Appendix D

Freeway Health Risk Assessment

942 NORTH BROADWAY PROJECT

Freeway Health Risk Assessment

Prepared for

July 2018

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ESA

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EXECUTIVE SUMMARY

Public Resources Code (PRC) Section 21155.1(a)(6)(C) requires that the transit priority project not result in a risk of a public health exposure at a level that would exceed the standards established by any state or federal agency. The purpose of this Freeway Health Risk Assessment (HRA) is to evaluate the potential health risk impacts to the future Project residents from freeway toxic air contaminant (TAC) emissions (i.e., diesel particulate matter) from SR-110. In 2012, the City of Los Angeles Planning Commission issued Zoning Information No. 2427, *Freeway-Adjacent Advisory Notice for Sensitive Uses*, regarding the need to consider the public health implications of certain freeway-adjacent projects.[1] The Advisory Notice recommends projects that place sensitive receptors in proximity (within 1,000 feet) to a freeway prepare a Freeway HRA. The Advisory Notice is informational in nature and does not impose any additional land use or zoning regulations; it is not a prohibition on development near freeways. Accordingly, for informational purposes, a Freeway HRA has been prepared for the Project. The health risk impacts to the future Project residents are compared to the South Coast Air Quality Management District (SCAQMD) numerical thresholds for health risk impacts. The findings of the analyses are as follows:

- The future on-site Project residents would be provided an adequate health-based separation distance from SR-110 which is located approximately 620 feet northwest from the Project Site. With the use of maximum efficiency report value (MERV) 13 indoor air filtration in regularly occupied spaces of residential uses with mechanically ventilated buildings, as required by Los Angeles Municipal Code (LAMC) Section 99.04.504 for residential uses within 1,000 feet of a freeway, the incremental increase in cancer and non-cancer impacts would not exceed the SCAQMD numerical thresholds for health risk impacts. Therefore, the Project would meet the requirements of PRC Section 21155.1(a)(6)(C).

[1] City of Los Angeles, Zoning Information No. 2427, Freeway Adjacent Advisory Notice for Sensitive Uses, Effective November 8, 2012, http://zimas.lacity.org/documents/zoneinfo/ZI2427.pdf. Accessed May 2018.

1.0 Introduction

1.1 Purpose of Study

In order for a project to be declared a Sustainable Communities Project, Public Resources Code (PRC) Section 21155.1(a)(6)(C) requires that the transit priority project not result in a risk of a public health exposure at a level that would exceed the standards established by any state or federal agency. The purpose of this Freeway Health Risk Assessment (HRA) is to quantify the potential air pollutant emissions from State Route 110 (SR-110 Freeway) that may result in a health risk that would exceed applicable standards to future residents that may occur with the implementation of the proposed 942 N. Broadway Project (Project) located in the City of Los Angeles.

The Freeway HRA evaluates the potential health risk impacts to the future Project residents from freeway toxic air contaminant (TAC) emissions (i.e., diesel particulate matter). In 2012, the City of Los Angeles Planning Commission issued Zoning Information No. 2427, *Freeway-Adjacent Advisory Notice for Sensitive Uses*, regarding the need to consider the public health implications of certain freeway-adjacent projects.[2] The Advisory Notice is informational in nature and does not impose any additional land use or zoning regulations; it is not a prohibition on development near freeways. In preparing this Advisory Notice, Planning staff collected research and studies documenting health impacts to occupants living and/or working near freeways. As part of this Advisory Notice, the City Planning Commission advises that projects that place sensitive receptors in proximity (within 1,000 feet) to a freeway prepare a Freeway HRA as a supplemental technical report. The results of the HRA would provide information to the City and Project Applicant regarding health impacts and allow the applicant to make an informed decision about site planning and design. Depending on the results of the Freeway HRA, the City may consider requirements including enhanced filtration or adjustments to building orientation, operable windows and screening with vegetation. The Project site is located within 1,000 feet of State Route 110 (SR-110) Freeway, which is within the Advisory Notice area where a Freeway HRA is recommended.

The Advisory Notice states that the City may, at its discretion, impose a requirement that any project proposing sensitive land uses within 1,000 feet of a freeway shall be required to install and maintain air filters meeting or exceeding the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) Standard 52.2 Minimum Efficiency Reporting Value (MERV) of 11 or higher. Subsequent to the issue date of this Advisory Notice, the City adopted a more stringent pollutant control requirement in Los Angeles Municipal Code (LAMC) Section

2 City of Los Angeles, Zoning Information No. 2427, Freeway Adjacent Advisory Notice for Sensitive Uses, Effective November 8, 2012, http://zimas.lacity.org/documents/zoneinfo/ZI2427.pdf. Accessed May 2018.

99.04.504, which requires MERV 13 in regularly occupied spaces of residential uses with mechanically ventilated buildings within 1,000 feet of a freeway. The MERV 13 requirement is incorporated into this analysis as regulatory compliance for residential uses with mechanically ventilated buildings. The ASHRAE 52.5 standard provides removal efficiencies for mechanical filtration. According to the ASHRAE 52.2 standard, MERV 13 filters have reduction efficiencies of 50, 85, and 90 percent for particles with diameter ranges of 0.3 to 1.0 micrometers (µm), 1.0 to 3.0 µm, and 3.0 to 10.0 µm, respectively.[3] Use of the MERV 13 filters is assumed in the analysis to conservatively result in a 50 percent reduction efficiency for particles of this size range.

Accordingly, for informational purposes, a Freeway HRA has been prepared for the Project. The Project is located in the South Coast Air Basin, which is under the jurisdiction of the South Coast Air Quality Management District (SCAQMD) for the implementation of state and federal air quality plans and attainment of the state and federal ambient air quality standards. Therefore, the SCAQMD numerical thresholds for health risk impacts are utilized to determine whether the Project would create a risk of public health exposure at a level that would exceed the standards set forth by a state or federal agency. Supporting Freeway HRA calculation worksheets and technical data used in this analysis are provided in **Appendix A**.

1.2 Project Description

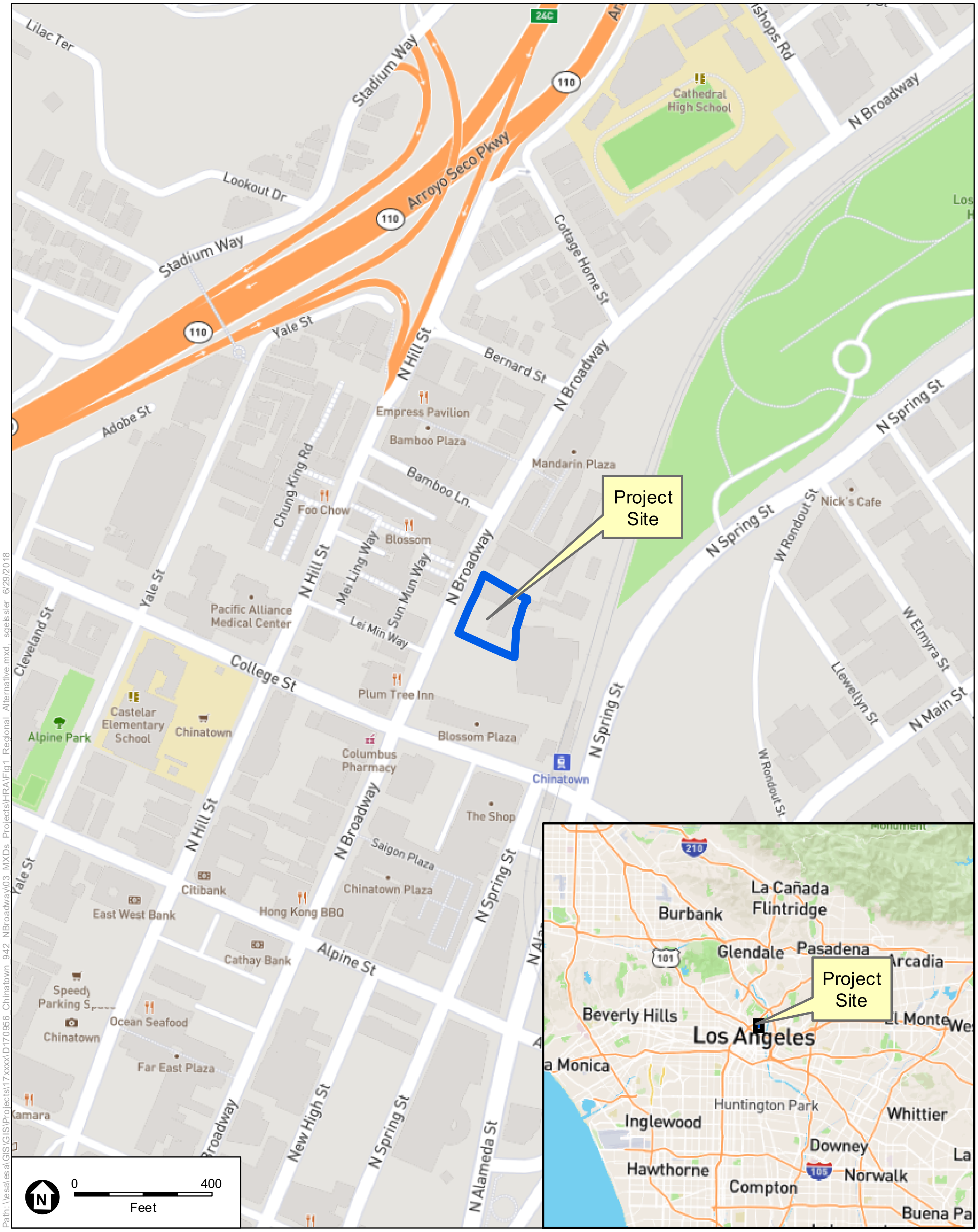
The Project Applicant proposes to redevelop the site located at 942 N. Broadway in the City of Los Angeles, which is in the Chinatown neighborhood. The location of the Project site and nearby vicinity is shown in **Figure 1**, *Regional and Vicinity Location Map*. As shown, the Project is 620 feet to the south of SR-110. SR-110 and Interstate 110 are 31.82 miles in length, consisting of the Arroyo Seco Parkway, the portion of the freeway north of Downtown Los Angeles, and the Harbor Freeway, the portion of the freeway south of Downtown Los Angeles, that serves as a commuter route through the heart of South Los Angeles that connects San Pedro with Downtown Los Angeles and Pasadena. The City of Los Angeles Ordinance No. 107,022, effective September 23, 1953, amended Municipal Code Section 80.36.6 to restrict the gross weight of vehicles to a maximum of 6,000 pounds on the Arroyo Seco Parkway from the Hollywood Freeway (which ends at Route 101) to the city limits of South Pasadena. Therefore, large trucks over 6,000 pounds are restricted from using the portion of the Arroyo Seco Parkway in the vicinity of the Project Site (unless authorized by the Public Utilities Commission).[4]

The Project would remove the existing multi-tenant commercial building that includes retail, restaurant, and office uses as well as related surface parking and would construct an approximately 211,725 square foot, 27-story, mixed-use building that would include 178 mixed-income residential units and approximately 36,805 square feet of commercial and office space. The Project would provide 270 parking spaces. The Project site plan is shown in **Figure 2,** *Project Site Plan*. The Project site is bounded to the west by North Broadway, to the south by the

[3] American Society of Heating, Refrigerating and Air-Conditioning Engineers, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size, 2015 Supplement, https://www.ashrae.org/File%20Library/Technical%20Resources/Standards%20and%20Guidelines/Standards%20Addenda/52_2_2012_2015Supplement.pdf. Accessed March 2018.

[4] California Department of Transportation, Special Route Restrictions, http://www.dot.ca.gov/trafficops/trucks/restrict-list.html. Accessed July 2018.

recently constructed five-story Blossom Plaza mixed-use residential development, and commercial uses and surface parking to the north as shown in **Figure 3**, *Aerial Photograph of Project Site and Vicinity*.



SOURCE: ESRI, 2018.

