APPENDIX A

Air Quality and Greenhouse Gas Emissions Analysis Technical Report

Air Quality and Greenhouse Gas Emissions Analysis Technical Report for the College Boulevard Improvement Project City of Oceanside, California

Prepared for:

City of Oceanside
300 N. Coast Highway
Oceanside, California 92054

Prepared by:

DUDEK
605 Third Street
Encinitas, California 92024
Contact: Matthew Morales

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ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Definition
AB	Assembly Bill
CAAQS	California Ambient Air Quality Standards
CALGreen	California Green Building Standards
CalRecycle	California Department of Resources Recycling and Recovery
CAP	climate action plan
CARB	California Air Resources Board
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CFC	chlorofluorocarbons
CH_4	methane
CNRA	California Natural Resources Agency
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
DPM	diesel particulate matter
E-CAP	Energy and Climate Action Element
EIR	environmental impact report
EO	Executive Order
EPA	U.S. Environmental Protection Agency
GHG	greenhouse gas
GWP	global warming potential
HAP	hazardous air pollutant
HCFC	hydrochlorofluorocarbons
HFC	hydrofluorocarbon
LOS	level of service
MMT	million metric ton
MT	metric ton
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NF_3	nitrogen trifluoride
NHTSA	National Highway Traffic Safety Administration
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
O_3	ozone
PFC	perfluorocarbon
PM_{10}	particulate matter with an aerodynamic diameter less than or equal to 10 microns
$PM_{2.5}$	particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
ppb	parts per billion
ppm	parts per million
RAQS	Regional Air Quality Strategy

Acronym/Abbreviation	Definition
RPS	Renewables Portfolio Standard
RTIP	Regional Transportation Improvement Program
RTP	regional transportation plan
SANDAG	San Diego Association of Governments
SB	Senate Bill
SCS	Sustainable Communities Strategy
SDAB	San Diego Air Basin
SDAPCD	San Diego Air Pollution Control District
SF_6	sulfur hexafluoride
SIP	state implementation plan
SLCP	short-lived climate pollutant
SO_2	sulfur dioxide
SO_x	sulfur oxides
TAC	toxic air contaminant
VOC	volatile organic compound
ZEV	Zero-Emissions Vehicle

EXECUTIVE SUMMARY

The purpose of this technical report is to assess the potential air quality and greenhouse gas (GHG) emissions impacts associated with implementation of the proposed College Boulevard Improvement Project (proposed project). This assessment uses the significance thresholds in Appendix G of the California Environmental Quality Act (CEQA) Guidelines (14 CCR 15000 et seq.).

Project Overview

The proposed project would widen College Boulevard to a six-lane major arterial from Olive Drive to Old Grove Road, which would be consistent with the City of Oceanside's Circulation Element Year 2030 classification of College Boulevard. Along this section, the City of Oceanside (City) proposes road and right-of-way improvements to the corridor to enhance existing and future traffic operations, provide congestion relief, reduce queue lengths, improve safety conditions for the unsignalized intersections and access points along the corridor, and provide safer travel routes for bicyclists and pedestrians. In addition to widening College Boulevard from four to six lanes between Olive Drive and Old Grove Road, the proposed project would include curb/gutter improvements and relocation of utilities, as needed to accommodate the widened roadway segment. It would also include installation of retaining walls, and relocation of bike lanes, lighting, and sidewalks in various locations along College Boulevard between Waring Road/Barnard Drive and Marcella Street, and between Olive Drive and Old Grove Road.

Air Quality

The air quality impact analysis evaluated the potential for adverse impacts to air quality due to construction and operational emissions resulting from the proposed project. Impacts were evaluated for their significance based on the San Diego Air Pollution Control District (SDAPCD) mass daily criteria air pollutant thresholds of significance. Criteria air pollutants are defined as pollutants for which the federal and state governments have established ambient air quality standards, or criteria, for outdoor concentrations to protect public health. Criteria air pollutants include ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter with an aerodynamic diameter less than or equal to 10 microns (PM_{10}), particulate matter with an aerodynamic diameter less than or equal to 2.5 microns ($PM_{2.5}$), and lead. Pollutants evaluated include volatile organic compounds (VOCs) (also referred to as reactive organic gases), oxides of nitrogen (NO_x), CO, sulfur oxides (SO_x), PM_{10}, and $PM_{2.5}$. VOCs and NO_x are important because they are precursors to O_3.

Air Quality Plan Consistency

If a project proposes development that is greater than that anticipated in the local plan and San Diego Association of Governments' (SANDAG's) growth projections, the project might be in conflict with the State Implementation Plan (SIP) and Regional Air Quality Strategy (RAQS) and may contribute to a potentially significant cumulative impact on air quality. Because the vehicle miles traveled (VMT) and emissions forecasts upon which the SIP and RAQS are based would be exceeded, the proposed project would conflict with or obstruct implementation of the applicable air quality plan and impacts would be potentially significant. However, with implementation of mitigation measure M-AQ-1, this impact would be reduced to a less than significant.

Construction Criteria Air Pollutant Emissions

Construction of the proposed project would result in the temporary addition of pollutants to the local airshed caused by on-site sources (i.e., off-road construction equipment, soil disturbance, and VOC off-gassing) and off-site sources (i.e., on-road haul trucks and worker vehicle trips). The proposed project's construction emissions were estimated using the Road Construction Emissions Model, Version 9.0.0. Maximum daily construction emissions of VOC, NO_x, CO, SO_x, PM_{10}, and $PM_{2.5}$ would not exceed the SDAPCD's significance thresholds. Therefore, the proposed project would have a less-than-significant impact during construction.

Operational Criteria Air Pollutant Emissions

The proposed project would result in an incremental increase in daily VMT in the region, which would result in increased emissions of VOC, NO_x, CO, PM_{10}, and $PM_{2.5}$ that would exceed the SDAPCD thresholds and would be potentially significant without mitigation. However, since the City lacks the authority to mandate emission reductions for on-road vehicles, or to control driver behavior, no feasible mitigation measures have been identified to reduce these emissions. This impact would be significant and unavoidable.

Exposure of Sensitive Receptors

Construction and operational activities would not generate emissions in excess of the SDAPCD mass daily thresholds; therefore, construction and operational impacts during construction of the proposed project would be less than significant. In addition, diesel equipment would also be subject to the California Air Resources Board (CARB) Airborne Toxic Control Measures for in-use off-road diesel fleets, which would minimize diesel particulate matter emissions. The proposed project does not include stationary sources that would emit air pollutants or toxic air contaminant (TAC) emissions during operation and would not require extensive use of off-road equipment and diesel vehicles. The proposed project would not expose sensitive receptors to Valley Fever and would comply with SDAPCD Rule 55 to help reduce impacts during grading/earthmoving activities. In regards to CO hotspots, the proposed improvements along College Boulevard under the proposed project provide an increase in capacity; however, the increased traffic demand under 2035 conditions would result in deficient peak hour roadway operating conditions along portions of the corridor. However, since no CO hotspots were identified along the impacted roadway segments under the proposed project, as well as other roadway segments with higher average daily traffic, in the *Oceanside Circulation Element Update Appendix B: Combined Impact Analysis, Acoustical/Air Quality/Greenhouse Gas* (Investigative Science and Engineering, Inc. 2011), the localized CO impact would be less than significant. Based on the above considerations, potential project-generated impacts associated with exposure of sensitive receptors to substantial pollutant concentrations would be less than significant.

In regards to health effects from criteria air pollutants, the proposed project would result in VOC, NO_x, CO, PM_{10}, and $PM_{2.5}$ emissions that would exceed the SDAPCD thresholds. Since the regional VMT increase under the proposed project is based on driver behavior changes from not widening a portion of College Boulevard under the proposed project, and since the City lacks the authority to mandate emission reductions for on-road vehicles, or to control driver behavior, no feasible mitigation measures have been identified to reduce these emissions. This impact would be significant and unavoidable.

Odors

Potential odors produced during construction would be attributable to concentrations of unburned hydrocarbons from tailpipes of construction equipment and from excavated sediment. These odors would disperse rapidly from the proposed project site and generally occur at magnitudes that would not affect substantial numbers of people. In regards to long-term operations, the proposed project consists of roadway improvements that would not result in objectionable odors. Therefore, impacts associated with odors during construction and operations would be less than significant.

Cumulative Impacts

The nonattainment status of regional pollutants is a result of past and present development, and the SDAPCD develops and implements plans for future attainment of ambient air quality standards. Based on these considerations, project-level thresholds of significance for criteria pollutants are relevant in the determination of whether a project's individual emissions would have a cumulatively significant impact on air quality. As discussed above, the proposed project would result in emissions of VOC, NO_x, CO, PM_{10}, and $PM_{2.5}$ that would exceed the SDAPCD's mass daily significance thresholds during operations; therefore, the proposed project would have a significant and unavoidable cumulative impact.

Greenhouse Gas Emissions

Global climate change is primarily considered a cumulative impact, but must also be evaluated on a project-level under CEQA. A project participates in this potential impact through its incremental contribution combined with the cumulative increase of all other sources of GHG emissions. GHGs are gases that absorb infrared radiation in the atmosphere. Principal GHGs regulated under state and federal law and regulations include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). GHG emissions are measured in metric tons of CO_2 equivalent (MT CO_2e), which account for weighted global warming potential factors for CH_4 and N_2O.

Potential to Generate Significant GHG Emissions

Construction of the proposed project would result in GHG emissions primarily associated with the use of off-road construction equipment, on-road hauling and water trucks, and worker vehicles. Total proposed project-generated GHG emissions during construction were estimated to be 447 MT CO_2e, or approximately 15 MT CO_2e per year when amortized over 30 years. During long-term operations, the incremental increase in annual GHG emissions with the proposed project, as compared to the existing Circulation Element, would be approximately 85,899 MT CO_2e per year as a result of the increase in regional VMT. After accounting for amortized proposed project construction emissions, total GHGs generated by the proposed project would be approximately 85,914 MT CO_2e per year. As such, annual operational GHG emissions with amortized construction emissions would exceed the applied threshold of 900 MT CO_2e per year and would be cumulatively considerable and potentially significant without mitigation. However, since the City lacks the authority to mandate GHG emission reductions for on-road vehicles, or to control driver behavior, no feasible mitigation measures have been identified to reduce these emissions. This impact would be significant and unavoidable.

Consistency with Applicable GHG Reduction Plans

Total GHGs generated by the proposed project would be approximately 85,914 MT CO_2e per year, which may interfere with the implementation of GHG reduction goals for 2030 and 2050. In addition, since the proposed project would result in a substantial increase in GHGs, it would not be consistent with the goals of the City Climate Action Plan (CAP) or the San Diego Association of Government's (SANDAG's) *San Diego Forward: The Regional Plan* (Regional Plan) (SANDAG 2015) of reducing VMT and GHG emissions. Therefore, the proposed project would potentially conflict with plans, policies, or regulations adopted for the purpose of reducing GHG emissions, and as such, impacts are considered potentially significant without mitigation. Implementation of mitigation measures M-GHG-1 and M-GHG-2 would result in future consistency with the City's CAP and SANDAG's Regional Plan. However, since these plans do not have defined update timelines, and based on the substantial GHGs anticipated from the increased regional VMT under the proposed project, this impact would be significant and unavoidable.

1 INTRODUCTION

1.1 Report Purpose and Scope

The purpose of this technical report is to assess the potential air quality and greenhouse gas (GHG) emissions impacts associated with implementation of the proposed College Boulevard Improvement Project (proposed project) located in the City Oceanside (City), California, within the County of San Diego (County). Potential air quality impacts are evaluated for their significance based on the criteria provided in the City's Initial Study Checklist (City of Oceanside 2011).

This introductory section provides a description of the proposed project. Section 2, Air Quality, presents the relevant existing setting in the context of air quality, climate, and meteorology, the federal, state, and local regulatory background associated with the proposed project; the thresholds of significance applied in the analysis and methodology, and assumptions used in the construction and operational emissions analysis; and the impact analysis. Section 3, Greenhouse Gas Emissions, presents the relevant existing setting in the context of climate change, greenhouse gases, and global warming potential; the federal, state, and local regulatory background associated with the proposed project; the thresholds of significance applied in the analysis and methodology, and assumptions used in the construction and operational emissions analysis; and the impact analysis. Section 4, References Cited, provides a list of the references cited, and Section 5, List of Preparers, provides a list of those who prepared this technical report. Modeling data and information related to the air quality and GHG analysis have been provided in Appendix A; additional information related to health effects is also provided in Appendix B.

1.2 Project Description

The proposed project site is located in the City of Oceanside and would consist of widening College Boulevard to a six-lane major arterial from Olive Drive to Old Grove Road, which would be consistent with the City's Circulation Element Year 2030 classification of College Boulevard. Along this section, the City proposes road and right-of-way improvements to the corridor to enhance existing and future traffic operations, provide congestion relief, reduce queue lengths, improve safety conditions for the unsignalized intersections and access points along the corridor, and provide safer travel routes for bicyclists and pedestrians. In addition to widening College Boulevard from four to six lanes between Olive Drive and Old Grove Road, the proposed project would include curb/gutter improvements and relocation of utilities, as needed to accommodate the widened roadway segment. It would also include installation of retaining walls, and relocation of bike lanes, lighting, and sidewalks in various locations along College

Boulevard between Waring Road/Barnard Drive and Marcella Street and between Olive Drive and Old Grove Road. The following improvements are an example of those proposed for the College Boulevard from Waring Road/Barnard Drive to Marcella Street:

- At the intersection of Waring Road/Barnard Drive, increase the curb radius from 30 feet to 50 feet to improve truck access, construct a 2-tier retaining wall system at the southeast corner of the Waring Road/Barnard Drive intersection with College Boulevard, and construct a 5-foot-high, single-tier retaining wall approximately 460 feet from the northeast corner.
- Widen approximately 600 feet of College Boulevard on the east side, north of Waring Road, to extend the bike lane and provide a third through lane and also construct multi-tier retaining walls on College Boulevard on the east side, north of Waring Road.
- Widen approximately 425 feet of College Boulevard on the west side, north of Barnard Drive, to extend the bike lane and provide a third through lane and also construct an approximately 5-foot-high, 460-foot-long single-tier retaining wall on College Boulevard on the west side, north of Barnard Drive.
- On both sides of College Boulevard, for an approximate distance of 3,000 feet, move the parkway adjacent to the curb and reconstruct the sidewalk adjacent to the right-of-way line.
- Stripe new crosswalks at the College Boulevard/Roselle Avenue intersection and install traffic-calming chokers to narrow the travel way at approximately 600 feet north of Roselle Avenue.
- Lengthen the northbound left-turn pocket at the intersection with Marvin Street West and implement additional minor curb and striping improvements.
- Lengthen the southbound left-turn pocket at the intersection with Thunder Drive.

The proposed project is located within the San Diego Air Basin (SDAB) and is within the jurisdictional boundaries of the San Diego Air Pollution Control District (SDAPCD).

2 AIR QUALITY

2.1 Environmental Setting

The proposed project site is within the SDAB, which is one of 15 air basins that geographically divide California. The SDAB lies in the southwest corner of California and comprises the entire San Diego region, covering approximately 4,260 square miles.

2.1.1 Climate and Meteorology

The primary factors that determine air quality are the locations of air pollutant sources and the amount of pollutants emitted. Meteorological and topographical conditions, however, are also important. Factors such as wind speed and direction, air temperature gradients and sunlight, and precipitation and humidity interact with physical landscape features to determine the movement and dispersal of air pollutants. Meteorological and topographical factors that affect air quality in the SDAB are described in this section.[1]

Regional Climate and Meteorological Conditions

The climate of the San Diego region, as in most of Southern California, is influenced by the strength and position of the semi-permanent high-pressure system over the Pacific Ocean, known as the Pacific High. This high-pressure ridge over the West Coast often creates a pattern of late-night and early-morning low clouds, hazy afternoon sunshine, daytime onshore breezes, and little temperature variation year-round. The SDAB is characterized as a Mediterranean climate with dry, warm summers and mild, occasionally wet winters. Average temperature ranges (in °F) from the mid-40s to the high 90s, with an average of 201 days warmer than 70°F. The SDAB experiences 9 to 13 inches of rainfall annually, with most of the region's precipitation falling from November through March, infrequent (approximately 10%) precipitation during the summer. El Niño and La Niña patterns have large effects on the annual rainfall received in San Diego, where San Diego receives less than normal rainfall during La Niña years.

The interaction of ocean, land, and the Pacific High maintains clear skies for much of the year and influences the direction of prevailing winds (westerly to northwesterly). The winds tend to blow onshore in the day and offshore at night. Local terrain is often the dominant factor inland,

[1] The discussion of meteorological and topographical conditions of the SDAB is based on information provided in the *Annual Air Quality Monitoring Network Plan 2016* (SDAPCD 2017), the *County of San Diego Guidelines for Determining Significance and Report Format and Content Requirements – Air Quality* (County of San Diego 2007), the Air Quality section of the *San Diego County General Plan Update Environmental Impact Report* (County of San Diego 2011), and Appendix 1 of the *Recommended Area Designation for the 2010 Federal Sulfur Dioxide Standard* (CARB 2011).

and winds in inland mountainous areas tend to blow through the valleys during the day and down the hills and valleys at night.

The favorable climate of San Diego also works to create air pollution problems. Sinking, or subsiding air from the Pacific High, creates a temperature inversion known as a subsidence inversion, which acts as a "lid" to vertical dispersion of pollutants. Weak summertime pressure gradients further limit horizontal dispersion of pollutants in the mixed layer below the subsidence inversion. Poorly dispersed anthropogenic emissions combined with strong sunshine leads to photochemical reactions that result in the creation of ozone (O_3) at this surface layer. In addition, light winds during the summer further limit ventilation.

In the fall months, the SDAB is often impacted by Santa Ana winds, which are the result of a high-pressure system over the Nevada and Utah regions that overcomes the westerly wind pattern and forces hot, dry winds from the east to the Pacific Ocean. The Santa Ana winds are powerful and can blow the SDAB's pollutants out to sea. However, a weak Santa Ana can transport air pollution from the South Coast Air Basin and greatly increase O_3 concentrations in the San Diego area.

Under certain conditions, atmospheric oscillation results in the offshore transport of air from the Los Angeles region to San Diego County. This often produces high O_3 concentrations, as measured at air pollutant monitoring stations within San Diego County. The transport of air pollutants from Los Angeles to San Diego can also occur within the stable layer of the elevated subsidence inversion, where high levels of O_3 are transported.

Site-Specific Meteorological Conditions

The local climate within the proposed project area is characterized as semi-arid with consistently mild, warmer temperatures throughout the year. The average summertime high temperature in the region is approximately 67.6°F, with highs reaching 73.6°F on average during the months of July through September. The average wintertime low temperature is approximately 52.9°F, reaching as low as 44.2°F on average during the months of November through March. Average precipitation in the local area is approximately 10.54 inches per year, with the bulk of precipitation falling between November and March (WRCC 2016).

2.1.2 Pollutants and Effects

2.1.2.1 Criteria Air Pollutants

Criteria air pollutants are defined as pollutants for which the federal and state governments have established ambient air quality standards, or criteria, for outdoor concentrations to protect public health. The federal and state standards have been set, with an adequate margin of safety, at levels above which concentrations could be harmful to human health and welfare. These standards are designed to protect the most sensitive persons from illness or discomfort. Pollutants of concern include O_3, nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter with an aerodynamic diameter less than or equal to 10 microns (PM_{10}), particulate matter with an aerodynamic diameter less than or equal to 2.5 microns ($PM_{2.5}$), and lead. These pollutants, as well as toxic air contaminants (TACs), are discussed in the following paragraphs.[2] In California, sulfates, vinyl chloride, hydrogen sulfide, and visibility-reducing particles are also regulated as criteria air pollutants. A more detailed discussion of health effects of criteria air pollutants is provided in Appendix C.

Ozone. O_3 is a strong-smelling, pale blue, reactive, toxic chemical gas consisting of three oxygen atoms. It is a secondary pollutant formed in the atmosphere by a photochemical process involving the sun's energy and O_3 precursors. These precursors are mainly oxides of nitrogen (NO_x) and volatile organic compounds (VOCs). The maximum effects of precursor emissions on O_3 concentrations usually occur several hours after they are emitted and many miles from the source. Meteorology and terrain play major roles in O_3 formation, and ideal conditions occur during late spring, summer, and early autumn on days with low wind speeds or stagnant air, warm temperatures, and cloudless skies. O_3 exists in the upper atmosphere ozone layer as well as at the Earth's surface in the troposphere.[3] The O_3 that the U.S. Environmental Protection Agency (EPA) and the California Air Resources Board (CARB) regulate as a criteria air pollutant is produced close to the ground level, where people live, exercise, and breathe. Ground-level O_3 is a harmful air pollutant that causes numerous adverse health effects and is thus considered "bad" O_3. Stratospheric, or "good," O_3 occurs naturally in the upper atmosphere, where it reduces the amount of ultraviolet light (i.e., solar radiation) entering the Earth's atmosphere. Without the protection of the beneficial stratospheric O_3 layer, plant and animal life would be seriously harmed.

O_3 in the troposphere causes numerous adverse health effects; short-term exposures (lasting for a few hours) to O_3 at levels typically observed in Southern California can result in breathing pattern changes, reduction of breathing capacity, increased susceptibility to infections, inflammation of the lung tissue, and some immunological changes (EPA 2013). These health problems are particularly acute in sensitive receptors such as the sick, the elderly, and young children.

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2 The descriptions of each of the criteria air pollutants and associated health effects are based on the EPA's "Criteria Air Pollutants" (EPA 2018a), CARB's "Glossary" (CARB n.d.), and the "ARB Fact Sheet: Air Pollution Sources, Effects and Control" (CARB 2009).

3 The troposphere is the layer of the Earth's atmosphere nearest to the surface of the Earth. The troposphere extends outward about 5 miles at the poles and about 10 miles at the equator.

Nitrogen Dioxide. NO_2 is a brownish, highly reactive gas that is present in all urban atmospheres. The major mechanism for the formation of NO_2 in the atmosphere is the oxidation of the primary air pollutant nitric oxide, which is a colorless, odorless gas. NO_2 is a constituent of NO_x, which plays a major role, together with VOCs, in the atmospheric reactions that produce O_3. NO_x is formed from fuel combustion under high temperature or pressure. In addition, NO_x is an important precursor to acid rain and may affect both terrestrial and aquatic ecosystems. The two major emissions sources of NO_2 are transportation and stationary fuel combustion sources such as electric utility and industrial boilers. NO_2 can irritate the lungs and may potentially lower resistance to respiratory infections (EPA 2018a).

Carbon Monoxide. CO is a colorless, odorless gas formed by the incomplete combustion of hydrocarbon, or fossil fuels. CO is emitted almost exclusively from motor vehicles, power plants, refineries, industrial boilers, ships, aircraft, and trains. In urban areas, such as the location of the proposed project, automobile exhaust accounts for the majority of CO emissions. CO is a nonreactive air pollutant that dissipates relatively quickly; therefore, ambient CO concentrations generally follow the spatial and temporal distributions of vehicular traffic. CO concentrations are influenced by local meteorological conditions, primarily wind speed, topography, and atmospheric stability. CO from motor vehicle exhaust can become locally concentrated when surface-based temperature inversions are combined with calm atmospheric conditions, which is a typical situation at dusk in urban areas from November to February. The highest levels of CO typically occur during the colder months of the year, when inversion conditions are more frequent.

In terms of adverse health effects, CO competes with oxygen, often replacing it in the blood, thereby reducing the blood's ability to transport oxygen to vital organs. The results of excess CO exposure can include dizziness, fatigue, and impairment of central nervous system functions.

Sulfur Dioxide. SO_2 is a colorless, pungent gas formed primarily from incomplete combustion of sulfur-containing fossil fuels. The main sources of SO_2 are coal and oil used in power plants and industries; as such, the highest levels of SO_2 are generally found near large industrial complexes. In recent years, SO_2 concentrations have been reduced by the increasingly stringent controls placed on stationary source emissions of SO_2 and limits on the sulfur content of fuels.

SO_2 is an irritant gas that affects the throat and lungs and can cause acute respiratory symptoms and diminished ventilator function in children. When combined with particulate matter, SO_2 can injure lung tissue and reduce visibility and the level of sunlight. SO_2 can also yellow plant leaves, and erode iron and steel.

Particulate Matter. Particulate matter pollution consists of very small liquid and solid particles floating in the air, which can include smoke, soot, dust, salts, acids, and metals. Particulate matter can form when gases emitted from industries and motor vehicles undergo chemical reactions in the atmosphere. $PM_{2.5}$ and PM_{10} represent fractions of particulate matter. Coarse particulate matter (PM_{10}) consists of particulate matter that is 10 microns or less in diameter and is about 1/7 the thickness of a human hair. Major sources of PM_{10} include crushing or grinding operations; dust stirred up by vehicles traveling on roads; wood-burning stoves and fireplaces; dust from construction, landfills, and agriculture; wildfires and brush/waste burning; industrial sources; windblown dust from open lands; and atmospheric chemical and photochemical reactions. Fine particulate matter ($PM_{2.5}$) consists of particulate matter that is 2.5 microns or less in diameter and is roughly 1/20 the diameter of a human hair. $PM_{2.5}$ results from fuel combustion (e.g., from motor vehicles, power generation, and industrial facilities), residential fireplaces, and woodstoves. In addition, $PM_{2.5}$ can be formed in the atmosphere from gases such as sulfur oxides (SO_x), NO_x, and VOCs.

$PM_{2.5}$ and PM_{10} pose a greater health risk than larger-size particles. When inhaled, these tiny particles can penetrate the human respiratory system's natural defenses and damage the respiratory tract. $PM_{2.5}$ and PM_{10} can increase the number and severity of asthma attacks, cause or aggravate bronchitis and other lung diseases, and reduce the body's ability to fight infections. Very small particles of substances such as lead, sulfates, and nitrates can cause lung damage directly or be absorbed into the blood stream, causing damage elsewhere in the body. Additionally, these substances can transport adsorbed gases such as chlorides or ammonium into the lungs, also causing injury. Whereas PM_{10} tends to collect in the upper portion of the respiratory system, $PM_{2.5}$ is so tiny that it can penetrate deeper into the lungs and damage lung tissue. Suspended particulates also damage and discolor surfaces on which they settle and produce haze and reduce regional visibility.

People with influenza, chronic respiratory or cardiovascular disease, and the elderly may suffer worsening illness and premature death as a result of breathing particulate matter. Premature mortality has been linked to $PM_{2.5}$ exposure even in otherwise healthy populations. People with bronchitis can expect aggravated symptoms from breathing in particulate matter. Children may experience a decline in lung function due to breathing in PM_{10} and $PM_{2.5}$ (EPA 2009).

Lead. Lead in the atmosphere occurs as particulate matter. Sources of lead include leaded gasoline; the manufacturing of batteries, paints, ink, ceramics, and ammunition; and secondary lead smelters. Before 1978, mobile emissions were the primary source of atmospheric lead. Between 1978 and 1987, the phaseout of leaded gasoline reduced the overall inventory of airborne lead by nearly 95%. With the phaseout of leaded gasoline, secondary lead smelters, battery recycling, and manufacturing facilities are becoming lead-emissions sources of greater concern.

Prolonged exposure to atmospheric lead poses a serious threat to human health. Health effects associated with exposure to lead include gastrointestinal disturbances, anemia, kidney disease, and in severe cases, neuromuscular and neurological dysfunction. Of particular concern are low-level lead exposures during infancy and childhood. Such exposures are associated with decrements in neurobehavioral performance, including intelligence quotient performance, psychomotor performance, reaction time, and growth. Children are highly susceptible to the effects of lead.

Sulfates. Sulfates are the fully oxidized form of sulfur, which typically occur in combination with metals or hydrogen ions. Sulfates are produced from reactions of SO_2 in the atmosphere. Sulfates can result in respiratory impairment, as well as reduced visibility.

Vinyl Chloride. Vinyl chloride is a colorless gas with a mild, sweet odor, which has been detected near landfills, sewage plants, and hazardous waste sites, due to the microbial breakdown of chlorinated solvents. Short-term exposure to high levels of vinyl chloride in air can cause nervous system effects, such as dizziness, drowsiness, and headaches. Long-term exposure through inhalation can cause liver damage, including liver cancer.

Hydrogen Sulfide. Hydrogen sulfide is a colorless and flammable gas that has a characteristic odor of rotten eggs. Sources of hydrogen sulfide include geothermal power plants, petroleum refineries, sewers, and sewage treatment plants. Exposure to hydrogen sulfide can result in nuisance odors, as well as headaches and breathing difficulties at higher concentrations.

Visibility-Reducing Particles. Visibility-reducing particles are any particles in the air that obstruct the range of visibility. Effects of reduced visibility can include obscuring the viewshed of natural scenery, reducing airport safety, and discouraging tourism. Sources of visibility-reducing particles are the same as for $PM_{2.5}$ described earlier in this section.

Volatile Organic Compounds. Hydrocarbons are organic gases that are formed from hydrogen and carbon and sometimes other elements. Hydrocarbons that contribute to formation of O_3 are referred to and regulated as VOCs (also referred to as reactive organic gases). Combustion engine exhaust, oil refineries, and fossil-fueled power plants are the sources of hydrocarbons. Other sources of hydrocarbons include evaporation from petroleum fuels, solvents, dry cleaning solutions, and paint.

The primary health effects of VOCs result from the formation of O_3 and its related health effects. High levels of VOCs in the atmosphere can interfere with oxygen intake by reducing the amount of available oxygen through displacement. Carcinogenic forms of hydrocarbons, such as benzene, are considered TACs. There are no separate health standards for VOCs as a group.

2.1.2.2 Non-Criteria Air Pollutants

Toxic Air Contaminants. A substance is considered toxic if it has the potential to cause adverse health effects in humans, including increasing the risk of cancer upon exposure, or acute and/or chronic non-cancer health effects. In California, specific air toxics are designated as TACs through a two-step process that was established in 1983 under the Toxic Air Contaminant Identification and Control Act. This two-step process of risk identification and risk management and reduction was designed to protect residents from the health effects of toxic substances in the air. Federal laws use the term hazardous air pollutants (HAPs) to refer to the same types of compounds that are referred to as TACs under state law.

Examples of TACs include certain aromatic and chlorinated hydrocarbons, certain metals, and asbestos. TACs are generated by a number of sources, including stationary sources, such as dry cleaners, gas stations, combustion sources, and laboratories; mobile sources, such as automobiles; and area sources, such as landfills. Adverse health effects associated with exposure to TACs may include carcinogenic (i.e., cancer-causing) and noncarcinogenic effects. Noncarcinogenic effects typically affect one or more target organ systems and may be experienced on either short-term (acute) or long-term (chronic) exposure to a given TAC.

Diesel Particulate Matter. Diesel particulate matter (DPM) is part of a complex mixture that makes up diesel exhaust. Diesel exhaust is composed of two phases, gas and particle, both of which contribute to health risks. More than 90% of DPM is less than 1 micrometer in diameter (about 1/70 the diameter of a human hair), and thus is a subset of $PM_{2.5}$ (CARB n.d.). DPM is typically composed of carbon particles (“soot,” also called black carbon) and numerous organic compounds, including over 40 known cancer-causing organic substances. Examples of these chemicals include polycyclic aromatic hydrocarbons, benzene, formaldehyde, acetaldehyde, acrolein, and 1,3-butadiene (CARB n.d.). The CARB classified “particulate emissions from diesel-fueled engines” (i.e., DPM; 17 CCR 93000) as a TAC in August 1998. DPM is emitted from a broad range of diesel engines: on-road diesel engines of trucks, buses, and cars, and off-road diesel engines including locomotives, marine vessels, and heavy-duty construction equipment, among others. Approximately 70% of all airborne cancer risk in California is associated with DPM (CARB 2000). Because it is part of $PM_{2.5}$, DPM also contributes to the same non-cancer health effects as $PM_{2.5}$ exposure. These effects include premature death; hospitalizations and emergency department visits for exacerbated chronic heart and lung disease, including asthma; increased respiratory symptoms; and decreased lung function in children. Several studies suggest that exposure to DPM may also facilitate development of new allergies (CARB n.d.). Those most vulnerable to non-cancer health effects of DPM are children whose lungs are still developing and the elderly who often have chronic health problems.

Odorous Compounds. Odors are generally regarded as an annoyance rather than a health hazard. Manifestations of a person's reaction to odors can range from psychological (e.g., irritation, anger, or anxiety) to physiological (e.g., circulatory and respiratory effects, nausea, vomiting, and headache). The ability to detect odors varies considerably among the population and is quite subjective. People may have different reactions to the same odor. An odor that is offensive to one person may be perfectly acceptable to another (e.g., coffee roaster). An unfamiliar odor is more easily detected and is more likely to cause complaints than a familiar one. Known as odor fatigue, a person can become desensitized to almost any odor, and recognition may only occur with an alteration in the intensity. The occurrence and severity of odor impacts depend on the nature, frequency, and intensity of the source; wind speed and direction; and the sensitivity of receptors.

Valley Fever. Coccidioidomycosis, more commonly known as "Valley Fever," is an infection caused by inhalation of the spores of the *Coccidioides immitis* fungus, which grows in the soils of the southwestern United States. When fungal spores are present, any activity that disturbs the soil, such as digging, grading, or other earthmoving operations, can cause the spores to become airborne and thereby increase the risk of exposure. The ecologic factors that appear to be most conducive to survival and replication of the spores are high summer temperatures, mild winters, sparse rainfall, and alkaline sandy soils.

The County is not considered a highly endemic region for Valley Fever; the San Diego County Health and Human Services Agency listed having 4.4 cases per 100,000 people (HHSA 2017). The proposed project site is located within the 92056 zip code; the incidence of Coccidioidomycosis is either less than the average County rate or had too few cases to be reliably utilized to calculate a rate (Nelson 2018). For comparison, statewide incidences in 2016 were 13.7 per 100,000 people (CDPH 2017).

Even if present at a site, earthmoving activities may not result in increased incidence of Valley Fever. Propagation of *Coccidioides immitis* is dependent on climatic conditions, with the potential for growth and surface exposure highest following early seasonal rains and long dry spells. *Coccidioides immitis* spores can be released when filaments are disturbed by earthmoving activities, although receptors must be exposed to and inhale the spores to be at increased risk of developing Valley Fever. Moreover, exposure to *Coccidioides immitis* does not guarantee that an individual will become ill—approximately 60% of people exposed to the fungal spores are asymptomatic and show no signs of an infection (USGS 2000).

2.1.3 Sensitive Receptors

Some land uses are considered more sensitive to changes in air quality than others, depending on the population groups and the activities involved. People most likely to be affected by air pollution include children, the elderly, athletes, and people with cardiovascular and chronic respiratory diseases. Facilities and structures where these air pollution-sensitive people live or spend considerable amounts of time are known as sensitive receptors. Land uses where air pollution-sensitive individuals are most likely to spend time include schools and schoolyards, parks and playgrounds, child-care centers, nursing homes, hospitals, and residential communities (often referred to as sensitive sites or sensitive land uses) (CARB 2005). The SDAPCD identifies sensitive receptors as those who are especially susceptible to adverse health effects from exposure to TACs, such as children, the elderly, and the ill. Sensitive receptors include schools (grades kindergarten through 12), child-care centers, nursing homes, retirement homes, health clinics, and hospitals (SDAPCD 2015a). Sensitive receptors, including residences and several schools (i.e., the Coastal Academy and La Petit Academy) are located along the proposed project corridor.

2.2 Regulatory Setting

2.2.1 Federal Regulations

2.2.1.1 Criteria Air Pollutants

The federal Clean Air Act, passed in 1970 and last amended in 1990, forms the basis for the national air pollution control effort. The EPA is responsible for implementing most aspects of the Clean Air Act, including setting National Ambient Air Quality Standards (NAAQS) for major air pollutants; setting HAP standards; approving state attainment plans; setting motor vehicle emission standards; issuing stationary source emission standards and permits; and establishing acid rain control measures, stratospheric O_3 protection measures, and enforcement provisions. Under the Clean Air Act, NAAQS are established for the following criteria pollutants: O_3, CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$, and lead.

