ENVIRONMENT
& HEALTH

MEMO

Date: **August 1, 2022**

To: **Connor Tutino, Associate Project Manager, David J Powers & Associates**

From: **Michael Keinath**

Subject: **CEQA AIR QUALITY AND HEALTH RISK ASSESSMENT FOR 222 EAST 4TH AVENUE MIXED-USE PROJECT, SAN MATEO, CALIFORNIA**

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Ramboll US Consulting, Inc. (Ramboll) conducted California Environmental Quality Act (CEQA) air quality and health risk analyses for the proposed 222 East 4th Avenue Mixed-Use Project in San Mateo, California (the "Project").

According to the Project sponsor, the Project would redevelop the site with a new five-story, approximately 155,346 052 square-foot mixed-use building with two levels of below-grade parking. The building would consist of approximately 104,755 square-feet of office space, 17,658 square-feet of retail space, and 8,938 square-feet of residential space. The residential space would be split between the ground floor (i.e., residential lobby/elevator) and the fifth floor living areas. Nearby uses to the site include residential uses and commercial uses surrounding the building in all directions; California State Highway 82 to the west; and U.S Route 101 and Caltrain/ heavy rail tracks to the east. The Project would include an emergency generator 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 May 2017 and 2022.[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. 2017. California Environmental Quality Act (CEQA) Air Quality Guidelines. May. Available online at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en
BAAQMD, 2022. Justification Report: CEQA Thresholds for Evaluating the Significance of Climate Impacts from Land Use Projects and Plans. April.

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 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 TACs emitted during Project construction and operation, including a cumulative assessment from all sources within the zone of influence. The memorandum also includes the health effects of the Project's emergency generator, in combination with offsite sources, on future onsite residents of the proposed Project.

The BAAQMD operational emissions screening size for mid-rise apartments is 494 dwelling units and for general office building is 346,000 square feet. Because the Project is below both operational criteria pollutant screening levels, an operational CAP assessment is not included in this memorandum.

SUMMARY OF RESULTS

Unmitigated and mitigated construction emissions are presented in **Table 2** and **Table 3,** respectively. As shown in the tables, both unmitigated and mitigated CAP emissions for construction are below the BAAQMD thresholds of significance. Construction emissions are reduced with the implementation of construction equipment mitigation, designed to mitigate the health risk impacts from the Project. Unmitigated and mitigated health risk impacts from the Project are shown in **Table 4** and **Table 5**, respectively. Health risk impacts on a cumulative basis are shown in **Table 6**, respectively. Construction equipment control is required to reduce the project's health risks impacts to below the BAAQMD thresholds of significance. The construction equipment mitigation requires tractors/loaders/backhoes, rubber tired dozers, water trucks, cranes, forklifts, and aerial lifts to use Tier 4 Final diesel engines. With the implementation of construction equipment mitigation, the mitigated health risk impacts are also below the BAAQMD thresholds of significance.

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.

Construction CAP Emissions Estimation

Ramboll utilized the California Emission Estimator Model version 2020.4.0 (CalEEMod®)[2] 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.

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,[3] 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

[2] California Air Pollution Control Officers Association (CAPCOA). 2020. California Emissions Estimator Model. Available at: http://www.CalEEMod.com/.

[3] 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: http://epa.gov/ttnchie1/ap42/.

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 7, 8**, and 9. It was assumed that construction would start as early as 2023. Under the unmitigated scenario, 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 off-gas and architectural coating emissions were also estimated using methodologies consistent with CalEEMod® and summarized in **Tables 10** and **11**.

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:

- Under the mitigated scenario, Project construction is assumed to use fleet-average tier diesel engines for all equipment, except for tractors/loaders/backhoes, rubber tired dozers, water trucks, cranes, forklifts, and aerial lifts, which would use Tier 4 Final diesel engines or better (for example, this could include natural gas generators or electric welders).
- Off-road equipment hours were updated to reflect utilization of each equipment per phase as provided by the Project sponsor.
- Haul truck trips for demolition were calculated by CalEEMod® based on the amount of demolition required for construction. The haul truck trips for grading were estimated by the Project sponsor based on soil exported and imported during construction. These estimates are shown in **Table 9**.

LOCAL COMMUNITY RISK AND HAZARD IMPACTS

Local Carbon Monoxide (CO) Impacts

According to the 2017 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 (see **Appendix A**), the project would generate less vehicle trips per hour during morning and evening rush hours compared to the existing land uses on the project site. Thus, operational impacts from Project CO emissions would be less than significant.

Toxic Air Contaminant (TAC) Emissions

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

1. <u>Diesel Particulate Matter (DPM)</u>: DPM emissions were used to evaluate the cancer risk and non-cancer chronic HI from Project construction. In this analysis, both onsite (i.e., construction equipment) and local offsite (i.e., construction mobile sources) particulate matter less than 10

microns (PM_{10}) exhaust emissions[4] 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. $\underline{PM_{2.5}}$: 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 12-14**. The modeled emissions were calculated using the same conservative assumptions as the DPM calculation.

Total modeled emissions are presented in **Table 15** as total PM_{10} and $PM_{2.5}$ from construction.

TAC emissions from Project operation were estimated for the proposed emergency generator. Based on the model information provided by the Project sponsor, horsepower, exhaust temperature, outlet size and other data were collected from the model's specification sheet.[5] Project emissions for the emergency generators are 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 CalEEMod® default emission factors and 100% load. Similar to construction TAC sources, PM_{10} exhaust emissions from the proposed generator were conservatively calculated as DPM. Modelling parameters for the proposed emergency generator are summarized in **Table 16**.

BAAQMD recommends analyzing TAC emissions from roadways with over 10,000 vehicles per day. As discussed above, per the traffic generation assessment conducted by the transportation consultant. (see **Appendix A**), the Project is expected to result in a net reduction of approximately 3,600 daily trips compared to the existing land uses on the Project site. Therefore, the Project would not generate 10,000 vehicles per day, so TAC emissions from operational mobile sources is not needed.

Health Risk Assessment

Ramboll analyzed Project construction-related and operational health risks by estimating ambient air concentrations of DPM and $PM_{2.5}$. To estimate air concentrations of DPM and $PM_{2.5}$, Ramboll used AERMOD, 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 17** and **Table 16**, respectively. Ramboll used five years of meteorological data from the San Francisco International Airport, which was the nearest dataset available 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

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

[5] Generac. SD 500 15.2L 500kW Industrial Diesel Generator Set. Available at: https://www.generac.com/generaccorporate/media/library/content/all-products/generators/industrial-generators/diesel/0197160sby-b-sd500-15-2l-perkins.pdf?ext=.pdf. Accessed: May 2022.

[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. Accessed: March 2022.

this effect into account for sources modeled as point sources. The dimensions and locations of the Project and the multi-story residential building adjacent to and south of 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 B**. The receptor, source and building setup are shown in **Figure 1**. It should be noted that the receptor heights at different floors were considered for the multi-family residential building to the south of the Project and the future on-site receptors on the Project site, while all other receptors are at ground-level.

Modeled Emissions

Based on the construction schedule provided by the Project sponsor, the Project will be completed in one phase. All emissions from Project construction were summed by year and modeled on an annual basis for off-site receptors. These modeled emission rates are shown in **Table 15**.

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.[7] The BAAQMD has issued HRA Guidelines formally adopting the OEHHA 2015 Guidance Manual.[8] This analysis followed the recommended methodology from the 2015 OEHHA Hot Spots Guidance.

Ramboll conservatively evaluated Project impacts due to construction emissions using default exposure assumptions for a resident child from OEHHAunless otherwise noted.[9] The resident child scenario assumes a much higher daily breathing rate and age-sensitivity factor (ASF)[10] 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. Other sensitive receptor locations were identified using a report from Environmental Data Resources (EDR). The EDR report identified daycares, childcares, and elementary schools in Project vicinity. 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 **Tables 18**.

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:

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

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

[8] BAAQMD, 2020. Health Risk Assessment Modeling Protocol. December.

[9] BAAQMD. 2010. BAAQMD Air Toxics NSR Program Health Risk Screening Analysis (HRSA) Guidelines. January.

[10] *Ibid.*

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.[11]

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 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 19**.

Cancer risk and chronic HI were calculated from ambient annual concentrations using intake factors, cancer potency factors, and chronic reference exposure levels calculated consistent with the 2015 OEHHA Hot Spots Guidance[12] and 2020 BAAQMD guidance.[13]

As shown in **Table 4**, the unmitigated cancer risk from Project construction and operation at the maximally exposed individual resident (MEIR) receptor is calculated to be 45.5 in 1 million, which would exceed the BAAQMD's threshold of 10 in 1 million. The unmitigated cancer at the maximally exposed individual student (MEIS) receptor is calculated to be 0.5 in 1 million, which would not exceed the applicable threshold. Unmitigated construction activities and operation would result in a non-cancer hazard index of 0.03 (threshold of 1.0), and maximum $PM_{2.5}$ concentration of 0.05 micrograms per cubic meter (μg/m^3) (threshold of 0.3 μg/m^3) at the MEIR. As shown in **Table 5**, mitigated construction activities and operation would also result in a non-cancer hazard index of less than 0.01 and maximum $PM_{2.5}$ concentration less than 0.01 μg/m^3 at the MEIS. Project operation would also result in a maximum cancer risk of 2.8 in 1 million, a non-cancer hazard index less than 0.01, and maximum $PM_{2.5}$ concentration less than 0.01 μg/m^3 at the Project's MEIR.