942 N. Broadway Project

Figure 1
Regional and Vicinity Location Map

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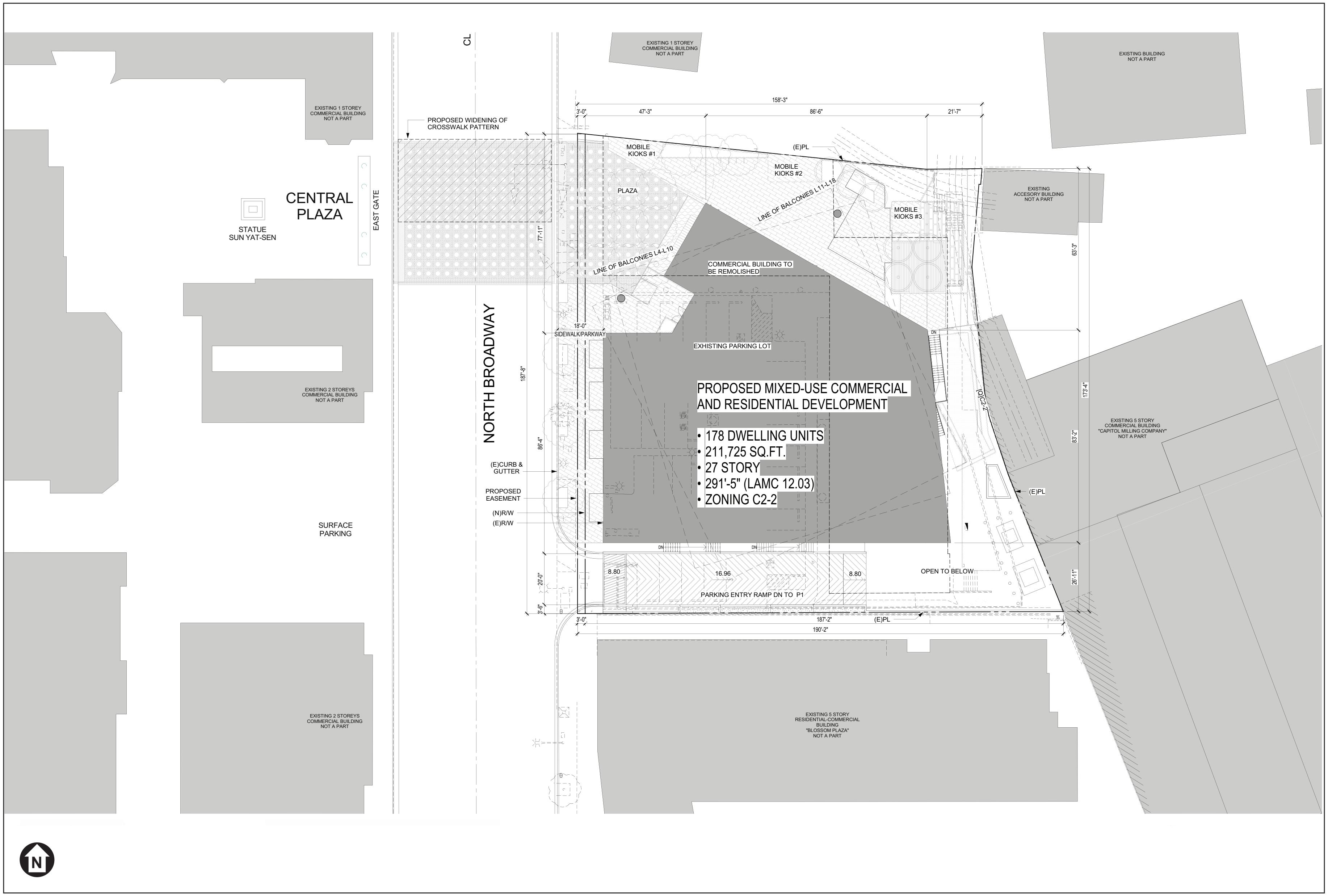
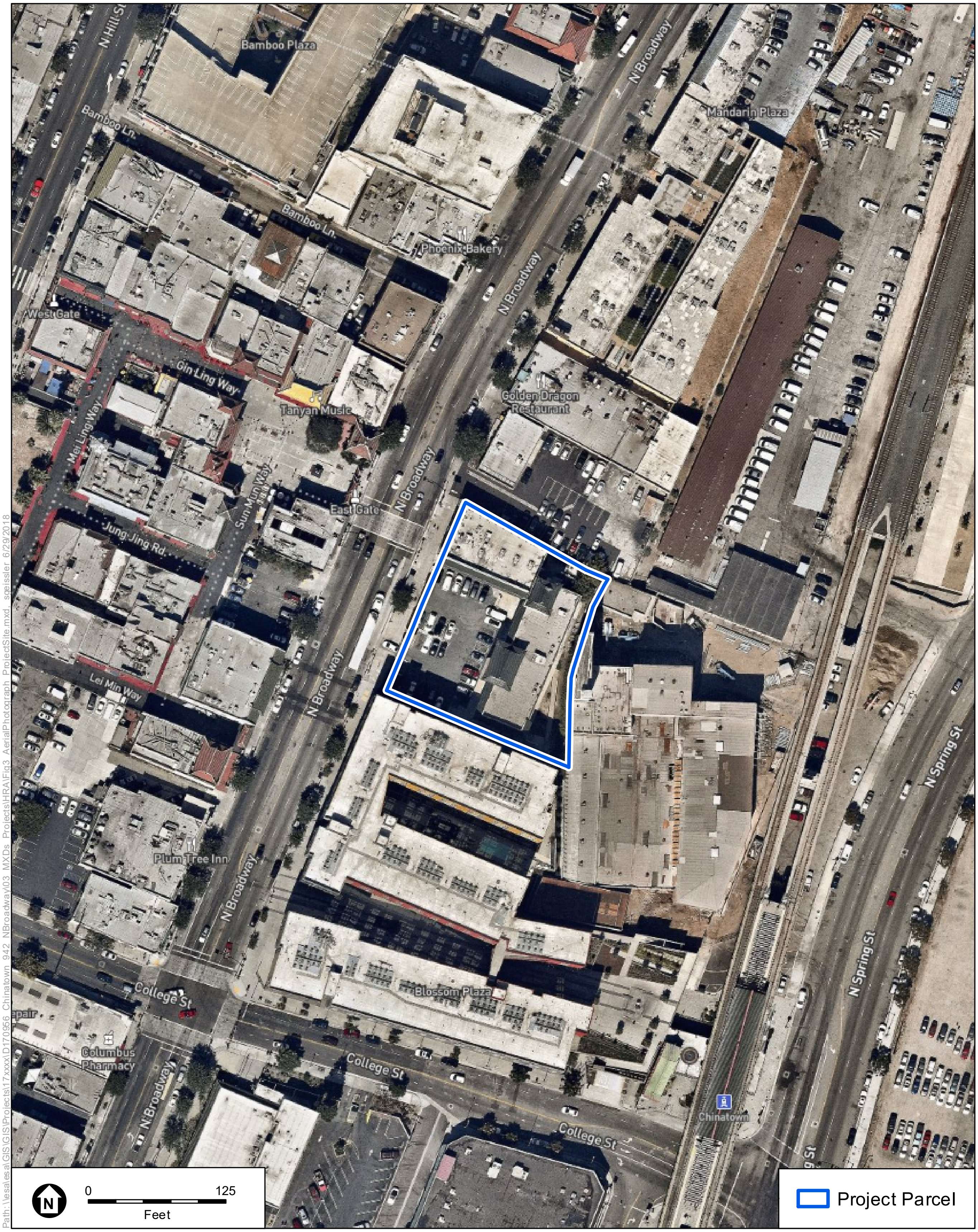


SOURCE: TF Broadway LP; Chris Dikeakos Architectural Corporation; SWA, 2018

942 N. Broadway Project

Figure 2
Project Site Plan



Path: \\esa\esa\GIS\GIS\Projects\17xxx\D170956_Chinatown_942_NBroadway\03_MXDs_Projects\HRA\Fig3_AerialPhotograph_ProjectSite.mxd, sgeissler 6/29/2018

SOURCE: OpenStreetMap, 2018.

942 N. Broadway Project

Figure 3
Aerial Photograph of Project Site and Vicinity

ESA

2.0
Environmental Impacts

2.1 Freeway Health Risk Assessment

The Project Applicant is voluntarily conducting a Freeway HRA in light of the City's Zoning Information No. 2427, *Freeway-Adjacent Advisory Notice for Sensitive Uses*[5] and to demonstrate that the Project would not result in a health risk impact per PRC Section 21155.1(a)(6)(C). Based on the numerical criteria set forth by the SCAQMD, the Project would result in a potential health risk impact to future residences of the Project if the following would occur:

- The Project would expose sensitive residential receptors on the Project Site to Freeway TAC emissions (i.e., diesel particulate matter) that would exceed an incremental increase in cancer risk of ten in one million or a cancer burden greater than 0.5 excess cancer cases (in areas greater than or equal to 1 in 1 million) or a non-cancer Hazard Index of 1.0.[6]

2.2 Methodology

2.2.1 Freeway Toxic Air Contaminant Emissions

Source Identification

The California Department of Transportation (Caltrans) Performance Measurement System (PeMS) collects and maintains traffic volume counts for vehicles traversing the California state highway system. Consistent with SCAQMD recommendations, the roadway segment lengths analyzed in this study were determined based on freeway segments located within an approximate 0.25-mile radius of the Project Site boundaries. A quarter-mile radius was selected based on SCAQMD recommendations for siting sources of toxics in relation to sensitive receptors (schools, residential uses).[7] **Table 1**, *State Route 110 Freeway and Ramp Traffic Volumes*, presents the annual average daily traffic volumes (AADT) and peak hour traffic volumes for the freeway segments considered in this assessment. The segments chosen are representative of traffic conditions the Project Site is likely to experience. The traffic volumes used in the HRA were provided from PEMS for June 2017 through May 2018. The average volumes for SR-110

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5 City of Los Angeles, Zoning Information No. 2427, Freeway Adjacent Advisory Notice for Sensitive Uses, Effective November 8, 2012, http://zimas.lacity.org/documents/zoneinfo/ZI2427.pdf. Accessed May 2018.

6 South Coast Air Quality Management District, SCAQMD Air Quality Significance Thresholds, March 2015, http://www.aqmd.gov/docs/default-source/ceqa/handbook/scaqmd-air-quality-significance-thresholds.pdf?sfvrsn=2. Accessed July 2018.

7 South Coast Air Quality Management District, Air Quality Issues in School Site Selection, May 2007, http://www.aqmd.gov/docs/default-source/planning/air-quality-guidance/school_guidance.pdf. Accessed May 2018.

on- and off-ramps in proximity to the Project Site were provided by Caltrans data.[8] For the purposes of evaluating health risk impacts, 2016 traffic volumes were projected through 2051 with a 1 percent annual growth rate.

TABLE 1
STATE ROUTE 110 FREEWAY AND RAMP TRAFFIC VOLUMES

Sources/Freeway Segment	Post Mile	AADT [a]	Peak Hour
Freeway – Mainline			
1. Northbound SR-110 Freeway-Stadium Mainline Segment	24.39	3,770	322
2. Southbound SR-110 Freeway-Stadium Mainline Segment	24.39	3,471	190
Freeway On/Off Ramps			
3. Southbound On-ramp from Stadium Way	24.352	291	16
4. Northbound Off-ramp to Stadium Way/Hill (Stadium Way)	24.307	159	14
5. Southbound Off-ramp to Hill Street	24.563	605	33
6. Northbound On-ramp from Hill Street	24.563	600	33
7. Northbound Off-ramp to Stadium Way/Hill (Hill)	24.307	159	14

NOTES:
[a] For Mainline Segments, AADT represents truck volumes. For On/Off ramps, AADT represents estimated truck volumes, where it was assumed approximately 5 percent of vehicle volumes are trucks.

SOURCE: Caltrans, PEMS 2018; Caltrans 2016. Refer to **Appendix A** for additional detail.

Emissions Calculations

Truck traffic and speed data were obtained from the Caltrans PeMS database for the SR-110 mainline. Truck traffic data for on-and off-ramps was obtained from Caltrans PeMS as well as from traffic count data from Caltrans Traffic Census Program. On- and off-ramp truck speeds were set at 15 miles per hour and mainline segments were set at a maximum of 55 miles per hour or less for those hours with mainline speeds less than 55 miles per hour. Truck traffic data for June 2017 through May 2018 were obtained from Caltrans for the segments of the SR-110 mainline and on- and off-ramps within a quarter-mile of the Project Site.[9] Hourly traffic data were also obtained to account for temporal variation of traffic flow. An annual traffic growth rate of one percent was applied to account for future traffic flow.

Emission factors were obtained from the CARB EMFAC2017 emissions model. EMFAC2017 was run for years 2022 through 2050 to identify the average DPM emission factors from heavy-

[8] Caltrans, 2016 Ramp Volumes on the California State Freeway System District 7 (Los Angeles and Ventura Counties).

[9] As previously discussed, large trucks over 6,000 pounds are restricted from using the portion of SR-110 in the vicinity of the Project Site (unless authorized by the Public Utilities Commission). Truck traffic from Caltrans indicates there are substantially fewer trucks traveling on the portion of SR-110 in the vicinity of the Project Site compared to other nearby freeways such as the U.S. 101 and Interstate 5. However, the number of large trucks on this portion of SR-110 is not zero. Therefore, large trucks are included in the analysis based on the Caltrans truck traffic data.

duty diesel trucks typical of SR-110 over the residential exposure duration for the Project's future residents assuming exposure duration of 30 years. The EMFAC2017 model does not calculate emission factors beyond 2050; therefore, year 2050 emission factors were used to represent year 2051 emission factors. Year 2022 emission factors were used to estimate DPM concentrations and health risks for the third trimester, while 2022 to 2023 emission factors were used to estimate DPM concentrations and health risks for the first two years of the health risk calculation. The 2024 to 2037 emission rates were used to calculate DPM concentrations and health risks for children from ages two through 16. The 2038 to 2051 emission factors were used to calculate DPM concentrations and health risks for ages 17 through 30.

As discussed previously, according to the ASHRAE 52.2 standard, MERV 13 filters have reduction efficiencies of 50, 85, and 90 percent for particles with diameter ranges of 0.3 to 1.0 micrometers (µm), 1.0 to 3.0 µm, and 3.0 to 10.0 µm, respectively.[10] According to CARB, diesel vehicle exhaust consists of particulate matter that is 100 percent PM10 and 92 percent PM2.5.[11] According to research cited by CARB in its *Technical Advisory – Strategies to Reduce Air Pollution Exposure Near High-Volume Roadways*, a study by Stephens and Siegel found that achieving substantial removal of ultrafine particles (UFPs) in real residential environments (>50 percent removal efficiency) requires higher efficiency filters (e.g., MERV 13 or higher).[12] Furthermore, the Southern California Association of Governments (SCAG) has recommended that residential, school, and other sensitive uses located within 500 feet of freeways install MERV 13 filters to reduce DPM consistent with CARB's *Air Quality and Land Use Handbook* (June 2005).[13] As a conservative assumption, this assessment assumes a 50 percent control efficiency even though the portion of DPM between 1.0 µm and 3.0 µm would be controlled at 85 percent and the portion of DPM between 3.0 µm and 10.0 µm would be controlled at 90 percent.

