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TECHNICAL MEMORANDUM

Date: May 6, 2017

To: GPA Consulting
231 California Street
El Segundo, CA 90245

From: Kurt Legleiter, Principal

Subject: **Air Quality & Greenhouse Gas Impact Assessment for the Golden Avenue Bridge Replacement/ Rehabilitation Project, City of Placentia, California**

INTRODUCTION

This report provides and overview of existing environmental conditions and applicable regulatory framework. Air quality impacts are analyzed in support of the Initial Study to be prepared for the proposed project and in accordance with the California Environmental Quality Act (CEQA) guidelines. Supporting materials for this report, including emissions modeling output files, are included in Appendix A.

Project Overview

The project would include replacing a functionally obsolete bridge with a replacement bridge that has the same number of through-traffic lanes as the existing bridge. The anticipated replacement bridge would accommodate two traffic lanes, Class II bike lanes/shoulders, and sidewalks that meet American Association of State Highway and Transportation Officials (AASHTO) minimum standards. In addition, the replacement bridge would be longer in order to accommodate the bike path along the Carbon Canyon Creek Channel as part of the Orange County Loop Bikeway Project. The proposed project area footprint is depicted in Figure 1. The preliminary site plan for the proposed project is depicted in Figure 2.

Construction of the proposed project would occur over an approximate four- to six-month period. A majority of the project construction is anticipated to occur during the summer months to minimize impacts to nearby schools.

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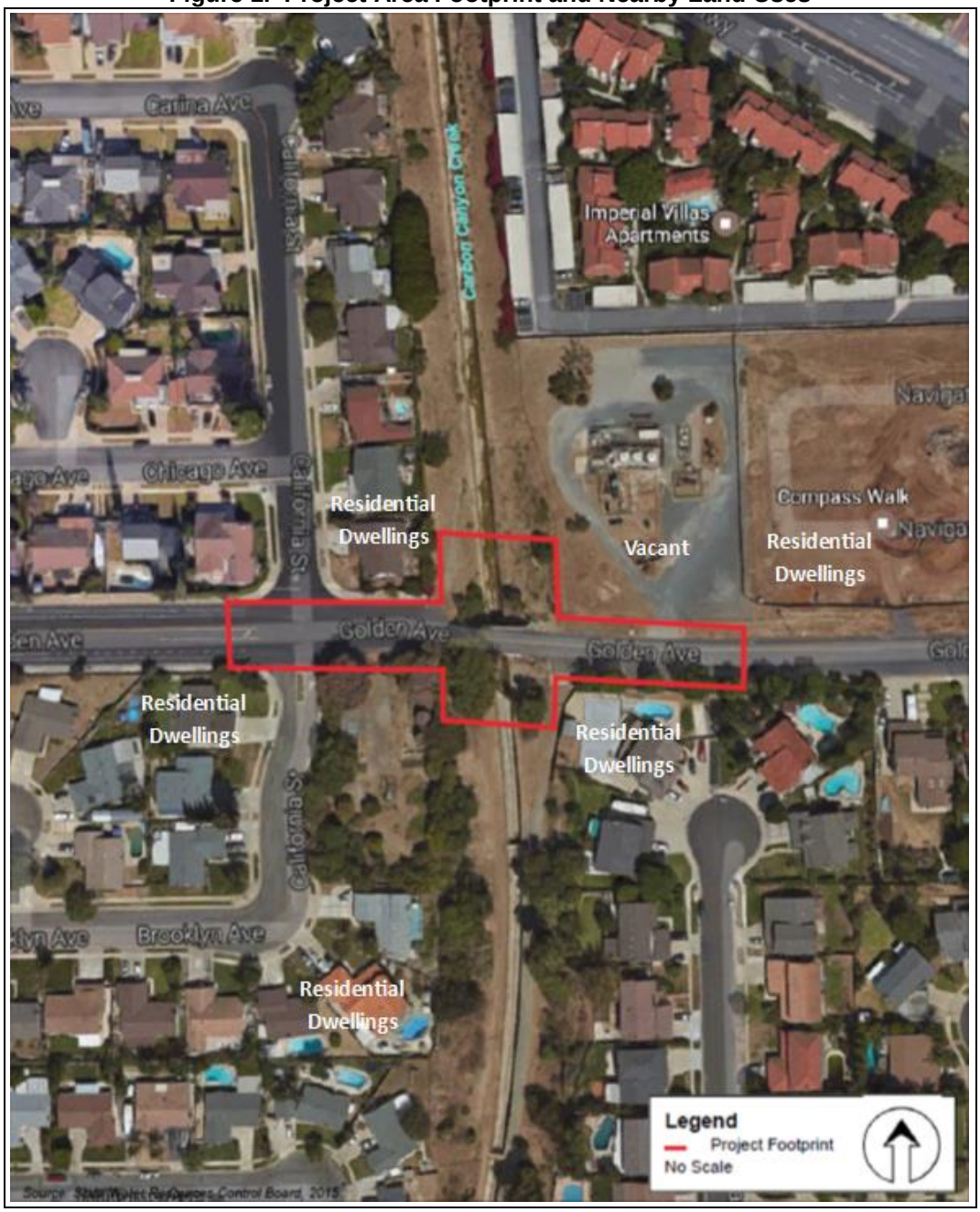
Figure 1. Project Area Footprint and Nearby Land Uses