[11] Cal/EPA. 2003. The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. Office of Environmental Health Hazard Assessment. August.

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

[13] BAAQMD, 2020. Health Risk Assessment Modeling Protocol. December.

Under the mitigated scenario, the cancer risk from Project construction and operation at the MEIR receptor is calculated to be 9.1 in 1 million. The other health risks under the mitigated scenario at the MEIR and MEIS are also shown in **Table 5** and are below the BAAQMD thresholds. Therefore, with the use of Tier 4 Final diesel engines, or equivalent lower emitting equipment, for tractors/loaders/backhoes, rubber tired dozers, water trucks, cranes, forklifts, and aerial lifts, the Project's health risks on on-site and off-site sensitive receptors are all below the BAAQMD thresholds of significance; thus, health risk impacts associated with construction and operation of the Project are less than significant with the engine tier requirement as a mitigation measure. There may be other methods for reducing emissions below thresholds (e.g., implementing Tier 4 Final requirements on other categories of equipment), but further analysis would be necessary to confirm they would meet the threshold. The location of the off-site MEIR and MEIS, and the on-site MEIR is shown in **Figure 2**.

Cumulative Health Risk Assessment

In accordance with BAAQMD CEQA guidelines, Ramboll conducted a cumulative HRA for both offsite sensitive receptors and new onsite sensitive receptors created by the Project. The cumulative assessment tabulates the impact of Project-related risks plus existing offsite sources (stationary and mobile) at the off-site and on-site MEIR locations. The cumulative assessment for onsite receptors is determined at the location of the maximum total risk from the proposed emergency generator. The evaluation requires the identification of any stationary and mobile sources within 1,000 feet of the Project boundary. In addition to the evaluation of each single source, the combined health risk from all TAC and $PM_{2.5}$ sources are evaluated.

Sources evaluated in the cumulative health risk assessment include any BAAQMD permitted stationary source, roadways with over 10,000 vehicles per day, and any other major source of emissions within the zone of influence such as railways. The BAAQMD provides tools with conservative estimates of impacts from these sources, including a stationary source tool and raster files for railways major streets, and highways. The preliminary health risk screening values from the existing stationary sources on the MEIRs were determined using the BAAQMD's Health Risk Calculator (Beta Version 4.0)[14] and the stationary source information provided by the BAAQMD.[15] One foreseeable future stationary source (emergency generator at the proposed development at 500 East 3rd Ave) was also included in the cumulative HRA. The preliminary health risk screening values from the stationary sources considered in the cumulative HRA are presented in **Table 20**.

BAAQMD's highway raster file includes impacts from highways in the Bay Area while the major street raster file includes impacts from all roadways with daily traffic above 30,000 vehicles per day. BAAQMD previously had a roadway screening analysis calculator that could be used to calculate impacts of roadways between 10,000 and 30,000 vehicles per day, but BAAQMD has since removed this roadway screening analysis calculator from their website. There is currently no alternative BAAQMD tool available for quantifying these results. There are no roadways with daily traffic between 10,000 and 30,000 vehicles per day within 1,000 feet of the MEIRs so the impacts from roadways with daily traffic below 30,000 vehicles per day were not calculated.

The raster files and stationary source screening tools were used to estimate the health impacts from all highways, major streets, railways, and stationary sources and combined with the impacts from all other sources at the construction offsite MEIR and on-site cumulative MEIR.

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[14] BAAQMD, 2019. BAAQMD Risk and Hazards Emissions Screening Calculator, Version 4.0 Beta. Available at: https://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/tools/baaqmd-health-risk-calculator-beta-4-0-xlsx.xlsx?la=fil-ph. September 19.

[15] BAAQMD. 2022. Personal Communication from Matthew Hanson to Carlos Ciudad-Real. March 25.

Details of each source included in the cumulative analysis are presented in **Table 6**. The combined impact from all the sources results in a cancer risk of 20 in 1 million at the on-site MEIR. The combined impact from all the sources results in an unmitigated cancer risk of 62 in 1 million and a mitigated cancer risk of 25 in a million at the off-site MEIR, compared to a threshold of 100 in 1 million. The combined non-cancer hazard index at all sensitive receptors are less than 0.1 (threshold of 10). The combined maximum $PM_{2.5}$ concentrations are 0.19 µg/m^3 at the on-site MEIR and 1.3 µg/m^3 at the off-site MEIR under the mitigated scenario, compared to a threshold of 0.8 µg/m^3). This would be considered a significant cumulative impact.

The primary contributor to the cumulative $PM_{2.5}$ concentration at the off-site MEIR is a lumber company with woodwork operation, located about 850 feet from the off-site MEIR and contributing approximately 1.1 µg/m^3 (80%). This stationary source with BAAQMD Facility Number 9555 caused the exceedance of the cumulative $PM_{2.5}$ concentrations over the cumulative threshold of 0.8 µg/m^3. 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. Therefore, the identified concentrations and risks are conservative. If this stationary source were not operational, there would be no cumulative impact associated with the Project and the rest of the cumulative sources. Further, the Project's contribution from construction activities would be temporary and are below the single source (Project level) thresholds. Therefore, the Project would not result in a cumulatively considerable contribution to the significant impact.

CLOSING

The analysis presented above represents emissions and health risk impacts from construction of the proposed Project. The Project does not exceed any BAAQMD CEQA significance thresholds, with the mitigation measure requiring Tier 4 Final diesel engines for the equipment categories of tractors/loaders/backhoes, rubber tired dozers, water trucks, cranes, forklifts, and aerial lifts. Other equivalent or better construction requirements may be available to reduce the Project's impacts to the same extent as the mitigation measure. Possible alternative measures include the use of natural gas or propane generators, electric welders, and use of cleaner diesel engines on selected pieces of construction equipment. These alternative measures will require additional emissions analysis to demonstrate the same effectiveness as the mitigation measure.

Attachments:

Tables

Figures

Appendix A: Traffic Study

Appendix B: AERMOD Input Files (provided Electronically)

TABLES

Table 1
Land Use Summary for Proposed Project
Draeger's Mixed-Use Project
222 E 4th Ave, San Mateo, CA

Project Description Land Use Type[1]	CalEEMod® Land Use Type	CalEEMod® Land Use Subtype	Value	Units	Square Footage	Acreage
Residential Space	Residential	Apartments Mid Rise	10	Dwelling Units	8,938	0.21
Retail Space	Retail	Regional Shopping Center	17.7	1000sqft	17,658	0.41
Office Space	Commerical	General Office Building	104.8	1000sqft	104,755	2.40
Shared Space	Commercial	General Office Building	1.5	1000sqft	1,515	0.03
Parking Garage	Parking	Enclosed Parking with Elevator	239	Spaces	101,910	2.34

Notes:

1. Information provided by project applicant.

Abbreviations:

CalEEMod® - California Emissions Estimator Model®

Table 2
Unmitigated Criteria Air Pollutants Emissions from Proposed Project Construction
Draeger's Mixed-Use Project
222 E 4th Ave, San Mateo, CA

Summary of Construction Emissions by Source

Phase	Source	CAP Emissions[1]			
		ROG	NOx	PM_{10}	$PM_{2.5}$
		lb/yr			
Demolition	On-Site Exhaust	12	105	4.7	4.4
	Mobile Exhaust	1.5	66	3.1	1.3
	Fugitive Dust	--	--	2.8	0.42
Site Preparation	On-Site Exhaust	0.38	4.4	0.15	0.13
	Mobile Exhaust	0.0089	0.0065	0.0012	0.00043
	Fugitive Dust	--	--	0.0080	0.0012
Grading / Excavation	On-Site Exhaust	78	690	28	26
	Mobile Exhaust	5.9	233	11	4.8
	Fugitive Dust	--	--	10	1.6
Trenching/Foundation	On-Site Exhaust	5.7	58	2.8	2.6
	Mobile Exhaust	0.36	0.26	0.048	0.017
	Fugitive Dust	--	--	0.32	0.048
Building - Structure	On-Site Exhaust	51	556	25	23
	Mobile Exhaust	22	236	12	5.2
	Fugitive Dust	--	--	24	3.6
	On-Site Exhaust	38	406	18	16
	Mobile Exhaust	16	180	10	4.0
	Fugitive Dust	--	--	19	2.9
Building - Exterior	On-Site Exhaust	63	677	29	26
	Mobile Exhaust	21	230	12	5.2
	Fugitive Dust	--	--	25	3.7
Paving	On-Site Exhaust	3.1	29	1.5	1.4
	Mobile Exhaust	1.3	11	0.66	0.28
	Fugitive Dust	0	0	1.4	0.2
	Paving Off-Gassing	0.75	0	0	0
	Architectural Coating	503	0	0	0

Average Construction Emissions by day

Year	ROG	NOx	PM_{10} (Exhaust)	$PM_{2.5}$ (Exhaust)
	lb/day			
2023	0.81	8.9	0.40	0.31
2024	2.8	6.7	0.31	0.23
BAAQMD Thresholds[2]	54	54	82	54
Exceeds Thresholds?	**No**	**No**	**No**	**No**

Notes:

1. Construction emissions were estimated with methodology equivalent to CalEEMod® 2020.4.0. On-Site Exhaust represents emissions from offroad equipment, while mobile exhaust includes emissions from worker, vendor, and hauling trucks. For PM, the construction emissions of fugitive dust include the entrained roadway dust.