Air filtration systems with filters have limitations for reducing indoor air pollution. For example, the use of MERV 13 filters would have reduced DPM filtration effectiveness when individual Project residents voluntarily decide to have their windows or doors open. Also, MERV 13 filters would not reduce DPM concentrations in open space or other common space areas that do not have air filtration systems with filters installed. Nonetheless, as indicated by CARB and SCAG, the use of MERV 13 filters is an effective method to minimize residential exposure to freeway

[10] American Society of Heating, Refrigerating and Air-Conditioning Engineers, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size, 2015 Supplement, https://www.ashrae.org/File%20Library/Technical%20Resources/Standards%20and%20Guidelines/Standards%20Addenda/52_2_2012_2015Supplement.pdf. Accessed May 2018.

[11] California Air Resources Board, Speciation Profiles Used in ARB Modeling, PMSIZE, Refer to PM Profile Number 425 (diesel vehicle exhaust), https://www.arb.ca.gov/ei/speciate/pmsizeprofile21march17.zip. Accessed May 2018.

[12] California Air Resources Board, Technical Advisory – Strategies to Reduce Air Pollution Exposure Near High-Volume Roadways, https://www.arb.ca.gov/ch/rd_technical_advisory_final.PDF. Accessed May 2018.

[13] Southern California Association of Governments, 2012 RTP/SCS PEIR, Appendix G, Measure AQ19.b.iv, http://rtpscs.scag.ca.gov/Documents/peir/2012/final/2012fPEIR_AppendixG_ExampleMeasures.pdf. Accessed May 2018. Also see: CARB, Air Quality and Land Use Handbook, California Air Resources Board, Air Quality and Land Use Handbook, 2005, https://www.arb.ca.gov/ch/handbook.pdf. Accessed May 2018.

DPM emissions and the conservative assumptions discussed above reflect a potential reduced control efficiency from the filters.

Dispersion Modeling

Air dispersion models are often used to simulate atmospheric processes for situations where the spatial scale is in the tens of meters to tens of kilometers. Selection of air dispersion models depends on many factors, such as the characteristics of emission sources (point, area, volume, or line), the type of terrain (flat or complex) at the emission source locations, and source-receptor relationships. Air dispersion modeling was conducted using the American Meteorological Society/Environmental Protection Agency Regulator Model (AERMOD). AERMOD is a steady state, multiple-source, Gaussian dispersion model designed for use with emission sources situated in terrain where ground elevations can exceed the release heights of the emission sources (i.e., complex terrain). AERMOD is the U.S. EPA's regulatory dispersion model specified in the Guideline for Air Quality Methods (Code of Federal Regulations, Title 40, Part 51, Appendix W). AERMOD is recommended for use by the SCAQMD, which has established its own modeling guidance for the model.[14]

The parameters used for dispersion modeling are based on the latest SCAQMD modeling guidance for AERMOD.[15] The remaining portion of this section describes the assumptions used to conduct the AERMOD dispersion modeling analysis.

Emission Sources

Within AERMOD, diesel truck traffic (based on truck traffic data from Caltrans) was modeled as a line source comprised of adjacent volume sources along the stretch of SR-110 that is located approximately within a quarter mile of the Project boundary. Also, northbound and southbound SR-110 on and off ramps were modeled as line sources comprised of volume sources. Based on U.S. EPA guidance,[16] the plume height was determined by multiplying the vehicle height (assumed 3 meters for a diesel truck) by a factor of 1.7, therefore, diesel exhaust emissions were modeled using a plume height of 5.1 meters. The release height was determined by multiplying the plume height by 0.5, thus, 2.55 meters was used in the analysis.[17] For the SR-110 mainline segments, the plume width used for each adjacent volume sources were dependent on the number of lanes for each segment. The freeway width was determined by measuring the approximate width of the freeway lanes. The plume width was determined by adding 6 meters to the freeway

14 South Coast Air Quality Management District, Modeling Guidance for AERMOD, http://www.aqmd.gov/home/air-quality/air-quality-data-studies/meteorological-data/modeling-guidance. Accessed May 2018.

15 South Coast Air Quality Management District, Modeling Guidance for AERMOD, http://www.aqmd.gov/home/air-quality/air-quality-data-studies/meteorological-data/modeling-guidance. Accessed May 2018.

16 United States Environmental Protection Agency, Haul Road Workgroup Final Report, 2011, https://www3.epa.gov/scram001/reports/Haul_Road_Workgroup-Final_Report_Package-20120302.pdf. Accessed May 2018.

17 United States Environmental Protection Agency, Haul Road Workgroup Final Report, 2011, https://www3.epa.gov/scram001/reports/Haul_Road_Workgroup-Final_Report_Package-20120302.pdf. Accessed May 2018.

width.[18] The stretch of the freeway where dispersion modeling was conducted for the Project is shown in **Figure 4,** *Dispersion Modeling of State Route 110*.

Meteorological Data

The AERMOD dispersion modeling program requires the following hourly surface meteorological data: wind speed, wind direction, ambient temperature, and opaque cloud cover. These meteorological variables are used to estimate air dispersion of pollutants in the atmosphere. Wind speed determines how rapidly pollutants are diluted and influences the rise of the emission plume in the air, thus affecting downwind pollutant concentrations. Wind direction determines where pollutants will be transported. The opaque cloud cover and upper air sounding data are used in calculations to determine other important dispersion parameters. These include atmospheric stability (a measure of turbulence and the rate at which pollutants disperse laterally and vertically) and mixing height (the vertical depth of the atmosphere within which dispersion occurs). The greater the mixing height is, the larger the volume of atmosphere is available to dilute the pollutant concentration.

The dispersion modeling for the Project utilized pre-processed meteorological data from the Central Los Angeles Meteorological Station, which is the station nearest to the Project site, obtained from SCAQMD's website (http://www.aqmd.gov/home/air-quality/air-quality-data-studies/meteorological-data/data-for-aermod). This meteorological data set includes the years 2010, 2011, and 2014-2016. This represents the latest available SCAQMD meteorological data for performing dispersion modeling.

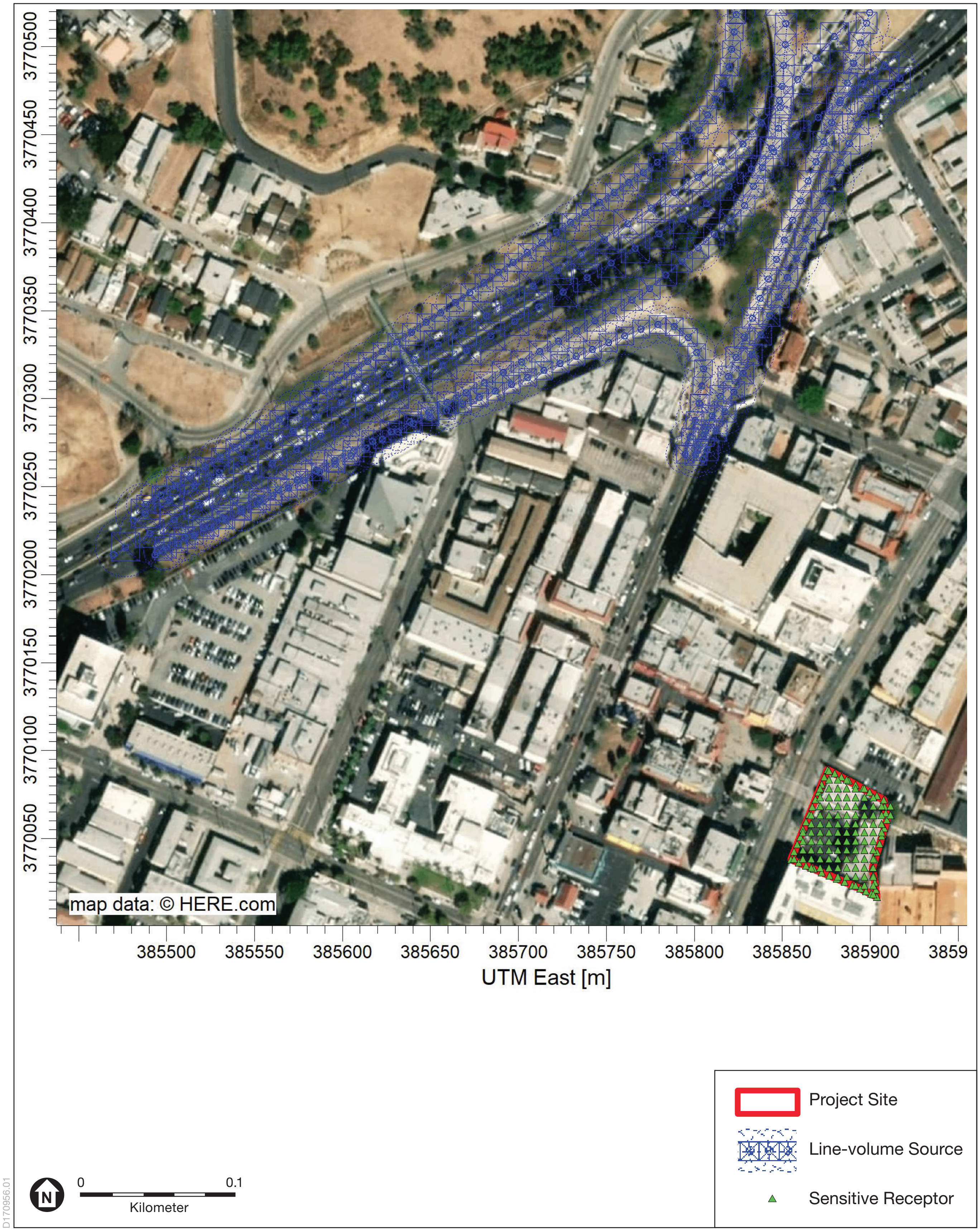
Receptors

In order to determine the DPM concentrations at the Project site, discrete receptors were placed inside the boundary of the project site at areas where future residences would be located. Based on SCAQMD's AERMOD modeling guidance, all receptors should be set to a height of 0.0 meters, so that ground-level concentrations are analyzed. Additionally, receptors were also placed on the Project site boundary and spaced accordingly to SCAQMD's requirements, which is a maximum of 20 meters for a site that is less than four acres. Receptors were spaced on the Project Site at 5 meter intervals to provide more robust coverage than the minimum requirement.

Terrain Data

The AERMOD dispersion modeling program included terrain data to assess impacts in three dimensions. The terrain data used for the analysis was from the digital elevation model data for the USGS National Elevation Dataset (NED).

[18] United States Environmental Protection Agency, Haul Road Workgroup Final Report, 2011, https://www3.epa.gov/scram001/reports/Haul_Road_Workgroup-Final_Report_Package-20120302.pdf. Accessed May 2018.



SOURCE: ESA, 2016

942 N. Broadway Project

Figure 4
Dispersion Modeling of Interstate 110

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Urban Coefficients

The AERMOD dispersion modeling program requires that the user specify whether a site should be modeled as either urban or rural. The urban option allows the user to incorporate the effects of increased surface heating from an urban area on pollutant dispersion under stable atmospheric conditions. Based on SCAQMD's AERMOD modeling guidance, all air quality impact analyses in the South Coast Air Basin should be executed using the urban modeling option. In addition, all sources should be modeled with urban effects using the population of the County where the project is located. As SCAQMD provides the various County populations within the SCAQMD jurisdiction, a population of 9,818,605 for Los Angeles County was used in AERMOD.

Cancer Risk and Health Impact Calculations

Cancer risk was calculated using the methodology and exposure parameters provided in the SCAQMD's Risk Assessment Procedures for Rules 1401, 1401.1, and 212, Version 8.1, Attachment N (Risk Assessment Procedures).[19] This is the most recent version of the SCAQMD's Risk Assessment Procedures that incorporates information from the Office of Environmental Health Hazard Assessment (OEHHA) Guidance Manual for Preparation of Health Risk Assessments (Guidance Manual)[20] that OEHHA adopted in March 2015. The SCAQMD uses the Risk Assessment Procedures for permit applications deemed complete on or after October 1, 2017.

The OEHHA Guidance Manual incorporates risk assessment factors for sensitive infant and children populations using Age Sensitivity Factors (ASF). The Project's residents could include child-age residents; therefore, the analysis is based on a 30-year residential exposure to DPM emissions from SR-110, starting at the third trimester. The exposure duration was set at 30 years, which is the SCAQMD recommended duration for residential exposure.[21] As stated previously, one of the SCAQMD's numerical criteria for determining a health risk impact is an incremental increase in cancer risk of 10 in one million. Dose-response and risk characterization are two major components for evaluating health impacts. These are discussed further below.

Dose-Response Assessment

The dose-response assessment is the process of characterizing the relationship between exposure to diesel exhaust and the incidence of an adverse health effect in exposed populations. The estimation of potential inhalation cancer risk posed by exposure to DPM requires a cancer potency factor. Cancer potency factors are expressed as the upper bound probability of developing cancer assuming continuous lifetime exposure to diesel exhaust at a dose of one milligram per kilogram of body weight, and are expressed in units of inverse dose as a potency

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[19] South Coast Air Quality Management District, Risk Assessment Procedures for Rules 1401, 1401.1, and 212, Version 8.1, Attachment N, September 2017, http://www.aqmd.gov/docs/default-source/permitting/rule-1401-risk-assessment/attachmentn-v8-1.pdf?sfvrsn=4. Accessed May 2018.

