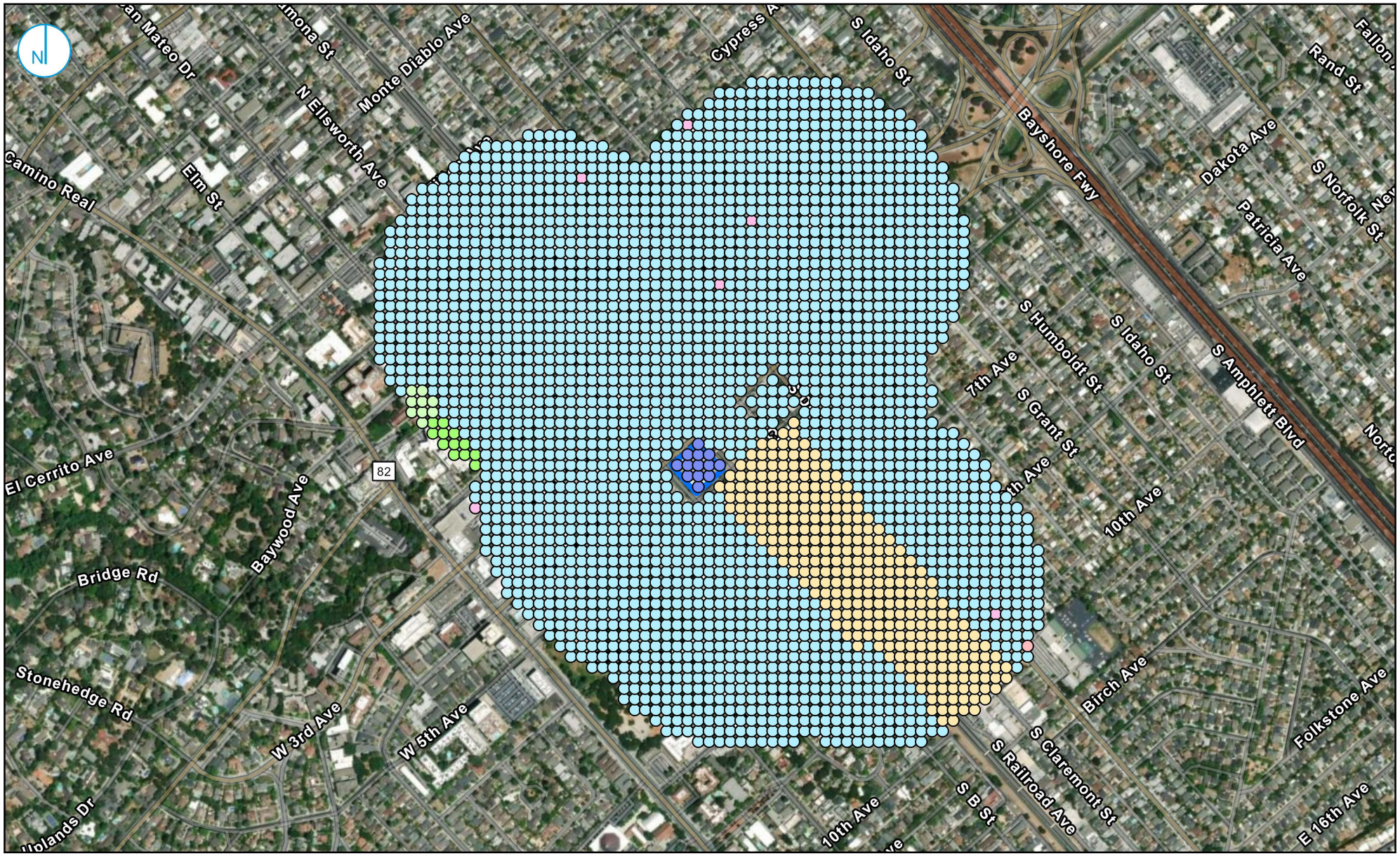
0 800 Feet

MODELED SOURCES AND MAXIMALLY EXPOSED INDIVIDUAL RECEPTOR LOCATIONS

455 South B Street
San Mateo, California

FIGURE 01

RAMBOLL



PROJECT SITE AND MODELED RECEPTORS

FIGURE 02

Receptor Type

- Daycare
- Hospital
- Offsite Resident
- Offsite Worker
- Onsite Resident
- Pre K-8th
- School
- Project Site