2. Thresholds are from BAAQMD Guidance for Assessing and Mitigating Air Quality Impacts. For PM, this excludes construction fugitive emissions.

Abbreviations:

BAAQMD - Bay Area Air Quality Management District
CalEEMod® - California Emissions Estimator Model®
CAP - Criteria Air Pollutants
CEQA - California Environmental Quality Act
lb/yr - pounds 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 Emissions Estimator Model (CalEEMod). 2020.4.0. CAPCOA. 2020. Available online at: http://www.caleemod.com

Table 3
Mitigated Criteria Air Pollutants Emissions from Proposed Project Construction
Draeger's Mixed-Use Project
222 E 4th Ave, San Mateo, CA

Summary of Construction Emissions by Source

Phase	Source	CAP Emissions[1]			
		ROG	NOx	PM_{10}	$PM_{2.5}$
		lb/yr			
Demolition	On-Site Exhaust	9	71	3.1	2.8
	Mobile Exhaust	1.5	66	3.1	1.3
	Fugitive Dust	--	--	2.8	0.42
Site Preparation	On-Site Exhaust	0.38	4.4	0.15	0.13
	Mobile Exhaust	0.0089	0.0065	0.0012	0.00043
	Fugitive Dust	--	--	0.0080	0.0012
Grading / Excavation	On-Site Exhaust	29	192	7	6
	Mobile Exhaust	5.9	233	11	4.8
	Fugitive Dust	--	--	10	1.6
Trenching/Foundation	On-Site Exhaust	1.5	7	0.20	0.20
	Mobile Exhaust	0.36	0.26	0.048	0.017
	Fugitive Dust	--	--	0.32	0.048
Building - Structure	On-Site Exhaust	12	83	1.4	1.4
	Mobile Exhaust	22	236	12	5.2
	Fugitive Dust	--	--	24	3.6
	On-Site Exhaust	9.6	65	1.1	1.1
	Mobile Exhaust	16	180	10	4.0
	Fugitive Dust	--	--	19	2.9
Building - Exterior	On-Site Exhaust	21	180	2.7	2.7
	Mobile Exhaust	21	230	12	5.2
	Fugitive Dust	--	--	25	3.7
Paving	On-Site Exhaust	3.1	29	1.5	1.4
	Mobile Exhaust	1.3	11	0.66	0.28
	Fugitive Dust	--	--	1.4	0.22
	Paving Off-Gassing	0.75	--	0	0
	Architectural Coating	503	--	0	0

Average Construction Emissions by day

Year	ROG	NOx	PM_{10} (Exhaust)	$PM_{2.5}$ (Exhaust)
	lb/day			
2023	0.38	4.1	0.17	0.10
2024	2.5	3.1	0.12	0.064
BAAQMD Thresholds[2]	54	54	82	54
Exceeds Thresholds?	**No**	**No**	**No**	**No**

Notes:

1. Construction emissions were estimated with methodology equivalent to CalEEMod® 2020.4.0. On-Site Exhaust represents emissions from offroad equipment, while mobile exhaust includes emissions from worker, vendor, and hauling trucks. For PM, the construction emissions of fugitive dust include the entrained roadway dust.

2. Thresholds are from BAAQMD Guidance for Assessing and Mitigating Air Quality Impacts. For PM, this excludes construction fugitive emissions.

Abbreviations:

BAAQMD - Bay Area Air Quality Management District
CalEEMod® - California Emissions Estimator Model®
CAP - Criteria Air Pollutants
CEQA - California Environmental Quality Act
lb/yr - pounds 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 Emissions Estimator Model (CalEEMod). 2020.4.0. CAPCOA. 2020. Available online at: http://www.caleemod.com

Table 4
Unmitigated Maximum Project Excess Lifetime Cancer Risk, Chronic HI and PM2.5
Draeger's Mixed-Use Project
222 E 4th Ave, San Mateo, CA

	Project Construction + Operation						**Project Operation**		
	Off-Site Resident			**Off-Site Daycare Child**			**On-Site Resident**		
Source Category	**Excess Lifetime Cancer Risk**[1]	**Chronic HI**	**Annual average $PM_{2.5}$**	**Excess Lifetime Cancer Risk**[1]	**Chronic HI**	**Annual average $PM_{2.5}$**	**Excess Lifetime Cancer Risk**[1]	**Chronic HI**	**Annual average $PM_{2.5}$**
	in a million	**unitless ratio**	**μg/m^3**	**in a million**	**unitless ratio**	**μg/m^3**	**in a million**	**unitless**	**μg/m^3**
Unmitigated off-road construction equipment exhaust and on-road construction mobile vehicles	43.15	0.033	0.051	0.44	0.00061	0.00094	--	--	--
Emergency Generator	2.37	0.00084	0.0042	0.014	0.000054	0.00027	2.78	0.00075	0.0037
Unmitigated Total	46	0.033	0.051	0.45	0.00061	0.00094	--	--	--
Significance Threshold	10	1	0.3	10	1	0.3	10	1	0.3
Exceeds thresholds?	**Yes**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**
UTMx	559960			559555			559960		
UTMy	4157625			4157657			4157665		

Note:

1. Excess lifetime cancer risk and chronic HI from construction sources represent the incremental increase in activity expected as a result of the Project.
2. 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 Inahalation Pathway (unitless)
C_i = Annual Average Air Concentration for Chemical "i" ug/m^3
CF = Conversion Factor (mg/ug)
IF_{inh} = Intake Factor for Inhalantion (m^3/kg-day)
CPF_i = Cancer Potency Factor (mg/kg-day)$^{-1}$
ASF = Age Sensitivity Factor (unitless)

3. 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)

Abbreviations:

μg - microgram
OEHHA - Office of Environmental Health Hazard Assessment
m^3 - cubic meter
PM - particulate matter

HI - Hazard Index

BAAQMD - Bay Area Air Quality Management District

UTMx, UTMy - Universal Transverse Mercator coordinates

Reference:

BAAQMD. 2017. California Environmental Quality Act Air Quality Guidelines. May. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en

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

Table 5
Mitigated Maximum Project Excess Lifetime Cancer Risk, Chronic HI and PM2.5
Draeger's Mixed-Use Project
222 E 4th Ave, San Mateo, CA

	Project Construction + Operation						Project Operation		
	Off-Site Resident			Off-Site Daycare Child			On-Site Resident		
Source Category	**Excess Lifetime Cancer Risk[1]**	**Chronic HI**	**Annual average $PM_{2.5}$**	**Excess Lifetime Cancer Risk[1]**	**Chronic HI**	**Annual average $PM_{2.5}$**	**Excess Lifetime Cancer Risk[1]**	**Chronic HI**	**Annual average $PM_{2.5}$**
	in a million	**unitless ratio**	**µg/m³**	**in a million**	**unitless ratio**	**µg/m³**	**in a million**	**unitless**	**µg/m³**
Mitigated off-road construction equipment exhaust and on-road construction mobile vehicles	6.71	0.0064	0.010	0.072	0.00012	0.00020	--	--	--
Emergency Generator	2.37	0.00084	0.0042	0.014	0.000054	0.00027	2.78	0.00075	0.0037
Mitigated Total	9.1	0.0064	0.010	0.085	0.00012	0.00027	--	--	--
Significance Threshold	10	1	0.3	10	1	0.3	10	1	0.3
Exceeds thresholds?	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**
UTMx	559960			559555			559960		
UTMy	4157625			4157657			4157665		

Note:

1. Excess lifetime cancer risk and chronic HI from construction sources represent the incremental increase in activity expected as a result of the Project.
2. 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 Inahalation Pathway (unitless)
C_i = Annual Average Air Concentration for Chemical "i" ug/m³
CF = Conversion Factor (mg/ug)
IF_{inh} = Intake Factor for Inhalantion (m³/kg-day)
CPF_i = Cancer Potency Factor $(mg/kg\text{-}day)^{-1}$
ASF = Age Sensitivity Factor (unitless)

3. 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)

Abbreviations:

µg - microgram
OEHHA - Office of Environmental Health Hazard Assessment
m³ - cubic meter
PM - particulate matter

HI - Hazard Index

BAAQMD - Bay Area Air Quality Management District

UTMx, UTMy - Universal Transverse Mercator coordinates

Reference:

BAAQMD. 2017. California Environmental Quality Act Air Quality Guidelines. May. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en