[20] Office of Environmental Health Hazard Assessment, Air Toxics Hotspots Program – Risk Assessment Guidelines, Guidance Manual for Preparation of Health Risk Assessments, February 2015, https://oehha.ca.gov/media/downloads/crnr/2015guidancemanual.pdf. Accessed May 2018.

[21] South Coast Air Quality Management District, Risk Assessment Procedures for Rules 1401, 1401.1, and 212, Version 8.1, p. 13, September 2017, http://www.aqmd.gov/docs/default-source/permitting/rule-1401-risk-assessment/riskassessproc-v8-1.pdf?sfvrsn=12. Accessed May 2018.

slope (i.e., $[mg/kg/day]^{-1}$). A cancer potency factor when multiplied by the dose of a carcinogen gives the associated cancer risk. Based on the OEHHA Guidance Manual, the cancer potency factor for DPM is 1.1 $(mg/kg/day)^{-1}$.

Potential non-cancer effects of chronic (i.e., long term) exposures were evaluated using the Hazard Index approach as described in the OEHHA Guidance Manual. The Hazard Index is calculated by dividing the maximum modeled concentration of a TAC at the maximum impacted sensitive receptor by the Reference Exposure Level (REL). The REL is the concentration at or below which no adverse non-cancer health effects are known or expected to occur for that TAC. Therefore, a Hazard Index of less than 1.0 means that the maximum impacted sensitive receptor would be exposed to TAC concentrations at a level in which adverse non-cancer health effects would not be known or expected to occur. Based on the OEHHA Guidance Manual, the chronic REL for DPM is 5 $\mu g/m^3$ and the chronic Hazard Index target organ for DPM is the respiratory system.

Risk Characterization

Risk characterization combines the maximum annual average ground-level DPM concentration from the exposure assessment and the cancer potency factor and chronic REL from the dose-response analysis to estimate the potential inhalation cancer risk and chronic Hazard Index (HI) from the exposure to DPM emissions.

The SCAQMD Risk Assessment Procedures recommends that an exposure duration (residency time) of 30 years be used to estimate individual cancer risk from the maximally exposed individual resident (MEIR). For the Project’s health risk evaluation, the maximum exposed individual (MEI) was assumed to reside at the same receptor location from the third trimester through age 30. The equation used to calculate the incremental increase in cancer risk for the residential inhalation pathway is as follows:

$$Dose = C_{air} \times DBR \times A \times EF \times CF$$

<u>Where</u>:

Dose= Dose through inhalation (milligrams per kilogram-day [mg/kg/day])

C_{air} = Concentration of DPM in air (micrograms per cubic meter [$\mu g/m^3$])

DBR = Daily breathing rate (liters per kilograms body weight-day [L/kg body weight - day])

A = Inhalation absorption factor (unitless)

EF = Exposure frequency (days per year [days/yr])

CF = Composite conversion factor (micrograms to milligram Liters to cubic meters)

$$Risk_{inh} = (Dose \times CPF \times ASF \times FAH) / AT \times ED$$

<u>Where:</u>

CPF= Cancer potency factor $[mg/kg/day]^{-1}$

ASF= Age sensitivity Factor (unitless)

FAH= Fraction of time at home (unitless)

AT = Averaging time period over which exposure is averaged (days over 70 years)

ED = Exposure duration (years[yr])

Table 2, *Cancer Risk Factors for Future Project Resident*, shows the cancer risk calculation assumptions for a resident at the Project site. The "years" column shows the number of years of exposure for each age category. The risk factors differ by age, as do the daily breathing rates. The risk factors and daily breathing rates are based on the SCAQMD Risk Assessment Procedures. For the cancer risk calculations, worst-case risk assumptions were used. Those assumptions assume a 30-year exposure beginning from the 3rd trimester and continuing to age 30. As shown in **Table 2**, this worst-case evaluation assumes 0.25 years exposure in the 3rd trimester to birth age category, 2 years exposure in the 0 to 2 year age category, 14 years of exposure in the 2 to 16 age category, and 14 years of exposure in the 16 to 30 age category. Total risk is the sum of exposures in each category.

TABLE 2
CANCER RISK FACTORS FOR FUTURE PROJECT RESIDENT

Age Group	Daily Breathing Rate [a]	Inhalation Absorption Rate	Days per Year	Years	Scalar Conversion Factor	Average Time (days)	Age Sensitivity Factor	Fraction of Time at Home
3rd Trimester	361	1	350	0.25	1.00E-06	25,550	10	1
0 to 2	1,090	1	350	2	1.00E-06	25,550	10	1
2 to 16	572	1	350	14	1.00E-06	25,550	3	1
16 to 30	261	1	350	14	1.00E-06	25,550	1	0.73

NOTES:

a South Coast Air Quality Management District, Risk Assessment Procedures for Rules 1401, 1401.1, and 212, Version 8.1, Attachment N, p. 15, Table 4.1 D – CEF for 30 Years, September 2017, http://www.aqmd.gov/docs/default-source/permitting/rule-1401-risk-assessment/attachmentn-v8-1.pdf?sfvrsn=4. Accessed May 2018.

SOURCE: SCAQMD 2018.

2.3 Project Impacts

2.3.1 Freeway Health Risks

The estimated incremental increase in cancer risk and chronic Hazard Index for the maximally exposed individual receptor (MEIR) for the Project with and without the use of MERV 13 indoor air filters is shown in **Table 3**, *Maximum Incremental Increase in Cancer Risk and Non-Cancer Hazard Index*. The residential MEIR is represented by the proposed residential dwelling unit located on the western side of the Project site approximately 620 feet from the nearest SR-110 off-ramp and approximately 1,000 feet from the SR-110 mainline. The maximum incremental increase in cancer risk from DPM emissions to the Project's residents would be less than the 10 in one million SCAQMD numerical criterion. With an estimated population of approximately 573 Project residents, based on a density of approximately 3.22 persons per dwelling unit in the Central City North Community Plan Area,[22] the Project cancer burden would be approximately 0.003 which would not exceed the 0.5 cancer burden threshold. This risk assessment is based on highly conservative exposure factors including the assumption that residents would have a fraction of time at home parameter of 1.0 from the third trimester through 16 years old, and a 30-year residential exposure duration, and thus represents a conservative analysis. Additionally, the maximum non-cancer Hazard Index for the Project's future residents would be substantially below the SCAQMD's numerical criterion for non-cancer impacts, which is an HI of 1.0.

In summary, on-site residential uses would be provided an adequate health-based separation distance from SR-110. Cancer and non-cancer impacts would not exceed the SCAQMD's numerical criteria. As a result, the Project would meet the requirements of PRC Section 21155.1(a)(6)(C).

TABLE 3
MAXIMUM INCREMENTAL INCREASE IN CANCER RISK AND NON-CANCER HAZARD INDEX

Maximum Exposed Future Project Receptor	Cancer Risk (risk in one million)	Chronic Hazard Index (HI)
Residential without MERV 13 Indoor Air Filters	6.3	0.004
Residential with MERV 13 Indoor Air Filters	3.2	0.002
SCAQMD Numerical Criteria	10	1.0
Exceeds SCAQMD Numerical Criteria?	No	No

SOURCE: ESA 2018. Detailed risk calculations are provided in **Appendix A**.

22 City of Los Angeles, Planning Commission, Demographic Statistics Report, October 2015, http://planning.lacity.org/PdisCaseInfo/Home/GetGeneralPlanningDocument/MTc40. Accessed May 2018.

3.0
Summary of Results

3.1 Freeway Health Risks

In 2012, the City of Los Angeles Planning Commission issued Zoning Information No. 2427, *Freeway-Adjacent Advisory Notice for Sensitive Uses*, regarding the need to consider the public health implications of certain freeway-adjacent projects.[23] The Advisory Notice is informational in nature and does not impose any additional land use or zoning regulations; it is not a prohibition on development near freeways. As part of this Advisory Notice, the City Planning Commission advises that projects that place sensitive receptors in proximity (within 1,000 feet) to a freeway prepare a Freeway HRA as a supplemental technical report. The Project site is located approximately 620 feet from State Route 110 (SR-110) Freeway, which is within the Advisory Notice area where a Freeway HRA is recommended.

As shown in **Table 3**, the estimated incremental increase in cancer risk and chronic Hazard Index for the maximally exposed individual receptor (MEIR) for the Project due to emissions of TACs (i.e., diesel particulate matter) would not exceed the SCAQMD's numerical criteria for health risks with incorporation of MERV 13 indoor air filtration in regularly occupied spaces of residential uses with mechanically ventilated buildings, as required by LAMC Section 99.04.504 for residential uses within 1,000 feet of a freeway. The maximum increase in cancer risk from freeway DPM emissions to the Project's residents would be a maximum carcinogenic risk of approximately 6.3 in one million without the use of MERV 13 filters for the 30-year residential exposure scenario, which is below the 10 in one million numerical criterion. With an estimated population of 573 Project residents, based on a density of 3.22 persons per dwelling unit in the Central City North Community Plan Area,[24] the Project would be 0.004 without the use of MERV 13 filters, which would not exceed the 0.5 cancer burden numerical criterion. The maximum non-cancer Hazard Index for the Project's future residents would 0.004, which would not exceed the non-caner numerical criterion of an HI of 1.0. Therefore, cancer and non-cancer impacts would not exceed the SCAQMD's numerical criteria for health risks and the Project would not create a risk of public health exposure at a level that would exceed the standards set by a state or federal agency. As a result, the Project would meet the requirements of PRC Section 21155.1(a)(6)(C).

[23] City of Los Angeles, Zoning Information No. 2427, Freeway Adjacent Advisory Notice for Sensitive Uses, Effective November 8, 2012, http://zimas.lacity.org/documents/zoneinfo/ZI2427.pdf. Accessed May 2018.

[24] City of Los Angeles, Planning Commission, Demographic Statistics Report, October 2015, http://planning.lacity.org/PdisCaseInfo/Home/GetGeneralPlanningDocument/MTc40. Accessed May 2018.

Appendix A
Freeway Health Risk Assessment Calculation Worksheets

A-1 Freeway Health Risk Assessment Calculation Worksheets

942 N. Broadway Project

Caltrans Performance Measurement System (PeMS) Traffic Volume Counts - SR-110 Mainline (June 2017-May 2018, Stadium)

	Column Labels					
	Average of Auto Flow (Veh/Hour)		**Average of Truck Flow (Veh/Hour)**		**Average of Speed (mph)**	
Hour of Day	**N**	**S**	**N**	**S**	**N**	**S**
0:00:00	1821	1154	72	149	67	63
1:00:00	1292	847	39	126	66	63
2:00:00	1068	738	24	120	66	63
3:00:00	824	704	15	117	67	63
4:00:00	978	1052	22	141	67	63
5:00:00	1735	2344	45	178	68	63
6:00:00	2761	3366	88	164	63	40
7:00:00	3673	3837	147	148	60	32
8:00:00	3654	3845	155	145	60	27
9:00:00	3464	3909	144	134	57	26
10:00:00	3428	3906	154	132	55	30
11:00:00	3585	3861	164	122	54	36
12:00:00	3773	3834	178	118	53	38
13:00:00	3998	3767	214	114	52	39
14:00:00	4246	3570	312	116	46	38
15:00:00	4121	3376	322	126	38	37
16:00:00	3980	3194	265	138	34	34
17:00:00	3981	3168	246	146	33	33
18:00:00	3921	3320	236	148	36	35
19:00:00	4013	3383	255	164	41	44
20:00:00	3843	2936	229	186	49	53
21:00:00	3596	2680	172	190	64	57
22:00:00	3295	2333	143	181	65	57
23:00:00	2530	1671	129	168	63	60
Total	73582	66794	3770	3471		

Source: Caltrans, Performance Measurement System (PeMS), SR-110-N Post Mile 24.39-Stadium, SR-110-S Post Mile 24.39-Stadium, http://pems.dot.ca.gov/.