Source: City of Placentia 2017

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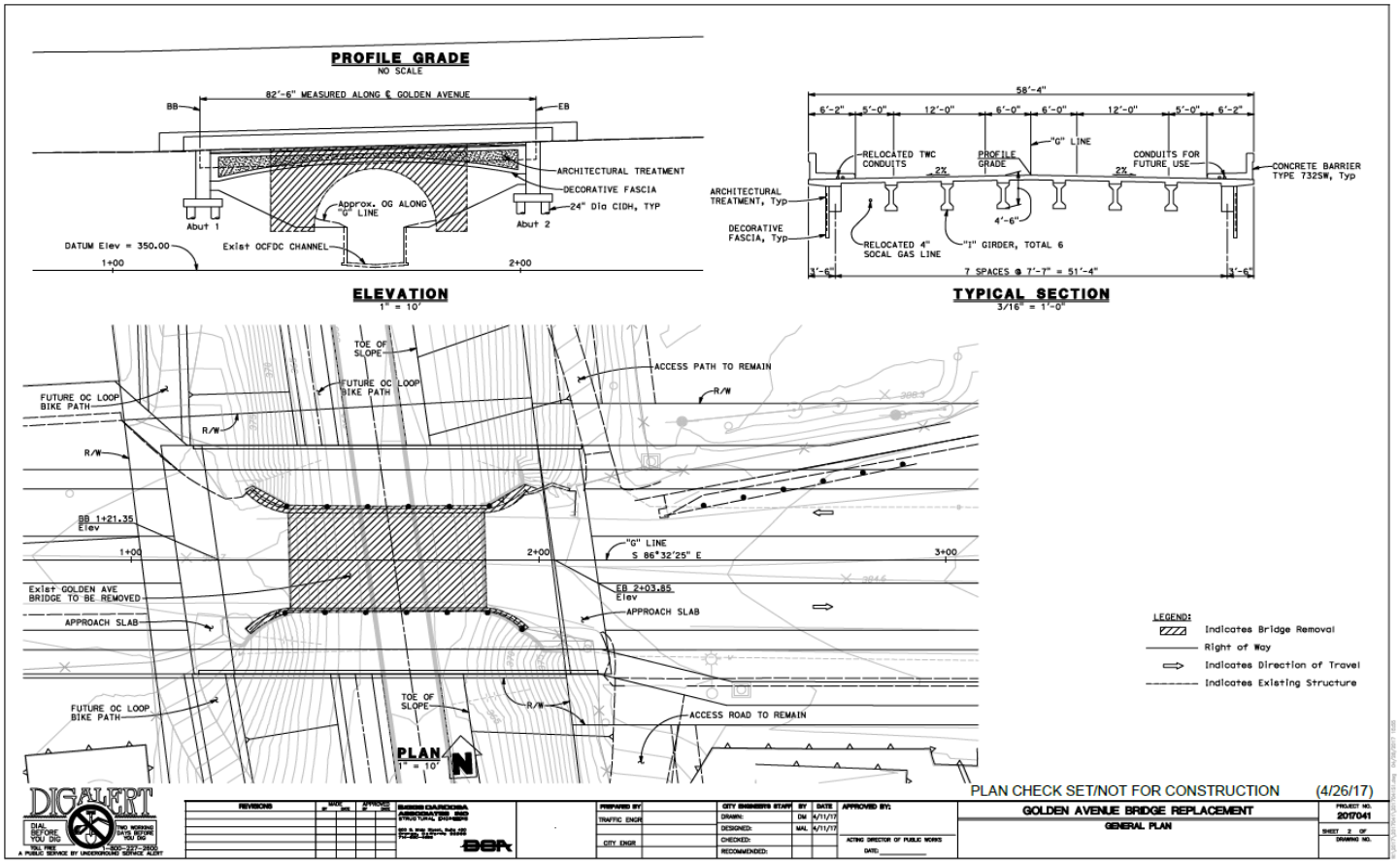
Figure 2. Preliminary Project Site Plan



Source: Biggs Cardosa Associates, Inc. 2016

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AIR QUALITY

Summary of Existing Conditions

Air Pollutants of Primary Concern

Criteria Air Pollutants

For the protection of public health and welfare, the Federal Clean Air Act (FCAA) required that the United States Environmental Protection Agency (U.S. EPA) establish National Ambient Air Quality Standards (NAAQS) for various pollutants. These pollutants are referred to as "criteria" pollutants because the U.S. EPA publishes criteria documents to justify the choice of standards. The FCAA allows states to adopt additional or more health-protective standards. Accordingly, the State of California has also adopted California Ambient Air Quality Standards (CAAQS) for criteria pollutants. The NAAQS and CAAQS define the maximum amount of an air pollutant that can be present in ambient air. An ambient air quality standard is generally specified as a concentration averaged over a specific time period, such as one hour, eight hours, 24 hours, or one year. The different averaging times and concentrations are meant to protect against different exposure effects. Standards established for the protection of human health are referred to as primary standards; whereas, standards established for the prevention of environmental and property damage are called secondary standards. The following provides a summary discussion of the criteria air pollutants of primary concern.

Ozone (O_3) is a reactive gas consisting of three atoms of oxygen. In the troposphere, it is a product of the photochemical process involving the sun's energy. It is a secondary pollutant that is formed when NO_X and volatile organic compounds (VOC), also referred to as reactive organic gases (ROG) react in the presence of sunlight. Ozone at the earth's surface causes numerous adverse health effects and is a criteria pollutant. It is a major component of smog. In the stratosphere, ozone exists naturally and shields Earth from harmful incoming ultraviolet radiation.

High concentrations of ground level ozone can adversely affect the human respiratory system and aggravate cardiovascular disease and many respiratory ailments. Ozone also damages natural ecosystems such as forests and foothill communities, agricultural crops, and some man-made materials, such as rubber, paint, and plastics.

Reactive Organic Gas (ROG) is a reactive chemical gas, composed of hydrocarbon compounds that may contribute to the formation of smog by their involvement in atmospheric chemical reactions. No separate health standards exist for ROG as a group. Because some compounds that make up ROG are also toxic, like the carcinogen benzene, they are often evaluated as part of a toxic risk assessment. Total Organic Gases (TOGs) includes all of the ROGs, in addition to low reactivity organic compounds like methane and acetone. ROGs and VOC are subsets of TOG.