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

Table 6
Construction and Operation Cumulative Risks and Hazards
Draeger's Mixed-Use Project
222 E 4th Ave, San Mateo, CA

Receptor Type	Source[1]	Lifetime Excess Cancer Risk[1] (in a million)	Noncancer Chronic HI[1]	$PM_{2.5}$ Concentration[1] (µg/m³)
Unmitigated Off-Site Resident	Stationary Sources[2]	1.1	0.00062	1.1
	Highway[3]	6.7	--	0.15
	Major Streets[3]	0.14	--	0.0036
	Railways[3]	8.2	--	0.016
	Project Construction+Operation	46	0.033	0.051
	Total	**62**	**0.034**	**1.4**
	Exceeds Threshold?	**NO**	**NO**	**YES**
Mitigated Off-Site Resident	Stationary Sources[2]	1.1	0.00062	1.14
	Highway[3]	6.7	--	0.15
	Major Streets[3]	0.14	**--**	0.0036
	Railways[3]	8.2	**--**	0.016
	Project Construction+Operation	9.1	0.0064	0.010
	Total	**25**	**0.0071**	**1.3**
	Exceeds Threshold?	**NO**	**NO**	**YES**
On-Site Resident	Stationary Sources[2]	0.89	0.0018	0.019
	Highway[3]	6.8	--	0.15
	Major Streets[3]	0.14	--	0.0036
	Railways[3]	9.3	--	0.018
	Project Operation	2.8	0.00075	0.0037
	Total	**20**	**0.0025**	**0.19**
	Exceeds Threshold?	**NO**	**NO**	**NO**
	Threshold	**100**	**10**	**0.8**

Notes:

[1] If the cell is marked with "--", no risk was calculated. For existing stationary sources, this is because the source was more than 1,000 feet from the identified sensitive receptors. For roadways, the chronic HI is not calculated in the BAAQMD screening tool.

[2] Stationary sources include existing stationary sources and foreseeable future stationary sources.

[3] Cancer risk and $PM_{2.5}$ concentration values were determined using BAAQMD screening tools and are based on the maximum impact of a raster cell located on the identified sensitive receptors.

Abbreviations:

µg - microgram
HI - hazard index
m^3 - cubic meter
$PM_{2.5}$ - fine particulate matter

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). 2020. Health Risk Calculator Beta 4.0. March. Available at: https://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/tools/baaqmd-health-risk-calculator-beta-4-0-xlsx.xlsx?la=en&rev=dab7d85a772d45caa9c99e59395bf12d\

BAAQMD. 2022. Personal Communication from Matthew Hanson to Carlos Ciudad-Real. March 25.

Ramboll. 2022. CEQA Air Quality and Health Risk Assessment for the Block 21 Mixed-Use Project, San Mateo, California (Draft). April 1.

Table 7
Construction Phasing Schedule
Draeger's Mixed-Use Project
222 E 4th Ave, San Mateo, CA

Phase	Start Date	End Date	Number of Work Days	Days per Week
Demolition	3/1/2023	4/5/2023	26	5
Site Preparation	4/5/2023	4/5/2023	1	5
Grading / Excavation	3/23/2023	6/29/2023	71	5
Trenching/Foundation	6/30/2023	8/24/2023	40	5
Building - Structure	8/16/2023	4/17/2024	176	5
Building - Exterior	4/18/2024	9/4/2024	100	5
Paving	9/5/2024	11/13/2024	50	5

Notes:
1. The construction schedule is based on information provided by the project applicant.

Table 8
Construction Equipment
Draeger's Mixed-Use Project
222 E 4th Ave, San Mateo, CA

Phase	Construction Subphase	Equipment[1]	CalEEMod Equipment[2]	Fuel[3]	Number[1]	Horsepower[1]	Daily Usage[4] (hours/day)	Utilization[5]	Unmitigated Tier[6]	Mitigated Tier[5]
Demolition	Demolition	Concrete/Industrial Saws	Concrete/Industrial Saws	Diesel	1	81	2	100%	No Specific Tier	No Specific Tier
	Demolition	Excavators	Excavators	Diesel	1	158	8	100%	No Specific Tier	No Specific Tier
	Demolition	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	8	100%	No Specific Tier	Tier 4 Final
Site Preparation	Site Preparation	Graders	Graders	Diesel	1	187	8	100%	No Specific Tier	No Specific Tier
Grading / Excavation	Grading / Excavation	Excavators	Excavators	Diesel	1	158	8	35%	No Specific Tier	No Specific Tier
	Grading / Excavation	Graders	Graders	Diesel	1	187	8	7.0%	No Specific Tier	No Specific Tier
	Grading / Excavation	Rubber Tired Dozers	Rubber Tired Dozers	Diesel	1	247	8	35%	No Specific Tier	Tier 4 Final
	Grading / Excavation	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	8	100%	No Specific Tier	Tier 4 Final
	Grading / Excavation	Shoring Drill Rig	Bore/Drill Rigs	Diesel	1	221	8	35%	No Specific Tier	No Specific Tier
	Grading / Excavation	Water Truck[7]	Off-Highway Trucks	Diesel	1	402	8	100%	No Specific Tier	Tier 4 Final
Trenching/Foundation	Trenching/Foundation	Tractor/Loader/Backhoe	Tractor/Loader/Backhoe	Diesel	1	97	8	100%	No Specific Tier	Tier 4 Final
Building - Structure	Building - Structure	Cranes	Cranes	Diesel	1	231	8	100%	No Specific Tier	Tier 4 Final
	Building - Structure	Forklifts	Forklifts	Diesel	2	89	5	100%	No Specific Tier	Tier 4 Final
	Building - Structure	Aerial Lifts	Aerial Lifts	Diesel	1	63	6	100%	No Specific Tier	Tier 4 Final
Building - Exterior	Building - Exterior	Cranes	Cranes	Diesel	1	231	8	100%	No Specific Tier	Tier 4 Final
	Building - Exterior	Forklifts	Forklifts	Diesel	2	89	8	100%	No Specific Tier	Tier 4 Final
	Building - Exterior	Aerial Lifts	Aerial Lifts	Diesel	2	63	8	100%	No Specific Tier	Tier 4 Final
	Building - Exterior	Welders	Welders	Diesel	1	46	8	15%	No Specific Tier	No Specific Tier
Paving	Paving	Pavers	Pavers	Diesel	1	130	8	12%	No Specific Tier	No Specific Tier
	Paving	Paving Equipment	Paving Equipment	Diesel	1	132	8	12%	No Specific Tier	No Specific Tier
	Paving	Rollers	Rollers	Diesel	1	80	8	12%	No Specific Tier	No Specific Tier

Notes:

1. Equipment lists were provided/confirmed by the Project Sponsor.
2. CalEEMod equipment types are assgined using CalEEMod User's Guide Appendix D.
3. All equipment is conservatively assumed to be diesel-fueled.
4. Construction activities are assumed to occur during 8AM to 8PM, consistent with San Mateo County guidelines.
5. Utilization is calculated based on the average hours per day of the equipment divided by daily usage (8 hours for all equipment except for concrete/industrial saws).
6. Assumed fleet-average tier.
7. An off-highway truck is added to account for water truck usage during the grading phase.

Abbreviations:

CalEEMod - California Emissions Estimator Model

References:

California Air Pollution Control Officers Association (CAPCOA). California Emissions Estimator Model (CalEEMod®), Version 2020.4.0. Available online at http://www.caleemod.com/

Table 9
Construction Trips
Draeger's Mixed-Use Project
222 E 4th Ave, 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[3] (miles/one way trip)			Worker VMT (miles)	Vendor VMT (miles)	Hauling VMT (miles)
						Worker	Vendor	Hauling			
Demolition[4]	2023	26	8	0	459	10.8	7.3	20	2,246	0	9,180
Site Preparation	2023	1	3	0	0	10.8	7.3	20	32	0	0
Grading / Excavation [5]	2023	71	13	0	1,615	10.8	7.3	20	9,968	0	32,300
Trenching/Foundation	2023	40	3	0	0	10.8	7.3	20	1,296	0	0
Building - Structure[6]	2023	98	61	23	839	10.8	7.3	20	64,562	16,454	16,780
Building - Structure[6]	2024	78	61	23	668	10.8	7.3	20	51,386	13,096	13,360
Building - Exterior[6]	2024	100	61	23	857	10.8	7.3	20	65,880	16,790	17,140
Paving [7]	2024	50	8	0	77	10.8	7.3	20	4,320	0	1,540

EMFAC Data[8]

Trip Type	EMFAC Settings	Fleet Mix	Fuel Type
Worker	San Mateo County Calendar Years 2023-2024 Annual Season Aggregated Model Year EMFAC2007 Vehicle Categories	50% LDA, 25% LDT1, 25% LDT2	Gasoline
Vendor		50% MHDT, 50% HHDT	Diesel
Hauling		100% HHDT	Diesel

Notes:

1. Worker and vendor trips during building construction is based on project land use areas and was scaled from default CalEEMod worker and vendor trips. Worker trips during architectural coating are equal to 20% of the building construction trips.
2. Hauling trip rates are calculated based on the import and export quantities provided by the Project Sponsor. Import and export quantities are converted from tons or cubic yards to corresponding one-way trips per phase by assuming 20 tons per truck or 16 cubic yards per truck. Default truck capacities are consistent with CalEEMod User's Guide Appendix A.
3. Trip lengths are based on CalEEMod Appendix D defaults for San Mateo County (urban).
4. Based on information provided by the project applicant, 75,000 square feet of building to be demolished and 22 tons of pavement to be demolished.
5. Based on information provided by the project applicant, 25,828 cubic yards of export volume
6. Based on information provided by the project applicant, 2,364 total round trips for cement trucks for building construction phases.
7. Based on information provided by the project applicant, 1,220 cubic yards of asphalt imported.
8. Emissions were calculated using emission factors from EMFAC2021 Emissions Inventory with the specified settings and fleet and fuel assumptions.