0 500 1,000 2,000 Feet

455 South B Street
San Mateo, California

RAMBOLL

APPENDIX A
MIXED LAND USE SCREENING TOOL FOR CRITERIA POLLUTANTS AND PRECURSORS

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Multi-land Use Screening Tool Overview

This screening tool helps to determine whether the daily construction or operational emissions associated with a proposed land use development project with multiple land use types would exceed BAAQMD's average daily thresholds.

Instructions

Use the drop-down menus to select the land use category and land use type for each type of land use included in the project. Enter the proposed size of each land use based on the default units that are autopopulated in column D.

The tool will estimate whether the project may exceed the construction thresholds, operational thresholds, or both, and whether further analysis is needed before making a significance determination. This tool will not work for projects which have construction-related activities overlapping with operational activities, and vice versa.

Construction and Operation Screening Tool				
Land Use Category	**Land Use Type**	**Unit**	**Project Land Use Size**	**Has Overlapping Construction Phases?**
Commercial	General Office Building	KSF	154	☑
Retail	Strip Mall	KSF	14	☑
Residential	Apartments Mid Rise	DU	71.0	☑
Parking	Enclosed Parking Structure	Spaces	119.0	☑
				☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐
Exceeds Construction Threshold?			YES	
Exceeds Operational Threshold?			NO	
BAAQMD's Recommendation			Further Analysis Required	