Volatile Organic Compounds (VOC) are hydrocarbon compounds that exist in the ambient air. VOCs contribute to the formation of smog and may also be toxic. VOC emissions are a major precursor to the formation of ozone. VOCs often have an odor, and some examples include gasoline, alcohol, and the solvents used in paints.

Oxides of Nitrogen (NO_X) are a family of gaseous nitrogen compounds and is a precursor to the formation of ozone and particulate matter. The major component of NO_X, nitrogen dioxide (NO_2), is a reddish-brown gas that is toxic at

high concentrations. NO_X results primarily from the combustion of fossil fuels under high temperature and pressure. On-road and off-road motor vehicles and fuel combustion are the major sources of this air pollutant.

Particulate Matter (PM), also known as particle pollution, is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles. The size of particles is directly linked to their potential for causing health problems. U.S. EPA is concerned about particles that are 10 micrometers in diameter or smaller because those are the particles that generally pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects. U.S. EPA groups particle pollution into three categories based on their size and where they are deposited:

- "Inhalable coarse particles ($PM_{2.5}$- PM_{10})," such as those found near roadways and dusty industries, are between 2.5 and 10 micrometers in diameter. $PM_{2.5\text{-}10}$ is deposited in the thoracic region of the lungs.
- "Fine particles ($PM_{2.5}$)," such as those found in smoke and haze, are 2.5 micrometers in diameter and smaller. These particles can be directly emitted from sources such as forest fires, or they can form when gases emitted from power plants, industries and automobiles react in the air. They penetrate deeply into the thoracic and alveolar regions of the lungs.
- "Ultrafine particles (UFP)," are very small particles less than 0.1 micrometers in diameter largely resulting from the combustion of fossils fuels, meat, wood and other hydrocarbons. While UFP mass is a small portion of $PM_{2.5}$, its high surface area, deep lung penetration, and transfer into the bloodstream can result in disproportionate health impacts relative to their mass.

PM_{10}, $PM_{2.5}$, and UFP include primary pollutants (emitted directly to the atmosphere) as well as secondary pollutants (formed in the atmosphere by chemical reactions among precursors). Generally speaking, $PM_{2.5}$ and UFP are emitted by combustion sources like vehicles, power generation, industrial processes, and wood burning, while PM_{10} sources include these same sources plus roads and farming activities. Fugitive windblown dust and other area sources also represent a source of airborne dust.

Numerous scientific studies have linked both long- and short-term particle pollution exposure to a variety of health problems. Long-term exposures, such as those experienced by people living for many years in areas with high particle levels, have been associated with problems such as reduced lung function and the development of chronic bronchitis and even premature death. Short-term exposures to particles (hours or days) can aggravate lung disease, causing asthma attacks and also acute (short-term) bronchitis, and may also increase susceptibility to respiratory infections. In people with heart disease, short-term exposures have been linked to heart attacks and arrhythmias. Healthy children and adults have not been reported to suffer serious effects from short term exposures, although they may experience temporary minor irritation when particle levels are elevated.

Carbon Monoxide (CO) is an odorless, colorless gas that is highly toxic. It is formed by the incomplete combustion of fuels and is emitted directly into the air (unlike ozone). The main source of CO is on-road motor vehicles. Other CO sources include other mobile sources, miscellaneous processes, and fuel combustion from stationary sources. Because of the local nature of CO problems, the California Air Resources Board (ARB) and U.S. EPA designate urban areas as CO nonattainment areas instead of the entire basin as with ozone and PM_{10}. Motor vehicles are by far the largest source of CO emissions. Emissions from motor vehicles have been declining since 1985, despite increases in vehicle miles traveled, with the introduction of new automotive emission controls and fleet turnover.

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Sulfur Dioxide (SO_2) is a colorless, irritating gas with a "rotten egg" smell formed primarily by the combustion of sulfur-containing fossil fuels. However, like airborne NO_X, suspended SO_X particles contribute to the poor visibility. These SO_X particles can also combine with other pollutants to form $PM_{2.5}$. The prevalence of low-sulfur fuel use has minimized problems from this pollutant.

Lead (Pb) is a metal that is a natural constituent of air, water, and the biosphere. Lead is neither created nor destroyed in the environment, so it essentially persists forever. The health effects of lead poisoning include loss of appetite, weakness, apathy, and miscarriage. Lead can also cause lesions of the neuromuscular system, circulatory system, brain, and gastrointestinal tract. Gasoline-powered automobile engines were a major source of airborne lead through the use of leaded fuels. The use of leaded fuel has been mostly phased out, with the result that ambient concentrations of lead have dropped dramatically.

Hydrogen Sulfide (H_2S) is associated with geothermal activity, oil and gas production, refining, sewage treatment plants, and confined animal feeding operations. Hydrogen sulfide is extremely hazardous in high concentrations; especially in enclosed spaces (800 ppm can cause death). OSHA regulates workplace exposure to H_2S.

Odors

Typically, odors are generally regarded as an annoyance rather than a health hazard. However, manifestations of a person's reaction to foul odors can range from the psychological (i.e. irritation, anger, or anxiety) to the physiological, including circulatory and respiratory effects, nausea, vomiting, and headache.

The ability to detect odors varies considerably among the population and overall is quite subjective. Some individuals have the ability to smell very minute quantities of specific substances; others may not have the same sensitivity but may have sensitivities to odors of other substances. In addition, people may have different reactions to the same odor and in fact an odor that is offensive to one person may be perfectly acceptable to another (e.g., fast food restaurant). It is important to also note that an unfamiliar odor is more easily detected and is more likely to cause complaints than a familiar one. This is because of the phenomenon known as odor fatigue, in which a person can become desensitized to almost any odor and recognition only occurs with an alteration in the intensity.