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

References:

California Air Pollution Control Officers Association (CAPCOA). California Emissions Estimator Model (CalEEMod®), Version 2020.4.0. 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 10
Estimated Emissions from Construction Paving Off-Gassing
Draeger's Mixed-Use Project
222 E 4th Ave, San Mateo, CA

Phase	Year	Asphalt-Paved Area (sqft)	Asphalt-Paved Area (acre)	Asphalt Paving Off-Gassing ROG Emission Factor (lb/acre)[1]	Asphalt Paving Off-Gassing ROG Emissions (lb)
Paving	2024	101,910	2.34	2.62	6.13

Notes:
1. Emission factor from CalEEMod User's Guide, Appendix A.

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

References:

California Air Pollution Control Officers Association (CAPCOA). 2020. Appendix A. Available at: http://www.caleemod.com

Table 11
Estimated Emissions from Construction Architectural Coating Off-Gassing
Draeger's Mixed-Use Project
222 E 4th Ave, San Mateo, CA

Inputs

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%	
Fraction of Surface Area	Interior Surfaces	75%	
	Exterior Shell	25%	
Indoor Paint VOC Content		100	g/L
Outdoor Paint VOC Content		150	g/L

Emissions

Land Use[1]	Square Footage (square feet)	Buidling Surface Area (square feet)	Architectural Coating VOC emissions[2] (lb)
Residential Exterior	8,938	24,133	42
Nonresidential Exterior	123,928	247,856	431
Parking	101,910	6,115	28.3
		Total	**501**

Notes:

1. Calculated based on CalEEMod® assumption that 1 gallon of paint covers 180 square feet.

Abbreviations:

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

References:

California Air Pollution Control Officers Association (CAPCOA). 2020. California Emissions Estimator Model (CalEEMod), Version 2020.4.0. Available online at http://www.caleemod.com/

Table 12
Silt Loading Emission Factors
Draeger's Mixed-Use Project
222 E 4th Ave, 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 - Air Resources Board
g - gram(s)
m - meter

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 13
Emission Factors for Entrained Roadway Dust
Draeger's Mixed-Use Project
222 E 4th Ave, 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_{10} (lb/VMT)	0.0022
$PM_{2.5}$ (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 0.01 in of precipitation during the annual averaging period	74
N = number of days in the averaging period	365

Entrained Road Dust Emission Factors	
PM_{10} Emission Factor [lb/VMT]	2.5E-04
$PM_{2.5}$ Emission Factor [lb/VMT]	3.7E-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 ARB 2021. This is slightly higher than the default from CalEEMod® Appendix D Table 1.1 (70 days), which was based on older historic data and would result in slightly higher emissions. 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). 2020. California Emissions Estimator Model (CalEEMod), Version 2020.4.0. Available online at http://www.caleemod.com/

Table 14
Emission Factors for Entrained Roadway Dust
Draeger's Mixed-Use Project
222 E 4th Ave, San Mateo, CA

Entrained Road Dust Emission Factors

PM10 Emission Factor [lb/VMT]	2.5E-04
PM2.5 Emission Factor [lb/VMT]	3.7E-05

Phase	Year	Construction Days	Total VMT (miles)	Total Emissions (lb)	
				PM_{10}	PM_{25}
Demolition	2023	26	11,426	2.8	0.42
Site Preparation	2023	1	32	0.0080	0.0012
Grading / Excavation	2023	71	42,268	10	1.6
Trenching/Foundation	2023	40	1,296	0.32	0.048
Building - Structure	2023	98	97,797	24	3.6
Building - Structure	2024	78	77,843	19	2.9
Building - Exterior	2024	100	99,810	25	3.7
Paving	2024	50	5,860	1.4	0.22

Abbreviations:

lb - pound

VMT - vehicle miles travelled

Table 15
Modeled Emission Rates from Proposed Project Construction Sources
Draeger's Mixed-Use Project
222 E 4th Ave, San Mateo, CA

Phase	Year	Construction Emissions[1] [g/s]					
		Unmitigated Offroad		Mitigated Offroad		Onroad	
		DPM	$PM_{2.5}$	DPM	$PM_{2.5}$	DPM	$PM_{2.5}$
Demolition	2023	1.4E-04	1.3E-04	8.8E-05	8.2E-05	1.1E-06	2.6E-06
Site Preparation	2023	4.2E-06	3.9E-06	4.2E-06	3.9E-06	3.6E-10	1.5E-09
Grading / Excavation	2023	8.1E-04	7.5E-04	2.0E-04	1.8E-04	3.7E-06	9.3E-06
Trenching/Foundation	2023	8.0E-05	7.4E-05	5.8E-06	5.8E-06	1.4E-08	5.9E-08
Building - Structure	2023	7.1E-04	6.5E-04	4.3E-05	4.3E-05	7.0E-06	1.7E-05
Building - Structure	2024	5.1E-04	4.7E-04	3.4E-05	3.4E-05	5.3E-06	1.3E-05
Building - Exterior	2024	8.2E-04	7.6E-04	8.0E-05	7.8E-05	6.8E-06	1.7E-05
Paving	2024	4.3E-05	3.9E-05	4.3E-05	3.9E-05	2.2E-07	6.1E-07

Notes:

1. Construction TAC emissions were estimated from on-site off-road emissions, where all PM_{10} tailpipe emissions are assumed to be DPM (although a portion of this is likely not from diesel sources). On-road emissions from hauling and vendor vehicles were estimated using a modeled trip length of 0.65 miles. These emissions were modeled with the on-site construction sources rather than on separate haul roads. The inclusion of on-road emissions and decision to model these emissions onsite is conservative as the estimated traffic volumes do not exceed the screening levels recommended by BAAQMD (i.e., more than 5,000 vehicles per day and 500 trucks per day) and can be considered minor sources (BAAQMD 2011).

Abbreviations:

BAAQMD - Bay Area Air Quality Management District
CalEEMod® - California Emissions Estimator Model®
CAP - Criteria Air Pollutants
CEQA - California Environmental Quality Act
DPM - diesel particulate matter
$PM_{2.5}$ - particulate matter less than 2.5 microns
g/s - grams/second

References:

California Emissions Estimator Model (CalEEMod). 2020.4.0. CAPCOA. 2020. Available online at: http://www.caleemod.com

California Environmental Quality Act (CEQA) Guidelines. 2017. Bay Area Air Quality Management District (BAAQMD). May. Available online at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en

Recommended Methods for Screening and Modeling Local Risks and Hazards. 2012. BAAQMD. May. Available online at: https://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/risk-modeling-approach-may-2012.pdf?la=en

Table 16
Emergency Generator Moedeling Parameters
Draeger's Mixed-Use Project
222 E 4th Ave, San Mateo, CA

Source	Source Type	Number of Sources	Release Height[2]	Exit Temperature[3]	Exit Flow[3]	Exit Diameter[3]	Annual Average Emission Rate[4]
			(m)	(K)	(m^3/min)	(mm)	(g/s)
Generators[1]	Point	1	2.4	823	71	183	1.80E-04

Notes:

1. One generator rated 500 kilowatts woud be located on the western side of the proposed building.
2. According to the Project Sponsor, generator would exhaust between the first and second floors of the building.
3. Based on the specification sheet for the Generac SD500 model.
4. Annual emissions of DPM and $PM_{2.5}$ were based on 50 hours of non-emergency operation of the emergency generator operating at 100% load.