The NAAQS describe acceptable air quality conditions designed to protect the health and welfare of the citizens of the nation. The NAAQS (other than for O_3, NO_2, SO_2, PM_{10}, $PM_{2.5}$, and those based on annual averages or arithmetic mean) are not to be exceeded more than once per year. NAAQS for O_3, NO_2, SO_2, PM_{10}, and $PM_{2.5}$ are based on statistical calculations over 1- to 3-year periods, depending on the pollutant. The Clean Air Act requires the EPA to reassess the NAAQS at least every 5 years to determine whether adopted standards are adequate to protect public health based on current scientific evidence. States with areas that exceed the NAAQS must prepare a state implementation plan (SIP) that demonstrates how those areas will attain the standards within mandated time frames.

2.2.1.2 *Hazardous Air Pollutants*

The 1977 federal Clean Air Act amendments required the EPA to identify National Emission Standards for Hazardous Air Pollutants to protect public health and welfare. HAPs include certain volatile organic chemicals, pesticides, herbicides, and radionuclides that present a tangible hazard, based on scientific studies of exposure to humans and other mammals. Under the 1990 Clean Air Act amendments, which expanded the control program for HAPs, 187 substances and chemical families were identified as HAPs.

2.2.2 State Regulations

2.2.2.1 *Criteria Air Pollutants*

The federal Clean Air Act delegates the regulation of air pollution control and the enforcement of the NAAQS to the states. In California, the task of air quality management and regulation has been legislatively granted to CARB, with subsidiary responsibilities assigned to air quality management districts and air pollution control districts at the regional and county levels. CARB, which became part of the California Environmental Protection Agency in 1991, is responsible for ensuring implementation of the California Clean Air Act of 1988, responding to the federal Clean Air Act, and regulating emissions from motor vehicles and consumer products.

CARB has established California Ambient Air Quality Standards (CAAQS), which are generally more restrictive than the NAAQS. The CAAQS describe adverse conditions; that is, pollution levels must be below these standards before a basin can attain the standard. Air quality is considered “in attainment” if pollutant levels are continuously below the CAAQS and violate the standards no more than once each year. The CAAQS for O_3, CO, SO_2 (1-hour and 24-hour), NO_2, PM_{10}, and $PM_{2.5}$ and visibility-reducing particles are values that are not to be exceeded. All others are not to be equaled or exceeded. The NAAQS and CAAQS are presented in Table 1.

Table 1
Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[a]	National Standards[b]	
		Concentration[c]	*Primary*[c,d]	*Secondary*[c,e]
O_3	1 hour	0.09 ppm (180 μg/m³)	—	Same as primary standard[f]
	8 hours	0.070 ppm (137 μg/m³)	0.070 ppm (137 μg/m³)[f]	
NO_2[g]	1 hour	0.18 ppm (339 μg/m³)	0.100 ppm (188 μg/m³)	Same as primary standard
	Annual arithmetic mean	0.030 ppm (57 μg/m³)	0.053 ppm (100 μg/m³)	
CO	1 hour	20 ppm (23 mg/m³)	35 ppm (40 mg/m³)	—
	8 hours	9.0 ppm (10 mg/m³)	9 ppm (10 mg/m³)	

Table 1
Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[a]	National Standards[b]	
		Concentration[c]	*Primary[c,d]*	*Secondary[c,e]*
SO_2[h]	1 hour	0.25 ppm (655 μg/m³)	0.075 ppm (196 μg/m³)	—
	3 hours	—	—	0.5 ppm (1,300 μg/m³)
	24 hours	0.04 ppm (105 μg/m³)	0.14 ppm (for certain areas)[g]	—
	Annual	—	0.030 ppm (for certain areas)[g]	—
PM_{10}[i]	24 hours	50 μg/m³	150 μg/m³	Same as primary standard
	Annual arithmetic mean	20 μg/m³	—	
$PM_{2.5}$[i]	24 hours	—	35 μg/m³	Same as primary standard
	Annual arithmetic mean	12 μg/m³	12.0 μg/m³	15.0 μg/m³
Lead[j,k]	30-day Average	1.5 μg/m³	—	—
	Calendar quarter	—	1.5 μg/m³ (for certain areas)[k]	Same as primary standard
	Rolling 3-month average	—	0.15 μg/m³	
Hydrogen sulfide	1 hour	0.03 ppm (42 μg/m³)	—	—
Vinyl chloride[j]	24 hours	0.01 ppm (26 μg/m³)	—	—
Sulfates	24 hours	25 μg/m³	—	—
Visibility reducing particles	8 hour (10:00 a.m. to 6:00 p.m. PST)	Insufficient amount to produce an extinction coefficient of 0.23 per kilometer due to the number of particles when the relative humidity is less than 70%	—	—

Source: CARB 2016.

Notes: — = no standards; μg/m³ = micrograms per cubic meter; CO = carbon monoxide; mg/m³= milligrams per cubic meter; NO_2 = nitrogen dioxide; O_3 = ozone; PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 microns; $PM_{2.5}$ = particulate matter with an aerodynamic diameter less than or equal to 2.5 microns; ppm = parts per million by volume; SO_2 = sulfur dioxide.

a California standards for O_3, CO, SO_2 (1-hour and 24-hour), NO_2, suspended particulate matter (PM_{10}, $PM_{2.5}$), and visibility-reducing particles are values that are not to be exceeded. All others are not to be equaled or exceeded. CAAQS are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

b National standards (other than O_3, NO_2, SO_2, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once per year. The O_3 standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over 3 years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 μg/m³ is equal to or less than 1. For $PM_{2.5}$, the 24-hour standard is attained when 98% of the daily concentrations, averaged over 3 years, are equal to or less than the standard.

c Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based on a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

d National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health.

[e] National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

[f] On October 1, 2015, the EPA Administrator signed the notice for the final rule to revise the primary and secondary NAAQS for O_3. The EPA is revising the levels of both standards from 0.075 ppm to 0.070 ppm and retaining their indicators (O_3), forms (fourth-highest daily maximum, averaged across 3 consecutive years), and averaging times (8 hours). The EPA is in the process of submitting the rule for publication in the Federal Register. The final rule will be effective 60 days after the date of publication in the Federal Register. The lowered national 8-hour standards are reflected in the table.

[g] To attain the national 1-hour standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 parts per billion (ppb). Note that the national 1-hour standard is in units of ppb. California standards are in units of ppm. To directly compare the national 1-hour standard to the California standards, the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.

[h] On June 2, 2010, a new 1-hour SO_2 standard was established, and the existing 24-hour and annual primary standards were revoked. To attain the national 1-hour standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until 1 year after an area is designated for the 2010 standard, except that in areas designated nonattainment of the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

[i] On December 14, 2012, the national annual $PM_{2.5}$ primary standard was lowered from 15 $\mu g/m^3$ to 12.0 $\mu g/m^3$. The existing national 24-hour $PM_{2.5}$ standards (primary and secondary) were retained at 35 $\mu g/m^3$, as was the annual secondary standard of 15 $\mu g/m^3$. The existing 24-hour PM_{10} standards (primary and secondary) of 150 $\mu g/m^3$ were also retained. The form of the annual primary and secondary standards is the annual mean averaged over 3 years.

[j] CARB has identified lead and vinyl chloride as TACs with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

[k] The national standard for lead was revised on October 15, 2008, to a rolling 3-month average. The 1978 lead standard (1.5 $\mu g/m^3$ as a quarterly average) remains in effect until 1 year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

2.2.2.2 Toxic Air Contaminants

The state Air Toxics Program was established in 1983 under Assembly Bill (AB) 1807 (Tanner). The California TAC list identifies more than 700 pollutants, of which carcinogenic and noncarcinogenic toxicity criteria have been established for a subset of these pollutants pursuant to the California Health and Safety Code. In accordance with AB 2728, the state list includes the (federal) HAPs. The Air Toxics "Hot Spots" Information and Assessment Act of 1987 (AB 2588) seeks to identify and evaluate risk from air toxics sources; however, AB 2588 does not regulate air toxics emissions. Rather, AB 2588 quantifies and prioritizes TAC emissions from individual facilities. "High-priority" facilities are required to perform a health risk assessment, and if specific thresholds are exceeded, are required to communicate the results to the public in the form of notices and public meetings.

In 2000, CARB approved a comprehensive Diesel Risk Reduction Plan to reduce diesel emissions from both new and existing diesel-fueled vehicles and engines. The regulation is anticipated to result in an 80% decrease in statewide diesel health risk in 2020 compared with the diesel risk in 2000 (CARB 2000). Additional regulations apply to new trucks and diesel fuel, including the On-Road Heavy Duty Diesel Vehicle (In-Use) Regulation, the On-Road Heavy Duty (New) Vehicle Program, the In-Use Off-Road Diesel Vehicle Regulation, and the New Off-Road Compression-Ignition (Diesel) Engines and Equipment Program. All of these regulations and programs have timetables by which manufacturers must comply and existing operators must upgrade their diesel powered equipment. Airborne Toxic Control Measures that reduce diesel emissions include In-Use Off-Road Diesel-Fueled Fleets (13 CCR 2449 et seq.) and In-Use On-Road Diesel-Fueled Vehicles (13 CCR 2025).

California Health and Safety Code, Section 41700

California Health and Safety Code, Section 41700 states that a person shall not discharge from any source whatsoever quantities of air contaminants or other material that cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public; or that endanger the comfort, repose, health, or safety of any of those persons or the public; or that cause, or have a natural tendency to cause, injury or damage to business or property. This section also applies to sources of objectionable odors.

2.2.3 Local Regulations

2.2.3.1 San Diego Air Pollution Control District

Although CARB is responsible for the regulation of mobile emissions sources within the state, local air quality management districts and air pollution control districts are responsible for enforcing standards and regulating stationary sources. The proposed project is located within the SDAB and is subject to the guidelines and regulations of the SDAPCD.

Federal Attainment Plans

In December 2016, the SDAPCD adopted an update to the *Eight-Hour Ozone Attainment Plan for San Diego County*. The plan indicates that local controls and state programs would allow the region to reach attainment of the federal 8-hour O_3 standard (1997 O_3 NAAQS) by 2018 (SDAPCD 2016a). In this plan, SDAPCD relies on the Regional Air Quality Strategy (RAQS) to demonstrate how the region will comply with the federal O_3 standard. The RAQS details how the region will manage and reduce O_3 precursors (i.e., NO_x and VOCs) by identifying measures and regulations intended to reduce these pollutants. The control measures identified in the RAQS generally focus on stationary sources; however, the emissions inventories and projections in the RAQS address all potential sources, including those under the authority of CARB and the EPA. Incentive programs for reduction of emissions from heavy-duty diesel vehicles, off-road equipment, and school buses are also established in the RAQS.

As documented in the 2016 update to the *Eight-Hour Ozone Attainment Plan for San Diego County*, the County has a likely chance of obtaining attainment due to the transition to low-emission cars, stricter new source review rules, and continuing the requirement of general conformity for military growth and the San Diego International Airport. The County will also continue emission control measures including ongoing implementation of existing regulations in ozone precursor reduction to stationary and area-wide sources, subsequent inspections of facilities and sources, and the adoption of laws requiring Best Available Retrofit Control Technology for control of emissions (SDAPCD 2016a).

State Attainment Plans

The SDAPCD and the San Diego Association of Governments (SANDAG) are responsible for developing and implementing the clean air plan for attainment and maintenance of the ambient air quality standards in the SDAB. The RAQS for the SDAB was initially adopted in 1991 and is updated on a triennial basis, most recently in 2016 (SDAPCD 2016b). The RAQS outlines SDAPCD's plans and control measures designed to attain the state air quality standards for O_3. The RAQS relies on information from CARB and SANDAG, including mobile and area source emissions, as well as information regarding projected growth in the County and the cities in the County, to forecast future emissions and then determine from that the strategies necessary for the reduction of emissions through regulatory controls. CARB mobile source emission projections and SANDAG growth projections are based on population, vehicle trends, and land use plans developed by the County and the cities in the County as part of the development of their general plans (SANDAG 2017a, n.d).

In December 2016, the SDAPCD adopted the revised RAQS for the County. Since 2007, the San Diego region reduced daily VOC emissions and NO_x emissions by 3.9% and 7.0% respectively; the SDAPCD expects to continue reductions through 2035 (SDAPCD 2016b). These reductions were achieved through implementation of six VOC control measures and three NO_x control measures adopted in the SDAPCD's 2009 RAQS (SDAPCD 2009a). In addition, the SDAPCD is considering additional measures, including three VOC measures and four control measures to reduce 0.3 daily tons of VOC and 1.2 daily tons of NO_x, provided they are found to be feasible region-wide. SDAPCD has also implemented nine incentive-based programs, has worked with SANDAG to implement regional transportation control measures, and has reaffirmed the state emission offset repeal.

In regards to particulate matter emissions reduction efforts, in December 2005, the SDAPCD prepared a report titled "Measures to Reduce Particulate Matter in San Diego County" to address implementation of Senate Bill (SB) 656 in San Diego County; SB 656 required additional controls to reduce ambient concentrations of PM_{10} and $PM_{2.5}$ (SDAPCD 2005). In the report, SDAPCD evaluated implementation of source-control measures that would reduce particulate matter emissions associated with residential wood combustion; various construction activities including earthmoving, demolition, and grading; bulk material storage and handling; carryout and trackout removal and cleanup methods; inactive disturbed land; disturbed open areas; unpaved parking lots/staging areas; unpaved roads; and windblown dust (SDAPCD 2005).

SDAPCD Rules and Regulations

As stated earlier in this section, the SDAPCD is responsible for planning, implementing, and enforcing federal and state ambient standards in the SDAB. The following rules and regulations apply to all sources in the jurisdiction of SDAPCD, and would apply to the proposed project:

- **Regulation IV: Prohibitions; Rule 50: Visible Emissions.** Prohibits discharge into the atmosphere, from any single source of emissions whatsoever any air contaminant for a period or periods aggregating more than 3 minutes in any period of 60 consecutive minutes that is darker in shade than that designated as Number 1 on the Ringelmann Chart, as published by the United States Bureau of Mines, or of such opacity as to obscure an observer's view to a degree greater than does smoke of a shade designated as Number 1 on the Ringelmann Chart (SDAPCD 1997).

- **Regulation IV: Prohibitions; Rule 51: Nuisance.** Prohibits the discharge, from any source, of such quantities of air contaminants or other materials that cause or have a tendency to cause injury, detriment, nuisance, annoyance to people and/or the public, or damage to any business or property (SDAPCD 1976).

- **Regulation IV: Prohibitions; Rule 55: Fugitive Dust.** Regulates fugitive dust emissions from any commercial construction or demolition activity capable of generating fugitive dust emissions, including active operations, open storage piles, and inactive disturbed areas, as well as trackout and carryout onto paved roads beyond a project site (SDAPCD 2009b).

- **Regulation IV: Prohibitions; Rule 67.0.1: Architectural Coatings.** Requires manufacturers, distributors, and end users of architectural and industrial maintenance coatings to reduce VOC emissions from the use of these coatings, primarily by placing limits on the VOC content of various coating categories (SDAPCD 2015b).

2.2.3.2 San Diego Association of Governments

SANDAG is the regional planning agency for San Diego County, and serves as a forum for regional issues relating to transportation, the economy, community development, and the environment. SANDAG serves as the federally designated metropolitan planning organization for San Diego County. With respect to air quality planning and other regional issues, SANDAG has prepared *San Diego Forward: The Regional Plan* (Regional Plan) for the San Diego region (SANDAG 2015). The Regional Plan combines the big-picture vision for how the region will grow over the next 35 years with an implementation program to help make that vision a reality. The Regional Plan, including its Sustainable Communities Strategy (SCS), is built on an integrated set of public policies, strategies, and investments to maintain, manage, and improve the transportation system so that it meets the diverse needs of the San Diego region through 2050.

In regard to air quality, the Regional Plan sets the policy context in which SANDAG participates in and responds to the air district's air quality plans, and builds off the air district's air quality plan processes that are designed to meet health-based criteria pollutant standards in several ways (SANDAG 2015). First, it complements air quality plans by providing guidance and incentives for public agencies to consider best practices that support the technology-based control measures in air quality plans. Second, the Regional Plan emphasizes the need for better coordination of land use and transportation planning, which heavily influences the emissions inventory from the transportation sectors of the economy. This also minimizes land use conflicts, such as residential development near freeways, industrial areas, or other sources of air pollution.

On September 23, 2016, SANDAG's Board of Directors adopted the final *2016 Regional Transportation Improvement Program* (RTIP). The 2016 RTIP is a multi-billion dollar, multi-year program of projects for major transportation projects in the San Diego region. Transportation projects supported through federal, state, and TransNet (the San Diego transportation sales tax program) funds must be included in an approved RTIP. The programming of locally funded projects also may be programmed at the discretion of the agency. The 2016 RTIP covers 5 fiscal years and incrementally implements the Regional Plan (SANDAG 2016).

2.2.3.3 City of Oceanside

The City of Oceanside General Plan includes various policies related to improving air quality (both directly and indirectly) (City of Oceanside 2002). Applicable policies include the following:

Land Use Element

- **Air Quality**
  - The City will continue to cooperate with the SDAPCD Board. This will include participation in the development of the RAQS through cooperation with the San Diego County Air Quality Planning Team.
- **Energy**
  - **Policy A:** The City shall encourage the design, installation, and use of passive and active solar collection systems.
  - **Policy B**: The City shall encourage the use of energy efficient design, structures, materials, and equipment in all land developments or uses.

- **Grading and Excavation**
  - **Policy A**: Investigation and evaluation of affected areas will indicate the measures to be included, such as the following measures:
    1. Keep grading to a minimum; leave vegetation and soils undisturbed wherever possible.
    2. Plant bare slopes and cleared areas with appropriate vegetation immediately after grading.
    3. Chemically treat soils to increase resistance to erosion.
    4. Install retaining structures where appropriate.
    5. Construct drainage systems to direct and control rate of surface runoff.
    6. Construct silt traps and settling basins in drainage systems.
    7. Construct weirs and check dams on streams.

In addition, the City of Oceanside General Plan Circulation Element includes the following policies (City of Oceanside 2012). Applicable policies include the following:

Circulation Element

- **Long Range Policy Direction**
  - **Policy 2.5:** The City will strive to incorporate complete streets throughout the Oceanside transportation network which are designed and constructed to serve all users of streets, roads and highways, regardless of their age or ability, or whether they are driving, walking, bicycling, or using transit.
- **Transportation Demand Management**
  - **Policy 4.1:** The City shall encourage the reduction of vehicle miles traveled, reduction of the total number of daily and peak hour vehicle trips, and provide better utilization of the circulation system through development and implementation of TDM [transportation demand management] strategies. These may include, but not limited to, implementation of peak hour trip reduction, encourage staggered work hours, telework programs, increased development of employment centers where transit usage is highly viable, encouragement of ridesharing options in the public and private sector, provision for park-and-ride facilities adjacent to the regional transportation system, and provision for transit subsidies.

- **Policy 4.2:** Maintain and implement the policies and recommendations of the Bicycle Master Plan as part of the Recreational Trails Element. These facilities shall connect residential areas with schools, parks, recreation areas, major employment centers, and neighborhood commercial areas.
- **Policy 4.3:** Maintain and implement the policies and recommendations of the Pedestrian Master Plan as part of the Recreational Trails Element to ensure pedestrian access along streets and other locations throughout the City are properly maintained and provided.
- **Policy 4.9:** The City shall look for opportunities to incorporate TDM programs into their Energy Roadmap that contributes to state and regional goals for saving energy and reducing GHG emissions.

- **Bicycle Facilities**
  - **Policy 6.3:** Integrate bicycle and pedestrian planning and safety considerations more fully into the planning and design of the roadway network, transit facilities, public buildings, and parks.
  - **Policy 6.4:** Provide and maintain a safe, direct, and comprehensive bicycle network connecting neighborhoods, employment locations, public facilities, transit stations, parks and other key destinations.
  - **Policy 6.5:** Plan Class II bicycle lanes into all prime arterial, major arterials, and secondary collectors where safe and appropriate as determined by City staff.
- **Pedestrian Facilities**
  - **Policy 7.7:** Require the construction of a minimum five-foot wide sidewalk in all new developments and street improvements but will encourage sidewalk widths that go beyond the minimum five-foot ADA standards in areas with high pedestrian activity.

2.3 Regional and Local Air Quality Conditions

2.3.1 San Diego Air Basin Attainment Designation

Pursuant to the 1990 federal Clean Air Act amendments, the EPA classifies air basins (or portions thereof) as "attainment" or "nonattainment" for each criteria air pollutant, based on whether the NAAQS have been achieved. Generally, if the recorded concentrations of a pollutant are lower than the standard, the area is classified as "attainment" for that pollutant. If an area exceeds the standard, the area is classified as "nonattainment" for that pollutant. If there is not enough data available to determine whether the standard is exceeded in an area, the area is designated as "unclassified" or "unclassifiable." The designation of "unclassifiable/attainment" means that the area meets the standard or is expected to meet the standard despite a lack of monitoring data. Areas that achieve the standards after a nonattainment designation are re-designated as maintenance areas and must have approved Maintenance Plans to ensure continued attainment of the standards. The California Clean Air Act, like its federal counterpart, called for the designation of areas as "attainment" or "nonattainment," but based on CAAQS rather than the NAAQS. Table 2 depicts the current attainment status of the proposed project site with respect to the NAAQS and CAAQS.

Table 2
San Diego Air Basin Attainment Classification

Pollutant	Designation/Classification	
	Federal Standards	*State Standards*
Ozone (O_3) – 1 hour [a]	Attainment[a]	**Nonattainment**
O_3 (8-hour – 1997) (8-hour – 2008)	Attainment (Maintenance) **Nonattainment (Moderate)**	**Nonattainment**
Nitrogen Dioxide (NO_2)	Unclassifiable/Attainment	Attainment
Carbon Monoxide (CO)	Attainment (Maintenance)	Attainment
Sulfur Dioxide (SO_2)	Unclassifiable/Attainment	Attainment
Coarse Particulate Matter (PM_{10})	Unclassifiable/Attainment	**Nonattainment**
Fine Particulate Matter ($PM_{2.5}$)	Unclassifiable/Attainment	**Nonattainment**
Lead	Unclassifiable/Attainment	Attainment
Hydrogen Sulfide	No federal standard	Attainment
Sulfates	No federal standard	Unclassified
Visibility-Reducing Particles	No federal standard	Unclassified
Vinyl Chloride	No federal standard	No designation

Sources: EPA 2018b (federal); CARB 2018a (state).
Notes:
Attainment = meets the standards; Attainment/Maintenance = achieve the standards after a nonattainment designation; Nonattainment = does not meet the standards; Unclassified or Unclassifiable = insufficient data to classify; Unclassifiable/Attainment = meets the standard or is expected to be meet the standard despite a lack of monitoring data.
[a] The federal 1-hour standard of 0.12 parts per million was in effect from 1979 through June 15, 2005. The revoked standard is referenced here because it was employed for such a long period and because this benchmark is addressed in SIPs.

In summary, the SDAB is designated as an attainment area for the 1997 8-hour O_3 NAAQS and as a nonattainment area for the 2008 8-hour O_3 NAAQS. The SDAB is designated as a nonattainment area for O_3, PM_{10}, and $PM_{2.5}$ CAAQS. The portion of the SDAB where the proposed project is located is designated as attainment or unclassifiable/unclassified for all other criteria pollutants under the NAAQS and CAAQS.

2.3.2 Local Ambient Air Quality

CARB, air districts, and other agencies monitor ambient air quality at approximately 250 air quality monitoring stations across the state. Local ambient air quality is monitored by the SDAPCD. The

SDAPCD operates a network of ambient air monitoring stations throughout San Diego County, which measure ambient concentrations of pollutants and determine whether the ambient air quality meets the CAAQS and the NAAQS. The nearest SDAPCD-operated monitoring station is the Camp Pendleton monitoring station, which is located approximately 7 miles northeast of the proposed project site. This monitoring station was used to show the background ambient air quality for O_3 and NO_2. The closest monitoring site that measures PM_{10} and $PM_{2.5}$ is the Kearny Villa Road monitoring station located at 6125A Kearny Villa Road, San Diego, which is about 26 miles southeast of the site. The closest monitoring site that measures CO and SO_2 is the First Street monitoring station located at 533 First Street, El Cajon, which is about 35 miles southeast of the site. The most recent background ambient air quality data and number of days exceeding the ambient air quality standards from 2016 to 2018 are presented in Table 3.

Table 3
Local Ambient Air Quality Data

Averaging Time	Unit	Agency/Method	Ambient Air Quality Standard	Measured Concentration by Year			Exceedances by Year		
				2016	*2017*	*2018*	*2016*	*2017*	*2018*
Ozone (O_3) – Camp Pendleton									
Maximum 1-hour concentration	ppm	State	0.09	0.083	0.094	0.084	0	0	0
Maximum 8-hour concentration	ppm	State	0.070	0.073	0.082	0.069	5	5	0
		Federal	0.070	0.073	0.081	0.068	4	4	0
Nitrogen Dioxide (NO_2) – Camp Pendleton									
Maximum 1-hour concentration	ppm	State	0.18	0.072	0.063	0.048	0	0	0
		Federal	0.100	0.072	0.063	0.048	0	0	0
Annual concentration	ppm	State	0.030	0.006	0.006	—	—	—	—
		Federal	0.053	0.006	0.006	—	—	—	—
Carbon Monoxide (CO) – First Street									
Maximum 1-hour concentration	ppm	State	20	1.6	1.5	1.4	0	0	0
		Federal	35	1.6	1.5	1.4	0	0	0
Maximum 8-hour concentration	ppm	State	9.0	1.3	1.4	1.1	0	0	0
		Federal	9	1.3	1.4	1.1	0	0	0
Sulfur Dioxide (SO_2) – First Street									
Maximum 1-hour concentration	ppm	Federal	0.075	0.0006	0.0011	0.0035	0	0	0
Maximum	ppm	Federal	0.14	0.0002	0.0004	0.0004	0	0	0

Table 3
Local Ambient Air Quality Data

Averaging Time	Unit	Agency/Method	Ambient Air Quality Standard	Measured Concentration by Year			Exceedances by Year		
				2016	*2017*	*2018*	*2016*	*2017*	*2018*
24-hour concentration									
Annual concentration	ppm	Federal	0.030	0.00008	0.00011	0.0001	0	0	0
Coarse Particulate Matter (PM_{10})[a] – Kearny Villa Road									
Maximum 24-hour concentration	μg/m^3	State	50	35.0	47.0	38.0	—	0.0 (0)	0.0 (0)
		Federal	150	36.0	46.0	38.0	0.0 (0)	0.0 (0)	0.0 (0)
Annual concentration	μg/m^3	State	20	—	17.6	18.4	—	—	—
Fine Particulate Matter ($PM_{2.5}$)[a] – Kearny Villa Road									
Maximum 24-hour concentration	μg/m^3	Federal	35	19.4	27.5	32.2	0.0 (0)	0.0 (0)	0.0 (0)
Annual concentration	μg/m^3	State	12	7.8	8.0	8.3	—	—	—
		Federal	12.0	7.5	7.9	8.3	—	—	—

Sources: CARB 2019; EPA 2018c.
Notes: — = not available; μg/m^3 = micrograms per cubic meter; ppm = parts per million.
Data taken from CARB iADAM (http://www.arb.ca.gov/adam) and EPA AirData (http://www.epa.gov/airdata/) represent the highest concentrations experienced over a given year.
Daily exceedances for particulate matter are estimated days because PM_{10} and $PM_{2.5}$ are not monitored daily. All other criteria pollutants did not exceed federal or state standards during the years shown. There is no federal standard for 1-hour O_3, annual PM_{10}, or 24-hour SO_2, nor is there a state 24-hour standard for $PM_{2.5}$.
Camp Pendleton monitoring station is located at 21441 West B Street, Camp Pendleton, California.
El Cajon monitoring station is located at 533 First Street, El Cajon, California.
San Diego–Kearny Villa Road monitoring station is located at 6125A Kearny Villa Road, San Diego, California.
[a] Measurements of PM_{10} and $PM_{2.5}$ are usually collected every 6 days and every 1 to 3 days, respectively. Number of days exceeding the standards is a mathematical estimate of the number of days concentrations would have been greater than the level of the standard had each day been monitored. The numbers in parentheses are the measured number of samples that exceeded the standard.

2.4 Significance Criteria and Methodology

2.4.1 Thresholds of Significance

The significance criteria used to evaluate the proposed project impacts to air quality is based on the recommendations provided in Appendix G of the CEQA Guidelines. For the purposes of this air quality analysis, a significant impact would occur if the proposed project would (14 CCR 15000 et seq.):

1. Conflict with or obstruct implementation of the applicable air quality plan.

2. Violate any air quality standard or contribute substantially to an existing or projected air quality violation.
3. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors).
4. Expose sensitive receptors to substantial pollutant concentrations.
5. Create objectionable odors affecting a substantial number of people.

Appendix G of the CEQA Guidelines (14 CCR 15000 et seq.) indicates that, where available, the significance criteria established by the applicable air quality management district or pollution control district may be relied upon to determine whether the proposed project would have a significant impact on air quality.

As part of its air quality permitting process, the SDAPCD has established thresholds in Rule 20.2 requiring the preparation of Air Quality Impact Assessments for permitted stationary sources (SDAPCD 2016c). The SDAPCD sets forth quantitative emission thresholds below which a stationary source would not have a significant impact on ambient air quality. Although these trigger levels do not generally apply to mobile sources or general land development projects, for comparative purposes these levels may be used to evaluate the increased emissions that would be discharged to the SDAB from proposed land development projects (County of San Diego 2007). Project-related air quality impacts estimated in this environmental analysis would be considered significant if any of the applicable significance thresholds presented in Table 4 are exceeded.

Table 4
SDAPCD Air Quality Significance Thresholds

Construction Emissions			
Pollutant	*Total Emissions (Pounds per Day)*		
Respirable Particulate Matter (PM_{10})	100		
Fine Particulate Matter ($PM_{2.5}$)	55		
Oxides of Nitrogen (NO_x)	250		
Oxides of Sulfur (SO_x)	250		
Carbon Monoxide (CO)	550		
Volatile Organic Compounds (VOC)	75*		
Operational Emissions			
Pollutant	*Total Emissions*		
	Pounds per Hour	*Pounds per Day*	*Tons per Year*
Respirable Particulate Matter (PM_{10})	—	100	15
Fine Particulate Matter ($PM_{2.5}$)	—	55	10
Oxides of Nitrogen (NO_x)	25	250	40
Sulfur Oxides (SO_x)	25	250	40
Carbon Monoxide (CO)	100	550	100
Lead and Lead Compounds	—	3.2	0.6
Volatile Organic Compounds (VOC)	—	75*	13.7

Sources: SDAPCD 1995; SDAPCD 2016c.
* VOC threshold based on the threshold of significance for VOCs from the South Coast Air Quality Management District for the Coachella Valley as stated in the San Diego County Guidelines for Determining Significance.

The thresholds listed in Table 4 represent screening-level thresholds that can be used to evaluate whether proposed project-related emissions could cause a significant impact on air quality. Emissions below the screening-level thresholds would not cause a significant impact. The emissions-based thresholds for O_3 precursors are intended to serve as a surrogate for an “O_3 significance threshold” (i.e., the potential for adverse O_3 impacts to occur). This approach is used because O_3 is not emitted directly (see the discussion of O_3 and its sources in Section 2.1.2, Pollutants and Effects), and the effects of an individual project’s emissions of O_3 precursors (VOC and NO_x) on O_3 levels in ambient air cannot be determined through air quality models or other quantitative methods. For nonattainment pollutants, if emissions exceed the thresholds shown in Table 4, the proposed project could have the potential to result in a cumulatively considerable net increase in these pollutants and thus could have a significant impact on the ambient air quality.

With respect to odors, SDAPCD Rule 51 (Public Nuisance) prohibits emission of any material that causes nuisance to a considerable number of persons or endangers the comfort, health, or safety of any person. A project that proposes a use that would produce objectionable odors would be deemed to have a significant odor impact if it would affect a considerable number of off-site receptors.

2.4.2 Approach and Methodology

2.4.2.1 Construction Emissions

Emissions from the construction phase of the proposed project were estimated using the Road Construction Emissions Model Version 9.0.0 (SMAQMD 2018).

For the purposes of modeling, it was assumed that construction of the proposed project would commence in January 2019, and would occur over a period of approximately 6 months. Based on the proposed project area, it was estimated that up to 7 acres would be disturbed. For material transport, a total of approximately 3,416 and 4,641 cubic yards of material (i.e., asphalt, aggregate base, and concrete) would be exported (during the grubbing/land clearing and grading/excavation phases) and imported (during the drainage/utilities/sub-grade and paving phases), respectively. The analysis contained herein is based on the default model assumptions outlined in Table 5 (duration of phases is approximate).

Table 5
Construction Phasing Assumptions

Proposed Project Construction Phase	Construction Start Month/Day/Year	Phase Duration (Months)
Grubbing/Land Clearing	01/01/2019	0.6
Grading/Excavation	01/20/2019	2.4
Drainage/Utilities/Sub-Grade	04/03/2019	2.1
Paving	06/06/2019	0.9

Source: See Appendix A for details.

The construction equipment mix, worker trips, water truck trips, and material haul truck trips used for estimating the construction emissions of the proposed project are based on model defaults and are shown in Table 6.

Table 6
Construction Scenario Assumptions

Construction Phase	One-way Vehicle Trips			Equipment		
	Average Daily Worker Trips	*Average Daily Water Truck Trips*	*Average Daily Haul Truck Trips*	*Equipment Type*	*Quantity*	*Usage Hours*
Grubbing/Land Clearing	20	10	6	Crawler Tractors	1	8
				Excavators	2	8
				Signal Boards	5	8
Grading/Excavation	50	10	6	Crawler Tractors	1	8
				Excavators	3	8
				Graders	2	8
				Rollers	2	8
				Rubber-Tired Loaders	1	8
				Scrapers	2	8
				Signal Boards	5	8
				Tractors/Loaders/Backhoes	4	8
Drainage/Utilities/Sub-Grade	38	10	8	Air Compressors	1	8
				Generator Sets	1	8
				Graders	1	8
				Plate Compactors	1	8
				Pumps	1	8
				Rough Terrain Forklifts	1	8
				Scrapers	1	8
				Signal Boards	5	8
				Tractors/Loaders/Backhoes	3	8
Paving	30	10	8	Pavers	1	8
				Paving Equipment	1	8
				Rollers	2	8
				Signal Boards	5	8
				Tractors/Loaders/Backhoes	3	8

Notes: See Appendix A for details.

For the analysis, it was assumed that heavy construction equipment would be operating for 8 hours per day, 5 days per week (22 days per month) during proposed project construction.

Construction of proposed project components would be subject to SDAPCD Rule 55 (Fugitive Dust Control). This rule requires that construction of proposed project components include steps to restrict visible emissions of fugitive dust beyond the property line (SDAPCD 2009b). Compliance with Rule 55 would limit fugitive dust (PM_{10} and $PM_{2.5}$) that may be generated during grading and construction activities.

A detailed depiction of the construction schedule and assumptions is included in Appendix A of this report.

2.4.2.2 Operational Emissions

The proposed project would include road and right-of-way improvements to the corridor to enhance existing and future traffic operations, provide congestion relief, reduce queue lengths, improve safety conditions for the unsignalized intersections and access points along the corridor, and provide safer travel routes for bicyclists and pedestrians. However, as described in the Transportation Impact Analysis (TIA) prepared for the proposed project (Appendix K), the 2035 daily vehicle miles traveled (VMT) estimated using the SANDAG Series 12 traffic model for the proposed project would be higher than for buildout of College Boulevard in accordance with the City's current Circulation Element (102,604,488 miles versus 101,798,320 miles) (Appendix K). The higher cumulative VMT figure under the proposed project is due to a higher average trip length, which reflects changes in travel behavior patterns based on not widening a section of the College Boulevard study corridor (i.e., Olive Drive to Barnard Drive/Waring Road (Appendix K). Since the proposed project would result in higher VMT, emissions associated with the net increase in VMT were estimated using the California Emissions Estimator Model (CalEEMod), version 2016.3.2. The default number of trips and trip lengths in CalEEMod were adjusted to match the daily VMT increase of 806,168 miles (i.e., 102,604,488 miles minus 101,798,320 miles). Other CalEEMod default data, including variable start information, emissions factors, and fleet mix were conservatively used for the model inputs. Emission factors for year 2035 were used to estimate emissions associated with full buildout of the proposed project. CalEEMod output data are included in Appendix A of this report.