Quality and intensity are two properties present in any odor. The quality of an odor indicates the nature of the smell experience. For instance, if a person describes an odor as flowery or sweet, then the person is describing the quality of the odor. Intensity refers to the strength of the odor. For example, a person may use the word strong to describe the intensity of an odor. Odor intensity depends on the odorant concentration in the air. When an odorous sample is progressively diluted, the odorant concentration decreases. As this occurs, the odor intensity weakens and eventually becomes so low that the detection or recognition of the odor is quite difficult. At some point during dilution, the concentration of the odorant reaches a detection threshold. An odorant concentration below the detection threshold means that the concentration in the air is not detectable by the average human.

Toxic Air Contaminants

Toxic air contaminants (TACs) are air pollutants that may cause or contribute to an increase in mortality or serious illness, or which may pose a hazard to human health. TACs are usually present in minute quantities in the ambient air, but due to their high toxicity, they may pose a threat to public health even at very low concentrations. Because

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there is no threshold level below which adverse health impacts are not expected to occur, TACs differ from criteria pollutants for which acceptable levels of exposure can be determined and for which state and federal governments have set ambient air quality standards. TACs, therefore, are not considered "criteria pollutants" under either the FCAA or the CCAA, and are thus not subject to National or State AAQS. TACs are not considered criteria pollutants in that the federal and California Clean Air Acts do not address them specifically through the setting of National or State AAQS. Instead, the U.S. EPA and ARB regulate Hazardous Air Pollutants (HAPs) and TACs, respectively, through statutes and regulations that generally require the use of the maximum or best available control technology to limit emissions. In conjunction with District rules, these federal and state statutes and regulations establish the regulatory framework for TACs. At the national levels, the U.S. EPA has established National Emission Standards for HAPs (NESHAPs), in accordance with the requirements of the FCAA and subsequent amendments. These are technology-based source-specific regulations that limit allowable emissions of HAPs.

Within California, TACs are regulated primarily through the Tanner Air Toxics Act (AB 1807) and the Air Toxics Hot Spots Information and Assessment Act of 1987 (AB 2588). The Tanner Act sets forth a formal procedure for ARB to designate substances as TACs. This includes research, public participation, and scientific peer review before ARB designates a substance as a TAC. Existing sources of TACs that are subject to the Air Toxics Hot Spots Information and Assessment Act are required to: (1) prepare a toxic emissions inventory; (2) prepare a risk assessment if emissions are significant; (3) notify the public of significant risk levels; and (4) prepare and implement risk reduction measures.

At the state level, the ARB has authority for the regulation of emissions from motor vehicles, fuels, and consumer products. Most recently, Diesel-exhaust particulate matter (DPM) was added to the ARB list of TACs. DPM is the primary TACs of concern for mobile sources. Of all controlled TACs, emissions of DPM are estimated to be responsible for about 70 percent of the total ambient TAC risk. The ARB has made the reduction of the public's exposure to DPM one of its highest priorities, with an aggressive plan to require cleaner diesel fuel and cleaner diesel engines and vehicles (ARB 2005).

Regulatory Attainment Designations

Under the California Clean Air Act (CCAA), the ARB is required to designate areas of the state as attainment, nonattainment, or unclassified with respect to applicable state ambient air quality standards. An "attainment" designation for an area signifies that pollutant concentrations did not violate the applicable standard in that area. A "nonattainment" designation indicates that a pollutant concentration violated the applicable standard at least once, excluding those occasions when a violation was caused by an exceptional event, as defined in the criteria. Depending on the frequency and severity of pollutants exceeding applicable standards, the nonattainment designation can be further classified as serious nonattainment, severe nonattainment, or extreme nonattainment, with extreme nonattainment being the most severe of the classifications. An "unclassified" designation signifies that the data does not support either an attainment or nonattainment designation. The CCAA divides districts into moderate, serious, and severe air pollution categories, with increasingly stringent control requirements mandated for each category.

With regard to the NAAQS, the U.S. EPA designates areas for ozone, CO, and NO_2 as "does not meet the primary standards," "cannot be classified," or "better than national standards." For SO_2, areas are designated as "does not meet the primary standards," "does not meet the secondary standards," "cannot be classified," or "better than national standards." However, the ARB terminology of attainment, nonattainment, and unclassified is more

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frequently used. The U.S. EPA uses the same sub-categories for nonattainment status: serious, severe, and extreme. All other areas are designated "unclassified."

The proposed project site is located within the South Coast Air Basin (SCAB) is currently designated as a nonattainment area with respect to the CAAQS for ozone, PM_{10}, and $PM_{2.5}$, as well as the national 1-hour ozone and $PM_{2.5}$ standards. The SCAB is designated attainment or unclassified for the remaining State and Federal standards (SCAQMD 2017a).

Sensitive Receptors

One of the most important reasons for air quality standards is the protection of those members of the population who are most sensitive to the adverse health effects of air pollution, termed "sensitive receptors." The term "sensitive receptors" refers to specific population groups, as well as the land uses where individuals would reside for long periods. Commonly identified sensitive population groups are children, the elderly, the acutely ill, and the chronically ill. Commonly identified sensitive land uses would include facilities that house or attract children, the elderly, people with illnesses, or others who are especially sensitive to the effects of air pollutants. Residential dwellings, schools, parks, playgrounds, childcare centers, convalescent homes, and hospitals are examples of sensitive land uses.

Sensitive land uses in the project vicinity consist predominantly of residential land uses. The nearest residential land uses are depicted in Figure 1.