942 N. Broadway Project
Caltrans Traffic Volume Counts - SR-110 On- and Off-Ramps (2014, Near Broadway)

RAMP		Auto	Trucks	FWY	Notes
SB On from Stadium Way	5925	5634	291	SR-110	2018 PeMs
NB off to Stadium Way/Hill	3250	3091	159	SR-110	http://www.dot.ca.gov/trafficops/census/docs/2016-ramp-vol-district07.pdf
SB off to Hill Street	12341	11736	605	SR-110	http://www.dot.ca.gov/trafficops/census/docs/2016-ramp-vol-district07.pdf
NB On from Hill St	12225	11625	600	SR-110	http://www.dot.ca.gov/trafficops/census/docs/2016-ramp-vol-district07.pdf
NB off to Stadium Way/Hill	3250	3091	159	SR-110	http://www.dot.ca.gov/trafficops/census/docs/2016-ramp-vol-district07.pdf

* RAMPS are listed in order from North to South

% Auto	0.950948	Ratio between total auto flow and total flow (2014)
% Trucks	0.049052	Ratio between total truck flow count and total flow (2014)

Mainline Ratio for Ramp Hourly Flow Calculation

Sum of Average Hourly Traffic	North	South
Auto	73582	66794
Trucks	3770	3471

North Bound Ratio

Time of Day	Auto	Trucks
0:00:00	0.024754	0.0191
1:00:00	0.017556	0.0103
2:00:00	0.014517	0.0063
3:00:00	0.011205	0.0039
4:00:00	0.013287	0.0059
5:00:00	0.023585	0.0121
6:00:00	0.037528	0.0233
7:00:00	0.049917	0.0391
8:00:00	0.04966	0.041
9:00:00	0.047072	0.0383
10:00:00	0.046582	0.0408
11:00:00	0.048727	0.0434
12:00:00	0.051281	0.0472
13:00:00	0.054339	0.0567
14:00:00	0.057698	0.0827
15:00:00	0.056009	0.0854
16:00:00	0.054087	0.0704
17:00:00	0.054106	0.0653
18:00:00	0.05329	0.0626
19:00:00	0.054543	0.0678
20:00:00	0.052227	0.0607
21:00:00	0.048865	0.0456
22:00:00	0.044782	0.038
23:00:00	0.03438	0.0342

South Bound Ratio

Time of Day	Auto	Trucks
0:00:00	0.017275	0.043
1:00:00	0.012683	0.0363
2:00:00	0.011053	0.0346
3:00:00	0.010544	0.0338
4:00:00	0.015746	0.0406
5:00:00	0.035086	0.0512
6:00:00	0.050395	0.0472
7:00:00	0.057438	0.0427
8:00:00	0.057569	0.0418
9:00:00	0.05852	0.0386
10:00:00	0.058481	0.038
11:00:00	0.057807	0.0351
12:00:00	0.057398	0.034
13:00:00	0.056401	0.0329
14:00:00	0.053447	0.0336
15:00:00	0.050551	0.0362
16:00:00	0.047812	0.0397
17:00:00	0.047425	0.0421
18:00:00	0.049707	0.0425
19:00:00	0.050644	0.0473
20:00:00	0.043957	0.0535
21:00:00	0.040126	0.0547
22:00:00	0.034923	0.0521
23:00:00	0.025011	0.0485

*Ratio is average hourly flow divided by total flow

942 N. Broadway Project
EMFAC 2022 Emission Factors

Heavy Duty Vehicles PM10	
Speed	**Average of emission_rate (grams/mile)**
5	0.186156202
10	0.158029608
15	0.113102697
20	0.081649243
25	0.068559097
30	0.061089018
35	0.056061237
40	0.053407759
45	0.053155897
50	0.055245338
55	0.059234258
60	0.063902733
65	0.065284384
70	0.067042342

Source: EMFAC2017

942 N. Broadway Project
EMFAC 2022-2023 Emission Factors

Heavy Duty Vehicles PM10	
Speed	**Average of emission_rate (grams/mile)**
5	0.103280554
10	0.087675724
15	0.063039017
20	0.045844768
25	0.038695245
30	0.0348058
35	0.032481113
40	0.031670164
45	0.032390133
50	0.03459037
55	0.037804978
60	0.041856538
65	0.043701517
70	0.045046186

Source: EMFAC2017

942 N. Broadway Project
EMFAC 2024-2037 Emission Factors

Heavy Duty Vehicles PM10	
Speed	**Average of emission_rate (grams/mile)**
5	0.014324631
10	0.012369733
15	0.009465858
20	0.007546692
25	0.006780959
30	0.006770127
35	0.007394549
40	0.008638792
45	0.010487911
50	0.012937617
55	0.015524752
60	0.019068828
65	0.021471144
70	0.022170381

Source: EMFAC2017

942 N. Broadway Project
EMFAC 2038-2051 Emission Factors

Heavy Duty Vehicles PM10	
Speed	**Average of emission_rate (grams/mile)**
5	0.009381564
10	0.008320336
15	0.006669759
20	0.005601146
25	0.005182348
30	0.005362595
35	0.006101881
40	0.007388269
45	0.009214011
50	0.011576425
55	0.013783801
60	0.017092066
65	0.019336804
70	0.01956815

Source: EMFAC2017

942 N. Broadway Project
Emissions Calculations

On/Off-Ramps

Annual Growth Rate:	1%
Traffic Data Year:	2014
Analysis Start Year:	2022
Analysis End Year:	2023
Averaging Period:	2 years
Analysis Start Year:	2024
Analysis End Year:	2037
Averaging Period:	14 years
Analysis Start Year:	2038
Analysis End Year:	2051
Averaging Period:	14 years

Freeway Traffic

Annual Growth Rate:	1%
Traffic Data Year:	2017
Analysis Start Year:	2022
Analysis End Year:	2023
Averaging Period:	2 years
Analysis Start Year:	2024
Analysis End Year:	2037
Averaging Period:	14 years
Analysis Start Year:	2038
Analysis End Year:	2051
Averaging Period:	14 years

SR-110 Mainline North									**EMISSION FACTORS (grams/mile)**				**EMISSION RATES (grams/second)**				**SCALAR VALUES FOR AERMOD**			
									2022	**2022-2023**	**2024-2037**	**2038-2051**	**2022**	**2022-2023**	**2024-2037**	**2038-2051**	**2022**	**2022-2023**	**2024-2037**	**2038-2051**
Time	Length (mi)	2017 Truck Flow (vehicle/hr)	2022 Truck Flow (vehicle/hr)	2022-2023 Average Truck Flow (vehicle/hr)	2024-2037 Average Truck Flow (vehicle/hr)	2038-2051 Average Truck Flow (vehicle/hr)	Auto Speed (mph)	Truck Speed (mph)	Truck PM10 EF (Dsl) (g/mi)	Truck PM10 EF (Dsl) (g/mi)	Truck PM10 EF (Dsl) (g/mi)	Truck PM10 EF (Dsl) (g/mi)	Truck PM Emissions (g/s)	Truck PM Emissions (g/s)	Truck PM Emissions (g/s)	Truck PM Emissions (g/s)	Truck PM Scalar	Truck PM Scalar	Truck PM Scalar	Truck PM Scalar
0:00:00	0.332	72	76	76	82	95	65	55	0.0592	0.0378	0.0155	0.0138	4.16E-04	2.65E-04	1.18E-04	1.21E-04	0.2494	0.2668	0.3400	0.3458
1:00:00	0.332	39	41	41	45	51	65	55	0.0592	0.0378	0.0155	0.0138	2.24E-04	1.43E-04	6.45E-05	6.49E-05	0.1345	0.1439	0.1866	0.1856
2:00:00	0.332	24	25	25	27	32	65	55	0.0592	0.0378	0.0155	0.0138	1.37E-04	8.72E-05	3.87E-05	4.07E-05	0.0820	0.0878	0.1120	0.1165
3:00:00	0.332	15	16	16	17	20	65	55	0.0592	0.0378	0.0155	0.0138	8.75E-05	5.58E-05	2.44E-05	2.54E-05	0.0525	0.0562	0.0705	0.0728
4:00:00	0.332	22	23	23	25	29	65	55	0.0592	0.0378	0.0155	0.0138	1.26E-04	8.03E-05	3.58E-05	3.69E-05	0.0755	0.0808	0.1037	0.1056
5:00:00	0.332	45	47	48	52	59	70	55	0.0592	0.0378	0.0155	0.0138	2.57E-04	1.68E-04	7.45E-05	7.51E-05	0.1542	0.1685	0.2156	0.2147
6:00:00	0.332	88	92	93	101	116	65	55	0.0592	0.0378	0.0155	0.0138	5.03E-04	3.25E-04	1.45E-04	1.48E-04	0.3019	0.3265	0.4188	0.4222
7:00:00	0.332	147	154	155	168	193	60	55	0.0592	0.0378	0.0155	0.0138	8.42E-04	5.41E-04	2.41E-04	2.46E-04	0.5053	0.5442	0.6966	0.7025
8:00:00	0.332	155	163	164	177	204	60	55	0.0592	0.0378	0.0155	0.0138	8.91E-04	5.72E-04	2.54E-04	2.60E-04	0.5349	0.5758	0.7339	0.7425
9:00:00	0.332	144	151	152	165	189	55	55	0.0592	0.0378	0.0155	0.0138	8.26E-04	5.30E-04	2.36E-04	2.40E-04	0.4955	0.5337	0.6842	0.6879
10:00:00	0.332	154	162	163	176	203	55	55	0.0592	0.0378	0.0155	0.0138	8.86E-04	5.69E-04	2.52E-04	2.58E-04	0.5316	0.5723	0.7298	0.7389
11:00:00	0.332	164	172	173	188	216	55	55	0.0592	0.0378	0.0155	0.0138	9.40E-04	6.04E-04	2.69E-04	2.75E-04	0.5644	0.6074	0.7795	0.7862
12:00:00	0.332	178	187	188	204	234	55	55	0.0592	0.0378	0.0155	0.0138	1.02E-03	6.56E-04	2.92E-04	2.98E-04	0.6136	0.6601	0.8459	0.8517
13:00:00	0.332	214	225	226	245	282	50	50	0.0552	0.0346	0.0129	0.0116	1.15E-03	7.22E-04	2.93E-04	3.01E-04	0.6886	0.7260	0.8466	0.8621
14:00:00	0.332	312	328	330	357	411	45	45	0.0532	0.0324	0.0105	0.0092	1.61E-03	9.87E-04	3.46E-04	3.50E-04	0.9658	0.9927	1.0000	1.0000
15:00:00	0.332	322	338	340	369	424	40	40	0.0534	0.0317	0.0086	0.0074	1.67E-03	9.94E-04	2.94E-04	2.89E-04	1.0000	1.0000	0.8514	0.8272
16:00:00	0.332	265	279	280	303	349	35	35	0.0561	0.0325	0.0074	0.0061	1.44E-03	8.40E-04	2.07E-04	1.97E-04	0.8665	0.8446	0.5984	0.5623
17:00:00	0.332	246	259	260	282	324	35	35	0.0561	0.0325	0.0074	0.0061	1.34E-03	7.80E-04	1.92E-04	1.82E-04	0.8043	0.7843	0.5569	0.5221
18:00:00	0.332	236	248	249	270	311	35	35	0.0561	0.0325	0.0074	0.0061	1.28E-03	7.47E-04	1.84E-04	1.75E-04	0.7702	0.7511	0.5332	0.5011
19:00:00	0.332	255	268	269	292	336	40	40	0.0534	0.0317	0.0086	0.0074	1.32E-03	7.86E-04	2.33E-04	2.29E-04	0.7929	0.7912	0.6737	0.6555
20:00:00	0.332	229	241	242	262	301	50	50	0.0552	0.0346	0.0129	0.0116	1.23E-03	7.73E-04	3.13E-04	3.22E-04	0.7376	0.7774	0.9053	0.9201
21:00:00	0.332	172	181	182	197	226	65	55	0.0592	0.0378	0.0155	0.0138	9.90E-04	6.35E-04	2.82E-04	2.88E-04	0.5939	0.6390	0.8168	0.8226
22:00:00	0.332	143	150	151	164	188	65	55	0.0592	0.0378	0.0155	0.0138	8.20E-04	5.27E-04	2.35E-04	2.39E-04	0.4922	0.5301	0.6800	0.6843
23:00:00	0.332	129	136	136	148	170	65	55	0.0592	0.0378	0.0155	0.0138	7.44E-04	4.75E-04	2.12E-04	2.16E-04	0.4463	0.4775	0.6137	0.6188
													1.67E-03	**9.94E-04**	**3.46E-04**	**3.50E-04**				