Abbreviations:

K - Kelvin
m - meter
g/s - grams/second
min - minute
mm - millimeter

Table 17
Construction Modeling Parameters
Draeger's Mixed-Use Project
222 E 4th Ave, San Mateo, CA

Construction Sources

Source[1]	Source Type	Number of Sources	Source Dimension		Release Height	Initial Vertical Dimension[3]	Initial Lateral Dimension[3]
			Value	Units	[m]	[m]	[m]
Construction Equipment	Area [2]	1	800	m^2	5	1.2	-
On-Road Haul Trucks	Volume	Multiple	Width of Road + 6	m	2.55	2.37	Source Dimension/2.15

Notes:

1. Modeled emission rates for emission sources are 1 g/s to generate unit dispersion factors. The complete AERMOD input file can be found in Appendix C.
2. Area source release height assumed to be 5 meters, consistent with SCAQMD LST Guidance.
3. According to USEPA's AERMOD guidance, initial vertical dimension of the modeled construction equipment area sources is the release hegith divided by 4.3. According to the USEPA Haul Road Guidance, the initial vertical dimension for line sources is the top of plume height divided by 2.15, where the top of the plume is equal to 2*Release Height. According to USEPA's AERMOD guidance, the initial horizontal dimension for construction volume sources is the source width divided by 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

United States Environmental Protection Agency (USEPA). 2012. Haul Road Workgroup Final Report Submission to EPA-OAQPS. U.S. EPA Office of Air Quality and Planning Standards, Research Triangle Park, North Carolina. Available at: https://www3.epa.gov/scram001/reports/Haul_Road_Workgroup-Final_Report_Package-20120302.pdf

USEPA. 2012. Haul Road Workgroup Final Report Submission to EPA-OAQPS. U.S. EPA Office of Air Quality and Planning Standards, Research Triangle Park, North Carolina. Available at: https://www3.epa.gov/scram001/reports/Haul_Road_Workgroup-Final_Report_Package-20120302.pdf

USEPA. 2019. 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://www3.epa.gov/ttn/scram/models/aermod/aermod_userguide.pdf

Table 18
Construction and Operational Exposure Parameters
Draeger's Mixed-Use Project
222 E 4th Ave, 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	Averaging Time (AT)	Intake Factor, Inhalation (IF_{inh})
				[L/kg-day]	[years]	[unitless]	[days/year]		[days]	[m^3/kg-day]
Resident	Construction	2023	3rd Trimester	361	0.30	1.0	350	10	25500	0.015
		2023	0-<2	1090	0.70	1.0		10		0.105
		2024	0-<2	1090	1.00	1.0		10		0.149
	Operation	2024	0-<2	1090	1.00	1.0		10		0.149
		2025	2-<16	572	14.00	1.0		3		0.329
		2029	16-30	261	14.00	0.7		1		0.037
Daycare	Construction	2023	0-<2	750	1.00	1.00	250.0	10		0.073
		2024	0-<2	750	1.00	1.00		10		0.073
	Operation	2024	2-<16	415	3.75	1.0		3		0.046
Childcare	Construction	2023	2-<9	415	1.00	1.0		3		0.012
		2024	2-<9	415	1.00	1.0		3		0.012
	Operation	2024	2-<9	415	4.75	1.0		3		0.058

Operation Only Scenario

Receptor Type	Project Phase	Year	Receptor Age Group	Exposure Parameters						
				Daily Breathing Rate (DBR)[1]	Exposure Duration (ED)[5]	Fraction of Time at Home (FAH)[3]	Exposure Frequency (EF)[4]	Age Sensitivity Factor	Averaging Time (AT)	Intake Factor, Inhalation (IF_{inh})
				[L/kg-day]	[years]	[unitless]	[days/year]		[days]	[m^3/kg-day]
Resident	Operation	2024	3rd Trimester	361	0.25	1.0	350	10	25500	0.012
			0-<2	1090	2.00	1.0		10		0.299
			2-<16	572	14.00	1.0		3		0.329
			16-30	261	14.00	0.7		1		0.037

Notes:

1. Daily breathing rates reflect default breathing rates from OEHHA 2015 as follows:
   95th percentile moderate intensity 8-hour daily breathing rate for age 16-70
   9th percentile 8-hour daily breathing rate for age 0-2 years, assuming 2 hours of moderate intensity and 6 hours of light intensity activity
2. Exposure duration for residential receptor is assumed to begin at the start of construction and continue for 30 years of operation.
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 2016) 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 (2016).
4. Exposure frequency reflects default exposure frequency from OEHHA 2015.
5. For the operation-only, the maximally exposed project resident is assumed to be exposed to risks for 30 years, beginning at the start of operation.

Calculation:

IF_{inh} = DBR * FAH * EF * ED * CF / AT
CF = 0.001 (m^3/L)

Abbreviations:

AT - averaging time

IF_{inh} - intake factor

BAAQMD - Bay Area Air Quality Management District
DBR - daily breathing rate
ED - exposure duration
EF - exposure frequency
FAH - fraction of time at home
kg - kilogram
L - liter
m^3 - cubic meter
OEHHA - Office of Environmental Health Hazard Assessment

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

Table 19
Toxicity Values
Draeger's Mixed-Use Project
222 E 4th Ave, 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 - 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
PM - particulate matter
REL - reference exposure level

Reference:

Cal/EPA. 2015. OEHHA/ARB Consolidated Table of Approved Risk Assessment Health Values. May 13.

Table 20
Health Risk Impacts from Stationary Sources for Cumulative Analysis
Draeger's Mixed-Use Project
222 E 4th Ave, San Mateo, CA

Location of MEIR	BAAQMD Facility Number[1]	Facility Name[1]	Source type (used for distance multiplier)[1]	Location[1,2]		Health Risk Screening Values Adjusted by BAAQMD Screening Tool[3]		
				Latitude	Longitude	Lifetime Excess Cancer Risk	Noncancer Chronic HI	$PM_{2.5}$ Concentration
				(degrees)		(in a million)		(μg/m^3)
Off-Site Resident	15342	Eurocraft Auto Body LLC	Auto Body Coating Operation	37.564	-122.318	0.00	0.00	0.000
	20478	Gramercy on the Park Condos	Generators	37.564	-122.321	0.96	0.00	0.001
	9555	San Mateo Lumber Co , Inc	Woodworking Operation	37.563	-122.318	0.00	0.00	1.118
	10327	Sutter Bay Hospitals dba Mills-Peninsula Health	Generators	37.563	-122.324	0.05	0.00	0.018
	NA	Block 21 Development[4]	Emergency Generator	37.566	-122.320	0.09	0.00	0.000
On-Site Resident	15342	Eurocraft Auto Body LLC	Auto Body Coating Operation	37.564	-122.318	0.00	0.00	0.000
	20478	Gramercy on the Park Condos	Generators	37.564	-122.321	0.39	0.00	0.000
	112208	APRO LLC dba United Pacific #2201	Gas Dispensing Facility	37.566	-122.319	0.32	0.00	0.000
	10327	Sutter Bay Hospitals dba Mills-Peninsula Health	Generators	37.563	-122.324	0.05	0.00	0.018
	NA	Block 21 Development[4]	Emergency Generator	37.566	-122.320	0.12	0.00	0.000

Notes:

1. Facility information provided by the BAAQMD except for where facility numbers are absent.
2. Locations are approximate for preliminary assessment of risk.
3. Health impacts 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.
4. Screening level health risk impacts from the foreseeable future development were obtained from the environmental study of this project.

Abbreviations:

μg - microgram
BAAQMD - Bay Area Air Quality Management District
ft - feet
HI - hazard index
m - meter
m^3 - cubic meter
MEI - maximum exposed individual
$PM_{2.5}$ - fine particulate matter

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). 2020. Health Risk Calculator Beta 4.0. March. Available at: https://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/tools/baaqmd-health-risk-calculator-beta-4-0-xlsx.xlsx?la=en&rev=dab7d85a772d45caa9c99e59395bf12d\