2.5 Impact Analysis

2.5.1 Threshold AQ-1

Would the project conflict with or obstruct implementation of the applicable air quality plan?

As mentioned in Section 2.2.3, Local Regulations, the SDAPCD and SANDAG are responsible for developing and implementing the clean air plans for attainment and maintenance of the ambient air quality standards in the basin—specifically, the SIP and RAQS.[4] The federal O_3 maintenance plan, which is part of the SIP, was adopted in 2012. The most recent O_3 attainment plan was adopted in 2016. The SIP includes a demonstration that current strategies and tactics will maintain acceptable

[4] For the purpose of this discussion, the relevant federal air quality plan is the O_3maintenance plan (SDAPCD 2012). The RAQS is the applicable plan for purposes of state air quality planning. Both plans reflect growth projections in the basin.

air quality in the basin based on the NAAQS. The RAQS was initially adopted in 1991, and is updated on a triennial basis (most recently in 2016). The RAQS outlines SDAPCD's plans and control measures designed to attain the state air quality standards for O_3. The SIP and RAQS rely on information from CARB and SANDAG, including mobile and area source emissions, as well as information regarding projected growth in the County as a whole and the cities in the County, to project future emissions and determine the strategies necessary for the reduction of emissions through regulatory controls. CARB mobile source emission projections and SANDAG growth projections are based on population, vehicle trends, and land use plans developed by the County and the cities in the County as part of the development of their general plans.

If a proposed project involves development that is greater than that anticipated in the local plan and SANDAG's growth projections, the proposed project might be in conflict with the SIP and RAQS, and may contribute to a potentially significant cumulative impact on air quality. While the SDAPCD and City do not provide guidance regarding the analysis of impacts associated with air quality plan conformance, the *County of San Diego Guidelines for Determining Significance and Report Format and Content Requirements – Air Quality* does discuss conformance with the RAQS (County of San Diego 2007). The guidance indicates that if a project, in conjunction with other projects, contributes to growth projections that would not exceed SANDAG's growth projections for the City, the project would not be in conflict with the RAQS (County of San Diego 2007). The proposed project would consist of roadway improvements and would not result in additional growth in the City. However, as identified in the TIA, the proposed project would result in increased VMT associated with changes in travel behavior patterns based on not widening a section of the College Boulevard study corridor, as compared to the current Circulation Element. Because the VMT and emissions forecasts upon which the SIP and RAQS are based would be exceeded, the proposed project would conflict with or obstruct implementation of the applicable air quality plan and impacts would be potentially significant.

Mitigation Measures

M-AQ-1 Prior to the San Diego Air Pollution Control District's (SDAPCD's) next triennial review of the Regional Air Quality Strategy, the City of Oceanside (City) shall coordinate with SDAPCD to amend the vehicle miles traveled (VMT) and emissions assumptions using the proposed project's College Boulevard corridor revisions. This includes downgrading the future classification of College Boulevard between Olive Drive and Waring Road in the Circulation Element from a six-lane Major Arterial to a four-lane Major Arterial.

Level of Significance After Mitigation

Impacts would be less than significant with mitigation.

2.5.2 Threshold AQ-2

Would the project violate any air quality standard or contribute substantially to an existing or projected air quality violation?

Construction

Construction of the proposed project would result in the temporary addition of pollutants to the local airshed caused by on-site sources (i.e., off-road construction equipment, soil disturbance, and VOC off-gassing) and off-site sources (worker vehicle trips). Construction emissions can vary substantially from one day to the next, depending on the level of activity, the specific type of operation, and for dust, the prevailing weather conditions.

Criteria air pollutant emissions associated with construction activity were quantified using the Road Construction Emissions Model. Default values provided by the Road Construction Emissions Model were used where detailed proposed project information was not available. A detailed depiction of the construction schedule—including information regarding phasing, equipment used during each phase, haul trucks, water trucks, and worker vehicles—is included in Section 2.4.2.1, Construction Emissions.

Implementation of the proposed project would generate air pollutant emissions from entrained dust, off-road equipment, vehicle emissions, and asphalt pavement application. Entrained dust results from the exposure of earth surfaces to wind from the direct disturbance and movement of soil, resulting in PM_{10} and $PM_{2.5}$ emissions. The proposed project is subject to SDAPCD Rule 55, Fugitive Dust Control. This rule requires that the proposed project take steps to restrict visible emissions of fugitive dust beyond the property line. Compliance with Rule 55 would limit fugitive dust (PM_{10} and $PM_{2.5}$) generated during grading and construction activities. To account for dust control measures in the calculations, it was assumed that the active sites would be watered sufficiently to result in an approximately 50% reduction of particulate matter.

Exhaust from internal combustion engines used by construction equipment, trucks, and worker vehicles would result in emissions of VOC, NO_x, CO, SO_x, PM_{10}, and $PM_{2.5}$.

Table 7 shows the estimated maximum daily construction emissions associated with the construction of the proposed project without mitigation. Complete details of the emissions calculations are provided in Appendix A of this document.

Table 7
Estimated Maximum Daily Construction Criteria Air Pollutant Emissions

Year 2019	VOC	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
	Pounds per Day					
Grubbing/Land Clearing	1.51	16.17	12.08	0.03	1.30	0.74
Grading/Excavation	6.79	76.70	51.86	0.11	4.01	3.20
Drainage/Utilities/Sub-Grade	4.16	41.80	33.48	0.07	2.70	2.06
Paving	2.08	19.96	19.82	0.04	1.20	1.06
Maximum Daily Emissions	**6.79**	**76.70**	**51.86**	**0.11**	**4.01**	**3.20**
SDAPCD Threshold	*75*	*250*	*550*	*250*	*100*	*55*
Threshold Exceeded?	**No**	**No**	**No**	**No**	**No**	**No**

Source: See Appendix A for detailed results.
Notes: CO = carbon monoxide; NO_x = oxides of nitrogen; $PM_{2.5}$ = fine particulate matter; PM_{10} = coarse particulate matter; SDAPCD = San Diego Air Pollution Control District; SO_x = sulfur oxides; VOC = volatile organic compound.
The values shown are the maximum daily emissions results from the Road Construction Emission Model and reflect 50% fugitive dust reduction to account for compliance with SDAPCD Rule 55 (Fugitive Dust).

As shown in Table 7, daily construction emissions would not exceed the significance thresholds for any criteria air pollutant. Therefore, impacts during construction would be less than significant.

Operations

The proposed project would result in right-of-way improvements to the corridor to enhance existing and future traffic operations, provide congestion relief, reduce queue lengths, improve safety conditions for the unsignalized intersections and access points along the corridor, and provide safer travel routes for bicyclists and pedestrians. However, as described in the TIA, the regional 2035 daily VMT associated with the proposed project would be higher than for buildout of College Boulevard in accordance with the City's existing Circulation Element (an increase of 806,168 miles) due to a higher average trip length, which reflects changes in travel behavior patterns based on not widening a section of the College Boulevard between Olive Drive and Barnard Drive/Waring Road (Appendix K). The incremental increase in VMT was modeled in CalEEMod to estimate increased emissions with the proposed project, which are summarized in Table 8. Complete details of the emissions calculations are provided in Appendix A.

Table 8
Estimated Incremental Increase in Maximum Daily Operational Criteria Air Pollutant Emissions – Project vs Existing Circulation Element

Year 2035	VOC	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
	Pounds per Day					
Incremental Increase in Daily Emissions from On-Road VMT	88.28	393.29	1,160.65	5.27	626.25	169.00
SDAPCD Threshold	*75*	*250*	*550*	*250*	*100*	*55*
Threshold Exceeded?	**Yes**	**Yes**	**Yes**	**No**	**Yes**	**Yes**

Source: See Appendix A for detailed results.
Notes: CO = carbon monoxide; NO_x = oxides of nitrogen; $PM_{2.5}$ = fine particulate matter; PM_{10} = coarse particulate matter; SDAPCD = San Diego Air Pollution Control District; SO_x = sulfur oxides; VOC = volatile organic compound; VMT = vehicle miles traveled.
The values shown are the maximum summer or winter daily emissions results from CalEEMod.

As depicted in Table 8, the incremental increase in emissions of VOC, NO_x, CO, PM_{10}, and $PM_{2.5}$ would exceed the SDAPCD thresholds and would be potentially significant without mitigation. However, since the City lacks the authority to mandate emission reductions for on-road vehicles, or to control driver behavior, no feasible mitigation measures have been identified to reduce these emissions. This impact would be significant and unavoidable.

As discussed above, the proposed project would result in emissions that would exceed the SDAPCD thresholds for VOC, NO_x, CO, PM_{10}, and $PM_{2.5}$ exceedances during operations. Notably, since the emission-based thresholds used in this analysis were established to provide project-level estimates of criteria air pollutant quantities that the SDAB can accommodate without affecting the attainment dates for the ambient air quality standards, and since the EPA and CARB have established the ambient air quality standards at levels above which concentrations could be harmful to human health and welfare, with an adequate margin of safety, elevated levels of criteria air pollutants above adopted thresholds as a result of the proposed project's operation could cause adverse health effects associated with these pollutants. (The effects typically associated with unhealthy levels of criteria air pollutant exposure are described in Section 2.1.2, Pollutants and Effects, above.) However, as detailed in Appendix B, there are numerous scientific and technological complexities associated with correlating criteria air pollutant emissions from an individual project to specific health effects or potential additional nonattainment days, and there are currently no modeling tools that could provide reliable and meaningful additional information regarding health effects from criteria air pollutants generated by individual projects.

Mitigation Measures

No feasible mitigation measures have been identified.

Level of Significance After Mitigation

The proposed project would result in a significant and unavoidable impact.

2.5.3 Threshold AQ-3

Would the project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?

Air pollution is largely a cumulative impact. The nonattainment status of regional pollutants is a result of past and present development, and the SDAPCD develops and implements plans for future attainment of ambient air quality standards. Based on these considerations, project-level thresholds of significance for criteria pollutants are relevant in the determination of whether a project's individual emissions would have a cumulatively significant impact on air quality. As described under Section 2.5.2, Threshold AQ-2, the proposed project would have a less-than-significant impact for short-term construction. However, over the long-term, the incremental increase in regional VMT associated with the proposed project (i.e., widening of College Boulevard between Olive Drive and Old Grove Road), as compared to future (2035) traffic operations assuming buildout of College Boulevard in accordance with the existing the Circulation Element (i.e., widening from Old Grove Road to Barnard Drive/Waring Road), would result in a significant and unavoidable increase in emissions of VOC, NO_x, CO, PM_{10}, and $PM_{2.5}$.

The SDAB has been designated as a federal nonattainment area for O3 and a state nonattainment area for O_3, PM_{10}, and $PM_{2.5}$. The nonattainment status is the result of cumulative emissions from all sources of these air pollutants and their precursors within the basin. Projects that emit these pollutants or their precursors (i.e., VOCs and NO_x for O_3) potentially contribute to poor air quality. In analyzing cumulative impacts from a project, the analysis must specifically evaluate the project's contribution to the cumulative increase in pollutants for which the basin is designated as nonattainment for the CAAQS and NAAQS. Since the proposed project would result in regional emissions of VOCs, NO_x, PM_{10}, and $PM_{2.5}$ that would exceed SDAPCD thresholds, the proposed project would result in a cumulatively considerable increase in these nonattainment pollutants. As described under Section 2.5.2, Threshold AQ-2, since the City lacks the authority to mandate emission reductions for on-road vehicles, or to control driver behavior, no feasible mitigation measures have been identified to reduce these emissions. This cumulative impact would be significant and unavoidable.

Mitigation Measures

No feasible mitigation measures have been identified.

Level of Significance After Mitigation

The proposed project would result in a significant and unavoidable impact.

2.5.4 Threshold AQ-4

Would the project expose sensitive receptors to substantial pollutant concentrations?

Air quality varies as a direct function of the amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. Air quality problems arise when the rate of pollutant emissions exceeds the rate of dispersion. Reduced visibility, eye irritation, and adverse health impacts upon those persons termed "sensitive receptors" are the most serious hazards of existing air quality conditions in the area. Some land uses are considered more sensitive to changes in air quality than others, depending on the population groups and the activities involved. Sensitive receptors include residences, schools, playgrounds, child-care centers, athletic facilities, long-term health-care facilities, rehabilitation centers, convalescent centers, and retirement homes. Sensitive receptors, including residences and several schools (i.e., the Coastal Academy and La Petit Academy) are located along the proposed project corridor.

Health Impacts of Toxic Air Contaminants

TACs (primarily diesel particulate matter) would be emitted in fuel combustion exhaust. "Incremental cancer risk" is the net increased likelihood that a person continuously exposed to concentrations of TACs resulting from a project over a 9-, 30-, and 70-year exposure period would contract cancer based on the use of standard OEHHA risk-assessment methodology (OEHHA 2015). In addition, some TACs have non-carcinogenic effects. According to the OEHHA, health risk assessments should be based on a 30-year exposure duration based on typical residency period; however, such assessments should be limited to the period/duration of activities associated with the project (OEHHA 2015). Notably, the proposed project alignment is linear and spans approximately 2.41 miles, whereby the duration of construction activities (and exposure of an individual receptor to pollutants) would be minimal at any one location. Thus, the duration of proposed construction activities would only constitute a small percentage of the total long-term exposure period and would not result in exposure of proximate sensitive receptors to substantial TACs. In addition, heavy-duty construction equipment and diesel trucks are subject to CARB Airborne Toxics Control Measures to reduce diesel particulate emissions. After construction is completed, there would be no long-term source of TAC emissions during operation. Based on these considerations, sensitive receptors would not be exposed to substantial TAC concentrations and this impact would be less than significant.

Valley Fever Exposure

As discussed in Section 2.1.2.2, Non-Criteria Air Pollutants, Valley Fever is not highly endemic to San Diego County. The incidence rate of Coccidioidomycosis within the proposed project area is below the County average, as well as the statewide average. The proposed project would be consistent with SDAPCD Rule 55, which limits the amount of fugitive dust generated during construction, and would thereby control the release of the *Coccidioides immitis* fungus from construction activities. Based on the low incidence rate of Coccidioidomycosis in the vicinity of the proposed project site and in greater San Diego County, as well as the proposed project's implementation of dust control strategies, it is not anticipated that earthmoving activities during proposed project construction would result in exposure of nearby sensitive receptors to Valley Fever. Therefore, the proposed project would have a less-than-significant impact with respect to Valley Fever exposure to sensitive receptors.

Health Impacts of Carbon Monoxide

Regionally, traffic adds to regional trip generation and increases the vehicle miles traveled within the local airshed and the SDAB. Locally, traffic adds to the City's roadway system, and if such traffic occurs during periods of poor atmospheric ventilation, consists of a large number of vehicles "cold-started" and operating at pollution-inefficient speeds, and operates on roadways already crowded with non-project traffic, there is a potential for the formation of microscale CO "hotspots" in the area immediately around points of congested traffic. Because of continued improvement in mobile emissions at a rate faster than the rate of vehicle growth and/or congestion, the potential for CO hotspots in the basin is steadily decreasing.

Projects contributing to adverse traffic impacts may result in the formation of CO hotspots. As the City does not have CO hotspots guidelines, the County's CO hotspot screening guidance (County of San Diego 2007) was followed to determine if the proposed project would require a site-specific hotspot analysis. The County recommends that a local CO hotspot analysis be conducted if the intersection meets one of the following criteria: (1) the project causes road intersections to operate at level of service (LOS) E or worse and where peak-hour trips exceeds 3,000 trips, or (2) the project causes road intersections to operate at LOS E or worse and under cumulative conditions when the addition of peak-hour trips from the project and the surrounding projects exceed 2,000 trips. As indicated in the TIA, the proposed project would not cause peak hour intersection LOS operations to degrade to deficient levels (LOS E or LOS F) (Fehr and

Peers 2019). The proposed improvements along College Boulevard under the proposed project provide an increase in capacity; however, the increased traffic demand under 2035 conditions would result in deficient peak hour roadway operating conditions along portions of the corridor. Of note, the roadway segment with the greatest average daily traffic (ADT) in 2035 (College Boulevard between Oceanside Boulevard and Olive Drive) would also have deficient LOS F under the proposed project, as well as under existing Circulation Element buildout of College Boulevard. However, CO concentrations along this roadway segment, as well as other roadway segments with higher ADT, were assessed in the *Oceanside Circulation Element Update Appendix B: Combined Impact Analysis, Acoustical/Air Quality/Greenhouse Gas* (Investigative Science and Engineering, Inc. 2011), which determined that no CO hotspots would occur along the corridor. Therefore, impacts would be less than significant to sensitive receptors with regard to potential CO hotspots resulting from project contribution to cumulative traffic-related air quality impacts, and no mitigation is required.

Health Impacts of Other Criteria Air Pollutants

Construction of the proposed project would not result in emissions that exceed the SDAPCD's emission thresholds for any criteria air pollutants. However, operation of the proposed project would result in emissions that would exceed the SDAPCD thresholds for criteria air pollutants including VOC, NO_x, CO, PM_{10}, and $PM_{2.5}$. As discussed in Section 2.4.2.2, the substantial increase in emissions associated with the proposed project is due to the projected increase in 2035 daily VMT under the proposed project than for buildout of College Boulevard in accordance with the City's current Circulation Element, based on the entire SANDAG Series 12 model-wide VMT (Appendix K). The higher cumulative VMT figure under the proposed project is due to a higher average trip length, which reflects changes in travel behavior patterns based on not widening a section of the College Boulevard study corridor (i.e., Olive Drive to Barnard Drive/Waring Road (Appendix K).

VOCs and NO_x are precursors to O_3, for which the SDAB is designated as nonattainment with respect to the NAAQS and CAAQS (the SDAB is designated by the EPA as a nonattainment area for the 2008 8-hour O_3 NAAQS). As discussed in Section 2.1.2, Pollutants and Effects, the health effects associated with O_3 are generally associated with reduced lung function. The contribution of VOCs and NO_x to regional ambient O_3 concentrations is the result of complex photochemistry. The increases in O_3 concentrations in the SDAB due to O_3 precursor emissions tend to be found downwind from the source location to allow time for the photochemical reactions to occur. However, the potential for exacerbating excessive O_3 concentrations would also depend on the time of year that the VOC emissions would occur, because exceedances of the NAAQS and CAAQS for O_3 tend to occur between April and October when solar radiation is highest. The holistic effect of a single project's emissions of O_3 precursors is speculative due to the lack of quantitative methods to assess this impact. Nonetheless, because the VOC and NO_x emissions associated with the increased regional VMT under the proposed project operations, as compared to the City's current Circulation Element, would exceed the SDAPCD mass daily thresholds, it could minimally contribute to regional O_3 concentrations and the associated health impacts.

Health effects that result from NO_2 (which is a constituent of NO_x) include respiratory irritation. Although the regional VMT increase under the proposed project, as compared to the City's current Circulation Element, would generate NO_x emissions that would exceed the SDAPCD mass daily thresholds, operation of the proposed project is not anticipated to contribute to exceedances of the NAAQS and CAAQS for NO_2 because the SDAB is designated as in attainment of the NAAQS and CAAQS for NO_2 and the existing NO_2 concentrations in the area are well below the NAAQS and CAAQS standards. Nonetheless, because there are nearby receptors to be affected by operational sources of NO_x, the proposed project could result in potential health effects associated with NO_2.

CO tends to be a localized impact associated with congested intersections. The associated potential for CO hotspots were discussed previously and are determined to be a less-than-significant impact. However, the increase in regional VMT under the proposed project, as compared to the City's current Circulation Element, would generate CO emissions that would exceed the SDAPCD thresholds. Therefore, the CO emissions under the proposed project could potentially contribute to significant health effects associated with this pollutant.

The increased regional VMT associated with operation of the proposed project, as compared to the City's current Circulation Element, would exceed thresholds for PM_{10} or $PM_{2.5}$. As such, the proposed project would potentially contribute to exceedances of the NAAQS and CAAQS for particulate matter or would obstruct the SDAB from coming into attainment for these pollutants. Because the proposed project has the potential to contribute particulate matter that exceeds SDAPCD mass daily thresholds during operations, the proposed project could result in associated health effects.

In summary, because operation of the proposed project, as compared to the current Circulation Element, would result in an increase in regional VMT that could result in exceedances of the SDAPCD significance thresholds for VOC, NO_x, CO, PM_{10}, and $PM_{2.5}$, the potential health effects associated with criteria air pollutants are considered potentially significant. Notably, there are numerous scientific and technological complexities associated with correlating criteria air pollutant emissions from an individual project to specific health effects or potential additional nonattainment days, and there are currently no modeling tools that could provide reliable and meaningful additional information regarding health effects from criteria air pollutants generated by individual projects. These subjects are discussed further in Appendix B. Overall, since the regional VMT increase is based on driver behavior changes from not widening a portion of College Boulevard under the proposed project, and since the City lacks the authority to mandate emission reductions for on-road vehicles, or to control driver behavior, no feasible mitigation measures have been identified to reduce these emissions. This impact would be significant and unavoidable.

Mitigation Measures

No feasible mitigation measures have been identified.

Level of Significance After Mitigation

The proposed project would have a significant and unavoidable.

2.5.5 Threshold AQ-5

Would the project create objectionable odors affecting a substantial number of people?

The California Health and Safety Code, Division 26, Part 4, Chapter 3, Section 41700; SDAPCD Rule 51; and City of Oceanside Municipal Code Section 13.16, commonly referred to as public nuisance law, prohibit emissions from any source whatsoever in such quantities of air contaminants or other material that cause injury, detriment, nuisance, or annoyance to the public health or damage to property. Projects required to obtain permits from SDAPCD are evaluated by SDAPCD staff for potential odor nuisance, and conditions may be applied (or control equipment required) where necessary to prevent occurrence of public nuisance.

SDAPCD Rule 51 (Public Nuisance) also prohibits emission of any material that causes nuisance to a considerable number of persons or endangers the comfort, health, or safety of any person. A project that proposes a use that would produce objectionable odors would be deemed to have a significant odor impact if it would affect a considerable number of off-site receptors. Odor issues are very subjective by the nature of odors themselves and due to the fact that their measurements are difficult to quantify. As a result, this guideline is qualitative, and will focus on the existing and potential surrounding uses and location of sensitive receptors.

The occurrence and severity of potential odor impacts depends on numerous factors. The nature, frequency, and intensity of the source; the wind speeds and direction; and the sensitivity of receiving location each contribute to the intensity of the impact. Although offensive odors seldom cause physical harm, they can be annoying and cause distress among the public and generate citizen complaints.

Odors would be potentially generated from vehicles and equipment exhaust emissions during construction of the proposed project. Potential odors produced during construction would be attributable to concentrations of unburned hydrocarbons from tailpipes of construction equipment. Such odors would disperse rapidly from the proposed project site and generally occur at magnitudes that would not affect substantial numbers of people. In regards to long-term operations, the proposed project consists of roadway improvements that would not result in objectionable odors. Therefore, impacts associated with odors during construction and operations would be less than significant**.**

Mitigation Measures

No mitigation is required.

Level of Significance After Mitigation

The proposed project would have a less-than-significant impact prior to mitigation.

3 GREENHOUSE GAS EMISSIONS

3.1 Environmental Setting

3.1.1 Climate Change Overview

Climate change refers to any significant change in measures of climate, such as temperature, precipitation, or wind patterns, lasting for an extended period of time (decades or longer). The Earth's temperature depends on the balance between energy entering and leaving the planet's system. Many factors, both natural and human, can cause changes in Earth's energy balance, including variations in the Sun's energy reaching Earth, changes in the reflectivity of Earth's atmosphere and surface, and changes in the greenhouse effect, which affects the amount of heat retained by Earth's atmosphere (EPA 2017).

The greenhouse effect is the trapping and build-up of heat in the atmosphere (troposphere) near the Earth's surface. The greenhouse effect traps heat in the troposphere through a threefold process as follows: Short-wave radiation emitted by the Sun is absorbed by the Earth; the Earth emits a portion of this energy in the form of long-wave radiation; and GHGs in the upper atmosphere absorb this long-wave radiation and emit it into space and toward the Earth. The greenhouse effect is a natural process that contributes to regulating the Earth's temperature and creates a pleasant, livable environment on the Earth. Human activities that emit additional GHGs to the atmosphere increase the amount of infrared radiation that gets absorbed before escaping into space, thus enhancing the greenhouse effect and causing the Earth's surface temperature to rise.

The scientific record of the Earth's climate shows that the climate system varies naturally over a wide range of time scales and that in general, climate changes prior to the Industrial Revolution in the 1700s can be explained by natural causes, such as changes in solar energy, volcanic eruptions, and natural changes in GHG concentrations. Recent climate changes, in particular the warming observed over the past century, however, cannot be explained by natural causes alone. Rather, it is extremely likely that human activities have been the dominant cause of warming since the mid-20th century, and is the most significant driver of observed climate change (IPCC 2013; EPA 2017). Human influence on the climate system is evident from the increasing GHG concentrations in the atmosphere, positive radiative forcing, observed warming, and improved understanding of the climate system (IPCC 2013). The atmospheric concentrations of GHGs have increased to levels unprecedented in the last 800,000 years, primarily from fossil fuel emissions and secondarily from emissions associated with land use changes (IPCC 2013). Continued emissions of GHGs will cause further warming and changes in all components of the climate system, which is discussed further in Section 3.3.2, Potential Effects of Climate Change.

3.1.2 Greenhouse Gases

A GHG is any gas that absorbs infrared radiation in the atmosphere; in other words, GHGs trap heat in the atmosphere. GHGs include, but are not limited to, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), O_3, water vapor, hydrofluorocarbons (HFCs), hydrochlorofluorocarbons (HCFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).[5] Some GHGs, such as CO_2, CH_4, and N_2O, occur naturally and are emitted to the atmosphere through natural processes and human activities. Of these gases, CO_2 and CH_4 are emitted in the greatest quantities from human activities. Manufactured GHGs, which have a much greater heat-absorption potential than CO_2, include fluorinated gases, such as HFCs, HCFCs, PFCs, and SF_6, and are associated with certain industrial products and processes. A summary of the most common GHGs and their sources is included in this section.[6] Also included is a discussion of other climate forcing substances.

Carbon Dioxide. CO_2 is a naturally occurring gas and a by-product of human activities. It is the principal anthropogenic GHG that affects the Earth's radiative balance. Natural sources of CO_2 include respiration of bacteria, plants, animals, and fungus; evaporation from oceans; volcanic out-gassing; and decomposition of dead organic matter. Human activities that generate CO_2 are from the combustion of fuels such as coal, oil, natural gas, and wood, as well as changes in land use.

Methane. CH_4 is produced through both natural and human activities. CH_4 is a flammable gas and is the main component of natural gas. Methane is produced through anaerobic (i.e., without oxygen) decomposition of waste in landfills, flooded rice fields, animal digestion, decomposition of animal wastes, production and distribution of natural gas and petroleum, coal production, and incomplete fossil fuel combustion.

Nitrous Oxide. N_2O is produced through natural and human activities, mainly through agricultural activities and natural biological processes, although fuel burning and other processes also create N_2O. Sources of N_2O include soil cultivation practices (microbial processes in soil and water), especially the use of commercial and organic fertilizers, manure management, industrial processes (such as in nitric acid production, nylon production, and fossil-fuel-fired power plants), vehicle emissions, and using N_2O as a propellant (such as in rockets, race cars, and aerosol sprays).

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5 California Health and Safety Code, Section 38505 identifies seven GHGs that CARB is responsible for monitoring and regulating to reduce emissions: CO_2, CH_4, N_2O, SF_6, HFCs, PFCs, and nitrogen trifluoride (NF_3).

6 The descriptions of GHGs are summarized from the Intergovernmental Panel on Climate Change Second Assessment Report (IPCC 1995) and Fourth Assessment Report (IPCC 2007), CARB's Glossary of Terms Used in Greenhouse Gas Inventories (2018b), and the EPA's Glossary of Climate Change Terms (EPA 2016).

Fluorinated Gases. Fluorinated gases (also referred to as F-gases) are synthetic powerful GHGs emitted from many industrial processes. Fluorinated gases are commonly used as substitutes for stratospheric O_3-depleting substances (e.g., chlorofluorocarbons (CFCs), HCFCs, and halons). The most prevalent fluorinated gases include the following:

- **Hydrofluorocarbons:** HFCs are compounds containing only hydrogen, fluorine, and carbon atoms. HFCs are synthetic chemicals used as alternatives to O_3-depleting substances in serving many industrial, commercial, and personal needs. HFCs are emitted as by-products of industrial processes and are used in manufacturing.
- **Perfluorocarbons:** PFCs are a group of human-made chemicals composed of carbon and fluorine only. These chemicals were introduced as alternatives, along with HFCs, to the O_3-depleting substances. The two main sources of PFCs are primary aluminum production and semiconductor manufacturing. Since PFCs have stable molecular structures and do not break down through the chemical processes in the lower atmosphere, these chemicals have long lifetimes, ranging between 10,000 and 50,000 years.
- **Sulfur Hexafluoride:** SF_6 is a colorless gas that is soluble in alcohol and ether and slightly soluble in water. SF_6 is used for insulation in electric power transmission and distribution equipment, semiconductor manufacturing, the magnesium industry, and as a tracer gas for leak detection.
- **Nitrogen Trifluoride:** Nitrogen trifluoride (NF_3) is used in the manufacture of a variety of electronics, including semiconductors and flat panel displays.

Chlorofluorocarbons. CFCs are synthetic chemicals that have been used as cleaning solvents, refrigerants, and aerosol propellants. CFCs are chemically unreactive in the lower atmosphere (troposphere), and the production of CFCs was prohibited in 1987 due to the chemical destruction of stratospheric O_3.

Hydrochlorofluorocarbons. HCFCs are a large group of compounds, whose structure is very close to that of CFCs—containing hydrogen, fluorine, chlorine, and carbon atoms—but including one or more hydrogen atoms. Like HFCs, HCFCs are used in refrigerants and propellants. HCFCs were also used in place of CFCs for some applications; however, their use in general is being phased out.

Black Carbon. Black carbon is a component of fine particulate matter ($PM_{2.5}$), which has been identified as a leading environmental risk factor for premature death. It is produced from the incomplete combustion of fossil fuels and biomass burning, particularly from older diesel engines and forest fires. Black carbon warms the atmosphere by absorbing solar radiation, influences cloud formation, and darkens the surface of snow and ice, which accelerates heat absorption and melting. Black carbon is a short-lived substance that varies spatially, which makes it difficult to quantify the global warming potential (GWP). DPM emissions are a major source of black carbon and are TACs that have been regulated and controlled in California for several decades to protect public health. In relation to declining DPM as a result of the CARB's regulations pertaining to diesel engines, diesel fuels, and burning activities, CARB estimates that annual black carbon emissions in California have reduced by 70% between 1990 and 2010, with 95% control expected by 2020 (CARB 2014).

Water Vapor. The primary source of water vapor is evaporation from the ocean, with additional vapor generated by sublimation (change from solid to gas) from ice and snow, evaporation from other water bodies, and transpiration from plant leaves. Water vapor is the most important, abundant, and variable GHG in the atmosphere and maintains a climate necessary for life.

Ozone. Tropospheric O_3, which is created by photochemical reactions involving gases from both natural sources and human activities, acts as a GHG. Stratospheric O_3, which is created by the interaction between solar ultraviolet radiation and molecular oxygen, plays a decisive role in the stratospheric radiative balance. Depletion of stratospheric O_3, due to chemical reactions that may be enhanced by climate change, results in an increased ground-level flux of ultraviolet-B radiation.

Aerosols. Aerosols are suspensions of particulate matter in a gas emitted into the air through burning biomass (plant material) and fossil fuels. Aerosols can warm the atmosphere by absorbing and emitting heat and can cool the atmosphere by reflecting light.

3.1.3 Global Warming Potential

Gases in the atmosphere can contribute to climate change both directly and indirectly. Direct effects occur when the gas itself absorbs radiation. Indirect radiative forcing occurs when chemical transformations of the substance produce other GHGs, when a gas influences the atmospheric lifetimes of other gases, and/or when a gas affects atmospheric processes that alter the radiative balance of the Earth (e.g., affect cloud formation or albedo) (EPA 2016). The Intergovernmental Panel on Climate Change developed the GWP concept to compare the ability of each GHG to trap heat in the atmosphere relative to another gas. The GWP of a GHG is defined as the ratio of the time-integrated radiative forcing from the instantaneous release of 1 kilogram of a trace substance relative to that of 1 kilogram of a reference gas (IPCC 2014). The reference gas used is CO_2; therefore, GWP-weighted emissions are measured in metric tons of carbon dioxide equivalent (MT CO_2e).

The current version of the Road Construction Emission Model (Version 9.0.0) assumes that the GWP for CH_4 is 25 (i.e., emissions of 1 MT of CH_4 are equivalent to emissions of 25 MT of CO_2), and the GWP for N_2O is 298, based on the Intergovernmental Panel on Climate Change Fourth Assessment Report (IPCC 2007). These GWP values were applied to the proposed project.

3.2 Regulatory Setting

3.2.1 Federal Regulations

Massachusetts v. EPA. In *Massachusetts v. EPA* (April 2007), the U.S. Supreme Court directed the EPA administrator to determine whether GHG emissions from new motor vehicles cause or contribute to air pollution that may reasonably be anticipated to endanger public health or welfare, or whether the science is too uncertain to make a reasoned decision. In December 2009, the administrator signed a final rule with the following two distinct findings regarding GHGs under Section 202(a) of the federal Clean Air Act:

- The administrator found that elevated concentrations of GHGs—CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6—in the atmosphere threaten the public health and welfare of current and future generations. This is the "endangerment finding."
- The administrator further found the combined emissions of GHGs—CO_2, CH_4, N_2O, and HFCs—from new motor vehicles and new motor vehicle engines contribute to the GHG air pollution that endangers public health and welfare. This is the "cause or contribute finding."

These two findings were necessary to establish the foundation for regulation of GHGs from new motor vehicles as air pollutants under the federal Clean Air Act.

Energy Independence and Security Act. The Energy Independence and Security Act of 2007, among other key measures, would do the following, which would aid in the reduction of national GHG emissions:

- Increase the supply of alternative fuel sources by setting a mandatory renewable fuel standard requiring fuel producers to use at least 36 billion gallons of biofuel in 2022.
- Set a target of 35 miles per gallon for the combined fleet of cars and light trucks by model year 2020 and direct the National Highway Traffic Safety Administration (NHTSA) to establish a fuel economy program for medium- and heavy-duty trucks and create a separate fuel economy standard for work trucks.
- Prescribe or revise standards affecting regional efficiency for heating and cooling products, as well as procedures for new or amended standards, energy conservation, energy efficiency labeling for consumer electronic products, residential boiler efficiency, electric motor efficiency, and home appliances.

Federal Vehicle Standards. In 2007, in response to the *Massachusetts v. EPA* U.S. Supreme Court ruling, the Bush Administration issued Executive Order (EO) 13432 directing the EPA, the Department of Transportation, and the Department of Energy to establish regulations that reduce GHG emissions from motor vehicles, non-road vehicles, and non-road engines by 2008. In 2009, the NHTSA issued a final rule regulating fuel efficiency and GHG emissions from cars and light-duty trucks for model year 2011; and, in 2010, the EPA and NHTSA issued a final rule regulating cars and light-duty trucks for model years 2012–2016 (75 FR 25324–25728).

In 2010, President Obama issued a memorandum directing the Department of Transportation, Department of Energy, EPA, and NHTSA to establish additional standards regarding fuel efficiency and GHG reduction, clean fuels, and advanced vehicle infrastructure. In response to this directive, the EPA and NHTSA proposed stringent, coordinated federal GHG and fuel economy standards for model years 2017–2025 light-duty vehicles. The proposed standards projected to achieve 163 grams/mile of CO_2 in model year 2025, on an average industry fleet-wide basis, which is equivalent to 54.5 miles per gallon if this level were achieved solely through fuel efficiency. The final rule was adopted in 2012 for model years 2017–2021 (77 FR 62624–63200), and NHTSA intends to set standards for model years 2022–2025 in a future rulemaking.

In addition to the regulations applicable to cars and light-duty trucks described above, in 2011, the EPA and NHTSA announced fuel economy and GHG standards for medium- and heavy-duty trucks for model years 2014–2018. The standards for CO_2 emissions and fuel consumption are tailored to three main vehicle categories: combination tractors, heavy-duty pickup trucks and vans, and vocational vehicles. According to the EPA, this regulatory program will reduce GHG emissions and fuel consumption for the affected vehicles by 6%–23% over the 2010 baselines (76 FR 57106–57513).