SR-110 Mainline South									**2022**	**2022-2023**	**2024-2037**	**2038-2051**	**2022**	**2022-2023**	**2024-2037**	**2038-2051**	**2022**	**2022-2023**	**2024-2037**	**2038-2051**
Time	Length (mi)	2017 Truck Flow (vehicle/hr)	2022 Truck Flow (vehicle/hr)	2022-2023 Average Truck Flow (vehicle/hr)	2024-2037 Average Truck Flow (vehicle/hr)	2038-2051 Average Truck Flow (vehicle/hr)	Auto Speed (mph)	Truck Speed (mph)	Truck PM10 EF (Dsl) (g/mi)	Truck PM10 EF (Dsl) (g/mi)	Truck PM10 EF (Dsl) (g/mi)	Truck PM10 EF (Dsl) (g/mi)	Truck PM Emissions (g/s)	Truck PM Emissions (g/s)	Truck PM Emissions (g/s)	Truck PM Emissions (g/s)	Truck PM Scalar	Truck PM Scalar	Truck PM Scalar	Truck PM Scalar
0:00:00	0.310	149	157	157	171	196	65	55	0.0592	0.0378	0.0155	0.0138	8.01E-04	5.12E-04	2.29E-04	2.33E-04	0.7850	0.7811	0.7880	0.7840
1:00:00	0.310	126	132	133	144	166	65	55	0.0592	0.0378	0.0155	0.0138	6.74E-04	4.33E-04	1.93E-04	1.97E-04	0.6600	0.6617	0.6636	0.6640
2:00:00	0.310	120	126	127	137	158	65	55	0.0592	0.0378	0.0155	0.0138	6.43E-04	4.14E-04	1.83E-04	1.88E-04	0.6300	0.6318	0.6313	0.6320
3:00:00	0.310	117	123	124	134	154	65	55	0.0592	0.0378	0.0155	0.0138	6.28E-04	4.04E-04	1.79E-04	1.83E-04	0.6150	0.6169	0.6175	0.6160
4:00:00	0.310	141	148	149	161	186	65	55	0.0592	0.0378	0.0155	0.0138	7.56E-04	4.85E-04	2.15E-04	2.21E-04	0.7400	0.7413	0.7419	0.7440
5:00:00	0.310	178	187	188	204	234	65	55	0.0592	0.0378	0.0155	0.0138	9.55E-04	6.13E-04	2.73E-04	2.78E-04	0.9350	0.9353	0.9401	0.9360
6:00:00	0.310	164	172	173	188	216	40	40	0.0534	0.0317	0.0086	0.0074	7.92E-04	4.72E-04	1.40E-04	1.38E-04	0.7754	0.7210	0.4821	0.4631
7:00:00	0.310	148	156	156	169	195	30	30	0.0611	0.0348	0.0068	0.0054	8.21E-04	4.68E-04	9.86E-05	9.01E-05	0.8044	0.7145	0.3396	0.3035
8:00:00	0.310	145	152	153	166	191	25	25	0.0686	0.0387	0.0068	0.0052	8.98E-04	5.10E-04	9.70E-05	8.53E-05	0.8796	0.7791	0.3341	0.2872
9:00:00	0.310	134	141	142	153	176	25	25	0.0686	0.0387	0.0068	0.0052	8.33E-04	4.74E-04	8.94E-05	7.86E-05	0.8160	0.7231	0.3080	0.2647
10:00:00	0.310	132	139	139	151	174	30	30	0.0611	0.0348	0.0068	0.0054	7.32E-04	4.17E-04	8.81E-05	8.04E-05	0.7168	0.6367	0.3035	0.2708
11:00:00	0.310	122	128	129	140	161	35	35	0.0561	0.0325	0.0074	0.0061	6.18E-04	3.61E-04	8.92E-05	8.47E-05	0.6057	0.5514	0.3073	0.2851
12:00:00	0.310	118	124	125	135	155	40	40	0.0534	0.0317	0.0086	0.0074	5.71E-04	3.41E-04	1.01E-04	9.87E-05	0.5590	0.5210	0.3462	0.3323
13:00:00	0.310	114	120	120	130	150	40	40	0.0534	0.0317	0.0086	0.0074	5.52E-04	3.28E-04	9.68E-05	9.55E-05	0.5410	0.5001	0.3334	0.3216
14:00:00	0.310	116	122	123	133	153	40	40	0.0534	0.0317	0.0086	0.0074	5.62E-04	3.36E-04	9.90E-05	9.74E-05	0.5500	0.5126	0.3411	0.3280
15:00:00	0.310	126	132	133	144	166	35	35	0.0561	0.0325	0.0074	0.0061	6.38E-04	3.72E-04	9.18E-05	8.73E-05	0.6246	0.5685	0.3161	0.2939
16:00:00	0.310	138	145	146	158	182	35	35	0.0561	0.0325	0.0074	0.0061	7.01E-04	4.09E-04	1.01E-04	9.57E-05	0.6862	0.6241	0.3468	0.3223
17:00:00	0.310	146	153	154	167	192	35	35	0.0561	0.0325	0.0074	0.0061	7.39E-04	4.31E-04	1.06E-04	1.01E-04	0.7240	0.6583	0.3666	0.3400
18:00:00	0.310	148	156	156	169	195	35	35	0.0561	0.0325	0.0074	0.0061	7.54E-04	4.37E-04	1.08E-04	1.03E-04	0.7382	0.6668	0.3709	0.3453
19:00:00	0.310	164	172	173	188	216	45	45	0.0532	0.0324	0.0105	0.0092	7.88E-04	4.83E-04	1.70E-04	1.72E-04	0.7718	0.7374	0.5853	0.5776
20:00:00	0.310	186	195	196	213	245	55	55	0.0592	0.0378	0.0155	0.0138	9.95E-04	6.39E-04	2.85E-04	2.91E-04	0.9750	0.9751	0.9816	0.9800
21:00:00	0.310	190	200	201	217	250	55	55	0.0592	0.0378	0.0155	0.0138	1.02E-03	6.55E-04	2.90E-04	2.97E-04	1.0000	1.0000	1.0000	1.0000
22:00:00	0.310	181	190	191	207	238	55	55	0.0592	0.0378	0.0155	0.0138	9.70E-04	6.22E-04	2.77E-04	2.83E-04	0.9500	0.9502	0.9539	0.9520
23:00:00	0.310	168	177	177	192	221	60	55	0.0592	0.0378	0.0155	0.0138	9.04E-04	5.77E-04	2.57E-04	2.63E-04	0.8850	0.8806	0.8848	0.8840
													1.02E-03	**6.55E-04**	**2.90E-04**	**2.97E-04**				

On and Off Ramps

SB On from Stadium Way									2022	2022-2023	2024-2037	2038-2051	2022	2022-2023	2024-2037	2038-2051	2022	2022-2023	2024-2037	2038-2051
Time	Length (mi)	2013 Truck Flow (vehicle/hr)	2022 Truck Flow (vehicle/hr)	2022-2023 Average Truck Flow (vehicle/hr)	2024-2037 Average Truck Flow (vehicle/hr)	2038-2051 Average Truck Flow (vehicle/hr)	Auto Speed (mph)	Truck Speed (mph)	Truck PM10 EF (Dsl) (g/mi)	Truck PM10 EF (Dsl) (g/mi)	Truck PM10 EF (Dsl) (g/mi)	Truck PM10 EF (Dsl) (g/mi)	Truck PM Emissions (g/s)	Truck PM Emissions (g/s)	Truck PM Emissions (g/s)	Truck PM Emissions (g/s)	Truck PM Scalar	Truck PM Scalar	Truck PM Scalar	Truck PM Scalar
0:00:00	0.304	13	14	14	15	18	15	15	0.1131	0.0630	0.0095	0.0067	1.34E-04	7.44E-05	1.20E-05	1.01E-05	0.8235	0.8235	0.7895	0.8182
1:00:00	0.304	11	12	12	13	15	15	15	0.1131	0.0630	0.0095	0.0067	1.14E-04	6.38E-05	1.04E-05	8.44E-06	0.7059	0.7059	0.6842	0.6818
2:00:00	0.304	10	11	11	12	14	15	15	0.1131	0.0630	0.0095	0.0067	1.05E-04	5.85E-05	9.58E-06	7.87E-06	0.6471	0.6471	0.6316	0.6364
3:00:00	0.304	10	11	11	12	14	15	15	0.1131	0.0630	0.0095	0.0067	1.05E-04	5.85E-05	9.58E-06	7.87E-06	0.6471	0.6471	0.6316	0.6364
4:00:00	0.304	12	13	13	14	16	15	15	0.1131	0.0630	0.0095	0.0067	1.24E-04	6.91E-05	1.12E-05	9.00E-06	0.7647	0.7647	0.7368	0.7273
5:00:00	0.304	15	16	16	18	20	15	15	0.1131	0.0630	0.0095	0.0067	1.53E-04	8.51E-05	1.44E-05	1.12E-05	0.9412	0.9412	0.9474	0.9091
6:00:00	0.304	14	15	15	17	19	15	15	0.1131	0.0630	0.0095	0.0067	1.43E-04	7.97E-05	1.36E-05	1.07E-05	0.8824	0.8824	0.8947	0.8636
7:00:00	0.304	12	13	13	14	16	15	15	0.1131	0.0630	0.0095	0.0067	1.24E-04	6.91E-05	1.12E-05	9.00E-06	0.7647	0.7647	0.7368	0.7273
8:00:00	0.304	12	13	13	14	16	15	15	0.1131	0.0630	0.0095	0.0067	1.24E-04	6.91E-05	1.12E-05	9.00E-06	0.7647	0.7647	0.7368	0.7273
9:00:00	0.304	11	12	12	13	15	15	15	0.1131	0.0630	0.0095	0.0067	1.14E-04	6.38E-05	1.04E-05	8.44E-06	0.7059	0.7059	0.6842	0.6818
10:00:00	0.304	11	12	12	13	15	15	15	0.1131	0.0630	0.0095	0.0067	1.14E-04	6.38E-05	1.04E-05	8.44E-06	0.7059	0.7059	0.6842	0.6818
11:00:00	0.304	10	11	11	12	14	15	15	0.1131	0.0630	0.0095	0.0067	1.05E-04	5.85E-05	9.58E-06	7.87E-06	0.6471	0.6471	0.6316	0.6364
12:00:00	0.304	10	11	11	12	14	15	15	0.1131	0.0630	0.0095	0.0067	1.05E-04	5.85E-05	9.58E-06	7.87E-06	0.6471	0.6471	0.6316	0.6364
13:00:00	0.304	10	11	11	12	14	15	15	0.1131	0.0630	0.0095	0.0067	1.05E-04	5.85E-05	9.58E-06	7.87E-06	0.6471	0.6471	0.6316	0.6364
14:00:00	0.304	10	11	11	12	14	15	15	0.1131	0.0630	0.0095	0.0067	1.05E-04	5.85E-05	9.58E-06	7.87E-06	0.6471	0.6471	0.6316	0.6364
15:00:00	0.304	11	12	12	13	15	15	15	0.1131	0.0630	0.0095	0.0067	1.14E-04	6.38E-05	1.04E-05	8.44E-06	0.7059	0.7059	0.6842	0.6818
16:00:00	0.304	12	13	13	14	16	15	15	0.1131	0.0630	0.0095	0.0067	1.24E-04	6.91E-05	1.12E-05	9.00E-06	0.7647	0.7647	0.7368	0.7273
17:00:00	0.304	12	13	13	14	16	15	15	0.1131	0.0630	0.0095	0.0067	1.24E-04	6.91E-05	1.12E-05	9.00E-06	0.7647	0.7647	0.7368	0.7273
18:00:00	0.304	12	13	13	14	16	15	15	0.1131	0.0630	0.0095	0.0067	1.24E-04	6.91E-05	1.12E-05	9.00E-06	0.7647	0.7647	0.7368	0.7273
19:00:00	0.304	14	15	15	17	19	15	15	0.1131	0.0630	0.0095	0.0067	1.43E-04	7.97E-05	1.36E-05	1.07E-05	0.8824	0.8824	0.8947	0.8636
20:00:00	0.304	16	17	17	19	22	15	15	0.1131	0.0630	0.0095	0.0067	1.62E-04	9.04E-05	1.52E-05	1.24E-05	1.0000	1.0000	1.0000	1.0000
21:00:00	0.304	16	17	17	19	22	15	15	0.1131	0.0630	0.0095	0.0067	1.62E-04	9.04E-05	1.52E-05	1.24E-05	1.0000	1.0000	1.0000	1.0000
22:00:00	0.304	15	16	16	18	20	15	15	0.1131	0.0630	0.0095	0.0067	1.53E-04	8.51E-05	1.44E-05	1.12E-05	0.9412	0.9412	0.9474	0.9091
23:00:00	0.304	14	15	15	17	19	15	15	0.1131	0.0630	0.0095	0.0067	1.43E-04	7.97E-05	1.36E-05	1.07E-05	0.8824	0.8824	0.8947	0.8636
													1.62E-04	**9.04E-05**	**1.52E-05**	**1.24E-05**				