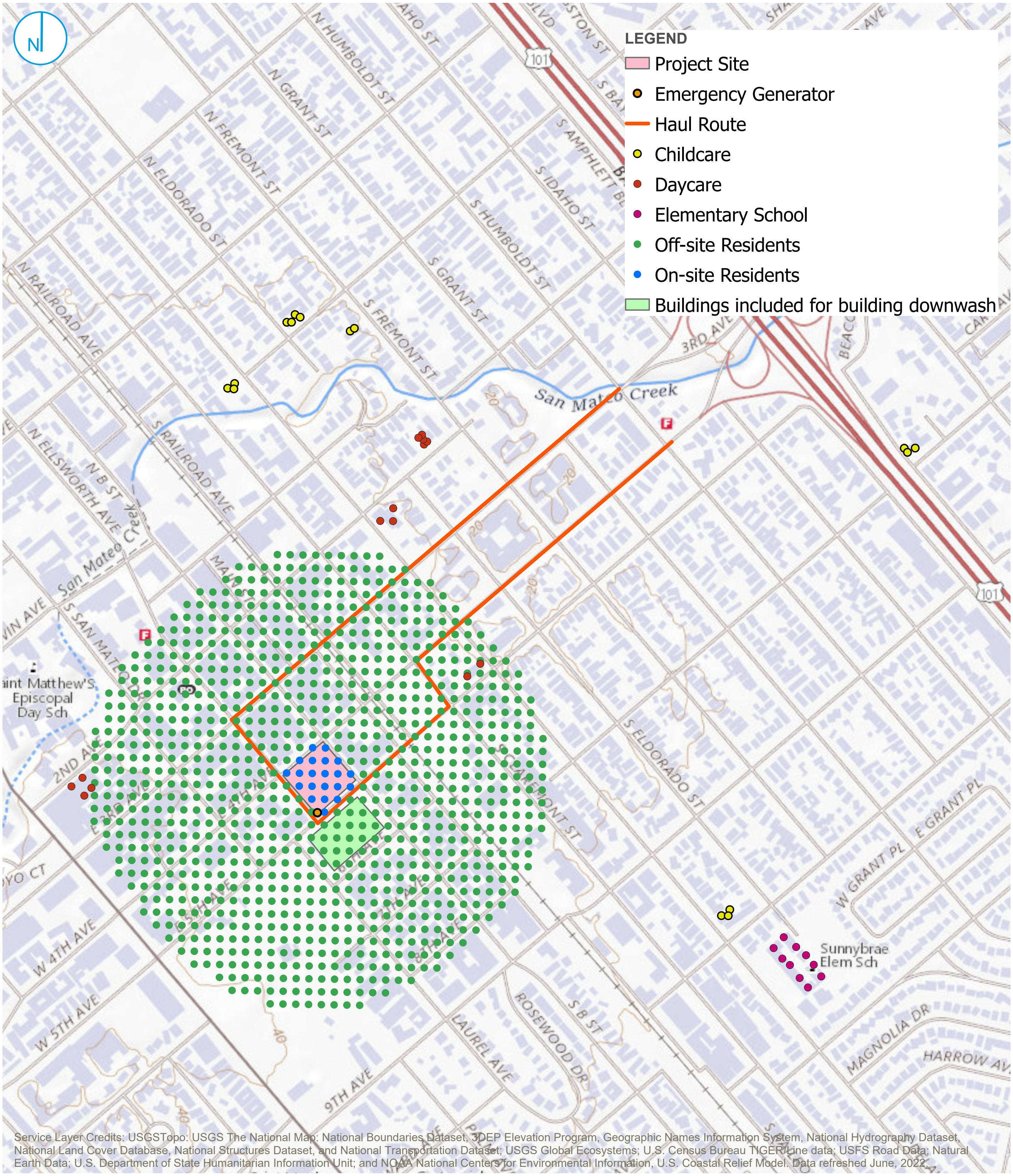
BAAQMD. 2022. Personal Communication from Matthew Hanson to Carlos Ciudad-Real. March 25.

Ramboll. 2022. CEQA Air Quality and Health Risk Assessment for the Block 21 Mixed-Use Project, San Mateo, California (Draft). April 1.

FIGURES

C:\Users\CCiudadReal\Ramboll\DJPA Draeger's Mixed Use 222 E 4th - Documents\GIS\Draegers.aprx\

PROJECT: 1690002413 | DATED: | DESIGNER:



Map Scale: 1:10,490 | Map Center: 122°19'6"W 37°34'1"N

SOURCE AND RECEPTOR SETUP

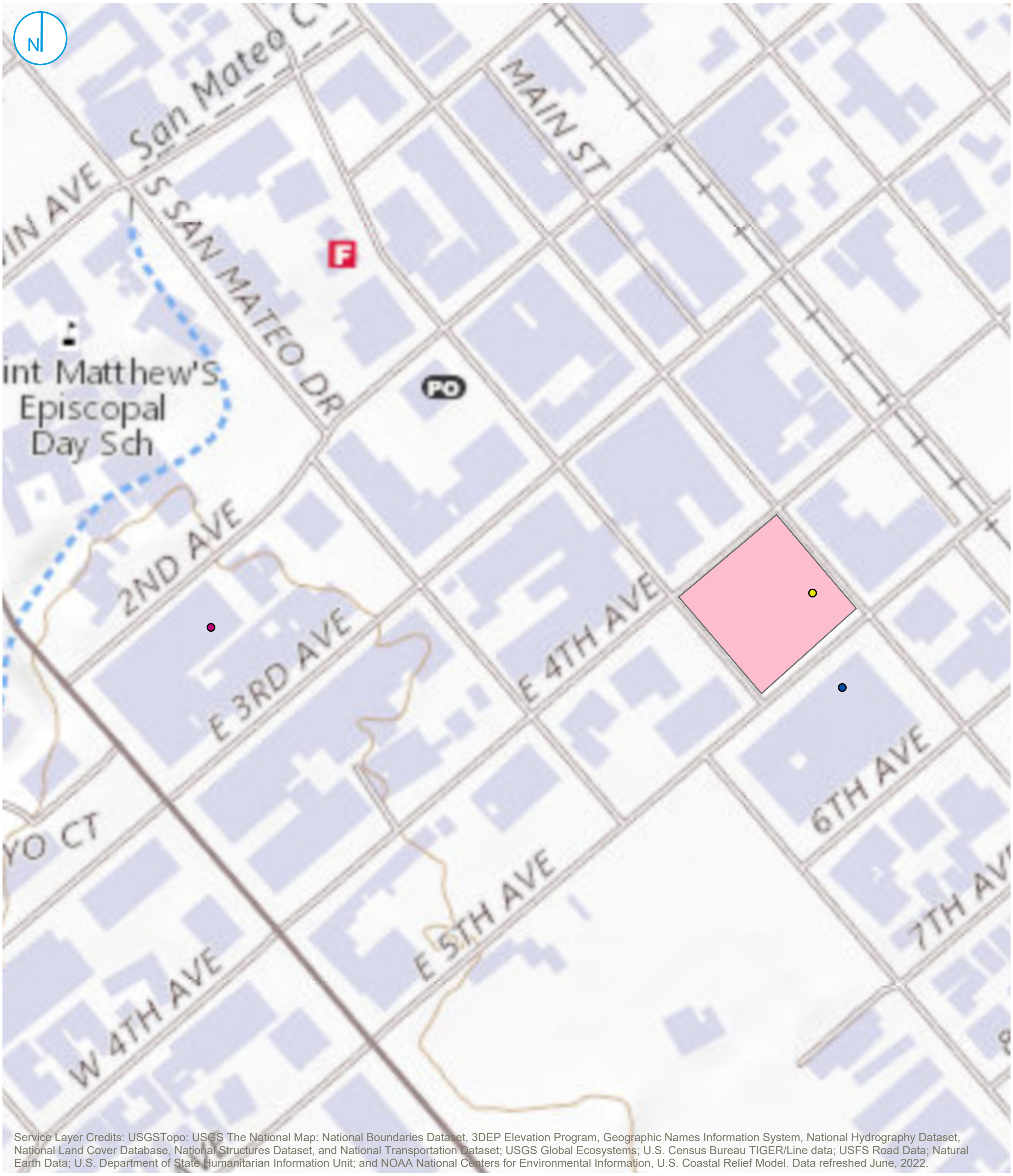
FIGURE 01

RAMBOLL US CONSULTING, INC.
A RAMBOLL COMPANY

222 E 4th Ave Mixed Use Project
500 E 3rd Ave
San Mateo, CA

0 1,000 2,000 Feet

RAMBOLL



PROJECT: 1690002413 | DATED: | DESIGNER: C:\Users\CCiudadReal\Ramboll\DJPA Draeger's Mixed Use 222 E 4th - Documents\GIS\Draegers.aprx\

Map Scale: 1:4,297 | Map Center: 122°19'25"W 37°33'51"N

LEGEND

- Project Site
- Off-Site Daycare Child
- On-Site Resident
- Off-Site Resident

0 1,000 2,000 Feet

LOCATION OF MEIR'S AND MEIS

FIGURE 02

222 E 4th Ave Mixed Use Project
500 E 3rd Ave
San Mateo, CA

RAMBOLL US CONSULTING, INC.
A RAMBOLL COMPANY

APPENDIX A
TRAFFIC STUDY

KITTELSON & ASSOCIATES
155 Grand Avenue, Suite 505
Oakland, CA 94612

Technical Memorandum

July 11, 2022 Project# 24837.004

To: Wendy Lao
City of San Mateo
330 West 20th Avenue
San Mateo, California 94403

From: Allison Woodworth; Anusha Musunuru, PhD; Mychal Loomis, PE

CC: Bethany Lopez, Sue-Ellen Atkinson, Mike Kato

RE: **San Mateo Draeger's Traffic Impact Analysis – Trip Generation Memorandum DRAFT**