In August 2016, the EPA and NHTSA announced the adoption of the phase two program related to the fuel economy and GHG standards for medium- and heavy-duty trucks. The phase two program will apply to vehicles with model year 2018 through 2027 for certain trailers, and model years 2021 through 2027 for semi-trucks, large pickup trucks, vans, and all types of sizes of buses and work trucks. The final standards are expected to lower carbon dioxide emissions by approximately 1.1 billion MT and reduce oil consumption by up to 2 billion barrels over the lifetime of the vehicles sold under the program (EPA and NHTSA 2016).

In August 2018, EPA and NHTSA proposed to amend certain fuel economy and GHG standards for passenger cars and light trucks and establish new standards for model years 2021 through 2026. Compared to maintaining the post-2020 standards now in place, the 2018 proposal would increase U.S. fuel consumption by about half a million barrels per day (2%–3% of total daily consumption, according to the Energy Information Administration) and would impact the global climate by 3/1000th of one degree Celsius by 2100 (EPA and NHTSA 2018). California and other states have stated their intent to challenge federal actions that would delay or eliminate GHG reduction measures and have committed to cooperating with other countries to implement global climate change initiatives. Thus, the timing and consequences of the 2018 federal proposal are speculative at this time.

3.2.2 State Regulations

The statewide GHG emissions regulatory framework is summarized in this section by the following categories: state climate change targets, building energy, renewable energy and energy procurement, mobile sources, solid waste, water, and other state regulations and goals. The following text describes EOs, ABs, SBs, and other regulations and plans that would directly or indirectly reduce GHG emissions.

State Climate Change Targets

EO S-3-05. EO S-3-05 (June 2005) established the following statewide goals: GHG emissions should be reduced to 2000 levels by 2010; GHG emissions should be reduced to 1990 levels by 2020; and GHG emissions should be reduced to 80% below 1990 levels by 2050.

AB 32 and CARB's Climate Change Scoping Plan. In furtherance of the goals established in EO S-3-05, the Legislature enacted AB 32, the California Global Warming Solutions Act of 2006. AB 32 requires California to reduce its GHG emissions to 1990 levels by 2020.

Under AB 32, CARB is responsible for and is recognized as having the expertise to carry out and develop the programs and requirements necessary to achieve the GHG emissions reduction mandate of AB 32. Under AB 32, CARB must adopt regulations requiring the reporting and verification of statewide GHG emissions from specified sources. This program is used to monitor and enforce compliance with established standards. CARB also is required to adopt rules and regulations to achieve the maximum technologically feasible and cost-effective GHG emission reductions. AB 32 relatedly authorized CARB to adopt market-based compliance mechanisms to meet the specified requirements. Finally, CARB is ultimately responsible for monitoring compliance and enforcing any rule, regulation, order, emission limitation, emission reduction measure, or market-based compliance mechanism adopted.

In 2007, CARB approved a limit on the statewide GHG emissions level for year 2020 consistent with the determined 1990 baseline (427 million metric tons (MMT) CO_2e). CARB's adoption of this limit is in accordance with Health and Safety Code Section 38550.

Further, in 2008, CARB adopted the *Climate Change Scoping Plan: A Framework for Change* (Scoping Plan) in accordance with Health and Safety Code Section 38561. The Scoping Plan establishes an overall framework for the measures that will be adopted to reduce California's GHG emissions for various emission sources/sectors to 1990 levels by 2020. The Scoping Plan evaluates opportunities for sector-specific reductions, integrates all CARB and Climate Action Team early actions and additional GHG reduction features by both entities, identifies additional measures to be pursued as regulations, and outlines the role of a cap-and-trade program. The key elements of the Scoping Plan include the following (CARB 2008):

1. Expanding and strengthening existing energy efficiency programs, as well as building and appliance standards.
2. Achieving a statewide renewable energy mix of 33%.
3. Developing a California cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system and caps sources contributing 85% of California's GHG emissions.
4. Establishing targets for transportation-related GHG emissions for regions throughout California, and pursuing policies and incentives to achieve those targets.
5. Adopting and implementing measures pursuant to existing state laws and policies, including California's clean car standards, goods movement measures, and the Low Carbon Fuel Standard (LCFS).
6. Creating targeted fees, including a public goods charge on water use, fees on high GWP gases, and a fee to fund the administrative costs of the State of California's long-term commitment to AB 32 implementation.

The Scoping Plan also identified local governments as essential partners in achieving California's goals to reduce GHG emissions because they have broad influence and, in some cases, exclusive authority over activities that contribute to significant direct and indirect GHG emissions through their planning and permitting processes, local ordinances, outreach and education efforts, and municipal operations. Specifically, the Scoping Plan encouraged local governments to adopt a reduction goal for municipal operations and for community emissions to reduce GHGs by approximately 15% from then levels (2008) by 2020. Many local governments developed community-scale local GHG reduction plans based on this Scoping Plan recommendation.

In 2014, CARB adopted the *First Update to the Climate Change Scoping Plan: Building on the Framework* (First Update). The stated purpose of the First Update is to "highlight California's success to date in reducing its GHG emissions and lay the foundation for establishing a broad framework for continued emission reductions beyond 2020, on the path to 80% below 1990 levels by 2050" (CARB 2014). The First Update found that California is on track to meet the 2020 emissions reduction mandate established by AB 32. It also noted that California could reduce emissions further by 2030 to levels squarely in line with those needed to stay on track to reduce emissions to 80% below 1990 levels by 2050 if the state realizes the expected benefits of existing policy goals.

In conjunction with the First Update, CARB identified "six key focus areas comprising major components of the state's economy to evaluate and describe the larger transformative actions that will be needed to meet the state's more expansive emission reduction needs by 2050" (CARB 2014). Those six areas are: (1) energy, (2) transportation (vehicles/equipment, sustainable communities, housing, fuels, and infrastructure), (3) agriculture, (4) water, (5) waste management, and (6) natural and working lands. The First Update identifies key recommended actions for each sector that will facilitate achievement of EO S-3-05's 2050 reduction goal.

CARB's research efforts presented in the First Update indicate that it has a "strong sense of the mix of technologies needed to reduce emissions through 2050" (CARB 2014). Those technologies include energy demand reduction through efficiency and activity changes; large-scale electrification of on-road vehicles, buildings, and industrial machinery; decarbonizing electricity and fuel supplies; and the rapid market penetration of efficient and clean energy technologies.

As part of the First Update, CARB recalculated the state's 1990 emissions level using more recent GWPs identified by the IPCC. Using the recalculated 1990 emissions level (431 MMT CO_2e) and the revised 2020 emissions level projection identified in the 2011 Final Supplement, CARB determined that achieving the 1990 emissions level by 2020 would require a reduction in GHG emissions of approximately 15% (instead of 28.5% or 16%) from the Business-As-Usual conditions.

In December 2017, CARB adopted California's 2017 Climate Change Scoping Plan (2017 Scoping Plan*)* for public review and comment (CARB 2017). The 2017 Scoping Plan builds on the successful framework established in the initial Scoping Plan and First Update, while identifying new, technologically feasible and cost-effective strategies that will serve as the framework to achieve the 2030 GHG target as established by SB 32 and define the state's climate change priorities to 2030 and beyond. The strategies' known commitments include implementing renewable energy and energy efficiency (including the mandates of SB 350), increasing stringency of the LCFS, implementing measures identified in the Mobile Source and Freight Strategies, implementing measures identified in the proposed Short-Lived Climate Pollutant Plan, and increasing stringency of SB 375 targets. To fill the gap in additional reductions needed to achieve the 2030 target, it recommends continuing the Cap-and-Trade Program and a measure to reduce GHGs from refineries by 20%.

For local governments, the 2030 Scoping Plan replaced the initial Scoping Plan's 15% reduction goal with a recommendation to aim for a community-wide goal of no more than 6 MT CO_2e per capita by 2030 and no more than 2 MT CO_2e per capita by 2050, which are consistent with the state's long-term goals. These goals are also consistent with the Under 2 MOU (Under 2 2019) and the Paris Agreement, which are developed around the scientifically based levels necessary to limit global warming below 2°C. The 2030 Scoping Plan recognized the benefits of local government GHG planning (e.g., through climate action plans (CAPs)) and provide more information regarding tools CARB is working on to support those efforts. It also recognizes the CEQA streamlining provisions for project-level review where there is a legally adequate CAP.[7] The Second Update was approved by CARB's Governing Board on December 14, 2017.

The Scoping Plan recommends strategies for implementation at the statewide level to meet the goals of AB 32, SB 32, and the EOs and establishes an overall framework for the measures that will be adopted to reduce California's GHG emissions. A project is considered consistent with the statutes and EOs if it meets the general policies in reducing GHG emissions to facilitate the achievement of the state's goals and does not impede attainment of those goals. As discussed in several cases, a given project need not be in perfect conformity with each and every planning policy or goals to be consistent. A project would be consistent, if it will further the objectives and not obstruct their attainment.

EO B-30-15. EO B-30-15 (April 2015) identified an interim GHG reduction target in support of targets previously identified under S-3-05 and AB 32. EO B-30-15 set an interim target goal of reducing statewide GHG emissions to 40% below 1990 levels by 2030 to keep California on its trajectory toward meeting or exceeding the long-term goal of reducing statewide GHG emissions to 80% below 1990 levels by 2050 as set forth in S-3-05. To facilitate achievement of this goal, EO B-30-15 calls for an update to CARB's Scoping Plan to express the 2030 target in terms of MMT CO_2e. The EO also calls for state agencies to continue to develop and implement GHG emission reduction programs in support of the reduction targets. EO B-30-15 does not require local agencies to take any action to meet the new interim GHG reduction target.

[7] *Sierra Club v. County of Napa* (2004) 121 Cal.App.4th 1490; *San Francisco Tomorrow et al. v. City and County of San Francisco* (2015) 229 Cal.App.4th 498; *San Franciscans Upholding the Downtown Specific Plan v. City and County of San Francisco* (2002) 102 Cal.App.4th 656; *Sequoyah Hills Homeowners Assn. V. City of Oakland* (1993) 23 Cal.App.4th 704, 719.

SB 32 and AB 197. SB 32 and AB 197 (enacted in 2016) are companion bills that set new statewide GHG reduction targets, make changes to CARB's membership and increase legislative oversight of CARB's climate change-based activities, and expand dissemination of GHG and other air quality-related emissions data to enhance transparency and accountability. More specifically, SB 32 codified the 2030 emissions reduction goal of EO B-30-15 by requiring CARB to ensure that statewide GHG emissions are reduced to 40% below 1990 levels by 2030. AB 197 established the Joint Legislative Committee on Climate Change Policies, consisting of at least three members of the Senate and three members of the Assembly, in order to provide ongoing oversight over implementation of the state's climate policies. AB 197 also added two members of the Legislature to CARB as nonvoting members; requires CARB to make available and update (at least annually via its website) emissions data for GHGs, criteria air pollutants, and TACs from reporting facilities; and, requires CARB to identify specific information for GHG emissions reduction measures when updating the Scoping Plan.

SB 605 and SB 1383. SB 605 (2014) requires CARB to complete a comprehensive strategy to reduce emissions of SLCPs in the state; and SB 1383 (2016) requires CARB to approve and implement that strategy by January 1, 2018. SB 1383 also establishes specific targets for the reduction of SLCPs (40% below 2013 levels by 2030 for CH_4 and HFCs, and 50% below 2013 levels by 2030 for anthropogenic black carbon), and provides direction for reductions from dairy and livestock operations and landfills. Accordingly, and as mentioned above, CARB adopted its *Short-Lived Climate Pollutant Reduction Strategy* in March 2017, which establishes a framework for the statewide reduction of emissions of black carbon, CH_4 and fluorinated gases.

EO B-55-18. EO B-55-18 (September 2018) establishes a statewide policy for the state to achieve carbon neutrality no later than 2045, and achieve and maintain net negative emissions thereafter. The goal is an addition to the existing statewide targets of reducing the state's GHG emissions. CARB will work with relevant state agencies to ensure that future Scoping Plans identify and recommend measures to achieve the carbon neutrality goal.

Building Energy

Title 24, Part 6. Title 24 of the California Code of Regulations was established in 1978 and serves to enhance and regulate California's building standards. While not initially promulgated to reduce GHG emissions, Part 6 of Title 24 specifically establishes Building Energy Efficiency Standards that are designed to ensure new and existing buildings in California achieve energy efficiency and preserve outdoor and indoor environmental quality. These energy efficiency standards are reviewed every few years by the Building Standards Commission and the California Energy Commission (CEC) (and revised if necessary) (California Public Resources Code, Section 25402(b)(1)). The regulations receive input from members of industry, as well as the public, with the goal of "reducing of wasteful, uneconomic, inefficient, or unnecessary consumption of energy" (California Public Resources Code, Section 25402). These regulations are carefully scrutinized and analyzed for technological and economic feasibility (California Public Resources Code, Section 25402(d)) and cost effectiveness (California Public Resources Code, Sections 25402(b)(2) and (b)(3)). These standards are updated to consider and incorporate new energy-efficient technologies and construction methods. As a result, these standards save energy, increase electricity supply reliability, increase indoor comfort, avoid the need to construct new power plants, and help preserve the environment.

Title 24, Part 11. In addition to the CEC's efforts, in 2008, the California Building Standards Commission adopted the nation's first green building standards. The California Green Building Standards Code (CALGreen) establishes minimum mandatory standards, as well as voluntary standards, pertaining to the planning and design of sustainable site development, energy efficiency (in excess of the California Energy Code requirements), water conservation, material conservation, and interior air quality. The CALGreen standards took effect in January 2011 and instituted mandatory minimum environmental performance standards for all ground-up, new construction of commercial, low-rise residential, and state-owned buildings, schools, and hospitals. The CALGreen 2016 standards became effective on January 1, 2017. The CALGreen 2019 standards will continue to improve upon the 2016 CALGreen standards, and will go into effect on January 1, 2020.

The mandatory standards require the following (24 CCR Part 11):

- Mandatory reduction in indoor water use through compliance with specified flow rates for plumbing fixtures and fittings.
- Mandatory reduction in outdoor water use through compliance with a local water efficient landscaping ordinance or the California Department of Water Resources' Model Water Efficient Landscape Ordinance.
- Diversion of 65% of construction and demolition waste from landfills.
- Mandatory inspections of energy systems to ensure optimal working efficiency.
- Inclusion of electric vehicle (EV) charging stations or designated spaces capable of supporting future charging stations.
- Low-pollutant emitting exterior and interior finish materials, such as paints, carpets, vinyl flooring, and particle boards.

The CALGreen standards also include voluntary efficiency measures that are provided at two separate tiers and implemented at the discretion of local agencies and applicants. CALGreen's

Tier 1 standards call for a 15% improvement in energy requirements, stricter water conservation, 65% diversion of construction and demolition waste, 10% recycled content in building materials, 20% permeable paving, 20% cement reduction, and cool/solar-reflective roofs. CALGreen's more rigorous Tier 2 standards call for a 30% improvement in energy requirements, stricter water conservation, 75% diversion of construction and demolition waste, 15% recycled content in building materials, 30% permeable paving, 25% cement reduction, and cool/solar-reflective roofs.

Title 20. Title 20 of the California Code of Regulations requires manufacturers of appliances to meet state and federal standards for energy and water efficiency. Performance of appliances must be certified through the CEC to demonstrate compliance with standards. New appliances regulated under Title 20 include refrigerators, refrigerator–freezers, and freezers; room air conditioners and room air-conditioning heat pumps; central air conditioners; spot air conditioners; vented gas space heaters; gas pool heaters; plumbing fittings and plumbing fixtures; fluorescent lamp ballasts; lamps; emergency lighting; traffic signal modules; dishwashers; clothes washers and dryers; cooking products; electric motors; low-voltage dry-type distribution transformers; power supplies; televisions and consumer audio and video equipment; and battery charger systems. Title 20 presents protocols for testing for each type of appliance covered under the regulations, and appliances must meet the standards for energy performance, energy design, water performance and water design. Title 20 contains three types of standards for appliances: federal and state standards for federally regulated appliances, state standards for federally regulated appliances, and state standards for non-federally regulated appliances.

SB 1. SB 1 (2006) established a $3 billion rebate program to support the goal of the state to install rooftop solar energy systems with a generation capacity of 3,000 megawatts through 2016. SB 1 added sections to the Public Resources Code, including Chapter 8.8 (California Solar Initiative), that require building projects applying for ratepayer-funded incentives for photovoltaic systems to meet minimum energy efficiency levels and performance requirements. Section 25780 established that it is a goal of the state to establish a self-sufficient solar industry in which solar energy systems are a viable mainstream option for both homes and businesses within 10 years of adoption, and to place solar energy systems on 50% of new homes within 13 years of adoption. SB 1, also termed "GoSolarCalifornia," was previously titled "Million Solar Roofs."

AB 1470. This bill established the Solar Water Heating and Efficiency Act of 2007. The bill makes findings and declarations of the Legislature relating to the promotion of solar water heating systems and other technologies that reduce natural gas demand. The bill defines several terms for purposes of the act. The bill requires the commission to evaluate the data available from a specified pilot program, and, if it makes a specified determination, to design and implement a program of incentives for the installation of 200,000 solar water heating systems in homes and businesses throughout the state by 2017.

AB 1109. Enacted in 2007, AB 1109 required the CEC to adopt minimum energy efficiency standards for general purpose lighting, to reduce electricity consumption 50% for indoor residential lighting and 25% for indoor commercial lighting.

Renewable Energy and Energy Procurement

SB 1078. SB 1078 (2002) established the Renewables Portfolio Standard (RPS) program, which requires an annual increase in renewable generation by the utilities equivalent to at least 1% of sales, with an aggregate goal of 20% by 2017. This goal was subsequently accelerated, requiring utilities to obtain 20% of their power from renewable sources by 2010.

SB 1368. SB 1368 (2006) requires the CEC to develop and adopt regulations for GHG emission performance standards for the long-term procurement of electricity by local publicly owned utilities. These standards must be consistent with the standards adopted by the California Public Utilities Commission. This effort will help protect energy customers from financial risks associated with investments in carbon-intensive generation by allowing new capital investments in power plants whose GHG emissions are as low as or lower than new combined-cycle natural gas plants by requiring imported electricity to meet GHG performance standards in California and by requiring that the standards be developed and adopted in a public process.

SB X1 2. SB X1 2 (2011) expanded the RPS by establishing that 20% of the total electricity sold to retail customers in California per year by December 31, 2013, and 33% by December 31, 2020, and in subsequent years, be secured from qualifying renewable energy sources. Under the bill, a renewable electrical generation facility is one that uses biomass, solar thermal, photovoltaic, wind, geothermal, fuel cells using renewable fuels, small hydroelectric generation of 30 megawatts or less, digester gas, municipal solid waste conversion, landfill gas, ocean wave, ocean thermal, or tidal current, and that meets other specified requirements with respect to its location. In addition to the retail sellers previously covered by the RPS, SB X1 2 added local, publicly owned electric utilities to the RPS.

SB 350. SB 350 (2015) further expanded the RPS by establishing that 50% of the total electricity sold to retail customers in California per year by December 31, 2030, be secured from qualifying renewable energy sources. In addition, SB 350 includes the goal to double the energy efficiency savings in electricity and natural gas final end uses (such as heating, cooling, lighting, or class of energy uses on which an energy-efficiency program is focused) of retail customers through energy conservation and efficiency. The bill also requires the California Public Utilities Commission, in consultation with the CEC, to establish efficiency targets for electrical and gas corporations consistent with this goal.

SB 100. SB 100 (2018) increased the standards set forth in SB 350 establishing that 44% of the total electricity sold to retail customers in California per year by December 31, 2024, 52% by December 31, 2027, and 60% by December 31, 2030, be secured from qualifying renewable energy sources. SB 100 states that it is the policy of the state that eligible renewable energy resources and zero-carbon resources supply 100% of the retail sales of electricity to California. This bill requires that the achievement of 100% zero-carbon electricity resources do not increase the carbon emissions elsewhere in the western grid and that the achievement not be achieved through resource shuffling.

Mobile Sources

AB 1493. In a response to the transportation sector accounting for more than half of California's CO_2 emissions, AB 1493 was enacted in July 2002. AB 1493 required CARB to set GHG emission standards for passenger vehicles, light-duty trucks, and other vehicles determined by the State Board to be vehicles that are primarily used for noncommercial personal transportation in the state. The bill required that CARB set GHG emission standards for motor vehicles manufactured in 2009 and all subsequent model years. CARB adopted the standards in September 2004. When fully phased in, the near-term (2009–2012) standards will result in a reduction of about 22% in GHG emissions compared to the emissions from the 2002 fleet, while the mid-term (2013–2016) standards will result in a reduction of about 30%.

EO S-1-07. EO S-1-07 (2007) sets a declining LCFS for GHG emissions measured in CO_2e grams per unit of fuel energy sold in California. The target of the LCFS is to reduce the carbon intensity of California passenger vehicle fuels by at least 10% by 2020. The carbon intensity measures the amount of GHG emissions in the lifecycle of a fuel, including extraction/feedstock production, processing, transportation, and final consumption, per unit of energy delivered. CARB adopted the implementing regulation in April 2009. The regulation is expected to increase the production of biofuels, including those from alternative sources, such as algae, wood, and agricultural waste.

SB 375. SB 375 (2008) addresses GHG emissions associated with the transportation sector through regional transportation and sustainability plans. SB 375 required CARB to adopt regional GHG reduction targets for the automobile and light-truck sector for 2020 and 2035. Regional metropolitan planning organizations are then responsible for preparing a SCS within their Regional Transportation Plan (RTP). The goal of the SCS is to establish a forecasted development pattern for the region that, after considering transportation measures and policies, will achieve, if feasible, the GHG reduction targets. If an SCS is unable to achieve the GHG reduction target, a metropolitan planning organization must prepare an Alternative Planning Strategy demonstrating how the GHG reduction target would be achieved through alternative development patterns, infrastructure, or additional transportation measures or policies.

Pursuant to Government Code Section 65080(b)(2)(K), an SCS does not: (1) regulate the use of land; (2) supersede the land use authority of cities and counties; or (3) require that a city's or county's land use policies and regulations, including those in a general plan, be consistent with it. Nonetheless, SB 375 makes regional and local planning agencies responsible for developing those strategies as part of the federally required metropolitan transportation planning process and the state-mandated housing element process.

In 2010, CARB adopted the SB 375 targets for the regional metropolitan planning organizations. The targets for SANDAG are a 7% reduction in emissions per capita by 2020 and a 13% reduction by 2035.

SANDAG completed and adopted its *2050 Regional Transportation Plan/Sustainable Communities Strategy* (2050 RTP/SCS) in October 2011 (SANDAG 2011). In November 2011, CARB, by resolution, accepted SANDAG's GHG emissions quantification analysis and determination that, if implemented, the 2050 RTP/SCS would achieve CARB's 2020 and 2035 GHG emissions reduction targets for the region.

After SANDAG's 2050 RTP/SCS was adopted, a lawsuit was filed by the Cleveland National Forest Foundation and others. The case was decided in July 2017, and the court found that the environmental impact report (EIR) did not have to use EO S-3-05's 2050 goal of an 80% reduction in GHG emissions from 1990 levels as a threshold because the EIR sufficiently informed the public of the potential impacts.

Although the EIR for SANDAG's 2050 RTP/SCS is pending before the California Supreme Court, in 2015, SANDAG adopted the next iteration of its RTP/SCS in accordance with statutorily mandated timelines, and no subsequent litigation challenge was filed. More specifically, in October 2015, SANDAG adopted *San Diego Forward: The Regional Plan*. Like the 2050 RTP/SCS, this planning document meets CARB's 2020 and 2035 reduction targets for the region (SANDAG 2015). In December 2015, CARB, by resolution, accepted SANDAG's GHG emissions quantification analysis and determination that, if implemented, the SCS would achieve CARB's 2020 and 2035 GHG emissions reduction targets for the region.

Advanced Clean Cars Program. In January 2012, CARB approved the Advanced Clean Cars program, a new emissions-control program for model years 2015 through 2025. The program combines the control of smog- and soot-causing pollutants and GHG emissions into a single coordinated package. The package includes elements to reduce smog-forming pollution and GHG emissions, promote clean cars, and provide the fuels for clean cars (CARB 2012). To improve air quality, CARB has implemented new emission standards to reduce smog-forming emissions beginning with 2015 model year vehicles. It is estimated that in 2025, cars will emit 75% less smog-forming pollution than the average new car sold before 2012. To reduce GHG emissions, CARB, in conjunction with the EPA and the NHTSA, has adopted new GHG standards for model year 2017 to 2025 vehicles; the new standards are estimated to reduce GHG emissions by 34% in 2025. The Zero-Emissions Vehicle (ZEV) program will act as the focused technology of the Advanced Clean Cars program by requiring manufacturers to produce increasing numbers of ZEVs and plug-in hybrid electric vehicles in the 2018 to 2025 model years. The Clean Fuels Outlet regulation will ensure that fuels such as electricity and hydrogen are available to meet the fueling needs of the new advanced technology vehicles as they come to the market.

EO B-16-12. EO B-16-12 (2012) directs state entities under the governor's direction and control to support and facilitate development and distribution ZEVs. This EO also sets a long-term target of reaching 1.5 million ZEVs on California's roadways by 2025. On a statewide basis, EO B-16-12 also establishes a GHG emissions reduction target from the transportation sector equaling 80% less than 1990 levels by 2050. In furtherance of this EO, the governor convened an Interagency Working Group on ZEVs that has published multiple reports regarding the progress made on the penetration of ZEVs in the statewide vehicle fleet.

AB 1236. AB 1236 (2015) as enacted in California's Planning and Zoning Law, requires local land use jurisdictions to approve applications for the installation of EV charging stations, as defined, through the issuance of specified permits, unless there is substantial evidence in the record that the proposed installation would have a specific, adverse impact upon the public health or safety, and there is no feasible method to satisfactorily mitigate or avoid the specific, adverse impact. The bill provides for appeal of that decision to the planning commission, as specified. The bill requires local land use jurisdictions with a population of 200,000 or more residents to adopt an ordinance by September 30, 2016, that creates an expedited and streamlined permitting process for EV charging stations, as specified. Prior to this statutory deadline, in August 2016, the County Board of Supervisors adopted Ordinance No. 10437 (N.S.), thereby adding a section to its County Code related to the expedited processing of EV charging station permits consistent with AB 1236.

SB 350. In 2015, SB 350—the Clean Energy and Pollution Reduction Act—was enacted into law. As one of its elements, SB 350 establishes a statewide policy for widespread electrification of the transportation sector, recognizing that such electrification is required for achievement of the state's 2030 and 2050 reduction targets (see Public Utilities Code, Section 740.12).

EO B-48-18. EO B-48-18 (January 2018) launches an eight-year initiative to accelerate the sale of EVs through a mix of rebate programs and infrastructure improvements. The order also sets a new EV target of five million EVs in California by 2030. EO B-48-18 includes funding for multiple state agencies including the CEC to increase EV charging infrastructure and CARB to provide rebates for the purchase of new EVs and purchase incentives for low-income customers.

Solid Waste

AB 939 and AB 341. In 1989, AB 939, known as the Integrated Waste Management Act (Public Resources Code, Sections 40000 et seq.), was passed because of the increase in waste stream and the decrease in landfill capacity. The statute established the California Integrated Waste Management Board, which oversees a disposal reporting system. AB 939 mandated a reduction of waste being disposed where jurisdictions were required to meet diversion goals of all solid waste through source reduction, recycling, and composting activities of 25% by 1995 and 50% by the year 2000.

AB 341 (2011) amended the California Integrated Waste Management Act of 1989 to include a provision declaring that it is the policy goal of the state that not less than 75% of solid waste generated be source-reduced, recycled, or composted by the year 2020, and annually thereafter. In addition, AB 341 required the California Department of Resources Recycling and Recovery (CalRecycle) to develop strategies to achieve the state's policy goal. CalRecycle has conducted multiple workshops and published documents that identify priority strategies that it believes would assist the state in reaching the 75% goal by 2020.

Water

EO B-29-15. In response to the ongoing drought in California, EO B-29-15 (April 2015) set a goal of achieving a statewide reduction in potable urban water usage of 25% relative to water use in 2013. The term of the EO extended through February 28, 2016, although many of the directives have since become permanent water-efficiency standards and requirements. The EO includes specific directives that set strict limits on water usage in the state. In response to EO B-29-15, the California Department of Water Resources has modified and adopted a revised version of the Model Water Efficient Landscape Ordinance that, among other changes, significantly increases the requirements for landscape water use efficiency and broadens its applicability to include new development projects with smaller landscape areas.

Other State Regulations and Goals

SB 97. SB 97 (Dutton) (August 2007) directed the Governor's Office of Planning and Research to develop guidelines under CEQA for the mitigation of GHG emissions. In 2008, the Office of Planning and Research issued a technical advisory as interim guidance regarding the analysis of

GHG emissions in CEQA documents. The advisory indicated that the lead agency should identify and estimate a project's GHG emissions, including those associated with vehicular traffic, energy consumption, water usage, and construction activities (OPR 2008). The advisory further recommended that the lead agency determine significance of the impacts and impose all mitigation measures necessary to reduce GHG emissions to a level that is less than significant. The California Natural Resources Agency (CNRA) adopted the CEQA Guidelines amendments in December 2009, which became effective in March 2010.

Under the amended CEQA Guidelines, a lead agency has the discretion to determine whether to use a quantitative or qualitative analysis, or apply performance standards to determine the significance of GHG emissions resulting from a particular project (14 CCR 15064.4(a)). The Guidelines require a lead agency to consider the extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHG emissions (14 CCR 15064.4(b)). The Guidelines also allow a lead agency to consider feasible means of mitigating the significant effects of GHG emissions, including reductions in emissions through the implementation of project features or off-site measures. The adopted amendments do not establish a GHG emission threshold, but instead allow a lead agency to develop, adopt, and apply its own thresholds of significance or those developed by other agencies or experts. The CNRA also acknowledges that a lead agency may consider compliance with regulations or requirements implementing AB 32 in determining the significance of a project's GHG emissions (CNRA 2009a).

With respect to GHG emissions, the CEQA Guidelines state in Section 15064.4(a) that lead agencies should "make a good faith effort, to the extent possible on scientific and factual data, to describe, calculate or estimate" GHG emissions. The CEQA Guidelines note that an agency may identify emissions by either selecting a "model or methodology" to quantify the emissions or by relying on "qualitative analysis or other performance based standards" (14 CCR 15064.4(a)). Section 15064.4(b) states that the lead agency should consider the following when assessing the significance of impacts from GHG emissions on the environment: (1) the extent a project may increase or reduce GHG emissions as compared to the existing environmental setting; (2) whether the project emissions exceed a threshold of significance that the lead agency determines applies to the project; and (3) the extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHG emissions (14 CCR 15064.4(b)).

EO S-13-08. EO S-13-08 (November 2008) is intended to hasten California's response to the impacts of global climate change, particularly sea-level rise. Therefore, the EO directs state agencies to take specified actions to assess and plan for such impacts. The final *2009 California Climate Adaptation Strategy* report was issued in December 2009 (CNRA 2009a), and an update, *Safeguarding California: Reducing Climate Risk*, followed in July 2014 (CNRA 2014). To assess the state's vulnerability, the report summarizes key climate change impacts to the state for the following areas: agriculture, biodiversity and habitat, emergency management, energy, forestry, ocean and coastal ecosystems and resources, public health, transportation, and water. Issuance of the *Safeguarding California: Implementation Action Plans* followed in March 2016 (CNRA 2016). Presently, the *Safeguarding California Plan: 2018 Update* was developed to communicate current and needed actions that state government should take to build climate change resiliency (CNRA 2018).

3.2.3 Local Regulations

3.2.3.1 San Diego Air Pollution Control District

The SDAPCD does not have established GHG rules, regulations, or policies.

3.2.3.2 City of Oceanside

General Plan

The City's General Plan includes various goals and policies designed to reduce GHG emissions within the City. Policies addressing climate change are integrated throughout the City's General Plan. Many GHG emissions reduction strategies result in co-benefits with reducing criteria air pollutant emissions and vice versa. See Section 2.2.3.3, City of Oceanside, for a discussion of the City's air quality policies, which would also reduce GHG emissions.

Oceanside Climate Action Plan and Energy and Climate Action Element

The City has held public workshops on the City's General Plan Update, which includes development of a Climate Action Plan (CAP) and a policy framework to the Energy and Climate Action Element (E-CAP). The E-CAP proactively supports statewide efforts to cut GHG emissions by expanding local renewable energy generation, reducing energy use, promoting recycling and reuse, facilitating active transportation, and encouraging other sustainable practices. As part of this effort to ensure a sustainable future, the City prepared a GHG emissions inventory and a CAP, both of which inform the E-CAP. The City's Final CAP was adopted on May 8, 2019. The City is currently in process of developing the CAP Consistency Checklist; thus, the City has established efficiency metric thresholds, which projects are to use to evaluate impacts from GHG emissions, in order to help the City to meet state reduction targets for 2020 and 2030. Projects are required to meet an efficiency metric threshold of 4.0 MT CO_2e per service population per year (MT CO_2e/SP/yr) for year 2020 and an efficiency metric threshold of

3.0 MT CO_2e/SP/yr for year 2030 (City of Oceanside 2019). Projects that meet these thresholds would be considered consistent with the City's CAP.

3.3 Greenhouse Gas Inventories and Climate Change Conditions

3.3.1 Sources of Greenhouse Gas Emissions

National and State Inventories

Per the EPA's *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2017*, total U.S. GHG emissions were approximately 6,457 MMT CO_2e in 2017 (EPA 2019). The largest source of CO_2, and of overall GHG emissions, was fossil-fuel combustion, which accounted for approximately 93.2% of CO_2 emissions in 2017 (4,912.0 MMT CO_2e). Relative to the 1990 emissions level, gross U.S. GHG emissions in 2017 were 1.3% higher; however, the gross emissions are down from a high of 15.7% above the 1990 level that occurred in 2007. GHG emissions decreased from 2016 to 2017 by 0.5% (35.5 MMT CO_2e) and, overall, net emissions in 2017 were 13% below 2005 levels (EPA 2019).

According to the California Greenhouse Gas Emission Inventory—2018 Edition, California emitted 429.4 MMT CO_2e in 2016, including emissions resulting from out-of-state electrical generation (CARB 2018c). The sources of GHG emissions in California include transportation, industrial uses, electric power production from both in-state and out-of-state sources, commercial and residential uses, agriculture, high-GWP substances, and recycling and waste. The California GHG emission source categories (as defined in CARB 2008) and their relative contributions in 2016 are presented in Table 9.

Table 9
Greenhouse Gas Emissions Sources in California

Source Category	Annual GHG Emissions (MMT CO_2e)	Percent of Total[a]
Transportation	169.38	41%
Industrial uses	89.61	23%
Electricity generation[b]	68.58	16%
Residential and commercial uses	39.36	12%
Agriculture	33.84	8%
High global warming potential substances	19.78	4%
Recycling and waste	8.81	2%
Totals	**429.4**	**100%**

Source: CARB 2018c.
Notes: GHG = greenhouse gas; MMT CO_2e = million metric tons of carbon dioxide equivalent.
Emissions reflect 2016 California GHG inventory.
[a] Percentage of total has been rounded and total may not sum due to rounding.

[b] Includes emissions associated with imported electricity, which account for 26.28 MMT CO_2e.

3.3.2 Potential Effects of Climate Change

Globally, climate change has the potential to affect numerous environmental resources through uncertain impacts related to future air temperatures and precipitation patterns. The *Climate Change 2014: Synthesis Report* indicated that warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. Signs that global climate change has occurred include warming of the atmosphere and ocean, diminished amounts of snow and ice, and rising sea levels (IPCC 2014).

In California, climate change impacts have the potential to affect sea level rise, agriculture, snowpack and water supply, forestry, wildfire risk, public health, and electricity demand and supply (CCCC 2006). The primary effect of global climate change has been a 0.2°C rise in average global tropospheric temperature per decade, determined from meteorological measurements worldwide between 1990 and 2005. Scientific modeling predicts that continued emissions of GHGs at or above current rates would induce more extreme climate changes during the twenty-first century than were observed during the twentieth century. A warming of about 0.2°C (0.36°F) per decade is projected, and there are identifiable signs that global warming could be taking place.