NB off to Stadium Way/Hill									2022	2022-2023	2024-2037	2038-2051	2022	2022-2023	2024-2037	2038-2051	2022	2022-2023	2024-2037	2038-2051
Time	Length (mi)	2013 Truck Flow (vehicle/hr)	2022 Truck Flow (vehicle/hr)	2022-2023 Average Truck Flow (vehicle/hr)	2024-2037 Average Truck Flow (vehicle/hr)	2038-2051 Average Truck Flow (vehicle/hr)	Auto Speed (mph)	Truck Speed (mph)	Truck PM10 EF (Dsl) (g/mi)	Truck PM10 EF (Dsl) (g/mi)	Truck PM10 EF (Dsl) (g/mi)	Truck PM10 EF (Dsl) (g/mi)	Truck PM Emissions (g/s)	Truck PM Emissions (g/s)	Truck PM Emissions (g/s)	Truck PM Emissions (g/s)	Truck PM Scalar	Truck PM Scalar	Truck PM Scalar	Truck PM Scalar
0:00:00	0.347	3	3	3	3	4	15	15	0.1131	0.0630	0.0095	0.0067	3.27E-05	1.82E-05	2.74E-06	2.57E-06	0.2000	0.2000	0.1875	0.2222
1:00:00	0.347	2	2	2	2	3	15	15	0.1131	0.0630	0.0095	0.0067	2.18E-05	1.22E-05	1.83E-06	1.93E-06	0.1333	0.1333	0.1250	0.1667
2:00:00	0.347	1	1	1	1	1	15	15	0.1131	0.0630	0.0095	0.0067	1.09E-05	6.08E-06	9.13E-07	6.43E-07	0.0667	0.0667	0.0625	0.0556
3:00:00	0.347	1	1	1	1	1	15	15	0.1131	0.0630	0.0095	0.0067	1.09E-05	6.08E-06	9.13E-07	6.43E-07	0.0667	0.0667	0.0625	0.0556
4:00:00	0.347	1	1	1	1	1	15	15	0.1131	0.0630	0.0095	0.0067	1.09E-05	6.08E-06	9.13E-07	6.43E-07	0.0667	0.0667	0.0625	0.0556
5:00:00	0.347	2	2	2	2	3	15	15	0.1131	0.0630	0.0095	0.0067	2.18E-05	1.22E-05	1.83E-06	1.93E-06	0.1333	0.1333	0.1250	0.1667
6:00:00	0.347	4	4	4	5	5	15	15	0.1131	0.0630	0.0095	0.0067	4.36E-05	2.43E-05	4.56E-06	3.22E-06	0.2667	0.2667	0.3125	0.2778
7:00:00	0.347	6	6	6	7	8	15	15	0.1131	0.0630	0.0095	0.0067	6.54E-05	3.65E-05	6.39E-06	5.15E-06	0.4000	0.4000	0.4375	0.4444
8:00:00	0.347	7	7	7	8	9	15	15	0.1131	0.0630	0.0095	0.0067	7.63E-05	4.26E-05	7.30E-06	5.79E-06	0.4667	0.4667	0.5000	0.5000
9:00:00	0.347	6	6	6	7	8	15	15	0.1131	0.0630	0.0095	0.0067	6.54E-05	3.65E-05	6.39E-06	5.15E-06	0.4000	0.4000	0.4375	0.4444
10:00:00	0.347	7	7	7	8	9	15	15	0.1131	0.0630	0.0095	0.0067	7.63E-05	4.26E-05	7.30E-06	5.79E-06	0.4667	0.4667	0.5000	0.5000
11:00:00	0.347	7	7	7	8	9	15	15	0.1131	0.0630	0.0095	0.0067	7.63E-05	4.26E-05	7.30E-06	5.79E-06	0.4667	0.4667	0.5000	0.5000
12:00:00	0.347	8	8	8	9	11	15	15	0.1131	0.0630	0.0095	0.0067	8.73E-05	4.86E-05	8.22E-06	7.08E-06	0.5333	0.5333	0.5625	0.6111
13:00:00	0.347	9	9	10	10	12	15	15	0.1131	0.0630	0.0095	0.0067	9.82E-05	6.08E-05	9.13E-06	7.72E-06	0.6000	0.6667	0.6250	0.6667
14:00:00	0.347	13	14	14	15	17	15	15	0.1131	0.0630	0.0095	0.0067	1.53E-04	8.51E-05	1.37E-05	1.09E-05	0.9333	0.9333	0.9375	0.9444
15:00:00	0.347	14	15	15	16	18	15	15	0.1131	0.0630	0.0095	0.0067	1.64E-04	9.12E-05	1.46E-05	1.16E-05	1.0000	1.0000	1.0000	1.0000
16:00:00	0.347	11	12	12	13	14	15	15	0.1131	0.0630	0.0095	0.0067	1.31E-04	7.29E-05	1.19E-05	9.00E-06	0.8000	0.8000	0.8125	0.7778
17:00:00	0.347	10	11	11	11	13	15	15	0.1131	0.0630	0.0095	0.0067	1.20E-04	6.69E-05	1.00E-05	8.36E-06	0.7333	0.7333	0.6875	0.7222
18:00:00	0.347	10	11	11	11	13	15	15	0.1131	0.0630	0.0095	0.0067	1.20E-04	6.69E-05	1.00E-05	8.36E-06	0.7333	0.7333	0.6875	0.7222
19:00:00	0.347	11	12	12	13	14	15	15	0.1131	0.0630	0.0095	0.0067	1.31E-04	7.29E-05	1.19E-05	9.00E-06	0.8000	0.8000	0.8125	0.7778
20:00:00	0.347	10	11	11	11	13	15	15	0.1131	0.0630	0.0095	0.0067	1.20E-04	6.69E-05	1.00E-05	8.36E-06	0.7333	0.7333	0.6875	0.7222
21:00:00	0.347	7	7	7	8	9	15	15	0.1131	0.0630	0.0095	0.0067	7.63E-05	4.26E-05	7.30E-06	5.79E-06	0.4667	0.4667	0.5000	0.5000
22:00:00	0.347	6	6	6	7	8	15	15	0.1131	0.0630	0.0095	0.0067	6.54E-05	3.65E-05	6.39E-06	5.15E-06	0.4000	0.4000	0.4375	0.4444
23:00:00	0.347	5	5	5	6	7	15	15	0.1131	0.0630	0.0095	0.0067	5.45E-05	3.04E-05	5.48E-06	4.50E-06	0.3333	0.3333	0.3750	0.3889
													1.64E-04	**9.12E-05**	**1.46E-05**	**1.16E-05**				

SB off to Hill Street									2022	2022-2023	2024-2037	2038-2051	2022	2022-2023	2024-2037	2038-2051	2022	2022-2023	2024-2037	2038-2051
Time	Length (mi)	2013 Truck Flow (vehicle/hr)	2022 Truck Flow (vehicle/hr)	2022-2023 Average Truck Flow (vehicle/hr)	2024-2037 Average Truck Flow (vehicle/hr)	2038-2051 Average Truck Flow (vehicle/hr)	Auto Speed (mph)	Truck Speed (mph)	Truck PM10 EF (Dsl) (g/mi)	Truck PM10 EF (Dsl) (g/mi)	Truck PM10 EF (Dsl) (g/mi)	Truck PM10 EF (Dsl) (g/mi)	Truck PM Emissions (g/s)	Truck PM Emissions (g/s)	Truck PM Emissions (g/s)	Truck PM Emissions (g/s)	Truck PM Scalar	Truck PM Scalar	Truck PM Scalar	Truck PM Scalar
0:00:00	0.188	26	28	28	31	35	15	15	0.1131	0.0630	0.0095	0.0067	1.65E-04	9.22E-05	1.53E-05	1.22E-05	0.7778	0.7778	0.7949	0.7778
1:00:00	0.188	22	24	24	26	30	15	15	0.1131	0.0630	0.0095	0.0067	1.42E-04	7.90E-05	1.29E-05	1.04E-05	0.6667	0.6667	0.6667	0.6667
2:00:00	0.188	21	23	23	25	28	15	15	0.1131	0.0630	0.0095	0.0067	1.36E-04	7.57E-05	1.24E-05	9.75E-06	0.6389	0.6389	0.6410	0.6222
3:00:00	0.188	20	22	22	24	27	15	15	0.1131	0.0630	0.0095	0.0067	1.30E-04	7.24E-05	1.19E-05	9.40E-06	0.6111	0.6111	0.6154	0.6000
4:00:00	0.188	25	27	27	29	34	15	15	0.1131	0.0630	0.0095	0.0067	1.59E-04	8.89E-05	1.43E-05	1.18E-05	0.7500	0.7500	0.7436	0.7556
5:00:00	0.188	31	34	34	37	42	15	15	0.1131	0.0630	0.0095	0.0067	2.01E-04	1.12E-04	1.83E-05	1.46E-05	0.9444	0.9444	0.9487	0.9333
6:00:00	0.188	29	31	32	34	39	15	15	0.1131	0.0630	0.0095	0.0067	1.83E-04	1.05E-04	1.68E-05	1.36E-05	0.8611	0.8889	0.8718	0.8667
7:00:00	0.188	26	28	28	31	35	15	15	0.1131	0.0630	0.0095	0.0067	1.65E-04	9.22E-05	1.53E-05	1.22E-05	0.7778	0.7778	0.7949	0.7778
8:00:00	0.188	25	27	27	29	34	15	15	0.1131	0.0630	0.0095	0.0067	1.59E-04	8.89E-05	1.43E-05	1.18E-05	0.7500	0.7500	0.7436	0.7556
9:00:00	0.188	23	25	25	27	31	15	15	0.1131	0.0630	0.0095	0.0067	1.48E-04	8.23E-05	1.33E-05	1.08E-05	0.6944	0.6944	0.6923	0.6889
10:00:00	0.188	23	25	25	27	31	15	15	0.1131	0.0630	0.0095	0.0067	1.48E-04	8.23E-05	1.33E-05	1.08E-05	0.6944	0.6944	0.6923	0.6889
11:00:00	0.188	21	23	23	25	28	15	15	0.1131	0.0630	0.0095	0.0067	1.36E-04	7.57E-05	1.24E-05	9.75E-06	0.6389	0.6389	0.6410	0.6222
12:00:00	0.188	21	23	23	25	28	15	15	0.1131	0.0630	0.0095	0.0067	1.36E-04	7.57E-05	1.24E-05	9.75E-06	0.6389	0.6389	0.6410	0.6222
13:00:00	0.188	20	22	22	24	27	15	15	0.1131	0.0630	0.0095	0.0067	1.30E-04	7.24E-05	1.19E-05	9.40E-06	0.6111	0.6111	0.6154	0.6000
14:00:00	0.188	20	22	22	24	27	15	15	0.1131	0.0630	0.0095	0.0067	1.30E-04	7.24E-05	1.19E-05	9.40E-06	0.6111	0.6111	0.6154	0.6000
15:00:00	0.188	22	24	24	26	30	15	15	0.1131	0.0630	0.0095	0.0067	1.42E-04	7.90E-05	1.29E-05	1.04E-05	0.6667	0.6667	0.6667	0.6667
16:00:00	0.188	24	26	26	28	33	15	15	0.1131	0.0630	0.0095	0.0067	1.54E-04	8.56E-05	1.38E-05	1.15E-05	0.7222	0.7222	0.7179	0.7333
17:00:00	0.188	26	28	28	31	35	15	15	0.1131	0.0630	0.0095	0.0067	1.65E-04	9.22E-05	1.53E-05	1.22E-05	0.7778	0.7778	0.7949	0.7778
18:00:00	0.188	26	28	28	31	35	15	15	0.1131	0.0630	0.0095	0.0067	1.65E-04	9.22E-05	1.53E-05	1.22E-05	0.7778	0.7778	0.7949	0.7778
19:00:00	0.188	29	31	32	34	39	15	15	0.1131	0.0630	0.0095	0.0067	1.83E-04	1.05E-04	1.68E-05	1.36E-05	0.8611	0.8889	0.8718	0.8667
20:00:00	0.188	32	35	35	38	43	15	15	0.1131	0.0630	0.0095	0.0067	2.07E-04	1.15E-04	1.88E-05	1.50E-05	0.9722	0.9722	0.9744	0.9556
21:00:00	0.188	33	36	36	39	45	15	15	0.1131	0.0630	0.0095	0.0067	2.13E-04	1.18E-04	1.93E-05	1.57E-05	1.0000	1.0000	1.0000	1.0000
22:00:00	0.188	32	35	35	38	43	15	15	0.1131	0.0630	0.0095	0.0067	2.07E-04	1.15E-04	1.88E-05	1.50E-05	0.9722	0.9722	0.9744	0.9556
23:00:00	0.188	29	31	32	34	39	15	15	0.1131	0.0630	0.0095	0.0067	1.83E-04	1.05E-04	1.68E-05	1.36E-05	0.8611	0.8889	0.8718	0.8667
													2.13E-04	**1.18E-04**	**1.93E-05**	**1.57E-05**				