Environmental Impacts

Significance Threshold Criteria

According to Appendix G of the CEQA Guidelines, a project would normally have a significant effect on the environment if the project would:

- Conflict with or obstruct implementation of the applicable air quality plan.
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation.
- 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).
- Expose sensitive receptors to substantial pollutant concentrations.
- Create objectionable odors affecting a substantial number of people.

South Coast Air Quality Management District Thresholds

The quantifiable thresholds shown below are currently recommended by the South Coast Air Quality Management District (SCAQMD) and are used to determine the significance of air quality impacts associated with the proposed project (SCAQMD 2017b).

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Regional Air Quality Impacts

Regional significance thresholds recommended by SCAQMD are summarized in Table 1. Project-generated emissions that exceed these mass emissions thresholds would be considered to have a potentially significant impact, which could interfere with regional air quality attainment plans.

Table 1. SCAQMD-Recommended CEQA Significance Thresholds

Pollutant	Construction Emissions (lbs/day)	Operational Emissions (lbs/day)
VOC	75	55
NO_X	100	55
CO	550	550
PM_{10}	150	150
$PM_{2.5}$	55	55
SO_X	150	150

Exposure to Localized Pollutant Concentrations

In addition to the mass emissions thresholds identified above, the SCAQMD has established the following threshold criteria to determine if a project has the potential to contribute to a localized exceedance of the state Ambient Air Quality Standards in the immediate vicinity of the site:

- California State 1-hour CO standard of 20.0 ppm
- California State 8-hour CO standard of 9.0 ppm
- California State 1-hour NO_2 standard of 0.25 ppm
- SCAQMD 24-hour construction PM_{10} LST of 10.4 µg/m^3
- SCAQMD 24-hour construction $PM_{2.5}$ LST of 10.4 µg/m^3
- SCAQMD 24-hour operational PM_{10} LST of 2.5 µg/m^3
- SCAQMD 24-hour operational $PM_{2.5}$ LST of 2.5 µg/m^3

The SCAQMD provides screening criteria that can be relied upon to determine if the daily emissions for proposed construction or operational activities would have a potential to exceed the Localized Significance Thresholds (LSTs). LSTs represent the maximum emissions at a project site that are not expected to cause or contribute to an exceedance of the most stringent NAAQS or state CAAQS. LSTs are based on the ambient concentrations of that pollutant within the project area and the distance to the nearest sensitive receptor. An LST analysis for construction activities is applicable to projects five acres, or less, in size; but can be used to screen larger projects to determine whether or not dispersion modeling may be required. If calculated daily emissions are below the LST screening levels the project would be considered to have a less than significant impact.

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Methodology

Construction-generated emissions were quantified using the California Emissions Estimator Model (CalEEMod), version 2016.3.1 computer program. Off-road equipment, quantities of material to be imported and exported, and construction activity schedules were based on information provided by the project engineer. All other modeling assumptions, including vehicle trip distances, emission factors, and equipment usage factors, were based on CalEEMod defaults for Orange County. Modeling assumptions and results are included in Appendix A of this report.

Impacts and Mitigation Measures

Impact AQ-1: Would the project conflict with or obstruct implementation of the applicable air quality plan?

The SCAB is currently designated as a nonattainment area with respect to the state ozone, PM_{10}, and $PM_{2.5}$ standards, as well as the national 8-hour ozone and $PM_{2.5}$ standards. The proposed project would not result in long-term changes in vehicle operations (e.g., traffic volumes, vehicle speeds) along Golden Avenue or other area roadways. As a result, the proposed project would not result in long-term air quality impacts. Furthermore, short-term construction of the proposed project would not result in significant increases in emissions that would exceed SCAQMD-recommended significance thresholds. For these reasons, this impact is considered less-than-significant. Refer to Impact AQ-2 for additional discussion of air quality impacts.

Impact AQ-2: Would the project violate any air quality standard or contribute substantially to an existing or projected air quality violation?

The proposed project would not result in long-term changes in vehicle operations (e.g., traffic volumes, vehicle speeds) along Golden Avenue or other area roadways. As a result, the proposed project would not result in long-term air quality impacts. The proposed project would, however, result in short-term construction-generated emissions. Construction-generated emissions were quantified using the CalEEMod, version 2016.3.1 computer program based on the estimated construction schedule and equipment anticipated to be required for this project. Construction-generated emissions are summarized in Table 2. Emissions modeling assumptions and results are included in Appendix A. Based on the modeling conducted construction of the proposed project would generated maximum-daily emissions of approximately 2.1 lbs/day of ROG, 17.3 lbs/day of NO_X, 17.5 lbs/day of CO, 1.5 lbs/day of PM_{10}, and 1.2 lbs/day of $PM_{2.5}$. Emissions of SO_X would be negligible (less than 0.1 lbs/day). Construction-generated emissions would not exceed SCAQMD-recommended CEQA significance thresholds for regional air quality impacts.

Construction projects can result in short-term increases of TACs, as well as, emissions of airborne fugitive dust, which can result in localized air quality impacts. The SCAQMD has developed localized significance thresholds (LSTs) for the evaluation of short-term localized air quality impacts. The LSTs are based on CAAQS, which have been established to provide a margin of safety regarding the protection of public health and welfare. Construction-generated emissions in comparison to SCAQMD's LSTs are summarized in Table 3. As noted, construction-generated emissions associated within onsite activities would not exceed SCAQMD corresponding LSTs. In addition, the proposed project

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Table 2. Construction Emissions without Mitigation