Although climate change is driven by global atmospheric conditions, climate change impacts are felt locally. A scientific consensus confirms that climate change is already affecting California. The average temperatures in California have increased, leading to more extreme hot days and fewer cold nights; shifts in the water cycle have been observed, with less winter precipitation falling as snow, and both snowmelt and rainwater running off earlier in the year; sea levels have risen; and wildland fires are becoming more frequent and intense due to dry seasons that start earlier and end later (CAT 2010).

An increase in annual average temperature is a reasonably foreseeable effect of climate change. Observed changes over the last several decades across the western United States reveal clear signals of climate change. Statewide average temperatures increased by about 1.7°F from 1895 to 2011, and warming has been greatest in the Sierra Nevada (CCCC 2012). By 2050, California is projected to warm by approximately 2.7°F above 2000 averages, a threefold increase in the rate of warming over the last century. By 2100, average temperatures could increase by 4.1°F to 8.6°F, depending on emissions levels. Springtime warming—a critical influence on snowmelt—will be particularly pronounced. Summer temperatures will rise more than winter temperatures, and the increases will be greater in inland California, compared to the coast. Heat waves will be more frequent, hotter, and longer. There will be fewer extremely cold nights (CCCC 2012). Over the next 100 years, scientists predict a decline of 30% to as much as 90% in Sierra snowpack, which accounts for approximately half of the surface water storage in California and much of the state's water supply (CAT 2006).

Model projections for precipitation over California continue to show the Mediterranean pattern of wet winters and dry summers with seasonal, year-to-year, and decade-to-decade variability. For the first time, however, several of the improved climate models shift toward drier conditions by the mid-to-late twenty-first century in central and, most notably, Southern California. By late-century, all projections show drying, and half of them suggest 30-year average precipitation will decline by more than 10% below the historical average (CCCC 2012).

A summary of current and future climate change impacts to resource areas in California, as discussed in the *Safeguarding California: Reducing Climate Risk* (CNRA 2014), is provided in this section.

Agriculture. The impacts of climate change on the agricultural sector are far more severe than the typical variability in weather and precipitation patterns that occur year to year. The agriculture sector and farmers face some specific challenges that include more drastic and unpredictable precipitation and weather patterns; extreme weather events that range from severe flooding to extreme drought, to destructive storm events; significant shifts in water availably and water quality; changes in pollinator lifecycles; temperature fluctuations, including extreme heat stress and decreased chill hours; increased risks from invasive species and weeds, agricultural pests, and plant diseases; and disruptions to the transportation and energy infrastructure supporting agricultural production. These challenges and associated short-term and long-term impacts can have both positive and negative effects on agricultural production. Nonetheless, it is predicted that current crop and livestock production will suffer long-term negative effects resulting in a substantial decrease in the agricultural sector if not managed or mitigated.

Biodiversity and Habitat. The state's extensive biodiversity stems from its varied climate and assorted landscapes, which have resulted in numerous habitats where species have evolved and adapted over time. Specific climate change challenges to biodiversity and habitat include species migration in response to climatic changes, range shift, and novel combinations of species; pathogens, parasites and disease; invasive species; extinction risks; changes in the timing of seasonal life-cycle events; food web disruptions; and threshold effects (i.e., a change in the ecosystem that results in a "tipping point" beyond which irreversible damage or loss has occurs). Habitat restoration, conservation, and resource management across California and through collaborative efforts amongst public, private, and nonprofit agencies has assisted in the effort to fight climate change impacts on biodiversity and habitat. One of the key measures in these efforts is ensuring species' ability to relocate as temperature and water availability fluctuate as a result of climate change, based on geographic region.

Energy. The energy sector provides California residents with a supply of reliable and affordable energy through a complex integrated system. Specific climate change challenges for the energy sector include temperature, fluctuating precipitation patterns, increasing extreme weather events, and sea level rise. Increasing temperatures and reduced snowpack negatively impact the availability of a steady flow of snowmelt to hydroelectric reservoirs. Higher temperatures also reduce the capacity of thermal power plants, since power plant cooling is less efficient at higher ambient temperatures. Increased temperatures will also increase electricity demand associated with air conditioning. Natural gas infrastructure in coastal California is threatened by sea level rise and extreme storm events.

Forestry. Forests occupy approximately 33% of California's 100 million acres, and provide key benefits such as wildlife habitat, absorption of carbon dioxide, renewable energy, and building materials. The most significant climate change-related risk to forests is accelerated risk of wildfire and more frequent and severe droughts. Droughts have resulted in more large-scale mortalities and, combined with increasing temperatures, have led to an overall increase in wildfire risks. Increased wildfire intensity subsequently increases public safety risks, property damage, fire suppression and emergency response costs, watershed and water quality impacts, and vegetation conversions. These factors contribute to decreased forest growth, geographic shifts in tree distribution, loss of fish and wildlife habitat, and decreased carbon absorption. Climate change may result in increased establishment of non-native species, particularly in rangelands where invasive species are already a problem. Invasive species may be able to exploit temperature or precipitation changes, or quickly occupy areas denuded by fire, insect mortality, or other climate change effects on vegetation.

Ocean and Coastal Ecosystems and Resources. Sea level rise, changing ocean conditions, and other climate change stressors are likely to exacerbate long-standing challenges related to ocean and coastal ecosystems in addition to threatening people and infrastructure located along the California coastline and in coastal communities. Sea level rise, in addition to more frequent and severe coastal storms and erosion, are threatening vital infrastructure such as roads, bridges, power plants, ports and airports, gasoline pipes, and emergency facilities, as well as negatively impacting the coastal recreational assets such as beaches and tidal wetlands. Water quality and ocean acidification threaten the abundance of seafood and other plant and wildlife habitats throughout California and globally.

Public Health. Climate change can impact public health through various environmental changes, and is the largest threat to human health in the twenty-first century. Changes in precipitation patterns affect public health primarily through potential for altered water supplies, and extreme events such as heat, floods, droughts, and wildfires. Increased frequency, intensity, and duration of extreme heat and heat waves is likely to increase the risk of mortality due to heat-related illness, as well as exacerbate existing chronic health conditions. Other extreme weather events are likely to negatively impact air quality and increase or intensify respiratory illness such as asthma and allergies. Additional health impacts that may be impacted by climate change include cardiovascular disease, vector-borne diseases, mental health impacts, and malnutrition injuries. Increased frequency of these ailments is likely to subsequently increase the direct risk of injury and/or mortality.

Transportation. Residents of California rely on airports, seaports, public transportation, and an extensive roadway network to gain access to destinations, goods, and services. While the transportation industry is a source of GHG emissions, it is also vulnerable to climate change risks. Particularly, sea level rise and erosion threaten many coastal California roadways, airports, seaports, transit systems, bridge supports, and energy and fueling infrastructure. Increasing temperatures and extended periods of extreme heat threaten the integrity of the roadways and rail lines. High temperatures cause the road surfaces to expand, which leads to increased pressure and pavement buckling. High temperatures can also cause rail breakages, which could lead to train derailment. Other forms of extreme weather events, such as extreme storm events, can negatively impact infrastructure, which can impair movement of peoples and goods, or potentially block evacuation routes and emergency access roads. Increased wildfires, flooding, erosion risks, landslides, mudslides, and rockslides can all profoundly impact the transportation system and pose a serious risk to public safety.

Water. Water resources in California support residences, plants, wildlife, farmland, landscapes, and ecosystems, and bring trillions of dollars in economic activity. Climate change could seriously impact the timing, form, amount of precipitation, runoff patterns, and frequency and severity of precipitation events. Higher temperatures reduce the amount of snowpack and lead to earlier snowmelt, which can impact water supply availability, natural ecosystems, and winter recreation. Water supply availability during the intense dry summer months is heavily dependent on the snowpack accumulated during the winter. Increased risk of flooding has a variety of public health concerns including water quality, public safety, property damage, displacement, and post-disaster mental health problems. Prolonged and intensified droughts can also negatively affect groundwater reserves and result in increased overdraft and subsidence. Droughts can also negatively impact agriculture and farmland throughout the state. The higher risk of wildfires can lead to increased erosion, which can negatively impact watersheds and result in poor water quality. Water temperatures are also prone to increase, which can negatively impact wildlife that rely on a specific range of temperatures for suitable habitat.

In March 2016, the CNRA released *Safeguarding California: Implementation Action Plans*, a document that shows how California is acting to convert the recommendations contained in the 2014 *Safeguarding California: Reducing Climate Risk* into action (CNRA 2016). More recently, the CNRA released *Safeguarding California Plan: 2018 Update* in January 2018, which provides a roadmap for state agencies to protect communities, infrastructure, services, and the natural environment from climate change impacts. The 2018 Update includes 69 recommendations across 11 sectors and more than 1,000 ongoing actions and next steps developed by scientific and policy experts across 38 state agencies (CNRA 2018). As with previous state adaptation plans, the 2018 Update addresses the following: acceleration of warming across the state, more intense and frequent heat waves, greater riverine flows, accelerating sea level rise, more intense and frequent drought, more severe and frequent wildfires, more severe storms and extreme weather events, shrinking snowpack and less overall precipitation, and ocean acidification, hypoxia, and warming.

3.4 Significance Criteria and Methodology

3.4.1 Thresholds of Significance

The significance criteria used to evaluate the proposed project's GHG emissions impacts are based on the recommendations provided in Appendix G of the CEQA Guidelines. For the purposes of this GHG emissions analysis, the proposed project would have a significant environmental impact if it would (14 CCR 15000 et seq.):

1. Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment.
2. Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs.

As stated in the CEQA Guidelines, Section 15064.4(b)(1)-(3), "a lead agency should consider the following factors, among others, when assessing the significance of impacts from GHG emissions on the environment: (1) the extent to which a project may increase or reduce GHG emissions as compared to the existing environmental setting; (2) whether project emissions exceed a threshold of significance that the lead agency determines applies to the project; and, (3) the extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of greenhouse gas emissions."

Section 15064(h)(3) of the CEQA Guidelines also states that: "A lead agency may determine that a project's incremental contribution to a cumulative effect is not cumulatively considerable if the project will comply with the requirements in a previously approved plan or mitigation program that provides specific requirements that will avoid or substantially lessen the cumulative problem within the geographic area in which the project is located."

The CEQA Guidelines do not prescribe specific methodologies for performing an assessment, do not establish specific quantitative thresholds of significance, and do not mandate specific mitigation measures. Rather, the CEQA Guidelines emphasize the lead agency's discretion to determine the appropriate methodologies and thresholds of significance consistent with the manner in which other impact areas are handled in CEQA (CNRA 2009b).

According to the California Governor's Office of Planning and Research Technical Advisory on CEQA and Climate Change, "public agencies are encouraged but not required to adopt thresholds of significance for environmental impacts. Even in the absence of clearly defined thresholds for GHG emissions, the law requires that such emissions from CEQA projects must be disclosed and mitigated to the extent feasible whenever the lead agency determines that the project contributes to a significant, cumulative climate change impact" (OPR 2008). Furthermore, the advisory document indicates that, "in the absence of regulatory standards for GHG emissions or other scientific data to clearly define what constitutes a 'significant impact,' individual lead agencies may undertake a project-by-project analysis, consistent with available guidance and current CEQA practice."

Global climate change is a cumulative impact; a project participates in this potential impact through its incremental contribution combined with the cumulative increase of all other sources of GHGs. There are currently no established quantitative thresholds for assessing whether the GHG emissions of a project, such as the proposed project, would be considered a cumulatively considerable contribution to global climate change; however, all reasonable efforts should be made to minimize a project's contribution to global climate change. In addition, while GHG impacts are recognized exclusively as cumulative impacts (CAPCOA 2008), GHG emissions impacts must also be evaluated on a project-level under CEQA.

City of Oceanside

As the lead agency, the City has the discretion to choose the significance threshold for discretionary projects. As discussed in Section 3.2.3.2, City of Oceanside, the City has established efficiency metric thresholds, which land use development projects can use to evaluate impacts from GHG emissions. However, since the proposed project consists of roadway improvements and would not result in an increase in service population (i.e., residents or employees), the efficiency metric threshold would not be appropriate for the proposed project. Instead, the proposed project will utilize a 900 MT CO_2e per year threshold consistent with the California Air Pollution Control Officers Association interim screening level as discussed below. This is also consistent with recent projects certified by the City.

The analysis for compliance with regulatory programs only applies to the individual area addressed by the regulatory program. If the proposed project is determined to have GHG emissions less than 900 MT CO_2e per year, then the proposed project's cumulative contribution of GHG emissions would be considered less than significant.[8]

3.4.2 Approach and Methodology

3.4.2.1 Construction Emissions

The Road Construction Emission Model was used to estimate potential project-generated GHG emissions during construction. Construction of the proposed project would result in GHG emissions primarily associated with the use of off-road construction equipment, on-road hauling and water trucks, and worker vehicles. All details for construction criteria air pollutants discussed in Section 2.4.2.1 are also applicable for the estimation of construction-related GHG emissions. As such, see Section 2.4.2.1 for a discussion of construction emissions calculation methodology and assumptions.

3.4.2.2 Operational Emissions

The proposed project would include road and right-of-way improvements to the corridor to enhance existing and future traffic operations, provide congestion relief, reduce queue lengths, improve safety conditions for the unsignalized intersections and access points along the corridor, and provide safer travel routes for bicyclists and pedestrians. However, as described in the TIA prepared for the proposed project, the 2035 daily VMT estimated using the SANDAG Series 12 traffic model for the proposed project would be higher than for the Circulation Element Alternative (approximate increase of 806,168 miles) (Appendix K). The higher cumulative VMT figure under the proposed project is due to a higher average trip length, which reflects changes in travel behavior patterns based on not widening a section of the College Boulevard study corridor (Appendix K). Since the proposed project would result in higher VMT, GHG emissions associated with the net increase in VMT were estimated using CalEEMod. CalEEMod output data are included in Appendix A of this report.

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8 Thresholds of significance must be backed by substantial evidence, which is defined in the CEQA statute to mean "facts, reasonable assumptions predicated on facts, and expert opinion supported by facts" (14 CCR 15384(b)). Substantial evidence can be in the form of technical studies, agency staff reports or opinions, expert opinions supported by facts, and prior CEQA assessments and planning documents. The 900 MT CO_2e per year screening threshold is supported by expert opinion (i.e., CAPCOA 2008), agency guidance (e.g., County of San Diego 2015), and prior environmental impact reports (e.g., ESA 2017), at a minimum.

3.5 Impact Analysis

3.5.1 Threshold GHG-1

Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

Construction

Table 10 shows the estimated annual GHG construction emissions by phase associated with the proposed project for year 2019.

Table 10
Estimated Annual Construction GHG Emissions

Year 2019	CO_2e
	Metric Tons per Phase
Grubbing/Land Clearing	17.55
Grading/Excavation	256.02
Drainage/Utilities/Sub-Grade	139.35
Paving	33.54
Total	**446.45**

Notes: Totals may not sum due to rounding. CO_2e = carbon dioxide equivalent
See Appendix A for complete results.

As shown in Table 10, estimated total proposed project-generated construction GHG emissions would be approximately 447 MT CO_2e. The amortized construction GHG emissions over the lifetime of the proposed project (30 years) would be approximately 15 MT CO_2e per year.

Operations

As described in the TIA, the regional 2035 daily VMT associated with the proposed project would be higher than for the City's current Circulation Element (an increase of 806,168 miles) due to a higher average trip length, which reflects changes in travel behavior patterns based on not widening a section of the College Boulevard study corridor (Fehr and Peers 2019). The incremental increase in VMT was modeled in CalEEMod to estimate increased emissions with the proposed project for year 2035, which are summarized in Table 11. Complete details of the emissions calculations are provided in Appendix A.

Table 11
Estimated Annual Operational GHG Emissions

Year 2035	CO_2e
	Metric Tons per Year
Incremental increase in annual GHGs from on-road VMT	85,898.95
Amortized construction emissions	14.88
Total operational + amortized construction GHGs	**85,913.83**

Notes: Totals may not sum due to rounding.CO_2e = carbon dioxide equivalent ; VMT = vehicle miles traveled
See Appendix A for complete results.

As shown in Table 11, the incremental increase in annual GHG emissions with the proposed project, as compared to the current Circulation Element, would be approximately 85,899 MT CO_2e per year as a result of the increase in regional VMT. After accounting for amortized proposed project construction emissions, total GHGs generated by the proposed project would be approximately 85,914 MT CO_2e per year. As such, annual operational GHG emissions with amortized construction emissions would exceed the applied threshold of 900 MT CO_2e per year. Therefore, the proposed project's GHG contribution would be cumulatively considerable and is potentially significant without mitigation. However, since the City lacks the authority to mandate GHG emission reductions for on-road vehicles, or to control driver behavior, no feasible mitigation measures have been identified to reduce these emissions. This impact would be significant and unavoidable.

Mitigation Measures

No feasible mitigation measures have been identified.

Level of Significance After Mitigation

The proposed project would result in a significant and unavoidable impact.

3.5.2 Threshold GHG-2

Would the project conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

Consistency with the City's CAP, the Scoping Plan, the Regional Plan, and future GHG reduction goals are described below.

Project's Consistency with the City's CAP

The City developed a CAP to reduce GHG emissions within the City and thereby reduce the City's contribution to global climate change concerns. The City CAP includes GHG reduction strategies in the sectors of energy and buildings, water and wastewater, solid waste, transportation and land use, and agriculture and forestry to reach the City's GHG reduction targets (City of Oceanside 2019). The proposed project would result in roadway improvements along the College Boulevard corridor. As indicated in the TIA, implementation of the proposed project, as compared to the improvements assessed in the Circulation Element, would result in a regional increase in daily VMT of approximately 806,168 miles in year 2035. This increase in VMT would result in an approximate increase in annual GHGs of approximately 85,899 MT CO_2e per year, as described in Section 3.5.1 above. Since the proposed project would result in a substantial increase in GHG emissions, the proposed project would not be consistent with the GHG reduction goals of the City's CAP.

Project's Consistency with the Scoping Plan

The Scoping Plan, approved by CARB on December 12, 2008, provides a framework for actions to reduce California's GHG emissions and requires CARB and other state agencies to adopt regulations and other initiatives to reduce GHGs. As such, the Scoping Plan is not directly applicable to specific projects. In the *Final Statement of Reasons for Regulatory* Action, the CNRA observed that "[t]he [Scoping Plan] may not be appropriate for use in determining the significance of individual projects because it is conceptual at this stage and relies on the future development of regulations to implement the strategies identified in the Scoping Plan" (CNRA 2009b). Under the Scoping Plan, however, there are several state regulatory measures aimed at the identification and reduction of GHG emissions. CARB and other state agencies have adopted many of the measures identified in the Scoping Plan. Most of these measures focus on area source emissions (e.g., energy usage, high-GWP GHGs in consumer products) and changes to the vehicle fleet (i.e., hybrid, electric, and more fuel-efficient vehicles) and associated fuels (e.g., low carbon fuel standard), among others. The Scoping Plan recommends strategies for implementation at the statewide level to meet the goals of AB 32 and establishes an overall framework for the measures that will be adopted to reduce California's GHG emissions. The proposed project would comply with all applicable regulations adopted in furtherance of the Scoping Plan to the extent required by law.

Project's Consistency with SANDAG's Regional Plan

At the regional level, SANDAG's Regional Plan has been adopted for the purpose of reducing GHG emissions attributable to passenger vehicles and light-duty trucks in the San Diego region. Like the 2050 RTP/SCS, the Regional Plan meets CARB's 2020 and 2035 reduction targets for the region. The Regional Plan does not regulate land use or supersede the exercise of land use authority by SANDAG's member jurisdictions, whereas the Regional Plan is a relevant regional reference document for purposes of evaluating the intersection of land use and transportation patterns and the corresponding GHG emissions. Typically, a project would be consistent with the RTP/SCS if the project does not exceed the underlying growth assumptions within the RTP/SCS. As identified in the TIA, the proposed project would result in increased VMT (and thus GHGs) associated with changes in travel behavior patterns based on not widening a section of the College Boulevard study corridor, as compared to the current Circulation Element. As such, the proposed project would potentially conflict with the goals of the Regional Plan.

Project's Consistency with SB 32 and EO S-3-05

The proposed project would potentially impede the attainment of the GHG reduction goals for 2030 or 2050, as identified in EO S-3-05 and SB 32. As discussed in Section 3.2.2, State Regulations, EO S-3-05 establishes the following goals: GHG emissions should be reduced to 2000 levels by 2010, to 1990 levels by 2020, and to 80% below 1990 levels by 2050. SB 32 establishes a statewide GHG emissions reduction target whereby CARB, in adopting rules and regulations to achieve the maximum technologically feasible and cost-effective GHG emissions reductions, shall ensure that statewide GHG emissions are reduced to at least 40% below 1990 levels by December 31, 2030. This section evaluates whether the GHG emissions trajectory after proposed project completion would impede the attainment of the 2030 and 2050 GHG reduction goals identified in EOs B-30-15 and S-3-05.

To begin, CARB has expressed optimism with regard to both the 2030 and 2050 goals. It states in the First Update to the Climate Change Scoping Plan that "California is on track to meet the near-term 2020 GHG emissions limit and is well positioned to maintain and continue reductions beyond 2020 as required by AB 32" (CARB 2014). With regard to the 2050 target for reducing GHG emissions to 80% below 1990 levels, the First Update to the Climate Change Scoping Plan states the following (CARB 2014):

> This level of reduction is achievable in California. In fact, if California realizes the expected benefits of existing policy goals (such as 12,000 megawatts of renewable distributed generation by 2020, net zero energy homes after 2020, existing building retrofits under AB 758, and others) it could reduce emissions by 2030 to levels squarely in line with those needed in the developed world and to stay on track to reduce emissions to 80% below 1990 levels by 2050. Additional measures, including locally driven measures and those necessary to meet federal air quality standards in 2032, could lead to even greater emission reductions.

In other words, CARB believes that the state is on a trajectory to meet the 2030 and 2050 GHG reduction targets set forth in AB 32, EO B-30-15, and EO S-3-05. This is confirmed in the 2017 Scoping Plan, which states (CARB 2017):

> The Scoping Plan builds upon the successful framework established by the Initial Scoping Plan and First Update, while identifying new, technologically feasible and cost-effective strategies to ensure that California meets its GHG reduction targets in a way that promotes and rewards innovation, continues to foster economic growth, and delivers improvements to the environment and public health, including in disadvantaged communities.

As discussed in Section 3.5.1, total incremental increased GHG emissions under the proposed project (i.e., widening of College Boulevard between Olive Drive and Old Grove Road), including operation and amortized construction, would be approximately 85,914 MT CO_2e per year and would exceed the applied threshold of 900 MT CO_2e per year. As discussed earlier, the proposed project is similar to the existing Circulation Element with the exception of widening between Olive Drive and Barnard Drive/Waring Road (which the City has determined is infeasible). As such, the proposed project would generate GHG emissions that may interfere with the implementation of GHG reduction goals for 2030 and 2050. In addition, the proposed project would not be consistent with the goals of the City's CAP or Regional Plan of reducing VMT and GHG emissions. Therefore, the proposed project would potentially conflict with plans, policies, or regulations adopted for the purpose of reducing GHG emissions, and impacts are considered potentially significant without mitigation.

Mitigation Measures

MM-GHG-1 Prior to the City of Oceanside's next review and update of the City's Climate Action Plan (CAP), the City shall amend the estimate vehicle miles traveled (VMT) and greenhouse gas (GHG) inventory using the proposed project's College Boulevard corridor revisions.

MM-GHG-2 Prior to the San Diego Association of Government's (SANDAG's) next update of the Regional Plan, the City of Oceanside (City) shall coordinate with SANDAG to amend the vehicle miles traveled (VMT) and emissions assumptions using the proposed project's College Boulevard corridor revisions.

Level of Significance After Mitigation

Although MM-GHG-1 and MM-GHG-2 would result in updating the City's CAP and SANDAG's Regional Plan with consistent assumptions based on the proposed project, these plans do not have required timelines of revision. As such, the proposed project would not be consistent with the goals and assumptions in the City's CAP or SANDAG's Regional Plan for an indeterminate amount of time. Additionally, the proposed project would generate GHG emissions that may interfere with the implementation of GHG reduction goals for 2030 and 2050. Based on these considerations, the proposed project would potentially conflict with plans, policies, or regulations adopted for the purpose of reducing GHG emissions, and would result in a significant and unavoidable impact.

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5 LIST OF PREPARERS

Matthew Morales, Air Quality Specialist
Nicole Sanchez-Sullivan, Technical Editor

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APPENDIX A

Emissions Modeling Results

Road Construction Emissions Model, Version 9.0.0

Daily Emission Estimates for -> College Blvd - Oceanside

Project Phases (Pounds)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	SOx (lbs/day)	CO2 (lbs/day)	CH4 (lbs/day)	N2O (lbs/day)	CO2e (lbs/day)
Grubbing/Land Clearing	1.51	12.08	16.17	1.30	0.70	0.60	0.74	0.62	0.12	0.03	2,883.16	0.61	0.11	2,930.88
Grading/Excavation	6.79	51.86	76.70	4.01	3.41	0.60	3.20	3.07	0.12	0.11	10,561.02	2.90	0.19	10,689.60
Drainage/Utilities/Sub-Grade	4.16	33.48	41.80	2.70	2.10	0.60	2.06	1.93	0.12	0.07	6,569.36	1.24	0.16	6,649.36
Paving	2.08	19.82	19.96	1.20	1.20	0.00	1.06	1.06	0.00	0.04	3,674.39	0.77	0.14	3,734.72
Maximum (pounds/day)	6.79	51.86	76.70	4.01	3.41	0.60	3.20	3.07	0.12	0.11	10,561.02	2.90	0.19	10,689.60
Total (tons/construction project)	0.31	2.42	3.29	0.19	0.16	0.03	0.15	0.14	0.01	0.00	485.97	0.12	0.01	492.12

Notes:

Project Start Year ->	2019
Project Length (months) ->	6
Total Project Area (acres) ->	7
Maximum Area Disturbed/Day (acres) ->	0
Water Truck Used? ->	Yes

	Total Material Imported/Exported Volume (yd^3/day)		Daily VMT (miles/day)			
Phase	Soil	Asphalt	Soil Hauling	Asphalt Hauling	Worker Commute	Water Truck
Grubbing/Land Clearing	0	52	0	90	400	40
Grading/Excavation	0	52	0	90	1,000	40
Drainage/Utilities/Sub-Grade	0	70	0	120	760	40
Paving	0	70	0	120	600	40

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

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

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

Total Emission Estimates by Phase for -> College Blvd - Oceanside

Project Phases (Tons for all except CO2e. Metric tonnes for CO2e)	ROG (tons/phase)	CO (tons/phase)	NOx (tons/phase)	Total PM10 (tons/phase)	Exhaust PM10 (tons/phase)	Fugitive Dust PM10 (tons/phase)	Total PM2.5 (tons/phase)	Exhaust PM2.5 (tons/phase)	Fugitive Dust PM2.5 (tons/phase)	SOx (tons/phase)	CO2 (tons/phase)	CH4 (tons/phase)	N2O (tons/phase)	CO2e (MT/phase)
Grubbing/Land Clearing	0.01	0.08	0.11	0.01	0.00	0.00	0.00	0.00	0.00	0.00	19.03	0.00	0.00	17.55
Grading/Excavation	0.18	1.37	2.02	0.11	0.09	0.02	0.08	0.08	0.00	0.00	278.81	0.08	0.00	256.02
Drainage/Utilities/Sub-Grade	0.10	0.77	0.97	0.06	0.05	0.01	0.05	0.04	0.00	0.00	151.75	0.03	0.00	139.35
Paving	0.02	0.20	0.20	0.01	0.01	0.00	0.01	0.01	0.00	0.00	36.38	0.01	0.00	33.54
Maximum (tons/phase)	0.18	1.37	2.02	0.11	0.09	0.02	0.08	0.08	0.00	0.00	278.81	0.08	0.00	256.02
Total (tons/construction project)	0.31	2.42	3.29	0.19	0.16	0.03	0.15	0.14	0.01	0.00	485.97	0.12	0.01	446.45

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

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

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

The CO2e emissions are reported as metric tons per phase.

Road Construction Emissions Model Version 9.0.0

Data Entry Worksheet

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells D10 through D24, E28 through G35, and D38 through D41 for all project types.
Please use "Clear Data Input & User Overrides" button first before changing the Project Type or begin a new project.

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Input Type

Project Name	College Blvd - Oceanside	
Construction Start Year	2019	Enter a Year between 2014 and 2040 (inclusive)
Project Type	2	1) New Road Construction : Project to build a roadway from bare ground, which generally requires more site preparation than widening an existing roadway 2) Road Widening : Project to add a new lane to an existing roadway 3) Bridge/Overpass Construction : Project to build an elevated roadway, which generally requires some different equipment than a new roadway, such as a crane 4) Other Linear Project Type: Non-roadway project such as a pipeline, transmission line, or levee construction
Project Construction Time	6.00	months
Working Days per Month	22.00	days (assume 22 if unknown)
Predominant Soil/Site Type: Enter 1, 2, or 3 (for project within "Sacramento County", follow soil type selection instructions in cells E18 to E20 otherwise see instructions provided in cells J18 to J22)	1	1) Sand Gravel : Use for quaternary deposits (Delta/West County) 2) Weathered Rock-Earth : Use for Laguna formation (Jackson Highway area) or the Ione formation (Scott Road, Rancho Murieta) 3) Blasted Rock : Use for Salt Springs Slate or Copper Hill Volcanics (Folsom South of Highway 50, Rancho Murieta)
Project Length	2.41	miles
Total Project Area	7.00	acres
Maximum Area Disturbed/Day	0.06	acres
Water Trucks Used?	1	1. Yes 2. No

Please note that the soil type instructions provided in cells E18 to E20 are specific to Sacramento County. Maps available from the California Geologic Survey (see weblink below) can be used to determine soil type outside Sacramento County.

http://www.conservation.ca.gov/cgs/information/geologic_mapping/Pages/googlemaps.aspx#regionalseries

Material Hauling Quantity Input

Material Type	Phase	Haul Truck Capacity (yd^3) (assume 20 if unknown)	Import Volume (yd^3/day)	Export Volume (yd^3/day)
Soil	Grubbing/Land Clearing	20.00		
	Grading/Excavation	20.00		
	Drainage/Utilities/Sub-Grade	20.00		
	Paving	20.00		
Asphalt	Grubbing/Land Clearing	20.00		51.76
	Grading/Excavation	20.00		51.76
	Drainage/Utilities/Sub-Grade	20.00	70.32	
	Paving	20.00	70.32	

Mitigation Options

On-road Fleet Emissions Mitigation		Select "2010 and Newer On-road Vehicles Fleet" option when the on-road heavy-duty truck fleet for the project will be limited to vehicles of model year 2010 or newer
Off-road Equipment Emissions Mitigation		Select "20% NOx and 45% Exhaust PM reduction" option if the project will be required to use a lower emitting off-road construction fleet. The SMAQMD Construction Mitigation Calculator can be used to confirm compliance with this mitigation measure (http://www.airquality.org/Businesses/CEQA-Land-Use-Planning/Mitigation). Select "Tier 4 Equipment" option if some or all off-road equipment used for the project meets CARB Tier 4 Standard

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells D50 through D53, and F50 through F53.

Construction Periods	User Override of Construction Months	Program Calculated Months	User Override of Phase Starting Date	Program Default Phase Starting Date
Grubbing/Land Clearing		0.60		1/1/2019
Grading/Excavation		2.40		1/20/2019
Drainage/Utilities/Sub-Grade		2.10		4/3/2019
Paving		0.90		6/6/2019
Totals (Months)		6		

Note: Soil Hauling emission default values can be overridden in cells D61 through D64, and F61 through F64.

Soil Hauling Emissions / **User Input**	User Override of Miles/Round Trip	Program Estimate of Miles/Round Trip	User Override of Truck Round Trips/Day	Default Values Round Trips/Day	Calculated Daily VMT
Miles/round trip: Grubbing/Land Clearing		30.00		0	0.00
Miles/round trip: Grading/Excavation		30.00		0	0.00
Miles/round trip: Drainage/Utilities/Sub-Grade		30.00		0	0.00
Miles/round trip: Paving		30.00		0	0.00

Emission Rates	**ROG**	**CO**	**NOx**	**PM10**	**PM2.5**	**SOx**	**CO2**	**CH4**	**N2O**	**CO2e**
Grubbing/Land Clearing (grams/mile)	0.04	0.42	2.95	0.11	0.05	0.02	1,795.97	0.00	0.28	1,880.15
Grading/Excavation (grams/mile)	0.04	0.42	2.95	0.11	0.05	0.02	1,795.97	0.00	0.28	1,880.15
Draining/Utilities/Sub-Grade (grams/mile)	0.04	0.42	2.95	0.11	0.05	0.02	1,795.97	0.00	0.28	1,880.15
Paving (grams/mile)	0.04	0.42	2.95	0.11	0.05	0.02	1,795.97	0.00	0.28	1,880.15
Grubbing/Land Clearing (grams/trip)	0.00	0.00	2.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grading/Excavation (grams/trip)	0.00	0.00	2.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Draining/Utilities/Sub-Grade (grams/trip)	0.00	0.00	2.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving (grams/trip)	0.00	0.00	2.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling Emissions	**ROG**	**CO**	**NOx**	**PM10**	**PM2.5**	**SOx**	**CO2**	**CH4**	**N2O**	**CO2e**
Pounds per day - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Grading/Excavation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Grading/Excavation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Drainage/Utilities/Sub-Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Drainage/Utilities/Sub-Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Paving	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total tons per construction project	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: Asphalt Hauling emission default values can be overridden in cells D91 through D94, and F91 through F94.

Asphalt Hauling Emissions / **User Input**	User Override of Miles/Round Trip	Program Estimate of Miles/Round Trip	User Override of Truck Round Trips/Day	Default Values Round Trips/Day	Calculated Daily VMT
Miles/round trip: Grubbing/Land Clearing		30.00		3	90.00
Miles/round trip: Grading/Excavation		30.00		3	90.00
Miles/round trip: Drainage/Utilities/Sub-Grade		30.00		4	120.00
Miles/round trip: Paving		30.00		4	120.00

Emission Rates	**ROG**	**CO**	**NOx**	**PM10**	**PM2.5**	**SOx**	**CO2**	**CH4**	**N2O**	**CO2e**
Grubbing/Land Clearing (grams/mile)	0.04	0.42	2.95	0.11	0.05	0.02	1,795.97	0.00	0.28	1,880.15
Grading/Excavation (grams/mile)	0.04	0.42	2.95	0.11	0.05	0.02	1,795.97	0.00	0.28	1,880.15
Draining/Utilities/Sub-Grade (grams/mile)	0.04	0.42	2.95	0.11	0.05	0.02	1,795.97	0.00	0.28	1,880.15
Paving (grams/mile)	0.04	0.42	2.95	0.11	0.05	0.02	1,795.97	0.00	0.28	1,880.15
Grubbing/Land Clearing (grams/trip)	0.00	0.00	2.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grading/Excavation (grams/trip)	0.00	0.00	2.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Draining/Utilities/Sub-Grade (grams/trip)	0.00	0.00	2.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving (grams/trip)	0.00	0.00	2.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Emissions	**ROG**	**CO**	**NOx**	**PM10**	**PM2.5**	**SOx**	**CO2**	**CH4**	**N2O**	**CO2e**
Pounds per day - Grubbing/Land Clearing	0.01	0.08	0.60	0.02	0.01	0.00	356.35	0.00	0.06	373.05
Tons per const. Period - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	2.35	0.00	0.00	2.46
Pounds per day - Grading/Excavation	0.01	0.08	0.60	0.02	0.01	0.00	356.35	0.00	0.06	373.05
Tons per const. Period - Grading/Excavation	0.00	0.00	0.02	0.00	0.00	0.00	9.41	0.00	0.00	9.85
Pounds per day - Drainage/Utilities/Sub-Grade	0.01	0.11	0.80	0.03	0.01	0.00	475.13	0.00	0.07	497.40
Tons per const. Period - Drainage/Utilities/Sub-Grade	0.00	0.00	0.02	0.00	0.00	0.00	10.98	0.00	0.00	11.49
Pounds per day - Paving	0.01	0.11	0.80	0.03	0.01	0.00	475.13	0.00	0.07	497.40
Tons per const. Period - Paving	0.00	0.00	0.01	0.00	0.00	0.00	4.70	0.00	0.00	4.92
Total tons per construction project	0.00	0.01	0.05	0.00	0.00	0.00	27.44	0.00	0.00	28.72

Note: Worker commute default values can be overridden in cells D121 through D126.