Developed by

ASCENT ENVIRONMENTAL

Last updated: 5/6/2022

APPENDIX B
TRAFFIC STUDY

Existing Balanced Counts		AM												PM											
Int #	Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
14	E 4th Ave / S B St	25	42	51	31	58	72	7	260	14	12	102	7	30	72	84	38	46	81	17	496	32	19	117	19
15	E 4th Ave / S Railroad Ave	0	0	0	3	10	19	0	341	1	7	102	0	0	0	0	3	2	47	0	613	5	4	108	0
3	E 4th Ave / S Claremont St	6	78	32	44	65	13	14	326	4	6	90	11	8	66	45	82	88	31	9	598	9	4	73	5
17	E 5th Ave / S B St	42	90	28	3	52	29	19	165	38	18	117	9	28	110	45	6	69	22	54	256	65	20	128	22
18	E 5th Ave / S Railroad Ave	0	0	0	1	9	8	0	191	5	14	136	0	0	0	0	1	4	6	0	303	4	18	164	0
5	E 5th Ave / S Claremont St	15	84	18	8	60	7	17	154	21	62	128	15	17	65	40	19	70	12	29	260	15	45	153	25
Existing + Project		AM												PM											
Int #	Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
14	E 4th Ave / S B St	26	42	54	31	58	72	7	305	14	12	107	7	31	72	84	38	46	81	17	502	32	19	121	19
15	E 4th Ave / S Railroad Ave	0	0	0	3	10	19	0	345	46	40	106	0	0	0	0	3	2	47	0	613	14	10	108	0
3	E 4th Ave / S Claremont St	6	80	32	44	69	13	14	330	4	6	93	11	8	72	45	82	92	31	9	598	9	4	73	5
17	E 5th Ave / S B St	42	95	29	3	52	29	19	177	39	20	131	9	28	110	46	6	69	22	54	267	66	26	182	22
18	E 5th Ave / S Railroad Ave	0	0	0	12	9	19	0	204	5	14	141	0	0	0	0	47	4	51	0	315	4	18	179	0
5	E 5th Ave / S Claremont St	15	84	18	8	60	7	23	165	21	62	136	15	17	65	40	19	70	12	51	298	15	45	161	25
Opening Year		AM												PM											
Int #	Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
14	E 4th Ave / S B St	25	39	51	29	58	72	7	253	15	12	100	7	31	75	86	16	46	81	17	494	33	19	110	19
15	E 4th Ave / S Railroad Ave	0	0	0	3	10	19	0	341	1	7	102	0	0	0	0	3	2	47	0	613	5	4	108	0
3	E 4th Ave / S Claremont St	6	89	47	39	91	13	29	321	4	6	82	10	8	57	80	83	109	40	3	566	9	4	71	3
17	E 5th Ave / S B St	49	88	28	3	52	34	18	232	42	18	191	9	32	108	45	6	66	26	62	360	66	20	208	22
18	E 5th Ave / S Railroad Ave	1	1	5	0	9	40	28	225	6	15	204	2	2	0	2	0	4	33	28	381	6	23	207	0
5	E 5th Ave / S Claremont St	15	84	18	8	60	7	17	154	21	62	128	15	17	65	40	19	70	12	29	260	15	45	153	25
Opening Year + Project		AM												PM											
Int #	Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
14	E 4th Ave / S B St	26	39	54	29	58	72	7	298	15	12	105	7	32	75	86	16	46	81	17	500	33	19	114	19
15	E 4th Ave / S Railroad Ave	0	0	0	3	10	19	0	345	46	40	106	0	0	0	0	3	2	47	0	613	14	10	108	0
3	E 4th Ave / S Claremont St	6	91	47	39	95	13	29	325	4	6	85	10	8	63	80	83	113	40	3	566	9	4	71	3
17	E 5th Ave / S B St	49	93	29	3	52	34	18	244	43	20	205	9	32	108	46	6	66	26	62	371	67	26	262	22
18	E 5th Ave / S Railroad Ave	1	1	5	11	9	51	28	238	6	15	209	2	2	0	2	46	4	78	28	393	6	23	222	0
5	E 5th Ave / S Claremont St	15	84	18	8	60	7	23	165	21	62	136	15	17	65	40	19	70	12	51	298	15	45	161	25
Cumulative		AM												PM											
Int #	Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
14	E 4th Ave / S B St	39	60	77	50	90	110	10	335	20	20	145	10	39	110	120	60	70	120	30	724	50	30	166	30
15	E 4th Ave / S Railroad Ave	0	0	0	0	10	30	0	496	1	7	146	0	0	0	0	0	0	70	0	900	1	4	160	0
3	E 4th Ave / S Claremont St	10	108	60	60	156	20	30	426	10	10	217	20	30	74	110	110	116	40	10	680	10	20	130	10
17	E 5th Ave / S B St	60	125	39	0	80	40	30	228	59	28	156	10	40	160	69	10	100	30	80	369	99	24	136	30
18	E 5th Ave / S Railroad Ave	0	0	0	0	10	40	0	267	10	20	195	0	0	0	0	0	10	33	0	438	10	30	225	0
5	E 5th Ave / S Claremont St	20	90	20	0	50	10	24	199	20	90	252	20	20	90	40	10	80	10	28	312	30	30	282	20
Cumulative + Project		AM												PM											
Int #	Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
14	E 4th Ave / S B St	40	60	80	50	90	110	10	380	20	20	150	10	40	110	120	60	70	120	30	730	50	30	170	30
15	E 4th Ave / S Railroad Ave	0	0	0	0	10	30	0	500	50	40	150	0	0	0	0	0	0	70	0	900	10	10	160	0
3	E 4th Ave / S Claremont St	10	110	60	60	160	20	30	430	10	10	220	20	30	80	110	110	120	40	10	680	10	20	130	10
17	E 5th Ave / S B St	60	130	40	0	80	40	30	240	60	30	170	10	40	160	70	10	100	30	80	380	100	30	190	30
18	E 5th Ave / S Railroad Ave	0	0	0	10	10	50	0	280	10	20	200	0	0	0	0	50	10	80	0	450	10	30	240	0
5	E 5th Ave / S Claremont St	20	90	20	0	50	10	30	210	20	90	260	20	20	90	40	10	80	10	50	350	30	30	290	20

APPENDIX C
AERMOD INPUT FILES (PROVIDED ELECTRONICALLY)