Source	Emissions (lbs/day)[1]					
	ROG	NO_X	CO	SO_X	PM_{10}	$PM_{2.5}$
Site Preparation/Grubbing	0.6	5.6	6.1	<0.1	0.4	0.3
Grading/Excavation/Bridge Demolition	2.1	22	17.5	<0.1	1.5	1.2
Bridge Construction/Drainage Improvements/Utilities/Subgrade/Retaining Walls	1.8	17.3	13.7	<0.1	1.1	0.9
Paving	1.2	9.4	9.5	<0.1	0.7	0.5
Maximum Daily[2]:	2.1	17.3	17.5	<0.1	1.5	1.2
SCAQMD Significance Thresholds[2]:	75	100	550	150	150	55
Exceeds Thresholds?	No	No	No	No	No	No

1. Emissions were quantified using the CalEEMod, v2016.3.1, computer program. Does not include reductions in fugitive dust associated with compliance with SCAQMD's Rule 403. Totals may not sum due to rounding.
2. Maximum daily emissions assume some activities, such as grading, excavation, and bridge demolition, could occur simultaneously on any given day.
Refer to Appendix A for emissions modeling assumptions and results.

Table 3. On-Site Construction Emissions without Mitigation

Source	Emissions (lbs/day)[1]					
	ROG	NO_X	CO	SO_X	PM_{10}	$PM_{2.5}$
Site Preparation/Grubbing	0.6	5.4	5.9	<0.1	0.3	0.3
Grading/Excavation/Bridge Demolition	1.9	17.9	15.8	<0.1	1.1	1.0
Bridge Construction/Drainage Improvements/Utilities/Subgrade/Retaining Walls	1.7	15.3	12.8	<0.1	0.9	0.8
Paving	1.1	9.4	9.1	<0.1	0.5	0.5
Maximum Daily Onsite[2]:	1.9	17.9	15.8	<0.1	1.1	1.0
SCAQMD Localized Significance Thresholds[2]:	None	103	522	None	4	3
Exceeds Thresholds?	NA	No	No	NA	No	No

1. Emissions were quantified using the CalEEMod, v2016.3.1, computer program. Totals may not sum due to rounding.
2. Maximum daily emissions assume some activities, such as grading, excavation, and bridge demolition, could occur simultaneously on any given day.
3. LSTs are based on a one-acre site with sensitive receptors located within 25 meters.
Refer to Appendix A for emissions modeling assumptions and results.

would not require extensive ground-disturbing activities that would result in significant increases of fugitive dust. As a result, construction-generated emissions would be considered to have a less-than-significant localized air quality impact.

It is important to also note that construction of the proposed project would be required to comply with SCAQMD's Rule 402 (Nuisance) and Rule 403 (Fugitive Dust), which identifies measures to be implemented for the control fugitive dust generated during onsite demolition and ground-disturbance activities[1]. Furthermore, on-road diesel vehicles, such as haul trucks, would also be required to comply with Section 2485 of Title 13 of the California Code of Regulations.[2] This regulation limits idling from diesel-fueled commercial motor vehicles with gross vehicular

[1] Refer to SCAQMD's website (http://www.aqmd.gov/home/regulations/rules/scaqmd-rule-book) for additional information regarding applicable SCAQMD rules and regulations.

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weight ratings of more than 10,000 pounds and licensed for operation on highways. It applies to California and non-California based vehicles. In general, the regulation specifies that drivers of said vehicles:

1) Shall not idle the vehicle's primary diesel engine for greater than 5 minutes at any location, except as noted in Subsection (d) of the regulation; and,

2) Shall not operate a diesel-fueled auxiliary power system to power a heater, air conditioner, or any ancillary equipment on that vehicle during sleeping or resting in a sleeper berth for greater than 5.0 minutes at any location when within 1,000 feet of a restricted area, except as noted in Subsection (d) of the regulation.

The operation of off-road construction equipment would also be subject to ARB's In-Use Off-road Diesel Vehicle regulation, which generally limits idling of off-road equipment to no more than five consecutive minutes, excluding equipment and activities for which idling is required (e.g., concrete mixing)[2].

Impact 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)?

The project area is currently designated nonattainment with respect to the state ozone, PM_{10}, and $PM_{2.5}$ standards, as well as the national 8-hour ozone and $PM_{2.5}$ standards. The project area is also designated a maintenance area for national CO standards.

The proposed project would not result in changes in vehicle operations (e.g., traffic volumes, vehicle speeds) on Golden Avenue or other area roadways. In addition, as noted in Impact AQ-2, short-term construction-generated emissions would not exceed SCAQMD-recommended significance thresholds. In accordance with SCAQMD-recommended methodologies for the evaluation of air quality impacts, projects that do not exceed project-specific thresholds would also be considered to have a less-than-significant cumulative contribution to regional air quality impacts. For these reasons, the proposed project would not result in a cumulatively considerable net increase of any criteria pollutant for which the project region is designated non-attainment or maintenance. This impact is considered less than significant. Refer to Impact AQ-2 for additional discussion of air quality impacts.

Impact AQ-4: Would the project result in the expose sensitive receptors to substantial pollutant concentrations?

Construction projects can result in short-term increases of TACs, as well as, emissions of airborne fugitive dust, which can result in localized air quality impacts. The SCAQMD has developed localized significance thresholds (LSTs) for the evaluation of short-term localized air quality impacts. The LSTs are based on the CAAQS, which have been established to provide a margin of safety regarding the protection of public health and welfare. As noted in Impact AQ-2, short-term construction-generated emissions would not exceed SCAQMD-recommended LSTs. This impact is considered less than significant. Refer to Impact AQ-2 for additional discussion of air quality impacts.

[2] Refer to the California Air Resources Board's website for additional information regarding idling restrictions for on-road and off-road vehicles (https://www.arb.ca.gov/msprog/ordiesel/guidance/writtenidlingguide.pdf).

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Impact AQ-5: Would the project create objectionable odors affecting a substantial number of people?