Worker Commute Emissions User Input	User Override of Worker Commute Default Values	Default Values		
Miles/ one-way trip		20	Calculated	Calculated
One-way trips/day		2	Daily Trips	Daily VMT
No. of employees: Grubbing/Land Clearing		10	20	400.00
No. of employees: Grading/Excavation		25	50	1,000.00
No. of employees: Drainage/Utilities/Sub-Grade		19	38	760.00
No. of employees: Paving		15	30	600.00

Emission Rates	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Grubbing/Land Clearing (grams/mile)	0.03	1.37	0.13	0.05	0.02	0.00	361.65	0.01	0.01	364.76
Grading/Excavation (grams/mile)	0.03	1.37	0.13	0.05	0.02	0.00	361.65	0.01	0.01	364.76
Draining/Utilities/Sub-Grade (grams/mile)	0.03	1.37	0.13	0.05	0.02	0.00	361.65	0.01	0.01	364.76
Paving (grams/mile)	0.03	1.37	0.13	0.05	0.02	0.00	361.65	0.01	0.01	364.76
Grubbing/Land Clearing (grams/trip)	1.34	3.17	0.41	0.00	0.00	0.00	77.30	0.10	0.04	91.28
Grading/Excavation (grams/trip)	1.34	3.17	0.41	0.00	0.00	0.00	77.30	0.10	0.04	91.28
Draining/Utilities/Sub-Grade (grams/trip)	1.34	3.17	0.41	0.00	0.00	0.00	77.30	0.10	0.04	91.28
Paving (grams/trip)	1.34	3.17	0.41	0.00	0.00	0.00	77.30	0.10	0.04	91.28
Emissions	**ROG**	**CO**	**NOx**	**PM10**	**PM2.5**	**SOx**	**CO2**	**CH4**	**N2O**	**CO2e**
Pounds per day - Grubbing/Land Clearing	0.08	1.34	0.13	0.04	0.02	0.00	322.33	0.01	0.01	325.69
Tons per const. Period - Grubbing/Land Clearing	0.00	0.01	0.00	0.00	0.00	0.00	2.13	0.00	0.00	2.15
Pounds per day - Grading/Excavation	0.21	3.36	0.33	0.10	0.04	0.01	805.83	0.02	0.03	814.21
Tons per const. Period - Grading/Excavation	0.01	0.09	0.01	0.00	0.00	0.00	21.27	0.00	0.00	21.50
Pounds per day - Drainage/Utilities/Sub-Grade	0.16	2.55	0.25	0.08	0.03	0.01	612.43	0.02	0.02	618.80
Tons per const. Period - Drainage/Utilities/Sub-Grade	0.00	0.06	0.01	0.00	0.00	0.00	14.15	0.00	0.00	14.29
Pounds per day - Paving	0.13	2.02	0.20	0.06	0.03	0.00	483.50	0.01	0.02	488.53
Tons per const. Period - Paving	0.00	0.02	0.00	0.00	0.00	0.00	4.79	0.00	0.00	4.84
Total tons per construction project	0.01	0.18	0.02	0.01	0.00	0.00	42.34	0.00	0.00	42.78

Note: Water Truck default values can be overridden in cells D153 through D156, I153 through I156, and F153 through F156.

Water Truck Emissions User Input	User Override of Default # Water Trucks	Program Estimate of Number of Water Trucks	User Override of Truck Round Trips/Vehicle/Day	Default Values Round Trips/Vehicle/Day	Calculated Trips/day	User Override of Miles/Round Trip	Default Values Miles/Round Trip	Calculated Daily VMT
Grubbing/Land Clearing - Exhaust		1		5	5		8.00	40.00
Grading/Excavation - Exhaust		1		5	5		8.00	40.00
Drainage/Utilities/Subgrade		1		5	5		8.00	40.00
Paving		1		5	5		8.00	40.00

Emission Rates	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Grubbing/Land Clearing (grams/mile)	0.04	0.42	2.95	0.11	0.05	0.02	1,795.97	0.00	0.28	1,880.15
Grading/Excavation (grams/mile)	0.04	0.42	2.95	0.11	0.05	0.02	1,795.97	0.00	0.28	1,880.15
Draining/Utilities/Sub-Grade (grams/mile)	0.04	0.42	2.95	0.11	0.05	0.02	1,795.97	0.00	0.28	1,880.15
Paving (grams/mile)	0.04	0.42	2.95	0.11	0.05	0.02	1,795.97	0.00	0.28	1,880.15
Grubbing/Land Clearing (grams/trip)	0.00	0.00	2.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grading/Excavation (grams/trip)	0.00	0.00	2.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Draining/Utilities/Sub-Grade (grams/trip)	0.00	0.00	2.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving (grams/trip)	0.00	0.00	2.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Emissions	**ROG**	**CO**	**NOx**	**PM10**	**PM2.5**	**SOx**	**CO2**	**CH4**	**N2O**	**CO2e**
Pounds per day - Grubbing/Land Clearing	0.00	0.04	0.28	0.01	0.00	0.00	158.38	0.00	0.02	165.80
Tons per const. Period - Grubbing/Land Clearing	0.00	0.00	0.00	0.00	0.00	0.00	1.05	0.00	0.00	1.09
Pounds per day - Grading/Excavation	0.00	0.04	0.28	0.01	0.00	0.00	158.38	0.00	0.02	165.80
Tons per const. Period - Grading/Excavation	0.00	0.00	0.01	0.00	0.00	0.00	4.18	0.00	0.00	4.38
Pounds per day - Drainage/Utilities/Sub-Grade	0.00	0.04	0.28	0.01	0.00	0.00	158.38	0.00	0.02	165.80
Tons per const. Period - Drainage/Utilities/Sub-Grade	0.00	0.00	0.01	0.00	0.00	0.00	3.66	0.00	0.00	3.83
Pounds per day - Paving	0.00	0.04	0.28	0.01	0.00	0.00	158.38	0.00	0.02	165.80
Tons per const. Period - Paving	0.00	0.00	0.00	0.00	0.00	0.00	1.57	0.00	0.00	1.64
Total tons per construction project	0.00	0.00	0.02	0.00	0.00	0.00	10.45	0.00	0.00	10.94

Note: Fugitive dust default values can be overridden in cells D183 through D185.

Fugitive Dust	User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing		0.06	0.60	0.00	0.12	0.00
Fugitive Dust - Grading/Excavation		0.06	0.60	0.02	0.12	0.00
Fugitive Dust - Drainage/Utilities/Subgrade		0.06	0.60	0.01	0.12	0.00

Off-Road Equipment Emissions

Grubbing/Land Clearing Override of Default Number of Vehicles	Default Number of Vehicles *Program-estimate*	Mitigation Option Override of Default Equipment Tier (applicable only when "Tier 4 Mitigation" Option Selected)	Default Equipment Tier	Type	ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day	PM2.5 pounds/day	SOx pounds/day	CO2 pounds/day	CH4 pounds/day	N2O pounds/day	CO2e pounds/day
			Model Default Tier	Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Cranes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1		Model Default Tier	Crawler Tractors	0.61	2.58	7.99	0.30	0.28	0.01	777.28	0.25	0.01	785.48
			Model Default Tier	Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2		Model Default Tier	Excavators	0.52	6.53	5.36	0.26	0.24	0.01	1,022.25	0.32	0.01	1,033.03
			Model Default Tier	Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Graders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other General Industrial Equipn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other Material Handling Equipn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pavers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pumps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rollers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5		Model Default Tier	Signal Boards	0.29	1.51	1.80	0.07	0.07	0.00	246.57	0.03	0.00	247.82
			Model Default Tier	Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Tractors/Loaders/Backhoes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Welders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

User-Defined Off-road Equipment If non-default vehicles are used, please provide information in 'Non-default Off-road Equipment' tab

Number of Vehicles	Equipment Tier	Type		ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day	PM2.5 pounds/day	SOx pounds/day	CO2 pounds/day	CH4 pounds/day	N2O pounds/day	CO2e pounds/day
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Grubbing/Land Clearing	pounds per day	1.42	10.61	15.15	0.63	0.59	0.02	2,046.10	0.59	0.02	2,066.34
Grubbing/Land Clearing	tons per phase	0.01	0.07	0.10	0.00	0.00	0.00	13.50	0.00	0.00	13.64

Grading/Excavation Override of Default Number of Vehicles	Default Number of Vehicles *Program-estimate*	Mitigation Option Override of Default Equipment Tier (applicable only when "Tier 4 Mitigation" Option Selected)	Default Equipment Tier	Type	ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day	PM2.5 pounds/day	SOx pounds/day	CO2 pounds/day	CH4 pounds/day	N2O pounds/day	CO2e pounds/day
			Model Default Tier	Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0		Model Default Tier	Cranes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1		Model Default Tier	Crawler Tractors	0.61	2.58	7.99	0.30	0.28	0.01	777.28	0.25	0.01	785.48
			Model Default Tier	Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3		Model Default Tier	Excavators	0.78	9.79	8.05	0.39	0.36	0.02	1,533.38	0.49	0.01	1,549.55
			Model Default Tier	Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2		Model Default Tier	Graders	0.97	3.68	13.16	0.42	0.39	0.01	1,315.26	0.42	0.01	1,329.11
			Model Default Tier	Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other General Industrial Equipn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other Material Handling Equipm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pavers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pumps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2		Model Default Tier	Rollers	0.45	3.81	4.48	0.29	0.27	0.01	519.37	0.16	0.00	524.84
			Model Default Tier	Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1		Model Default Tier	Rubber Tired Loaders	0.40	1.68	4.83	0.16	0.15	0.01	618.81	0.20	0.01	625.34
	2		Model Default Tier	Scrapers	2.13	16.12	25.83	1.01	0.93	0.03	2,999.63	0.95	0.03	3,031.27
	5		Model Default Tier	Signal Boards	0.29	1.51	1.80	0.07	0.07	0.00	246.57	0.03	0.00	247.82
			Model Default Tier	Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4		Model Default Tier	Tractors/Loaders/Backhoes	0.93	9.21	9.35	0.62	0.57	0.01	1,230.17	0.39	0.01	1,243.12
			Model Default Tier	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Welders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

User-Defined Off-road Equipment

If non-default vehicles are used, please provide information in 'Non-default Off-road Equipment' tab

Number of Vehicles	Equipment Tier	Type		ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day	PM2.5 pounds/day	SOx pounds/day	CO2 pounds/day	CH4 pounds/day	N2O pounds/day	CO2e pounds/day
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Grading/Excavation	pounds per day	6.57	48.38	75.48	3.27	3.02	0.09	9,240.46	2.87	0.08	9,336.53
Grading/Excavation	tons per phase	0.17	1.28	1.99	0.09	0.08	0.00	243.95	0.08	0.00	246.48

Drainage/Utilities/Subgrade Override of Default Number of Vehicles	Default Number of Vehicles *Program-estimate*	Mitigation Option Override of Default Equipment Tier (applicable only when "Tier 4 Mitigation" Option Selected)	Default Equipment Tier		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
					pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
			Model Default Tier	Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1		Model Default Tier	Air Compressors	0.36	2.46	2.45	0.17	0.17	0.00	375.26	0.03	0.00	376.90
			Model Default Tier	Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Cranes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Excavators	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1		Model Default Tier	Generator Sets	0.44	3.72	3.78	0.23	0.23	0.01	623.04	0.04	0.00	625.42
	1		Model Default Tier	Graders	0.49	1.84	6.58	0.21	0.19	0.01	657.63	0.21	0.01	664.55
			Model Default Tier	Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other General Industrial Equipn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other Material Handling Equipm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pavers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1		Model Default Tier	Plate Compactors	0.04	0.21	0.25	0.01	0.01	0.00	34.48	0.00	0.00	34.65
			Model Default Tier	Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1		Model Default Tier	Pumps	0.47	3.78	3.83	0.24	0.24	0.01	623.04	0.04	0.00	625.47
			Model Default Tier	Rollers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1		Model Default Tier	Rough Terrain Forklifts	0.14	2.30	1.85	0.08	0.08	0.00	340.97	0.11	0.00	344.56
			Model Default Tier	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1		Model Default Tier	Scrapers	1.07	8.06	12.91	0.51	0.47	0.02	1,499.82	0.47	0.01	1,515.63
	5		Model Default Tier	Signal Boards	0.29	1.51	1.80	0.07	0.07	0.00	246.57	0.03	0.00	247.82
			Model Default Tier	Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3		Model Default Tier	Tractors/Loaders/Backhoes	0.70	6.91	7.01	0.47	0.43	0.01	922.63	0.29	0.01	932.34
			Model Default Tier	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Welders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

User-Defined Off-road Equipment If non-default vehicles are used, please provide information in 'Non-default Off-road Equipment' tab

Number of Vehicles	Equipment Tier	Type		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
				pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Drainage/Utilities/Sub-Grade	pounds per day	3.99	30.78	40.46	1.98	1.88	0.06	5,323.42	1.22	0.04	5,367.35
Drainage/Utilities/Sub-Grade	tons per phase	0.09	0.71	0.93	0.05	0.04	0.00	122.97	0.03	0.00	123.99

Paving Override of Default Number of Vehicles	Default Number of Vehicles *Program-estimate*	Mitigation Option Override of Default Equipment Tier (applicable only when "Tier 4 Mitigation" Option Selected)	Default Equipment Tier	Type	ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day	PM2.5 pounds/day	SOx pounds/day	CO2 pounds/day	CH4 pounds/day	N2O pounds/day	CO2e pounds/day
			Model Default Tier	Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Cranes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Excavators	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Graders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other General Industrial Equipn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other Material Handling Equipm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1		Model Default Tier	Pavers	0.29	2.90	3.12	0.15	0.14	0.00	465.50	0.15	0.00	470.41
	1		Model Default Tier	Paving Equipment	0.21	2.52	2.26	0.11	0.10	0.00	403.32	0.13	0.00	407.58
			Model Default Tier	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pumps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2		Model Default Tier	Rollers	0.45	3.81	4.48	0.29	0.27	0.01	519.37	0.16	0.00	524.84
			Model Default Tier	Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5		Model Default Tier	Signal Boards	0.29	1.51	1.80	0.07	0.07	0.00	246.57	0.03	0.00	247.82
			Model Default Tier	Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3		Model Default Tier	Tractors/Loaders/Backhoes	0.70	6.91	7.01	0.47	0.43	0.01	922.63	0.29	0.01	932.34
			Model Default Tier	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Welders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

User-Defined Off-road Equipment If non-default vehicles are used, please provide information in 'Non-default Off-road Equipment' tab

Number of Vehicles	Equipment Tier	Type	ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day	PM2.5 pounds/day	SOx pounds/day	CO2 pounds/day	CH4 pounds/day	N2O pounds/day	CO2e pounds/day
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving		pounds per day	1.94	17.65	18.67	1.10	1.02	0.03	2,557.38	0.76	0.02	2,582.99
Paving		tons per phase	0.02	0.17	0.18	0.01	0.01	0.00	25.32	0.01	0.00	25.57
Total Emissions all Phases (tons per construction period) =>			0.29	2.23	3.21	0.15	0.14	0.00	405.74	0.12	0.00	409.68

Equipment default values for horsepower and hours/day can be overridden in cells D403 through D436 and F403 through F436.

Equipment	User Override of Horsepower	Default Values Horsepower	User Override of Hours/day	Default Values Hours/day
Aerial Lifts		63		8
Air Compressors		78		8
Bore/Drill Rigs		221		8
Cement and Mortar Mixers		9		8
Concrete/Industrial Saws		81		8
Cranes		231		8
Crawler Tractors		212		8
Crushing/Proc. Equipment		85		8
Excavators		158		8
Forklifts		89		8
Generator Sets		84		8
Graders		187		8
Off-Highway Tractors		124		8
Off-Highway Trucks		402		8
Other Construction Equipment		172		8
Other General Industrial Equipment		88		8
Other Material Handling Equipment		168		8
Pavers		130		8
Paving Equipment		132		8
Plate Compactors		8		8
Pressure Washers		13		8
Pumps		84		8
Rollers		80		8
Rough Terrain Forklifts		100		8
Rubber Tired Dozers		247		8
Rubber Tired Loaders		203		8
Scrapers		367		8
Signal Boards		6		8
Skid Steer Loaders		65		8
Surfacing Equipment		263		8
Sweepers/Scrubbers		64		8
Tractors/Loaders/Backhoes		97		8
Trenchers		78		8
Welders		46		8

END OF DATA ENTRY SHEET

College Blvd Regional VMT Increase under Project
San Diego County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Parking	7.00	User Defined Unit	7.00	0.00	0

1.2 Other Project Characteristics

Urbanization Urban **Wind Speed (m/s)** 2.6 **Precipitation Freq (Days)** 40

Climate Zone 13 **Operational Year** 2035

Utility Company San Diego Gas & Electric

CO2 Intensity (lb/MWhr) 720.49 **CH4 Intensity (lb/MWhr)** 0.029 **N2O Intensity (lb/MWhr)** 0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Modeling emissions associated with incremental increase in VMT for Recommended Alternative (i.e., the Project) vs the Circulation Element

Land Use - Modeling increased VMT emissions only. For modeling purposes, assumed 7-acres disturbed under the "User Defined Parking" land use.

Construction Phase - Modeling increased VMT only

Off-road Equipment - Modeling increased VMT only

Trips and VMT - Modeling increased VMT only

Architectural Coating - Modeling increased VMT only

Vehicle Trips - Adjusted trips and triplength to match the incremental increase of 806,168 daily VMT in 2035 under the Recommended Alternative vs Circulation Element

Consumer Products - Modeling increased VMT only

Area Coating - Modeling increased VMT only

Energy Use - Modeling increased VMT only

Landscape Equipment - Modeling increased VMT only

Table Name	Column Name	Default Value	New Value
tblAreaCoating	ReapplicationRatePercent	10	0
tblLandUse	LotAcreage	0.00	7.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	UsageHours	6.00	0.00
tblVehicleTrips	CC_TL	7.30	10.00
tblVehicleTrips	CC_TTP	0.00	100.00
tblVehicleTrips	CNW_TL	7.30	10.00
tblVehicleTrips	CW_TL	9.50	10.00
tblVehicleTrips	PR_TP	0.00	100.00
tblVehicleTrips	ST_TR	0.00	11,548.32
tblVehicleTrips	SU_TR	0.00	11,548.32
tblVehicleTrips	WD_TR	0.00	11,548.32

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2018	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2018	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	**Start Date**	**End Date**	**Maximum Unmitigated ROG + NOX (tons/quarter)**	**Maximum Mitigated ROG + NOX (tons/quarter)**
		Highest		

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.0000e-005	0.0000	6.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.3000e-004	1.3000e-004	0.0000	0.0000	1.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	15.3259	71.8024	202.8077	0.9205	110.8485	0.4632	111.3116	29.6728	0.4307	30.1035	0.0000	85,797.99 99	85,797.99 99	4.0381	0.0000	85,898.95 15
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**15.3259**	**71.8024**	**202.8077**	**0.9205**	**110.8485**	**0.4632**	**111.3116**	**29.6728**	**0.4307**	**30.1035**	**0.0000**	**85,798.00 00**	**85,798.00 00**	**4.0381**	**0.0000**	**85,898.95 16**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.0000e-005	0.0000	6.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.3000e-004	1.3000e-004	0.0000	0.0000	1.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	15.3259	71.8024	202.8077	0.9205	110.8485	0.4632	111.3116	29.6728	0.4307	30.1035	0.0000	85,797.99 99	85,797.99 99	4.0381	0.0000	85,898.95 15
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**15.3259**	**71.8024**	**202.8077**	**0.9205**	**110.8485**	**0.4632**	**111.3116**	**29.6728**	**0.4307**	**30.1035**	**0.0000**	**85,798.00 00**	**85,798.00 00**	**4.0381**	**0.0000**	**85,898.95 16**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Architectural Coating	Architectural Coating	11/6/2018	12/3/2018	5	20	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 7

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	0	0.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Architectural Coating	0	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Architectural Coating - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	15.3259	71.8024	202.8077	0.9205	110.8485	0.4632	111.3116	29.6728	0.4307	30.1035	0.0000	85,797.9999	85,797.9999	4.0381	0.0000	85,898.9515
Unmitigated	15.3259	71.8024	202.8077	0.9205	110.8485	0.4632	111.3116	29.6728	0.4307	30.1035	0.0000	85,797.9999	85,797.9999	4.0381	0.0000	85,898.9515

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Parking	80,838.27	80,838.27	80838.27	294,251,296	294,251,296
Total	80,838.27	80,838.27	80,838.27	294,251,296	294,251,296

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
User Defined Parking	10.00	10.00	10.00	0.00	100.00	0.00	100	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
User Defined Parking	0.617626	0.036451	0.176904	0.096837	0.011340	0.005282	0.018425	0.026503	0.001944	0.001632	0.005548	0.000800	0.000709

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
User Defined Parking	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
User Defined Parking	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
User Defined Parking	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
User Defined Parking	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	1.0000e-005	0.0000	6.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.3000e-004	1.3000e-004	0.0000	0.0000	1.3000e-004
Unmitigated	1.0000e-005	0.0000	6.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.3000e-004	1.3000e-004	0.0000	0.0000	1.3000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	6.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.3000e-004	1.3000e-004	0.0000	0.0000	1.3000e-004
Total	**1.0000e-005**	**0.0000**	**6.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**1.3000e-004**	**1.3000e-004**	**0.0000**	**0.0000**	**1.3000e-004**

<u>Mitigated</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	6.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.3000e-004	1.3000e-004	0.0000	0.0000	1.3000e-004
Total	**1.0000e-005**	**0.0000**	**6.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**1.3000e-004**	**1.3000e-004**	**0.0000**	**0.0000**	**1.3000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e

Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
User Defined Parking	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
User Defined Parking	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
User Defined Parking	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e

Land Use	tons	MT/yr			
User Defined Parking	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

College Blvd Regional VMT Increase under Project

San Diego County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Parking	7.00	User Defined Unit	7.00	0.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.6	**Precipitation Freq (Days)**	40
Climate Zone	13			**Operational Year**	2035
Utility Company	San Diego Gas & Electric				
CO2 Intensity (lb/MWhr)	720.49	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Modeling emissions associated with incremental increase in VMT for Recommended Alternative (i.e., the Project) vs the Circulation Element

Land Use - Modeling increased VMT emissions only. For modeling purposes, assumed 7-acres disturbed under the "User Defined Parking" land use.

Construction Phase - Modeling increased VMT only

Off-road Equipment - Modeling increased VMT only

Trips and VMT - Modeling increased VMT only

Architectural Coating - Modeling increased VMT only

Vehicle Trips - Adjusted trips and triplength to match the incremental increase of 806,168 daily VMT in 2035 under the Recommended Alternative vs Circulation Element

Consumer Products - Modeling increased VMT only

Area Coating - Modeling increased VMT only

Energy Use - Modeling increased VMT only

Landscape Equipment - Modeling increased VMT only

Table Name	Column Name	Default Value	New Value
tblAreaCoating	ReapplicationRatePercent	10	0
tblLandUse	LotAcreage	0.00	7.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	UsageHours	6.00	0.00
tblVehicleTrips	CC_TL	7.30	10.00
tblVehicleTrips	CC_TTP	0.00	100.00
tblVehicleTrips	CNW_TL	7.30	10.00
tblVehicleTrips	CW_TL	9.50	10.00
tblVehicleTrips	PR_TP	0.00	100.00
tblVehicleTrips	ST_TR	0.00	11,548.32
tblVehicleTrips	SU_TR	0.00	11,548.32
tblVehicleTrips	WD_TR	0.00	11,548.32

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2018	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2018	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	6.0000e-005	1.0000e-005	7.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5300e-003	1.5300e-003	0.0000		1.6300e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	88.2791	384.5616	1,160.6504	5.2708	623.6981	2.5459	626.2440	166.6312	2.3670	168.9982		541,072.9214	541,072.9214	24.6334		541,688.7552
Total	**88.2791**	**384.5616**	**1,160.6511**	**5.2708**	**623.6981**	**2.5459**	**626.2440**	**166.6312**	**2.3670**	**168.9982**		**541,072.9229**	**541,072.9229**	**24.6334**	**0.0000**	**541,688.7568**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	6.0000e-005	1.0000e-005	7.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5300e-003	1.5300e-003	0.0000		1.6300e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	88.2791	384.5616	1,160.6504	5.2708	623.6981	2.5459	626.2440	166.6312	2.3670	168.9982		541,072.9214	541,072.9214	24.6334		541,688.7552
Total	**88.2791**	**384.5616**	**1,160.6511**	**5.2708**	**623.6981**	**2.5459**	**626.2440**	**166.6312**	**2.3670**	**168.9982**		**541,072.9229**	**541,072.9229**	**24.6334**	**0.0000**	**541,688.7568**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Architectural Coating	Architectural Coating	11/6/2018	12/3/2018	5	20	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 7

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	0	0.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Architectural Coating	0	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Architectural Coating - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	lb/day										lb/day					
Mitigated	88.2791	384.5616	1,160.650 4	5.2708	623.6981	2.5459	626.2440	166.6312	2.3670	168.9982		541,072.9 214	541,072.9 214	24.6334		541,688.7 552
Unmitigated	88.2791	384.5616	1,160.650 4	5.2708	623.6981	2.5459	626.2440	166.6312	2.3670	168.9982		541,072.9 214	541,072.9 214	24.6334		541,688.7 552

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Parking	80,838.27	80,838.27	80838.27	294,251,296	294,251,296
Total	80,838.27	80,838.27	80,838.27	294,251,296	294,251,296

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
User Defined Parking	10.00	10.00	10.00	0.00	100.00	0.00	100	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
User Defined Parking	0.617626	0.036451	0.176904	0.096837	0.011340	0.005282	0.018425	0.026503	0.001944	0.001632	0.005548	0.000800	0.000709

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Parking	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Land Use	kBTU/yr	lb/day										lb/day					
User Defined Parking	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	6.0000e-005	1.0000e-005	7.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5300e-003	1.5300e-003	0.0000		1.6300e-003
Unmitigated	6.0000e-005	1.0000e-005	7.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5300e-003	1.5300e-003	0.0000		1.6300e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Landscaping	6.0000e-005	1.0000e-005	7.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5300e-003	1.5300e-003	0.0000		1.6300e-003
Total	**6.0000e-005**	**1.0000e-005**	**7.1000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**1.5300e-003**	**1.5300e-003**	**0.0000**		**1.6300e-003**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	6.0000e-005	1.0000e-005	7.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5300e-003	1.5300e-003	0.0000		1.6300e-003
Total	**6.0000e-005**	**1.0000e-005**	**7.1000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**1.5300e-003**	**1.5300e-003**	**0.0000**		**1.6300e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

College Blvd Regional VMT Increase under Project

San Diego County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Parking	7.00	User Defined Unit	7.00	0.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.6	**Precipitation Freq (Days)**	40
Climate Zone	13			**Operational Year**	2035
Utility Company	San Diego Gas & Electric				
CO2 Intensity (lb/MWhr)	720.49	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Modeling emissions associated with incremental increase in VMT for Recommended Alternative (i.e., the Project) vs the Circulation Element

Land Use - Modeling increased VMT emissions only. For modeling purposes, assumed 7-acres disturbed under the "User Defined Parking" land use.

Construction Phase - Modeling increased VMT only

Off-road Equipment - Modeling increased VMT only

Trips and VMT - Modeling increased VMT only

Architectural Coating - Modeling increased VMT only

Vehicle Trips - Adjusted trips and triplength to match the incremental increase of 806,168 daily VMT in 2035 under the Recommended Alternative vs Circulation Element

Consumer Products - Modeling increased VMT only

Area Coating - Modeling increased VMT only

Energy Use - Modeling increased VMT only

Landscape Equipment - Modeling increased VMT only

Table Name	Column Name	Default Value	New Value
tblAreaCoating	ReapplicationRatePercent	10	0
tblLandUse	LotAcreage	0.00	7.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	UsageHours	6.00	0.00
tblVehicleTrips	CC_TL	7.30	10.00
tblVehicleTrips	CC_TTP	0.00	100.00
tblVehicleTrips	CNW_TL	7.30	10.00
tblVehicleTrips	CW_TL	9.50	10.00
tblVehicleTrips	PR_TP	0.00	100.00
tblVehicleTrips	ST_TR	0.00	11,548.32
tblVehicleTrips	SU_TR	0.00	11,548.32
tblVehicleTrips	WD_TR	0.00	11,548.32

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2018	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2018	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	6.0000e-005	1.0000e-005	7.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5300e-003	1.5300e-003	0.0000		1.6300e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	85.7701	393.2863	1,121.2214	5.0136	623.6981	2.5511	626.2492	166.6312	2.3719	169.0031		515,072.4778	515,072.4778	24.6466		515,688.6424
Total	**85.7701**	**393.2863**	**1,121.2221**	**5.0136**	**623.6981**	**2.5511**	**626.2492**	**166.6312**	**2.3719**	**169.0031**		**515,072.4793**	**515,072.4793**	**24.6466**	**0.0000**	**515,688.6440**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	6.0000e-005	1.0000e-005	7.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5300e-003	1.5300e-003	0.0000		1.6300e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	85.7701	393.2863	1,121.2214	5.0136	623.6981	2.5511	626.2492	166.6312	2.3719	169.0031		515,072.4778	515,072.4778	24.6466		515,688.6424
Total	**85.7701**	**393.2863**	**1,121.2221**	**5.0136**	**623.6981**	**2.5511**	**626.2492**	**166.6312**	**2.3719**	**169.0031**		**515,072.4793**	**515,072.4793**	**24.6466**	**0.0000**	**515,688.6440**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Architectural Coating	Architectural Coating	11/6/2018	12/3/2018	5	20	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 7

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	0	0.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Architectural Coating	0	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Architectural Coating - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000

Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	85.7701	393.2863	1,121.2214	5.0136	623.6981	2.5511	626.2492	166.6312	2.3719	169.0031		515,072.4778	515,072.4778	24.6466		515,688.6424
Unmitigated	85.7701	393.2863	1,121.2214	5.0136	623.6981	2.5511	626.2492	166.6312	2.3719	169.0031		515,072.4778	515,072.4778	24.6466		515,688.6424

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Parking	80,838.27	80,838.27	80838.27	294,251,296	294,251,296
Total	80,838.27	80,838.27	80,838.27	294,251,296	294,251,296

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
User Defined Parking	10.00	10.00	10.00	0.00	100.00	0.00	100	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
User Defined Parking	0.617626	0.036451	0.176904	0.096837	0.011340	0.005282	0.018425	0.026503	0.001944	0.001632	0.005548	0.000800	0.000709

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Land Use	kBTU/yr	lb/day										lb/day					
User Defined Parking	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Parking	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	6.0000e-005	1.0000e-005	7.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5300e-003	1.5300e-003	0.0000		1.6300e-003
Unmitigated	6.0000e-005	1.0000e-005	7.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5300e-003	1.5300e-003	0.0000		1.6300e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	6.0000e-005	1.0000e-005	7.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5300e-003	1.5300e-003	0.0000		1.6300e-003
Total	**6.0000e-005**	**1.0000e-005**	**7.1000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**1.5300e-003**	**1.5300e-003**	**0.0000**		**1.6300e-003**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	6.0000e-005	1.0000e-005	7.1000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5300e-003	1.5300e-003	0.0000		1.6300e-003
Total	**6.0000e-005**	**1.0000e-005**	**7.1000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**1.5300e-003**	**1.5300e-003**	**0.0000**		**1.6300e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

APPENDIX B

Health Effects from Criteria Air Pollutants Memorandum

3544 UNIVERSITY AVENUE
RIVERSIDE, CALIFORNIA 92501
T 951.300.2100 F 951.300.2105

DRAFT
MEMORANDUM

To:	Memorandum to File
From:	Matthew Morales, Dudek
Subject:	Health Effects from Criteria Air Pollutants Associated with the College Boulevard Improvement Project
Date:	August 5, 2019

1 Purpose

In response to the California Supreme Court's *Sierra Club v. County of Fresno* decision (referred to herein as the Friant Ranch decision), this memorandum addresses the potential for adverse health effects related to emissions of criteria air pollutants associated with construction and operation of the College Boulevard Improvement Project (proposed project), based on scientific information and technological methods available at the time of this memorandum's preparation. The published Friant Ranch decision (issued on December 24, 2018) addresses the need to correlate mass emission values for criteria air pollutants to specific health consequences, and contains the following direction from the California Supreme Court: "The EIR must provide an adequate analysis to inform the public how its bare numbers translate to create potential adverse impacts or it must explain what the agency *does* know and why, given existing scientific constraints, it cannot translate potential health impacts further." (Italics original.) (Sierra Club v. County of Fresno 2018.)

As discussed below, at the time of this memorandum's preparation, no expert agency, including the San Diego Air Pollution Control District (SDAPCD), the California Air Resources Board (CARB), or the U.S. Environmental Protection Agency (EPA), have approved a quantitative method to reliably and meaningfully translate the mass emission estimates for the criteria air pollutants resulting from the proposed project to specific health effects. No California air district or other expert agency/entity has published *quantitative* guidance on how to address the Friant Ranch decision,[1] and no industry-accepted modeling platforms with demonstrated results that are reliable and meaningful are available to qualified environmental consultants for such correlation. In April 2019, the Sacramento Metropolitan Air Quality Management District (SMAQMD) published an Interim Recommendation on implementing the Friant Ranch decision in the review and analysis of proposed projects under CEQA in Sacramento County. The

[1] The following air districts, state agencies and entities were contacted by Dudek in January 2019, which could not provide guidance on how to proceed in response to the Friant Ranch decision at that time: SDAPCD, South Coast Air Quality Management District (AQMD), Mojave Desert AQMD, San Joaquin Valley Air Pollution Control District (APCD), Santa Barbara County APCD, San Luis Obispo County APCD, SMAQMD (see discussion of their April 2019 Interim Guidance herein), Bay Area AQMD, California Air Resources Board, California Office of Planning and Research, California Air Pollution Control Officers Association, and Office of Environmental Health Hazard Assessment.

SMAQMD interim recommendation, which does not endorse use of any quantitative methodology, is summarized in Section 4, below.

2 National and California Ambient Air Quality Standards

As discussed in Chapter 4.2, Air Quality, of the proposed project's EIR), ambient air quality standards (AAQS) define clean air, and are established to protect even the most sensitive individuals (CARB 2019a). An AAQS defines the maximum amount of a pollutant averaged over a specified period of time that can be present in outdoor air without harm to the public's health. The EPA and CARB are both authorized to set AAQS.

The Clean Air Act Amendments of 1970 instruct the EPA to set primary National AAQS (NAAQS) to protect public health, and secondary NAAQS to protect plants, forests, crops and materials from damage due to exposure to the following criteria air pollutants: ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter with an aerodynamic diameter less than or equal to 10 microns (PM_{10}), particulate matter with an aerodynamic diameter less than or equal to 2.5 microns ($PM_{2.5}$), and lead.

The federal Clean Air Act requires that the EPA reassess, at least every five years, whether adopted standards are adequate to protect public health based on current scientific evidence. The EPA is required to rely on the advice of an independent scientific panel, the Clean Air Scientific Advisory Committee. Reviewing the NAAQS is a lengthy undertaking and includes the following major phases: planning, integrated science assessment, risk/exposure assessment, policy assessment, and rulemaking (EPA 2018a). During the integrated science assessment, a comprehensive review, synthesis, and evaluation of the most policy-relevant science is conducted, including key science judgments that are important to inform the development of the risk and exposure assessments (EPA 2018a). Then, the risk/exposure assessment draws upon information and conclusions presented in the integrated science assessment to develop quantitative characterizations of exposures and associated risks to human health or the environment associated with recent air quality conditions and with air quality estimated to just meet the current or alternative standard(s) under consideration (EPA 2018a). Scientific review during policy assessment development, and the NAAQS review process in general, is thorough and extensive.

In 1959, California enacted legislation requiring the state Department of Public Health to establish AAQS and necessary controls for motor vehicle emissions (CARB 2019b). California's AAQS (CAAQS) were adopted in 1971 (CARB 2019b). The CAAQS are established for O_3, NO_2, CO, SO_2, PM_{10}, and $PM_{2.5}$, as well as hydrogen sulfide, vinyl chloride, sulfates, and visibility reducing particles.