NB On from Hill St									2022	2022-2023	2024-2037	2038-2051	2022	2022-2023	2024-2037	2038-2051	2022	2022-2023	2024-2037	2038-2051
Time	Length (mi)	2013 Truck Flow (vehicle/hr)	2022 Truck Flow (vehicle/hr)	2022-2023 Average Truck Flow (vehicle/hr)	2024-2037 Average Truck Flow (vehicle/hr)	2038-2051 Average Truck Flow (vehicle/hr)	Auto Speed (mph)	Truck Speed (mph)	Truck PM10 EF (Dsl) (g/mi)	Truck PM10 EF (Dsl) (g/mi)	Truck PM10 EF (Dsl) (g/mi)	Truck PM10 EF (Dsl) (g/mi)	Truck PM Emissions (g/s)	Truck PM Emissions (g/s)	Truck PM Emissions (g/s)	Truck PM Emissions (g/s)	Truck PM Scalar	Truck PM Scalar	Truck PM Scalar	Truck PM Scalar
0:00:00	0.159	26	28	28	31	35	15	15	0.1131	0.0630	0.0095	0.0067	1.40E-04	7.78E-05	1.29E-05	1.03E-05	0.7778	0.7778	0.7949	0.7778
1:00:00	0.159	22	24	24	26	30	15	15	0.1131	0.0630	0.0095	0.0067	1.20E-04	6.67E-05	1.08E-05	8.82E-06	0.6667	0.6667	0.6667	0.6667
2:00:00	0.159	21	23	23	25	28	15	15	0.1131	0.0630	0.0095	0.0067	1.15E-04	6.39E-05	1.04E-05	8.23E-06	0.6389	0.6389	0.6410	0.6222
3:00:00	0.159	20	22	22	24	27	15	15	0.1131	0.0630	0.0095	0.0067	1.10E-04	6.11E-05	1.00E-05	7.94E-06	0.6111	0.6111	0.6154	0.6000
4:00:00	0.159	24	26	26	28	33	15	15	0.1131	0.0630	0.0095	0.0067	1.30E-04	7.23E-05	1.17E-05	9.70E-06	0.7222	0.7222	0.7179	0.7333
5:00:00	0.159	31	34	34	37	42	15	15	0.1131	0.0630	0.0095	0.0067	1.70E-04	9.45E-05	1.54E-05	1.23E-05	0.9444	0.9444	0.9487	0.9333
6:00:00	0.159	28	30	30	33	38	15	15	0.1131	0.0630	0.0095	0.0067	1.50E-04	8.34E-05	1.38E-05	1.12E-05	0.8333	0.8333	0.8462	0.8444
7:00:00	0.159	26	28	28	31	35	15	15	0.1131	0.0630	0.0095	0.0067	1.40E-04	7.78E-05	1.29E-05	1.03E-05	0.7778	0.7778	0.7949	0.7778
8:00:00	0.159	25	27	27	29	34	15	15	0.1131	0.0630	0.0095	0.0067	1.35E-04	7.50E-05	1.21E-05	1.00E-05	0.7500	0.7500	0.7436	0.7556
9:00:00	0.159	23	25	25	27	31	15	15	0.1131	0.0630	0.0095	0.0067	1.25E-04	6.95E-05	1.13E-05	9.11E-06	0.6944	0.6944	0.6923	0.6889
10:00:00	0.159	23	25	25	27	31	15	15	0.1131	0.0630	0.0095	0.0067	1.25E-04	6.95E-05	1.13E-05	9.11E-06	0.6944	0.6944	0.6923	0.6889
11:00:00	0.159	21	23	23	25	28	15	15	0.1131	0.0630	0.0095	0.0067	1.15E-04	6.39E-05	1.04E-05	8.23E-06	0.6389	0.6389	0.6410	0.6222
12:00:00	0.159	20	22	22	24	27	15	15	0.1131	0.0630	0.0095	0.0067	1.10E-04	6.11E-05	1.00E-05	7.94E-06	0.6111	0.6111	0.6154	0.6000
13:00:00	0.159	20	22	22	24	27	15	15	0.1131	0.0630	0.0095	0.0067	1.10E-04	6.11E-05	1.00E-05	7.94E-06	0.6111	0.6111	0.6154	0.6000
14:00:00	0.159	20	22	22	24	27	15	15	0.1131	0.0630	0.0095	0.0067	1.10E-04	6.11E-05	1.00E-05	7.94E-06	0.6111	0.6111	0.6154	0.6000
15:00:00	0.159	22	24	24	26	30	15	15	0.1131	0.0630	0.0095	0.0067	1.20E-04	6.67E-05	1.08E-05	8.82E-06	0.6667	0.6667	0.6667	0.6667
16:00:00	0.159	24	26	26	28	33	15	15	0.1131	0.0630	0.0095	0.0067	1.30E-04	7.23E-05	1.17E-05	9.70E-06	0.7222	0.7222	0.7179	0.7333
17:00:00	0.159	25	27	27	29	34	15	15	0.1131	0.0630	0.0095	0.0067	1.35E-04	7.50E-05	1.21E-05	1.00E-05	0.7500	0.7500	0.7436	0.7556
18:00:00	0.159	26	28	28	31	35	15	15	0.1131	0.0630	0.0095	0.0067	1.40E-04	7.78E-05	1.29E-05	1.03E-05	0.7778	0.7778	0.7949	0.7778
19:00:00	0.159	28	30	30	33	38	15	15	0.1131	0.0630	0.0095	0.0067	1.50E-04	8.34E-05	1.38E-05	1.12E-05	0.8333	0.8333	0.8462	0.8444
20:00:00	0.159	32	35	35	38	43	15	15	0.1131	0.0630	0.0095	0.0067	1.75E-04	9.73E-05	1.59E-05	1.26E-05	0.9722	0.9722	0.9744	0.9556
21:00:00	0.159	33	36	36	39	45	15	15	0.1131	0.0630	0.0095	0.0067	1.79E-04	1.00E-04	1.63E-05	1.32E-05	1.0000	1.0000	1.0000	1.0000
22:00:00	0.159	31	34	34	37	42	15	15	0.1131	0.0630	0.0095	0.0067	1.70E-04	9.45E-05	1.54E-05	1.23E-05	0.9444	0.9444	0.9487	0.9333
23:00:00	0.159	29	31	32	34	39	15	15	0.1131	0.0630	0.0095	0.0067	1.55E-04	8.89E-05	1.42E-05	1.15E-05	0.8611	0.8889	0.8718	0.8667
													1.79E-04	**1.00E-04**	**1.63E-05**	**1.32E-05**				

NB off to Stadium Way/Hill									2022	2022-2023	2024-2037	2038-2051	2022	2022-2023	2024-2037	2038-2051	2022	2022-2023	2024-2037	2038-2051
Time	Length (mi)	2013 Truck Flow (vehicle/hr)	2022 Truck Flow (vehicle/hr)	2022-2023 Average Truck Flow (vehicle/hr)	2024-2037 Average Truck Flow (vehicle/hr)	2038-2051 Average Truck Flow (vehicle/hr)	Auto Speed (mph)	Truck Speed (mph)	Truck PM10 EF (Dsl) (g/mi)	Truck PM10 EF (Dsl) (g/mi)	Truck PM10 EF (Dsl) (g/mi)	Truck PM10 EF (Dsl) (g/mi)	Truck PM Emissions (g/s)	Truck PM Emissions (g/s)	Truck PM Emissions (g/s)	Truck PM Emissions (g/s)	Truck PM Scalar	Truck PM Scalar	Truck PM Scalar	Truck PM Scalar
0:00:00	0.253	3	3	3	4	4	15	15	0.1131	0.0630	0.0095	0.0067	2.38E-05	1.33E-05	2.66E-06	1.87E-06	0.2000	0.2000	0.2353	0.2105
1:00:00	0.253	2	2	2	2	3	15	15	0.1131	0.0630	0.0095	0.0067	1.59E-05	8.85E-06	1.33E-06	1.41E-06	0.1333	0.1333	0.1176	0.1579
2:00:00	0.253	1	1	1	1	1	15	15	0.1131	0.0630	0.0095	0.0067	7.94E-06	4.43E-06	6.65E-07	4.68E-07	0.0667	0.0667	0.0588	0.0526
3:00:00	0.253	1	1	1	1	1	15	15	0.1131	0.0630	0.0095	0.0067	7.94E-06	4.43E-06	6.65E-07	4.68E-07	0.0667	0.0667	0.0588	0.0526
4:00:00	0.253	1	1	1	1	1	15	15	0.1131	0.0630	0.0095	0.0067	7.94E-06	4.43E-06	6.65E-07	4.68E-07	0.0667	0.0667	0.0588	0.0526
5:00:00	0.253	2	2	2	2	3	15	15	0.1131	0.0630	0.0095	0.0067	1.59E-05	8.85E-06	1.33E-06	1.41E-06	0.1333	0.1333	0.1176	0.1579
6:00:00	0.253	4	4	4	5	5	15	15	0.1131	0.0630	0.0095	0.0067	3.18E-05	1.77E-05	3.32E-06	2.34E-06	0.2667	0.2667	0.2941	0.2632
7:00:00	0.253	6	6	7	7	8	15	15	0.1131	0.0630	0.0095	0.0067	4.77E-05	3.10E-05	4.65E-06	3.75E-06	0.4000	0.4667	0.4118	0.4211
8:00:00	0.253	7	8	8	8	9	15	15	0.1131	0.0630	0.0095	0.0067	6.35E-05	3.54E-05	5.32E-06	4.22E-06	0.5333	0.5333	0.4706	0.4737
9:00:00	0.253	6	6	7	7	8	15	15	0.1131	0.0630	0.0095	0.0067	4.77E-05	3.10E-05	4.65E-06	3.75E-06	0.4000	0.4667	0.4118	0.4211
10:00:00	0.253	7	8	8	8	9	15	15	0.1131	0.0630	0.0095	0.0067	6.35E-05	3.54E-05	5.32E-06	4.22E-06	0.5333	0.5333	0.4706	0.4737
11:00:00	0.253	7	8	8	8	9	15	15	0.1131	0.0630	0.0095	0.0067	6.35E-05	3.54E-05	5.32E-06	4.22E-06	0.5333	0.5333	0.4706	0.4737
12:00:00	0.253	8	9	9	9	11	15	15	0.1131	0.0630	0.0095	0.0067	7.15E-05	3.98E-05	5.98E-06	5.15E-06	0.6000	0.6000	0.5294	0.5789
13:00:00	0.253	9	10	10	11	12	15	15	0.1131	0.0630	0.0095	0.0067	7.94E-05	4.43E-05	7.31E-06	5.62E-06	0.6667	0.6667	0.6471	0.6316
14:00:00	0.253	13	14	14	15	18	15	15	0.1131	0.0630	0.0095	0.0067	1.11E-04	6.20E-05	9.97E-06	8.43E-06	0.9333	0.9333	0.8824	0.9474
15:00:00	0.253	14	15	15	17	19	15	15	0.1131	0.0630	0.0095	0.0067	1.19E-04	6.64E-05	1.13E-05	8.90E-06	1.0000	1.0000	1.0000	1.0000
16:00:00	0.253	11	12	12	13	15	15	15	0.1131	0.0630	0.0095	0.0067	9.53E-05	5.31E-05	8.64E-06	7.03E-06	0.8000	0.8000	0.7647	0.7895
17:00:00	0.253	10	11	11	12	14	15	15	0.1131	0.0630	0.0095	0.0067	8.74E-05	4.87E-05	7.98E-06	6.56E-06	0.7333	0.7333	0.7059	0.7368
18:00:00	0.253	10	11	11	12	14	15	15	0.1131	0.0630	0.0095	0.0067	8.74E-05	4.87E-05	7.98E-06	6.56E-06	0.7333	0.7333	0.7059	0.7368
19:00:00	0.253	11	12	12	13	15	15	15	0.1131	0.0630	0.0095	0.0067	9.53E-05	5.31E-05	8.64E-06	7.03E-06	0.8000	0.8000	0.7647	0.7895
20:00:00	0.253	10	11	11	12	14	15	15	0.1131	0.0630	0.0095	0.0067	8.74E-05	4.87E-05	7.98E-06	6.56E-06	0.7333	0.7333	0.7059	0.7368
21:00:00	0.253	7	8	8	8	9	15	15	0.1131	0.0630	0.0095	0.0067	6.35E-05	3.54E-05	5.32E-06	4.22E-06	0.5333	0.5333	0.4706	0.4737
22:00:00	0.253	6	6	7	7	8	15	15	0.1131	0.0630	0.0095	0.0067	4.77E-05	3.10E-05	4.65E-06	3.75E-06	0.4000	0.4667	0.4118	0.4211
23:00:00	0.253	5	5	5	6	7	15	15	0.1131	0.0630	0.0095	0.0067	3.97E-05	2.21E-05	3.99E-06	3.28E-06	0.3333	0.3333	0.3529	0.3684
													1.19E-04	**6.64E-05**	**1.13E-05**	**8.90E-06**				

Source: ESA, 2018

942 N. Broadway
Freeway Health Risk Assessment for Future Project Residents

Maximum Individual Cancer Risk Calculations - Sensitive Receptors (Maximum Impacted Residential Receptor)

Cancer Risk Calculations

Parameter		Age Bins: 3rd Trimester	Age Bins: 0 < 2	Age Bins: 2 < 16	Age Bins: 16 < 30	Total 30 Year Exposure
DBR	Daily Breathing Rate (L/kg (body weight) per day)	361	1090	572	261	
A	Inhalation absorption factor (default = 1).	1	1	1	1	
EF	Exposure Frequency (days/year)	350	350	350	350	
ED	Exposure Duration (years)	0.25	2	14	14	**30.25**
FAH	Fraction of Time at Home [a]	1.00	1.00	1.00	0.73	
AT	Averaged Exposure Time Period (days)	25550	25550	25550	25550	
ASF	Age Sensitvity Factor	10	10	3	1	
CONC	Toxic Air Contaminant Concentration (μg/m^3)	2.18E-02	1.32E-02	4.25E-03	4.18E-03	
DOSE	*[= CONC × DBR × A × EF × ED × FAH / AT]* (mg/kg-d)	2.70E-02	3.93E-01	4.66E-01	1.53E-01	
CPF	Cancer Potency Factor (mg/kg-d)$^{-1}$					
	Diesel Particulate Matter	1.1	1.1	1.1	1.1	
RISK	Cancer Risk (in one million) [= *DOSE × CPF × ASF*]	2.97E-01	4.33E+00	1.54E+00	1.68E-01	**6.33**

Note:

a. FAH values of 1.0 for the child age groups are conservatively used.

Sources:

OEHHA, Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments (2015), https://oehha.ca.gov/media/downloads/crnr/2015guidancemanual.pdf. Accessed June 2018.

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SCAQMD, Permit Application Package "N," Version 8.1, Table 4.1 D, p. 15, (2017), http://www.aqmd.gov/docs/default-source/permitting/rule-1401-risk-assessment/attachmentn-v8-1.pdf?sfvrsn=4. Accessed June 2018.

ESA, 2018.

942 N. Broadway
Freeway Health Risk Assessment for Future Project Residents

Maximum Non-cancer Chronic Hazards / Toxicological Endpoints*

Receptor Group	Pollutant	CREL[1]	CONC	WFrac	$CONC_{WF}$	HI	ALIM	BN	CVS	DEV	ENDC	EYE	HEM	IMMUN	KIDN	NS	REPRO	RESP	SK	Threshold	Over?
Project:																					
MEI - Residential	DPM	5.00E+00	2.18E-02	1.00E+00	2.18E-02	4.37E-03	-	-	-	-	-	-	-	-	-	-	-	4.37E-03	-	1.0	NO

Notes:

1. OEHHA/CARB, "Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values" and "OEHHA/ARB Approved Chronic Reference Exposure Levels and Target Organs," http://www.arb.ca.gov/toxics/healthval/healthval.htm.
   Tables last updated: Feburary 23, 2017.

Source: ESA 2018

Where:

$CONC_{WF}$	Pollutant Concentration ($\mu g/m^3$) multiplied by the weight fraction
CREL	Chronic Reference Exposure Level
HI	Hazard Index
MEI	Maximally Exposed Individual
WFrac	Weight fraction of speciated component

* Key to Toxicological Endpoints

ALIM	Alimentary Tract	EYE	Eye	NS	Nervous System
BN	Bone	HEM	Hematologic System	REPRO	Reproductive System
CVS	Cardiovascular System	IMMUN	Immune System	RESP	Respiratory System
DEV	Developmental System	KIDN	Kidney	SK	Skin
ENDC	Endocrine System				