The occurrence and severity of odor impacts depends on numerous factors, including: the nature, frequency, and intensity of the source; wind speed and direction; and the sensitivity of the receptors. While offensive odors rarely cause any physical harm, they still can be very unpleasant, leading to considerable distress among the public and often generating citizen complaints to local governments and regulatory agencies.

The proposed project would not include the installation of any major sources of odors. However, construction of the proposed project would involve the use of a variety of gasoline or diesel-powered equipment that would emit exhaust fumes. Exhaust fumes, particularly diesel-exhaust, may be considered objectionable by some people. In addition, pavement coatings used during project construction would also emit temporary odors. However, construction-generated emissions would occur intermittently throughout the workday and would dissipate rapidly within increasing distance from the source. As a result, short-term construction activities would not expose a substantial number of people to frequent odorous emissions. This impact would be considered less than significant.

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GREENHOUSE GASES AND CLIMATE CHANGE

Summary of Existing Conditions

To fully understand global climate change, it is important to recognize the naturally occurring "greenhouse effect" and to define the greenhouse gases (GHGs) that contribute to this phenomenon. Various gases in the earth's atmosphere, classified as atmospheric GHGs, play a critical role in determining the earth's surface temperature. Solar radiation enters the earth's atmosphere from space and a portion of the radiation is absorbed by the earth's surface. The earth emits this radiation back toward space, but the properties of the radiation change from high-frequency solar radiation to lower-frequency infrared radiation. Greenhouse gases, which are transparent to solar radiation, are effective in absorbing infrared radiation. As a result, this radiation that otherwise would have escaped back into space is now retained, resulting in a warming of the atmosphere. This phenomenon is known as the greenhouse effect. Among the prominent GHGs contributing to the greenhouse effect are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Primary GHGs attributed to global climate change, are discussed, as follows (U.S. EPA 2016):

- **Carbon Dioxide**. Carbon dioxide (CO_2) is a colorless, odorless gas. CO_2 is emitted in a number of ways, both naturally and through human activities. The largest source of CO_2 emissions globally is the combustion of fossil fuels such as coal, oil, and gas in power plants, automobiles, industrial facilities, and other sources. A number of specialized industrial production processes and product uses such as mineral production, metal production, and the use of petroleum-based products can also lead to CO_2 emissions. The atmospheric lifetime of CO_2 is variable because it is so readily exchanged in the atmosphere.

- **Methane**. Methane (CH_4) is a colorless, odorless gas that is not flammable under most circumstances. CH_4 is the major component of natural gas, about 87% by volume. It is also formed and released to the atmosphere by biological processes occurring in anaerobic environments. Methane is emitted from a variety of both human-related and natural sources. Human-related sources include fossil fuel production, animal husbandry (enteric fermentation in livestock and manure management), rice cultivation, biomass burning, and waste management. These activities release significant quantities of methane to the atmosphere. Natural sources of methane include wetlands, gas hydrates, permafrost, termites, oceans, freshwater bodies, non-wetland soils, and other sources such as wildfires. Methane's atmospheric lifetime is about 12 years.

- **Nitrous Oxide**. Nitrous oxide (N_2O) is a clear, colorless gas with a slightly sweet odor. N_2O is produced by both natural and human-related sources. Primary human-related sources of N_2O are agricultural soil management, animal manure management, sewage treatment, mobile and stationary combustion of fossil fuels, adipic acid production, and nitric acid production. N_2O is also produced naturally from a wide variety of biological sources in soil and water, particularly microbial action in wet tropical forests. The atmospheric lifetime of N_2O is approximately 120 years.

- **Hydrofluorocarbons.** Hydrofluorocarbons (HFCs) are man-made chemicals, many of which have been developed as alternatives to ozone-depleting substances for industrial, commercial, and consumer products. The only significant emissions of HFCs before 1990 were of the chemical HFC-23, which is generated as a byproduct of the production of HCFC-22 (or Freon 22, used in air conditioning applications). The atmospheric lifetime for HFCs varies from just over a year for HFC-152a to 260 years for HFC-23. Most of the commercially

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used HFCs have atmospheric lifetimes of less than 15 years (e.g., HFC-134a, which is used in automobile air conditioning and refrigeration, has an atmospheric life of 14 years).

- **Perfluorocarbons.** Perfluorocarbons (PFCs) are colorless, highly dense, chemically inert, and nontoxic. There are seven PFC gases: perfluoromethane (CF_4), perfluoroethane (C_2F_6), perfluoropropane (C_3F_8), perfluorobutane (C_4F_{10}), perfluorocyclobutane (C_4F_8), perfluoropentane (C_5F_{12}), and perfluorohexane (C_6F1_4). Natural geological emissions have been responsible for the PFCs that have accumulated in the atmosphere in the past; however, the largest current source is aluminum production, which releases CF_4 and C_2F_6 as byproducts. The estimated atmospheric lifetimes for CF_4 and C_2F_6 are 50,000 and 10,000 years, respectively.

- **Nitrogen Trifluoride**. Nitrogen trifluoride (NF_3) is an inorganic, colorless, odorless, toxic, nonflammable gas used as an etchant in microelectronics. Nitrogen trifluoride is predominantly employed in the cleaning of the plasma-enhanced chemical vapor deposition chambers in the production of liquid crystal displays and silicon-based thin film solar cells. It has a global warming potential of 17,200 carbon dioxide equivalents (CO_2e). While NF_3 may have a lower global warming potential than other chemical etchants, it is still a potent GHG. In 2009, NF_3 was listed by California as a high global warming potential GHG to be listed and regulated under Assembly Bill (AB) 32 (Section 38505 Health and Safety Code).