Air quality standard setting in California commences with a critical review of all relevant peer reviewed scientific literature. The Office of Environmental Health Hazard Assessment (OEHHA) uses the review of health literature to develop a recommendation for the standard. The recommendation can be for no change, or can recommend a new standard. The review, including the OEHHA recommendation, is summarized in a document called the draft Initial Statement of Reasons (ISOR), which is released for comment by the public, and also for public peer review by the Air Quality Advisory Committee (AQAC). AQAC members are appointed by the President of the University of California for their expertise in the range of subjects covered in the ISOR, including health, exposure, air quality monitoring, atmospheric chemistry and physics, and effects on plants, trees, materials, and ecosystems. The Committee provides written comments on the draft ISOR. CARB staff next revises the ISOR based on comments from AQAC and the public. The revised ISOR is then released for a 45-day public comment period prior to consideration by the Board of CARB at a regularly scheduled Board hearing (CARB 2017a).

Federal law requires that all states attain the NAAQS. Failure of a state to reach attainment of the NAAQS by the target date can trigger penalties, including withholding of federal highway funds (CARB 2019b). California law similarly continues to mandate CAAQS, although attainment of the NAAQS has precedence over attainment of the CAAQS (CARB 2019b).

Of importance to this memorandum, California air districts have based their thresholds of significance for California Environmental Quality Act (CEQA) purposes on the levels that scientific and factual data demonstrate that the air basin can accommodate without affecting the attainment date for the NAAQS or CAAQS. Since an AAQS is based on maximum pollutant levels in outdoor air that would not harm the public's health, and air district thresholds pertain to attainment of the AAQS, this means that the thresholds established by air districts are also protective of human health. The particular thresholds of relevance to the proposed project are illustrated in Table 4.2-4, SDAPCD Air Quality Significance Thresholds, of Chapter 4.2, Air Quality, of the EIR. Because O_3 is not emitted directly, air districts have established emissions-based thresholds for O_3 precursors—volatile organic compounds (VOCs) and oxides of nitrogen (NO_x)—which are intended to serve as a surrogate for an "O_3 significance threshold" (i.e., the potential for adverse O_3 impacts to occur).

The NAAQS and CAAQS for O_3, NO_2, CO, SO_2, PM_{10}, and $PM_{2.5}$ are presented in Table 1. Hydrogen sulfide, vinyl chloride, sulfates, and visibility reducing particles are not addressed further in this evaluation because they are not routinely associated with land use development projects subject to CEQA review, and are thus not presented in Table 1.[2]

2 Ambient Air Quality Standards table is provided as Table 4.2-2 in the EIR.

Table 1
Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[a]	National Standards[b]	
		Concentration[c]	Primary[c,d]	Secondary[c,e]
O_3	1 hour	0.09 ppm (180 μg/m³)	—	Same as Primary Standard[f]
	8 hours	0.070 ppm (137 μg/m³)	0.070 ppm (137 μg/m³)[f]	
NO_2[g]	1 hour	0.18 ppm (339 μg/m³)	0.100 ppm (188 μg/m³)	Same as Primary Standard
	Annual Arithmetic Mean	0.030 ppm (57 μg/m³)	0.053 ppm (100 μg/m³)	
CO	1 hour	20 ppm (23 mg/m³)	35 ppm (40 mg/m³)	None
	8 hours	9.0 ppm (10 mg/m³)	9 ppm (10 mg/m³)	
SO_2[h]	1 hour	0.25 ppm (655 μg/m³)	0.075 ppm (196 μg/m³)	—
	3 hours	—	—	0.5 ppm (1,300 μg/m³)
	24 hours	0.04 ppm (105 μg/m³)	0.14 ppm (for certain areas)[g]	—
	Annual	—	0.030 ppm (for certain areas)[g]	—
PM_{10}[i]	24 hours	50 μg/m³	150 μg/m³	Same as Primary Standard
	Annual Arithmetic Mean	20 μg/m³	—	
$PM_{2.5}$[i]	24 hours	—	35 μg/m³	Same as Primary Standard
	Annual Arithmetic Mean	12 μg/m³	12.0 μg/m³	15.0 μg/m³

Source: CARB 2016.

Notes: μg/m³ = micrograms per cubic meter; mg/m³= milligrams per cubic meter; ppm = parts per million by volume; O_3 = ozone; NO_2 = nitrogen dioxide; CO = carbon monoxide; SO_2 = sulfur dioxide; PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 microns; $PM_{2.5}$ = particulate matter with an aerodynamic diameter less than or equal to 2.5 microns.

a California standards for O_3, CO, SO_2 (1-hour and 24-hour), NO_2, suspended particulate matter (PM_{10}, $PM_{2.5}$), and visibility-reducing particles are values that are not to be exceeded. All others are not to be equaled or exceeded. CAAQS are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

b National standards (other than O_3, NO_2, SO_2, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once per year. The O_3 standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over 3 years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 μg/m³ is equal to or less than 1. For $PM_{2.5}$, the 24-hour standard is attained when 98% of the daily concentrations, averaged over 3 years, are equal to or less than the standard.

c Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based on a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

d National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health.

e National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

f On October 1, 2015, the national 8-hour O_3 primary and secondary standards were lowered from 0.075 to 0.070 ppm.

g To attain the national 1-hour standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 parts per billion (ppb). Note that the national 1-hour standard is in units of ppb. California standards are in units of ppm. To directly compare the national 1-hour standard to the California standards, the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.

h On June 2, 2010, a new 1-hour SO_2 standard was established, and the existing 24-hour and annual primary standards were revoked. To attain the national 1-hour standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until 1 year after an area is designated for the 2010 standard, except that in areas designated nonattainment of the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

i CARB adopted new PM standards in June of 2002, responding to requirements of the Children's Environmental Health Protection Act (Senate Bill 25, Escutia 1999), specifically the evaluation of all health-based AAQS to determine if the standards adequately protect human health, particularly that of infants and children. The subsequent review of the PM standards resulted in the recommendation of more health-protective AAQS for PM_{10} and a new standard for $PM_{2.5}$. The new PM standards became effective in 2003. Upon further review, the national annual $PM_{2.5}$ primary standard was lowered from 15 $\mu g/m^3$ to 12.0 $\mu g/m^3$ on December 14, 2012. The existing national 24-hour $PM_{2.5}$ standards (primary and secondary) were retained at 35 $\mu g/m^3$, as was the annual secondary standard of 15 $\mu g/m^3$. The existing 24-hour PM_{10} standards (primary and secondary) of 150 $\mu g/m^3$ were also retained. The form of the annual primary and secondary standards is the annual mean averaged over 3 years.

Pursuant to the 1990 Clean Air Act amendments, the EPA classifies air basins (or portions thereof) as "attainment" or "nonattainment" for each criteria air pollutant, based on whether the NAAQS have been achieved. Generally, if the recorded concentrations of a pollutant are lower than the standard, the area is classified as "attainment" for that pollutant. If an area exceeds the standard, the area is classified as "nonattainment" for that pollutant. If there is not enough data available to determine whether the standard is exceeded in an area, the area is designated as "unclassified" or "unclassifiable." The designation of "unclassifiable/attainment" means that the area meets the standard or is expected to be meet the standard despite a lack of monitoring data. Nonattainment areas must develop plans to attain the NAAQS. Areas that achieve the standards after a nonattainment designation are redesignated as maintenance areas and must have approved maintenance plans to ensure continued attainment of the standards. The California Clean Air Act, like its federal counterpart, called for the designation of areas as "attainment" or "nonattainment," but based on CAAQS rather than NAAQS. The attainment designations for O_3, NO_2, CO, SO_2, PM_{10}, and $PM_{2.5}$ for the San Diego Air Basin (SDAB) are listed in Table 2.[3]

Table 2
San Diego Air Basin Attainment Designation

Pollutant	National Designation	California Designation
O_3 (1-hour)	Attainment[a]	**Nonattainment**
O_3 (8-hour – 1997) (8-hour – 2008)	Attainment (Maintenance) **Nonattainment (Moderate)**	**Nonattainment**
NO_2	Unclassifiable/Attainment	Attainment
CO	Attainment (Maintenance)	Attainment
SO_2	Unclassifiable/Attainment	Attainment
PM_{10}	Unclassifiable/Attainment	**Nonattainment**
$PM_{2.5}$	Unclassifiable/Attainment	**Nonattainment**

Sources: EPA 2018b (national); CARB 2018a (California).
Notes:
Bold text = not in attainment; Attainment = meets the standards; Attainment (Maintenance) = achieve the standards after a nonattainment designation; Nonattainment = does not meet the standards; Unclassified or Unclassifiable = insufficient data to classify; Unclassifiable/Attainment = meets the standard or is expected to be meet the standard despite a lack of monitoring data.

a The federal 1-hour standard of 0.12 parts per million was in effect from 1979 through June 15, 2005. The revoked standard is referenced here because it was employed for such a long period and because this benchmark is addressed in SIPs.

3 The same discussion of the SDAB attainment designation is provided in Section 4.2.1 of the EIR.

As shown in Table 2, the SDAB is designated as a nonattainment area for O_3, PM_{10}, and $PM_{2.5}$ under the NAAQS and/or the CAAQS.

As discussed in Section 4.2.4.2, Impact Analysis, of Chapter 4.2, Air Quality, of the EIR, the SDAPCD is responsible for developing and implementing the clean air plan for attainment and maintenance of the AAQS in the SDAB. Accordingly, the SDAPCD has adopted federal and state attainment plans; most recently, the 2016 Eight-Hour Ozone Attainment Plan for San Diego County (2008 O_3 NAAQS) and the 2016 Regional Air Quality Strategy (RAQS). The RAQS relies on information from CARB and the San Diego Association of Governments (SANDAG), including mobile and area source emissions, as well as information regarding projected growth in San Diego County and the cities in the County, to forecast future emissions and then determine from that the strategies necessary for the reduction of emissions through regulatory controls. As the SDAPCD develops and implements plans and control measures designed to attain the AAQS, the SDAPCD implements measures to reduce public health effects associated with criteria air pollutants.

3 Health Effects of Criteria Air Pollutants and their Precursors

Numerous scientific studies published over the past 50 years point to the harmful effects of air pollution (CARB 2019b). As explained above, the AAQS are designed to prevent these effects (CARB 2019b). The adverse health effects associated with air pollution are diverse and include (SCAQMD 2017):

- Premature mortality
- Cardiovascular effects
- Increased health care utilization (hospitalization, physician and emergency room visits)
- Increased respiratory illness and other morbidity (symptoms, infections, and asthma exacerbation)
- Decreased lung function (breathing capacity)
- Lung inflammation
- Potential immunological changes
- Increased airway reactivity to a known pharmacological agent exposure - a method used in laboratories to evaluate the tendency of airways to have an increased possibility of developing an asthmatic response
- A decreased tolerance for exercise
- Adverse birth outcomes such as low birth weights

The evidence linking these effects to air pollutants is derived from population-based observational and field studies (epidemiological) as well as controlled laboratory studies involving human subjects and animals. There have been an increasing number of studies focusing on the mechanisms (that is, on learning how specific organs, cell types, and biomarkers are involved in the human body's response to air pollution) and specific pollutants responsible for individual effects. Yet the underlying biological pathways for these effects are not always clearly understood (SCAQMD 2017).

Although individuals inhale pollutants as a mixture under ambient conditions, the regulatory framework and the control measures developed are pollutant-specific for six major outdoor pollutants covered under Sections 108 and 109 of the Clean Air Act. This is appropriate, in that different pollutants usually differ in their sources, their times and places of occurrence, the kinds of health effects they may cause, and their overall levels of health risk. Different pollutants, from the same or different sources, oftentimes occur together. Evidence for more than additive effects has not been strong and, as a practical matter, health scientists, as well as regulatory officials, usually must deal with one pollutant at a time in adopting AAQS (SCAQMD 2017).

Health effects associated with criteria air pollutants are discussed below; the same or similar information is provided in Section 4.2-1 of the proposed project's EIR Air Quality chapter (i.e., Chapter 4.2).

Ozone (O_3). O_3 in the troposphere causes numerous adverse health effects; short-term exposures (lasting for a few hours) to O_3 at levels typically observed in Southern California can result in breathing pattern changes, reduction of breathing capacity, respiratory symptoms, worsening of lung disease leading to premature death, increased susceptibility to infections, inflammation of and damage to the lung tissue, and some immunological changes (EPA 2013, CARB 2019c). These health problems are particularly acute in sensitive receptors such as the sick, older adults, and young children.

Inhalation of O_3 causes inflammation and irritation of the tissues lining human airways, causing and worsening a variety of symptoms. Exposure to O_3 can reduce the volume of air that the lungs breathe in and cause shortness of breath. O_3 in sufficient doses increases the permeability of lung cells, rendering them more susceptible to toxins and microorganisms. The occurrence and severity of health effects from O_3 exposure vary widely among individuals, even when the dose and the duration of exposure are the same. Research shows adults and children who spend more time outdoors participating in vigorous physical activities are at greater risk from the harmful health effects of O_3 exposure. While there are relatively few studies of O_3's effects on children, the available studies show that children are no more or less likely to suffer harmful effects than adults. However, there are a number of reasons why children may be more susceptible to O_3 and other pollutants. Children and teens spend nearly twice as much time outdoors and engaged in vigorous activities as adults. Children breathe more rapidly than adults and inhale more pollution per pound of their body weight than adults. Also, children are less likely than adults to notice their own symptoms and avoid harmful exposures. Further research may be able to better distinguish between health effects in children and adults. Children, adolescents and adults who exercise or work outdoors, where O_3 concentrations are the highest, are at the greatest risk of harm from this pollutant (CARB 2019c).

A number of population groups are potentially at increased risk for O_3 exposure effects. In the ongoing review of O_3, the EPA has identified populations as having adequate evidence for increased risk from O_3 exposures include individuals with asthma, younger and older age groups, individuals with reduced intake of certain nutrients such as Vitamins C and E, and outdoor workers. There is suggestive evidence for other potential factors, such as variations in genes related to oxidative metabolism or inflammation, gender, socioeconomic status, and obesity. However further evidence is needed (SCAQMD 2017).

The adverse effects reported with short-term O_3 exposure are greater with increased activity because activity increases the breathing rate and the volume of air reaching the lungs, resulting in an increased amount of O_3 reaching the lungs. Children may be a particularly vulnerable population to air pollution effects because they spend more time outdoors, are generally more active, and have a higher specific ventilation relative to their body weight, compared to adults (SCAQMD 2017).

Volatile Organic Compounds (VOCs). The primary health effects of VOCs result from the formation of O_3 and its related health effects. High levels of VOCs in the atmosphere can interfere with oxygen intake by reducing the amount of available oxygen through displacement. Carcinogenic forms of hydrocarbons, such as benzene, are considered TACs. There are no separate health standards for VOCs as a group. Within this evaluation, VOC and reactive organic gases (ROGs) are used interchangeably.

Nitrogen Dioxide (NO_2). A large body of health science literature indicates that exposure to NO_2 can induce adverse health effects. The strongest health evidence, and the health basis for the AAQS for NO_2, is results from controlled human exposure studies that show that NO_2 exposure can intensify responses to allergens in allergic asthmatics. In addition, a number of epidemiological studies have demonstrated associations between NO_2 exposure and premature death, cardiopulmonary effects, decreased lung function growth in children, respiratory symptoms, emergency room visits for asthma, and intensified allergic responses. Infants and children are particularly at risk because they have disproportionately higher exposure to NO_2 than adults due to their greater breathing rate for their body weight and their typically greater outdoor exposure duration. Several studies have shown that long-term NO_2 exposure during childhood, the period of rapid lung growth, can lead to smaller lungs at maturity in children with higher compared to lower levels of exposure. In addition, children with asthma have a greater degree of airway responsiveness compared with adult asthmatics. In adults, the greatest risk is to people who have chronic respiratory diseases, such as asthma and chronic obstructive pulmonary disease (CARB 2019d).

Carbon Monoxide (CO). Carbon monoxide is harmful because it binds to hemoglobin in the blood, reducing the ability of blood to carry oxygen. This interferes with oxygen delivery to the body's organs. The most common effects of CO exposure are fatigue, headaches, confusion and reduced mental alertness, and light-headedness, dizziness due to inadequate oxygen delivery to the brain. For people with cardiovascular disease, short-term CO exposure can further reduce their body's already compromised ability to respond to the increased oxygen demands of exercise, exertion, or stress. Inadequate oxygen delivery to the heart muscle leads to chest pain and decreased exercise tolerance. Unborn babies whose mothers experience high levels of CO exposure during pregnancy are at risk of adverse developmental effects. Unborn babies, infants, elderly people, and people with anemia or with a history of heart or respiratory disease are most likely to experience health effects with exposure to elevated levels of CO (CARB 2019e).

Sulfur Dioxide (SO_2). SO_2 is an irritant gas that attacks the throat and lungs and can cause acute respiratory symptoms and diminished ventilator function in children. When combined with particulate matter (PM), SO_2 can injure lung tissue and reduce visibility and the level of sunlight. SO_2 can worsen asthma resulting in increased symptoms, increased medication usage, and emergency room visits.

Controlled human exposure and epidemiological studies show that children and adults with asthma are more likely to experience adverse responses with SO_2 exposure, compared with the non-asthmatic population. Effects at levels near the one-hour standard are those of asthma exacerbation, including bronchoconstriction accompanied by symptoms of respiratory irritation such as wheezing, shortness of breath and chest tightness, especially during exercise or physical activity. Also, exposure at elevated levels of SO_2 (above 1 parts per million (ppm)) results in increased incidence of pulmonary symptoms and disease, decreased pulmonary function, and increased risk of mortality. The elderly and people with cardiovascular disease or chronic lung disease (such as bronchitis or emphysema) are most likely to experience these adverse effects (CARB 2019f).

SO_2 is of concern both because it is a direct respiratory irritant and because it contributes to the formation of sulfate and sulfuric acid in PM (NRC 2005). People with asthma are of particular concern, both because they have increased baseline airflow resistance and because their SO_2-induced increase in resistance is greater than in healthy people, and it increases with the severity of their asthma (NRC 2005). SO_2 is thought to induce airway constriction via neural reflexes involving irritant receptors in the airways (NRC 2005).

Particulate Matter (PM_{10} and $PM_{2.5}$). A number of adverse health effects have been associated with exposure to both $PM_{2.5}$ and PM_{10}. For $PM_{2.5}$, short-term exposures (up to 24-hours duration) have been associated with premature mortality, increased hospital admissions for heart or lung causes, acute and chronic bronchitis, asthma attacks, emergency room visits, respiratory symptoms, and restricted activity days. These adverse health effects have been reported primarily in infants, children, and older adults with preexisting heart or lung diseases. In addition, of all of the common air pollutants, $PM_{2.5}$ is associated with the greatest proportion of adverse health effects related to air pollution, both in the United States and world-wide based on the World Health Organization's Global Burden of Disease Project. Short-term exposures to PM_{10} have been associated primarily with worsening of respiratory diseases, including asthma and chronic obstructive pulmonary disease, leading to hospitalization and emergency department visits (CARB 2017b).

Long-term (months to years) exposure to $PM_{2.5}$ has been linked to premature death, particularly in people who have chronic heart or lung diseases, and reduced lung function growth in children. The effects of long-term exposure to PM_{10} are less clear, although several studies suggest a link between long-term PM_{10} exposure and respiratory mortality. The International Agency for Research on Cancer published a review in 2015 that concluded that PM in outdoor air pollution causes lung cancer (CARB 2017b).

People with influenza, people with chronic respiratory and cardiovascular diseases, and older adults may suffer worsening illness and premature death as a result of breathing PM. People with bronchitis can expect aggravated symptoms from breathing PM. Children may experience a decline in lung function due to breathing in PM_{10} and $PM_{2.5}$ (EPA 2009).

PM encompasses a physically and chemically diverse class of ambient air pollutants of both anthropogenic and biological origin. The PM standard is the only NAAQS that does not target a specific chemical or family of chemical species (NRC 2005). The range of human health effects associated with ambient PM levels or demonstrated in laboratory studies has expanded from earlier concerns for total mortality and respiratory morbidity to include cardiac mortality and morbidity, blood vessel constriction, stroke, premature birth, low birth weight, retarded lung growth, enhancement of allergic responses, reduced resistance to infection, degenerative lesions in the brain, and lung cancer (EPA 2004).

4 Scientific and Technological Complexities

At issue in the Friant Ranch decision was the fact that a development project's EIR did not connect its mass emission totals to specific adverse human health effects. Concerned with the sufficiency of the EIR as an informational document, and specifically whether the magnitude of project impacts was adequately disclosed, the California Supreme Court stated the following:

> "The task for real party and the County is clear: The EIR must provide an adequate analysis to inform the public how its bare numbers translate to create potential adverse impacts or it must adequately explain what the agency *does* know and why, given existing scientific constraints, it cannot translate potential health impacts further." (Sierra Club v. County of Fresno 2018; italics original)

As discussed further below, at the time of this writing, no available modeling tools have been proven to provide a reliable and meaningful analysis to correlate an increase in mass totals or concentrations of criteria air pollutants from an individual project to specific health effects, or estimate additional pollutant nonattainment days relative to the NAAQS and CAAQS due to a single project.

Formation of Secondary Pollutants

The California Supreme Court noted, in the Friant Ranch decision, that: "The raw numbers estimating the tons per year of ROG and NO_x from the Project do not give any information to the reader about how much ozone is estimated to be produced as a result."

In response, the formation of O_3 and PM in the atmosphere, as secondary pollutants,[4] involves complex chemical and physical interactions of multiple pollutants from natural and anthropogenic sources, as further explained below. The complexity in how secondary pollutants are formed and dispersed has resulted in ongoing difficulties in measuring and regulating those pollutants.

Tropospheric, or ground level O_3, is not emitted directly into the air, but is created by chemical reactions between NO_x and VOCs (EPA 2018c). This happens when pollutants emitted by cars, power plants, industrial boilers, refineries, chemical plants, and other sources chemically react in the presence of sunlight (EPA 2018c). O_3 is most likely to reach unhealthy levels on hot sunny days in urban environments, but can still reach high levels during colder months (EPA 2018c). O_3 can also be transported long distances by wind, so even rural areas can experience high O_3 levels (EPA 2018c).

The O_3 reaction is self-perpetuating (or catalytic) in the presence of sunlight because NO_2 is photochemically reformed from nitric oxide (NO). In this way, O_3 is controlled by both NO_x and VOC emissions (NRC 2005). The complexity of these interacting cycles of pollutants means that incremental decreases in one emission may not result in proportional decreases in O_3 (NRC 2005). Although these reactions and interactions are well understood, variability in emission source operations and meteorology creates uncertainty in the modeled O_3 concentrations to which downwind populations may be exposed (NRC 2005). This is especially true for individual projects, like the proposed project, where project-generated criteria air pollutant emissions are not derived from a single "point source," but from mobile sources (cars and trucks) driving in the region.

In many urban areas, O_3 nonattainment is not caused by emissions from the local area alone (EPA 2008). Due to atmospheric transport, contributions of precursors from the surrounding region can also be important (EPA 2008, O_3 NAAQS). Thus, in designing control strategies to reduce O_3 concentrations in a local area, it is often necessary to account for regional transport within the U.S. (EPA 2008). In some areas, such as California, global transport of O_3 from beyond North America also can contribute to nonattainment areas (EPA 2008).

PM can be divided into two categories: directly emitted PM and secondary PM. Secondary PM, like O_3, is formed via complex chemical reactions in the atmosphere between precursor chemicals such as SO_x and NO_x (SJVAPCD 2015). In general, PM_{10} is composed largely of primary particles, and a much greater portion of $PM_{2.5}$ contains secondary particles (EPA 2015b). The secondary formation of $PM_{2.5}$ is dominated by a variety of chemical species or

4 Air pollutants formed through chemical reactions in the atmosphere are referred to as secondary pollutants.

components of atmospheric particles, such as ammonium sulfate, ammonium nitrate, organic carbon mass, elemental carbon, and other soil compounds and oxidized metals. $PM_{2.5}$, sulfate, nitrate, and ammonium ions are predominantly the result of chemical reactions of the oxidized products of SO_2 and NO_x emissions with direct ammonia emission (EPA 2017a). Because of the complexity of secondary PM formation, including the potential to be transported long distances by wind, the tonnage of PM-forming precursor emissions in an area does not necessarily result in an equivalent concentration of secondary PM in that area (SJVAPCD 2015).

Because of the long-range transport of some pollutants, important emission sources may be far from the locations where measured pollutant concentrations exceed the AAQS (NRC 2005). Thus, for areas experiencing higher ambient concentrations of pollutants, such as O_3 and PM, controlling emissions of those pollutants and their precursors is typically a regional, often multistate, problem, not a local one (NRC 2005).

San Joaquin Valley Air Pollution Control District and South Coast Air Quality Management District Briefs

In connection with the judicial proceedings culminating in issuance of the Friant Ranch decision, the San Joaquin Valley Air Pollution Control District (SJVAPCD) and the South Coast Air Quality Management District (SCAQMD) filed amicus briefs attesting to the extreme difficulty of correlating an individual project's criteria air pollutant emissions to specific health impacts. Both the SJVAPCD and the SCAQMD have among the most sophisticated air quality modeling and health impact evaluation capabilities of the air districts in the State. While the information and arguments presented in those briefs was considered by the California Supreme Court, the Court noted that such information was not part of the administrative record associated with the County's decision to approve the Friant Ranch project. A summary of the key, relevant points of the SJVAPCD and SCAQMD briefs is provided below.

Difference between Toxic Air Contaminants and Criteria Air Pollutants

As explained in Section 4.2.1 of the EIR's Air Quality chapter (i.e., Chapter 4.2), a toxic air contaminant (TAC) is an air pollutant, identified in regulation by CARB, which may cause or contribute to an increase in deaths or in serious illness, or which may pose a present or potential hazard to human health. TACs are considered under a different regulatory process (California Health and Safety Code section 39650 et seq.) than pollutants subject to CAAQS and NAAQS. Health effects to TACs may occur at extremely low levels and it is typically difficult to identify levels of exposure which do not produce adverse health effects. A criteria air pollutant, on the other hand, is an air pollutant for which acceptable levels of exposure can be determined and for which an AAQS has been set (CARB 2019g).

As the SJVAPCD explained in their brief, "Although criteria air pollutants can also be harmful to human health, they are distinguishable from TACs and are regulated separately. The most relevant difference between criteria pollutants and TACs for purposes of this case is the manner in which human health impacts are accounted for. While it is common practice to analyze the correlation between an individual facility's TAC emissions and the expected localized human health impacts, such is not the case for criteria pollutants" (SJVAPCD 2015). Unlike with TACs (where assessment occurs in conjunction with environmental analysis for individual projects), the human health impacts associated with criteria air pollutants are analyzed and taken into consideration when EPA sets the NAAQS for each criteria pollutant. (42 U.S.C. § 7409(b)(1).) The health impact of a particular criteria pollutant is analyzed on a regional and not a facility or individual project level based on how close the area is to complying with (attaining) the NAAQS (SJVAPCD 2015). The SJVAPCD concluded that while it is possible to perform a health impact analysis for TACs, "it is not feasible to conduct a similar analysis for criteria air pollutants because currently available computer modeling tools are not equipped for this task" (SJVAPCD 2015).

Disconnect Between Mass and Concentration

Another important technical nuance is that health effects from air pollutants are related to the concentration of the air pollutant that an individual is exposed to, not necessarily the individual mass quantity of emissions associated with an individual project. For example, health effects from O_3 are correlated with increases in the ambient level of O_3 in the air a person breathes (SCAQMD 2015). However, it takes a large amount of additional precursor emissions to cause a modeled increase in ambient O_3 levels over an entire region (SCAQMD 2015).

For CEQA analyses, project-generated emissions are typically estimated in pounds per day or tons per year and compared to mass daily or annual emission thresholds. While CEQA thresholds are established at levels that the air basin can accommodate without affecting the attainment date for the AAQS, even if a project exceeds established CEQA significance thresholds, this does not mean that one can easily determine the concentration of O_3 or PM that will be created at or near the project site on a particular day or month of the year, or what specific health impacts will occur (SJVAPCD 2015).

As the SJVAPCD points out, the tonnage of PM "emitted does not always equate to the local PM concentration because it can be transported long distances by wind," and "[s]econdary PM, like O_3, is formed via complex chemical reactions in the atmosphere between precursor chemicals such as sulfur dioxides (SO_x) and NO_x," meaning that "the tonnage of PM-forming precursor emissions in an area does not necessarily result in an equivalent concentration of secondary PM in that area" (SJVAPCD 2015). The disconnect between the tonnage of precursor pollutants (NO_x, SO_x and VOCs) and the concentration of O_3 or PM formed is important because it is not necessarily the tonnage of precursor pollutants that causes human health effects, but the concentration of resulting O_3 or PM (SJVAPCD 2015). As discussed previously, the AAQS are established as concentrations of O_3 or PM and not as tonnages of their precursor pollutants (SJVAPCD 2015). The disconnect between the amount of precursor pollutants and the concentration of O_3 or PM formed makes it difficult to determine potential health impacts, which are related to the concentration of O_3 and PM experienced by the receptor rather than levels of NO_x, SO_x, and VOCs produced by a source (SJVAPCD 2015).

As discussed above, attainment of a particular AAQS occurs when the concentration of the relevant pollutant remains below a set threshold on a consistent basis throughout a particular region (SJVAPCD 2015). Because the AAQS are focused on achieving a particular concentration of pollution region-wide, an air district's tools and plans for attaining the AAQS are regional in nature (SJVAPCD 2015). For instance, the computer models used to simulate and predict an attainment date for the O_3 or PM NAAQS in the San Joaquin Valley are based on regional inputs, such as regional inventories of precursor pollutants (NO_x, SO_x and VOCs) and the atmospheric chemistry and meteorology of the San Joaquin Valley (SJVAPCD 2015). At a very basic level, the models simulate future O_3 or PM levels based on predicted changes in precursor emissions San Joaquin Valley Air Basin-wide (SJVAPCD 2015). Because the AAQS are set levels necessary to protect human health, the closer a region is to attaining a particular AAQS, the lower the human health impact is from that pollutant (SJVAPCD 2015).

The goal of these modeling exercises is not to determine whether the emissions generated by a particular factory or development project will affect the date that the San Joaquin Valley Air Basin attains the AAQS (SJVAPCD 2015). Rather, the SJVAPCD's modeling and planning strategy is regional in nature and based on the extent to which all of the emission-generating sources in the San Joaquin Valley Air Basin (current and future) must be controlled in order to reach attainment (SJVAPCD 2015).

Correlation to Health Effects

The SJVAPCD ties the difficulty of correlating the emission of criteria pollutants to health impacts to how O_3 and PM are formed, as explained above. According to SJVAPCD, "even once a model is developed to accurately ascertain local increases in concentrations of photochemical pollutants like O_3 and some particulates, it remains impossible, using today's models, to correlate that increase in concentration to a specific health impact [because] such models are designed to determine regional, population-wide health impacts, and simply are not accurate when applied at the local level" (SJVAPCD 2015).

SCAQMD used O_3, which is formed from the chemical reaction of NO_x and VOCs in the presence of sunlight, as an example of why it is impracticable to determine specific health outcomes from criteria pollutants for all but very large, regional-scale projects. First, forming O_3 "takes time and the influence of meteorological conditions for these reactions to occur, so ozone may be formed at a distance downwind from the sources" (SCAQMD 2015). Second, "it takes a large amount of additional precursor emissions (NO_x and VOCs) to cause a modeled increase in ambient ozone levels over an entire region," with a 2012 study showing that "reducing NO_x by 432 tons per day (157,680 tons/year) and reducing VOC by 187 tons per day (68,255 tons/year) would reduce ozone levels at the SCAQMD's monitor site with the highest levels by only 9 parts per billion" (SCAQMD 2015). SCAQMD thus concludes that it "does not currently know of a way to accurately quantify O_3-related health impacts caused by NO_x or VOC emissions from relatively small projects" (SCAQMD 2015).

Essentially, SCAQMD takes the position that a project emitting only 10 tons per year of NO_x or VOC is small enough that its regional impact on ambient O_3 levels may not be detected in the regional air quality models that are currently used to determine O_3 levels; thus, in this case it would not be feasible to directly correlate project emissions of VOC or NO_x with specific health impacts from O_3 (SCAQMD 2015). Therefore, lead agencies that use SCAQMD's thresholds of significance may determine that many projects have "significant" air quality impacts and must apply all feasible mitigation measures, yet will not be able to precisely correlate the project to quantifiable health impacts.

Effects on Number of Nonattainment Days

In regard to regional concentrations and air basin attainment, the SJVAPCD emphasized that attempting to identify a change in background pollutant concentrations that can be attributed to a single project, even one as large as the entire Friant Ranch Specific Plan, is a theoretical exercise. The SJVAPCD brief noted that it "would be extremely difficult to model the impact on NAAQS attainment that the emissions from the Friant Ranch project may have" (SJVAPCD 2015). The situation is further complicated by the fact that background concentrations of regional pollutants are not uniform either temporally or geographically throughout an air basin, but are constantly fluctuating based upon meteorology and other environmental factors. As discussed above, the currently available modeling tools are equipped to model the impact of all emission sources in the San Joaquin Valley Air Basin on attainment (SJVAPCD 2015). The SJVAPCD brief then indicated that, "Running the photochemical grid model used for predicting O_3 attainment with the emissions solely from the Friant Ranch project (which equate to less than one-tenth of one percent of the total NO_x and VOC in the Valley) is not likely to yield valid information given the relative scale involved" (SJVAPCD 2015).

Sacramento Metropolitan Air Quality Management District Interim Guidance

As previously discussed, the SMAQMD is to date the only California air district to formally release, as guidance, an Interim Recommendation (April 2019) for lead agencies and practitioners preparing CEQA documents for projects within Sacramento County to comply with the Friant Ranch decision. Consistent with the expert opinions submitted to the Court in Friant Ranch by SJVAPCD and SCAQMD, the SMAQMD guidance confirms the absence of an acceptable or reliable quantitative methodology that would correlate the expected criteria air pollutant emissions of projects to the likely health consequences to people of project-generated criteria air pollutant emissions. The SMAQMD guidance explains that while it is in the process of developing a methodology to assess these impacts, lead agencies should follow the Friant Court's advice to explain in meaningful detail why this analysis is not yet feasible.

The Interim Recommendation further states that, "neither the Sac Metro Air District nor any other air district currently have methodologies that would provide Lead Agencies and CEQA practitioners with a consistent, reliable, and meaningful analysis to correlate specific health impacts that may result from a proposed project's mass emissions" (SMAQMD 2019). The recommendation further explains that air districts have focused on reducing regional emissions from all sectors to meet the health-based concentration standards, thereby reducing the pollutant specific health impacts for the entire population. For example, the SMAQMD prepared plans to attain and maintain the O_3 and PM AAQS. These attainment plans include emissions inventories, air monitoring data, control measures, modeling, future pollutant-level estimates, and general health information. Attainment planning models rely on regional inputs to determine O_3 and PM formation and concentrations in a regional context, not a project specific context. Because of the complexity of O_3 formation, the pounds or tons of emissions from a proposed project in a specific geographical location does not equate to a specific concentration of ozone formation in a given area, because in addition to emission levels, O_3 formation is affected by atmospheric chemistry, geography, and weather. Secondary formation of particulate matter is very similar to the complexity of O_3 formation, and localized impacts of directly emitted PM do not always equate to local PM concentrations due to transport of emissions. Accordingly, because air district attainment plans and supporting air model tools are regional in nature, they do not allow for analysis of the health impacts of specific projects on any given geographic location. The Interim Recommendation also references available health-related information, but indicates that the available information cannot be directly correlated to the pounds/day or tons/year of emissions estimated from a single, proposed project.

The interim recommendation is in place to assist lead agencies and practitioners with CEQA document preparation until SMAQMD develops a methodology that provides a consistent, reliable and meaningful analysis to address the Court's direction on correlating health impacts to a project's emissions.