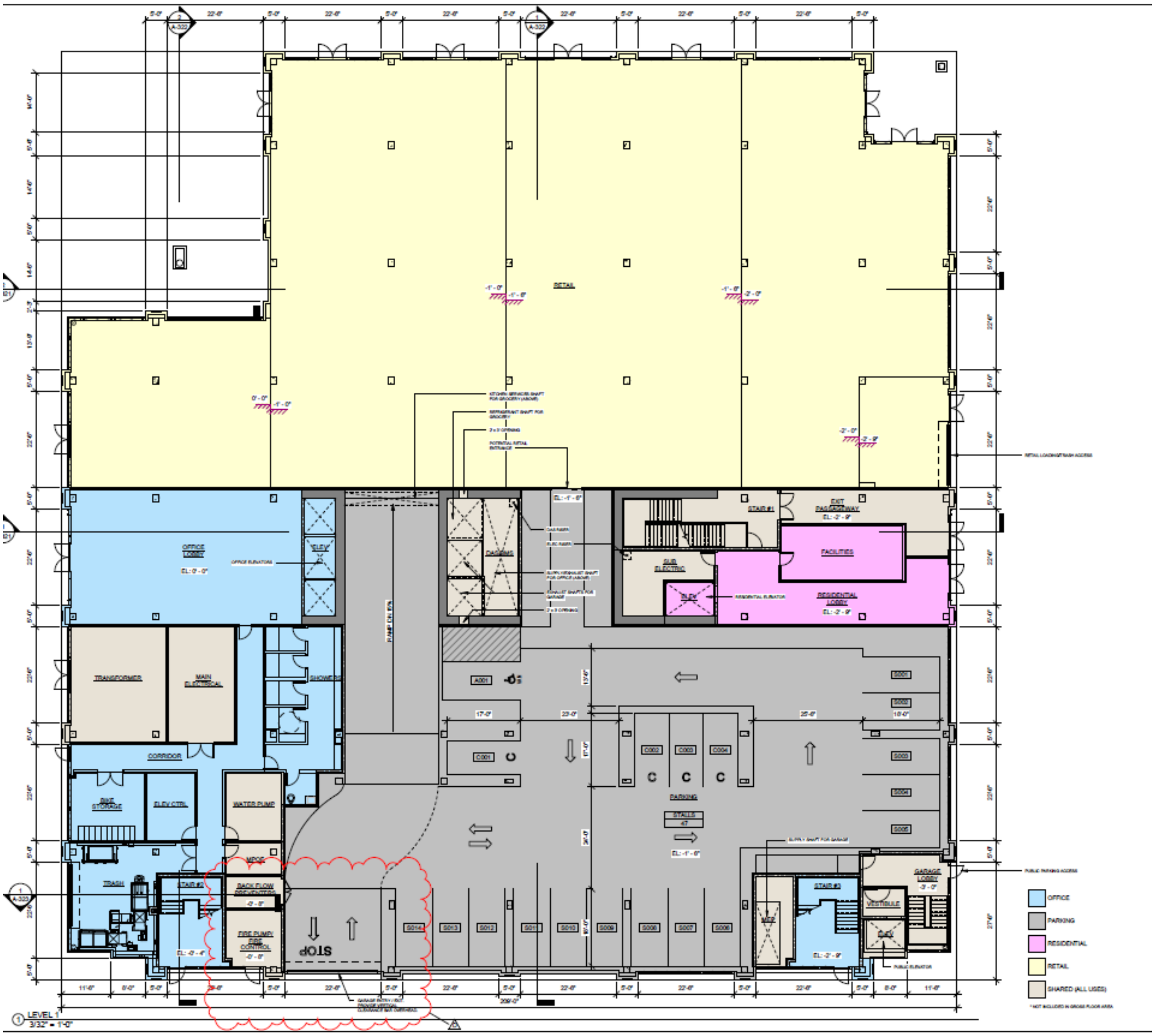
Kittelson & Associates, Inc. (Kittelson) prepared this trip generation memorandum for the 222 East 4th Avenue Project at the existing Draeger's site in San Mateo, California (Project). The Project proposes to redevelop the existing Draeger Market into a mixed-use building with office, residential, and retail space. Site access will be accommodated for personal and delivery vehicles, bicycles, pedestrians.

Project Description

Lane Partners is proposing to replace the existing 60,965 square feet Draeger's market located at 222 East 4th Avenue with a 5-story, approximately 155,052 square feet mixed-use building with two levels of below grade parking. The building would consist of approximately 104,722 square feet of office space, 17,658 square feet of retail space, and 8,971 square feet of residential space for 10 below-market-rate units at the lower income level. The retail floor would be located on the ground floor, the office space would be spread throughout the first four floors, and the residential space would be split between the ground floor (i.e., residential lobby/elevator) and the fifth floor living areas. The ground floor would also include 12,392 square feet of covered parking area and two levels (89,519 square feet) below grade for a total of 239 parking spaces and 50-60 valet parking spaces. The Project site plan is shown in Figure 1.

The Project site is in downtown San Mateo and is zoned as Central Business District/Residential Overlay District – Mixed Use (CBD). The site is also in a designated "Transit Oriented Development" area as it is within a half mile of the San Mateo Caltrain station.

Figure 1: Proposed Mixed-Use Project Site Plan



Source: https://www.cityofsanmateo.org/4386/222-E-4th-Ave-Draegers

Trip Generation Calculation

ITE DEVELOPMENT LAND USE CODES

Trip generation is a key consideration for determining local effects of the project on the transportation network. Trip generation rates published in the Institute of Transportation Engineers (ITE) Trip Generation Manual 11th Edition were used to estimate the number of trips the mixed-use proposed project would generate. ITE trip estimates are tied to specific land use codes. The ITE land use codes found to be most applicable to the Project are listed below.

- Supermarket (ITE 850)
- General Office Building (ITE 710)
- Affordable Housing (ITE 223)

In addition, this Project is assumed to be in the '**Dense Multi-Use Urban**' context, considered by ITE to be an area that has diverse and interacting complementary land uses with good pedestrian connectivity, and convenient and frequent transit service. This is consistent with the Transit Oriented Development overlay and CBD zoning for the project site for which the San Mateo Municipal code promotes mixed-uses and pedestrian activity. Table 1 below shows the trip generation rates used for the analysis.

Table 1: Trip Generation Rates, ITE Trip Generation Manual 11th Edition

Land Use	ITE Code	Land Use Context	Units*	Weekday Daily Rate	Weekday AM Peak Hour			Weekday PM Peak Hour		
					Rate	In %	Out %	Rate	In %	Out %
Retail (Supermarket)	850	Dense Multi-Use Urban	1000 SF GFA	107.42	4.99	55%	45%	9.32	50%	50%
Office Space	710	Dense Multi-Use Urban	1000 SF GFA	none provided	0.84	87%	13%	0.87	16%	84%
Office Space	710	General Urban/ Suburban[1]	1000 SF GFA	Fitted Curve[2]						
Affordable Housing	223	Dense Multi-Use Urban	DU	3.83	0.5	29%	71%	0.36	61%	39%

*: GFA – Gross Floor Area, SF – Square Feet, DU – Dwelling Units
[1]: The weekday daily rate for General Urban/Suburban land use was used for Office Space (ITE 710) as no vehicle rate was provided for the Dense Multi-Use Urban land use context.
[2]: ITE 710 (General Urban/Suburban) daily rate fitted curve equation: $Ln(T) = 0.87\ Ln(X) + 3.05$

TRIP GENERATION CALCULATION

Trip generation estimates for this Project took into consideration three types of trips:

- **Primary or New**: These are the trips whose specific purpose was to visit the site. Primary trip rates were generated using ITE Trip Generation Manual 11th Edition.

- **Pass-by**: Drivers already on their way to a destination that stop temporarily at the Project Site without a major roadway diversion are considered making "pass-by" trips. Supermarket 850 is the only land use code in ITE Trip Generation Manual 11th Edition for which a pass-by rate was supplied. The 24% average pass-by rate for this land use was only applicable for Weekday PM Peak, resulting in a reduction of 39 trips.

- **Internal**: Trips that occur between land-uses on a multi-use project site and which can be made without using the off-site street network are considered "internal trips". Internal trips for this project can be made by walking between uses. Internal capture was estimated using methodology from NCHRP Report 684 – Enhancing Internal Trip Capture for Mixed-Use Developments.

The existing Draeger's market was included as existing trip credits as it currently generates trips to and from the site. Pass-by trips were also applied to the existing supermarket use.

Table 2 provides a summary of the proposed project's trip generation. As shown in the table, the net new trip generation would be a reduction of 3,645 average daily weekday trips with a reduction of 135 new trips occurring the morning peak and a reduction of 231 new trips occurring the afternoon peak.

Table 2: Proposed Project Net Trip Generation Calculations

Land Use	Size	Weekday Daily Trips	Weekday AM Peak Hour			Weekday PM Peak Hour		
			In	Out	Total	In	Out	Total
Proposed Project								
Retail (Supermarket)	17.6 KSF	1,891	48	40	88	82	82	164
Office Space	104.7 KSF	1,208	77	11	88	15	76	91
Affordable Housing	10 DU	38	1	4	5	2	2	4
Internal Capture		-233	-6	-6	-12	-11	-11	-22
Pass-by reduction (24% PM only)		0	0	0	0	-18	-18	-36
Total Proposed Project Trips		***2,904***	***120***	***49***	***169***	***70***	***131***	***201***
Existing Project								
Retail (Supermarket)	61 KSF	6,549	167	137	304	284	284	568
Pass-by reduction (24% PM only)		0	0	0	0	-68	-68	-136
Total Existing Trips		***6,549***	***167***	***137***	***304***	***216***	***216***	***432***
Net New Project Trips		**-3,645**	**-47**	**-88**	**-135**	**-146**	**-84**	**-231**

Conclusion

The Proposed Project would generate less daily and peak hour trips than what is currently being generated by the existing Draeger's supermarket. The proposed mixed-use site would therefore not affect the operations of the roadway network and no further traffic analysis is required.

APPENDIX B
AERMOD INPUT FILES (PROVIDED ELECTRONICALLY)