- **Sulfur Hexafluoride**. Sulfur hexafluoride (SF_6) is an inorganic compound that is colorless, odorless, nontoxic, and generally nonflammable. SF_6 is primarily used as an electrical insulator in high voltage equipment. The electric power industry uses roughly 80% of all SF_6 produced worldwide. Leaks of SF_6 occur from aging equipment and during equipment maintenance and servicing. SF_6 has an atmospheric life of 3,200 years.

- **Black Carbon**. Black carbon is the most strongly light-absorbing component of particulate matter (PM) emitted from burning fuels such as coal, diesel, and biomass. Black carbon contributes to climate change both directly by absorbing sunlight and indirectly by depositing on snow and by interacting with clouds and affecting cloud formation. Black carbon is considered a short-lived species, which can vary spatially and, consequently, it is very difficult to quantify associated global-warming potentials. The main sources of black carbon in California are wildfires, off-road vehicles (locomotives, marine vessels, tractors, excavators, dozers, etc.), on-road vehicles (cars, trucks, and buses), fireplaces, agricultural waste burning, and prescribed burning (planned burns of forest or wildlands). California has been an international leader in reducing emissions of black carbon, with close to 95 percent control expected by 2020 due to existing programs that target reducing PM from diesel engines and burning activities.

Each GHG differs in its ability to absorb heat in the atmosphere based on the lifetime, or persistence, of the gas molecule in the atmosphere. For instance, Methane traps over 25 times more heat per molecule than CO_2, and N_2O absorbs roughly 298 times more heat per molecule than CO_2. To account for the global warming potential (GWP) of GHGs, estimates of GHGs are typically presented in carbon dioxide equivalents (CO_2e), which weights each gas by its GWP. Expressing GHG emissions in carbon dioxide equivalents takes the contribution of all GHG emissions to the greenhouse effect and converts them to a single unit equivalent to the effect that would occur if only CO_2 were being emitted. GHGs in this report are based on carbon dioxide equivalents expressed in metric tons ($MTCO_2e$).

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Effects of Global Climate Change

There are uncertainties as to exactly what the climate changes will be in various local areas of the earth. There are also uncertainties associated with the magnitude and timing of other consequences of a warmer planet: sea level rise, spread of certain diseases out of their usual geographic range, the effect on agricultural production, water supply, sustainability of ecosystems, increased strength and frequency of storms, extreme heat events, increased air pollution episodes, and the consequence of these effects on the economy.

In 2009, the California Natural Resources Agency prepared a report to the Governor entitled "2009 California Climate Adaptation Strategy." The report details the expected impacts of global warming in California. The sea level along California's coasts has risen nearly 8 inches in the past century and is projected to rise by as much as 20 to 55 inches by the end of the century. As sea levels rise, saltwater contamination of the State's delta and levee systems will increase. Saltwater contamination of the Sacramento/San Joaquin Delta will threaten wildlife and the source of drinking water for 20 million Californians. Farmland in low areas may also be harmed by salt-contaminated water. Climate change is also projected to result in earlier snowmelt in the Sierra Nevada and reduced snowpack. This snowpack is a principal supply of water for the state, providing roughly 50 percent of state's annual runoff. These changes may result in increased danger of floods during the winter months and adversely affect electricity generation from hydroelectric facilities. A changing climate may also impact agricultural crop yields, coastal structures, public health and biodiversity (CNRA 2009).

Environmental Impacts

Significance Threshold Criteria

According to Appendix G of the CEQA Guidelines, a project would normally have a significant effect on the environment if the project would:

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

At present time, SCAQMD has not yet adopted GHG thresholds for the assessment of project- or plan-level GHG impacts. The SCAQMD is considering a tiered approach to determine the significance of residential and commercial projects. The SCAQMD has also prepared draft thresholds, which were initially released in October 2008 with subsequent revisions to these draft thresholds released in November 2009. Based on the draft thresholds recommended, a project would be considered to have a potentially significant impact if emissions would exceed a screening threshold 3,000 $MTCO_2e$/year for residential and commercial development and 10,000 $MTCO_2e$/year for industrial uses. Projects that do not exceed these thresholds would be considered to have a less-than-significant impact on the environment and would not conflict with GHG-reduction planning efforts.

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Methodology

Construction-generated emissions were quantified using the CalEEMod, version 2016.3.1 computer program. Off-road equipment, quantities of material to be imported and exported, and construction activity schedules were based on information provided by the project engineer. All other modeling assumptions, including vehicle trip distances, emission factors, and equipment usage factors, were based on CalEEMod defaults for Orange County. Modeling assumptions and results are included in Appendix A of this report.

Impacts and Mitigation Measures

Impact GHG-1: ***Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment; or, conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions?***

The proposed project would not result in changes in vehicle operations (e.g., traffic volumes, vehicle speeds) on Golden Avenue or other area roadways. As a result, the proposed project would not result in long-term increases of GHG emissions.

Short-term annual GHG emissions for the proposed project are summarized in Table 4. Based on the modeling conducted, construction of the proposed project would generate a total approximately 98.2 $MTCO_2e$. There would also be a small amount of GHG emissions from waste generated during construction; however, this amount is speculative. Construction-generated GHG emissions would be well below the significance threshold of 3,000 $MTCO_2e$. For this reason, and because project-generated emissions would be temporary, the proposed project would not result in a significant impact on the environment, nor conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions.

Table 4. Short-Term Construction-Generated GHG Emissions

Year	GHG Emissions ($MTCO_2e$)
Site Preparation/Grubbing	6.7
Grading/Excavation/Bridge Demolition	17.6
Bridge Construction/Drainage Improvements/Utilities/Subgrade/Retaining Walls	73.9
Paving	6.8
Total:	98.2

Based on CalEEMod computer modeling. Amortized emissions assume an average project life of 30 years. Refer to Appendix A for modeling results and assumptions.

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APPENDIX A

Emissions Modeling