Methods Evaluated

At the time of writing, there are no specific tools established for use in CEQA documents to connect criteria air pollutant emissions from an individual project to specific health effects that have been endorsed by an expert agency such as a California air district or CARB. Similarly, there are no specific tools established for use in National Environmental Policy Act (NEPA) documents that provide the discussed correlation that have been endorsed by the EPA. As such, Dudek evaluated existing modeling tools and calculation methods established for other purposes and uses, in order to determine whether such tools and methods could potentially be used in CEQA documents in a manner that would address the Friant Ranch decision and provide reliable and meaningful results. Of importance, as noted previously, no expert agency has approved a quantitative method or guidance to reliably and meaningfully translate the mass emission estimates for the criteria air pollutants resulting from the proposed project to specific health effects. As such, regardless if there is a method available to evaluate health effects from a proposed project, the lack of available guidance could potentially result in health effect estimates that have yet to be demonstrated as reliable. In addition, the meaningfulness of results for an individual project has yet to be demonstrated at this time.

California Emissions Estimator Model

The California Emissions Estimator Model (CalEEMod) is a statewide land use emissions computer model designed to provide a uniform platform for government agencies, land use planners, and environmental professionals to quantify potential criteria pollutant and greenhouse gas emissions associated with both construction and operations from a variety of land use development projects (CAPCOA 2017). CalEEMod quantifies direct emissions from construction and operational activities. CalEEMod incorporates vehicle emission factors from the CARB Mobile Source Emissions Inventory, EMFAC, and CARB's offroad equipment inventory, OFFROAD. CalEEMod was developed for the California Air Pollution Officers Association (CAPCOA) in collaboration with numerous expert consultants and California Air Districts. CalEEMod is broadly accepted by lead agencies and technical experts as a comprehensive tool for quantifying air quality impacts from land use projects located throughout California for CEQA purposes.

CalEEMod estimates emissions of ROG, NO_x, CO, SO_x, PM_{10}, $PM_{2.5}$ in mass daily emissions (pounds per day) and mass annual emissions (tons per year). For PM_{10} and $PM_{2.5}$, CalEEMod estimates exhaust and fugitive dust emissions separately. CalEEMod does not estimate concentrations of air pollutants and does not estimate emissions of secondary pollutants such as O_3 and $PM_{2.5}$. In addition, CalEEMod does not estimate potential health effects of a project. Accordingly, CalEEMod is not suitable to evaluate health effects from individual projects.

EMFAC and OFFROAD

CARB's Mobile Source Emissions Inventory or EMissions FACtor (EMFAC) model was developed and used by CARB to assess emissions from on-road vehicles, including cars, trucks, and buses in California, and to support CARB's regulatory and air quality planning efforts to meet the Federal Highway Administration's transportation planning requirements. The CARB offroad equipment inventory, OFFROAD, is an emissions inventory for off-road diesel engines quantify the amount of pollutants from thousands of engines in equipment used in industrial applications, agriculture, construction, mining, oil drilling, power generation, and many other industries. As with CalEEMod, EMFAC and OFFROAD do not perform dispersion of pollutants, do not estimate concentrations of air pollutants, and do not estimate health effects of a project. Accordingly, EMFAC and OFFROAD are not suitable to evaluate health effects from individual projects.

Ambient Air Quality Analysis Using Dispersion Model

An ambient air quality analysis (AAQA) is typically conducted to estimate the maximum concentration of a criteria air pollutant taking into consideration meteorology, including wind direction and speed, and terrain for the area, as well as emission source characteristics, such as coordinates and facility boundaries. AAQAs are conducted for on-site air pollutant sources to assess potential concentrations in the vicinity of a project or facility. If a project exceeds a mass daily or annual threshold for a pollutant for which an air basin is in attainment of, an AAQA can evaluate whether the maximum project-generated pollutant concentration plus the ambient background concentration of that pollutant in the project area could result in an exceedance of an AAQS.

An AAQA is typically conducted using an air dispersion model. Air dispersion models calculate the atmospheric transport and fate of pollutants from the emission source. The models calculate the concentration of selected pollutants at specific downwind ground-level points, such as residential or off-site workplace receptors. The transformation (fate) of an airborne pollutant, its movement with the prevailing winds (transport), its crosswind and vertical movement due to atmospheric turbulence (dispersion), and its removal due to dry and wet deposition are influenced by the pollutant's physical and chemical properties and by meteorological and environmental conditions. Factors such as distance from the source to the receptor, meteorological conditions, intervening land use and terrain, pollutant release characteristics, and background pollutant concentrations affect the predicted air concentration of an air pollutant. Air dispersion models have the capability to take all of these factors into consideration when calculating downwind ground-level pollutant concentrations.

The American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) is typically used for an AAQA. AERMOD is a steady-state plume model that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain. AERMOD can estimate pollutant concentrations of NO_x, NO_2, CO, SO_2, PM_{10}, $PM_{2.5}$, total suspended particulates, lead, and other pollutants. AERMOD cannot estimate concentrations of O_3 or secondary PM.

The SJVAPCD has developed an AAQA modeling methodology with three levels of increasing refinement and complexity (SJVAPCD 2014). For each level, the SJVAPCD recommends first summing the maximum modeled concentration for each pollutant and averaging period combination with the corresponding background concentrations and comparing against the respective AAQS. If the project does not cause an exceedance of any AAQS, then no further evaluation is required. However, if the project results in an exceedance of an AAQS, the SJVAPCD then recommends comparing the project's maximum modeled concentration for each pollutant and averaging period combination with the corresponding EPA Significant Impact Level (SIL), which are used as concentration screening thresholds to determine whether a project source's emissions would have a potentially significant impact on air quality in the area (SJVAPCD 2014). The SILs are based on the EPA Prevention of Significant Deterioration (PSD) permitting program to represent the point below which the increased emissions from a new or modified major source on air quality does not cause or contribute to a violation of the NAAQS.

While AERMOD can estimate concentrations for certain pollutants (though it cannot estimate concentrations of secondary pollutants such as O_3 and PM), no methods have been demonstrated to reliably and meaningfully connect pollutant concentrations to specific health effects. Further, when a project exceeds a threshold for a pollutant for which the air basin is in nonattainment and the background level in the project area already exceeds the AAQS, the AAQA is not presently able to estimate additional nonattainment days resulting from the project's pollutant concentration contribution.

SCAQMD Localized Significance Threshold Analysis

The SCAQMD developed a localized significance threshold (LST) analysis in response to CARB Governing Board's Environmental Justice Enhancement Initiative I-4. LSTs represent the maximum emissions from a project that will not cause or contribute to an exceedance of the most stringent applicable national or state AAQS at the nearest sensitive receptor, taking into consideration ambient concentrations in each source receptor area, project size, and distance to the nearest sensitive receptor. LSTs has been developed for NO_2, CO, PM_{10}, and $PM_{2.5}$. Because O_3 is a pollutant of regional concern, LSTs are not applicable to VOC emissions, which contribute to O_3 formation. Per the

LST guidance, only on-site emissions should be included; off-site mobile emissions from the project should not be included in the emissions compared to the LSTs (SCAQMD 2008).

The SCAQMD developed LST lookup tables to assist lead agencies with a simple tool for evaluating the impacts from small, typical projects; the LST mass rate look-up tables allow a user to readily determine if the daily emissions for proposed construction or operational activities could result in significant localized air quality impacts without performing project-specific dispersion modeling. If the calculated emissions for the proposed construction or operational activities are below the LST emission levels found on the LST mass rate look-up tables and no potentially significant impacts are found to be associated with other environmental issues, then the proposed construction or operation activity is not significant for air quality. Proposed projects whose calculated emission budgets for the proposed construction or operational activities are above the LST emission levels found in the LST mass rate look-up tables should not assume that the project would necessarily generate adverse impacts. Detailed air dispersion modeling may demonstrate that pollutant concentrations are below LSTs. The lead agency may choose to describe project emissions above those presented in the LST mass rate look-up tables as significant or perform detailed air dispersion modeling or perform localized air quality impact analysis according to their own significance criteria (SCAQMD 2008). The SCAQMD provides guidance for performing the dispersion modeling if the lead agency chooses to.

As noted above, the LST analysis is not for all criteria air pollutants; LSTs have only been established for localized (onsite) emissions of NO_2, CO, PM_{10}, and $PM_{2.5}$. As with the AAQA discussion above, the LST analysis does not connect pollutant concentrations to specific health effects. Further, the LST analysis does not estimate additional nonattainment days resulting from the project's pollutant concentration contribution.

Toxic Air Contaminant Health Risk Assessments

Generically, risk is the probability of an adverse outcome from any situation or action. A health risk assessment (HRA), therefore, is an analysis or report that describes the type and quantity of pollutants a person may be exposed to and estimates the potential cancer or noncancer health risk from the predicted exposures using mathematical models (CARB 2018c). The HRA includes a comprehensive analysis of the dispersion of hazardous substances, the potential for human exposure, and a quantitative assessment of both individual and population wide health risks (CARB 2018c).

As explained above, there are important differences between TACs and criteria air pollutants. Health effects to TACs may occur at extremely low levels and it is typically difficult to identify levels of exposure which do not produce adverse health effects, while a criteria air pollutant is an air pollutant for which acceptable levels of exposure can be determined (CARB 2019g).

HRAs in California are to be conducted according to methods developed by the OEHHA and are intended to be protective of the public's health (CARB 2018c). OEHHA has developed an Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments (Guidance Manual), which includes a description of the algorithms, recommended exposure variates, cancer and noncancer health values, and the air modeling protocols needed to perform a HRA under the Air Toxics Hot Spots Information and Assessment Act of 1987 (Health and Safety Code Section 44300 et seq.) (OEHHA 2015).

HRAs typically use AERMOD, which, as explained above, is a dispersion model that can estimate concentrations of certain pollutants. A HRA typically also uses CARB's Hotspots Analysis and Reporting Program (HARP), which is a software suite that addresses the programmatic requirements of the Air Toxics "Hot Spots" Program (Assembly Bill 2588). HARP combines the tools needed to implement the requirements of AB 2588, such as reporting a facilities emissions inventory, determining a facilities prioritization score, conducting air dispersion modeling, and performing a facility HRA, and incorporates the information presented in the OEHHA 2015 Guidance Manual. HARP can also be used for conducting HRAs used in other programs such as for CEQA assessments. HARP can only calculate risk for pollutants that have health values approved for use in the AB 2588 program (CARB 2018c).

While a HRA can be feasibly conducted for TACs and air districts, such as the SCAQMD, have established significance thresholds for TAC exposure, a similar analysis cannot be conducted for criteria air pollutants as current modeling tools, such as AERMOD and HARP, are not set-up to estimate health effects from criteria air pollutants.

Reference Exposure Levels

Dose-response assessment describes the quantitative relationship between the amount of exposure to a substance (the dose) and the incidence or occurrence of an adverse health impact (the response) (OEHHA 2015). Dose-response information for noncancer health effects is used to determine Reference Exposure Levels (RELs). Inhalation RELs are air concentrations or doses at or below which adverse noncancer health effects are not expected even in sensitive members of the general population under specified exposure scenarios. The hazard index target organs for the inhalation RELs include: respiratory system/eyes for O_3, respiratory system for NO_2, cardiovascular system for CO, and respiratory system for SO_2 (OEHHA 2016). The acute RELs are for infrequent 1-hour exposures that occur no more than once every two weeks in a given year, although this time frame of exposure does not necessarily apply to chemicals that can bio-accumulate (e.g., dioxins and furans, PCBs, and various metals). The chronic RELs are for 24-hour per day exposures for at least a significant fraction of a lifetime, defined as about 8 years (≥12% of a 70 year lifespan). The 8-hour RELs are for repeated 8-hour exposures for a significant fraction of a lifetime such as the exposures that offsite workers might typically receive.

The first step in determining an acute, 8-hour, or chronic REL is to determine a point of departure. The point of departure is preferably determined by the benchmark concentration procedure applied to human or animal studies, but if this method of calculation cannot be used with a particular data set, a no observed adverse effect level (NOAEL) or lowest observed adverse effect level (LOAEL) may be used as the point of departure (OEHHA 2015). The benchmark concentration method (also referred to as the benchmark dose method for oral exposures) is a preferred method to estimate a point of departure because it takes all of the available dose-response data into account to statistically estimate, typically, a 5% response rate.

It should be emphasized that exceeding the acute or chronic REL does not necessarily indicate that an adverse health impact will occur. The REL is not the threshold where population health effects would first be seen. However, levels of exposure above the REL have an increasing, but undefined, probability of resulting in an adverse health impact, particularly in sensitive individuals (e.g., depending on the toxicant, the very young, the elderly, pregnant women, and those with acute or chronic illnesses) (OEHHA 2015). The significance of exceeding the REL is dependent on the seriousness of the health endpoint, the strength and interpretation of the health studies, the magnitude of combined safety factors, and other considerations. In addition, there is a possibility that a REL may not be protective of certain small, unusually sensitive human subpopulations. Such subpopulations can be difficult to identify and study because of their small numbers, lack of knowledge about toxic mechanisms, and other factors. It may be useful to consult OEHHA staff when a REL is exceeded (hazard quotient or hazard index is greater than 1.0).

By definition, an acute REL is an exposure that is not likely to cause adverse health effects in a human population, including sensitive subgroups, exposed to that concentration (in units of micrograms per cubic meter or $\mu g/m^3$) for the specified exposure duration on an intermittent basis (OEHHA 2015). All criteria air pollutants have established acute RELs by OEHHA except for PM_{10} and $PM_{2.5}$ because PM in and of itself does not have known acute or chronic effects, rather the components of PM (including TACs) have the known effects. No chronic RELs have been established for criteria air pollutants because the epidemiological studies needed to establish the long-term health effects have not been conducted mainly due to the complexity needed to isolate an individual criteria air pollutant from ambient air and conduct a long-term exposure experiment.

As discussed previously, it is possible using air dispersion models (such as AERMOD) to estimate the concentration of a primary air pollutant emitted from a project from various sources. This concentration could then be compared to the REL for each criteria air pollutant. However, even if a REL is exceeded, the conclusion would be an increasing but undefined probability of resulting in an adverse health impact. Therefore, the conclusion would not be meaningful in the context of CEQA and the Friant Ranch decision.

Regional Photochemical Models

Air districts, such as the SCAQMD, use photochemical air quality models for regional air quality planning. The following discussion of photochemical air quality models is derived from EPA's Support Center for Regulatory Atmospheric Modeling (SCRAM), Photochemical Air Quality Modeling summary (EPA 2017b):

Photochemical air quality models have become widely recognized and routinely utilized tools for regulatory analysis and attainment demonstrations by assessing the effectiveness of control strategies. These photochemical models are large-scale air quality models that simulate the changes of pollutant concentrations in the atmosphere using a set of mathematical equations characterizing the chemical and physical processes in the atmosphere. These models are applied at multiple spatial scales from local, regional, national, and global.

There are two types of photochemical air quality models commonly used in air quality assessments: the Lagrangian trajectory model that employs a moving frame of reference, and the Eulerian grid model that uses a fixed coordinate system with respect to the ground. Earlier generation modeling efforts often adopted the Lagrangian approach to simulate the pollutants formation because of its computational simplicity. The disadvantage of Lagrangian approach, however, is that the physical processes it can describe are somewhat incomplete. Most of the current operational photochemical air quality models have adopted the three-dimensional Eulerian grid modeling mainly because of its ability to better and more fully characterize physical processes in the atmosphere and predict the species concentrations throughout the entire model domain. Several photochemical air quality models are summarized below:

> **Community Multiscale Air Quality (CMAQ):** The CMAQ modeling system includes state-of-the-science capabilities for conducting urban-to-regional-to-hemispheric scale simulations of multiple air quality issues, including tropospheric O_3, fine particles, TACs, acid deposition, and visibility degradation. CMAQ brings together three kinds of models: (1) Meteorological models to represent atmospheric and weather activities, (2) Emission models to represent man-made and naturally-occurring contributions to the atmosphere, and (3) An air chemistry-transport model to predict the atmospheric fate of air pollutants under varying conditions (EPA 2018d).

Comprehensive Air Quality Model with extensions (CAMx): The CAMx model simulates air quality over many geographic scales. The model treats a wide variety of inert and chemically active pollutants, including O_3, PM, inorganic and organic $PM_{2.5}/PM_{10}$, and mercury and other toxics. CAMx also has plume-in-grid and source apportionment capabilities.

As explained in the Regulatory Impact Analysis of the Final Revisions to the National Ambient Air Quality Standards for Ground-Level Ozone: "CAMx is a three-dimensional grid-based Eulerian air quality model designed to estimate the formation and fate of oxidant precursors, primary and secondary particulate matter concentrations, and deposition over regional and urban spatial scales (e.g., over the contiguous U.S.) (EPA 2015a). Because it accounts for spatial and temporal variations as well as differences in the reactivity of emissions, CAMx is useful for evaluating the impacts of the control strategies on ozone concentrations" (EPA 2015a).

Regional Modeling System for Aerosols and Deposition (REMSAD): REMSAD was designed to calculate the concentrations of both inert and chemically reactive pollutants by simulating the physical and chemical processes in the atmosphere that affect pollutant concentrations over regional scales. It includes those processes relevant to regional haze, PM, and other airborne pollutants, including soluble acidic components and mercury.

Urban Airshed Model Variable Grid (UAM-V): The UAM-V Photochemical Modeling System was a pioneering effort in photochemical air quality modeling in the early 1970s and has been used widely for air quality studies focusing on O_3. It is a three-dimensional photochemical grid model designed to calculate the concentrations of both inert and chemically reactive pollutants by simulating the physical and chemical processes in the atmosphere that affect pollutant concentrations. This model is typically applied to model air quality "episodes" - periods during which adverse meteorological conditions result in elevated O_3 pollutant concentrations.

As explained in the SJVAPCD brief and noted previously, running the photochemical grid model used for predicting O_3 attainment with the emissions solely from an individual project like the Friant Ranch project or the proposed project is not likely to yield valid information given the relative scale involved. In addition, and similarly noted previously, even if local increases in concentrations of pollutants can be estimated, there is currently no way to accurately correlate that increase in concentration to a specific health effect as current models are not accurate when applied at the local level. Accordingly, use of photochemical models have not been demonstrated to provide reliable and meaningful results for an individual project.

Methodology for Estimating Premature Deaths Associated with Long-term $PM_{2.5}$ Exposure

CARB has developed a methodology to estimate premature deaths from large amounts of $PM_{2.5}$ (CARB 2008a). Regarding the general relationship (relative risk) for use in California, the methodology document states: "From the procedures described in Section II.D, the central estimate of the relative risk of premature death is 10 percent per 10 $\mu g/m^3$ increase in $PM_{2.5}$ exposure, with a 3 to 20 percent confidence interval" (CARB 2008a).

The SCAQMD used the CARB methodology to predict impacts from three very large power plants, which ranged from 723 to 1,837 pounds of $PM_{2.5}$ per day, and determined mortality ranging from a low of 0.05 persons per year to a high of 1.77 persons per year (SCAQMD 2015). However, the SCAQMD brief states, "the primary author of the CARB methodology has reported that this $PM_{2.5}$ health impact methodology is not suited for small projects and may yield unreliable results due to various uncertainties" (SCAQMD 2015). Among these uncertainties are the representativeness of the population used in the methodology, and the specific source of PM and the corresponding health impacts (SCAQMD 2015). Furthermore, in regards to evaluating the potential for application of a concentration-response function, such as the one CARB developed, to an individual project, peer-reviewers of the CARB study noted specific concerns about applying the CARB methodology to specific emission sources (even large-scale sources such as the ports) (Environ 2011). As noted in the 2008 CARB study (Environ 2011):

- Small population samples may introduce systemic uncertainties in exposure and susceptibility, and the age/sex distribution of the population should be adjusted if the county-wide incidence rate is applied to smaller areas;
- Population demographics should be the same as those in the concentration-response function;
- The effect of population size is important and is a function of variability and confidence intervals of the underlying epidemiological studies; and
- The concentration-response function will vary based on the source of PM and other caveats, including those above.

SCAQMD staff concluded that use of this methodology for a small source could result in unreliable findings and would not provide meaningful information; while it may be technically possible to plug the data into the methodology, the results would not be considered reliable or meaningful (SCAQMD 2015).

EPA Photochemical Grid Models for Single-Source Ozone and Secondary $PM_{2.5}$ Impacts for Permitting

On January 17, 2017, EPA published (82 FR 5182) revisions to the Guideline on Air Quality Models, referred to as Appendix W, including criteria and process steps for choosing single-source analytical techniques or models to estimate O_3 impacts from precursor NO_x and VOC emissions and concentrations of direct and secondarily-formed $PM_{2.5}$. EPA has developed a two-tiered demonstration approach for addressing single-source impacts on O_3 and secondary $PM_{2.5}$. Tier 1 demonstration involve use of technically credible relationships between emissions and ambient impacts based on existing modeling studies, and Tier 2 demonstration involves case-specific application of chemical transport modeling (e.g., with an Eulerian grid or Lagrangian model).

While EPA has recently published PSD SILs for O_3 and $PM_{2.5}$, April 17, 2018, EPA has acknowledged the complexity of modeling single-source project impacts with the development of a tiered approach discussed above and detailed in Appendix W. While the development of PSD SILs and Appendix W modeling methodology provides evidence of potential modeling to support the evaluation of project impacts under CEQA reviews, there are technical differences between stationary source projects regulated under the PSD program compared to land use development projects regulated under CEQA that result in uncertainty of results, discussed as follows.

As described in the EPA Memorandum, August 4, 2017, "*Use of Photochemical Grid Models for Single-Source Ozone and Secondary $PM_{2.5}$ impacts for Permit Program Related Assessments and for NAAQS Attainment Demonstrations for Ozone, $PM_{2.5}$ and Regional Haze*," there are multiple criteria that need to be satisfied to provide demonstration that a modeling system is fit for the purpose of supporting permitting demonstrations of NAAQS attainment, including:

1. The model or technique has received a scientific peer review;
2. The model or technique can be demonstrated to be applicable to the problem on a theoretical basis;
3. The database which are necessary to perform the analysis are available and adequate;
4. Appropriate performance evaluations of the model or technique have shown that the model or technique is not inappropriately biased for regulatory application; and
5. A protocol on methods and procedures to be followed has been established.

The EPA has assessed these five criteria in support of Appendix W changes to include criteria and process steps for choosing single-source analytical techniques or models to estimate O_3 effects from NO_x and VOC emissions and to estimate concentrations direct and secondarily-formed $PM_{2.5}$. However, this assessment has been performed relative to stationary sources and includes Criteria 4 performance evaluations of stationary sources only. In development of the Modeled Emission Rates for Precursors (MERPs) for the PSD Tier 1 Demonstration Tool, EPA modeled theoretical single-sources projects located throughout the continental United States. These projects were modeled at a low and high stack height of 1 meter (m) and 90 m, respectively; stack diameter of 5 m; exit temperature of 100 Fahrenheit (°F); and exit velocity of 27 meters per second (89 feet per second). The hypothetical sources included multiple emission rates: 100, 300, 500, 1,000, 2,000, and 3,000 tons per year.

CEQA requires review of all project-generated criteria air pollutant emissions, including emissions resulting from stationary sources, mobile sources, construction sources, operational, and maintenance activities and includes secondarily generated emissions from energy usage, water, solid waste, and wastewater generation. Many CEQA project emissions, like those for the proposed project, are dominated by mobile sources and fugitive emission sources with essentially no vertical plume velocity and have very different dispersion characteristics as compared to PSD major sources like those modeled for MERPs. Therefore, there is uncertainty of the results of applying performance evaluations from the PSD project examples to CEQA project emissions given the complexity of modeling the photochemical reactions resulting in O_3 formation and secondary $PM_{2.5}$, as discussed above. At this time, to our knowledge, chemical transport modeling of the formation of O_3 and $PM_{2.5}$ has not been proven under performance evaluations to show that the available modeling techniques are not inappropriately biased for CEQA projects.

Environmental Benefits Mapping and Analysis Program – Community Edition (BenMAP-CE)

The environmental Benefits Mapping and Analysis Program—Community Edition (BenMAP-CE) estimates the number and economic value of health effects resulting from changes in air pollution concentrations (EPA 2018e). The open-source BenMAP-CE tool replaces the proprietary version of the program (BenMAP) that the EPA first developed in 2003 to analyze national-scale air quality policies. These analyses include EPA's health benefits assessments for the NAAQs for PM (2006, 2012) and O_3 (2008, 2010), as well as the Locomotive Marine Engine Rule (2008). EPA and its partners designed BenMAP-CE to serve the analytical needs of a range of users, including scientists, policy analysts, and decision makers. Most users apply the BenMAP-CE tool to answer one of two types of questions (EPA 2018e):

1) What are the human health and economic benefits associated with a policy improving air quality?

and/or

2) What is the human health burden attributable to total air pollution levels?

The health impact function in BenMAP-CE incorporates four key sources of data: (i) modeled or monitored air quality changes, (ii) population, (iii) baseline incidence rates, and (iv) an effect estimate. When using BenMAP-CE on a local scale, data typically used, which needs to match the grid definition,[5] include air quality modeling, incidence data, and population data. While BenMAP-CE can be used on a local-scale if accurate input information is available, using BenMAP-CE for a project-level analysis in CEQA has not yet been demonstrated to provide meaningful results in a CEQA context.

CARB conducted a health risk assessment for the West Oakland community in 2008 ("Diesel Particulate Matter HRA for the West Oakland Community"). The study was designed to evaluate the emissions impacts and the potential public health risk to both residents of West Oakland and the broader Bay Area from exposures to diesel PM from the Maritime Port of Oakland, the Union Pacific Railroad, and additional sources adjacent to the West Oakland Community (i.e., ocean-going vessels, commercial harbor craft, cargo handling equipment, locomotives, Amtrak maintenance facility, major construction projects, stationary point sources, on-road trucks, and truck-based businesses and distribution centers), and used BenMAP to estimate non-cancer health effects (CARB 2008b). CARB staff included only directly emitted PM and did not account for secondary PM formed from NO_x and SO_x emissions. As explained in the West Oakland study, "Risk assessment is a complex process which requires the integration of many variables and assumptions. Due to these variables and assumptions, there are uncertainties and limitations with the results. Generally, the assumptions are designed to be health protective so that the estimates of risks to individuals are not underestimated. Uncertainty associated with the key elements used in a risk assessment include uncertainty in the health risk values, the air dispersion modeling used to predict diesel PM concentrations, and the model input parameters" (CARB 2008b).

Furthermore, in regards to conducting a health impact assessment, in general, as the spatial scale decreases, national or "generic" data may become less representative (Hubbell 2009). At the same time, local data may not be available or may be more uncertain given smaller sample sizes (Hubbell 2009). In addition, there is a tension between developing assessments that are locally meaningful and using methods that are consistent with other health impact assessments, so that results can be compared across settings (Hubbell 2009).

Benefit or Incidents per Ton Factors

In 2013, EPA published a Technical Support Document (TSD) describing an approach for estimating the average avoided human health impacts, and monetized benefits related to emissions of $PM_{2.5}$ and $PM_{2.5}$ precursors,

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5 A BenMAP-CE Grid Definition provides a method of breaking a geographic region into areas of interest (Grid Cells) in conducting an analysis (EPA 2018e). This can be done in two ways - by loading a Shapefile (a particular type of GIS file) or by specifying a regularly shaped grid pattern. These are referred to as Shapefile Grid Definitions and Regular Grid Definitions, respectively. Typically a Shapefile Grid Definition is used when the areas of interest are political boundaries with irregularly shaped borders, while a Regular Grid Definition is used when the areas of interest are uniformly shaped grids (e.g., rectangles) (EPA 2018e).

including NO_x and SO_2, from 17 sectors[6] using the results of source apportionment photochemical modeling. In 2017, EPA released a new version of its BenMAP-CE tool that incorporated new demographic and economic parameters. Using the 2017 version of BenMAP-CE, EPA re-calculated the $PM_{2.5}$ benefit per ton values.

The procedure for calculating benefit per ton coefficients follows three steps (EPA 2018f):

1. Using source apportionment photochemical modeling, predict annual average ambient concentrations of primary $PM_{2.5}$, nitrate and sulfate attributable to each of 17 emission sectors across the Continental U.S.

2. For each sector, estimate the health impacts, and the economic value of these impacts, associated with the attributable ambient concentrations of primary $PM_{2.5}$, sulfate and nitrate $PM_{2.5}$ using BenMAP v1.3.71.[7]

3. For each sector, divide the $PM_{2.5}$-related health impacts attributable to each type of $PM_{2.5}$, and the monetary value of these impacts, by the level of associated precursor emissions. That is, primary $PM_{2.5}$ benefits are divided by direct $PM_{2.5}$ emissions, sulfate benefits are divided by SO_2 emissions, and nitrate benefits are divided by NO_x emissions.

The benefit per ton analysis includes many data sources as inputs, including emission inventories, air quality data from models (with their associated parameters and inputs), population data, health effect estimates from epidemiology studies, and economic data for monetizing benefits (EPA 2018e). Each of these inputs may be uncertain and would affect the benefits estimate (EPA 2018e). When the uncertainties from each stage of the analysis are compounded, small uncertainties can have large effects on the total quantified benefits (EPA 2018f).

The limitations and uncertainties discussion in the benefit per ton analysis cautions that: "Great care should be taken in applying these estimates to emission reductions occurring in any specific location, as these are all based on national emission reduction assumptions and therefore represent an average benefit per ton over the entire United States. The benefit per ton for emission reductions in specific locations may be very different from the estimates presented here. In addition, estimates do not capture important differences in marginal benefit per ton that may exist due to different combinations of reductions (i.e., all other sectors are held constant) or nonlinearities within a particular pollutant (e.g., non-zero second derivatives with respect to emissions)" (EPA 2018f).

CARB has similarly developed incidents per ton values to evaluate costs versus benefits of air quality rules and regulations. Examples include the economic valuation during rulemaking for the Ports and Goods Movement in California (CARB 2006) and the Truck and Bus Regulation, the Drayage Truck Regulation, and the Tractor-Trailer Greenhouse Gas Regulation (CARB 2010).

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[6] The 17 sectors include locomotives and marine vessels, area sources, cement kilns, coke ovens, electric arc furnaces, electricity generating units, ferroalloy facilities, industrial point sources, integrated iron and steel facilities, iron and steel facilities, non-road mobile sources, ocean-going vessels, on-road mobile sources, pulp and paper facilities, refineries, residential wood combustion, and taconite mines (EPA 2018f).

[7] In this stage, EPA estimated the $PM_{2.5}$-related impacts associated with changes in directly emitted $PM_{2.5}$, nitrate and sulfate separately, so that they may ultimately calculate the benefit per ton reduced of the corresponding $PM_{2.5}$ precursor, or directly emitted $PM_{2.5}$, in step 3. When estimating these impacts, the EPA applied effect coefficients that relate changes in total $PM_{2.5}$ mass to the risk of adverse health outcomes; the EPA did not apply effect coefficients that are differentiated by $PM_{2.5}$ specie.

CARB staff assessed the potential health effects associated with exposure to air pollutants arising from ports and goods movement in California focusing on PM and O_3, as they represent the majority of known risk associated with exposure to outdoor air pollution and there have been sufficient studies performed to allow quantification of the health effects associated with the referenced emission sources (CARB 2006). The assessment quantifies the premature deaths and increased cases of disease linked to exposure to PM and O_3 from ports and goods movement, and provides an economic valuation of these health effects.

The study noted that there are significant uncertainties involved in quantitatively estimating the health effects of exposure to outdoor air pollution (CARB 2006), The various uncertainties and limitations include uncertainties related to emissions estimation, exposure estimates and populations, concentration-response functions, baseline rates of mortality and morbidity, health effects of sulfate exposure, and unquantified adverse effects. Many of these elements have a factor-of-two uncertainty; over time, some of these uncertainties may be reduced as new research is completed. However, significant uncertainty will remain in any estimate made over the foreseeable future (CARB 2006).

The benefit or incidents per ton factor assessment, while useful for economic valuations during rulemaking for regulatory controls that would reduce substantial quantities of air pollutant emissions, in its current form, has too substantial of uncertainties when applied to individual projects to be used for CEQA analyses with a level of accuracy. Therefore, as currently used by CARB and EPA, the benefit or incidents per ton factor assessment is determined to not provide reliable and meaningful results for individual projects.

Conclusion

As explained above, there are numerous scientific and technological complexities associated with correlating criteria air pollutant emissions from an individual project to specific health effects or potential additional nonattainment days, which coupled with lack of expert agency guidance, has yet to provide reliable and meaningful additional information regarding health effects from criteria air pollutants generated by individual projects. Neither the SJVAPCD nor the SCAQMD have identified a method to connect project-generated criteria air pollutant emissions to specific health effects for individual development projects.

5 Evaluation of the Proposed Project's Health Effects

As explained in Section 2, the EPA and CARB have established AAQS at levels above which concentrations could be harmful to human health and welfare, with an adequate margin of safety. Further, California air districts (like SDAPCD) have established emission-based thresholds that provide project-level estimates of criteria air pollutant quantities that air basins can accommodate without affecting the attainment dates for the AAQS. Accordingly, elevated levels of criteria air pollutants as a result of a proposed project's emissions could cause adverse health effects associated with these pollutants.

In this case, construction of the proposed project would not exceed any of the SDAPCD thresholds. However, operation of the proposed project would result in emissions that would exceed the SDAPCD thresholds for criteria air pollutants including VOC, NO_x, CO, PM_{10}, and $PM_{2.5}$. As shown in Table 2 (Section 2), the SDAB is designated as a nonattainment area for O_3 under the NAAQS and the CAAQS, and nonattainment for PM_{10} and $PM_{2.5}$ under the CAAQS.

VOCs and NO_x are precursors to O_3, for which the SDAB is designated as nonattainment with respect to the NAAQS and CAAQS. The health effects associated with O_3 are generally associated with reduced lung function. The contribution of VOCs and NO_x to regional ambient O_3 concentrations is the result of complex photochemistry. The increases in O_3 concentrations in the SDAB due to O_3 precursor emissions tend to be found downwind from the source location to allow time for the photochemical reactions to occur. However, the potential for exacerbating excessive O_3 concentrations would also depend on the time of year that the VOC emissions would occur because exceedances of the O_3 ambient air quality standards tend to occur between April and October when solar radiation is highest. The holistic effect of a single project's emissions of O_3 precursors is speculative because of the lack of quantitative methods to assess this impact. Nonetheless, because VOC and NO_x emissions associated with proposed project operation would exceed the SDAPCD mass daily thresholds, it could minimally contribute to regional O_3 concentrations and the associated health effects.

Health effects that result from NO_2 (which is a constituent of NO_x) include respiratory irritation. Although the proposed project operation would generate NO_x emissions that would exceed the SDAPCD mass daily threshold, the proposed project is not anticipated to contribute to exceedances of the NAAQS and CAAQS for NO_2 because the SDAB is designated as in attainment of the NAAQS and CAAQS for NO_2 and the existing NO_2 concentrations in the area are well below the NAAQS and CAAQS standards. Nonetheless, because there are nearby receptors to be affected by operational sources (i.e., on-road vehicles) of NO_x, the proposed project could result in potential health effects associated with NO_2.

CO tends to be a localized impact associated with congested intersections. The associated potential for CO hotspots were discussed in Section 4.2.4.2 of the EIR's Air Quality chapter and were determined to be a less-than-significant impact. However, operation of the proposed project would generate CO emissions that would exceed the SDAPCD thresholds. Therefore, the proposed project's CO emissions could potentially contribute to significant health effects associated with this pollutant.

Operation of the proposed project would exceed thresholds for PM_{10} or $PM_{2.5}$. As such, the proposed project would potentially contribute to exceedances of the NAAQS and CAAQS for particulate matter or would obstruct the SDAB from coming into attainment for these pollutants. Because the proposed project has the potential to contribute particulate matter that exceeds SDAPCD mass daily thresholds during operations, the proposed project could result in associated health effects.

In summary, because operation of the proposed project could result in exceedances of the SDAPCD significance thresholds for VOC, NO_x, CO, PM_{10}, and $PM_{2.5}$, the potential health effects associated with criteria air pollutants are considered potentially significant. Notably, there are numerous scientific and technological complexities associated with correlating criteria air pollutant emissions from an individual project to specific health effects or potential additional nonattainment days, and there are currently no modeling tools that could provide reliable and meaningful additional information regarding health effects from criteria air pollutants generated by individual projects. Overall, since the vehicle-miles traveled increase is based on driver behavior changes from not widening a portion of College Boulevard under the proposed project, and since the City of Oceanside lacks the authority to mandate emission reductions for on-road vehicles, or to control driver behavior, no feasible mitigation measures have been identified to reduce these emissions.

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